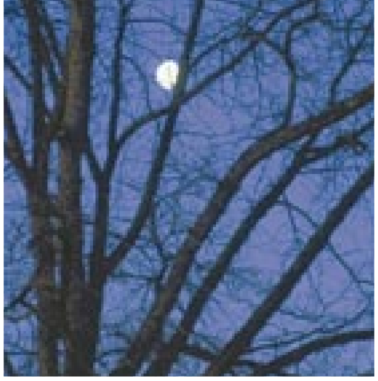
Threatened and Endangered Species Habitat Management Plan Overview



BACK TO TES/HMP HOME PAGE

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Cover Photographs: Teralene S. Foxx and Stock Photos

Contributing Personnel

M. Diana Webb, Group Leader, Ecology Group
Teralene S. Foxx, Project Manager
John D. Huchton, Acting Deputy Group Leader, Ecology Group
Carey M. Bare, Environmental Planner
Leslie A. Hansen, Wildlife Biologist
Timothy K. Haarmann, Ecologist
Kathryn D. Bennett, Ecologist, Geographic Information System Specialist
David C. Keller, Ornithologist
Steven W. Koch, Ecologist
H. Todd Haagenstad, Ecologist
Gilbert J. Gonzales, Ecologist
Anthony F. Gallegos, Radioecologist
James R. Biggs, Wildlife Biologist
Mary A. Mullen, Bio Statistician
Randy G. Balice, Plant Ecologist
New Mexico Natural Heritage Program, University of New Mexico
Biological Research Division of the United States Geologic Survey
Earth Data Analysis Center, University of New Mexico
Biology Department, University of New Mexico
Science Applications International Corporation
Terrell H. Johnson, Consulting Ornithologist
Hector A. Hinojosa, Editing
L. Kim Nguyen Gunderson, Graphic Design and Layout
Guadalupe D. Archuleta, Printing Coordinator

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CONTENTS

We do not weave the web of life;
We are merely a strand in it.
What ever we do to the web,
We do to ourselves. . . . . .

–Chief Seattle

Introduction

The relative isolation and undisturbed natural setting of much of Los Alamos National Laboratory (LANL) make this facility ideally suited for its defense-related mission. These factors, combined with limited public access, also have resulted in the preservation of habitat that can sustain a number of species receiving federal protection under the Endangered Species Act (ESA). The Threatened and Endangered Species Habitat Management Plan (HMP) at LANL—which covers all of the lands within LANL's boundaries—was developed over a three-year period with the dual intent of providing protection for threatened or endangered species that may reside on or use LANL property as well as facilitating the implementation of the Department of Energy's (DOE) mission at LANL. The procedures and strategies outlined in the HMP provide the basis for the sound management of these species while allowing LANL's programs to proceed in an efficient and cost-effective manner.

This document provides an overview of the HMP, including

- Regulatory requirements and reviews that led to its development;
- Existing conditions at LANL that gave rise to the need for an HMP;
- Goals, objectives, and implementing strategies;
- HMP components;
- A summary of roles and responsibilities of key organizations involved in implementing the HMP;
- Long-term activities required to implement the HMP;
- Methods for modifying the HMP; and
- Methods for tracking the success of the plan and for implementing corrective actions where needed.

Section 3 of the ESA defines

- endangered species as any species which is in danger of extinction throughout all or a significant portion of its range,

- threatened species as any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, and

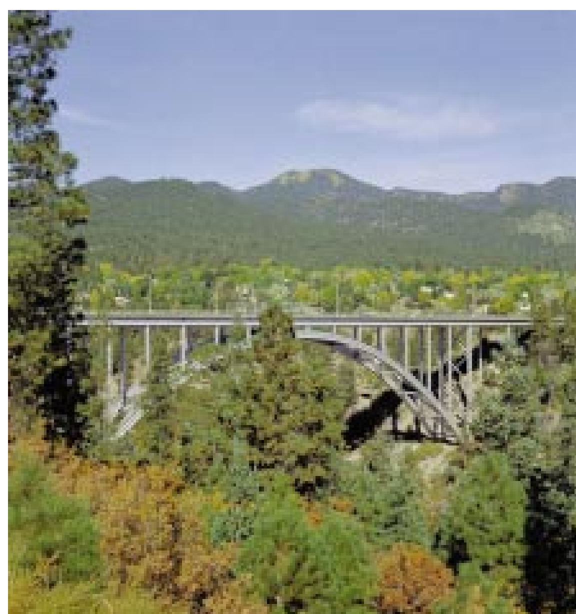
- candidate species as species that are being investigated for listing.

Why Develop the Habitat Management Plan?

In the past, natural resources at LANL were not managed actively. Decisions regarding the locations for new development and upgrades to existing development were based on engineering and programmatic criteria on a project-by-project basis. The perimeter areas and other undeveloped areas were designated simply as unmanaged buffers. In recent years, however, LANL managers have become increasingly aware of the need for proactive management of the natural environments under their jurisdiction. This approach stems not only from an appreciation of the role that diverse natural environments and biota play in enhancing the quality of life for both LANL employees and nearby residents, but also from federal laws and regulations requiring that specific natural resources at LANL be managed to meet certain objectives and criteria. The primary federal environmental laws and regulations that affect activities at LANL are described in the accompanying tables.

The two federal acts that have the most direct bearing on the development of the HMP are the National Environmental Policy Act (NEPA) and the ESA. In accordance with NEPA requirements, DOE published a final Environmental Impact Statement (EIS) on LANL's Dual Axis Radiographic Hydrodynamic Test (DARHT) facility in August of 1995 (DOE/AOO-LAAO 1995). The final EIS identified and discussed measures that would mitigate potential adverse effects resulting from the various alternatives evaluated in the draft EIS. Among these measures was the commitment of DOE to develop a habitat management plan for all threatened and endangered species occurring at LANL. The plan would be used to determine long-range mitigation actions to protect the habitat of these species. The EIS contained additional mitigation measures for protecting the nesting habitat of the Mexican spotted owl and other selected species; it also recommended the collection of baseline data to document the presence of contaminants that could adversely affect these species.

DOE issued a Record of Decision (ROD) on the DARHT project on October 10, 1995, which was published in the Federal Register on October 16, 1995 (60 FR 53588). The ROD commits DOE to the implementation of the mitigation measures described above and added that the habitat management plan must be completed within three years from the date of the ROD and updated as necessary. Each of the measures is restated in the mitigation action plan prepared for the DARHT project (DOE/AOO-LAAO 1996).



This HMP was prepared to fulfill the requirements of the ROD. The mitigation measures for threatened and endangered species are included in the HMP as part of the Area of Environmental Interest (AEI) Site Plans and Monitoring Plans, which are described in subsequent sections.

The HMP also complies with the provisions of the ESA. It fulfills the requirements that federal agencies carry out programs for the conservation of threatened and endangered species and ensure that their actions are not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of habitat determined to be critical to the species. It has the added advantage of streamlining the review process for new projects by identifying actions that can occur without triggering the need for a Biological Assessment. Before the existence of the HMP, all LANL projects and activities were reviewed individually for compliance with the ESA. For actions that are outside of the range of activities addressed in this HMP, DOE, in consultation with LANL contractor biologists will follow established procedures for determining whether a Biological Assessment is required.

The policies associated with the National Environmental Research Park (NERP) at LANL also serve as a source of guidance for the HMP. LANL was established as a NERP in 1976 by the DOE, with the goal of contributing to the understanding of how humans can best live in balance with nature, while enjoying the benefits of technology. This is accomplished by an integrated scientific approach for evaluation of the environmental significance of stressors to the environment and the mitigation of possible effects from these stressors.

Summary of General Federal Environmental Laws Governing LANL

Federal Law	What It Does
Resource Conservation and Recovery Act (RCRA) and its Hazardous and Solid Waste Amendments	Regulates hazardous waste from generation to disposal and mandates reduction in the amount of hazardous waste produced.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	Establishes requirements for environmental restoration and outlines appropriate responses to hazardous substance releases to the environment.
Toxic Substances Control Act (TSCA)	Regulates the use, storage, handling, and disposal of polychlorinated biphenyls (PCBs).
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	Regulates the manufacture, handling, application, and disposal of pesticides.
Clean Air Act	Regulates both radioactive and nonradioactive air emissions.
Clean Water Act	Protects the chemical, physical, and biological integrity of the nation's waters and requires permits that establish specific criteria for effluent discharges.
Safe Drinking Water Act	Requires routine water sample monitoring to determine the levels of microbiological organisms, organic and inorganic chemicals, and radioactivity in drinking water.
National Environmental Policy Act (NEPA)	Requires federal agencies to consider the environmental impact of their activities—including the impact on cultural resources; endangered, threatened, or sensitive species; and floodplains or wetlands—before deciding to proceed with those activities.

Summary of Federal Laws and Executive Orders Regulating Biological Resources at LANL

Federal Law/Executive Order	What It Does
Endangered Species Act (ESA)	Protects proposed and listed threatened or endangered species. Section 7 of the ESA directs federal agencies, such as the DOE, to use their authorities to carry out programs for the conservation of endangered and threatened species. Specifically, federal agencies must ensure that their actions are not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of habitat determined by the Secretary of the Interior to be critical to the species. Formal consultation with the U.S. Fish and Wildlife Service (USFWS) is required for federal projects and all other projects that require federal permits where such actions could directly or indirectly affect any proposed or listed species. As part of consultation, Biological Assessments used to determine if agency actions may affect a listed or proposed species are submitted to the USFWS. The ESA also prohibits the importing, exporting, or taking of threatened or endangered species, their possession or sale, or the violation of any regulation pertaining to them. Civil and criminal penalties may be levied for violating these prohibitions or any other provision of the ESA.
Migratory Bird Treaty Act	Protects all migratory birds by limiting the transportation, importation, killing, or possession of those birds.
Executive Order 11990, Protection of Wetlands	Requires that governmental agencies, in carrying out their responsibilities, provide leadership and take actions to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.
Executive Order 11988, Floodplain Management	Requires that governmental agencies, in carrying out their responsibilities, provide leadership and take action to restore and preserve the natural and beneficial values served by floodplains.
Fish and Wildlife Coordination Act	Requires consultation with the USFWS and the state agency responsible for fish and wildlife management whenever a federal project would impound, divert, or otherwise control or modify a body of water.
Fish and Wildlife Conservation Act	Promotes state programs to conserve, restore, and benefit non-game fish and wildlife and their habitat.
Bald Eagle and Golden Eagle Protection Act	Addresses the protection of bald and golden eagles with criminal penalties for their disturbance.

Location and Surrounding Land Uses

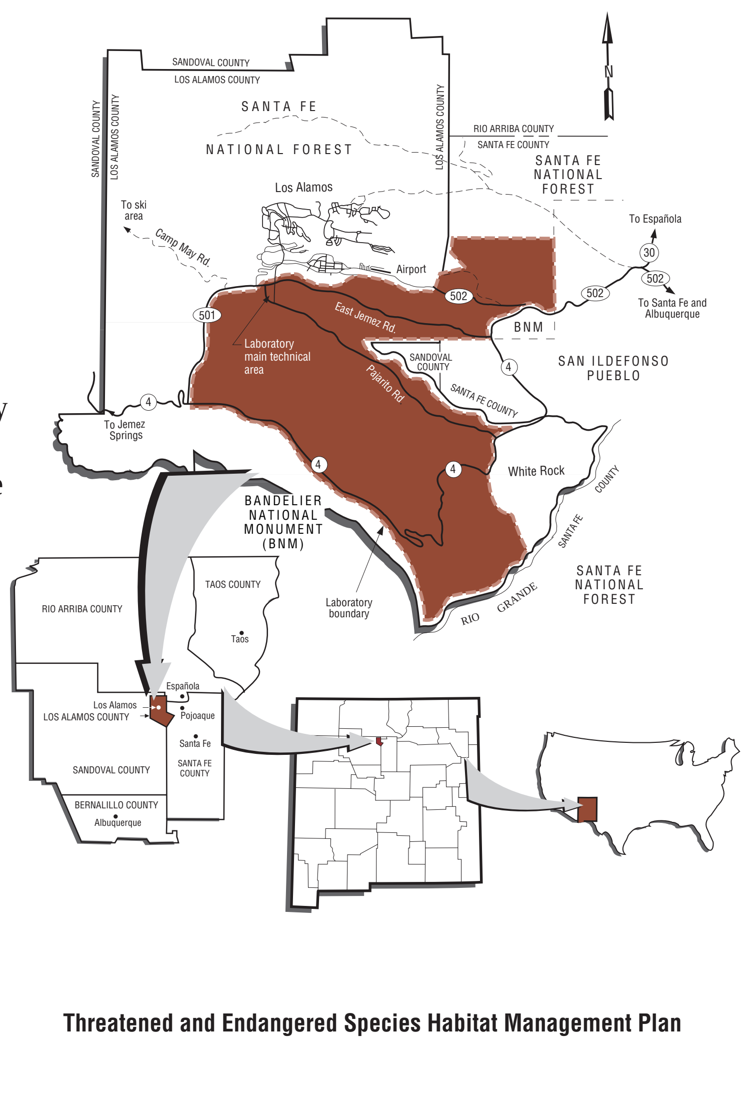
LANL is located on the eastern slopes of the Jemez Mountains, approximately 80 miles north of Albuquerque and 25 miles northwest of Santa Fe. Much of the area surrounding LANL is under the jurisdiction of Los Alamos County, although a substantial area to the north and west is under the management of the U.S. Forest Service. LANL is bordered on the east by the Pueblo of San Ildefonso and on the south by Bandelier National Monument. Two populated areas, Los Alamos townsite and White Rock townsite, are adjacent to LANL on the north and southeast, respectively. Most of the land surrounding the facility is undeveloped, although some ranching and light farming occurs. In recent years, land management agencies have developed increasingly effective mechanisms for interagency coordination and collaboration in order to facilitate managing the large tracts of undeveloped land surrounding LANL.

Historical Background

LANL has been in existence since 1943. Administered by the DOE with the University of California serving as the management and operations contractor, its primary missions are to conduct nuclear weapons research and development for the DOE and to reduce nuclear danger. Before 1943, much of the area that is now developed with LANL facilities was homesteaded or logged, and the tendency to develop facilities in previously cleared areas generally has persisted to the present. As a result, LANL consists of a mosaic of developed land and undeveloped land with a variety of naturally occurring plant communities.

General Environmental Setting

A wide variety of natural environments are found within the 43 square miles that comprise LANL. The facility contains three major vegetational zones (juniper savanna, piñon-juniper woodland, and ponderosa pine forest) in addition to several types of localized or unique habitats, such as wetlands and cliffs. The higher mountains to the west of LANL are vegetated primarily by mixed conifer forests and spruce-fir forests. These diverse habitats provide food and shelter for a wide variety of animal species, as well as opportunities for a variety of recreational activities.



LANL's varied topography is one of the reasons for its diverse habitats. The facility ranges in elevation from approximately 5350 ft at the bottom of White Rock Canyon—where flows the Rio Grande—to 7820 feet at its western border, which also marks the western limit of the Pajarito Plateau.

The local climatic conditions also are strongly influenced by the steep elevation change from the Rio Grande to the peaks of the Jemez Mountains. At the lowest elevations in White Rock Canyon, the climate is arid continental. Throughout the rest of the region, the climate is temperate, semiarid continental. There is a corresponding shift in air temperature and moisture content, from warm and dry at the lower elevations to relatively cool and moist in the mountains. The Los Alamos region, along with much of New Mexico and Arizona, receives much of its annual precipitation during the summer months. During the winter months in the Los Alamos region, most of the precipitation is snow.

Although the regional increase in elevation from the Rio Grande westward to the crest of the Jemez Mountains is a major reason for LANL's environmental diversity, it is not the only reason. For example, localized topographic features are complex. White Rock Canyon is a rugged chasm that is approximately one mile wide and extends to a depth of nearly 900 feet. Additionally, the surface of the Pajarito Plateau is dissected into narrow mesas by a series of east-west trending canyons. To the west of the plateau, these canyons continue to the higher elevations of the Jemez Mountains.

Surface water in the Los Alamos region consists primarily of one river, the Rio Grande, and several intermittent streams. Perennial springs supply base flow into the upper reaches of some canyons, but the volume is insufficient, in the face of evaporation and infiltration, to maintain surface flow across LANL to the Rio Grande. In some drainages, increased stream runoff from thunderstorms and snowmelt reaches the Rio Grande several times a year. Additionally, the flow levels within segments of some intermittent streams are augmented by treated discharge from sanitary sewage and industrial waste treatment facilities.

Ground water in the Los Alamos region is stratified as (1) alluvial water, (2) perched water, and (3) water contained in a deeper, main aquifer. The latter provides the major source of water for domestic and industrial uses in the Los Alamos region. The main aquifer is also the source of permanently flowing springs that emanate near the Rio Grande in White Rock Canyon.


Chaquehui Canyon

Threatened and Endangered Species

Three types of species are addressed under the ESA: those that are proposed for listing, those that are listed as threatened, and those that are listed as endangered. No proposed species are known to occur in Los Alamos County. Habitat exists for two threatened species, the bald eagle and Mexican spotted owl, as well as for two endangered species, the American peregrine falcon and southwestern willow flycatcher. The habitat requirements for occupancy by the endangered black-footed ferret, Arctic peregrine falcon, and whooping crane are not completely met at LANL, but these species will be monitored because they could potentially occur on the property. The following species are addressed under the HMP.

Species	Status
Mexican Spotted Owl *(Strix occidentalis lucida)*	Threatened
Bald Eagle *(Haliaeetus leucocephalus)*	Threatened
Southwestern Willow Flycatcher *(Empidonax traillii extimus)*	Endangered
Whooping Crane *(Grus americana)*	Endangered (Experimental)
American Peregrine Falcon *(Falco peregrinus anatum)*	Endangered
Arctic Peregrine Falcon *(Falco peregrinus tundrius)*	Endangered (Similarity of Appearance)
Black-Footed Ferret *(Mustela nigripes)*	Endangered

Mexican spotted owl *(Strix occidentalis lucida)*

The Mexican spotted owl can be found in most of the mountain ranges of New Mexico and Arizona and in portions of Colorado, Utah, Texas, and northern Mexico. Spotted owls occupy mixed conifer forests or ponderosa pine forests that are intermixed with firs and oaks. Home ranges for a pair of nesting owls vary from approximately 1000 ac in canyon habitats, to 2800 ac in mixed conifer forests, and 3800 ac in pine-oak forests.

In the LANL region, the Mexican spotted owl is a year-round resident of forested areas. The owls nest in canyons vegetated by mixed conifer forests. Nesting usually begins in late March or early April (Travis 1992). The owls forage in adjacent areas that are vegetated by a variety of community types, including open grasslands, ponderosa pine forests, and piñon-juniper woodlands. Most individual owls and pairs of owls remain in their summer territory throughout the year; however, some individuals move to lower elevations during winter months, and about 10 percent travel as far as 35 miles from the nesting area.

The reproductive success of Mexican spotted owls that nest in the LANL region has been good to excellent. One pair of owls on LANL property has fledged two chicks per year for the last four years. Successful nests also have been maintained in Los Alamos County, at Bandelier National Monument, and elsewhere in the Jemez Mountains (Bennett 1995).

Bald eagle
(Haliaeetus leucocephalus)

The historic range of the bald eagle extended across much of North America; eagles are usually found near water where they can find fish, their favorite food (Clark and Wheeler 1987). Both the range and population of bald eagles have declined drastically in recent decades, however. The primary cause for the decline is the ingestion of prey containing DDT and other persistent pesticides, which results in thinning of the eggshells and consequent reproductive failure. Habitat modification, reduction in prey availability, and hunting may have been contributing factors to this decline. Some populations have recovered in recent years.

In New Mexico, the bald eagle is primarily a winter inhabitant in the San Juan, upper Rio Grande, Pecos, Canadian, San Francisco, Chama, Gila, and Estancia valleys (Hubbard 1985). On average, about 430 eagles per year winter in these areas, and up to 100 individuals may gather at a single communal roosting site. Bald eagles also occur sporadically in New Mexico during the summer months.

In the LANL region, bald eagles roost throughout much of White Rock Canyon from November until late March or mid-April. Since 1979, these wintering populations have doubled in size and have extended their occupancy from the Cochiti Lake area upriver to include most of the Rio Grande in White Rock Canyon. In particular, they have been commonly observed at roost sites near Water and Chaquehui Canyons (Keller et al. 1996).

American peregrine falcon
(Falco peregrinus anatum)

Historically, the American peregrine falcon nested over much of North America, between the Arctic tundra and north-central Mexico, and wintered as far south as the Caribbean and South America. Populations declined drastically because of increased use of DDT and other pesticides, and this species continues only in scattered areas across its historic range. With the elimination of DDT in the 1970s, however, breeding populations of peregrine falcons have largely stabilized and even increased in some areas. In New Mexico, peregrine falcons are rare to uncommon residents of montane areas from May to late August. During migration and the winter, they may be present throughout the state.

The breeding territories of peregrine falcons center on cliffs that are in wooded or forested regions. All of Los Alamos County is within the foraging range of identified suitable nesting habitat. Peregrines range widely during foraging. They take virtually all of their prey on the wing, typically after a swoop or dive from above. Prey consists almost entirely of birds, most typically jays, woodpeckers, swifts, mourning doves, and pigeons.

Several peregrine falcon nesting areas are located in the LANL region. Production at these nesting sites has been similar to the state as a whole. One nesting area has been occupied each year since 1994, and at least four young were fledged during this period.

In 1998, the USFWS has proposed the delisting of the Peregrine Falcon.

Artic peregrine falcon
(Falco peregrinus tundrius)

The Arctic peregrine falcon breeds in the Arctic tundra and inhabits coastlines and mountains from Florida to South America in winter. In New Mexico it is considered a rare migrant, having been verified only in the Roswell area. It is slightly smaller and paler than the American peregrine falcon, although the two are difficult to distinguish except on close examination. Because of the similarity in appearance between these two subspecies, the Arctic peregrine falcon has been granted protection as an endangered species under the ESA.

Southwestern willow flycatcher *(Empidonax traillii extimus)*

The southwestern willow flycatcher breeds in riparian habitats from southern California to Arizona and New Mexico, extending northward to southern Utah and Nevada. It may also be found in southwest Colorado and western Texas. The songbird is found in the United States from May until September. It winters in southern Mexico, Central America, and northern South America.

During migration, southwestern willow flycatchers occur throughout their range. However, to complete their breeding cycle, from May until September, they require riparian habitats. These are characterized by dense stands of willows, tamarisk, buttonbush, and other riparian shrubs with open canopies of cottonwoods. The USFWS has identified habitat that is critical for the survival of the southwestern willow flycatcher, but the closest example of this critical habitat is restricted to the Gila and San Francisco rivers in southwest New Mexico.

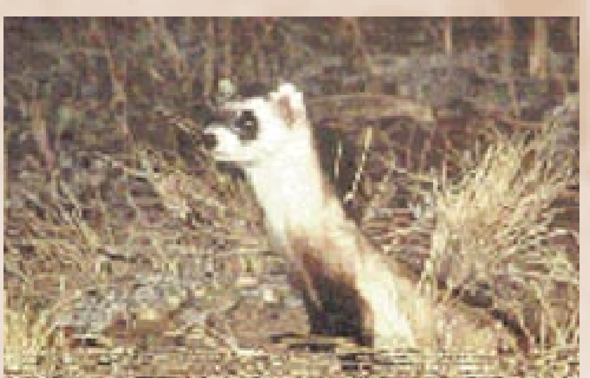
The breeding populations of southwestern willow flycatchers have been reduced by the loss of their preferred riparian habitats and by nest parasitism. Census data collected since the late 1980s indicate that only 300 to 500 breeding pairs remain. Many nesting groups have continued to decline, and some groups have had all of their nests parasitized by cowbirds. The breeding success of this species is also reduced by excessive cattle grazing and other physical disturbances to their riparian habitats. The breeding population in New Mexico is estimated to be about 100 pairs, and overall numbers have declined throughout much of the Rio Grande Valley. Seventy-five percent of these pairs occur in one localized area.

In the Los Alamos region, southwestern willow flycatchers have been observed in Bandelier National Monument, but there has been no indication that they have successfully nested there. The nearest known nest site is along the Rio Grande near Española, upstream from LANL. Willow flycatchers occasionally have been observed in White Rock Canyon, and one sighting of a migrating individual occurred on LANL property in the wetlands of Pajarito Canyon.

Black-footed ferret *(Mustela nigripes)*

The black-footed ferret was once widely distributed between Saskatchewan, Canada and Arizona, New Mexico, and Texas, where it lived in close association with prairie dog colonies (Findley 1987). It is now considered to be the rarest mammal in North America, and the only known populations were introduced into Wyoming, Montana, and South Dakota (Finch 1992). In New Mexico, if any animals survive, they would most likely occur in the northwestern part of the state. The most recent reliable sightings come from Valencia, McKinley, Los Alamos, and Curry counties (Hubbard et al. 1979). However, the last confirmed sighting was in 1934.

Little is known about the habits, home ranges, and other behavior patterns of black-footed ferrets (Findley 1987). Apparently, they are permanent residents of prairie dog towns where they feed primarily on prairie dogs and ground squirrels. They may also feed on other small to medium-sized mammals. Within the LANL region, the nearest prairie dog colony is in the vicinity of Española and Pojoaque.



Whooping crane *(Grus americana)*

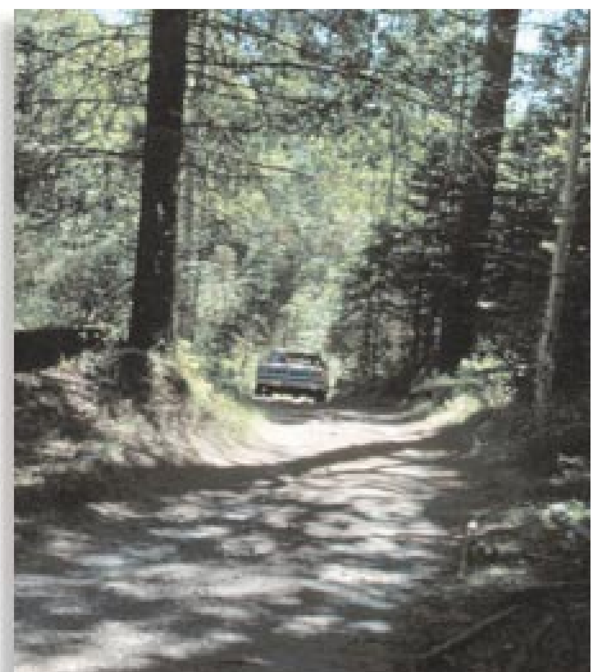
This species once was fairly widespread in North America, but the population declined to 21 birds in 1941 (Lewis 1995). Since that time, the population has increased to 153 individuals. Excessive hunting and conversion of prairie wetlands to croplands contributed to the decline of this species (Finch 1992).

A population was established in 1975 with sandhill cranes as foster parents at Grays Lake National Wildlife Refuge in Idaho (Hubbard 1985). Both cranes migrate together to the Rio Grande Valley in southern New Mexico. The whooping crane population had a maximum of 35 birds (Lewis 1995), but since pairing and reproduction among the whooping cranes never occurred, the experimental population dwindled to three individuals in 1997.

During fall and spring migration, the whooping cranes follow the Rio Grande through northern and central New Mexico. The cranes roost on sandbars along the way, including those in White Rock Canyon and the upper sections of Cochiti Reservoir. This is the only known time period when whooping cranes might occur on or near LANL.

Potential Sources of Disturbance

A number of activities at LANL have the potential to adversely impact threatened and endangered species. Many of the industrial processes used at LANL have involved hazardous and radioactive materials. During World War II and for a while thereafter, some of these materials were disposed of on LANL property or were otherwise released into the environment. More than 2500 potential release sites have been identified at the facility, ranging in size from several square feet or smaller to several acres. These sites include past disposal sites as well as areas where accidental spills of hazardous materials have been reported and areas suspected of past disposal or association with potentially hazardous materials. Congress has enacted a variety of laws and regulations to protect the environment since the 1970s. In accordance with this legislation, LANL has conducted surveys to determine the presence of hazardous and radioactive wastes and has begun to remediate sites where such materials are found to exist. Many sites still remain, however.



Hazardous and radioactive materials may disturb or reduce the population viability of threatened and endangered species; however, these are not the only potential sources of disturbance at LANL. Habitat destruction or fragmentation resulting from soil erosion, forest fires, fire management practices, or the development of new facilities and infrastructure can also have an adverse effect on the well-being of plants and animals, as can light and noise resulting from construction activities or laboratory operations.

The HMP specifically addresses these potential sources of disturbance to threatened and endangered species. It contains specific measures—described below under Components of the Habitat Management Plan—that address impacts from hazardous and radioactive materials through the monitoring of contaminants in biota and through ecological risk models and determinations. It also describes allowable activities that can be conducted in environmentally sensitive areas without adversely impacting the species considered in this HMP.

Goals and Objectives of the Habitat Management Plan

Goals and objectives were defined in the early stages of HMP preparation in order to give clear direction to plan development. In addition, specific strategies for implementing these goals and objectives were developed. These are outlined below.

Goal 1

Develop a comprehensive management plan that protects undeveloped portions of LANL that are suitable or potentially suitable habitat for threatened and endangered species, while allowing current operations to continue and future development to occur with a minimum of project or operational delays or additional costs related to protecting species or their habitats.

- Objective: Provide facility and project managers with a process that enables them to plan operations and facilities effectively, while minimizing impacts to threatened and endangered species.

    Strategy: Develop an application for planning and review of proposed projects, operations, or facilities for both short- and long-term planning timeframes.

- Objective: Minimize project costs and delays by reducing the need to engage in the USFWS consultation process on new projects.

    Strategy: Develop a strategy to consult with the USFWS on groupings of activities commonly conducted, so that individual agency consultations on individual projects will be reduced.

    Strategy: Develop strategies to help facility planners and managers avoid or mitigate activities that may affect threatened and endangered species.

Goal 2

Facilitate DOE compliance with the ESA and related federal regulations by protecting and aiding in the recovery of threatened and endangered species.

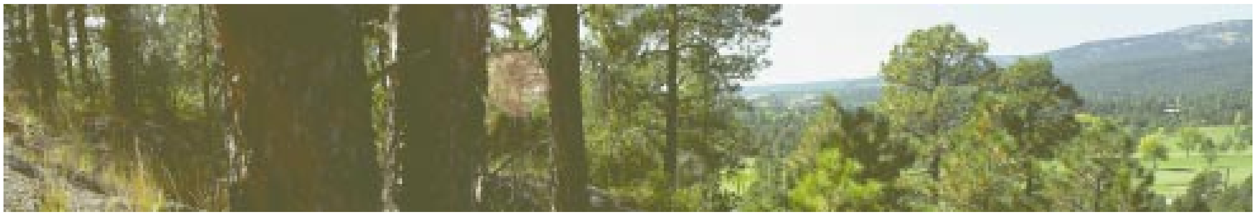
- Objective: By October 10, 1998, fulfill the requirements of the DAHRT facility mitigation action plan that are related to completion of the HMP.

    Strategy: Milestones will be developed and an annual review conducted so that the planning activities remain on schedule and results are reviewed and found acceptable.

- Objective: Develop tools for more timely, accurate, and defensible assessments of impacts and cumulative effects and aid in species recovery in compliance with Section 7 of the ESA.

    Strategy: Develop a land cover map so that habitats of species can be delineated and essential elements of those habitats protected.

    Strategy: Review approaches taken by other DOE and Department of Defense facilities that may be applicable at LANL.



Strategy: Develop tools, such as survey methods and habitat evaluation models, to understand where and how threatened or endangered species are found on LANL.

Strategy: Obtain training to understand the full extent of ESA Section 7 requirements.

Goal 3

Promote good environmental stewardship by monitoring and managing threatened and endangered species and their habitats using sound scientific principles.

- Objective: Develop monitoring plans, conduct surveys, and collect data on threatened and endangered species.

    Strategy: Personnel will become certified in accepted protocols for specific species, obtain federal permits, and conduct appropriate surveys on an annual basis. Use the expertise both within LANL and within New Mexico for species that are threatened or endangered.

    Strategy: Report the status of habitat occupancy to appropriate organizations within and outside of DOE, including University of California management and USFWS.

- Objective: Develop and maintain a system for effective data management and analysis that is timely, accurate, and easy to use.

    Strategy: Centralize all previously collected and new data into a geographic information system (GIS) where it can be easily accessed for the purposes of mapping, displaying, and analyzing. This includes data on threatened or endangered species, as well as species that may be prey or part of the food chain for a threatened or endangered species.

    Strategy: Develop protocols to maintain the data management system so that it is timely, accurate, and easy to use.

    Strategy: Develop consistent standards for nomenclature, data entry, and data storage.

- Objective: Develop and implement management plans for species and their habitats.

    Strategy: Prepare monitoring plans that will establish the breeding and rearing seasons and population levels of species, as well as methods for long-term monitoring and management.

The HMP consists of two components in addition to this overview document: Area of Environmental Interest (AEI) Site Plans and Monitoring Plans. The AEI Site Plans establish species-specific restrictions and criteria for planning and implementing projects and activities at LANL. The Monitoring Plans provide the technical basis for conducting the species-specific research and activities necessary for maintaining the HMP's technical viability. The Monitoring Plans also provide the technical basis and justification for future studies associated with the HMP. These elements are tightly integrated to ensure that the short- and long-term implementation of the plan is functional, effective, and accurate. Each component is described below.

Area of Environmental Interest Site Plans

What Are AEIs?

AEIs are areas within LANL that are being managed and protected because of their significance to biological or other resources. Habitats of threatened and endangered species that occur or may occur at LANL are designated as AEIs. In general, a threatened and endangered species AEI consists of a core area that contains important breeding or wintering habitat for a specific species and a buffer area around the core area. The buffer protects the area from disturbances that would degrade the value of the core area to the species. The exact form and size of an AEI differs from species to species.

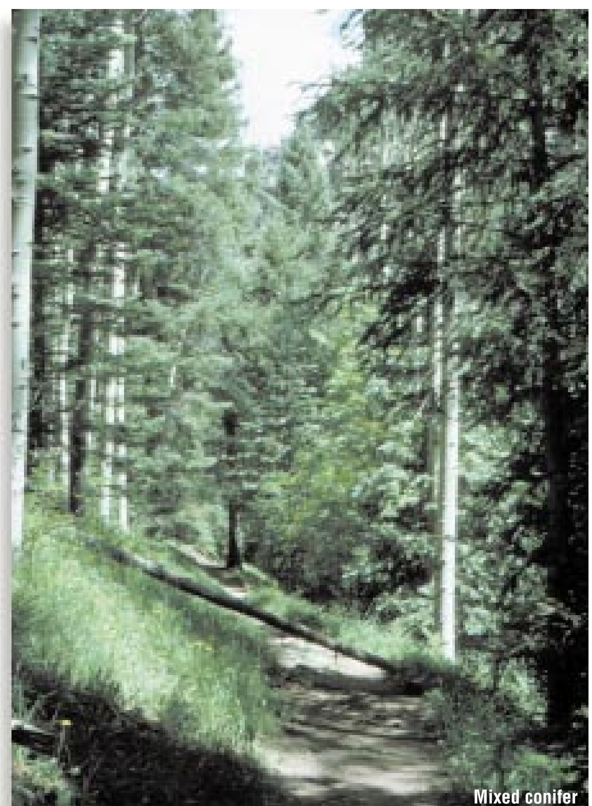
How Were the AEIs Defined?

The core AEIs are defined geographically based on habitat requirements of the threatened and endangered species. Core zones of potential (suitable) habitat were defined after a multi-step process that included a literature review, development of a land cover map, species surveys, data and technical reviews from regional species experts, guidance from state and federal regulatory agencies, and modeling habitat components to define the most suitable habitat.

The literature review was considered essential to understanding the habitat requirements of threatened and endangered species. A systematic search is conducted to find published data that can be used to help determine which habitat components are important to these species. Knowledge of the land cover types is fundamental to determining areas of habitat suitability. A basic land cover map for LANL identifying areas of dominant vegetation was therefore developed using satellite imagery. The satellite image was classified into eight land cover types. Land cover types used by the threatened and endangered species can then be mapped to develop a very general habitat suitability map.

The general habitat suitability map and information from regional and LANL species experts were used to identify areas to survey for the presence of threatened and endangered species or to measure additional habitat components for the currently identified threatened and endangered species. Information from these surveys fed back into the general habitat suitability map, refining areas of potential habitat. For peregrine falcon, regional species experts had already identified the habitats, and interagency agreements were in place for the management of those habitats. In these situations, the habitats were directly incorporated into the threatened and endangered species habitat suitability map. Similar steps would be taken for newly listed species in the future.

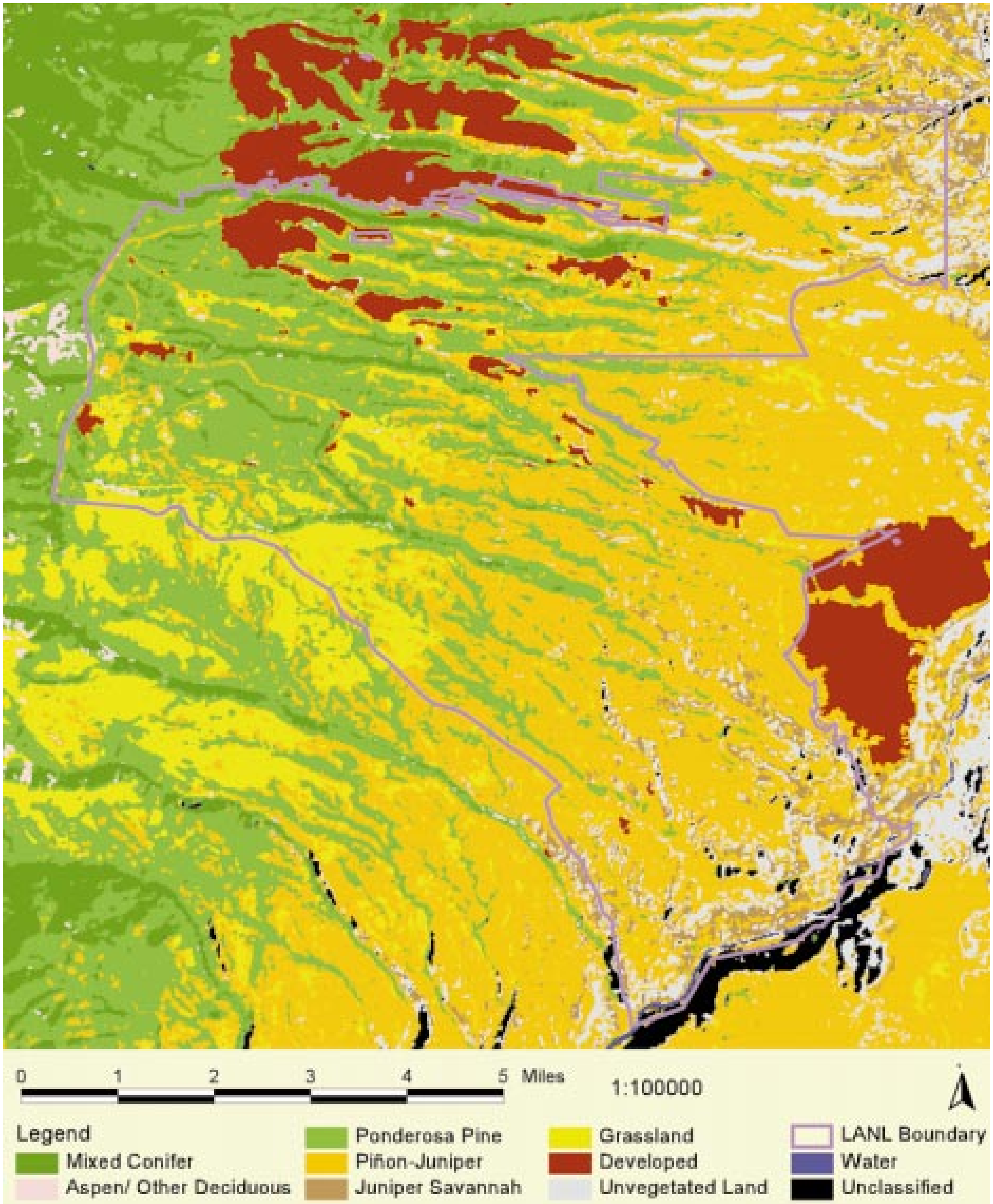
For some species, habitat components could be mapped on a regional basis, and species models were used to identify areas of high habitat suitability. For example, a topographical model coupled with land cover data was used to identify areas of suitable habitat for Mexican spotted owls (Johnson 1996). Areas of high suitability were incorporated into the habitat suitability map.

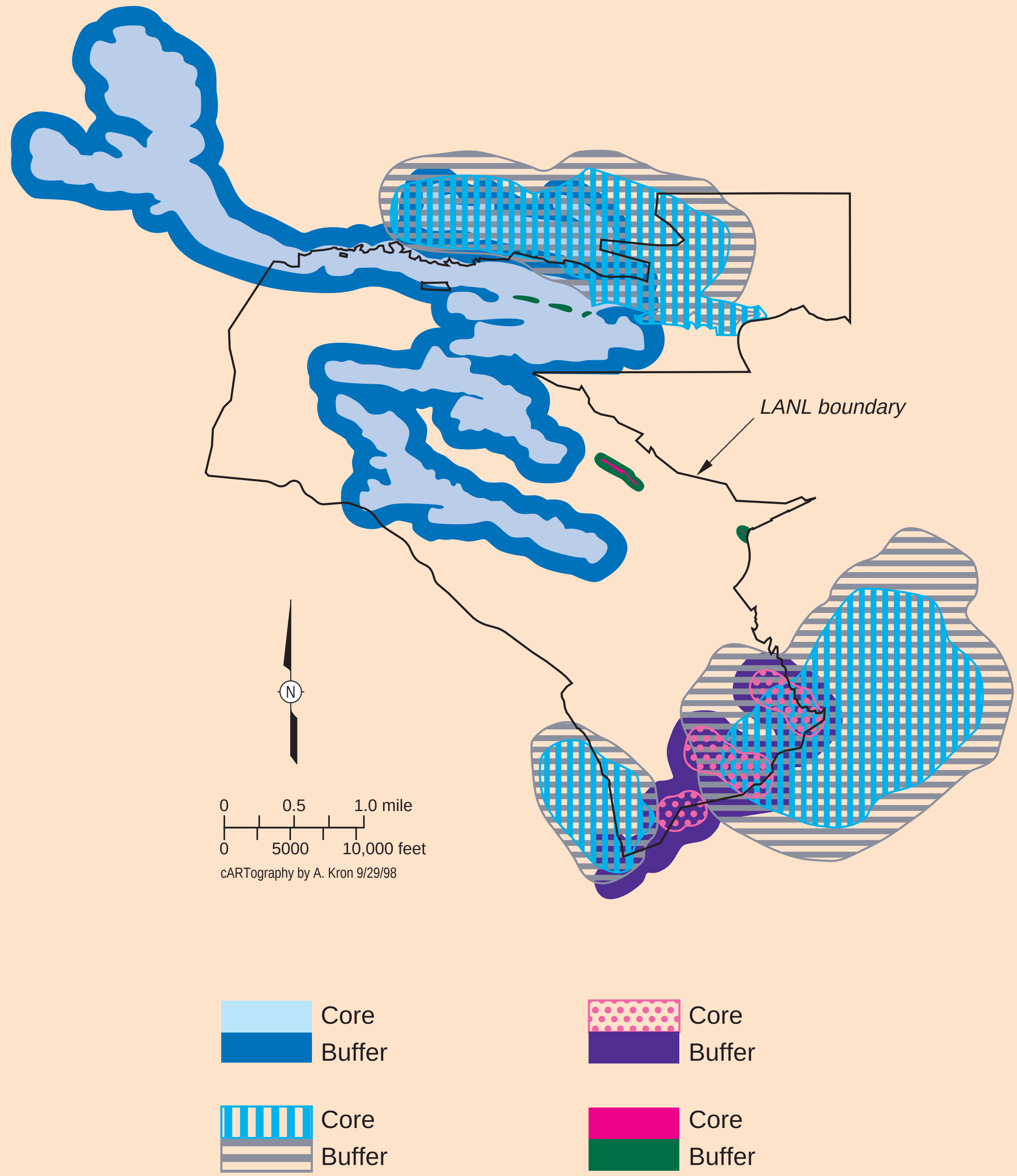

Mixed conifer

From the habitat suitability map, core areas were drawn to reflect highly suitable areas for each species. Buffer zones were established around each core zone based on regulatory guidance and literature information on species' reactions to disturbance.

AEI Site Plans are intended to be living documents, and additional species-specific information on habitat requirements, the impact of human activities, or listing status can lead to changes in what are considered acceptable activities. The AEI boundaries will be reviewed periodically to reflect current understanding of the species in question. Occupancy will be determined on a yearly basis for all listed species living within the defined LANL site. AEIs will be developed for any newly listed species. Most changes will require review and concurrence by the USFWS before they can be incorporated into an AEI Site Plan. Activities that do not fall within the parameters of a Site Plan generally may be undertaken following preparation of a Biological Assessment and formal or informal consultation with USFWS. Biological Assessments will be submitted by DOE to USFWS and require that the latter concur that the activity will not adversely affect a listed species or its habitat before the activity can go forward. Field research and preparation of a Biological Assessment can take up to about six months with an additional two months or so for DOE and USFWS review for actions that will not result in any adverse effects to the habitat or individuals of the species. Additional requirements, possibly taking up to five more months, would be necessary for actions that might result in adverse effects.

Land Cover Map





AEIs within Los Alamos National Laboratory

What is an AEI Site Plan?

An AEI Site Plan contains descriptions of an individual species, the AEI(s) for that species, and current impacts in the AEI. It also includes management plans that describe allowable activities within core and buffer areas. Collectively, the AEI Site Plans provide the basis for day-to-day HMP implementation.

In general, any activity that would detrimentally alter the habitat in an AEI or would cause unacceptable disturbances to the species inhabiting the AEI is not allowed under the AEI Site Plan. Buffer areas are managed to prevent degradation of the value of the core area to the species. Any activity that does not fall within the parameters that are established in an AEI Site Plan has to be considered in a Biological Assessment and given concurrence by USFWS before the activity can go forward.

Species Considered in AEI Site Plans

Site Plans and AEIs have been developed only for federally listed threatened and endangered species with suitable habitat within LANL boundaries, as follows.

Species with AEIs on or near LANL	Number of AEIs
Peregrine Falcon *(Falco peregrinus anatum)*	4
Mexican Spotted Owl *(Strix occidentalis lucida)*	6
Southwestern Willow Flycatcher *(Empidonax traillii extimus)*	1
Bald Eagle *(Haliaeetus leucocephalus)*	1

Site Plan Guidelines

Other than the identification of suitable habitat for a species, the core of a Site Plan is the definition of acceptable parameters for activities and habitat alteration within the AEI. Six categories of activities that might cause disturbance in an AEI are addressed in the Site Plans. The list is intended to be as comprehensive as possible, thereby reducing the need for individual review of activities for ESA compliance. The categories of activities are

- People (includes any entry of people into an AEI on foot).
- Vehicles (includes the entry of any ordinary two-axle highway vehicle into an AEI by any route other than a paved road or an improved gravel road).
- Aircraft (includes the operation of aircraft below an elevation of 2000 ft above the highest ground level in the local vicinity).
- Other Light Production (includes any activity not previously listed that causes additional light to occur in an AEI core area).
- Other Noise Production (includes any activity not previously listed, except for explosives testing, that causes additional noise to occur in an AEI).
- Explosives Detonation (includes the use of high explosives for any purpose).

Low, medium, and high levels of impact are defined for each of these activities, except for explosives detonation. Activity levels for explosives detonation were designed to follow the guidelines agreed upon by the DOE, LANL staff, and the USFWS in the DAHRT Facility Biological Assessment. The six categories of activities are restricted only in AEIs that are classified as occupied by the species.

The Site Plans identify parameters for these categories of activities to ensure no adverse effect to individuals of a species inhabiting an AEI and/or the quality of the habitat within the AEI. Some activities may be allowed with no restrictions; others may be allowed during certain seasons only. The acceptable activities were formulated by LANL biologists based on previous recommendations for the management of certain species developed by the USFWS (in recovery plans, for example), scientific literature concerning the species, and, where necessary, best biological opinions. The direction included in the Site Plans is designed to ensure that day-to-day Laboratory operations do not adversely impact threatened and endangered species.

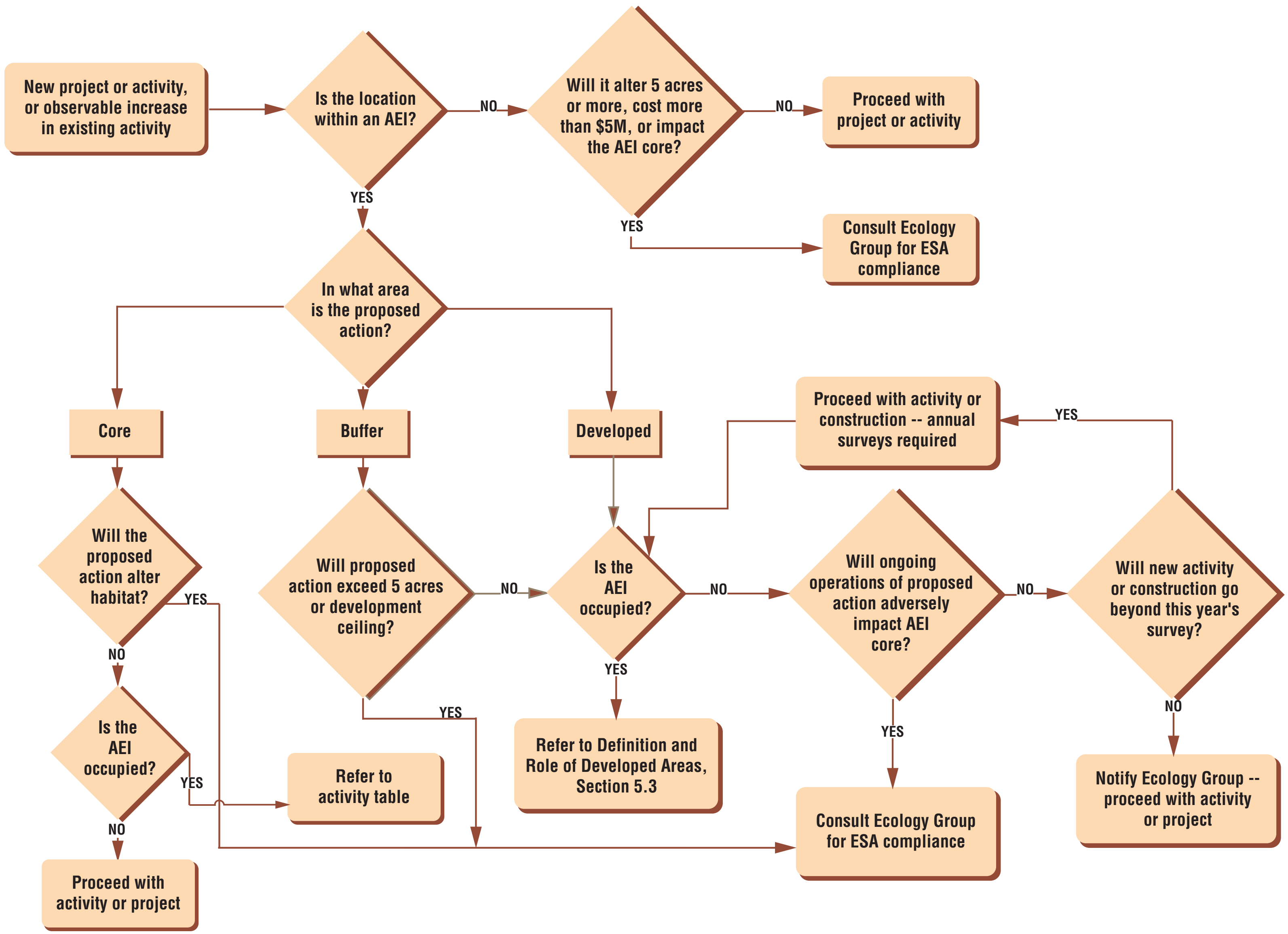
Site Plan Implementation

DOE Los Alamos Area Office, LANL's Ecology Group of the Environment, Safety, and Health (ESH) Division, Facility Managers, Facility Management Unit ESH-Deployed Teams, and line organizations are the key organizations responsible for implementing the Site Plans. Only persons with a "need to know" will receive the plans, which are considered controlled documents. Facility Managers, with the assistance of their staff, are responsible for determining if operations within their Facility Management Unit comply with the guidelines in the Site Plans. This is initiated through the ESH-Identification process, which is an internal review that identifies any environmental concerns associated with a project. The ESH-Deployed Teams may assist the Facility Managers with this process. Once the process has been initiated, the Ecology Group provides technical guidance by conducting the necessary impact evaluations and regulatory compliance actions at the direction of the DOE.

Each Site Plan provides a process flow diagram used to evaluate projects and activities. If the proposed action is within the scope of allowable activities as defined in the activity table provided in each Site Plan, the project or activity may proceed. However, if the activity is outside of the range of activities described in the Site Plan, the Ecology Group is consulted for further technical guidance. Existing operational procedures will be used to determine whether the action requires preparation of a Biological Assessment.

Each Site Plan describes the locations of AEIs and guidelines for a different species; thus, all of the plans need to be consulted to evaluate the compliance status of an activity. If an activity follows all guidelines, no additional ESA regulatory compliance action is required before going forward. Other regulatory compliance actions may still be required under NEPA, however, or to address impacts to cultural resources, wetlands, or other resources. It is the responsibility of the project leader or Facility Management staff to ensure that all requirements are satisfied.

Project/Activity Review Process



Monitoring Plans

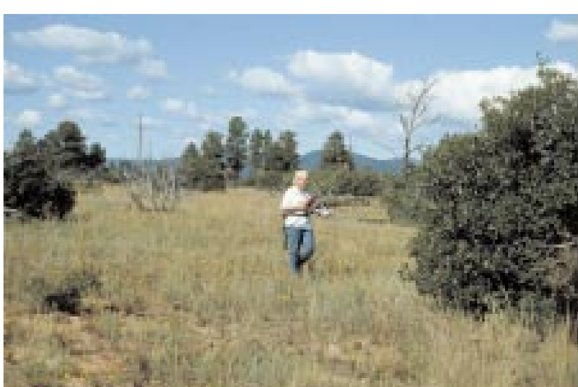
What is the Purpose of Monitoring Plans?

Monitoring Plans have been developed for each federally listed species that may occur in the Los Alamos area, and they describe the methodology used to determine if these species are present on LANL. For species that are present, Monitoring Plans may be designed to estimate reproduction, abundance, and/or distribution of the species at LANL. Monitoring Plans

1. Allow implementation of Site Plans for federally listed species. Guidelines for allowable activities differ for occupied and unoccupied habitats, and annual monitoring provides the greatest possible flexibility in conducting Laboratory operations, while ensuring adequate protection of the species.

2. Allow evaluation of the effectiveness of the HMP.

3. Will allow DOE to comply with proposed changes in the ESA, which include requiring federal agencies to report on the status of threatened, endangered, and candidate species on their property every five years.



Which Species are Covered by Monitoring Plans?

The following is a list of species for which Monitoring Plans have been developed.

- American peregrine falcon
- Arctic peregrine falcon
- Mexican spotted owl
- Whooping crane
- Bald eagle
- Southwestern willow flycatcher
- Black-footed ferret

What are Monitoring Plans?

Monitoring Plans generally consist of the following elements: a species description; monitoring justification, purpose, and objectives; existing monitoring protocols and proposed studies; species analysis and reporting protocol; and a list of technical references. The species description element provides background on a species' technical status, seasonal activities, behavior, and feeding characteristics. The monitoring justification, purpose, and objectives element establishes the reasons for species-specific monitoring activities and ranks the individual activities in terms of importance. The monitoring protocol and proposed studies element describes monitoring methodologies and presents a list of existing and proposed monitoring activities. Priorities for implementing each activity are identified; those activities considered less critical will proceed as funds are available. Finally, the species analysis and reporting element formalizes the protocol for notifying USFWS concerning monitoring activity field survey results. This element also establishes the protocol for HMP database management.

As with the AEI Site Plans, Monitoring Plans may be revised as new information becomes available. Monitoring Plans will be developed for any newly listed species in accordance with established protocols and in coordination with new AEI Site Plans. Personnel conducting surveys and research will be trained in those protocols.

Additionally, monitoring protocols for species not federally listed have been developed to standardize monitoring efforts at LANL. Sources of information for these protocols may include methods developed by other federal or state agencies, such as the US Forest Service or the US Geological Survey Biological Resources Division, protocols developed for similar species, scientific literature concerning the species, and experience with the species at LANL. Changes in monitoring plans for species not federally listed do not require consultation with the USFWS.

Levels of Monitoring

Most Monitoring Plans call for annual monitoring of a species. However, depending on the status of a species, its likelihood of occurring at LANL, and potential monitoring methods, some plans may call for monitoring at different intervals, monitoring of habitat only, or simply tracking the species' status. Nine levels of monitoring have been identified that may be applied individually or in combination.

1. Status Tracking—Maintaining up-to-date information on the federal status of a species through coordination with the USFWS.

2. Habitat Analysis and Models—Using habitat models and other available information to identify potential habitat at LANL.

3. Presence/Absence Surveys—Conducting field surveys to determine presence or absence of the species on LANL property. The Monitoring Plans identify the resources required, including personnel, equipment, training, and permits. Analysis and reporting requirements are specified, as well.

4. Reproduction Surveys—Conducting field surveys to (a) determine the breeding status of a given species, (b) collect productivity and breeding biology information, and (c) describe habitat characteristics and habitat use patterns. Required resources are the same as for Presence/Absence Surveys.

5. Contaminant Studies—Conducting field research to estimate contaminant loads and levels in prey species or in the species itself on LANL property.

6. Ecorisk—Developing models to estimate the toxicological risk to species inhabiting LANL property.

7. Prey Base—Conducting field research to estimate prey density and/or distribution at LANL.

8. Individual Tracking—Marking, tagging, and tracking of individuals.

9. Regional Studies—Initiating or participating in studies of the species at the regional level, with the goal of gaining more information about the species to make better management decisions. Any data collected will be shared with the USFWS.

Monitoring Plan Implementation

For federally listed species, the USFWS in cooperation with other agencies develops standardized monitoring protocols. The person conducting the monitoring must possess an ESA section 10(a)(1)(A) endangered species subpermit from the USFWS. Formal training in the standardized survey method may be required before the subpermit is granted.

The University of California's LANL Ecology Group is responsible for determining species' occupancy in suitable habitat and notifying the DOE and USFWS. Like the AEI Site Plans, the Monitoring Plans are controlled and will be issued only to persons who have a need to know and are trained by the Ecology Group or the DOE. The DOE Los Alamos Area Office is responsible for notifying the USFWS of occupancy of suitable habitat.

The schedule and milestones for individual monitoring activities are included in each Monitoring Plan. They take into consideration available resources, as well as technical and regulatory drivers. The final schedules and milestones are formalized in a work package agreement that is presented in each Monitoring Plan and is also submitted to the appropriate LANL organization with a request for funding.

The costs of implementing Monitoring Plan activities are evaluated yearly through a formal project management cost evaluation and estimate process. This process includes a detailed assessment of the scope and schedule for each of the selected activities, as well as the personnel and equipment needed to complete each activity. It also includes a funding source assessment provided by an authorized budget analyst. When the cost evaluation process is completed, a formal work package agreement containing the scope, schedule, and cost for each of the monitoring activities is submitted to the appropriate LANL organization with a request for funding.

Summary of Roles and Responsibilities

Many organizations were involved in the development of the HMP and will continue to play an active role in ensuring that it responds to changes in the scope of activities occurring at LANL, changes in the regulatory environment, and new information regarding biological resources. Other organizations will have the primary responsibility for implementing the HMP on a day-to-day basis. The following is a summary of the roles and responsibilities of the key organizations involved.

Roles and Responsibilities

- USFWS

  In accordance with the provisions of the ESA, USFWS will consult with DOE on the scope and proposed implementation of the HMP and will provide a letter of concurrence with the HMP.

- DOE

  DOE has administrative control of LANL and has developed the regulatory and technical components of the HMP with the Ecology Group and in consultation with the USFWS. The DOE will be responsible for ensuring the HMP is implemented and modified in the future, as needed.

- University of California

  The University of California manages and operates LANL under contract for the DOE.

- Environment, Safety, and Health (ESH) Division

  This is the division-level line organization responsible for providing guidance and support for implementing all applicable federal, state, and local regulatory requirements specific to the protection of human health and the environment.

- Ecology Group

  The Ecology Group developed the regulatory and technical components of the HMP with DOE and will maintain the AEI Site Plan and Monitoring Plan elements, such as species-specific information, habitat delineation and classification maps, species protection criteria, and species/habitat assessment protocols as directed by DOE. The group will conduct species-specific surveys, habitat evaluations, and habitat and species impact assessments, as required. The group will train LANL staff on the use of AEI Site Plans and Monitoring Plans and will review project consistency with the Site Plan activity tables. When a project is found to be outside the range of the activity table, they determine whether a Biological Assessment is needed in consultation with DOE. All HMP implementation requirements will be formally documented by the Ecology Group in specific Laboratory Implementation Requirements (LIRs). The group will also be responsible for implementing necessary changes to the HMP in the future as directed by DOE.

- Facilities Engineering (FE) Division

  The FE Division is the division-level line organization responsible for implementing the LANL-wide Facility Management System. FE Division supports Facility Managers (FMs) and other personnel to implement this system in a safe, reliable, and environmentally responsible manner.

- Facility Managers

  FMs are responsible for operating LANL facilities in a safe, reliable, and environmentally responsible manner. The FMs are responsible for ensuring the day-to-day implementation of the HMP as an integral part of LANL's LIRs and the Integrated Safety Management program.

- ESH-Deployed Teams

  The ESH-Deployed Teams are composed of environmental generalists that review projects and activities for FMs. They provide the first level of screening and will assist the Ecology Group with project review.

- Line Organizations

  Line organizations are responsible for following the Laboratory LIRs for management of projects and activities under their control. The HMP components include requirements that will be in the LIR.

Implementing the HMP is a dynamic, ongoing process. The following is a summary of major elements that will require long-term commitments from LANL staff, including funding work packages, in order to facilitate the HMP's success as a planning tool.

Long-Term Activities Required to Implement the HMP

Training

To maintain the highest degree of accuracy and efficiency, organizations and individuals involved in the daily implementation of the HMP must acquire and maintain proper training. The training associated with the AEI Site Plans is targeted for individuals within the Ecology Group, FM staff, ESH-Deployed Teams, and others who are responsible for reviewing project consistency with the activity tables. Specialized training is also provided for individuals within the Ecology Group who conduct technical evaluations (e.g., species-specific surveys, AEI habitat evaluations, habitat and species impact assessments) as part of implementing the AEI Site Plans and Monitoring Plans. This training is intended for individual specialists who are involved in decision making and detailed technical analyses. The training requirements will be formalized and documented as part of the LIR for management of LANL projects and activities related to biological resources.

Data Management

Data management is required to ensure the viability of the HMP. This includes tracking project reviews and the status of species, and updating maps and AEI boundaries. It also includes periodic checks of the accuracy of land cover maps, analysis of data for prey species, and data storage. Presently, biological data are stored in a GIS database that allows display, query, analysis, and modeling of biological data. This system must be maintained and updated to provide accurate point-in-time assessments.

Project Review Tools

The AEI concept must be integrated with the ESH-Identification process and other internal tracking project-management tools. Further development of GIS and Web-based management tools is necessary to facilitate this integration.

Monitoring

Monitoring of species' status and presence/absence is fundamental to the success of the HMP. Although monitoring activities are prioritized on a critical-to-least-critical basis, proactive management will include implementing those activities classified as less than critical. If surveys are not completed in accordance with the schedules and milestones included in the Monitoring Plans, the value of the HMP will be diminished.

Revision and Updating

AEI Site Plans and Monitoring Plans are controlled documents that will require periodic revision and updating. This may be necessary as a result of listing and delisting of species, changes in survey protocols, and changes in requirements under the ESA.

Monitoring of Disturbances to Threatened and Endangered Species

The impacts of noise, light, and contaminants to threatened and endangered species must be studied on an ongoing basis to enhance the HMP's usefulness and effectiveness as a planning tool.

Reporting Requirements

Implementation of the Monitoring Plans requires reporting of findings of presence/absence surveys and occupancy of species to the USFWS.

Habitat Improvement and Recovery

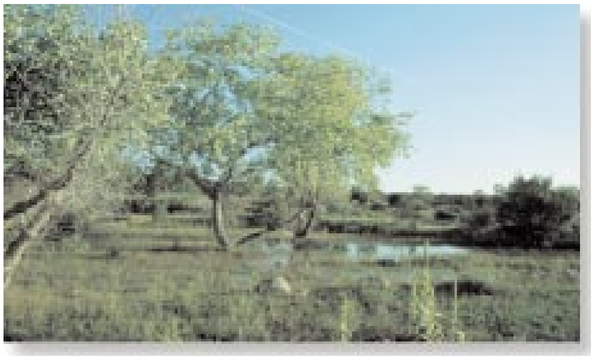
Each AEI Site Plan outlines actions that can protect and improve habitat for a specific species. Activities outlined under species recovery plans developed by USFWS should be considered as a means of improving habitat. They also should be considered when planning other activities, such as fire management, wetland management, and forest management.

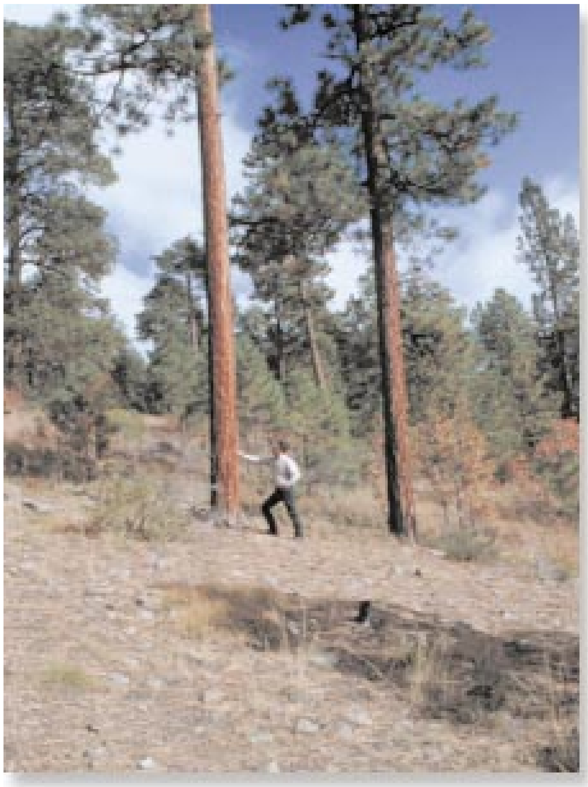
Regional Coordination

Each Monitoring Plan outlines the opportunities for regional studies of specific species, which will allow for better management of the AEIs. DOE and LANL staff will cooperate with the East Jemez Resource Council, a coordinating body for regional natural and cultural resource management, nearby pueblos, Bandelier National Monument, the U.S. Forest Service, and other key agencies to ensure that the HMP is integrated with the management plans for surrounding areas and that cumulative impacts from actions in these areas are addressed.

Metrics Tracking

This HMP describes social, management, and ecological metrics that will be used on an ongoing basis to measure the plan's success.





Changes to the Habitat Management Plan

Federal requirements under the ESA may vary as the law is changed and as individual species are listed or delisted. For these reasons, the HMP includes a mechanism for incorporating necessary technical and regulatory changes. Changes in how the HMP is implemented may result from both internal and external factors. The internal factors may include the following:

- changes in the data gathered from AEI Site Plans or Monitoring Plans regarding species presence, location, or habitat;
- changes in the prioritization scheme for individual AEI Site Plans or Monitoring Plan activities; and
- changes in the technical approach to conducting AEI Site Plans and Monitoring Plan activities.
- changes in DOE and LANL missions, facility operating procedures, or organizational structure; and

The external factors may include the following:

- changes in the ESA;
- changes in the USFWS implementation of the ESA and associated procedures and protocols;
- listing and delisting of species or declaration a species is extinct.

The HMP will be modified as necessary based on an assessment of these and other relevant factors. In addition, the HMP will be reviewed for technical and regulatory accuracy every five years. Following these assessments, the contents of the AEI Site Plans and Monitoring Plans will be revised as necessary. The Ecology Group will submit recommended changes to DOE, who will seek USFWS concurrence on the revisions through informal consultation. In some cases, depending on the scope and extent of changes, the USFWS may initiate formal consultation with DOE and LANL staff. All changes will be tracked in the metrics and performance measures of the HMP.

Metrics and Corrective Actions

A critical component of measuring the success of the HMP is the development and tracking of key metrics. These metrics will allow the DOE and the Ecology Group to assess whether the HMP's goals and objectives have been met and specifically to:

- accurately gauge the ecological success of the HMP;
- measure the level of support that the HMP provides to the overall mission of the DOE at LANL; and
- assess the integration of the HMP into the environmental planning process at LANL.

Of utmost importance is the careful selection of metrics that accurately gauge the success of the HMP. Metrics have been developed for three key areas—social, management, and ecological—and the appropriate corrective actions will be implemented in these areas when deemed necessary.

Social, Management, and Ecological Metrics

Several critical individual metrics were developed for each key area to most accurately assess success of each key area as a whole. These were selected in order to capture the key area using the fewest, but most accurate, metrics. Below is a list of metrics that will be used.

Social

- Measure the institutional and public approval level of the HMP through an annual survey.
- Track the total number of threatened and endangered species-related cooperative efforts with external agencies (e.g., East Jemez Resource Council, Native American Pueblos, U.S. Forest Service, Bandelier National Monument).

Management

- Estimate the temporal and economic savings the HMP provides to the Los Alamos National Laboratory related to the development of new projects, operations of existing facilities, maintenance, and similar activities, based on a formula that includes such factors as avoidance of delay, decrease in consultations, and decreased cost related to the Biological Assessment process for ESA Section 7 consultation.

Ecological

- Track development (roads, buildings, etc.) in any threatened and endangered species buffer zones.
- Track the preservation and protection of all core areas.
- Assess the distribution and reproductive success of all threatened and endangered species within LANL boundaries.

Social Metrics

"Measure the institutional and public approval level of the HMP through an annual survey."

Measuring the institutional and public approval level of the HMP will be accomplished by conducting a professional, well organized, annual survey to be distributed to select groups internal and external to DOE and the University of California. The HMP will not function at an optimal level without institutional and public approval.

"Track the total number of threatened and endangered species-related cooperative efforts with external agencies (e.g., East Jemez Resource Council, Native American Pueblos, U.S. Forest Service, Bandelier National Monument)."

An excellent gauge of the integration of the HMP with outside agencies and an assessment of the contributions the HMP provides to those external agencies, will be the total number of cooperative efforts with these agencies. The HMP will need to be highly integrated with external resource management plans if it is to be a success.

Management Metrics

"Estimate the temporal and economic savings the HMP provides to LANL related to the development of new projects, operations of existing facilities, maintenance, and similar activities, based on a formula that includes such factors as avoidance of delay, decrease in consultations, and decreased cost of Biological Assessment process."

If the HMP is to be successful in the key area of management, it must provide DOE with temporal and economic savings. Through proactive and organized planning, the HMP will orchestrate the integration of biological concerns with project- and maintenance-related concerns. If followed closely, the HMP guidelines will result in both temporal and economic savings. The success of the HMP will be judged by a simple algorithm aimed at calculating total savings.

Ecological Metrics

"Track the development in any threatened and endangered species buffer zones."

A critical component in measuring the HMP's ecological success will be tracking the development of the designated threatened and endangered species buffer zones. These buffer zones were carefully designated using the best scientific knowledge concerning potential impacts to the species. Using GIS, the DOE and the Ecology Group will track all buffer zone development to assure the designated development ceiling is not surpassed.

"Track the preservation and protection of all core areas."

Like the buffer zones, the core areas were carefully and logically designated using best scientific knowledge. The AEI Site Plans outline specific activities that are allowed in the core areas. Again, using a tracking system, the DOE and the Ecology Group will ensure that all recommended activities are being carefully followed, which will assure protection of the species.

"Assess the distribution and reproductive success of all threatened and endangered species within LANL boundaries."

A critical element of the HMP is the actual protection of species. Protection of species includes the maintenance of a suitable habitat; this, in turn, promotes successful reproduction and increased distribution of the species. If the species at LANL are experiencing ecologically successful levels of reproduction and distribution, the HMP will be successful.

Feedback Loop and Corrective Actions

Metrics will be used to measure the success levels of the HMP. When the metrics indicate that the HMP is not successful at meeting the desired expectations as a management tool, corrective actions will be undertaken, including but not limited to the following:

1. Updating AEI Site Plans and the designated AEIs.

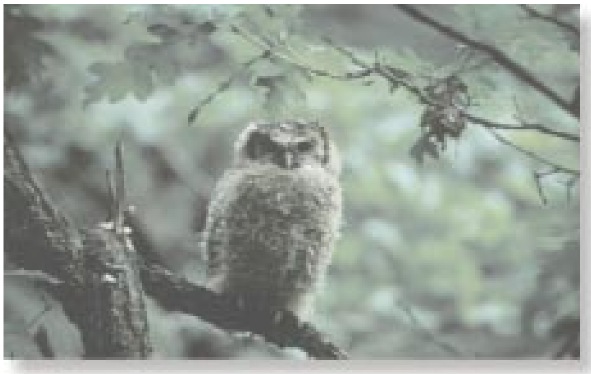
2. Updating Monitoring Plans.

3. Integrating the HMP with LANL projects earlier in the process.

4. Increasing training for individuals working with the HMP, including the ESH-Deployed Teams.

5. Consulting with USFWS to make changes or additions to the HMP, such as adding new species or AEIs.

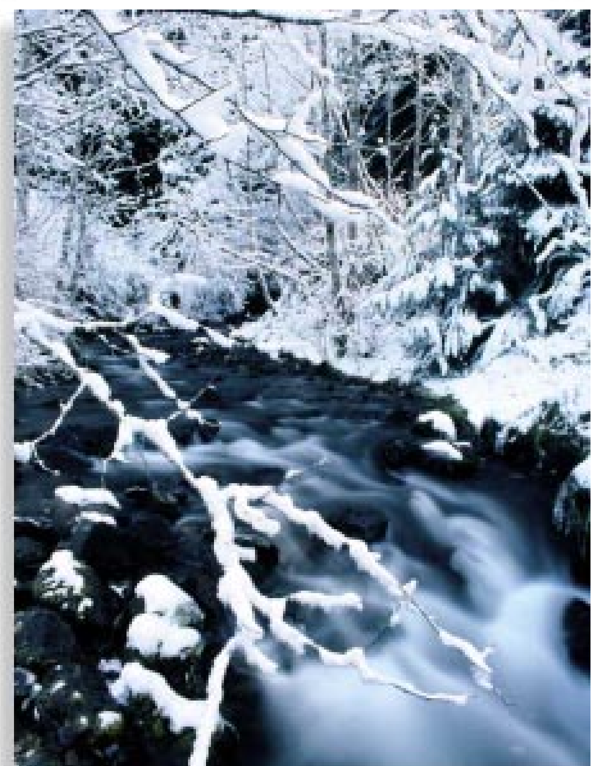
6. Increasing the cooperative efforts with outside agencies.



Conclusion

This HMP has been prepared in the spirit of DOE's goal of using "thoughtful planning to sustain the natural systems for which we are stewards." The plan is comprehensive, providing for the protection of threatened and endangered species while allowing the maximum flexibility for LANL operations. By taking a proactive approach to resource management, it prevents problems rather than trying to solve them after they have already occurred.

The HMP will be a dynamic, evolving document. It continually will be assessed to assure it is being used according to the original goals and objectives of those who developed it. By using the metrics described above, the DOE and LANL staff will be able to measure the success of the HMP, and if needed, take corrective actions to mitigate the problems. Because the HMP can improve over time, it has the potential to accomplish not only the original goals and objectives, but to go beyond that which was originally anticipated.



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Design and Layout: L. Kim Nguyen Gunderson
Editing: Hector A. Hinojosa

Photography credits:
Teralene S. Foxx
David C. Keller
Carolyn and Tom Jervis
D. Robert Franz
New Mexico Department of Game and Fish
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Los Alamos

NATIONAL LABORATORY

Los Alamos, New Mexico 87545

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Threatened, Endangered, and Sensitive Species Profile

Hector Hinojosa, CIC-1
L. Kim Nguyen, ESH-20

LA-UR-96-1269

FOREWORD

This document is intended to provide a thumbnail description of various plant and animal species that are included in lists on the federal, state, or local level proclaiming them to be at risk to some degree and that may inhabit or potentially inhabit areas in and around Los Alamos National Laboratory lands.

At the top of each profile is the category for the current status of each organism. This status will range from federal endangered, which designates the most serious condition for an organism, to species of local concern, which identifies an organism that is noted to be rare on a local level. The different labels of status are defined as follows:

- **Federal endangered** — Any species that is in danger of extinction throughout all or a significant portion of its range.

- **Federal threatened** — Any species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

- **Federal species of concern** — Any species whose population numbers are declining or whose range is diminishing to the point where it may become threatened in the near future.

- **State endangered** — Any species listed in the New Mexico state endangered list because it is rare in numbers and/or occurrences and, without protection, its further existence in the state is in serious jeopardy.

- **State threatened** — Any species whose prospects of survival or recruitment within the state are likely to become jeopardized in the near future.

- **Species of local concern** — Any species known to exist or potentially exist within the proximity of Los Alamos National Laboratory lands and surrounding areas that are rare in numbers and/or occurrences and whose habitat requirements are very specific, rare to this area, or threatened in any way.

The nature of this document allows for updates to be made to species that are already included in this list as new information becomes available. At the same time we will be able to add new species to this profile as they become a part of a category listed in the status section and delete any species that have been removed from any of these designations.

Mexican Spotted Owl

Strix occidentalis lucida

Status:
Federal threatened.

Description:
The Mexican spotted owl is one of three subspecies of spotted owl—Mexican, California, and Northern. This strictly nocturnal bird is fairly large, 42 to 53 cm (16.5 to 21 in.) tall. It is dark brown with a puffy head and has white spots on its head, back, and chest and barred underparts. Unlike most other owls, the Mexican spotted owl is dark-eyed rather than yellow-eyed.

Habitat:
Mixed Conifer, Ponderosa Pine. The Mexican spotted owl prefers tall, old-growth forests in canyons and moist areas for breeding. It will forage for woodrats and mice in forests, woodlands, and rocky areas.

Occurrence:
The Mexican spotted owl is a resident and has been confirmed on Los Alamos National Laboratory, Los Alamos County, Bandelier National Monument, and Santa Fe National Forest lands. Critical habitat has been designated in Santa Fe National Forest.

Courtesy of New Mexico Game and Fish

Black-Footed Ferret

Mustela nigripes

Status:
Federal endangered.

Description:
The weasel family, of which the black-footed ferret is a member, is the smallest of a group of predators that are different sizes but are similar in shape and habits. The black-footed ferret has a long body, 38 to 46 cm (15 to 18 in.), with a 13- to 15-cm (5- to 6-in.) long tail. This weasel can be identified by its yellowish brown to darker colored fur, black forehead, black-tipped tail, and black feet.

Habitat:
Prairie. The main prey of the black-footed ferret is the prairie dog. Hence, this weasel-like animal will not stray far from a prairie dog town. However, it may also occur in other areas where other rodents, small enough to be taken, abound.

Occurrence:
The presence of the black-footed ferret on Los Alamos National Laboratory and Los Alamos County lands or surrounding uplands is believed to be highly unlikely.

Courtesy of US Fish and Wildlife Service

WOOD LILY

Lilium philadelphicum var. *andinum*

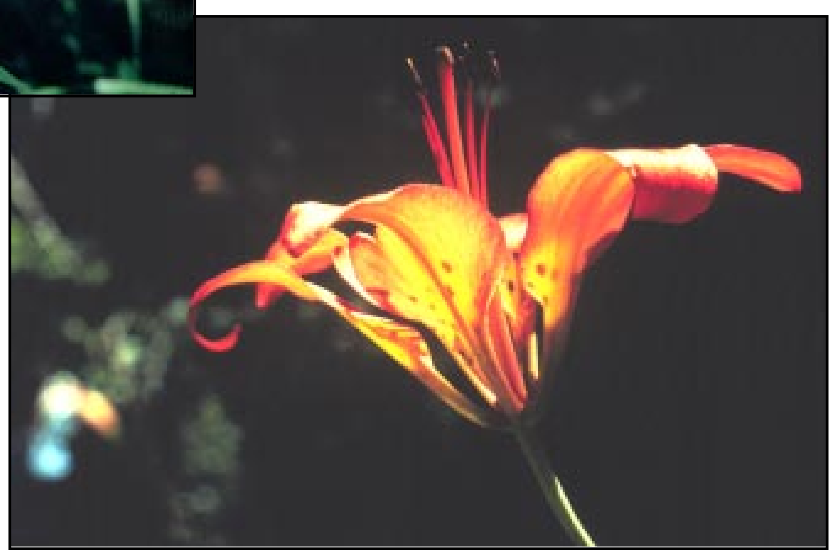
Status:
Species of concern, State endangered.

Description:
On a slender stalk, the wood lily stands to 40 cm (15 in.). Six petals that are yellowish in the center, changing to bright orange on the outside, make up the flower that adorns the top. At regular intervals down the length of the stalk, grow numerous slender leaves.

Habitat:
Riparian, Ponderosa Pine, Mixed Conifer, Spruce/Fir. The wood lily can be found in canyons above 2,285 m (7,500 ft) and usually occurs in areas of old growth conifers.

Occurrence:
The presence of the wood lily has been confirmed on Los Alamos County, Bandelier National Monument, and Santa Fe National Forest lands.

Courtesy of Teralene Foxx, LANL



Yellow Lady's Slipper

Cyprepedium calceolus var. *pubescens*

Status:
State endangered.

Description:
The yellow lady's slipper orchid will stand from 15 to 60 cm (6 to 23.5 in.) tall, topped by one or two large, yellow flowers. The lower segment of the flower is a pouch and resembles a lady's slipper. Three to five yellowish green, elliptic-shaped leaves ascend the stalk, growing out and over at regular intervals.

Habitat:
Riparian, Mixed Conifer. The yellow lady's slipper grows in a variety of moist habitats including bogs, humid woodlands, and rocky slopes in open woods.

Occurrence:
The presence of this orchid has been confirmed on Bandelier National Monument lands only.

Courtesy of Teralene Foxx, LANL

GRAMA GRASS CACTUS

Toumeya papyracantha

Status:
Species of local concern.

Description:
The stems of grama grass cactus are solitary, ribbed, and 2.5 to 20 cm (1 to 8 in.) tall. Central spines elongate, resembling dry grass blades that are flattened, grooved, and flexible. Radial spines are short and straight. Flowers are white and fruit is round, tan, and dry when mature.

Habitat:
Juniper Savanna, Piñon/Juniper. Grama grass cactus can be found from 1,530 to 2,225 m (5,000 to 7,300 ft) in the Jemez Mountains, usually where soil is sandy, and is associated with basalt outcrops.

Occurrence:
The presence of grama grass cactus has been confirmed on Los Alamos County, Bandelier National Monument, and Santa Fe National Forest lands.
This cactus has recently been dropped from the list but is still rare in Los Alamos County.

Courtesy of Teralene Foxx, LANL

SOUTHWESTERN WILLOW FLYCATCHER

Empidonax traillii extimus

Status:
Federal endangered, State endangered.

Description:
The southwestern willow flycatcher has a whitish throat, pale olive breast, pale yellow belly, and brownish olive upper parts. This bird can be distinguished from peewees, a bird that is similar in appearance, by the upward flicking of the tail feathers.

Habitat:
Riparian. The southwestern willow flycatcher requires cottonwoods or willows. It is generally found in dryer habitat, but near water, than the habitat of the closely related alder flycatcher.

Occurrence:
The presence of the southwestern willow flycatcher has been confirmed in the Jemez Mountains, and there may be possible breeding habitat on Los Alamos National Laboratory and Bandelier National Monument lands.

Courtesy of W. Maynard, New Mexico Game and Fish

Giant Helleborine

Epipactis gigantea

Status:
Species of local concern.

Description:
The giant helleborine will stand from 20 cm to 1 m (8 to 40 in.) on a single stem. From a rounded base to a tapered point, four to twelve leaves grow in alternating directions along the stem. The greenish-yellow flowers will grow in clusters with up to fifteen flowers on one stem. This plant will flower from March to August.

Habitat:
Riparian, Juniper Savanna, Piñon/Juniper. The giant helleborine can be found on sandbars of rivers and streams and in areas around springs and seeps.

Occurrence:
The presence of the giant helleborine has been confirmed on Los Alamos County lands but not on Los Alamos National Laboratory lands.

Courtesy of Teralene Foxx, LANL

NEW MEXICO MEADOW JUMPING MOUSE

Zapus hudsonius luteus

Status:
Species of concern, State threatened.

Description:
As with all species of jumping mice, the New Mexico meadow jumping mouse is equipped for jumping with long black feet and a long tail. However, it prefers to crawl from place to place under leaves and other vegetation. If hurried, it will run by making a quick series of short hops. Other characteristics of this species are grooved upper incisors and a colorful fur, exhibiting various shades of brown.

Habitat:
Riparian, Mixed Conifer, Spruce/Fir. The meadow jumping mouse prefers to live on ground surface in lush grassy or weedy meadows. By day it hides under heavy vegetation and by night in nests placed in protective areas such as hollow logs or short burrows. The meadow jumping mouse hibernates over the winter.

Occurrence:
The presence of New Mexico meadow jumping mouse has been confirmed on Los Alamos County and Santa Fe National Forest lands and may be possible on Los Alamos National Laboratory lands.

Courtesy of Joan Morrison

GOAT PEAK PIKA

Ochotona princeps

Status:
Species of concern.

Description:
As with all pikas, the Goat Peak pika is a small rodent, 15 to 22 cm (6 to 8.5 in.) in length and weighing from 4 to 6.5 oz. Its grayish buff or brown coloring helps it to blend into the favorite habitat of talus slopes. It has short ears that are broad and rounded and no visible tail.

Habitat:
Mixed Conifer, Spruce/Fir. The Goat Peak pika forages during the early morning, late afternoon, and nighttime hours close to talus slopes, rock slides, or boulder piles that afford protection and nesting areas. Pikas appear to utilize whatever plants are close to their burrows. They eat the leaves, stalks, and flowers of grasses, shrub twigs, and mosses and lichens.

Occurrence:
The presence of the Goat Peak pika has been confirmed on Los Alamos County, Bandelier National Monument, and Santa Fe National Forest lands but not on Los Alamos National Laboratory lands.

Courtesy of James R. des Lauriers

Bald Eagle

Haliaeetus leucocephalus

Status:

Federal threatened, State threatened.

Courtesy of New Mexico Game and Fish

Description:

The bald eagle is a huge raptor with a wingspan of 2.0 to 2.4 m (6.5 to 7.5 ft). The body plumage is dark, and the head and tail are white. The iris, cere, bill, and legs are yellow. An immature bald eagle is dark, usually with some white under the wings, and gradually develops a white head and tail.

Habitat:

Riparian and adjacent areas. The bald eagle prefers to inhabit areas near rivers and lakes with tall trees and cliffs that are protected from the wind. It eats fish, waterfowl, carrion, and rabbits.

Occurrence:

The bald eagle is a migrant and a winter resident along the Rio Grande and on adjacent Los Alamos National Laboratory, Los Alamos County, Bandelier National Monument, and Santa Fe National Forest lands.

MYOTIS BATS

Family Vespertilionidae

Status:
At least seven species of Myotis bats occur in this area—California myotis, fringed myotis, long-eared myotis, long-legged myotis, small-footed myotis, Yuma myotis, and occult little brown bat. All but the California myotis are considered species of concern, and all but the occult little brown bat have been documented on Los Alamos National Laboratory lands.

Description:
The Myotis bats form the largest group of bats and are widely distributed. They are all relatively small in size, some sort of brown in color, and have simple snouts. Some of the differences in physical characteristics of the Myotis bats in this area can be surmised by their names.

Habitat:
Ponderosa Pine, Piñon/Juniper, Mixed Conifer. The long-eared and long-legged myotis roost in snags of ponderosa pine or mixed conifer and in rock crevices. The others roost in cliffs or caves with occult little brown bat and Yuma myotis needing water close by.

Occurrence:
The presence of all species except the occult little brown bat has been confirmed on Los Alamos National Laboratory, Bandelier National Monument, and Santa Fe National Forest lands. Occult little brown bat has only been seen on Santa Fe National Forest lands.

Courtesy of Teralene Foxx, LANL

Whooping Crane

Grus americana

Status:

Federal endangered, State endangered.

Courtesy of Teralene Foxx, LANL

Description:

An adult whooping crane has an all-white plumage with black wingtips and red plumage on the forehead. With long legs and neck, an adult stands at about 132 cm (52 in.). The immature whooping crane is whitish with a reddish-brown head and neck.

Habitat:

River/Streams. The whooping crane roosts on sand bars, often returning to the same location year after year.

Occurrence:

The few remaining whooping cranes migrate along the Rio Grande and Cochiti Reservoir en route to southern New Mexico among flocks of sandhill cranes. These flocks are known to roost overnight in openings on mesas and on sand bars along their route. They are known to fly over but have not been confirmed to stop on Los Alamos National Laboratory lands.

Jemez Mountains Salamander

Plethodon neomexicanus

Status:
Species of concern, State threatened.

Description:
The Jemez Mountains salamander is elongated, from 50 to 110 mm (2 to 5 in.), is brown with fine brassy striping, and has small fore and hind limbs. It can be identified by a hairline furrow that extends from the nostril to the edge of the upper lip.

Habitat:
Mixed Conifer. The Jemez Mountains salamander requires shaded and moist wooded canyon slopes with loose, rocky soils that are at elevations from 2,200 to 2,820 m (7,225 to 9,250 ft.).

Occurrence:
The presence of the Jemez Mountains salamander has been confirmed on Los Alamos County, Bandelier National Monument, and Santa Fe National Forest lands and is believed to be on Los Alamos National Laboratory lands as well.

Courtesy of Teralene Foxx, LANL

PEREGRINE FALCON

Falco peregrinus

Status:
Federal delisted, State threatened.

Description:
The peregrine falcon is a swift-flying raptor with gray and white plumage and a black nape and crown. The crown extends wedge shaped below the eyes, forming a distinctive helmet. An immature peregrine is dark brownish above and heavily streaked below.

Habitat:
Piñon/Juniper, Ponderosa Pine, Mixed Conifer, Riparian, Grassland. The peregrine falcon inhabits canyons with cliffs that are required for breeding. It ranges widely and preys on birds that are captured in flight.

Occurrence:
The peregrine falcon is a migrant and summer resident and has been confirmed on Los Alamos National Laboratory, Bandelier National Monument, Santa Fe National Forest, and Los Alamos County lands.

Corel Professional Photos

Loggerhead Shrike

Lanius ludovicianus

Status:
Species of concern.

Description:
The loggerhead shrike resembles a mockingbird in size and appearance but is more bluish grey than the grey of a mockingbird. This bird is big-headed and slim-tailed with a black mask, an all-dark bill, and white, faintly barred underparts. A juvenile acquires adult coloring by the first fall but is paler and barred overall with brownish grey upperparts early on.

Habitat:
Juniper Savanna, Piñon/Juniper, Ponderosa Pine. Loggerhead shrikes prefer areas where they can hunt in fairly open or brushy terrain, diving from a low perch and swooping upward to another perch.

Occurrence:
The presence of the loggerhead shrike has been confirmed on Los Alamos County, Bandelier National Monument, and Santa Fe National Forest lands but not on Los Alamos National Laboratory lands.

Corel Professional Photos

SPOTTED BAT

Euderma maculata

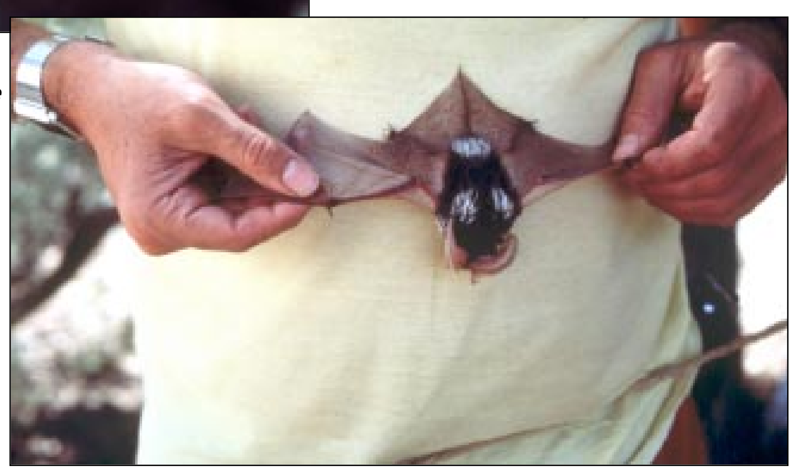
Status:
Species of concern, State threatened.

Description:
The spotted bat carries a unique white spot on its rump and each shoulder. It has huge pink ears and is dark sepia in color.

Habitat:
Riparian, Mixed Conifer, Piñon/Juniper, Ponderosa Pine. The spotted bat roosts in cliff crevices and other situations, often near water with an abundance of moths and other insects in the area.

Occurrence:
The presence of the spotted bat has been confirmed by capture at watering sites on adjacent lands of Bandelier National Monument and Santa Fe National Forest. Habitat and plant communities favored by the spotted bat are well represented within Los Alamos National Laboratory boundaries, and its distinctive echolocation calls have been heard on Los Alamos National Laboratory lands. The spotted bat has also been observed foraging in mixed Ponderosa Pine and Piñon/Juniper communities in Pueblo Canyon on Los Alamos County property.

Courtesy of Mike Bogan, National Biological Service



Big Free-Tailed Bat

Nyctinomops macrotis

Status:
Species of concern.

Description:
The big free-tailed bat is pale brown to black with a tail that extends beyond the tail membrane and ears that join at the midline of the forehead. With a wingspan of up to 42.5 cm (17 in.), this animal can be a swift, powerful flyer.

Habitat:
Piñon/Juniper, Ponderosa Pine, Mixed Conifer. This bat prefers canyon country that is rocky. It will roost in crevices of cliff faces and in rock hollows.

Occurrence:
The big free-tailed bat is a confirmed migrant on Los Alamos County, Bandelier National Monument, and Santa Fe National Forest lands.

Flathead Chub

Platygobio gracilis

Status:
Species of Concern.

Description:
The flathead chub is a fish that, in New Mexico, typically does not exceed 145 mm (inches) in length. This fish is scaled with an olivaceous colored back and sides that are silver. The head is broad in relation to its slender body and looks somewhat flattened. The dorsal and pectoral fins are sickle-shaped and the anal and pelvic fins are triangular.

Habitat:
The flathead chub can be found in rivers and larger streams with areas of highly turbid waters in moderate to strong currents. This fish is omnivorous but seems to prefer terrestrial insects.

Occurrence:
The flathead chub can be found in portions of the Rio Grande.

GRAY VIREO

Vireo vicinior

Status:
State threatened.

Description:
The plumage of the gray vireo is gray above and white below. There is a white ring around the eye and two bars along the wings. Short wings give this bird the appearance of having a long tail.

Habitat:
Juniper Savanna, Piñon/Juniper, especially on rocky slopes. This bird will forage through the undergrowth, flitting restlessly from place to place and flicking its tail feathers.

Occurrence:
The presence of the gray vireo has been confirmed on Los Alamos County, Bandelier National Monument, and Santa Fe National Forest lands but not on Los Alamos National Laboratory lands.

ZONE-TAILED HAWK

Buteo albonotatus

Status:
Species of local concern.

Description:
The zone-tailed hawk is a long-winged raptor that is black to dark grey in body. When perched, this bird's wingtips will extend back as far as the tail feathers. The wings are also dark in color but with a silvery tint, giving the underwing a two-tone appearance. In flight, it strongly resembles the turkey vulture (*Cathartes aura*). On the tail feathers the male has one wide and one slender whitish band and the female has two slender bands. The legs and the cere are bright yellow.

Habitat:
This buteo is relatively uncommon, but is widely distributed in Latin America and in the southwestern United States. In the US, it is most commonly found in the southern and central portions of Arizona and New Mexico. The zone-tailed hawk prefers mesa or mountain country where there are rivers or streams. Swooping down from a low glide, this hawk will prey upon rodents, lizards, fish, frogs, and small birds.

Occurrence:
The presence of the zone-tailed hawk has been confirmed on Los Alamos National Laboratory and Bandlier National Monument lands.

Information for profiles was derived from *Field Guide to the Birds of North America*, Scott, Ed., 2nd ed., (National Geograghic Society, Washington, D. C. 1985); *Western Birds*, Peterson, Ed., 3rd ed., (Houghton Mifflin Company, Boston 1990); *Mammals*, Peterson, Ed., 3rd ed., (Houghton; Mifflin Company, Boston 1980); *Field Guide to Orchids of North America*, Williams and Williams, (Universe Books, New York 1983); *The Encyclopedia of Mammals*, Macdonald, Ed., (Facts on File Publications, New York 1984); *Flowering Plants of the Southwestern Woodlands*, Foxx and Hoard, (Otowi Crossing Press, Los Alamos, New Mexico 1984); ESH-20 field notes; and first-person knowledge from the Ecological Studies Team members of ESH-20.

Back To
"Site Plans"

Back To
Species Main Page

BACK TO TES/HMP
HOME PAGE

LIST OF ACRONYMS

AEI	Area of Environmental Interest
BA	Biological Assessment
CEDE	committed effective dose equivalent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DARHT	Dual-Axis Radiographic Hydrodynamic Test
dB(A)	A-weighted decibels
DOE	Department of Energy
EPA	Environmental Protection Agency
ER	Environmental Restoration
ESA	Endangered Species Act
ftc	foot-candles (a unit of measurement for light)
GIS	geographic information system
HI	hazard index
HMP	Habitat Management Plan
LANL	Los Alamos National Laboratory
NFA	no further action
NPDES	National Pollutant Discharge Elimination System
PCBs	polychlorinated biphenyls
PRS	potential release site
RCRA	Resource Conservation and Recovery Act
TA	Technical Area
TRV	toxicity reference value
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

Back To Reference Lists

Monitoring Plan

for the

Arctic Peregrine Falcon

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is “to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved.” To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

The HMP has two associated documents: Area of Environmental Interest (AEI) Site Plans and Monitoring Plans. The AEIs are areas of LANL that are being managed and protected because of their biological or other significance. Habitats of threatened and endangered species that occur or may occur on LANL are designated as AEIs. The essential element of the AEI Site Plan is the management of each species-specific potential habitat through the allowable activities within the AEI. These allowable activities may be both spatially and time constrained and based on occupancy or non-occupancy of the habitat by the species.

These plans contain sensitive information concerning potential habitat for threatened and endangered species. For that reason, these documents are controlled and will be issued only to persons who have a “need to know” and are trained by LANL’s Ecology Group on the elements of the AEI Site Plan. All maps and associated materials should be considered sensitive and maintained as sensitive information.

If you need further information concerning the Endangered Species Program, these AEI Site Plans, or allowable activities, call the Ecology Group or DOE Los Alamos Area Office.

MONITORING PLAN FOR THE ARCTIC PEREGRINE FALCON

1.0 INTRODUCTION

The Threatened and Endangered Species Habitat Management Plan (HMP) will be partially implemented through the monitoring of Federal and State-listed species and local species of concern.

The majority of the information in this document was taken from NMDGF (1996), unless otherwise noted.

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

The peregrine falcon (*Falco peregrinus*) is a member of the order Falconiformes and family Falconidae, and is distributed worldwide, except Antarctica, with three subspecies occurring in North America. The historic breeding range of the American peregrine falcon (*F. p. anatum*) extended from central Mexico to subarctic Alaska and Canada, including central Alaska and almost all of the lower 48 states. This subspecies now breeds in most of its historic range in the western United States, but was extirpated in the eastern United States, where hybrids of other subspecies of the peregrine falcon have been introduced. The American peregrine falcon migrates and winters from the southern US to Central and South America. The Arctic peregrine falcon (*F. p. tundrius*) breeds in the extreme northern part of the continent and migrates though the United States. It is not distinguishable from the American peregrine falcon in the field. Peale's falcon (*F. p. pealei*) breeds and largely resides in coastal areas of the northwest.

2.2 STATUS

The Arctic peregrine falcon has been federally listed as endangered since passage of the Endangered Species Act in 1973. The subspecies was down-listed from endangered to threatened in 1984. In 1994 the Arctic peregrine falcon was removed from the Federal List of Endangered and Threatened Wildlife but is still protected under the similarity of appearance provision of the Endangered Species Act listing all *Falco peregrinus* found in the wild in the conterminous 48 states as endangered. The New Mexico Department of Game and Fish (NMDGF) reclassified the peregrine falcon from endangered to threatened in 1996.

Following restrictions on the use of organochlorine pesticides, reproductive rates in Arctic peregrine falcon populations increased, and populations began to expand by the mid- to late-1970s. Arctic peregrine falcons nest in the tundra regions of Alaska, Canada, and the ice-free perimeter of Greenland. The exact degree of population decline and subsequent recovery has been poorly documented because most breeding areas are extremely remote and because there were few population studies before the pesticide era, but it appears likely that the species' population has expanded 3-fold or more since the late 1970s (USFWS 1994).

In New Mexico, *F. p. tundrius* is a rare migrant, having been verified in the state only in the Roswell area. Key habitat areas are nest sites (eyries) and their vicinities, including both those that are currently occupied and historic ones that are still suitable for the species.

2.3 HABITAT

Peregrine breeding habitat is composed of nesting areas and foraging areas. Nest sites are typically located in cliff cavities, which can be defended against enemies, offer protection from weather, and provide a soil substrate in which a nesting depression can be formed. The quality of foraging habitat surrounding nesting areas is an important part of the breeding habitat. Peregrine falcons forage almost entirely for birds, which are attacked and caught in the air, often at high speeds. Avian prey is vulnerable when it is without cover, which may occur in a large gulf of air, as found over a canyon or over large grasslands or bodies of water.

2.4 CHRONOLOGY

Arctic peregrine falcons may migrate through New Mexico, typically in spring or fall.

2.5 BEHAVIOR

Very little is known about the Arctic peregrine falcon in New Mexico. Since the main migratory routes are along the Atlantic Coast and the Mississippi flyway to the Gulf Coast, Arctic peregrine falcon visits to New Mexico are rare. During migration the falcon may roost and hunt briefly in New Mexico before continuing south.

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

The Arctic peregrine falcon is protected under the similarity of appearance provision of the Endangered Species Act listing all *Falco peregrinus* found in the wild in the conterminous 48 states as endangered. LANL and the Department of Energy have obligations under the Endangered Species Act and the New Mexico Wildlife Conservation Act to ensure that their programs do not adversely affect individual peregrines.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change (for example, if the species is newly found at LANL). Activities that are not appropriate to a species are assigned a ranking of zero. The HMP contains a summary table ranking all species and activities. The following table lists importance rankings for Arctic peregrine falcon activities.

Section	Status Tracking	Habitat Analysis and Models	Presence/ Absence Surveys	Repro-duction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Ranking	1	3	3	0	0	0	0	0	3

4.1 STATUS TRACKING

This is a level one activity. The regional status of the Arctic peregrine falcon will be evaluated annually. Surveyors will attend status update meetings sponsored by the US Fish and Wildlife Service (USFWS). LANL biologist will remain up to date on information concerning the status of the Arctic peregrine falcon in New Mexico. All new information will be entered into a current LANL Threatened and Endangered Species Database and used as a reference document.

4.2 HABITAT ANALYSIS AND MODELS

This is a level three activity. No formal, annual field surveys will be conducted on LANL since this species is a migrant. However, in the future, LANL biologists should continue to assess the potential use of LANL by Arctic peregrine falcons, and perhaps initiate a habitat study related to Arctic peregrine falcon.

4.3 PRESENCE/ABSENCE SURVEY

This is a level three activity. Currently, there are no formal presence/absence surveys conducted at LANL. However, future studies might consider conducting presence/absence surveys during migration periods to gather more detailed information on baseline dates that Arctic peregrine falcon migrates over LANL property.

4.4 REPRODUCTIVE MONITORING

This is a level zero activity. There are no Arctic peregrine falcon reproductive monitoring studies being planned at LANL. There is no perceived need for this type of study in the future.

4.5 CONTAMINANT STUDIES

This is a level zero activity. Currently, there are no Arctic peregrine falcon contaminant studies being planned at LANL. There is no perceived need for this type of study in the future.

4.6 ECORISK STUDY

This is a level zero activity. Currently, there are no Arctic peregrine falcon ecorisk studies being planned at LANL. There is no perceived need for this type of study in the future.

4.7 PREY-BASE STUDIES

This is a level zero activity. Currently, there are no Arctic peregrine falcon prey-base studies being planned at LANL. There is no perceived need for this type of study in the future.

4.8 TRACKING OF INDIVIDUALS

This is a level zero activity. Currently, there are no Arctic peregrine falcon tracking studies being planned at LANL. There is no perceived need for this type of study in the future.

4.9 REGIONAL STUDIES

This is a level three activity. Any data collected on Arctic peregrine falcon must be reported to USFWS. Since other agencies near LANL (National Park Service, US Forest Service, Bureau of Land Management, State of New Mexico, San Ildefonso Pueblo, Cochiti Pueblo) have Arctic peregrine falcon issues, we may desire to collaborate on regional recovery efforts and studies with them.

5.0 ANALYSIS AND REPORTING

Because there will be no formal studies done at LANL on Arctic peregrine falcon, analysis and reporting will not be required.

6.0 LITERATURE CITED

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US Fish and Wildlife Service. 1994. Endangered and Threatened Wildlife and Plants; Removal of Arctic Peregrine Falcon From the List of Endangered and Threatened Wildlife. October 5, 1994. 50 CFR Part 17., US Department of the Interior.

Back To "Birds"

Monitoring Plan

for the

Reptile and Amphibian

Indicator Species

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

The HMP has two associated documents: Area of Environmental Interest (AEI) Site Plans and Monitoring Plans. The AEIs are areas of LANL that are being managed and protected because of their biological or other significance. Habitats of threatened and endangered species that occur or may occur on LANL are designated as AEIs. The essential element of the AEI Site Plan is the management of each species-specific potential habitat through the allowable activities within the AEI. These allowable activities may be both spatially and time constrained and based on occupancy or non-occupancy of the habitat by the species.

These plans contain sensitive information concerning potential habitat for threatened and endangered species. For that reason, these documents are controlled and will be issued only to persons who have a "need to know" and are trained by LANL's Ecology Group on the elements of the AEI Site Plan. All maps and associated materials should be considered sensitive and maintained as sensitive information.

If you need further information concerning the Endangered Species Program, these AEI Site Plans, or allowable activities, call the Ecology Group or DOE Los Alamos Area Office.

MONITORING PLAN FOR THE REPTILE AND AMPHIBIAN INDICATOR SPECIES

1.0 INTRODUCTION

The monitoring of Federal and State species and local species of concern is an integral part of the Threatened and Endangered Species Habitat Management Plan (HMP). In addition, the monitoring of non-listed species that are considered indicators of environmental health is a critical component in the assessment of the overall conditions of an ecosystem. This particular monitoring plan provides background information and establishes monitoring protocols for key reptile and amphibian species at Los Alamos National Laboratory (LANL).

2.0 SPECIES DESCRIPTION

2.1 COMMON SPECIES FOUND AT LANL

Past reptile and amphibian studies at LANL have concentrated primarily on those species that are most common to the region. These include

Tiger salamander (*Ambystoma tigrinum*)
New Mexico spadefoot toad (*Scaphiopus multiplicatus*)
Woodhouse's toad (*Bufo woodhousei*)
Canyon treefrog (*Hyla arenicolor*)
Western chorus frog (*Psuedacris triseriata*)
Prairie lizard (*Sceloporus undulatus*)
Plateau striped whiptail lizard (*Cnemidophorus velox*)
Many-lined skink (*Eumeces multivirgatus*)

Because these species are found in relative abundance around the LANL area, they are easily incorporated into studies that monitor and track population dynamics. By examining the population fluctuations of these species, LANL can use these species as basic indicators of environmental health.

2.2 STATUS

None of the reptiles or amphibians chosen as indicator species are federally or state listed.

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

Many amphibians and some reptiles are considered environmental indicator species. Amphibians are often considered sensitive indicators of environmental quality. Their moist skin allows absorption of both air- and water-borne pollutants. Because most of their life cycles include both aquatic and terrestrial stages, degradation in either habitat may negatively affect population viability and fitness. The sensitivity of amphibians and the widespread nature of their declines may reflect global environmental degradation (Jennings 1995).

Research has demonstrated the importance of both amphibians and reptiles in natural ecosystems. These animals are especially sensitive to pollution and loss of aquatic habitat (Hall 1980). Amphibians and reptiles are also important in food chains, and they make up large proportions of vertebrates in certain ecosystems (Bury and Raphael 1983). Because of recent concern for non-game wildlife, biologists and land managers find themselves faced with studies and management needs for a group of animals they know little about (Jones 1986).

The Ecology Group at LANL has been monitoring reptiles and amphibians since 1990. This allows the Ecology Group's Biology Team to provide pertinent information for LANL management decisions as they pertain to reptiles and amphibians.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change (for example, if the species is newly found at LANL). Some activities are not appropriate to every species (designated as zero). The HMP contains a summary table ranking all species and activities. The following table lists importance rankings for reptile and amphibian monitoring activities.

Section	Status Tracking	Habitat Analysis and Models	Presence/ Absence surveys	Repro-duction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Ranking	1	3	2	3	3	3	3	2	3

4.1 STATUS TRACKING

This is a level one activity. As it pertains to the use of these species as indicators of environmental health, the status of all the reptiles and amphibians used in our studies will be evaluated annually. All new information will be entered into a current LANL Threatened and Endangered Species Database and used as a reference document.

4.2 HABITAT ANALYSIS AND MODELS

This is a level three activity. Habitat analysis of these key species is not currently being conducted, but LANL may wish to do it in the future.

4.3 PRESENCE/ABSENCE SURVEY

This is a level two activity. Currently, presence/absence surveys are being conducted at LANL. As part of ongoing baseline data collection, reptile and amphibian studies have been conducted since 1990. These baseline studies will continue to be utilized to monitor current conditions of reptile and amphibian populations.

Reptiles and amphibians have been trapped at the Pajarito wetlands using pitfall traps since 1990 (excluding 1992). The project was initiated to monitor these species as they are affected greatly by environmental changes. Through the years we have modified our sampling design and implemented new techniques to help us better understand the population dynamics of these animals. With the data collected, we will develop a monitoring plan to identify if any significant changes have occurred within the populations over time. Monitoring generally requires sampling over several years so that species and community health can be more accurately evaluated. This is especially needed in sampling amphibians and reptiles because populations fluctuate greatly from year to year with environmental changes, with respect to precipitation. Data collected over several years allows biologists to determine if population trends are due to naturally fluctuating environmental conditions or to other causes (Jones 1986).

With the implementation of these studies, we are in the process of evaluating population dynamics such as survival rates and species composition as compared to annual and seasonal fluctuations in precipitation and temperature. In addition, issues of contamination effects on reptiles and amphibians may be evaluated.

4.3.1 Survey Locations

Pitfall traps are located within LANL's Technical Area 36, known as the Pajarito wetlands. The wetlands are located 804 m (2655 ft) west of White Rock on Pajarito Road. The study site is 127 m (419 ft) wide by 356 m (1175 ft) long. This area is classified as both a riparian association (Degenhart et al. 1996) and a dry upland. The major vegetation in the upland area is Apache plume (*Fallugia paradoxa*), rabbitbrush (*Chrysothamnus nauseosus*), big sage (*Artemisia tridentata*), white sweet clover (*Melilotus albus*), one-seed juniper (*Juniperus monosperma*), blue grama (*Bouteloua gracilis*), mutton grass (*Poa fendleriana*), and mullein (*Verbascum thapsus*). Vegetation in the wetland area is rush (*Juncus* spp), willows (*Salix* spp.), broad-leaved cattail (*Typha latifolia*), redtop (*Agrostis gigantea*), and mutton grass (*Poa fendleriana*). Pitfall traps are located by both upland and riparian vegetation types. Approximately 16 pitfall trap arrays are located within the study site. The study site is divided into two areas—denoted as north and south—by an ephemeral stream. Seven ponds are located adjacent to the north side of the stream.

4.3.2 Survey Dates

Pitfall traps are opened in early May and closed in late September.

4.3.3 Survey Technique

Studies of reptiles and amphibians have been conducted via pitfall trapping at LANL since 1990. Drift fences (aluminum flashing) with pitfall traps (large buckets) are used commonly to inventory and monitor populations of amphibians and reptiles (Heyer et al. 1994). Aluminum flashing is placed in the ground and used to intercept and direct animals into pitfall traps. Lids are elevated above the traps to provide overhead protection.

Traps are checked daily Monday through Friday and closed on the weekends. Trapping days for all years are similar. Once animals are captured, they are brought back to the laboratory to be measured. The mass of the animal is measured in grams with a Mettler electronic scale. The distance from the tip of the rostrum to the vent (snout-vent length) is measured in millimeters with Mitytoyo electronic calipers. Total tail length is measured from the vent to the tip of the tail. If the tail had been damaged or showed regeneration, then the regenerated portion of the tail was measured from the anterior portion of where the tail was broken off to the most posterior portion of the tail. The data are recorded with date, trap number, and comments.

4.3.4 Required Resources

The primary resources required for this project are person hours. In addition, a minimal amount of money is required for pitfall trap maintenance and upkeep.

4.3.4.1 Personnel

Two people are required to check the trap on a daily basis.

4.3.4.2 Equipment

Minimal equipment is required. Containers for transporting the animals to and from the biology lab are required. In addition, an accurate scale and calipers are required.

4.3.4.3 Training

All personnel will be trained according to Ecology Group Operating Procedures.

4.3.4.4 Permitting

No permits are required.

4.4 REPRODUCTIVE MONITORING

This is a level three activity. There is no reproductive monitoring currently being done at LANL. However, this type of information would be useful in using reptile and amphibians as indicator species.

4.5 CONTAMINANT STUDIES

This is a level three activity. Currently, there are no contaminant studies being planned at LANL. However, because amphibians and reptiles are considered good indicators of overall environmental health, LANL may wish to consider a contaminant study.

4.6 ECORISK STUDY

This is a level three activity. Currently, there are no ecorisk studies being planned at LANL. However, because amphibians are considered good indicators of overall environmental health, LANL may wish to consider an ecorisk study.

4.7 PREY-BASE STUDIES

This is a level three activity. Currently, there are no prey-base studies being planned at LANL. However, LANL may wish to conduct such a study in the future.

4.8 TRACKING OF INDIVIDUALS

This is a level two activity. There is a small-scale, pioneer study being conducted at LANL.

Pitfall trapping has been employed widely for surveys of amphibian and reptile diversity and abundance in different habitat types. Traps can be operated continuously so that variation in activity due to weather can be detected (Bury and Corn 1987).

Ecology Group personnel implemented a pioneer mark-recapture study in 1996 to study the feasibility of using mark-recapture methods for future use. A permanent marking system known as the passive integrated transponder (PIT) was implemented for the purpose of gathering mark and recapture data. In 1997, another permanent marking system, toe clipping, was used in addition to PIT tagging. Both methods are used independently of one another. PIT tagging is used only for animals that are eight grams or more in mass. Toe clipping is implemented if an animal is less than eight grams in mass. PIT tags are only used when the tag is less than 10% of the body mass of the animal.

When animals are caught in a pitfall trap, it can be determined if the animal is a recapture by counting the number of toes, or scanning the individual with the PIT wand for an implanted PIT tag. This method is used in mark-recapture studies where long-term monitoring is desirable. The Ecology Group will continue to use mark-recapture studies

4.8.4 Required Resources

Same as above mentioned resources.

4.8.4.1 Personnel

Same as above mentioned personnel.

4.8.4.2 Equipment

Same as above mentioned equipment. In addition, PIT tags and PIT scanning device.

4.8.4.3 Training

Same as above mentioned training. In addition, persons injecting the PIT will be trained by qualified individuals within the team.

4.8.4.4 Permitting

A current, LANL-approved permit from the “Institutional Animal Care and Use Committee” is required.

4.9 REGIONAL STUDIES

This is a level three activity. Currently, there are no regional studies being conducted relative to LANL’s indicator reptile and amphibian species. However, LANL may wish to do this type of study in the future.

5.0 ANALYSIS AND REPORTING

All results will be summarized and analyzed in an annual report. In addition, this information will be entered into a geographic information system.

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Back To "Other"

Monitoring Plan

for

Bats

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

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MONITORING PLAN FOR BATS

1.0 INTRODUCTION

The monitoring of Federal and State-listed species and local species of concern is an integral piece of the Threatened and Endangered Species Habitat Management Plan (HMP). This monitoring plan provides background information and establishes monitoring protocols for Federal bat species of concern at Los Alamos National Laboratory (LANL).

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

There are eight species of bats at LANL that are Federal species of concern and one of these that is a State-endangered species.

Western small-footed myotis (Federal species of concern)

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, SUBCLASS	Mammalia, Theria
ORDER, SUBORDER	Chiroptera, Microchiroptera
FAMILY, SUBFAMILY	Vespertilionidae, Vespertilioninae
GENUS,	*Myotis*
SPECIES	*ciliolabrum (leibii)*
SUBSPECIES	*melanorhinus* (NM)

The "Historic range" of the small-footed myotis includes Arizona, California, Colorado, Idaho, Montana, North Dakota, Nebraska, New Mexico, Nevada, South Dakota, Texas, Utah, Washington, and Mexico (USFWS 1994).

DESCRIPTION

Myotis leibii is known from all other species of myotis found in New Mexico, except *M. volans* and *M. californicus*, by the presence of a keel on the calcar. From the former, the present species differs in not having the wing membrane furred ventrally to a line joining the elbow and the knee. From the latter species, *M. leibii* is distinguished with somewhat more difficulty. In *M. leibii*, the profile of the skull rises very gradually from the top of the rostrum to the top of the braincase, while in *M. californicus* the profile rises abruptly. The braincase of *M. leibii* is relatively low; its height, expressed as a percent of greatest skull length, is equal to or less than 31.9% in 75% of specimens, and equal to or greater than 31.9% in 73% of specimens of *M. californicus*. *Myotis leibii* is larger than *M. californicus*. In 90% of the members of *M. leibii* from New Mexico, the greatest skull length equals or exceeds 13.6 mm (.54 in.), whereas 90% of New Mexican *M. californicus* have skulls that equal or are less than 13.5 mm (0.5 in.). The pelage of *M. leibii* is a bright golden brown, usually with a distinct sheen to the tips of the hairs. *Myotis californicus* varies in color geographically in New Mexico, but no populations have burnished tips to the hairs; rather, the pelage is of a dull appearance, regardless of its color.

The length of the third metacarpal relative to the length of the forearm has been used as a trait to separate *M. leibii* and *M. californicus*. This character may be used, but only with reservation. In 24% of *M. californicus*, the third metacarpal equals or exceeds the forearm in length, while in all *M. leibii* the metacarpal is less than the length of the forearm. In 76% of all *M. leibii*, the metacarpal is 1.2 mm (0.05 in.) or shorter than the forearm, while in 69% of *M. californicus* the difference is 1.2 mm (0.05 in.) or less. In addition, many *M. californicus* from desert areas in New Mexico have tricolored dorsal pelage, that is, the bases of the hairs are black, followed distally by a light band, then by somewhat darker tips. No *M. leibii* have noticeable tricoloration. The percentages contained therein are based on statistical probability. A small-keeled *Myotis* from New Mexico agreeing with five or more of the items in one column would certainly belong to the indicated species.

Long-eared myotis (Federal species of concern)

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, SUBCLASS	Mammalia, Theria
ORDER, SUBORDER	Chiroptera, Microchiroptera
FAMILY, SUBFAMILY	Vespertilionidae, Vespertilioninae
GENUS,	*Myotis*
SPECIES	*evotis*
SUBSPECIES	*evotis* (NM)

The "historic range" of the long-eared myotis includes Arizona, California, Colorado, Idaho, Montana, North Dakota, Nebraska, New Mexico, Nevada, Oregon, South Dakota, Texas, Utah, Washington, Canada, and Mexico (USFWS 1994).

Fringed myotis (Federal species of concern)

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, SUBCLASS	Mammalia, Theria
ORDER, SUBORDER	Chiroptera, Microchiroptera
FAMILY, SUBFAMILY	Vespertilionidae, Vespertilioninae
GENUS,	*Myotis*
SPECIES	*thysanodes*
SUBSPECIES	*thysanodes* (NM)

The "historic range" of the fringed myotis includes Arizona, California, Colorado, Idaho, Montana, Nebraska, New Mexico, Nevada, South Dakota, Texas, Utah, Washington, Canada, and Mexico (USFWS 1994).

Myotis thysanodes is the only long-eared species of New Mexican myotis with a distinct fringe of macroscopically visible short hairs on the free edge of the uropatagium.

Long-legged myotis (Federal species of concern)

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, SUBCLASS	Mammalia, Theria
ORDER, SUBORDER	Chiroptera, Microchiroptera
FAMILY, SUBFAMILY	Vespertilionidae, Vespertilioninae
GENUS,	*Myotis*
SPECIES	*volans*
SUBSPECIES	*interior* (NM)

The "historic range" of the long-legged myotis includes Arizona, California, Colorado, Idaho, Montana, North Dakota, Nebraska, New Mexico, Nevada, South Dakota, Texas, Utah, Washington, Canada, and Mexico (USFWS 1994).

Myotis volans is a large myotis with a keeled calcar and with the ventral surfaces of the plagiopatagia furred to the elbows (Findley et al. 1975).

Myotis volans has a long body; long tail; a relatively small skull that has a narrow rostrum and short toothrow; well developed keel on calcar; underside of wing furred to elbow (only species of myotis with this character); ears small, rounded, and dark; hind foot large; no bare patch on back between scapulae; slope of forehead abrupt; and upperparts dark brown, underparts usually washed with brown (Hoffmeister 1986).

Yuma myotis (Federal species of concern)

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, SUBCLASS	Mammalia, Theria
ORDER, SUBORDER	Chiroptera, Microchiroptera
FAMILY, SUBFAMILY	Vespertilionidae, Vespertilioninae
GENUS,	*Myotis*
SPECIES	*yumanensis*
SUBSPECIES	*yumanensis* (NM)

The "historic range" of the Yuma myotis includes Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Texas, Utah, Washington, Canada, and Mexico (USFWS 1994).

From most other New Mexican myotis, *M. yumanensis* may be told by short ears and by a lack of a keeled calcar and a sagittal crest. From *M. lucifugus*, which it often closely resembles, it may be distinguished by the dorsal fur, which usually lacks a sheen, and by the mastoid breadth, generally 7.4 mm (0.3 in.) or less (*M. lucifugus*, generally 7.5 mm or more). Of 110 Yuma myotis checked, only two reached a mastoid breadth of 7.5 mm, and none exceeded that figure. Hairs on dorsum are not tipped with a brighter brown.

Morphological variation of *M. yumanensis* in New Mexico is not great, being represented mainly by a slight clinal increase in size (as measured by length of maxillary tooth-row) from south to north; the few specimens from the Colorado River drainage of New Mexico and adjacent states, however, indicate an abrupt change from the Rio Grande drainage to that of the Colorado. Thus animals from the Jemez and Sangre de Cristo Mountains average slightly less than 5.1 mm (0.2 in.) in maxillary tooth-row length, while those from Tocito (San Juan, New Mexico) and Allison (La Plata County, Colorado) average about 5.4 mm (0.22 in.). The difference may reflect the absence of competition from the larger *M. lucifugus occultus* in the Colorado drainage, allowing attainment of greater size.

Spotted bat (State endangered, Federal species of concern)

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, SUBCLASS	Mammalia, Theria
ORDER, SUBORDER	Chiroptera, Microchiroptera
FAMILY, SUBFAMILY	Vespertilionidae, Vespertilioninae
GENUS,	*Euderma*
SPECIES	*maculatum*

The "historical range" of the spotted bat includes Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Wyoming, Texas, Canada, and Mexico (USFWS 1994).

The species occurs very locally from central California, southern British Columbia, central Montana, and the Big Bend region of Texas southward through north-central Mexico to Queretaro. New Mexico: This bat has been found in New Mexico from the vicinity of the Rio Grande Valley westward, occurring most regularly in the Jemez, San Mateo, and Mogollon Mountains and on Mt. Taylor (in the San Mateo Mountains)—which are presumably key habitat areas. There are additional highland records from near Ghost Ranch (Rio Arriba County) and Lake Roberts (Grant County), as well as single lowland records from Aztec, Albuquerque, and Mesilla Park (Dona Ana County) (NMDGF 1988).

Historic records suggest that the spotted bat was widely distributed but quite rare over its range, although it may have been locally abundant at certain sites. However, recent surveys based on echolocation calls revealed very few of these bats in areas where the species was previously more-or-less regular in occurrence, including in the Jemez, San Mateo, and Mogollon Mountains of New Mexico. Limiting factors for this bat were unknown, although the species could be adversely affected by pesticides ingested through contaminated insects (NMDGF 1988).

Distinguishing features: The spotted bat is a member of the Vespertilionidae, which is distinguished from other families of bats by the absence of a noseleaf and any notable extension of the tail beyond the interfemoral membrane (Findley et al. 1975). In the spotted bat, the upperparts are blackish with two large, white, roughly circular spots on the shoulders and another at the base of the tail—plus small patches at the posterior base of each ear. The large ears measure 45 to 50 mm (1.8 to 2 in.) from notch to tip when turgid, are naked, pinkish-red in color, and are remarkably sturdy for their size. The combination of the unique black-and-white color pattern and the large, pinkish-red ears readily distinguish this from all other New World bats (Hoffmeister 1986). The rather low-pitched voice is loud and also distinctive to people familiar with bat vocalizations (NMDGF 1988).

The venter is white, with the basal portion of the fur blackish. The skull has 34 teeth (including two upper and lower premolars), an exceptionally elongated braincase, and inflated auditory bullae. External measurements include total length 107 to 115 mm (4.2 to 4.6 in.); tail, 47 to 50 mm (1.9 to 2 in.); and forearm, 48 to 51 mm (1.9 to 2.04 in.) (NMDGF 1988).

Spotted bats' echolocation clicks are similar to those of *Plecotus phyllotus* and *Tadaria macrotis* with *Plecotus* being the softest and *Tadaria* being the most intense of the three (NMDGF 1988).

Echolocation calls and feeding buzzes of the spotted bat are audible to people (Rabe et al. 1997).

Townsend's big-eared bat (Federal species of concern)

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, SUBCLASS	Mammalia, Theria
ORDER, SUBORDER	Chiroptera, Microchiroptera
FAMILY, SUBFAMILY	Vespertilionidae, Vespertilioninae
GENUS,	*Plecotus*
SPECIES	*townsendii*
SUBSPECIES	*pallescens* (NM, AZ)

The "historic range" of the pale Townsend's (= western) big-eared bat includes Arizona, California, Colorado, Idaho, Kansas, Montana, North Dakota, Nebraska, New Mexico, Oklahoma, South Dakota, and Mexico (USFWS 1994).

The distribution of *C. townsendii* (= *P. townsendii*) tends to be geomorphically determined, and is strongly correlated with the availability of caves or cave-like roosting habitat (e.g., old mines). Population concentrations occur in areas with substantial surface exposures of cavity forming rock and in old mining districts (Idaho St. Conserv. 1995).

C. townsendii occurs throughout much of western North America, from British Columbia to Mexico, and eastward to Texas, with isolated populations in Kansas, Arkansas, Missouri, Oklahoma, Kentucky, West Virginia, and Virginia. *C. t. townsendii* occurs in Washington, Oregon, California, Nevada, Idaho, and possibly southwestern Montana and northwestern Utah; *C. t. pallescens* occurs in all the same states as *C. t. townsendii*, plus Arizona, Colorado, New Mexico, Texas, and Wyoming (Idaho St. Conserv. 1995).

A species of *Plecotus* with greatly enlarged glandular masses on sides of muzzle; no lappets extending forward from near base of ears; postpalatal spine present; external nasal vacuities short, and, when viewed dorsally, nearly round in outline and without a median spine; infraorbital foramen small; infraorbital plate not twisted, and lateral processes not noticeable; broadest part of zygomatic arch near posterior root of zygoma; and braincase and rostrum not especially broad.

C. townsendii can be distinguished from all other western bat species by the combination of a two-pronged, horseshoe-shaped lump on the nostrils, and large, rabbit-like ears. Although there are other western species with long ears, none of these have the two-pronged nose lump, and most can be distinguished by other features. The species that is most similar, *L. phyllotis*, has unspecialized nostrils, and a pair of fleshy lappets projecting from the ears over the forehead (Idaho St. Conserv. 1995).

Although the ears on *C. townsendii* are obvious (erect and facing forwards) when animals are alert, they can be difficult to see (curled tightly against the top of the head in the shape of a ram's horn) when animals are in torpor or hibernation. At such times, the tragus remains erect, and can be mistaken for ears, leading to misidentification of the species (Idaho St. Conserv. 1995).

C. townsendii is a medium sized (10 to 12 g [0.35 to 0.42 oz.]) bat, with an adult forearm length of 39 to 48 mm (1.5 to 1.9 in.) and ears of 30 to 39 mm (1.2 to 1.5 in.). It shows some regional variation in color, but generally has buffy brown dorsal fur with somewhat paler underparts (Idaho St. Conserv. 1995).

Though Handley makes the distinction between the two western subspecies, based on size and color characteristics, he also claims that one can observe a full spectrum of characteristics for both subspecies within a single population (Idaho St. Conserv. 1995).

Big free-tailed bat (Federal species of concern)

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, SUBCLASS	Mammalia, Theria
ORDER, SUBORDER	Chiroptera, Microchiroptera
FAMILY	Molossidae
GENUS,	*Nyctinomops*
SPECIES	*macrotis*
SUBSPECIES	*pallescens* (NM, AZ)

The "historic range" of the big free-tailed bat includes Arizona, Colorado, New Mexico, Utah, Mexico, and South America (USFWS 1994).

Tadarida macrotis is larger (forearm greater than 55 mm [2.2 in.]) than other members of the genus in New Mexico. This species seems to have approximately the same ecological distribution in New Mexico as *T. brasiliensis*, occurring rarely up to 2400 m (8000 ft) but being more common below 1800 m (6000 ft). The big free-tail, however, is a much less common species, as judged by frequency of capture or by noting its distinctive, loud, low-frequency calls.

The big free-tailed bat is a large bat with glossy, pale, reddish-brown hairs on its back (USFWS 1995).

A large species of *Tadarida* in which the ears are joined basally at the midline, forearm usually 58 to 64 mm (2.3 to 2.6 in.), ears appear to be large, upper incisors when viewed from the front nearly parallel, rostrum elongate and narrow, skull large (usually over 21 mm [0.8 in.]), length of shelf bony palate measured from posterior edge of anterior palatine vacuity behind incisors more than 7 mm (0.3 in.), breadth of braincase measured across roots of zygomata usually 9.5 mm (0.38 in.) or more, and skull with obvious sagittal crest.

2.2 STATUS DESCRIPTION

Western small-footed myotis:

1994: The small-footed myotis was listed in the Federal Register, November 15, 1994, as a Category 2 species for consideration to be listed as a threatened or endangered species (USFWS 1994).

1995: *Myotis ciliolabrum* was listed under the Natural Heritage Global Rank "G5" ("G5" = "Demonstrably Secure") (AGFD 1995).

1995: The species, *Myotis ciliolabrum*, was being "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (AGFD 1995) .

1996: The USFWS changed listing status of "Federal Candidate" species. This classification formerly included three subclassifications: Federal Candidate: Category 1, Category 2, and Category 3. There are no longer "Category" designations. This species was listed as a Federal Candidate Category 2 species. Species formerly designated Category 2 and Category 3 are no longer considered Federal candidate species, and so no longer have any Federal protection under the "Candidate" listing. However, such species may retain other Federal or State designated protections (USFWS 1996).

1996 (March): Former C2 species were reclassified as Federal: "Species of Concern" (Jahrsdoerfer 1996).

ARIZONA

1995: *Myotis ciliolabrum* was listed under the Natural Heritage Arizona State Rank "S3" ("S3" = "Uncommon or Restricted") (AGFD 1995).

COLORADO

Wildlife commission regulations state that non-game species (bats) are protected. Bats are not protected within municipalities where causing a nuisance or damage to property.

Long-eared myotis:

1994: The long-eared myotis was listed in the Federal Register, November 15, 1994, as a Category 2 species for consideration to be listed as a threatened or endangered species (USFWS 1994).

1995: *Myotis evotis* was listed under the Natural Heritage Global Rank "G5" ("G5" = "Demonstrably Secure") (AGFD 1995).

1995: The species, *Myotis evotis*, was being "Watched": data were being passively accumulated and entered into manual files by the Heritage Program (AGFD 1995).

1996: The USFWS changed listing status of "Federal Candidate" species. This classification formerly included three subclassifications: Federal Candidate: Category 1, Category 2, and Category 3. There are no longer "Category" designations. This species was listed as a Federal Candidate Category 2 species. Species formerly designated Category 2 and Category 3 are no longer considered Federal candidate species, and so no longer have any Federal protection under the "Candidate" listing. However, such species may retain other Federal or State designated protections (USFWS 1996).

1996 (March): Former C2 species were reclassified as Federal: “Species of Concern" (Jahrsdoerfer 1996).

ARIZONA

1995: *Myotis evotis* was listed under the Natural Heritage Arizona State Rank "S4" ("S4" = "Apparently Secure") (AGFD 1995).

Fringed myotis:

1994: The fringed myotis was listed in the Federal Register, November 15, 1994, as a Category 2 species for consideration to be listed as a threatened or endangered species (USFWS 1994).

1995: The species, *Myotis thysanodes*, was listed under the Natural Heritage Global Rank "G5" ("G5" = "Demonstrably Secure") (AGFD 1995).

1995: The species, *Myotis thysanodes*, was being "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (AGFD 1995).

1996: The USFWS changed listing status of "Federal Candidate" species. This classification formerly included three subclassifications: Federal Candidate: Category 1, Category 2, and Category 3. There are no longer "Category" designations. This species was listed as a Federal Candidate Category 2 species. Species formerly designated Category 2 and Category 3 are no longer considered Federal candidate species, and so no longer have any Federal protection under the "Candidate" listing. However, such species may retain other Federal or State designated protections (USFWS 1996).

1996: The complete Natural Heritage Global Rank for the species *Myotis thysanodes* was listed "G5" (CNHP 1996).

1996: The species, *Myotis thysanodes*, was listed by a New Mexico Natural Heritage Program list as "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (NMNHP 1996).

1996 (March): Former C2 species were reclassified as Federal: "Species of Concern" (Jahrsdoerfer 1996).

ARIZONA

1995: The species, *Myotis thysanodes*, was listed under the Natural Heritage Arizona State Rank "S3S4" ("S3S4" = "Fairly Common") (AGFD 1995).

COLORADO

Wildlife commission regulation states that non-game species are protected.

Long-legged myotis:

1994: The long-legged myotis was listed in the Federal Register, November 15, 1994, as a Category 2 species for consideration to be listed as a threatened or endangered species (USFWS 1994).

1995: The species, *Myotis volans*, was listed under the Natural Heritage Global Rank "G5" ("G5" = "Demonstrably Secure") (AGFD 1995).

1995: The species, *Myotis volans*, was being "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (AGFD 1995).

1996: The USFWS changed listing status of "Federal Candidate" species. This classification formerly included three subclassifications: Federal Candidate: Category 1, Category 2, and Category 3. There are no longer "Category" designations. This species was listed as a Federal Candidate Category 2 species. Species formerly designated Category 2 and Category 3 are no longer considered Federal candidate species, and so no longer have any Federal protection under the "Candidate" listing. However, such species may retain other Federal or State designated protections (USFWS 1996).

1996: The species, *Myotis volans*, was listed by a New Mexico Natural Heritage Program list as "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (NMNHP 1996).

1996 (March): Former C2 species were reclassified as Federal: "Species of Concern" (Jahrsdoerfer 1996).

ARIZONA

1995: The species, *Myotis volans*, was listed under the Natural Heritage Arizona State Rank "S4" ("S4" = "Apparently Secure") (AGFD 1995).

COLORADO

Wildlife commission regulations state that non-game species are protected. Bats are not protected within municipalities where causing a nuisance or damage to property.

Yuma myotis:

1994: The Yuma myotis was listed in the Federal Register, November 15, 1994, as a Category 2 species for consideration to be listed as a threatened or endangered species (USFWS 1994).

1995: The species, *Myotis yumanensis*, was listed under the Natural Heritage Global Rank "G5" ("G5" = "Demonstrably Secure") (AGFD 1995).

1995: The species, *Myotis yumanensis*, was being "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (AGFD 1995).

1996: The USFWS changed listing status of "Federal Candidate" species. This classification formerly included three subclassifications: Federal Candidate: Category 1, Category 2, and Category 3. There are no longer "Category" designations. This species was listed as a Federal Candidate Category 2 species. Species formerly designated Category 2 and Category 3 are no longer considered Federal candidate species, and so no longer have any Federal protection under the "Candidate" listing. However, such species may retain other Federal or State designated protections (USFWS 1996).

1996: The complete Natural Heritage Global Rank for the species *Myotis yumanensis* was listed "G5" (CNHP 1996).

1996: The species, *Myotis yumanensis*, was listed by a New Mexico Natural Heritage Program list as "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (NMNHP 1996).

ARIZONA

1995: The species, *Myotis yumanensis*, was listed under the Natural Heritage Arizona State Rank "S4" ("S4" = "Apparently Secure") (AGFD 1995).

COLORADO

The Yuma myotis is apparently migratory, but very little is known concerning migratory patterns. Wildlife commission regulations (chapter 10, article 1, #1000) state that non-game species are protected. Bats are not protected within municipalities where causing a nuisance is damage to property.

Spotted bat:

1988: Federal Status: The spotted bat was listed as a Federal Notice of Review species to be considered for potential listing as an endangered/threatened species (NMDGF 1988).

1990: The spotted bat was listed as an USFS Sensitive Species (USFS 1990).

1991: This species listed in the November 21, 1991, Federal Register, as a Notice of Review Candidate, Category 2 (USFWS 1991).

1994: The spotted bat (*Euderma maculatum*) was listed in the Federal Register, November 15, 1994, as a Category 2 species for consideration to be listed as a threatened or endangered species (USFWS 1994).

1994: *Euderma maculatus* was listed under the Navajo Endangered Species List "G4" ("Candidate" - Any species or subspecies for which the Navajo Fish and Wildlife Department (NFWD) does not currently have sufficient information to support their listing as G2 or G3 but has reason to consider them. The NFWD is actively seeking information to determine if they warrant inclusion in a different group or removal from the list. They are not protected under Tribal Code but should be considered in project planning (NESL 1995).

1995: *Euderma maculatum* was listed under the Natural Heritage Global Rank "G4" ("G4" = "Apparently Secure") (AGFD 1995).

1995: The species, *Euderma maculatum*, was being "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (AGFD 1995).

1996: The USFWS changed listing status of "Federal Candidate" species. This classification formerly included three subclassifications: Federal Candidate: Category 1, Category 2, and Category 3. There are no longer "Category" designations. This species was listed as a Federal Candidate Category 2 species. Species formerly designated Category 2 and Category 3 are no longer considered Federal candidate species, and so no longer have any Federal protection under the "Candidate" listing. However, such species may retain other Federal or State designated protections (USFWS 1996).

1996: The Natural Heritage Global Rank for the species, *Euderma maculatum*, was listed "G4" (CNHP 1996).

1996: The species, *Euderma maculatum*, was listed by a New Mexico Natural Heritage Program list as "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (NMNHP 1996).

1996 (March): Former C2 species were reclassified as Federal: "Species of Concern" (Jahrsdoerfer 1996).

1997: *Euderma maculatum* was considered Group 4 on the NESL (Navajo Endangered Species List) in 1994; however, this status was removed from the NESL in 1997 -- effective May 1, 1997. Change in status explanation: "Although this is not a species typically found in abundance, it appears to be widespread on the Navajo Nation; typically inhabits a variety of habitat types; no known threats" (NFWD 1997).

NEW MEXICO

1988: New Mexico Status: Endangered (group 2), first listed Jan. 9, 1988 (NMDGF 1988).

1990: Remained listed as State Endangered (Group 2) in Amended Listing of Endangered Wildlife of New Mexico, November 1990 (NMDGF 1990).

1994: Biologist’s Recommendation: In spring 1994, NMDGF recommended to the State Game Commission that the legal status of the spotted bat (*Euderma maculatum*) remain Group 2 (= "Endangered") within the State (NMDGF 1994).

1996: Biologist’s Recommendation: No change in the New Mexico listing was recommended by the NMDGF for the taxon at this time. It was recommended that the NMDGF should continue to encourage land management agencies to protect areas of known occurrence. Additional surveys were needed to detect the presence of this species and trends in populations. Additionally, it was determined that surveys for this species may detect unknown threats to spotted bats (NMDGF 1996).

ARIZONA

1995: *Euderma maculatum* was listed under the Natural Heritage Arizona State Rank "S2" ("S2" = "Rare") (AGFD 1995).

1996: The spotted bat (*E. maculatum*) was listed as an Arizona Species of Special Concern. The species’ status and biology are poorly known (AGFD 1996).

TEXAS

The spotted bat was listed State threatened. Laws and regulations pertaining to endangered or threatened animal species are contained in Chapters 67 and 68 of the Texas Parks and Wildlife (TPW) Code and Sections 65.171-65.184 of Title 31 of the Texas Administrative Code (TPWD 1993).

MEXICO

1995: *Euderma maculatum* was listed "Rare" in Mexico (AGFD 1995).

Townsend's big-eared bat:

1992: Because of its extreme sensitivity to human disturbance, vandalism of roost caves by recreationists, and its low reproductive rate, the Townsend's big-eared bat was listed as a species that required special Federal protection (Finch 1992).

1994: The Pale Townsend's (= western) big-eared bat (*Plecotus townsendii pallescens*) was listed in the Federal Register, November 15, 1994, as a Category 2 species for consideration to be listed as a threatened or endangered species (USFWS 1994).

1995: The two western subspecies, *P. t. townsendii* and *C. t. pallescens*, were concurrently recognized as Category 2 Federal Candidates. The two eastern subspecies, *P. t. ingnes* and *P. t. virginianus*, were listed as endangered under the Federal Endangered Species Act (Idaho St. Conserv. 1995).

1995: The USFS considered *P. townsendii* a sensitive species, and the Bureau of Land Management considered it a Species of Special Concern (Idaho St. Conserv. 1995).

1995: The subspecies, *Pipistrellus townsendii pallescens*, was listed under the Natural Heritage Global Rank "G4T4" ("G4" = [species listed] "Apparently Secure"; "T4" = [subspecies listed] "Apparently Secure") (AGFD 1995).

1995: The subspecies, *Plecotus townsendii*, was being "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (AGFD 1995).

1996: The USFWS changed listing status of "Federal Candidate" species. This classification formerly included three subclassifications: Federal Candidate: Category 1, Category 2, and Category 3. There are no longer "Category" designations. This species was listed as a Federal Candidate Category 2 species. Species formerly designated Category 2 and Category 3 are no longer considered Federal candidate species, and so no longer have any Federal protection under the "Candidate" listing. However, such species may retain other Federal or State designated protections (USFWS 1996).

1996: The complete Natural Heritage Global Rank for the subspecies *Plecotus townsendii pallescens* was G4T4 (CNHP 1996).

1996: The subspecies, *Plecotus townsendii pallescens*, was listed by a New Mexico Natural Heritage Program list as "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (NMNHP 1996).

1996 (March): Former C2 species were classified as Federal: "Species of Concern" (Jahrsdoerfer 1996).

NEW MEXICO

1995: *P. townsendii* was still an unprotected mammal in states (Nevada and New Mexico) where statute regulation changes were lagging behind Federal listing changes (Idaho St. Conserv. 1995).

ARIZONA

1995: The subspecies, *Plecotus townsendii pallescens*, was listed under the Natural Heritage Arizona State Rank "S3" ("S3" = "Uncommon or Restricted") (AGFD 1995).

UTAH

1995: *P. townsendii* was listed as an S2 species (a species of special concern because of limited distribution and habitat) by the Utah Division of Wildlife Resources (Idaho St. Conserv. 1995).

COLORADO

1995: *P. townsendii* was listed as a species of Undetermined Status by Colorado Division of Wildlife (Idaho St. Conserv. 1995).

Big free-tailed bat:

1994: The big free-tailed [*Nyctinomops macrotis* (= *Tadarida macrotis*, *Tadarida molossa*)] was listed in the Federal Register, November 15, 1994, as a Category 2 species for consideration to be listed as a threatened or endangered species (USFWS 1994).

1995: *Nyctinomops macrotis* was listed under the Natural Heritage Global Rank "G5" ("G5" = "Demonstrably Secure") (AGFD 1995).

1995: The species, *Nyctinomops macrotis*, was being "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (AGFD 1995).

1996: The USFWS changed listing status of "Federal Candidate" species. This classification formerly included three subclassifications: Federal Candidate: Category 1, Category 2, and Category 3. There are no longer "Category" designations. This species was listed as a Federal Candidate Category 2 species. Species formerly designated Category 2 and Category 3 are no longer considered Federal candidate species, and so no longer have any Federal protection under the "Candidate" listing. However, such species may retain other Federal or State designated protections (USFWS 1996).

1996: The complete Natural Heritage Global Rank for the species *Nyctinomops macrotis* was listed "G5" (CNHP 1996).

1996: The species, *Nyctinomops macrotis*, was listed by a New Mexico Natural Heritage Program list as "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (NMNHP 1996).

1996 (March): Former C2 species were reclassified as Federal: "Species of Concern" (Jahrsdoerfer 1996).

ARIZONA

1995: *Nyctinomops macrotis* was listed under the Natural Heritage Arizona State Rank "S2S3" (State Ranking not definitive—between S2 and S3) ("S2" = "Rare"; "S3" = "Uncommon or Restricted") (AGFD 1995).

2.3 HABITAT

Western small-footed myotis:

The center of distribution of this species seems to be in the ponderosa pine zone, although the animals occur as low as desert and as high as the lower edges of the spruce-fir zone. Of thirty-four specimens in the Museum of Southwestern Biology, 24% are from grassland (including riparian associations within grassland), 12% are from woodland and encinal, and 64% are from the yellow pine zone and its associates.

They are found in short-grass plains, sactan grassland, sycamore, cottonwood, rabbitbrush, oak savanna, oak woodlands, piñon-juniper woodland, chapparal woodlands, and coniferous forest.

Long-eared myotis:

Long-eared myotis roosts have been located in ponderosa pine and mixed conifer habitat types.

The long-eared myotis is seemingly a species of the yellow pine zone and above. None of our specimens have been taken lower than this zone, though some have been taken well within the zone of spruce and fir. All specimens have been taken in mist nets set over water holes.

M. evotis has been netted in spruce-fir-aspen (mixed conifer) forest at 2880 m (9600 ft) elevation in August. The netting site was at Eagle Creek Spring (Gannon 1994).

This species occurs in New Mexico in the following habitat type(s): The piñon-juniper habitat type occurs on the benches and mesa tops that are above 2043 m (6700 ft) elevation. Piñon pine and one-seed juniper are the dominant species. Ponderosa pine occurs sporadically in this type. Shrubs also occurring in this type include Gambels oak, fourwing saltbush, antelope bitterbrush, mountain mahogany, and big sagebrush. Grasses include sideoats grama, blue grama, muttongrass, galleta, sand dropseed, and Indian ricegrass. The juniper habitat type, which is located in the Zuni River valley bottom, is dominated by one-seed juniper with an occasional piñon pine and alligator juniper. Shrubs scattered throughout this type include big sagebrush, broom snakeweed, and rubber rabbitbrush. Grasses in this type include blue grama grass, crested wheatgrass, red three-awn, cheatgrass, sixweeks fescue, Indian ricegrass, and squirreltail grass (grazing has been heavy in juniper areas).

The cottonwood/willow habitat type is located on the upstream side of Black Rock Reservoir and continues upstream on the banks of the Zuni River to the highway crossing. Dominant trees include the Rio Grande cottonwood with some salt cedar and Russian olive comprising the understory. Dense willow growth occurs on the edges of the cottonwood bosque. Grasses collected in the cottonwood/willow habitat include red three-awn, cheatgrass, sixweeks fescue, galleta, and mutton grass. This is the largest cottonwood bosque found in the Zuni River drainage.

The wetland habitat type occurs directly below the Nutria 2 Dam on the Rio Nutria and downstream of Black Rock and Eustace Reservoirs on the Zuni River and approximately 6.4 km (4 mi) west of the Pueblo of Zuni (Tekapo). These wetlands can be described as persistent emergent wetlands within the Palustrine system (Cowardin et al. 1979). These wetlands are dominated by cattails with grasses and sedges occasionally present along the shorelines of the wetlands. Tekapo wetland area has open water areas and is subject to complete water withdrawal for irrigation. The other wetlands have dense willows and are supplied with permanent water from springs.

The reservoir habitat type is represented by four reservoirs; Eustace, Black Rock, Nutria 2, and Nutria 4. The reservoirs can be described as having unconsolidated bottom, within the Lacustrine system (Cowardin et al. 1979). The Lacustrine system includes wetlands and deep water habitats, which are situated in a topographic depression or a dammed river channel lacking trees, shrubs, persistent emergents, emergent mosses or lichens whose area exceeds 8 ha (20 ac). Portions of the reservoirs receive inflow from intermittent streams. Nutria 4 Reservoir differs from the other reservoirs because it receives water from a diversion canal from Nutria 3.

Fringed myotis:

Fringed myotis roosts have been located in ponderosa pine and mixed conifer habitat types.

This bat inhabits mid-elevation grasslands, deserts, and oak and piñon woodlands, but it has also been detected in high-elevation spruce-fir forests. In Colorado, fringed bats are reported to breed in caves and winter in piñon-juniper and ponderosa pine habitats (Finch 1992).

The zonal spectrum of this species extends from the yellow pine zone down into the grassland. The breeding colony in Isleta Cave, for example, contains animals that must forage over grassland and desert, while Embudo Cave, in the Sandia Mountains where other fringed myotis have been taken, is toward the upper limit of the yellow pine forest.

They are found in desert-shrub grassland, shortgrass plains, sactan grassland, sycamore, cottonwood, rabbitbrush; piñon-juniper, chapparal, and oak woodlands, and oak savanna.

This species occurs in New Mexico in the following habitat type(s): The mixed shrub habitat type occurs in lower elevations below the mesas (elevation less than 2043 m or 6700 ft). Broom snakeweed is the dominant plant species. Rubber rabbitbrush and fourwing saltbush are interspersed with sparse stands of big sagebrush. Some small areas are dominated by blue grama grass, western wheatgrass, cheatgrass, and squirreltail grass. Bare ground is prevalent in some areas. The sagebrush habitat type is also found below the mesas and is composed of dense stands of big sagebrush. Due to overgrazing, bare ground is prevalent under the sagebrush. Blue grama grass dominates the understory. Occasionally sagebrush is interspersed with saltbush, rubber rabbitbrush, and broom snakeweed. Portions of the sagebrush habitat have small grassland areas.

The piñon-juniper habitat type occurs on the benches and mesa tops that are above 2043 m (6700 ft) elevation. Piñon pine and one-seed juniper are the dominant species. Ponderosa pine occurs sporadically in this type. Shrubs also occurring in this type include Gambels oak, fourwing saltbush, antelope bitterbrush, mountain mahogany, and big sagebrush. Grasses include sideoats grama, blue grama, muttongrass, galleta, sand dropseed, and Indian ricegrass.

The juniper habitat type, which is located in the Zuni River valley bottom, is dominated by one-seed juniper with an occasional piñon pine and alligator juniper. Shrubs scattered throughout this type include big sagebrush, broom snakeweed, and rubber rabbitbrush. Grasses in this type include blue grama grass, crested wheatgrass, red three-awn, cheatgrass, sixweeks fescue, Indian ricegrass, and squirreltail grass (grazing has been heavy in juniper areas).

The cottonwood/willow habitat type is located on the upstream side of Black Rock Reservoir and continues upstream on the banks of the Zuni River to the highway crossing. Dominant trees include the Rio Grande cottonwood with some salt cedar and Russian olive comprising the understory. Dense willow growth occurs on the edges of the cottonwood bosque. Grasses collected in the cottonwood/willow habitat include red three-awn, cheatgrass, sixweeks fescue, galleta, and mutton grass. This is the largest cottonwood bosque found in the Zuni River drainage.

The agriculture habitat type is defined as any land which is cultivated for crops, is maintained as improved pasture for livestock, or has been cultivated in the past and is fallow. Agriculture lands are located north of Highway 53 and west of Black Rock Reservoir. Only a small percentage of irrigatable lands are actually cultivated. Corn and alfalfa are dominant crops on cultivated land. Some pastures used for livestock have a variety of grasses including crested wheatgrass, western wheatgrass, sixweeks fescue, Indian ricegrass, and others. Fallow and abandoned fields within this habitat have vegetation similar to the mixed shrub habitat with a dominance of grasses and forbs.

The wetland habitat type occurs directly below the Nutria 2 Dam on the Rio Nutria and downstream of Black Rock and Eustace Reservoirs on the Zuni River and approximately 6.4 km (4 mi) west of the Pueblo of Zuni (Tekapo). These wetlands can be described as persistent emergent wetlands within the Palustrine system (Cowardin et al. 1979). These wetlands are dominated by cattails with grasses and sedges occasionally present along the shorelines of the wetlands. Tekapo wetland area has open water areas and is subject to complete water withdrawal for irrigation. The other wetlands have dense willows and are supplied with permanent water from springs.

The reservoir habitat type is represented by four reservoirs; Eustace, Black Rock, Nutria 2, and Nutria 4. The reservoirs can be described as having unconsolidated bottom, within the Lacustrine system (Cowardin et al. 1979). The Lacustrine system includes wetlands and deep water habitats, which are situated in a topographic depression or a dammed river channel lacking trees, shrubs, persistent emergents, emergent mosses or lichens whose area exceeds 8 ha (20 ac). Portions of the reservoirs receive inflow from intermittent streams. Nutria 4 Reservoir differs from the other reservoirs because it receives water from a diversion canal from Nutria 3.

Long-legged myotis:

Long-legged myotis roosts have been located in ponderosa pine and mixed conifer habitat types (Green 1994).

The majority of our specimens of this bat have been taken in the ponderosa pine zone or above, although some have come from grassland, as at Albuquerque and Glenwood. It may be that these animals from lower stations are migrants; however, one from Glenwood was pregnant. Our specimens have been shot or taken in mist nets set over water holes. Davis and Barbour found a maternity colony in an abandoned building near Eagle Nest in Colfax County (Findley et al. 1975).

They are found in the encinal zone, sycamore, cottonwood, rabbitbrush, oak savanna, oak woodland, piñon-juniper woodland, chapparal woodland, and coniferous forest (Cook 1986).

Yuma myotis:

In New Mexico, the zonal center of abundance of this species seems to be in desert, grassland, and woodland, and the riparian communities of these zones, from 1200 to 2100 m (4000 to 7000 ft) in elevation. Specimens from Rio del Medio, 3030 m (8000 ft), in Taos County, provide the highest altitude record. On the western flank of the Sangre de Cristo range, the upper limit of grassland is only slightly below this level, and our collecting station was in woodland.

This species occurs in New Mexico in the following habitat type(s): The mixed shrub habitat type occurs in lower elevations below the mesas (elevation less than 2043 m or 6700 ft). Broom snakeweed is the dominant plant species. Rubber rabbitbrush and fourwing saltbush are interspersed with sparse stand of big sagebrush. Some small areas are dominated by blue grama grass, western wheatgrass, cheatgrass, and squirreltail grass. Bare ground is prevalent in some areas.

The sagebrush habitat type is also found below the mesas and is composed of dense stands of big sagebrush. Due to overgrazing, bare ground is prevalent under the sagebrush. Blue grama grass dominates the understory. Occasionally sagebrush is interspersed with saltbush, rubber rabbitbrush, and broom snakeweed. Portions of the sagebrush habitat have small grassland areas.

The piñon-juniper habitat type occurs on the benches and mesa tops that are above 2043 m (6700 ft) elevation. Piñon pine and one-seed juniper are the dominant species. Ponderosa pine occurs sporadically in this type. Shrubs also occurring in this type include Gambels oak, fourwing saltbush, antelope bitterbrush, mountain mahogany, and big sagebrush. Grasses include sideoats grama, blue grama, muttongrass, galleta, sand dropseed, and Indian ricegrass.

The juniper habitat type which is located in the Zuni River valley bottom is dominated by one-seed juniper with an occasional piñon pine and alligator juniper. Shrubs scattered throughout this type include big sagebrush, broom snakeweed, and rubber rabbitbrush.

Grasses in this type include blue grama grass, crested wheatgrass, red three-awn, cheatgrass, sixweeks fescue, Indian ricegrass, and squirreltail grass (grazing has been heavy in juniper areas).

In New Mexico, the zonal center of abundance of this species seems to be in desert, grassland, and woodland, and the riparian communities of these zones, from 1200 to 2100 m (4000 to 7000 ft) in elevation. We have taken few in nets. Specimens from Rio del Medio, 2400 m (8000 ft), in Taos County, provide the highest altitude record. On the western flank of the Sangre de Cristo range, the upper limit of grassland is only slightly below this level, and our collecting station was in woodland. That the species may occur higher is attested by G. Allen's (1919) finding of a specimen at 3300 m (11,000 ft) in Mount Whitney. Fort Yuma, California, the type locality of the species, is nearly at sea level. Published records suggest railroad bridges and buildings are common kinds of summer retreats for the species.

Spotted bat:

Spotted bats are frequently reported near cliffs over perennial water, but individuals range from low deserts to evergreen forests (Finch 1992).

Spotted bats have been recorded in a wide variety of habitats, from riparian and piñon-juniper woodlands to ponderosa pine and spruce-fir forests. In New Mexico, the species has been taken from the lower Rio Grande Valley near Las Cruces (1200 m [3960 ft]) to near the summit of Mt. Taylor (3230 m [10,659 ft]), but most records are in or near forested areas—usually of bats captured in nets placed over bodies of water. Spotted bats may summer in forested areas and migrate through lower elevations at other seasons (Hoffmeister 1986; NMDGF 1988).

Constantine's specimens were taken in the piñon-juniper woodland in an area of spectacular sandstone cliffs. Those that we have captured in the Mogollon, San Mateo, and Jemez mountains were netted over streams or water holes in ponderosa or mixed coniferous forest. In each case rock cliffs were located within a mile or so of the netting site. That rocks provide a favored hiding place for this species is strongly suggested by our experience with a captive animal which we used as a photographic subject for Nina Leen during her preparation of *The World of Bats*. We attempted to induce this animal to hang naturally on a variety of substrata, including ponderosa bark and branches, without any success. However, when we provided it with an uneven slab of lava rock, the animal's piercing cries subsided, and it quickly settled into a crevice. We felt very strongly that the bat had finally come upon something with which it felt at home (Findley et al. 1975).

Townsend's big-eared bat:

C. townsendii (= *P. townsendii*) occurs in a variety of xeric to mesic habitats, including desert scrub, sagebrush, chaparral, deciduous and coniferous forests (including, but not limited to, piñon-juniper, spruce-fir, redwood, mixed hardwood-conifer, and oak woodlands) (Idaho St. Conserv. 1995).

Shelters in which the bats have been found range from low, arid desert situations, as in the Sierra Rica and Tres Hermanas along the Mexican border, to Canadian Zone conditions, as in Embudo Cave in the fir zone of the Sandia Mountains. Handley noted that in the west this animal seems centered in the zonal range from the Upper Sonoran through Transition zones. The long-eared bats do, of course, occur in other zones, and the presence of suitable shelters seems to be one of the important limiting factors (Findley et al. 1975).

In summer these bats occur widely in the State and can be found over desert scrub, in shelters in desert-mountains, oak-woodland, piñon-juniper, or coniferous forests.

This bat occupies a diversity of habitats, including desert shrublands, piñon-juniper woodlands, and high-elevation coniferous forests (Finch 1992).

This bat can be found in oak, piñon-juniper, chapparal woodlands, and coniferous forest.

Big free-tailed bat:

This species seems to have approximately the same ecological distribution in New Mexico as *T. brasiliensis*, occurring rarely up to 2400 m (8000 ft) but being more common below 1800 m (6000 ft).

Big free-tailed bats have been taken in a variety of habitats in Arizona; ponderosa pine, piñon-juniper, Douglas-fir, and Sonoran desertscrub. Many of these places of capture could have been where the bats were feeding or drinking and not indicative of the area where they roost.

Several ponds at which big free-tailed bats have been captured ranged in size from 24 to 37 m (79 to 122 ft) in length, and were exceptionally free of obstacles along the flight path used for drinking (Tuttle 1996).

This species currently roosts and nests in Los Alamos County but not on LANL.

2.4 CHRONOLOGY

Western small-footed myotis:

The gestation period is approximately two months, one litter per year is born, with normally one young, but twins have been reported. Young are born in mid-June. They are promiscuous with no pair bond formed.

Records note pregnant females taken on June 6, 8, 20, and 29. V. Bailey records a pregnant female taken on May 29 at Santa Rosa (Findley et al. 1975). Lactating females have been recorded by us on June 20 and July 19 and 27. In all cases of pregnant animals, a single embryo was present. They have shown paturation in June in Hidalgo County.

Long-eared myotis:

We have taken no pregnant females in New Mexico but have recorded lactating specimens on July 27 and 28, and have taken young of the year on July 24, 27, 30, and 31.

Various accounts indicate that a single young is born in late June or July.

According to our records the species is active in the state at least from June 25 to August 15 inclusive.

Lactating long-eared myotis have been tagged in late July/early August.

There is a seasonal occurrence in Colorado May to October.

Various accounts indicate that a single young is born in late June or July.

Fringed myotis:

We have records of pregnant females taken on June 15 and 26, of lactating females taken on July 13 and August 25, and of young of the year taken on August 3 and September 5.

Copulation occurs in fall, ovulation, fertilization, and implantation in the spring. Gestation is 50 to 60 days. Individuals reach sexual maturity at 10 to 12 months.

Long-legged myotis:

Records show the species to be present in the State at least from May 10 to September 28, but we have no information as to its winter quarters (Findley et al. 1975).

We have taken pregnant females from June 8 to July 15, lactating females from June 15 to August 25, and young of the year on the wing from July 15 on.

Of 14 female specimens collected and saved on June 23, 1954, nearly all were either pregnant with nearly full-term embryos or were carrying newborn young. Subsequently, at this pond, we found only one female still carrying an embryo on July 1, and by July 19 none was pregnant, but they were lactating.

Long-legged myotis maternity roosts were abandoned by late August/early September (Chung-MacCoubrey 1995).

Yuma myotis:

Dalquest thought that copulation and insemination occurred in the fall and fertilization in the spring (Findley et al. 1975).

Hoffmeister (1986) estimated birth times for one maternity colony found July 5, 1958, to have been between May 25 and June 5.

On July 5, 1958, most of the young in one colony were able to fly, but the females were still nursing them.

Migrate south of Arizona and New Mexico in fall and return in spring.

Seemingly there are no records from December and January for this species. A colony that Howell observed at Fort Tejon, California, had dwindled from 1000 to 200 by September 23. A December 16 check revealed none. He remarked "beyond doubt migratory." However, Dalquest believed that such observations were the result of the earlier visits disturbing the colony with subsequent temporary abandonment, a situation he had observed frequently. On the basis of his experience in California, Dalquest thought that *M. yumanensis* "probably hibernates in the part of California where winter temperatures are low." He also noted a lack of specimens from December and January (Findley et al. 1975).

Spotted bat:

Their peak period of activity is from May to August, but also show a lesser peak during January.

Limited data suggest that one young is the normal litter size. Lactating females have been trapped in June, July, and August. Pregnant females have been trapped in June and July. It is thought that spotted bats breed in late February to early April, and give birth from late May to early July (NMDGF 1988).

Young may be born in early summer based on captures of lactating females in late June to mid-July (Findley et al. 1975; NMDGF 1996).

Townsend's big-eared bat:

Breeding occurs in January and February: births occur from May to mid-June. Gestation is 50 to 100 days. They have one litter per year. Females breed as juveniles, males breed as yearlings. Maximum breeding age is 16 years.

Big free-tailed bat:

Earliest and latest dates for this species in New Mexico are May 22 and October 22 (Findley et al. 1975).

Pregnant females have been caught on June 30, lactating females on July 23 and 27, and young on the wing August 20 and 22. Constantine (1961) took lactating females and young on the wing on August 14 and September 17. Eight of ten females taken by Borell and Bryant in southern Texas on May 7 contained one embryo (Findley et al. 1975). Earliest and latest dates for this species in New Mexico are May 22 and October 22.

A maternal colony along the Pine River in San Juan County was situated in a crevice in the roof of a large sandstone rock shelter. A second colony was discovered under slabs of lava on a perpendicular lava cliff in Valencia County.

Of 23 female big free-tailed bats taken in Cañon del Muerto, Cañon de Chelley, between June 17 and July 10, four contained embryos and one was lactating. Additional lactating females were taken on August 2 and August 4 in northern Mojave County, Arizona.

2.5 BEHAVIOR

2.5.1 Breeding and Roosting

Western small-footed myotis:

The gestation period is approximately two months. One litter per year is born, with normally one young, but twins have been reported. Young are born in mid-June. They are promiscuous with no pair bond formed.

The den sites are trees, caves, under rocks, and human-made structures. The female takes care of the young.

Cockrum et al. found that bats do not go farther than necessary to drink and that fewer water sources increase netting success (Castner et al. 1993).

Dalquest recorded night-roosting in a barn and under a concrete overpass in Washington, while Hall took a few flying in houses at dusk in Nevada. This species hibernates, although several observers note that complete torpor does not seem to be attained. Alcorn found 19 animals hibernating in 14 mine tunnels in Nevada 22 (Findley et al. 1975).

There is a correlation between roost site fidelity and the permanence of the roost-type used (e.g., cave roosts vs. foliage roosts). This is true on both an annual and daily basis. Site fidelity, however, is inversely correlated with availability of the roost-type used (Chung-MacCoubrey 1995).

These bats do not form colonies or cluster when they are nursing young; 10 of 12 roosts found in South Dakota contained only one female. One roost contained four lactating females; the other, two adult females. These roosts were warm, with the temperatures varying from 26 to 29 degrees.

M. leibii can tolerate colder temperatures, so they are late to hibernate (mid-November). They often hibernate near an entrance or narrow crevices or stones on the floor. They are solitary hibernators. There are rarely two together. Individuals are solitary, adult males are segregated from nursing females. They have slow fluttery flight, which is unusual for a small bat. Small nursery colonies are formed (12 to 20 bats). The dispersion is clumped. Migrations of long distance occur in eastern parts of the range. This species seems to make only local movements to and from the hibernacula in the west.

Long-eared myotis:

Pregnant females typically roost alone or in groups of fewer than a dozen individuals in rock crevices, on the ground in fallen logs, and in old stumps, especially where there is solar heating by day. They apparently form nursery colonies under the exfoliating bark of 150- to 350-year-old ponderosa snags just before giving birth (Tuttle 1996).

Myotis evotis was collected at Eagle Peak in the Reserve District of the Gila National Forest, Catron County at 2880 m (9600 ft) elevation (Gannon 1994).

Data indicate, for this species, that large snags are roost sites for both pregnant and lactating bats. They also suggest that large snags well distributed in a landscape may help maintain bat populations.

Long-eared myotis roost in groups of one to 21 individuals. Roosting substrates include ponderosa pine snags, downed logs, stumps, and rock crevices.

Long-eared myotis have been found in small roosts within cavities of junipers (Chung-MacCoubrey 1995).

Cockrum et al. found that bats do not go farther than necessary to drink and that fewer water sources increase netting success (Castner et al. 1993).

Long-eared bats are often regarded as late flyers, which may be true, but two specimens we collected on August 9 were shot at 7:50 p.m.

A roost of five long-eared myotis was found in a cavity within the dead trunk of a live juniper (Chung-MacCoubrey 1995).

Lactating long-eared myotis, tagged in late July/early August, were found to change roosts daily, and were not forming colony roosts. These females appeared to move amongst live and dead junipers and roosted within the twisted folds of the trunks. It seems these females had probably weaned their young already (Chung-MacCoubrey 1995).

There is a correlation between roost site fidelity and the permanence of the roost-type used (e.g., cave roosts vs. foliage roosts). This is true on both an annual and daily basis. Site fidelity, however, is inversely correlated with availability of the roost-type used (Chung-MacCoubrey 1995).

They forage principally during the first three hours after sundown.

Most radio-collared, reproductively active females, that have been tracked back to roosts, roosted within a 3.2-km (2-mi) radius of the water hole at which they were mist-netted (Tuttle 1996).

These bats roost in colonies in snags, downed logs, stumps, and rock crevices.

In a study on the Coconino National Forest, AZ, researchers found 80% of maternity roosts of the following species were in large ponderosa pine snags (mean diameter 70 cm (28 in.), range 30 to 102 cm (12 to 41 in.); mean 17.4 m (58 ft) tall, range 2.7 to 36 m (9 to 120 ft): occult little brown myotis (*Myotis lucifugus occultus*); long-legged myotis (*Myotis volans interior*); fringed myotis (*Myotis thysanodes thysanodes*); long-eared myotis (*Myotis evotis evotis*); big brown bat (*Eptesicus fuscus pallidus*); Allen's big-eared bat (*Idionycteris phyllotis*); and pallid bat (*Antrozous pallidus pallidus*). Most (74%) bats roosted under the exfoliating bark and the remainder used vertical cracks typically caused by lightning strikes. They also found maternity roosts of *M. lucifugus occultus* and *M. thysanodes* in Douglas fir snags; *M. l. occultus* in a cabin attic; and *M. evotis* in rock piles on the ground, down logs, Gambels oak tree cavities, and snags.

Roost snags were larger in diameter and more likely to have exfoliating bark than random snags. Roost snags were surrounded by forest with larger basal areas, higher tree densities and greater tree species diversity than random snags. Forests immediately surrounding roost snags had higher densities of snags and logs than random snag areas. Bats used multiple roosts with 49% using at least two snags during the study. Birds and bats often shared snags (Rabe 1997).

Fringed myotis:

Fringed myotis have been noted to roost in colonies in ponderosa pine snags of 56 to 58 cm (23 to 33 in.) in diameter.

This species has commonly been recorded roosting and breeding in caves and buildings. In fact, the majority of our specimens come from roosts, although many have been taken in mist nets over water holes.

Fringed myotis nursery colonies have been found in caves and abandoned mines as well as beneath exfoliating bark of 150- to 350-year-old ponderosa snags (Tuttle 1996).

Fringed myotis maternity roosts have been found in ponderosa pine snags and in live ponderosa pines with long, vertical cracks and loose bark. Such cracks are likely the product of lightning strikes (Chung-MacCoubrey 1995).

Fringed myotis maternity colonies have been found to include 30 to 40 individuals. Roosts were abandoned by late August/early September (Chung-MacCoubrey 1995).

One is the normal litter size. They have one litter per year. The young are precocial at birth. The female takes care of the young. They are promiscuous and form no pair bond. The nesting sites are caves or human-made structures.

In this study, fringed myotis were seen to roost in colonies of 2 to 68 individuals.

Fringed bats typically forage for insects over watercourses, but additionally feed on beetles. This species migrates and is also known to hibernate in caves (e.g., the Black Hills of South Dakota).

They roost at night and in abandoned houses.

This species has commonly been recorded roosting and breeding in caves and buildings. In fact, the majority of our specimens come from roosts, although many have been taken in mist nets over water holes.

Our observations of this species in captivity suggest it is one of the more agile fliers among New Mexican bats. Nearly vertical flight is commonly observed. The animals can land and take off from the floor with agility, and on several occasions a captive flew into a sink some two feet in diameter and slowly circled while drinking from a pool in the bottom. It seems likely that this species must at times pick up prey from the ground, perhaps landing to do so.

There is a correlation between roost site fidelity and the permanence of the roost-type used (e.g., cave roosts vs. foliage roosts). This is true on both an annual and daily basis. Site fidelity, however, is inversely correlated with availability of the roost-type used (Chung-MacCoubrey 1995).

These bats roost in colonies in snags. Fringed myotis roost in caves, mines, and human-made structures (Green 1994).

In a study on the Coconino National Forest, AZ, researchers found 80% of maternity roosts of the fringed myotis were in large ponderosa pine snags. Most (74%) bats roosted under the exfoliating bark and the remainder used vertical cracks typically caused by lightning strikes.

Roost snags were larger in diameter and more likely to have exfoliating bark than random snags. Roost snags were surrounded by forest with larger basal areas, higher tree densities and greater tree species diversity than random snags. Forests immediately surrounding roost snags had higher densities of snags and logs than random snag areas. Bats used multiple roosts with 49% using at least two snags during the study. Birds and bats often shared snags (Rabe 1997).

Long-legged myotis:

Long-legged myotis are only occasional mine roosters in Arizona (Snow et al. 1993).

Long-legged myotis roosted in ponderosa snags 60 to 90 cm (24 to 36 in.) in diameter. Some of these snags were of broken-topped structure (Green 1994).

Maternity roosts of long-legged myotis have been found in ponderosa pine snags and in live ponderosa pines with long, vertical cracks and loose bark. Such cracks were likely due to lightning strikes (Chung-MacCoubrey 1995).

We have taken pregnant females from June 8 to July 15, lactating females from June 15 to August 25, and young of the year on the wing from July 15 on. We have recorded no more than one embryo per female (Findley et al. 1975).

Davis and Barbour found a maternity colony in an abandoned building near Eagle Nest in Colfax County (Findley et al. 1975).

Of 14 female specimens collected and saved on June 23, 1954, nearly all were either pregnant with nearly full-term embryos or were carrying newborn young. Subsequently, at this pond, we found only one female still carrying an embryo on July 1, and by July 19 none was pregnant, but they were lactating. They give birth to a single young (Hoffmeister 1986).

Long-legged myotis maternity roosts have been found to contain 67 to over 200 individuals. Roosts were abandoned by late August/early September (Chung-MacCoubrey 1995).

It may be that these animals from lower stations are migrants; however, one from Glenwood was pregnant. Our specimens have been shot or taken in mist nets set over water holes. Our records show the species to be present in the state at least from May 10 to September 28, but we have no information as to its winter quarters (Findley et al. 1975).

These bats may form maternity colonies in attics or abandoned buildings (Hoffmeister 1986).

Lactating long-legged myotis, tagged in late July/early August, were found to change roosts daily, and were not forming colony roosts. It appeared that these females moved amongst piñon snags and roosted under sloughing bark. And, it seemed these females had probably weaned their young already (Chung-MacCoubrey 1995).

This species forms large nursery colonies. Males and females have separate distribution during summer breeding season. Adults and young leave the maternity colonies in the fall. This species apparently migrates, but the extent and direction of these movements are unknown.

Long-legged myotis roost in trees, caves, mines, rocky cliffs, and human-made structures (USFS 1995), and form maternity/nursery colonies (Hoffmeister 1986).

Roost snags were larger in diameter and more likely to have exfoliating bark than random snags. Roost snags were surrounded by forest with larger basal areas, higher tree densities and greater tree species diversity than random snags. Forests immediately surrounding roost snags had higher densities of snags and logs than random snag areas. Bats used multiple roosts with 49% using at least two snags during the study. Birds and bats often shared snags (Rabe 1997).

Yuma myotis:

Yuma myotis are only occasional mine roosters in Arizona.

Yuma myotis have been found in roosting colonies (some between 1500 and 2700 animals) in buildings in Arizona. They are also known to utilize mines in the state. Yuma myotis were also found in substantial numbers under some bridges surveyed in Arizona.

Myotis yumanensis is highly commensal with man using human-made structures for roosting and nursery sites.

Nursery yuma myotis sought to keep roost site at 40°C.

The largest samples come from maternity colonies in buildings in the riparian communities of the Socorro area.

Females have only one young a season.

Spotted bat:

Spotted bats will roost in coniferous forests, cliffs, or canyons. They require cracks or crevices with openings of 2.0 to 5.5 cm (0.8 to 2.2 in.) in cliff faces in which to roost.

Spotted bats roost in crevices in cliffs or under loose rocks, and rocky areas seem to be an important element in the habitat wherever these bats are found (NMDGF 1988).

Some evidence cited by Handley suggests caves are used as hibernacula (Findley et al. 1975).

Spotted bats use cliffs as roosts. One south-facing roost cliff was found at 700 m (2310 ft) elevation (Rabe et al. 1997).

Limited data suggest that one young is the normal litter size. Lactating females have been trapped in June, July, and August. Pregnant females have been trapped in June and July. It is thought that spotted bats breed in late February to early April, and give birth from late May to early July (NMDGF 1988).

Young may be born in early summer based on captures of lactating females in late June to mid-July (Findley et al. 1975; NMDGF 1996).

Moths appear to be the principal food of the spotted bat, and the bat's low-frequency echolocation call has apparently evolved to minimize its being detected by moths. These calls may also play a role in the spacing of individual bats on feeding areas. In New Mexico, this bat has been documented as occurring only during the warmer months from April through September, but Ruffner et al. captured several specimens in Utah in January and February. Spotted bats may summer in forested areas and migrate through lower elevations at other seasons (NMDGF 1988).

A number of specimens have come from valleys, for example, Aztec, Albuquerque, and Mesilla Park, but in each case the time and circumstances of capture suggest that the animals were en route to winter quarters. Spotted bats choose cracks or crevices in cliffs that have openings from 2.0 to 5.5 cm (0.8 to 2.2 in.) in width. Evidence suggests that spotted bats roost singly.

There is a correlation between roost site fidelity and the permanence of the roost-type used (e.g., cave roosts vs. foliage roosts). This is true on both an annual and daily basis. Site fidelity, however, is inversely correlated with availability of the roost-type used (Chung-MacCoubrey 1995).

Townsend's big-eared bat:

Because these bats tend to avoid nets, it should be sought in caves and other shelters (Findley et al. 1975).

Of North America's bats, Townsend's big-eared bats appear to be among the most dependent on the availability of abandoned or inactive mines.

With few exceptions the specimens of this species that we have taken in New Mexico have come from caves, rock shelters, or mines. *Plecotus townsendii* is the only species of New Mexican bat that may regularly be found in winter. During that season big-eared bats are often located in caves and mine shafts.

Population concentrations occur in areas with substantial surface exposures of cavity forming rock (e.g., limestone, sandstone, gypsum, or volcanic), and in old mining districts. They have been found from sea level along the Pacific coast to 2400 m (7920 ft) elevation in the mountains of New Mexico (Idaho St. Conserv. 1995).

C. townsendii (= *P. townsendii*) is primarily a cave dwelling species, which also roosts in human-made cave analogues, especially old mine workings. In some areas, it has been found in old, mostly abandoned buildings with cave-like attics and other human-made structures (e.g., water diversion tunnels and bridges) (Idaho St. Conserv. 1995).

Townsend's big-eared bats have been recorded roosting under some bridges surveyed in Arizona.

Recent studies in New Mexico have demonstrated the importance of deep mine shafts as hibernating sites for this and other bat species (Idaho St. Conserv. 1995).

Townsend's big-eared bats are to be found during the day mostly in caves or mine tunnels, but at night they often rest in abandoned buildings.

Studies in the western US have shown that *P. towndendii* selects roosts with stable, cold temperatures, and moderate airflow. Individuals roost on walls or ceilings, often near entrances. If undisturbed, individuals will frequently roost less than 3 m (10 ft) off the ground, and have been found in air pockets under boulders on cave floors (Idaho St. Conserv. 1995).

In early winter, individuals may hibernate near entrances, relying on the cool substrate to maintain stable body temperatures. If temperatures at entrances drop below freezing, bats may arouse and move into deeper, more stable parts of caves and mines (Idaho St. Conserv. 1995).

Regarding the entire species range: The summer roost sites of males and nonreproductive females include caves, buildings, shallow prospect holes, passages between fallen boulders on cave floors, and abandoned mines. Night roost sites of *P. townsendii* include caves, open buildings, rock shelters, cement culverts beneath roads, and mines (Idaho St. Conserv. 1995).

P. townsendii rarely occupy cracks and commonly are visible on the ribs (sides) and backs (ceilings) of adits and drifts (Idaho St. Conserv. 1995).

Townsend's big-eared bats roost in caves, mines, lava tubes, and human-made structures (USFWS 1995).

For hibernacula, *P. townsendii* uses roosts possessing low temperature and moderate to strong airflow. In New Mexico and Arizona, *P. Townsendii* is active at temperatures between 11 and 22°C.

The females form separate maternity colonies in warm sections of the caves.

P. townsendii tend to use cooler roost sites before young are born, and move to warmer sites after birth. Maternity roost sites in the west are found in caves, and a variety of human-made structures such as mines and old buildings (Idaho St. Conserv. 1995).

Though rarely documented, reproductive females have been observed to temporarily use mature tree cavities to roost in (Idaho St. Conserv. 1995).

This species seems to exhibit a high degree of site attachment returning year after year to the same maternity roost. The mating system is polyandrous. There is no pair bond formed. The nest sites are trees, caves, or human-made structures. The young are born altricial.

Caves and abandoned mine shafts are used by large congregations of bats as day and hibernation roosts (Finch 1992).

Rarely are these bats caught in mist nets, perhaps because the bats can detect and avoid the nets more easily than other kinds.

P. townsendii is a relatively sedentary species, for which no long-distance migrations have been reported. The longest movement known for this species in the west is 32.2 km (51.5 mi) (in California). They have demonstrated a high degree of site fidelity. In one study, greater than 80% of these bats remained at or returned to the same banding site in subsequent winters. Similar observations have been made with regard to roost site fidelity for female *P. townsendii*. However, it appears that a number of colonies use multiple roosts. They may shift roosts as the season progresses, either to different localities within one structure or to different structures. This behavior, in most cases, appears to be temperature driven, with the bats using cooler sites before young are born and moving to warmer sites after birth. Some colonies are known to have alternate roosts. Movements to alternate roosts are often in response to disturbance, but may occur for other reasons not yet identified. Within roosts *P. townsendii* form highly visible clusters on open surfaces, adding to their vulnerability to disturbance (Idaho St. Conserv. 1995).

The seasonal and daily roosting patterns of *C. townsendii* follow those observed for many other temperate zone bat species. The most significant roosts, which have the largest aggregations and are most critical to the survival of populations, are the winter hibernacula (both sexes) and the summer maternity roosts (entirely adult females and their young). Additionally, there are other summer roosts: those used in the daytime by males and nonreproductive females (usually containing no more than a few animals per roost), night roosts (generally at a different site than the day roost) used by both sexes as a place to rest and digest food during the night, and interim roosts (sites used in the spring before the young are born and in the fall before moving to hibernating sites) (Idaho St. Conserv. 1995).

P. townsendii does not generally associate with other species in its roosts, particularly at maternity and hibernating sites. Although a few individuals of other species may be present, they are not generally found in direct contact with *C. townsendii*, and most typically are in different areas of the structure (Idaho St. Conserv. 1995).

"Several thousand" *P. townsendii* have been observed in a single mine shaft hibernaculum in New Mexico. In general, *P. townsendii* individuals begin to arrive at hibernacula in October and reach maximum numbers in January. More typically, however, especially in the west, *P. townsendii* tends to form relatively small hibernating aggregations of a few to several dozen individuals (Idaho St. Conserv. 1995).

Based on at least one observation, *P. townsendii* may make use of large hollows in mature trees and snags (Idaho St. Conserv. 1995).

Townsend's big-eared bats have occasionally been found aggregated in roosts very early in the spring and in the fall at sites close to, but not the same as, those used as maternity roosts. These are considered transient roosts (Idaho St. Conserv. 1995).

Townsend's big-eared bats are late flyers, emerging from the roost primarily after dark, an average of 45.5 minutes after sunset. A netting study suggested two nightly activity peaks. Another study showed that during lactation females returned to the nursery roost up to three times per night, but after lactation remained away from the roost all night. Yet another study showed a bimodal concentration of activity prior to parturition, and nearly continuous activity through the night after young were born (Idaho St. Conserv. 1995).

P. townsendii are highly maneuverable flyers and are adept at detecting and avoiding obstacles, including mist nets (Idaho St. Conserv. 1995).

The majority of mines used by *P. townsendii* are hibernacula for 1 to 50 individuals. One to five individuals is most common (Idaho St. Conserv. 1995).

The roosting behavior of *P. townsendii* makes the species highly vulnerable to disturbance. The animals typically roost in highly visible clusters on open surfaces, rarely seeking shelter in crevices as many other bat species do. During the summer months, if undisturbed, a maternity cluster will generally roost in the twilight zone, close to the entrance of a cave or mine. Likewise in the winter, animals are frequently found in well-ventilated areas close to a roost entrance. Long-term banding studies have shown that nursery colony groups are stable, with individuals showing great fidelity to both their group and chosen roost sites (Idaho St. Conserv. 1995).

P. townsendii appears to arouse frequently from hibernation, move among roost sites in response to changes in microclimatic conditions, and may also shift among alternate maternity sites (Idaho St. Conserv. 1995).

Bats often use only one entrance of a mine that may have several. Disturbance at one entrance may cause bats to use an alternate portal (Idaho St. Conserv. 1995).

Big free-tailed bat:

Rocky cliffs with crevices and fissures are apparently required for roosting.

This species forms colonies, including maternity/nursery colonies in rocky cliffs with crevices and fissures.

One bat is born in a single litter per year. They are promiscuous. The nest sites are in a cave or under rocks.

2.5.2 Feeding Habits

Western small-footed myotis:

These bats forage by catching insects in flight during nightly activity. Cockrum et al. (1992) found that bats do not go farther than necessary to drink and that fewer water sources increase netting success (Castner et al. 1993).

In the Chiricahua Mountains, the vast majority of small-footed myotis' nightly activity occurs within 1.5 hours of sundown (Tuttle 1996).

Long-eared myotis:

Long-eared myotis glean insects directly from foliage (Tuttle 1996).

Fringed myotis:

Fringed myotis are gleaning feeders (USFWS 1995). They forage by gleaning in the air, tree branches, and tree leaves.

Long-legged myotis:

Some long-legged bats feed out on the more deserty flats at the base of the mountains, among oaks, rabbitbrush, sycamores, and mesquite (Hoffmeister 1986).

The long-legged myotis forages by flycatching in mid air. They forage approximately 10 m (33 ft) over the canopy and along the river bank.

Yuma Myotis:

This species seem to fill stomachs with 15 to 30 prey items rapidly. *Myotis* is an opportunistic feeder.

M. yumanensis is a water-surface forager. Its distribution is tied to permanent watercourses, usually below the coniferous forest zone.

In the Big Bend country of Texas, Easterla and Whitaker found that Yuma myotis feed extensively on small moths (39.5% by volume, 78.6% by frequency), and a variety of other small insects, including dipterans, primarily midges (23.9% by volume), and even some ground beetles (Hofmeister 1986).

Spotted bat:

Their primary foraging site is over standing water.

Spotted bats are known to forage over high meadows (Rabe et al. 1997).

Moths appear to be the principal food of the spotted bat, and the bat's low-frequency echolocation call has apparently evolved to minimize its being detected by moths (NMDGF 1988).

Spotted bats most often were observed taking "micromoths" that were possibly Noctuidae. Stomach analyses of bat stomach contents indicated Lepidoptera and Scarabidae (June beetles) were common food items. Captive spotted bats consumed moths, katydids, grasshoppers, flies, and meal worms.

Listed here are the occurrences (percentage of numbers of remains examined) of various insects in the diet of *Euderma maculata*: Lepidoptera, moths (100%). Remains of moths examined in fecal pellets included specimens of approximately 8 to 12 mm (0.32 to 0.48 in.) in length.

In northern Arizona, a single lactating female was observed as follows: She was found in a day roost in a south-facing limestone cliff (700 m [2310 ft] elev.), 38.5 km (61.6 mi) from her capture site. She demonstrated habitual foraging behaviors: she foraged in high meadows for part of the night, night roosted in a patch of aspen for 3 to 4 hours, then flew to the cliff roost in early morning. The long roost to foraging area distance, elevational difference between day-roost and foraging area, and night-roosting behavior of this bat differs from previously reported foraging movements for this species. Meadow systems are heavily used as foraging areas. When foraging, spotted bats emit feeding buzzes (Rabe et al. 1997).

Townsend's big-eared bat:

They forage by probing, stalking, and filtering. Foraging height is generally tree height or less. Dispersion varies in hibernaculum. Limited movements in migrations are recorded.

One study in the Southwest found that 38 of 40 *P.townsendii* stomachs contained only lepidopterans, averaging 6 to 12 mm (0.28 to 0.48 in.) in length. In other studies, small quantities of other insects have been detected, particularly Coleoptera and Diptera. Hemiptera, Hymenoptera, Homoptera, Neuroptera, Trichoptera, and Plecoptera have also been found sporadically (Idaho St. Conserv. 1995).

P. townsendii are Lepidopteran specialists with a diet consisting of greater than 90% moths (Idaho St. Conserv. 1995).

Cockrum et al. found that bats do not go farther than necessary to drink and that fewer water sources increase netting success (Castner et al. 1993).

The big-eared bat specializes on moths as prey, detecting them by echolocation, and capturing them in flight.

Big free-tailed bat:

This species catches insects in the air.

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

The bats in this report are Federal species of concern and the spotted bat is a State endangered species. In order for DOE to comply with the Endangered Species Act, we must know the status of these bats at LANL. We first need to determine if these bats are present at LANL, and if so, their breeding status.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change (for example, if the species is newly found at LANL). Activities that are not appropriate to a species are assigned a ranking of zero. The HMP contains a summary table ranking all species and activities. The following table lists importance rankings for bat monitoring.

Section	Status Tracking	Habitat Analysis and Models	Presence/ Absence Surveys	Reproduction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Bats	1	2	2	3	3	2	3	2	2

4.1 STATUS TRACKING

The regional status of bats should be evaluated annually. Surveyors should attend status update meetings sponsored by the USFWS. Status tracking is a level one activity.

4.2 HABITAT ANALYSIS AND MODELS

The entire LANL area provides suitable habitat for these bat species. A majority of activity will be concentrated around the canyon systems. Habitat analysis is a level two activity for the bats.

4.3 PRESENCE/ABSENCE SURVEY

The purpose of this type of survey is to determine the presence or absence of these bats. A Presence/Absence survey is a level two activity.

4.3.1 Survey Locations

Surveys will be conducted in the different vegetative habitat at LANL.

4.3.2 Survey Dates

Conduct a minimum of one survey in each major habitat type each year. The surveys can begin in May and can continue through September. The most concentrated activity should take place between mid May and the end of July. Netting success will be greatest before the monsoon season begins when water is more scarce and more bats will be coming to the water holes.

4.3.3 Survey Technique

Bat populations can be monitored by catching individual bats in nets and counting the species caught or through transects conducted by high-frequency monitoring equipment.

The netting of bats is labor intensive and only gives researchers a small look at the bats that come to the netting location. However, netting is the only way to distinguish between the sexes and obtain physical characteristics of the bats in a habitat. Additionally, netting is the only way to capture individual bats for the purpose of radio tracking and roost monitoring.

In this method, the researcher finds sources of water (e.g., streams or ponds) or possible flyways (e.g., paths in the woods) and captures any bats that fly over these sources of water. Nets are opened just before sunset and operated throughout the night. Only the number of nets that can be visited every fifteen minutes by the research should be used. All bats captured are removed from the net and physical features such as the weight, wing length, and sex are noted. An ANABAT recording of all bat species caught should be made.

From Elison (1997):

Set up ANABAT system near mist-netting area, but far enough away from water source or flyway to mitigate interference from other bats. Ideally, in order to get a good recording from a hand-released bat, three people are needed: a recorder, a spotlighter, and a releaser. After the bat has been processed, have the releaser stand about 20 to 25 m (66 to 82.5 ft) away from the recorder. Spotlighter should stand about 5 m (16.5 ft) away from releaser (with releaser between the recorder and spotlighter).

Releaser should then raise the bat above their head and release after it has been spotlighted. Recorder aims the ANABAT detector microphone toward the flying bat, saving files every 5 to 10 seconds or so. To record a good call sequence requires practice in gauging the time necessary before hitting the calibration button.

Record on datasheet the last sequence file saved from the hand-release and the total number of recordings made for that individual.

In electronic surveys a high-frequency detection devise (e.g., generic bat detector or specific brand such as ANABAT) and a computer are used to record the bats along an established transect. Each species has its own unique call and can be distinguished from other species. This method will give the researcher a picture of the species using the habitat along one transect and the proportion of each species. This method will not be able to tell the difference between individuals or between sexes.

From Elison (1997):

- Record header information on Transect Data Form: date, transect/directory, sunset, observers, weather variables, and time first bat is detected.
- Start point _ hour after sunset or directly after first bat is detected.
- Record a clutter index for each point. Clutter codes are at bottom of datasheet. Estimate clutter within a 25-meter radius from the center of the point.
- Each point lasts 5 minutes. While standing at the point, constantly sweep bat detector at about head level in all 4 cardinal directions. Record (press calibration button) every bat call sequence greater than 2 pulses. Tally all bat passes into one of 4 groupings: MYSP, EPFU/LANO/TABR, audible, unknown. Record start time of point, end time, tally number of files saved to the subdirectory, and record the name of the last file saved for that point.
- Points are spaced at least 200 meters apart.
- Repeat transects 3 nights in a row (repeating same points, same location).

Once the researcher is back in the laboratory, a comparison can be made of the transects results to a regional database of individual species echolocation patterns. Several transects should be conducted in each major habitat type each year to build long-term population trends on the bat populations.

To get a complete picture of the bat community at LANL, a combination of these two techniques will be required. The combination of the two techniques will provide an overall frequency of bat species as well as individual sex ratios and physical characteristics.

4.3.4 Required Resources

4.3.4.1 Personnel

Electronic surveying will require two persons for about 40 hours per survey session. Repeating the surveys will require an additional two persons for about 40 hours.

Netting will require four to five persons for 40 hours per week of netting done. This will include five separate locations or one location for five nights.

4.3.4.2 Equipment

Netting

- US Geological Survey topographic maps of the area to be netted
- bat nets and poles

- holding bags
- plastic bags
- waterproof markers
- mammal field guide
- field notebook
- head lamps
- spotlight
- warm clothing, even in summer
- rain equipment
- waders
- weighing scales
- ruler
- leather gloves
- radio or cellular phone for emergencies or pizza

Electronic Surveying

- US Geological Survey topographic maps of the area to be surveyed
- bat detector (ANABAT) with extra batteries
- laptop computer with extra batteries and disks
- clipboard and data sheets
- head lamp
- warm clothing, even in summer
- rain equipment
- spotlight
- radio or cellular phone for emergencies or pizza

The following equipment is recommended:

- Camera and film for habitat photos and bats caught.
- Global positioning survey unit--for determining survey coordinates and verifying location of survey plots on topographic maps.
- Survey flagging for marking survey sites and/or areas where netting took place.

4.3.4.3 Training

At least one of the surveyors or netters on the team must have worked with experienced bat researchers. All personnel involved with netting must have an up-to-date rabies vaccination.

4.3.4.4 Permitting

A State permit is required for the capturing of bats with special permission for State endangered species.

4.3.5 Analysis and Reporting

All data should be summarized annually and submitted to the State of New Mexico.

4.4 REPRODUCTIVE MONITORING

The purpose of reproductive monitoring is to:

- Determine the breeding status of resident sensitive bats,
- Collect productivity and breeding biology information, and
- Describe habitat characteristics and habitat use patterns.

Reproductive monitoring is a level three activity.

Reproductive monitoring would involve netting and noting the ratios of males to females as well as tracking sensitive bats back to their reproductive roosts.

4.4.1 Survey Locations

Survey areas of each major habitat for electronic surveying. Survey time and location should be varied to get an overall picture of bat movements. Netting will be done over suitable sources of water where available.

4.4.2 Survey Dates

After April 1.

4.4.3 Survey Technique

Same as 4.3.3.

4.4.4 Required Resources

4.4.4.1 Personnel

Same as 4.3.4.1.

4.4.4.2 Equipment

Same as in Section 4.3.4.2.

4.4.4.3 Training

Save as in Section 4.3.4.3.

4.4.4.4 Permitting

Same as in Section 4.3.4.4.

4.4.4.5 Analysis and Reporting

Same as in Section 4.3.4.5.

4.5 CONTAMINANT STUDIES

This is a level three activity. Such studies might include the collection and analysis of flying invertebrates or the taking and analysis of common nonsensitive bat species that use the same habitat and prey base as the sensitive bats. This protocol will be defined once a decision is made to implement this activity.

4.6 ECORISK STUDY

This is a level two activity. No ecorisk is currently under way on the sensitive bats of LANL. The general approach for performing this assessment is to make a quantitative appraisal of the potential effects that soil contaminants might have on the species when introduced through the soil ingestion pathways using the quotient method prescribed by the US Environmental Protection Agency.

4.7 PREY-BASE STUDIES

This activity is a level three. It may be possible to determine the predominant families of invertebrates taken by local bats by roost monitoring. This would be supplemented by baseline counts of flying invertebrates present in bat habitat. Analysis of stomach contents is not indicated due to the high risk of take during the procedure. This protocol will be defined once a decision is made to implement this activity.

4.8 TRACKING OF INDIVIDUALS

This is a level two activity. Individual bats of each species can be uniquely marked with highly visible colored and numbered bands. The presence of marked individuals opens the door to a wide range of studies, including studies on foraging area and plasticity, polygamy, roosting, return rate, and migration. The risk of take versus the benefit derived by marking individuals may be too high to recommend this procedure at this time. This protocol will be defined once a decision is made to implement this activity.

4.9 REGIONAL STUDIES

This is a level two activity. Any data collected on sensitive bat species must be reported to NMDGF. Since other agencies near LANL (National Park Service, National Forest Service, Bureau of Land Management, State of New Mexico, San Ildefonso Pueblo, and Cochiti Pueblo) own bat habitat, we may desire to collaborate on regional recovery efforts and studies with them.

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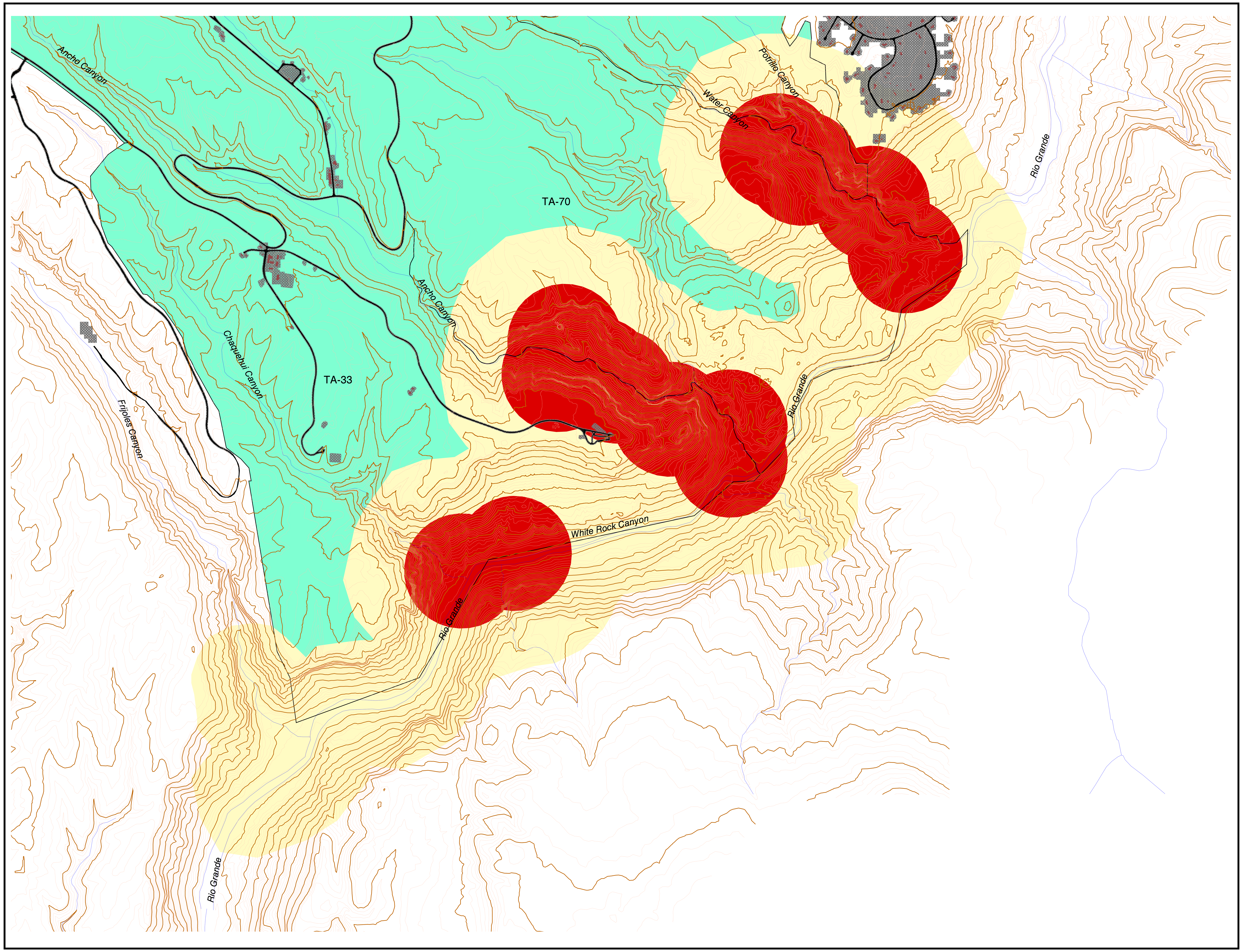
Back To "Mammals"



Detailed View of Bald Eagle AEI

LANL
Technical Area Boundary
Developed Areas
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Bald Eagle AEI
Core Area
Buffer Area

N
W E
S

1:12674

0.5 0 0.5 1 Miles

0.7 0 0.7 1.4 Kilometers

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Provisional Data Subject to Change

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett, Mary Salisbury, and Marjorie Wright
Date: December 8, 1998
Rev. 4
Revised: December 10,1999
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Back

Monitoring Plan

for the

Bald Eagle

Profile

Site Plan

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

The HMP has two associated documents: Area of Environmental Interest (AEI) Site Plans and Monitoring Plans. The AEIs are areas of LANL that are being managed and protected because of their biological or other significance. Habitats of threatened and endangered species that occur or may occur on LANL are designated as AEIs. The essential element of the AEI Site Plan is the management of each species-specific potential habitat through the allowable activities within the AEI. These allowable activities may be both spatially and time constrained and based on occupancy or non-occupancy of the habitat by the species.

These plans contain sensitive information concerning potential habitat for threatened and endangered species. For that reason, these documents are controlled and will be issued only to persons who have a "need to know" and are trained by LANL's Ecology Group on the elements of the AEI Site Plan. All maps and associated materials should be considered sensitive and maintained as sensitive information.

If you need further information concerning the Endangered Species Program, these AEI Site Plans, or allowable activities, call the Ecology Group or DOE Los Alamos Area Office.

MONITORING PLAN FOR THE BALD EAGLE

1.0 INTRODUCTION

The monitoring of Federal and State-listed species and local species of concern is an integral part of the Threatened and Endangered Species Habitat Management Plan (HMP). This particular monitoring plan provides background information on the bald eagle (*Haliaeetus leucocephalus*) and establishes some baseline monitoring protocols for the bald eagle at Los Alamos National Laboratory (LANL).

The majority of the information in this document was taken from NMDGF (1996a), unless otherwise noted.

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

PHYLUM, AND SUBPHYLUM	Chordata, Vertebrata
CLASS, AND SUBCLASS	Aves, Neornithes
ORDER, AND SUBORDER	Falconiformes, Accipitres
FAMILY, AND SUBFAMILY	Accipitridae, Accipitrinae
GENUS	*Haliaeetus*
SPECIES	*leucocephalus*
SUBSPECIES	*alascanus*

H. l. alascanus (Townsend) is the subspecies recognized in New Mexico. *H. l. leucocephalus* has been reported but not verified (NMDGF 1990). Literally translated, *Haliaeetus leucocephalus* means “white-headed sea eagle” (USFWS 1995).

2.2 STATUS

In 1967, the bald eagle had federal status as endangered (NMDGF 1988). In 1982, a Federal Recovery Plan was written and approved for this species (AGFD 1995a). In 1987, bald eagles were listed as a Federally endangered species without critical habitat (USFWS 1987). In 1990, bald eagle remained on the Federal endangered list (USFWS 1990). The next year, both import and export permits were required for international trade of bald eagles (USFWS 1992). Again, in 1993, bald eagle remained on the Federal endangered list (USFWS 1993).

A proposed rule to reclassify the bald eagle from endangered to threatened in most of the lower 48 states was published on July 12, 1994 (USFWS 1995). The proposed federal downlisting from endangered to threatened appeared to be warranted at this time (NMDGF 1994). In July of 1995, a final rule to reclassify the bald eagle from endangered to threatened in the lower 48 states was published on July 12, 1995. This ruling became effective on August 11, 1995 (USFWS 1995).

In 1995, the bald eagle was listed under the Natural Heritage Global Rank "G4" ("G4" = "Apparently Secure"). The subspecies, *H. l. alascanus*, was not listed independently in this table (AGFD 1995b). Later in 1995, the bald eagle was being "Tracked," i.e., data were being actively accumulated and entered into computerized and manual files by the Heritage Program (AGFD 1995b).

In 1996, the complete Natural Heritage Global Rank for the species *Haliaeetus leucocephalus* was listed "G4" (CNHP 1996).

NEW MEXICO

Bald eagle is listed as endangered (group 2), and was first listed January 24, 1975 (NMDGF Register 563).

In 1994, Biologist's Recommendation was for no change in the New Mexico state-listing status. It was stated, however, that the New Mexico Department of Game and Fish (NMDGF or the Department) should support the proposed federal downlisting to threatened (NMDGF 1994).

In 1996, only two pairs of bald eagles were nesting in the State, and these and their habitats warrant the protection of continued Federal and State listing as threatened (NMDGF 1996b). No change in the legal status of this species was recommended by the NMDGF at this time. It was, however, recommended that the Department should continue to monitor the breeding population, and to encourage maintenance and enhancement of the riparian/wetland areas where these eagles occur. The next step in the joint Federal/State recovery process for this species would entail establishment of sound criteria for full recovery which, when achieved, would allow delisting the bald eagle (NMDGF 1996b).

1996, the bald eagle was listed by a New Mexico Natural Heritage Program list as "Tracked" (NMNHP 1996).

2.3 HABITAT

Bald eagles are primarily water oriented, and the majority of the populations occurring in New Mexico are found near streams and lakes. On the other hand, there are some "dry land" areas where these eagles occur regularly—most notably in the region between the Pecos Valley and the Sandia, Manzano, Capitan, and Sacramento Mountains, plus on the Mogollon Plateau. The birds typically night-roost in groups in trees, usually in protected sites such as canyons (NMDGF 1988).

Bald eagles have been seen in association with open expanses of water. These birds are most often seen soaring, but on occasion they are also found perched in trees or on snags (Baltosser 1991).

Bald eagles can occur in woodlands, especially cottonwoods, that occur where desert streams provide sufficient moisture for a narrow band of trees and shrubs along the margins (USDA 1991).

Bald eagles also inhabit grasslands dominated by wild oat (*Avena* spp.), ripgut brome (*Bromus rigidus*), soft chess (*Bromus mollis*), bur clover (*Medicago hispida*), and filaree (*Erodium* spp.) with less than 5% wood cover. The eagles occur in mountain and alpine meadows where sedges (*Carex* spp.) and grasslike plants (Heleocharis, Scirpus) grow above treeline. They inhabit open to dense stands of shrubs and low trees, including big sagebrush (*Artemisia tridentata*), saltbush (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), or creosote bush (*Larrea divaricata*) (USDA 1991).

Eagles can be found in various forest types. Within Douglas fir common associates are western hemlock, western red cedar, true firs, redwood, ponderosa pine, and larch. Within Hemlock-Sitka Spruce common associates are Douglas-fir, silver fir, and western redcedar. In Redwood forests common associates are Douglas-fir, grand fir, and tanoak. This type extends inland and to the reaches of coastal fogs. Ponderosa pine is associated with white fir. It is usually distributed to the west, north, and east of the Great Basin and the deserts of the Southwest. Western white pine-larch is associated with western redcedar, larch, white fir, Douglas-fir, lodgepole pine, and Englemann spruce. Such admixtures produce the mixed conifer type. The lodgepole pine is best developed on moist, sandy or gravelly loam. Common associates are subalpine fir, western white pine, Engelmann spruce, aspen, and larch. The fir-spruce forests are the true firs, Engelmann spruce, or Colorado blue spruce. Common associates are lodgepole pine, and at high elevations, mountain hemlock. Aspen (hardwoods) or red alder is most common at middle elevations in the Rocky Mountain cordillera, where it is usually succeeded by interior Douglas-fir. Aspen is usually the first to dominate burns and other disturbed areas, where it produces even-aged stands. It has a herbaceous understory, commonly forbs, but sometimes grasses and sedges. Snowberry, chokeberry, and western serviceberry are common understory shrubs. Chaparral consists of heavily branched dwarfed trees or shrubs, commonly evergreens, whose canopy at maturity covers at least 50% of the ground. Common constituent plants include oaks, mountain mahogany, silktassel, ceanothus, manzanita, and chamisa. Piñon-juniper forests are widely distributed throughout the semiarid west, usually on dry, shallow, rocky soils of mesas, benches, and canyon walls (USDA 1991).

These birds require large trees or cliffs near water with a good supply of fish. They winter beside oceans, rivers, lakes, or where carrion is available (OSU 1993).

Specifically at LANL, bald eagles winter along the Rio Grande, including Department of Energy land in and around White Rock Canyon, and several dozen often congregate downstream near Cochiti Reservoir. Some are resident from November through March, but others move about, and peak numbers usually occur in January or early February. While they forage most often in the vicinity of Cochiti Reservoir, they use all of White Rock Canyon regularly, and the entire Pajarito Plateau occasionally. Bald eagles roost overnight in canyons that offer weather protection, security, and convenience to foraging areas, usually in tall ponderosa pines in lower portions of tributary canyons. Because few bald eagles nest in New Mexico, their nesting habitat is not well characterized, but a secure tree or cliff nest site near suitable aquatic habitat is probably required.

2.4 CHRONOLOGY

This species breeds from Alaska to Newfoundland and southward to Baja California, the Southwest, Texas, and Florida; it winters southward to northern Mexico (AOU 1982).

In New Mexico, this eagle migrates and winters from the northern border, southward regularly to the Gila, lower Rio Grande, middle Pecos, and Canadian valleys. The species is occasional elsewhere, in summer, and as a breeding bird—with nests reported in the extreme north and west. Unsubstantiated reports of nesting exist from elsewhere, including on the Canadian River west of Roy. Key habitat areas include winter roost and concentration areas, such as at Navajo Lake, the Chama Valley (Rio Arriba County), Cochiti Reservoir (Sandoval County), the northeastern lakes (Raton to Las Vegas), the lower Canadian Valley, Elephant Butte Lake, Caballo Lake, and the upper Gila Basin. Any nesting or summering area should be classified as key habitat for the species (NMDGF 1988).

Bald eagles occur casually to occasionally in summer and migrate and winter almost statewide. Main winter areas include San Juan, upper Rio Grande, upper and middle Pecos, Canadian, San Francisco, Gila, and Estancia valleys. Bald eagles occur casually to occasionally in summer and are considered rare and local near water. They migrate and winter almost statewide (Hubbard 1978).

2.5 BEHAVIOR

2.5.1 Breeding

The few nests reported from New Mexico have been in trees and on cliffs, which are typical sites elsewhere as well. The normal clutch is of two eggs, which are whitish in color and average 70 by 53 mm (3 by 2 in.) (NMDGF 1988).

Eagles build their nests on the tops of tall trees or on cliffs. Nests can be 180 cm (6 ft) across and 180 to 250 cm (6 to 8 ft) high. A pair of eagles will use the same nest year after year (OSU 1993).

In the southeastern United States, nesting activities may begin as early as September. Typically, two eggs make up a clutch and these hatch after approximately 35 days. It may be up to 12 more weeks before fledging occurs, and parents may care for young four to six additional weeks (OSU 1993). Sexual maturity for bald eagles is roughly five to six years (Bent 1964).

2.5.2 Feeding

The major food items of bald eagles in New Mexico appear to be waterfowl, fish, and carrion. Mammals such as jackrabbits (*Lepus* spp.) are also taken, especially by dry land eagles. Bald eagles feed mostly on fish, but also scavenge on dead deer and elk and other animals (NMDGF 1988).

3.0 MONITORING JUSTIFICATION, PURPOSE, AND OBJECTIVES

Because the federally listed bald eagles forage and roost on property belonging to LANL (Hinojosa 1997), it is required by the Threatened and Endangered Species Act to monitor this species in order to address potential impacts of LANL.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change (for example, if the species is newly found at LANL). Some activities are not appropriate to every species (designated as zero). The HMP contains a summary table ranking all species and activities. The following table lists importance rankings for bald eagle monitoring activities.

Section	Status Tracking	Habitat Analysis and Models	Presence/ Absence Surveys	Repro-duction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Ranking	1	1	1	4	2	1	3	4	2

4.1 STATUS TRACKING

This is a level one activity. The regional status of the bald eagle will be evaluated annually. Surveyors will attend status update meetings sponsored by the United States Fish and Wildlife Service (USFWS). LANL biologists will remain up to date on information concerning the status of the bald eagle in New Mexico. All new information will be entered into a current LANL Threatened and Endangered Species Database and used as a reference document.

4.2 HABITAT ANALYSIS AND MODELS

This is a level one activity. Potential habitat, including roosting trees, will continue to be surveyed and monitored on an annual basis. LANL biologists will continue to assess the potential use of LANL by bald eagles. This will include the potential areas of LANL property that are used as foraging habitat.

4.3 PRESENCE/ABSENCE SURVEY

This is a level one activity. LANL will continue to conduct presence/absence surveys on LANL property. These surveys will primarily be concentrated around existing habitat commonly used by the bald eagles.

4.3.1 Survey Locations

Surveys will be conducted along the Rio Grande portions of LANL.

4.3.2 Survey Dates

Surveys will be conducted during late winter months.

4.3.3 Survey Techniques

Roosting counts will be conducted by trained personnel. Roosting counts provide the most effective way to census wintering bald eagles, which tend to congregate at regular roosts (Johnson 1993). Late afternoon and early morning counts along flyways to and from roosts are more effective than counts of eagles at roosts, where growing darkness and the distance required to avoid disturbance limit visibility. Aerial counts cover more ground and sample aquatic foraging areas, but tend to detect relatively fewer immature eagles. Collection of castings and other prey remains under roost trees provide the most comprehensive picture of diet, but under-represent the absolute proportion of fish in the diet. These late winter surveys of suitable roost trees for accumulated castings, feathers, and droppings have proven to be the most efficient method of documenting occasional use of trees for roosting and perching.

4.3.4 Required Resources

4.3.4.1 Personnel

A minimum of two people is required per survey.

4.3.4.2 Equipment

Binoculars and field notebooks are required.

4.3.4.3 Training

All individuals participating in the surveys will complete the LANL operating procedure self-study documents, and will receive on-the-job training by qualified individuals.

4.3.4.4 Permitting

A permit is not required to conduct surveys on LANL property. Permission must be obtained before conducting surveys in areas under jurisdiction of other agencies.

4.4 REPRODUCTIVE MONITORING

This is a level four activity. There are no bald eagle reproductive monitoring studies currently being planned at LANL. However, in the future, LANL may wish to conduct reproductive monitoring studies, if current conditions change.

4.5 CONTAMINANT STUDIES

This is a level two activity. Contaminant studies should be conducted on the food sources of bald eagle. In addition, baseline contaminant studies should be conducted in the areas of environmental interest associated with bald eagles.

4.6 ECORISK STUDY

This is a level one activity. Because bald eagles are a federally listed species, LANL is conducting ecological risk assessments on the eagles. These studies will assess the impact that LANL-produced contaminants have on bald eagles. LANL will continue to do this type of study in the future.

4.7 PREY-BASE STUDIES

This is a level three activity. Currently, there are no bald eagle prey-base studies currently being planned at LANL. In order to gather more comprehensive baseline data on the eagle, LANL may want to conduct prey-base studies in the future.

4.8 TRACKING OF INDIVIDUALS

This is a level four activity. Currently, there are no individual eagle tracking studies currently being planned at LANL. However, if conditions change, there may be a need for this type of study in the future.

4.9 REGIONAL STUDIES

This is a level two activity. Any data collected on bald eagle must be reported to USFWS. Since other agencies near LANL have bald eagle issues, in the future, we may desire to collaborate on regional recovery efforts and studies with them.

5.0 ANALYSIS AND REPORTING

USFWS and the appropriate State agencies will be notified of all field survey results. In addition, survey results will be maintained in the LANL Threatened and Endangered Species Database.

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Back To "Birds"

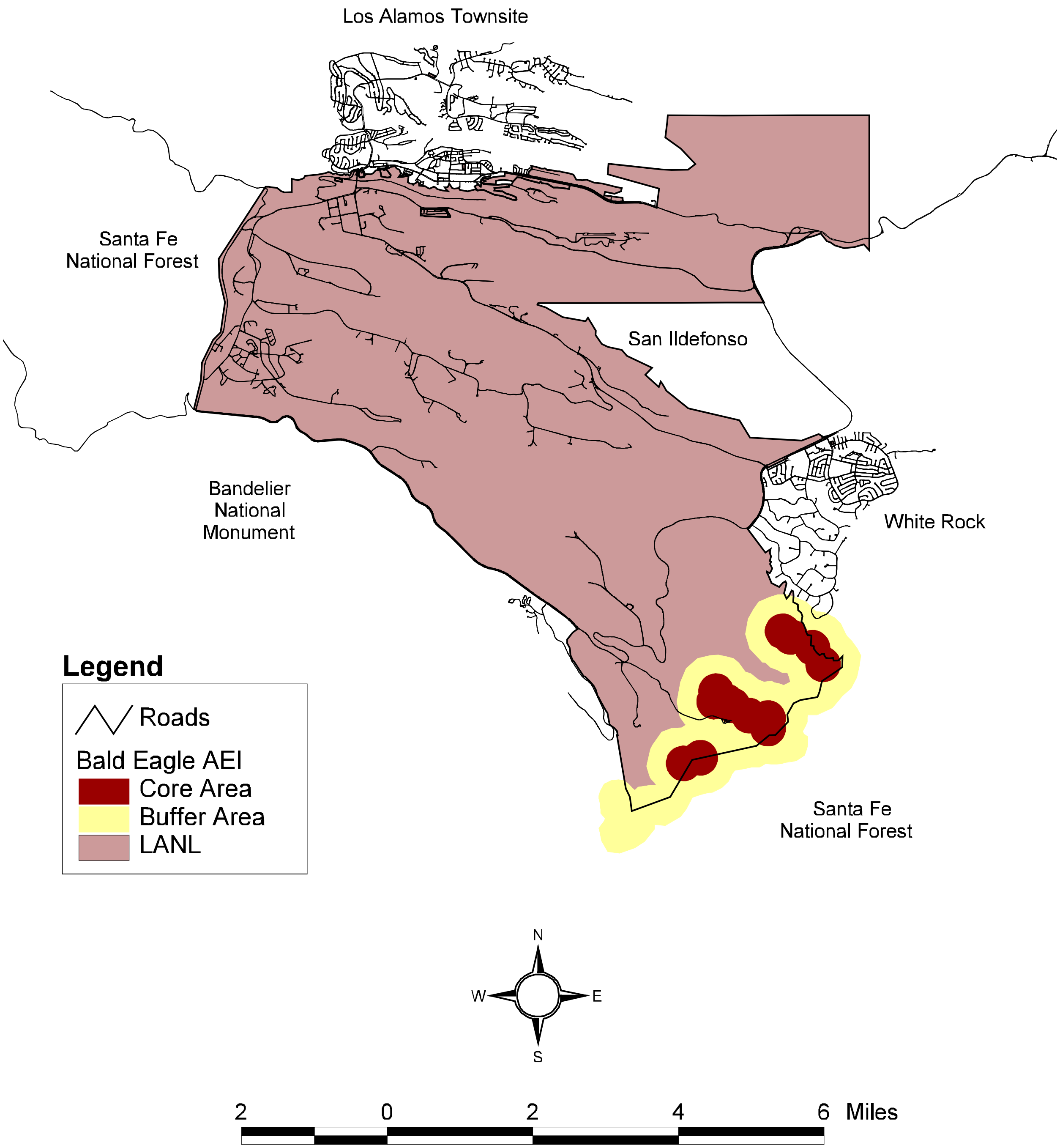


Figure 3.1. Location of Bald Eagle AEI.

Back

Threatened and Endangered Species Habitat Management Plan

Area of Environmental Interest

Site Plan

for the

Bald Eagle

Los Alamos National Laboratory
Ecology Group (ESH-20)

June 2000

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF MAPS

AREA OF ENVIRONMENTAL INTEREST
SITE PLAN FOR THE BALD EAGLE

1.0 SPECIES DESCRIPTION—BALD EAGLE

1.1 STATUS

In 1967, the bald eagle (*Haliaeetus leucocephalus*) was listed as federally endangered in most of the contiguous United States, including New Mexico (NMDGF 1988). The federal government reclassified the bald eagle from endangered to threatened status in the lower 48 states in 1995.

1.2 GENERAL BIOLOGY

Adult bald eagles are easily recognized by their white heads and tails (Hubbard 1985). Immature bald eagles are similar in appearance to the golden eagle (*Aquila chrysaetos*), but bald eagles generally have pale areas on the head, back, breast, and/or abdomen, whereas these areas are all dark in the golden eagle. Bald eagles do not reach complete adult plumage for about four to five years (OSU 1993).

Bald eagles occur casually to occasionally in summer and during migration in New Mexico. Bald eagles winter almost statewide. Main wintering areas in New Mexico include the San Juan, upper Rio Grande, upper and middle Pecos, Canadian, San Francisco, Gila, and Estancia valleys (Hubbard 1978). At Los Alamos National Laboratory (LANL), bald eagles winter along White Rock Canyon adjacent to the Rio Grande. Some of these eagles remain in the area through winter while others move around.

Bald eagles are carnivores and piscivores. They winter beside rivers and lakes or where carrion is available (Isaacs et al. 1993). The birds typically roost at night in trees that offer weather protection, security from predators, and accessibility to foraging areas. At LANL, they may roost overnight in ponderosa pine (*Pinus ponderosa*) trees located in the lower portions of the tributary canyons near the Rio Grande (Johnson 1996), particularly near the mouths of Water, Ancho, Potrillo, and Chaquehui Canyons. Bald eagles also use snags close to foraging areas as loafing sites, lookout posts, and hunting/hawking perches (Maser et al. 1988).

Overall, the major food items of bald eagles in New Mexico appear to be waterfowl, fish, and carrion (NMDGF 1988). Mammals such as jackrabbits (*Lepus* spp.) are also taken, especially by dry land eagles. Eagles occurring around LANL will forage on the Rio Grande, Cochiti Lake, and the Pajarito Plateau (Johnson 1996). Diet analysis of eagles wintering along White Rock Canyon include fish, waterfowl, deer (*Odocoileus hemionus*), and elk (*Cervus elaphus*). Table A.1.1 in the appendix lists the potential prey species occurring or potentially occurring within the Area of Environmental Interest (AEI). The wetland habitat above Cochiti Lake has expanded since 1979, providing suitable habitat for fish, wintering waterfowl, and bald eagles (Allen et al. 1993).

1.3 THREATS

Bald eagle numbers in the United States declined due to pesticide-induced reproductive failure, loss of riparian habitat, and human disturbances that included shooting, poisoning, and trapping. The primary cause for the initial decline of bald eagles was the ingestion of hydrocarbon pesticide residues in prey, which causes thinning of the eggshells and subsequent reproductive failure. The banning of DDT and related chemicals has helped in their recovery. The number of bald eagles wintering in New Mexico increased from an annual average of 220 birds in the early 1980s to 450 by the mid-1990s. The main threats to these wintering populations are habitat loss and degradation, including declines in prey and roost-site availability. Disturbance, environmental contamination, and illegal taking also may be problems for bald eagles (NMDGF 1994).

2.0 IMPACT OF HUMAN ACTIVITIES

2.1 INTRODUCTION

The primary threats to bald eagles over which LANL has control are (1) impacts on habitat quality from LANL operations and (2) disturbance of foraging or roosting eagles from LANL operations. In this section, we review and summarize scientific knowledge of the effects of various types of human activities on bald eagles and provide an overview of the current levels of activities at LANL.

2.2 IMPACTS ON HABITAT QUALITY

2.2.1 Development

McGarigal et al. (1991) found that breeding eagles typically avoided an area within 400 m of an experimental stationary boat located in heavily-used foraging habitat. Most eagles did not approach stationary human activities. Wintering bald eagles along the Colorado River were 22 times more common in river reaches with low human use compared with reaches with moderate to high human use (Brown and Stevens 1997). No eagles were found within 1 km of intensively used areas.

Property at LANL varies from remote isolation to heavily developed and/or industrialized. Most of the large developed areas at LANL are found on mesa tops, generally in the northern and western portion of LANL. There has been a limited amount of development by LANL in Los Alamos Canyon and by the County of Los Alamos in Pueblo Canyon. LANL is bounded by developed residential, industrial, and retail areas along its northern boundary (the town of Los Alamos) and by residential and retail development along a portion of its eastern boundary (the town of White Rock). Three major paved roads traverse LANL from northeast to southwest. Pueblo, Sandia, and Pajarito Canyons have paved roads along at least a portion of each canyon.

2.2.2 Contaminants

Elevated DDE concentrations have been documented as associated with eggshell thinning and reduced production of young in bald eagles (Weimeyer et al. 1993). Experience with other raptor species suggests that exposure to polychlorinated biphenyls (PCBs) and other organophosphate or organochlorine pesticides would probably be harmful (Cain 1988). Exposure to other contaminants could be harmful (Cain 1988).

In describing general conditions of contaminants at LANL, we have used the Environmental Surveillance and Compliance Report containing data from 1996 (ESP 1997). LANL conducts annual monitoring of air quality, surface water, groundwater, sediments, soils, and foodstuffs for levels of radionuclides, metals, and some organics (ESP 1997).

2.2.2.1 *Air Monitoring*

Air quality is monitored for tritium; americium-241; plutonium-238 and -240; and uranium-234, -235, and -238. During 1996, air concentrations of these radionuclides were well below applicable guides and limits.

2.2.2.2 *Groundwater Monitoring*

Groundwater samples are taken from the main aquifer underlying Los Alamos and from water supply wells. Trace levels of tritium are present in test wells in a few areas where former or present liquid waste discharges occurred. These include Los Alamos, Pueblo, and Mortandad Canyons. The highest level of tritium detected was about 2% of the drinking water standard, and is not believed to pose a health risk. Waters near former or present effluent discharge areas show the effects of these discharges; however, radionuclide activities are below Department of Energy (DOE) dose concentration guidelines for public exposure.

2.2.2.3 *Surface Water Monitoring*

The Laboratory Environmental Surveillance Program annually surveys surface water for levels of radionuclides, water quality parameters, and metals (ESP 1997). All radionuclide results for 1996 were below the DOE derived concentration guides for public dose. None of the surface water chemistry results exceeded water quality guidelines except for some pH measurements above 8.5. High levels of barium were detected in Water Canyon, Cañada del Buey, and Ancho Canyon. Mercury levels above New Mexico wildlife habitat stream standards were detected in DP Canyon. Aluminum, iron, and manganese concentrations exceed Environmental Protection Agency (EPA) secondary drinking water standards at most locations due to naturally occurring metals. Selenium values exceeded the New Mexico wildlife habitat stream standard at numerous locations. High explosives were detected in Frijoles and Water Canyons.

2.2.2.4 *Sediment Monitoring*

Sediments also are annually collected and tested for radionuclides and metals, and some samples are tested for organics. The majority of sediment samples collected outside known radioactive effluent release areas were within background levels that reflect worldwide fallout. Sediment samples from effluent release areas, including Acid, Pueblo, DP, Los Alamos, and Mortandad Canyons, exceeded worldwide fallout levels for tritium, strontium-90, cesium-137, plutonium, and americium-241. Sediments from Cochiti Lake had detections or possible detections of strontium-90, cesium-137, and plutonium. The only radioactive contaminant level that exceeded screening action levels was cesium-137 in Mortandad Canyon. Screening action levels identify the presence of contaminants at levels of concern to human health, and are derived from toxicity values and exposure parameters using data from the EPA (ESP 1997). None of the sediment samples tested for organics (approximately 1/6 of the samples) showed any significant accumulations of metals or organic compounds (including PCBs). Testing outside of the surveillance program has detected PCBs in Sandia Canyon (Fresquez 1992, Bennett et al. 1999).

2.2.2.5 *Biota Monitoring*

Wildlife such as large game animals, small mammals, birds, and other species are sampled for contaminants on a project-specific basis. Results of projects that are applicable to specific AEIs will be discussed in an AEI's description.

2.2.2.6 *Potential Contaminant Release Sites*

LANL's Environmental Restoration (ER) Project is responsible for characterizing potential threats to human health and the environment from past LANL operations and mitigating those threats through corrective actions that comply with applicable environmental regulations. The ER Project has identified over 2000 sites on LANL that potentially are a source of contaminants. These potential contaminant release sites (PRSs) were identified from historical records, area surveys, aerial photos, and interviews with current and former Laboratory employees. PRSs represent potential areas of legacy wastes from historical operations that have been discontinued. They do not represent current permitted and regulated operations. Most PRSs are regulated under the Resource Conservation and Recovery Act or the Comprehensive Environmental Response, Compensation, and Liability Act. Descriptions of specific AEIs contain a list of the PRSs occurring in or near that AEI, the type of PRS, and their current status. The data presented comes from the ER Project database maintained in the Facility Information Management, Analysis, and Display (FIMAD) at LANL.

2.2.2.7 *Ecorisk Assessment*

Gonzales et al. (1997a) conducted a preliminary screening risk assessment of the bald eagle at LANL using soil contaminant data collected for the ER Project and fish contaminant data collected for the Environmental Surveillance Program. These samples were analyzed for inorganic, organic, and radioactive contaminants. The bald eagle risk assessment used toxicity reference values (TRVs) obtained from the literature and laboratory studies to quantify the risk of nonradionuclide contaminants to animals. However, these TRVs are not available for radionuclides. Therefore, human risk standards were used. Gallegos et al. (1997a) estimated that these standards are 185 to 3650 times more protective of biota than standards proposed by the International Atomic Energy Agency. However, the assumption that wildlife species are adequately protected if humans are has not been tested (Gallegos et al. 1997a).

The bald eagle risk assessments were centered around the Rio Grande and White Rock Canyon. A hazard index (HI) <1.0 indicates no appreciable impacts from contaminants, and a HI between 1.0 and 10.0 indicates a small potential for impacts from contaminants. The range in mean HI values for different foraging scenarios was 0.0025 to 0.015. The highest mean HI of 0.015 indicates an acceptably low risk of impact in the areas examined. We are currently verifying the accuracy and latest findings of ER Project sampling data upon which the risk estimations are based.

2.2.3 Disturbance

2.2.3.1 *Pedestrians and Vehicles*

Grubb and King (1991) concluded that, all else being equal, pedestrians provoked the greatest frequency of response from breeding bald eagles. They suggested restricting pedestrian activity within 550 m of breeding eagles and restricting vehicles within 450 m of breeding eagles. Stalmaster and Kaiser (1997) found that 99% of wintering eagles feeding or standing on the ground near a watercourse flushed in response to a non-motorized raft travelling along the watercourse. The flush percentage of adult and immature eagles perched along the water course was between 54% and 65% and 32% for eagles >50 m from the water course.

Many canyon bottoms and mesa tops at LANL have dirt roads traversing them. Most of these roads are gated against unauthorized access by vehicles. However, many of these roads are accessible to LANL employees and the public on foot or by bike. Some areas, such as Los Alamos Canyon and the portion of LANL east of State Road 4 including White Rock Canyon are frequently used by hikers and people exercising dogs.

2.2.3.2 *Aircraft*

Stalmaster and Kaiser (1997) found that between 25% and 56% of wintering adult and subadult eagles along a river course flushed in response to low overflights (60 to 120 m agl) by military helicopters along a watercourse. Grubb and Bowerman (1997), studying bald eagle responses to jets, light planes, and helicopters, concluded that a categorical exclusion of aircraft within 600 m of nest sites of breeding bald eagles would limit bald eagle response frequency to 19%. Alert responses occurred at a median distance of 300 to 400 m, and flight responses occurred at a median distance of 150 to 200 m. Eagles apparently respond more strongly to helicopters than to fixed-wing aircraft (Watson 1993).

LANL is restricted airspace, and it is very unlikely that planes would be flying less than 2000 ft agl except in an emergency situation, such as wildfire. The County of Los Alamos operates an airport along the northern edge of LANL. The airport is located on the southern rim of Pueblo Canyon. Most flights approach and depart to the east of the airport, over the Rio Grande. Flight paths may follow above White Rock Canyon.

2.2.3.3 *Explosives*

Stalmaster and Kaiser (1997) examined the flushing response of wintering bald eagles to automatic weapons fire, artillery impacts, mortar impacts, and explosive destruction of ordnance. Fifty percent of 42 eagles flushed in response to ordnance explosions at distances <2 km. Flushing in response to ordnance explosions was not observed in 7 eagles at distances >2 km. Flushing rates for other firing activities ranged from 0% to 27% at 0.5 to 1.0 km, and 6% to 13% at distances of 1.0 to 2.0 km. Impulse sound levels over 110 dB may cause physical discomfort for humans (Bowles 1995). Holthuijzen et al. (1990) found that a 167-g charge of Kinestik produced noise levels between 138 and 141 dB at 100 m, and that a 500-g charge of TNT produced noise levels between 144 and 146 dB at 100 m. A 20-kg charge of TNT produced noise levels measuring 163 dB at 100 m (Paakkonen 1991).

Measurements of noise levels during explosives detonation (quantities of high explosives ranged from 4.5 to 67.5 kg of TNT during six shots) were made at three locations at LANL. Noise levels increased during the test from a background level of 31 dB(A)[1] to a range between 64 and 71 dB(A) during shots at a distance of 1.8 km. At a distance of 4.3 km, noise levels rose from a background range of 35 to 64 dB(A) to a range of 60 to 63 dB(A) (Vigil 1995). At a distance of 6.7 km, noise levels rose from a background range of 38 to 51 dB(A) to a range of 60 to 71 dB(A) (Burns 1995). Keller and Risberg

[1] Sound can be measured as decibels (dB), C-weighted decibels (dB(C)), or A-weighted decibels (dB(A)). The dB(A) measurement best resembles the response of the human ear by filtering out lower and higher frequency sound not normally heard by the human ear.

(1995) estimated that the noise from a shot at the Dual-Axis Radiographic Hydrodynamic Test facility would be 150 dB(A) at the source, and 80 dB(A) at 400 m.

2.2.3.4 *Other Sources of Noise*

We do not have good information on the effects of noise alone on bald eagles. Gunshots at a median distance of 850 m caused an alert response in 42% of 178 wintering bald eagles, and caused a flight response in 6% of the eagles (Grubb and King 1991).

We do not have any specific information on the response of bald eagles to machinery. However, we assume it would be similar to their response to vehicles, but occurring at a greater distance in proportion to the increased loudness of machinery.

Construction and maintenance operations at LANL are fairly common. In addition, a need for increased monitoring of groundwater has resulted in the drilling of shallow and deep test wells. Future planned fuels management operations will require the use of chainsaws.

Major noise-producing activities at LANL include automobile and truck traffic, noise associated with office buildings, construction activities, a live-fire range, and explosives testing. In addition, there is noise associated with aircraft traffic at the County airport. Huchton et al. (1997) conducted a study of noise levels in canyons at LANL. They found that the primary sources of noise exceeding 55 dB(A) were cars and trucks. Readings taken near flowing water were up to 11 dB(A) higher than readings taken elsewhere. The average dB(A) in canyons near paved roads ranged from 41 to 62 dB(A), with maximum values ranging from 62 to 74 dB(A). Away from paved roads 1.6 km or more, average dB(A) in canyons ranged from 37 to 50 dB(A), with all but one average beneath 45 dB(A). Maximum dB(A) away from paved roads ranged from 38 to 76 dB(A) (76 dB(A) was measured during a thunder clap). A bird singing in a canyon was measured at 43 dB(A), relative to a background measurement of 37 to 40 dB(A) (Keller and Risberg 1995).

Keller and Foxx (1997) made sound measurements at successive distances from an industrial area near a canyon rim, into the canyon, and to the opposite rim. Background dB(A) values ranged from 61 at the canyon rim, to 60 within the canyon, and to 62 at the bottom of the canyon near a stream. A truck horn blown at the rim of the canyon created a source sound of 121 dB(A). Sound levels measured during the horn blowing approached background levels at 50 m down the slope of the canyon. A similar test on a mesa top near a developed area found that the noise from the truck horn decreased to near-background (61 dB(A)) levels within 40 m from the source. Keller and Risberg (1995) estimated the maximum noise associated with construction operation of heavy machinery would be 110 dB(A) at the source, and average construction noise levels would be 93 dB(A) at the source.

Noise measurements taken at the Los Alamos County Airport (near the runway) during the maximum use time (06:30 to 07:30) had background values averaging 54 dB(A). Noise during plane arrivals ranged from 47 to 63 dB(A). No measurements were taken during take-offs. The maximum A-weighted sound level for Lear jets, the noisiest airplane currently using the airport, has been estimated as 94.7 dB(A) on approach and 84.7 dB(A) on take-off (USDOT 1996). Sound measurements made in the bottoms of Pueblo and Bayo Canyons ranged from 37 to 40 dB(A) in most areas of the canyon. At the sewage plant parking lot during a working day, the average dB(A) during a three-minute period was 46 (range 45 to 49), and, at the intersection of the road going into Pueblo Canyon with State Road 502, the average dB(A) during a three-minute period was 60 (range 41 to 70).

Overall, these studies appear to show that areas adjacent to or within developed areas or paved roads are likely to have daytime average background noise levels between 40 and 63 dB(A). More undisturbed areas are likely to have average background noise levels between 30 and 50 dB(A). Higher noise levels may be associated with the airport, explosives testing, or construction activity.

2.2.3.5 *Artificially Produced Light*

We have no information on the effects of artificially produced light on bald eagles.

Under the Los Alamos County Code, commercial site development plans are reviewed to ensure that lighting serves the intended use of the site while minimizing adverse impacts to adjacent residential property (Section 17.14.040G). Section 17.40.060 of the County Code includes light source measurement limitations in terms of strength of light in foot-candles (ftc). The code allows off-site light to be 0.5 ftc in residential areas. By comparison, full moonlight measures 0.1 ftc. A crescent moon was measured at 0.01 ftc.

Preliminary surveys were conducted for light levels within Los Alamos Canyon at the Omega Reactor (Keller and Foxx 1997). Omega Reactor is brightly lighted for purposes of security; therefore, total light intensity is greater than the average street lighting. Measurements were made at a light pole with an open parking lot at the reactor as the source. Trees did not obscure the area. Using the relationship of light intensity reducing as a square of the distance, calculations using the field data (Table A.2.1) indicate that at 30 m the light levels would be equivalent or nearly equivalent to full moonlight.

3.0 AEI GENERAL DESCRIPTION FOR BALD EAGLE

3.1 DESCRIPTION OF THE BALD EAGLE AEI

The AEI consists of two types of areas—core areas and buffer areas. AEIs for wintering bald eagles consist of a circular core area with a radius of 400 m surrounding identified roost trees and potential roost trees in and near White Rock Canyon. Core areas and the Rio Grande riverbed are surrounded by 400-m-wide buffer areas.

3.2 METHOD FOR IDENTIFYING THE BALD EAGLE AEI

The Rio Grande constitutes the primary foraging habitat for bald eagles in the LANL area. Some dry-land foraging may take place, but based on the number of recorded observations of eagles away from the Rio Grande, this foraging is scattered and sparse. Roost trees and potential roost trees along the Rio Grande were identified in 1992 by a walk of the bottom of White Rock Canyon and other tributary canyons near their confluence with White Rock Canyon (Johnson 1992). The locations of these roost trees then became the center points for the core areas of the AEI. A buffer was placed around the core areas and along the river.

3.3 LOCATION AND NUMBER OF BALD EAGLE AEIs

There is one bald eagle AEI and it is located along the eastern boundary of LANL in conjunction with the Rio Grande (Figure 3.1). There are three core areas within this AEI and a contiguous buffer area around the cores and along the river.

4.0 AEI MANAGEMENT

4.1 OVERVIEW

This AEI management section provides guidelines for LANL operations to reduce or eliminate the threats to bald eagles from (1) habitat alterations that reduce habitat quality and (2) disturbance of roosting bald eagles. Habitat alterations are considered for all AEIs and for both core and buffer areas. Activities causing disturbance—hereafter referred to as "disturbance activities"—to eagles are considered only for occupied AEIs and only for impacts on core areas. Developed areas (see definition below) that have ongoing baseline levels of activities and are not suitable habitat for eagles have different restrictions than undeveloped core or buffer areas. Therefore, the location of the disturbance activity within the AEI, the occupancy status of the AEI, and the type of activity all affect whether or not the activity is allowable. Remember, AEIs for different species may overlap, and an activity must meet the guidelines of all applicable site plans to be allowable. Protective measures are described as management practices that should be followed when working in AEIs.

4.2 DEFINITION AND ROLE OF OCCUPANCY IN AEI MANAGEMENT

***Summary:* The White Rock Canyon Bald Eagle AEI is considered occupied during 1 November through 31 March. See the Activity Table (Section 4.8.2) for restrictions on occupied undeveloped core and buffer areas, and see the developed area section (Section 4.3) for restrictions on developed areas.**

Occupancy simply refers to whether or not an AEI is occupied during a species' period of sensitivity. For bald eagles, we are primarily concerned with protecting the eagles from disturbance on their wintering grounds. Because bald eagles may visit the AEI at any time, and may stay for variable lengths of time, the AEI is considered occupied during the entire wintering period, 1 November through 31 March. The bald eagle AEI is considered unoccupied during the rest of the year (1 April to 30 September).

The occupancy status of an AEI affects what activities are allowable in the AEI. Although activities causing habitat alterations are restricted in all AEIs, disturbance activities are restricted only in occupied AEIs. The Activity Table (Table 4.1) tells when and what level of disturbance activities are allowed in occupied bald eagle AEIs under the guidelines of this site plan.

4.3 DEFINITION AND ROLE OF DEVELOPED AREAS IN AEI MANAGEMENT

***Summary:* Habitat alteration is not restricted in developed areas unless it impacts undeveloped core areas of an AEI (e.g., noise and light impacts on a core). Current ongoing disturbance activities are not restricted in developed areas. Disturbance activities not currently ongoing are restricted when impacts occur to undeveloped occupied core areas of an AEI.**

Developed areas include all building structures, paved roads, improved gravel roads, paved and unpaved parking lots, and firing sites. The current extent of developed areas in each AEI was determined using two methods. First, we placed a 15-m border (called the developed-area border) around all buildings and parking lots. For paved and improved gravel roads, the developed area was defined as the area to a roadside fence, if one exists within 9 m of the road, or 4.5 m (15 ft) on each side of the road, if there is no fence within 9 m. If an area of highly fragmented habitat was enclosed by roads, a security fence, or connected buildings, that area was also classified as developed. Developed areas at firing sites were defined as a circle with a 91.4-m radius from the most centrally located firing pad. Second, we overlaid scanned orthophotos on a base map of the Los Alamos area and digitized by hand all areas that appeared developed. These two information sources were overlaid and combined, so that areas that were classified as developed by either method were considered developed in our final maps and analyses. Some areas were ground-truthed, such as the firing sites. Developed areas are contained in the Habitat Management Plan (HMP) geographic information system database, and are designated as gray on maps prepared for the HMP.

Developed areas are located in the core and/or buffer of some AEIs. However, developed areas do not constitute suitable habitat for bald eagles. Current ongoing activities in developed areas constitute a baseline condition for the AEIs at this time and are not restricted. New activities including further development within already existing developed areas are not restricted unless they impact undeveloped portions of an AEI core. For example, if light or noise from a new office building in a developed area were to raise levels in an undeveloped core area, those light and noise levels would be subject to the guidelines on habitat alterations. If a proposed action within a developed area does not meet site plan guidelines, it must be individually reviewed for Endangered Species Act (ESA) compliance.

Building a new structure or clearing land within a previously designated developed area in an AEI core does not add to the size of the developed area. New structures in core areas will not be given any developed-area border unless they are individually reviewed for ESA compliance.

Development occurring in the developed area in an AEI buffer can be given a 15-m developed-area border at the discretion of the project leader or facility manager. To add to the size of a developed area in a buffer based on new developments, contact the Ecology Group (1-505-665-8961). Any land that is added to a developed area will be subtracted from the cumulative total development allowed in the buffer area for that AEI.

4.4 GENERAL DESCRIPTION OF BUFFER AREAS AND ALLOWABLE BUFFER AREA DEVELOPMENT

***Summary:* Limited future development is allowed in the currently undeveloped DOE-controlled buffer area under the guidelines of this site plan as long as it does not alter habitat in the undeveloped AEI core (including light and noise guidelines). Development beyond the cap established for each AEI, or greater than 2 ha (5 ac) in size, including the developed-area border, requires independent review for ESA compliance. New development projects in AEI buffer areas must be reported to the Ecology Group for tracking.**

The purpose of buffer areas is to protect core areas from undue disturbance or habitat degradation. The current levels of development in buffer and core areas represent baseline conditions for this site plan. No further development is allowed in the core area under the guidelines of this site plan. A limited amount of development is allowed in buffer areas. Development caps have been established for each AEI buffer area based on the current amount of development in the buffer and on the potential effects of buffer development on the species. Under the guidelines of this site plan, individual development projects are limited to 2 ha (5 ac) in size, including a 15-m developed-area border around structures and a 4.5-m (15-ft) developed-area border around paved and improved gravel roads. Projects greater than 2 ha (5 ac) in area require individual review for ESA compliance (see exception for fuels management activities in Section 4.7.2). New development projects in AEI buffer areas must be reported to the Ecology Group for tracking. Once the developed area in the buffer of an AEI reaches the cap for that AEI, all further development in that buffer area will require individual review for ESA compliance. Descriptions of each of the AEIs give the total area in each buffer available for development.

4.5 EMERGENCY ACTIONS

***Summary:* Contact DOE and the Ecology Group as soon as possible.**

If safety and/or property is immediately threatened by something occurring within an AEI (for example, wildfire, water line breakage, etc.) please contact the Ecology Group (1-505-665-8961) and DOE (1-505-667-8690) as soon as possible. If the emergency occurs outside of regular business hours, contact the Emergency Management Office (1-505-667-6211). This office will then communicate with the appropriate LANL and DOE personnel.

4.6 INTRODUCTION TO AEI MANAGEMENT GUIDELINES

***Summary:* The habitat alterations section and the activities section give the guidelines for habitat alteration and disturbance activities, respectively, for the bald eagle AEI. The flow chart (Figure 4.1) provides a quick reference to determine what, if any, guidelines need to be consulted for a specific activity. Protective measures give management practices that should be applied when working or considering work in the AEI. Ecology Group personnel (1-505-665-8961) are available to answer questions and provide advice.**

Sections 4.7 and 4.8 provide the guidelines for habitat alterations and allowable activities in AEI core and buffer areas. The flow chart (Figure 4.1) provides a quick reference that should be used to determine whether a project or activity will affect an AEI and what sections of the site plan need to be consulted. The section on habitat alterations (Section 4.7) describes what and where habitat alterations are allowed under the guidelines of this site plan. The section and table on allowable activities (Section 4.8) describes what, when, and where disturbance activities are allowed in occupied AEIs under the guidelines of this site plan. If an activity does not meet the restrictions given in the guidelines, the activity must be individually reviewed for ESA compliance. This site plan only provides guidelines for the bald eagle AEI. If an activity is desired in an area with overlapping AEIs, all applicable site plans must be consulted. AEI maps show the location of all AEIs in an area. The section on protective measures (Section 4.9) describes management practices that should be applied when working or considering work in an AEI. Ecology Group personnel (1-505-665-8961) are always available to help interpret site plans and answer questions.

4.7 DEFINITION OF AND RESTRICTIONS ON HABITAT ALTERATIONS

4.7.1 Definition of Habitat Alterations

Habitat alteration includes any action that alters over the long-term the soil structure, vegetative components necessary to the species, prey quality and quantity, water quality, hydrology, or noise or light levels in undeveloped areas of an AEI. Long-term means the alteration lasts for more than one year. For physical disturbances, in general, any activity that can be accomplished by one person with a hand tool is generally not considered habitat alteration; any activity that requires mechanized equipment on a landscape is habitat alteration. An actual activity may take place outside of the AEI and will be considered habitat alteration if consequences of the activity have effects inside the AEI core. The habitat components most important to bald eagles include presence of roost and perching trees, primarily ponderosa pines and snags, and disturbance levels, including noise and light.

A long-term change in light or noise levels within the undeveloped core of an AEI is considered to be a habitat alteration if it increases average noise levels by ≥6 dB(A) during any portion of the 24-hour day, or it increases average light levels by ≥0.05 ftc at night. Changes in noise and light levels are measured at the core area boundary if the source is outside the core area, or at 10 m from the source if the source is in the undeveloped core area. Impacts of changes in developed areas on undeveloped core are measured at the developed area boundary if it is within a core, or at the core area boundary if the developed area is outside of the core.

4.7.2 Fuels Management Practices to Reduce Wildfire Risk

The bald eagle AEI is located in primarily piñon-juniper habitat, and therefore wildfire is not as much of a threat to this AEI as it is in other areas of LANL. Retention of ponderosa pines and snags within core and buffer areas is critical for providing roosting and perching trees. Therefore, no fuels management that involves cutting ponderosa pines or snags may take place within core or buffer areas, unless it is within 30 m of buildings (see below). Junipers, piñons, and ground vegetation may be treated to reduce wildfire risks in buffer areas. Such treatments must follow the restrictions in the Activity Table (Table 4.1) for occupied habitat. Screening vegetation should be maintained at the edge of core areas.

For health and safety reasons, any trees within 30 m of buildings but outside a developed area may be thinned to achieve a 7.6-m spacing between crowns. Habitat alterations including thinning are not restricted in developed areas. However, we encourage the retention of trees and snags along canyon rims if the rim is in a developed area. Any tree over 22.4 cm diameter breast height within 380 m of a firing site or burn area may be delimbed to a height of 1.8 m to help prevent crown fires.

Allowable fuels management activities have to be reported for either core or buffer areas. Ecology Group foresters are available to provide guidance and mark trees for thinning (1-505-665-8961).

4.7.3 Utility Corridors

Habitat alterations such as cutting down trees that threaten power lines are allowed within 8 m to either side of an existing utility line in all areas of an AEI (Trujillo and Racinez 1995). New utility lines and utility lines requiring clearance of a right-of-way greater than 16 m total must be individually reviewed for ESA compliance. Disturbance activities must follow the guidelines given in the Activity Table (Table 4.1) for occupied AEIs.

4.7.4 Restrictions on Habitat Alterations

Summary: **Habitat alterations other than fuels management practices and utility corridor maintenance are not allowed in undeveloped core areas. Habitat alterations in buffer areas are restricted to 2 ha (5 ac) per project, with a maximum cap on development in the buffer for each AEI. Habitat alterations other than fuels management and utility corridor maintenance must be reported to the Ecology Group (1-505-665-8961) for tracking.**

Habitat alterations other than the fuels management practices and utility corridor maintenance described above are not allowed in undeveloped core areas under the guidelines of this site plan. If a project or activity is planned that would alter habitat in an undeveloped core area, it must be individually evaluated for ESA compliance. Habitat alterations in undeveloped buffer areas other than the fuels management and utility corridor maintenance activities described above are restricted to 2 ha in area per project and are subject to other restrictions including light and noise effects in the core (see Section 4.4). Projects in the buffer over 2 ha in size will require individual ESA compliance review. Habitat alterations in a buffer area other than the fuels management described above must be reported to LANL's Ecology Group for tracking. There is a cumulative maximum area that can be developed in each AEI's buffer. Once that cumulative area is reached, all habitat alterations in a buffer will require individual ESA reviews for compliance.

4.8 DEFINITION OF AND RESTRICTIONS ON DISTURBANCE ACTIVITIES

4.8.1 Definitions of Disturbance Activities

We considered six categories of activities that might cause disturbance in an AEI. Most of the categories were first identified in the document "Peregrine Falcon Habitat Management in the National Forests of New Mexico" prepared for the United States Forest Service (Johnson 1994). We added explosives, other light production, and other noise production to try and provide the most comprehensive list of activities possible, thereby reducing the need for individual review of activities for ESA compliance. The categories of activities are people, vehicles, aircraft, other light production, other noise production, and explosives detonation. We have defined low, medium, and high levels of impact for these activities except for explosives. Restrictions on explosives are described in the definition of the activity, but are not included in the Activity Table. These six categories of activities are restricted only in AEIs that are classified as occupied.

People—includes any entry of people into an AEI on foot.

- Low impact is the presence of three or fewer people per project and duration of one day or less during the wintering season.
- Medium impact is the exceedance of either the number of people or the duration criteria.
- High impact is the exceedance of both the number of people and the duration criteria.

Vehicles—includes the entry of any two-axle highway vehicle, all-terrain vehicle, or motorized machinery into an AEI by any route other than a paved road or an improved gravel road.

- Low impact is the presence of two or fewer vehicles per project and duration of one day or less during the wintering season.
- Medium impact is the exceedance of either the number of vehicles or the duration criteria.
- High impact is the exceedance of both the number of vehicles and the duration criteria.

Aircraft—includes the operation of any aircraft below an elevation of 600 m (2000 ft) above the highest ground level in the local vicinity.

- Low impact is the presence of one single-engine airplane and a duration of one day or less during the wintering season.
- Medium impact is the exceedance of either the number of aircraft or the duration criteria.
- High impact is the exceedance of both the number of aircraft and the duration criteria.

Any use of helicopters, jet airplanes, and propeller airplanes with two or more engines is classified as medium impact or above, depending on duration.

Other Light Production—includes any activity not previously listed that causes additional light to occur in an AEI core area. For example, plans for construction of a new building at the edge of a developed area may call for lighting at night to facilitate nighttime work that impacts an undeveloped core area.

- Low impact is the increase of light intensity by ≤0.05 ftc and a duration of one night or less per project per wintering season.
- Medium impact is the exceedance of either the intensity or duration criteria.
- High impact is the exceedance of both the intensity and duration criteria.

Measurements for increases in light are taken at the AEI core area boundary closest to the light source if the source is outside the core, and at 10 m from the source if the source is inside the core. Light measurements for developed areas are taken at the edge of the developed area if the developed area is within an AEI core, or at the closest core boundary if the developed area is outside of an AEI core.

Other Noise Production–includes any activity not previously listed except for explosives detonation that causes additional noise to occur in an AEI. For example, operation of machinery will create noise.

- Low impact is increasing noise levels in an AEI core by 6 dB(A) or less for one day or less per project per wintering season.
- Medium impact is the exceedance of either the level or the duration criteria.
- High impact is the exceedance of both the level and the duration criteria.

Measurements for increases in noise are taken at the AEI core boundary closest to the noise source if the source is outside the core, and at 10 m from the source if the source is inside the core. Noise measurements for developed areas are taken at the edge of the developed area if the developed area is within an AEI core, or at the closest core boundary if the developed area is outside of an AEI core.

Explosives Detonation—includes the use of high explosives for any purpose. We did not define low, medium, and high levels of impact for this activity because of the difficulty of determining levels for a shot before actually doing the shot. No explosives detonation will take place at night in core areas between 1 November and 31 March. There are no restrictions on daytime explosives detonation. There are no restrictions between 1 April and 30 September.

4.8.2 Activity Table

The dates shown in the Activity Table (Table 4.1) are the dates between which the activity in the row is restricted under the guidelines of this site plan. All AEIs are considered occupied from 1 November to 31 March.

4.9 PROTECTIVE MEASURES

***Summary:* This section provides a list of management practices to apply in AEIs.**

- Timing of projects must take into account that projects in core areas or that violate restrictions for occupied buffer areas must stop on 1 November through 31 March each year.
- Every reasonable effort should be made to reduce the noise from explosives testing within 800 m of occupied habitat. Methods to reduce noise could include contained shots, noise shields in the direction of AEI cores, etc. For night shots, every reasonable effort should be made to limit the amount of light directed into AEI core areas.

Table 4.1. Allowable activities for the White Rock Canyon Bald Eagle AEI.

Restrictions		Core	Buffer
People			
	Low	No Restrictions	No Restrictions
	Medium	Nov 1 to March 31	No Restrictions
	High	Nov 1 to March 31	Nov 15 to Feb 28
Vehicles			
	Low	No Restrictions	No Restrictions
	Medium	Nov 1 to March 31	No Restrictions
	High	Nov 1 to March 31	Nov 15 to Feb 28
Aircraft			
	Low	Nov 1 to March 31	Nov 1 to March 31
	Medium	Nov 1 to March 31	Nov 1 to March 31
	High	Nov 1 to March 31	Nov 1 to March 31
Other Light Production			
	Low	Nov 1 to March 31	No Restrictions*
	Medium	Nov 1 to March 31	No Restrictions*
	High	Nov 1 to March 31	No Restrictions*
Other Noise Production			
	Low	Nov 1 to March 31	No Restrictions*
	Medium	Nov 1 to March 31	No Restrictions*
	High	Nov 1 to March 31	No Restrictions*
Explosives Detonation-see Section 4.8.1			

*Noise or light production in the buffer is restricted if the activity would violate core area restrictions on noise or light.

- Put signs on dirt roads and trails leading into AEIs labeling them as restricted access areas and providing a number to contact for access restrictions.
- Keep disturbance and noise to a minimum.
- Avoid unnecessary disturbance to vegetation (e.g., excessive parking areas or equipment storage areas, off-road travel, materials storage areas, crossing of streams or washes).
- Avoid removal of vegetation along drainage systems and stream channels.
- Avoid all vegetation removals not absolutely necessary.
- Appropriate erosion and runoff controls should be employed to reduce soil loss. The controls must be put in place and periodically checked throughout the life of projects.
- All exposed soils must be revegetated as soon as feasible after construction to minimize erosion.

5.0 BALD EAGLE AEI DESCRIPTION

5.1 WHITE ROCK CANYON BALD EAGLE AEI

5.1.1 ENVIRONMENTAL DESCRIPTION

5.1.1.1 *Location*

There are three separate core zones within the AEI, which is located on the eastern edge of LANL along and adjacent to White Rock Canyon and the Rio Grande (Map 5.1). The zones include the lower reaches of Water Canyon, Ancho Canyon, Potrillo Canyon, and Chaquehui Canyon at their confluence with White Rock Canyon. These areas are considered roosting sites and are all located within Los Alamos County. The AEI core areas are a total of 397.6 ha in size, and the total buffer area is 954.3 ha. The total size of the core area and buffer zone that occurs on Laboratory property is 329.9 ha and 475.7 ha, respectively.

5.1.1.2 *Overlapping AEIs*

This AEI does not overlap any other AEIs.

5.1.1.3 *Topography*

The bald eagle AEI encompasses the previously described five canyons and the Rio Grande. The elevation at the lowest portion of the AEI, the Rio Grande, is at about 1660 m, and the elevation at the highest portion of the AEI is about 1950 m. The canyons are bordered by mesas along the western edge of the AEI.

5.1.1.4 *Vegetation*

The AEI primarily consists of piñon/juniper on the slopes and mesa tops, juniper woodland along the slopes, and ponderosa pine in the upper portions of the western edge of the AEI. Piñon/juniper makes up 48.5% of the AEI core area, juniper woodland makes up 21.5%, bare ground (rocks, etc.) is 27.5%, water is 1.5%, and ponderosa pine makes up 1%. The buffer zone is comprised of 3.0% water, 50.0% piñon/juniper, 31.9% bare ground, and 15.1%, juniper woodland. Maple (*Acer* spp.), salt cedar (*Tamarix gallica*), Russian olive (*Elaeagnus angustifolia*), and cottonwood (*Populus* spp.) are the most common riparian overstory species within the AEI (Foxx 1996) and are generally found along the Rio Grande.

5.1.1.5 Hydrology

Surface water in the Los Alamos area occurs primarily as short-lived or intermittent reaches of streams. Runoff from heavy thunderstorms or snowmelt reaches the Rio Grande several times a year in some drainages. There is some base flow in streams in Ancho Canyon as a result of springs. Springs and seeps that emerge from the walls of Ancho and Chaquehui Canyons within White Rock Canyon feed short stretches of a perennial stream. All streams terminate into the Rio Grande, which is perennially flowing throughout this entire area.

5.1.2 HUMAN IMPACTS

5.1.2.1 *Existing Developments*

Approximately 1.6 ha (0.4%) of the AEI core area and 11.5 ha (1.6%) of the buffer zone have been classified as developed. All of the development within the core area occurs within DOE property, and 40% (4.7 ha) of the development within the buffer zone is on DOE land (Map 5.1). The remaining 60% of development within the buffer zone is on private/county land. Developed areas include residential, commercial, and light industrial areas and roads. Part of the Pajarito Acres low-density residential subdivision extends into the buffer zone along the north end of the AEI. Several dirt roads and a paved road extend into the core area near Ancho Canyon, and dirt roads extend into the Water/Potrillo Canyon and Ancho Canyon buffer zones (Map 5.2). These roads are located on mesas, and do not extend into the canyons. The major high-voltage power lines supplying Los Alamos cross White Rock Canyon within the AEI. Two unnamed trails on Laboratory land provide access from the mesa top to the Rio Grande along the drainages of Ancho Canyon, and extend into the core area and buffer zone.

Hikers are known to travel along the edge of the Rio Grande passing through AEI core and buffer areas. Rafters also use this stretch of the Rio Grande primarily during spring and summer months.

5.1.2.2 *Contaminants*

The ER Project at LANL has identified 73 total PRSs in or near the White Rock Canyon Bald Eagle AEI (Table A.5.1). There is one surface water station and one surface water runoff station on or near the AEI. In addition, there are three surface water stations upstream of the AEI on the Rio Grande and one downstream of the AEI. Primary contaminants in this AEI would be expected to occur through runoff or sediment transport from canyon systems internal to the Laboratory. Samples taken north of the Laboratory (Rio Grande at Otowi) had detectable levels of americium-241, and one sample had detectable levels of plutonium-238. None of the measurements exceeded any standards, but suggested there may be a low-level source of radionuclides, possibly from a floodplain deposit from Los Alamos Canyon just south of the Otowi Bridge along the west bank of the Rio Grande. Of three samples collected below the AEI on the Rio Grande, one sample had detectable levels of americium-241, and the others did not. The runoff sample station had a possible detection of cesium-137. In 1995, the same station had a detection of strontium-90, but strontium was not detected in 1996. Levels of uranium (31.5 ± 1.1 µg/L) exceeded the proposed EPA primary drinking water standard (20 µg/L) and the DOE drinking water standard (30 µg/L). These uranium levels may have been the result of runoff from naturally-occurring uranium sources in Bandelier Tuff. In 1996, high levels of barium (810 µg/L) were observed in a runoff sample taken near the AEI. No high explosives were detected in these samples. Aluminum, iron, and manganese concentrations exceed EPA secondary drinking water standards at most locations. The results reflect the presence of suspended solids in the water samples. These are naturally occurring metals in the Los Alamos area. Levels of selenium in samples from the Rio Grande (3 µg/L) within the AEI exceeded the New Mexico wildlife habitat stream standard (2 µg/L).

Sediments also are annually collected and tested for radionuclides and metals. There are two sediment sampling stations along the Rio Grande within the AEI. However, these stations were not sampled in 1996. Sediment samples from upstream and downstream of the AEI had possible detections of strontium-90. None of the sediment samples showed any significant accumulations of metals or organics.

Game and nongame fish species have been sampled annually in the Rio Grande for radionuclide contamination both upstream and downstream of LANL since 1981. Fresquez et al. (1994) found no significant differences in strontium-90, cesium-137, plutonium-238, and plutonium-239 in fish collected downstream compared to fish collected upstream of the Laboratory. Uranium was significantly higher in both game and nongame fish downstream of LANL. These levels decreased significantly from 1981 to 1993, and no uranium was found in fish samples collected in 1993. The highest uranium concentrations were found in bottom-feeding fish. Based on the average radionuclide concentrations from 1981 through 1993, the effective radiation dose equivalent for a person consuming 21 kg (46 lb) of game fish and nongame fish from Cochiti Lake was 0.005 and 0.009 mrem/yr, respectively—the highest dose being less than 0.01% of the International Commission on Radiological Protection permissible dose limit for protecting the public.

Fresquez et al. (1995) have also sampled tissues of elk occurring on and off LANL property for radionuclide concentrations. Tissues were tested for levels of strontium-90, cesium-137, plutonium-238 and -239, and total uranium. They found no significant differences in radionuclide concentrations between elk sampled on LANL property and those sampled off LANL property.

5.1.2.3 *Noise*

Except for the developed residential area in the buffer area, there is very little regular human activity within the White Rock Canyon Bald Eagle AEI. Bald eagles within the AEI may hear explosives testing from a firing site within the buffer zone. The noise from wind traveling through the large high-voltage power lines traversing the canyon may cause disturbance. Recreationists hiking or rafting in White Rock Canyon may cause noise disturbances. The Laboratory buildings within the buffer zone are not in regular use, and vehicular access to the AEI on the west side of the Rio Grande is only on gated roads.

Public vehicular access is possible on the east side of the Rio Grande, but, because of the remoteness of the area and poor condition of the roads, is probably not very frequent.

5.1.2.4 *Light*

Light information has not been collected in White Rock Canyon. The canyon is remote from most development, and probably does not have appreciable levels of artificially produced light.

5.1.2.5 *Access*

The AEI is accessible to hikers via at least two unnamed trails leading into White Rock Canyon from the adjoining mesa tops on DOE and County property. Additionally, hikers are known to travel along the edge of the Rio Grande passing through the entire AEI core area. Rafters also use this stretch of the Rio Grande primarily during spring and summer months. Vehicle access is available via several dirt roads extending off of State Road 4, some of which are utility maintenance roads. Roads are located primarily on mesas, and do not extend into the canyons.

5.1.2.6 *Outfalls*

There are no LANL-permitted outfalls within the AEI core and buffer areas.

5.1.2.7 *Activities*

Activities in this AEI include periodic scientific surveys, power line maintenance, recreational use, residential development, ER Program activities, and possible use of a firing site.

5.1.3 <u>Allowable Habitat Alteration in the Buffer Area</u>

Unfavorable habitat alteration is not allowed in undeveloped areas of the core area without a Biological Assessment. Projects causing unfavorable habitat alteration in the buffer area are restricted in area to 2 ha or less, with a cumulative total area of no more than 90.4 ha in the DOE-controlled undeveloped buffer area.

5.1.4 <u>Recommendations</u>

- We will conduct annual monitoring to determine if there is any evidence of use of this AEI by bald eagles.
- Studies should continue within the Rio Grande and Cochiti Lake for determining contaminant levels including organics, radionuclides, and heavy metals.
- LANL will maintain an open line of communication with water management agencies and participate in discussions through the Cochiti Lake Advisory Committee concerning the management of wetlands associated with either Cochiti Lake or the riparian area along White Rock Canyon.

APPENDIX

Table A.1.1. Potential bald eagle prey species known to occur or potentially occur within the AEI.

Common Name	Scientific Name	Common Name	Scientific Name
Northern pintail	*Anas acuta*	Channel catfish	*Ictalurus punctatus*
American wigeon	*Anas americana*	Rio Grande trout	*Salmo clarki*
Northern shoveler	*Anas clypeata*	Rainbow trout	*Salmo gairdneri*
Mallard	*Anas platyrhynchos*	Brown trout	*Salmo trutta*
Gadwall	*Anas strepera*	Eastern brook trout	*Salvelinus fontinalis*
Redhead	*Aythya americana*	Rio Grande chub	*Gila nigrescens*
Ring-necked duck	*Aythya collaris*	Flathead chub	*Hybopsis gracilis*
Lesser scaup	*Aythya maila*	Black bullhead	*Ictalurus melas*
Canvasback	*Aythya valisineria*	White-footed mouse	*Peromyscus luecopus*
Bufflehead	*Bucephala albeola*	Deer mouse	*Peromyscus maniculatus*
Common goldeneye	*Bucephala clangula*	Piñon mouse	*Peromyscus trueii*
Oldsquaw	*Clangula hyemalus*	Western harvest mouse	*Reithrodontomys megalotis*
Common merganser	*Mergus merganser*	Desert cottontail	*Sylvilagus audobonii*
Common loon	*Gavia immer*	Rock squirrel	*Spermophilus variegatus*
Red-throated loon	*Gavia stellata*	Abert's squirrel	*Sciurus abertii*
American coot	*Fulica americana*	Chipmunks	*Eutamias spp.*
River carpsucker	*Carpoides carpio*	Pocket gopher	*Thomomys bottae*
White sucker	*Catostomus commersoni*	White-throated woodrat	*Neotoma albigula*
Green sunfish	*Lepomis cyanellus*	Brush mouse	*Peromyscus boylii*
Largemouth bass	*Micropterus salmoides*	Rock mouse	*Peromyscus difficilis*
Common carp	*Cyprinus carpio*	Mule deer	*Odocoileus hemionus*
Red shiner	*Notropis lutrensis*	Rocky Mountain elk	*Cervus elaphus*

Table A.2.1. Preliminary light measurements in ftc.

		Distance from Source			
	Source (street light)	5 m	10 m	15 m	20 m
ftc	3.70	2.28	1.20	0.62	0.32

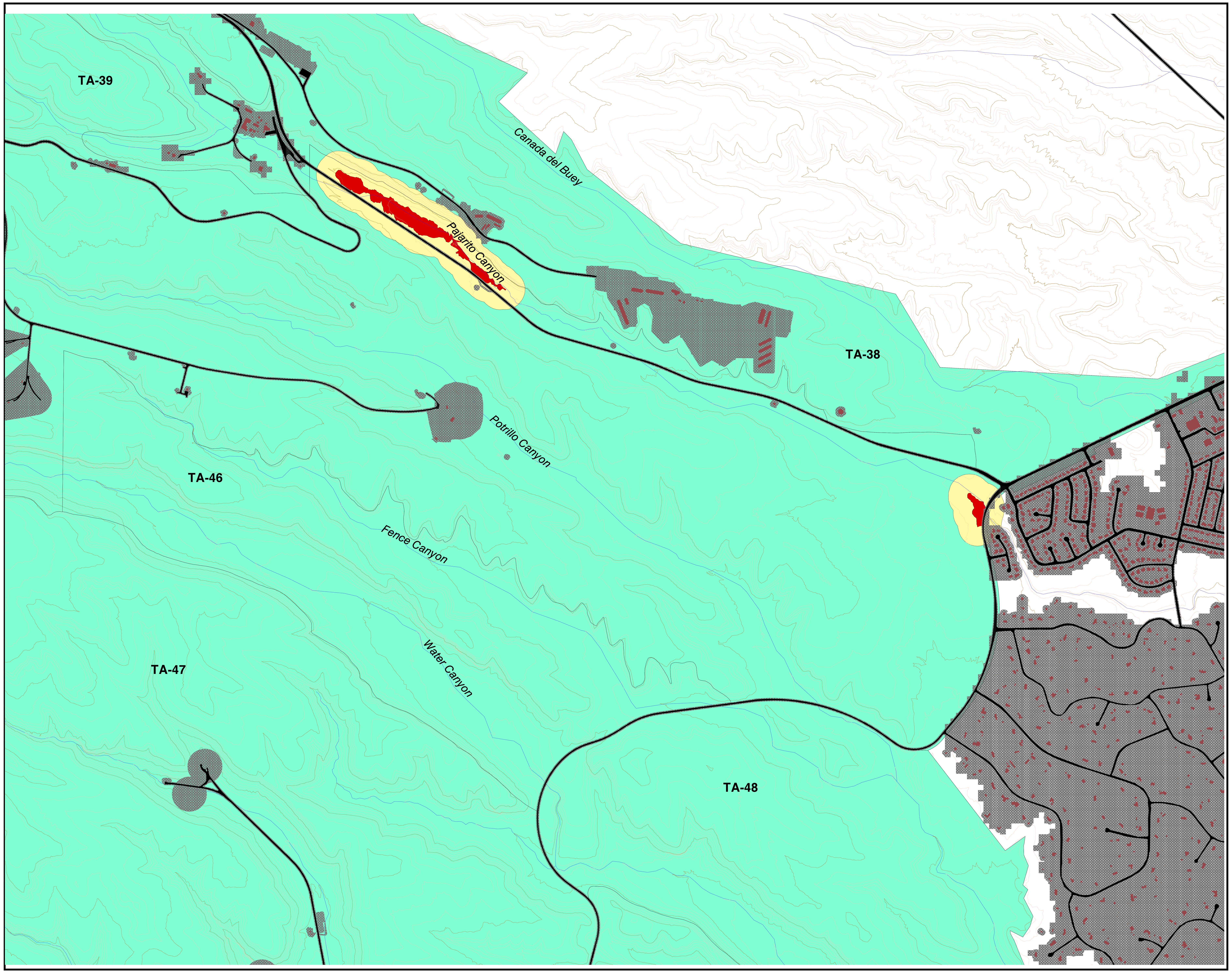
Table A.5.1. Status of PRSs within the White Rock Canyon Bald Eagle AEI.

	NFA* Category				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
Burn site		1			1
Drain line and outfall	1	1			2
Drum storage		2			2
Firing range/firing site		6			6
Incinerator	1	1			2
Landfill		3			3
Material disposal area	1	1	5		7
Operational release		1			1
Outfall	3	4			7
Satellite storage area				3	3
Seepage pit	1	1			2
Septic system or tank	3	7	3		13
Storage area	3	6	2		11
Sump		5			5
Surface disposal		8	1		9
Transformer			2		2

*NFA is an acronym for no further action. Administrative NFAs are areas that were identified during a first cut as potential release sites, but further investigation has found no evidence of contaminants at the site. Characterized and/or remediation means that the site does not require further action at this time. Not NFAd means that the site requires further action for cleanup.

Back To "Site Plans"

Detailed View of Southwestern Willow Flycatcher AEI



LANL
Technical Area Boundary
Developed Areas
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Southwestern Willow Flycatcher AEI
Core
Buffer

N
W E
S

1:9587

1000 0 1000 2000 3000 Feet

300 0 300 600 900 Meters

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Provisional Data Subject to Change

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett, Mary Salisbury, and Marjorie Wright
Date: January 21,1998
Rev. 3.0
Revised December 14, 1999
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Monitoring Plan

for the

Black-Footed Ferret

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is “to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved.” To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

The HMP has two associated documents: Area of Environmental Interest (AEI) Site Plans and Monitoring Plans. The AEIs are areas of LANL that are being managed and protected because of their biological or other significance. Habitats of threatened and endangered species that occur or may occur on LANL are designated as AEIs. The essential element of the AEI Site Plan is the management of each species-specific potential habitat through the allowable activities within the AEI. These allowable activities may be both spatially and time constrained and based on occupancy or non-occupancy of the habitat by the species.

These plans contain sensitive information concerning potential habitat for threatened and endangered species. For that reason, these documents are controlled and will be issued only to persons who have a “need to know” and are trained by LANL’s Ecology Group on the elements of the AEI Site Plan. All maps and associated materials should be considered sensitive and maintained as sensitive information.

If you need further information concerning the Endangered Species Program, these AEI Site Plans, or allowable activities, call the Ecology Group or DOE Los Alamos Area Office.

MONITORING PLAN FOR THE BLACK-FOOTED FERRET

1.0 INTRODUCTION

The monitoring of Federal and State-listed species and local species of concern is an integral piece of the Threatened and Endangered Species Habitat Management Plan (HMP). This monitoring plan provides background information and establishes monitoring protocols for the black-footed ferret (*Mustela nigripes*) at Los Alamos National Laboratory (LANL). This species occurs in association with prairie dog towns and, as a result, has been identified as potentially occurring in north-central New Mexico.

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

This species was last confirmed in New Mexico in 1934 (NMDGF 1997) and was presumed extirpated in New Mexico as of 1988. The historic range of *Mustela nigripes* stretches from southern Alberta and Saskatchewan through twelve western states including New Mexico at its southern limit. The black-footed ferret is associated with black-tailed prairie dog (*Cynomys ludovicianus*) colonies and Gunnison's prairie dog (*C. gunnisoni*) in New Mexico, and since black-tailed prairie dogs are largely eliminated in the southern part of the State, it is unlikely that any ferrets survive in that part of the State (NMDGF 1997). If black-footed ferrets exist in New Mexico, the northwestern part of the State is the most likely area due to the extensiveness of Gunnison's prairie dog towns in that area (Findley et al. 1975). From 1903 to 1934, black-footed ferrets have been reported from all but the southernmost part of the State. The most reliable sightings came from Valencia, McKinley, Los Alamos, and Curry Counties (Hubbard et al. 1979).

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, AND SUBCLASS	Mammalia, Theria
ORDER, AND SUBORDER	Carnivora, Fissipedia
FAMILY, AND SUBFAMILY	Mustelidae, Mustelinae
GENUS, AND SUBGENUS	*Mustela*
SPECIES	*nigripes*

2.2 STATUS DESCRIPTION

The black-footed ferret is listed as a federally endangered species, and in 1978 a Federal Recovery Plan was approved for this species. It is also listed as an endangered species (Group 1) by the State of New Mexico. Its Natural Heritage Global Rank was listed as "Critically Imperiled" (Finch 1992). Because this species was presumed extirpated in New Mexico by 1988, subsequent reported sightings were dismissed as a bridled subspecies of the long-tailed weasel (*Mustela frenata neomexicana*).

2.3 HABITAT DESCRIPTION

Black-footed ferrets are most commonly associated with prairie dog towns in the western US. Prairie dogs serve as the main food source for black-footed ferrets. During winter months, when surveys are most effectively done when snow cover is present, black-footed ferrets move from burrow to burrow feeding on hibernating prairie dogs. Prairie dog towns vary in size but can be expected to be found in relatively open terrain where vegetation does not hinder the line of sight to predators. There are no known prairie dog towns on LANL property, however, in recent years, several individual prairie dogs have been observed on LANL property. Black-footed ferrets are so heavily dependent on this food item that reduction in numbers of ferrets is directly related to a reduction in prairie dogs (NMDGF 1997).

2.4 CHRONOLOGY

Because so few of these animals exist in the wild, information on this species is based on captive animals or field studies on very limited populations in the western US. For captive animals, the breeding season is late February/early March with a 42 to 45 day gestation period (NMDGF 1997). They have one litter per year with the litter size averaging 3.5 young with a range of 1 to 5. Based on studies conducted in South Dakota, young black-footed ferrets are probably born in May or early June. The young remain with the mother until late summer.

2.5 BEHAVIOR

2.5.1 Denning

Black-footed ferrets den typically within underground burrows of other animals, primarily prairie dogs. The den sites are also their foraging sites where prairie dogs are inhabiting the burrows.

2.5.2 Feeding Habits

The main prey source of black-footed ferrets are prairie dogs, thus their distribution is strongly dependent on the distribution and abundance of prairie dogs. They may also feed on other rodents inhabiting a prairie dog colony.

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

The black-footed ferret is Federally Endangered and is the rarest mammal in North America, and no current populations are known to exist (NMDGF 1997). It receives the highest level of Federal protection, and its possible presence should be thoroughly evaluated. Although this species has not been observed in this State since 1934 and is expected to be extirpated here, historic records occur from the Jemez Mountains.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with a one being an activity that must be done, a two indicates an activity that should be done, a three indicating an activity that may be done, and a four indicating an activity that may occur in the future should conditions change (i.e., if the species is newly found at LANL). Activities that are not appropriate to a species are assigned a ranking of zero. The HMP contains a summary table that ranks all species and activities. The following table lists importance rankings for the black-footed ferret.

Section								
Status Tracking	Habitat Analysis and Models	Presence/Absence Surveys	Reproduction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
1	1	4	4	4	4	4	4	0

4.1 STATUS TRACKING

The black-footed ferret is currently federally listed as endangered. This is the most endangered mammal in the US, and its status is unlikely to change. Status tracking for this species is considered a level 1 activity.

4.2 HABITAT ANALYSIS AND MODELS

There is no documented evidence of prairie dog towns present in the vicinity of LANL facilities or in the area of proposed LANL facilities or other projects, therefore, formal surveys for black-footed ferrets will not be necessary at this time. However, because there have been isolated occurrences of prairie dogs being observed on LANL property, an investigation into the presence of prairie dog towns will be made. Formal habitat analysis will not be made unless prairie dog towns have been identified within or immediately adjacent to LANL property.

4.3 PRESENCE/ABSENCE SURVEYS

Formal surveys will not be conducted for this species unless prairie dog towns are found within or near LANL property. If a prairie dog town is found, then the protocol described in the following sections will be used.

4.3.1 Survey Locations

Locations for survey will be based on the location of prairie dog towns.

4.3.2 Survey Dates

Survey methodology differs from warmer months to cooler months (WCFW 1988). During periods of snow cover, surveys consist of daytime surveys where tracks, scat, and burrowing activity are the primary focus of search. During warmer months, surveys are conducted over several consecutive evenings.

4.3.3 Survey Technique

To ensure prairie dog towns of the required size necessary to support black-footed ferrets are absent from LANL property, vegetatively open areas on LANL property near reported sightings of prairie dogs on LANL property will be investigated. If no prairie dog burrows are found, then no further action on this species will be required. If prairie dog towns are found or if their presence is suspected, then further field surveys will be conducted to determine the size and extent of the prairie dog town. Formal surveys for this species are generally conducted on towns that are greater than 60 ha (150 ac) in size or a complex of towns greater than 60 total ha (150 total ac) that are less than 8 km (5 mi) apart from one another (WCFW 1988). Burrows have a distinctive formation that is unique to this species. A series of surveys are conducted over three consecutive nights. The surveys consist of a complete check of the prairie dog town by use of spotlighting and burrow checks of typical sign. Activities resulting in disturbance of any part of a prairie dog town or any part of a complex of towns require a complete survey.

4.3.4 Required Resources

4.3.4.1 Personnel

The number of personnel will be determined based on the size and extent of the prairie dog town(s). At least two people will be needed to conduct a survey of a prairie dog town to determine its size and level of activity (active vs. inactive burrows). If a prairie dog town is large enough to support ferrets, a minimum of four people will be required for any actual black-footed ferret survey, regardless of the size of the prairie dog town.

4.3.4.2 Equipment

Equipment needs will vary depending on the size of the prairie dog town, the location, accessibility, and time of year the survey will be conducted, as well as if a survey to determine presence of a prairie dog town is being conducted or the actual survey for ferrets is being conducted. Therefore, a list of equipment is not provided at this time.

4.3.4.3 Training

There are no special training requirements for determining the presence of a prairie dog town except that a person be capable of identifying prairie dog burrows, scat, bones, and or the actual animal. An approved training course on conducting black-footed ferret surveys is required before developing a survey plan to determine presence of ferrets. This training course is typically sponsored by State resource agencies and Federal agencies in the areas of known black-footed ferrets (i.e., Wyoming).

4.3.4.4 Permitting

No special permits are required to conduct surveys for prairie dog towns. However, if a prairie dog town is determined to be of suitable size, then State and Federal agencies will be consulted to determine procedural requirements of those agencies.

4.3.5 Analysis and Reporting

All field checks of prairie dogs or prairie dog towns will be documented for inclusion into the global indexing system mammal database. If a prairie dog town is found and a survey conducted, then information on the size of the town (including a detailed map of the town boundary using the global positioning system), the number of burrows (#/ha), the number of active burrows vs. inactive burrows, and the type of scat or bones collected will be required. Additionally, a photo record of the town and any atypical burrows (as identified in the Black-footed Ferret Survey Techniques Manual) will be developed. Any sign that may indicate presence of a black-footed ferret will be immediately reported to the United States Fish and Wildlife Service (USFWS). Additional information/data may be collected as described in the survey techniques manual (WCFW 1988).

4.4 REPRODUCTIVE MONITORING

The purpose of reproductive monitoring is to: (1) determine the breeding status of established ferret populations, (2) establish population trends in the occupied habitat, and (3) describe habitat characteristics and habitat use patterns.

A reproductive monitoring program will be developed in cooperation with the State of New Mexico and the USFWS only if an individual is found or if presence is suspected.

4.5 CONTAMINANT STUDIES

Because no individuals of this species have been found on LANL property, associated potential contamination issues cannot be identified at this time. Contaminant studies are a level 4 activity and will only be considered if individuals are found to be present on LANL property.

4.6 ECORISK STUDIES

No ecorisk studies will be developed for this species at this time. If individuals are found on LANL property and contaminants are identified as a potential issue of concern, then an ecorisk study will be considered for implementation.

4.7 PREY BASE STUDIES

No prey base studies will be developed for this species at this time. If individuals are found on LANL property, then a study identifying food habits and availability of food sources will be considered for implementation.

4.8 TRACKING OF INDIVIDUALS

The decision to track individuals will not be determined unless presence has been established.

4.9 REGIONAL STUDIES

No regional studies will be designed or implemented for this species.

5.0 LITERATURE CITED

Finch, D. M. August 1992. Threatened, endangered, and vulnerable species of terrestrial vertebrates in the Rocky Mountain Region. USDA Forest Service General Technical Report RM-215.

Findley, J. S., A. H. Harris, D. E. Wilson, and C. Jones. 1975. Mammals of New Mexico. University of New Mexico Press, Albuquerque, New Mexico. xxii + 360 pp.

Hubbard, J. P., M. C. Conway, H. Campbell, G. Schmitt, and M. D. Hatch. 1979. Handbook of species endangered in New Mexico. New Mexico Department of Game and Fish.

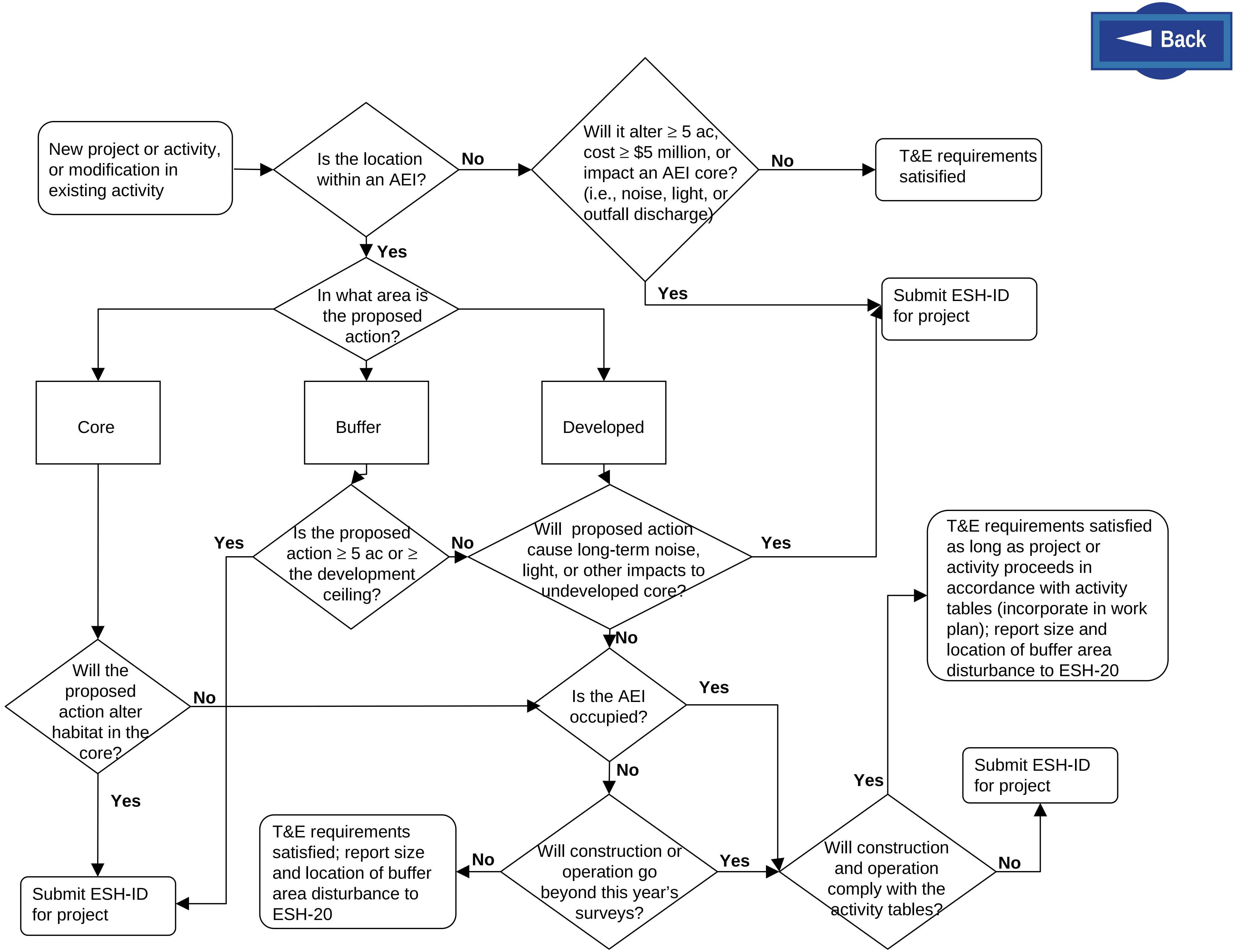
New Mexico Department of Game and Fish. 1997. Biota Information System of New Mexico (BISON-M). Species: Black-Footed Ferret (*Mustela nigripes*).

WCFW. Wyoming Cooperative Fishery and Wildlife Unit. 1988. Black-footed ferret survey techniques.

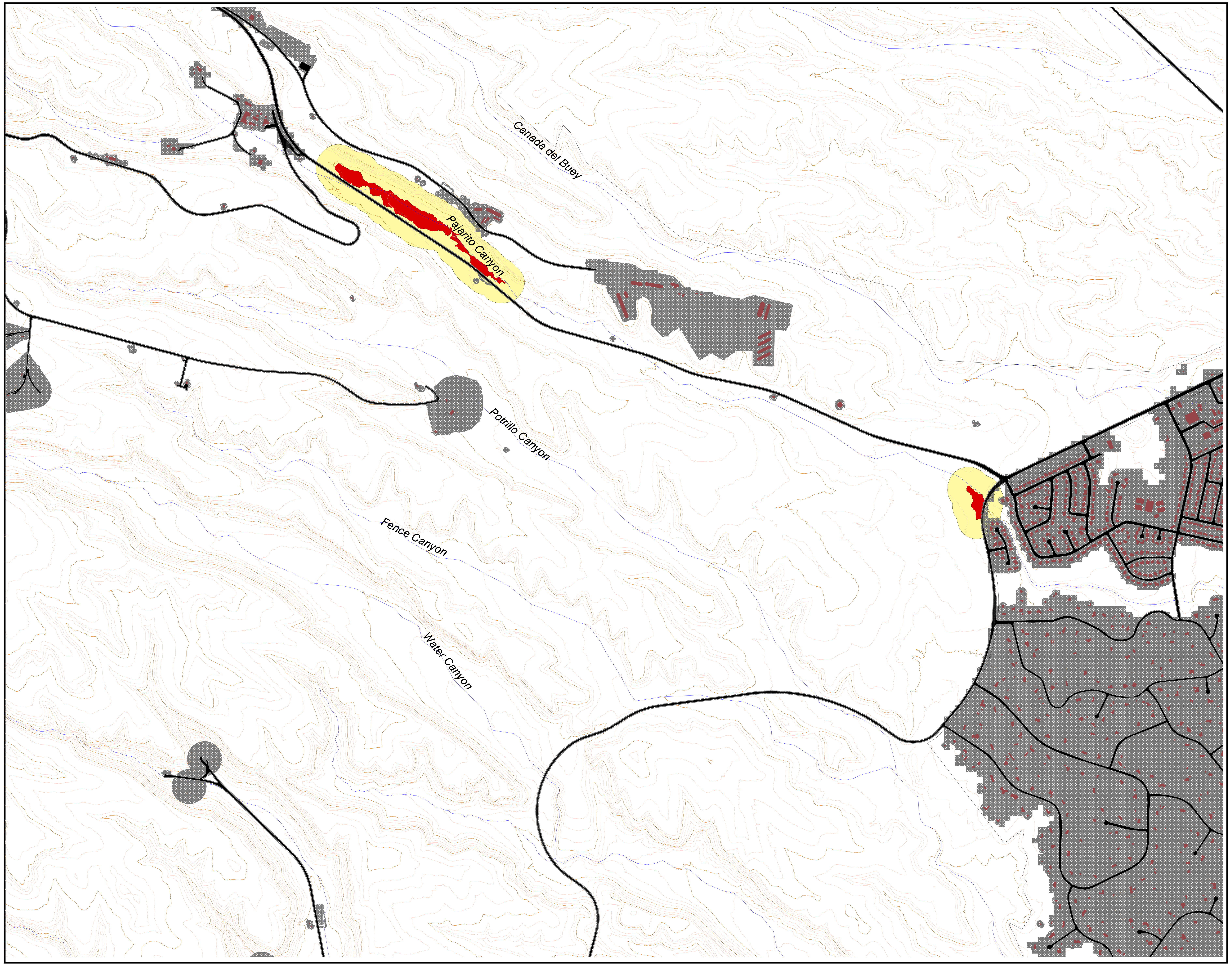
Back To "Mammals"

The relative isolation and undisturbed natural setting of much of Los Alamos National Laboratory make this facility ideally suited for its defense-related mission. These factors, combined with limited public access, also have resulted in the preservation of habitat that can sustain species receiving federal protection under the Endangered Species Act.

This Threatened and Endangered Species Habitat Management Plan—with sound procedures and strategies—provides protection for threatened and endangered species that may reside on Laboratory lands and surrounding area. This plan also facilitates the efficient and cost-effective implementation of the Department of Energy's mission here at the Laboratory.



Back
New project or activity, or modification in existing activity
Is the location within an AEI?
No
Will it alter ≥ 5 ac, cost ≥ $5 million, or impact an AEI core? (i.e., noise, light, or outfall discharge)
No
T&E requirements satisified
Yes
Yes
Submit ESH-ID for project
In what area is the proposed action?
Core
Buffer
Developed
Yes
Is the proposed action ≥ 5 ac or ≥ the development ceiling?
No
Will proposed action cause long-term noise, light, or other impacts to undeveloped core?
Yes
T&E requirements satisfied as long as project or activity proceeds in accordance with activity tables (incorporate in work plan); report size and location of buffer area disturbance to ESH-20
No
Will the proposed action alter habitat in the core?
No
Is the AEI occupied?
Yes
No
Yes
Submit ESH-ID for project
Yes
T&E requirements satisfied; report size and location of buffer area disturbance to ESH-20
No
Will construction or operation go beyond this year's surveys?
Yes
Will construction and operation comply with the activity tables?
No
Submit ESH-ID for project



Detailed View of Southwestern Willow Flycatcher AEI

LANL
Technical Area Boundary
Developed Areas
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Southwestern Willow Flycatcher AEI
Core
Buffer

N
W
E
S

1:9587

1000 0 1000 2000 3000 Feet

300 0 300 600 900 Meters

State Plane Coordinate System, New Mexico Central Zone.
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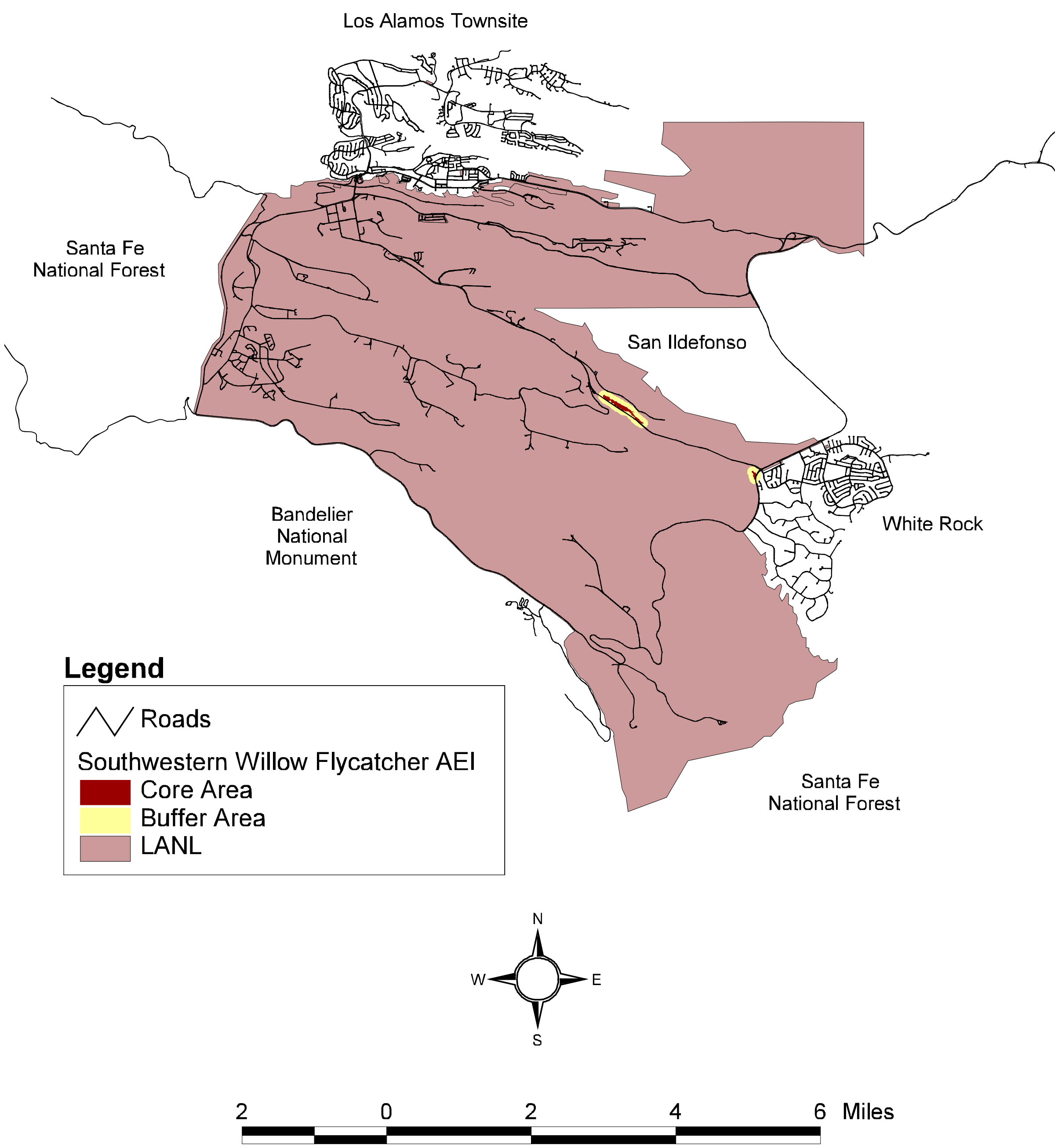

Figure 3.1. Location of Southwestern Willow Flycatcher AEI.

Back

GLOSSARY

Area of Environmental Interest (AEI): AEIs are geographic areas of Los Alamos National Laboratory (LANL) that are protected because of their significance to federally threatened or endangered species. The exact form and size of an AEI differs among species and sites.

AEI Core: An AEI core contains important breeding or wintering habitat for a species.

AEI Buffer: An AEI buffer is an area designated around the AEI core to protect the core from disturbances that would degrade the value of the habitat to a species.

Consultation: All Federal agencies must consult with the US Fish and Wildlife Service when an activity permitted, funded, or conducted by that agency may affect a listed species or designated critical habitat, or is likely to jeopardize proposed species or adversely modify proposed critical habitat.

Developed Areas: Developed areas include all building structures, paved roads, and firing sites on Los Alamos National Laboratory lands. The extent of the developed area was determined by placing a 15-m-wide border out from all buildings and a 4.5-m-wide border out from either side of roads. If roads had a roadside fence within 9 m, the fence was used as the boundary of the developed area rather than the 4.5-m-wide border. If an area of highly fragmented habitat was enclosed by roads, a security fence, or connected buildings, that area was also classified as developed. Developed areas at firing sites were defined as a circle with a 91.4-m radius from the most centrally located firing pad. This information is contained in the Habitat Management Plan geographic information system database, and is designated as gray on maps prepared for the Habitat Management Plan.

Endangered Species: Section 3 of the Endangered Species Act defines "endangered" species as "any species which is in danger of extinction throughout all or a significant portion of its range." This excludes species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to humankind.

Federal Agency: Federal agency means any department, agency, or instrumentality of the United States; in this case the Department of Energy is the implementing federal agency.

Federally Listed Species: A list of species determined by the Secretary of the Interior or Secretary of Commerce to be endangered or threatened. The list is revised under the authority of the Secretary and reflects recent determinations, designations, and revisions.

Fish or Wildlife: Means any member of the animal kingdom, including without limitations any mammal, fish, bird (including migratory, nonmigratory, or endangered bird for which protection is also afforded by treaty or other international agreement), amphibian, reptile, mollusk, crustacean, arthropod or other invertebrate, and includes any part, product, egg, or offspring, thereof, or the dead body or parts thereof.

Formal Consultation: Formal consultation is conducted when the Federal agency determines its action may affect a listed species. These consultations follow statutory and regulatory timeframes and procedures and result in a written biological opinion of whether the proposed action is likely to result in jeopardy to a listed species or adverse modification of designated critical habitat.

Informal Consultation: This consultation precedes formal consultation and may be requested by the Federal agency, an applicant, or a designated non-Federal representative. Information consultation concludes with the US Fish and Wildlife Service's written concurrence with the Federal agency's determination that its action is not likely to adversely affect listed species or their habitat.

Monitoring Plans: One of the three components of the Threatened and Endangered Species Habitat Management Plan. Monitoring plans are developed for Federally threatened and endangered species and for other species that have the potential to become threatened or endangered that may occur in the Los Alamos area. The monitoring plans are designed to determine if the species is present on Los Alamos National Laboratory. Monitoring plans also may provide short- and long-term estimates of reproduction, abundance, and/or distribution of species. The monitoring plans establish best management practices for maintaining populations of species that are not currently Federally listed but may be in the future.

Plant: Any member of the plant kingdom, including seeds, roots, and other parts thereof.

Recovery: The goal of the US Fish and Wildlife Service is to recover listed species and remove them from the list. Recovery tasks are actions needed to reduce or resolve the threats or limiting factors that contributed to the endangered or threatened status of the species. The Secretary develops and implements plans ("recovery plans") for the conservation and survival of endangered and threatened species.

Secretary: Means the Secretary of the Interior.

Threatened Species: Section 3 of the Endangered Species Act defines "threatened" species as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portions of its range."

Back To
Reference Lists

Monitoring Plan

for the

Jemez Mountains Salamander

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

The HMP has two associated documents: Area of Environmental Interest (AEI) Site Plans and Monitoring Plans. The AEIs are areas of LANL that are being managed and protected because of their biological or other significance. Habitats of threatened and endangered species that occur or may occur on LANL are designated as AEIs. The essential element of the AEI Site Plan is the management of each species-specific potential habitat through the allowable activities within the AEI. These allowable activities may be both spatially and time constrained and based on occupancy or non-occupancy of the habitat by the species.

These plans contain sensitive information concerning potential habitat for threatened and endangered species. For that reason, these documents are controlled and will be issued only to persons who have a "need to know" and are trained by LANL's Ecology Group on the elements of the AEI Site Plan. All maps and associated materials should be considered sensitive and maintained as sensitive information.

If you need further information concerning the Endangered Species Program, these AEI Site Plans, or allowable activities, call the Ecology Group or DOE Los Alamos Area Office.

MONITORING PLAN FOR THE JEMEZ MOUNTAINS SALAMANDER

1.0 INTRODUCTION

The monitoring of Federal and State species and local species of concern is an integral part of the Threatened and Endangered Species Habitat Management Plan (HMP). This particular monitoring plan provides background information and establishes monitoring protocols for the Jemez Mountains salamander (*Plethodon neomexicanus)* (JMS) at Los Alamos National Laboratory (LANL).

The majority of the information in this document was taken from NMDGF (1996a), unless otherwise noted.

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

PHYLUM, AND SUBPHYLUM	Chordata, Vertebrata
CLASS	Amphibia
ORDER	Caudata
FAMILY	Plethodontidae
GENUS	*Plethodon*
SPECIES	*neomexicanus*

The JMS is endemic to north-central New Mexico (Stebbins and Riemer 1950). The species is known from various localities in the Jemez Mountains including Sandoval, Los Alamos, and Rio Arriba Counties (Schmitt et al. 1985). Key habitat for this salamander includes all known localities of occurrence in the Jemez Mountains (NMDGF 1988).

2.2 STATUS

In 1975, the salamander was first listed in New Mexico as Group 2 (Threatened), on Jan. 24, 1975 (NMDGF 1988).

Ten years later, in 1985, this species was placed under Federal review as a potentially threatened or endangered species under the Federal Endangered Species Act. As a result, an interagency committee was established to identify data and management needs and develop strategies to address these needs (Ramotnik and Scott 1988). In 1988, the species population was under examination under Federal Notice of Review for potential listing as an endangered/threatened species (NMDGF 1988). Then, in 1991, this species was placed by the November 21, 1991, Federal Register, in Category 1 (USFWS 1991).

In 1994, *Plethodon neomexicanus* was a Federal Notice of Review Category 2 species. It was down-listed from Category 1, based on the signing of a Memorandum of Agreement. This down listing was based on US Fish and Wildlife Service (USFWS) policy and not on significant biological developments or findings that would justify down listing (NMDGF 1994).

Later in 1994, the JMS was listed in the Federal Register, November 15, 1994, as a Category 2 species for consideration to be listed as a threatened or endangered species (USFWS 1994).

In 1996, the USFWS changed the listing status of "Federal Candidate" species. This classification formerly included three subclassifications: Federal Candidate: Category 1, Category 2, and Category 3. There are no longer "Category" designations. This species was listed as a Federal Candidate Category 2 species. Species formerly designated Category 2 and Category 3 are no longer considered Federal candidate species, and so no longer have any

Federal protection under the "Candidate" listing. However, such species may retain other federal or state designated protections (USFWS 1996).

Later in 1996, JMS was listed by a New Mexico Natural Heritage Program list as "Tracked," i.e., data were being actively accumulated and entered into computerized and manual files by the Heritage Program (NMNHP 1996). In 1996 (March), former C2 species are now classified as Federal: “Species of Concern” (Jahrsdoerfer 1996).

NEW MEXICO

During the spring of 1994, the New Mexico Department of Game and Fish (NMDGF) recommended to the State Game Commission that the legal status of the JMS remain Group 2 (Threatened) within the state (NMDGF 1994). In 1996, it was the recommendation of the NMDGF that the JMS maintain its listing as threatened (NMDGF 1996b).

2.3 HABITAT

This small woodland salamander is found in mixed conifer and spruce-fir forests above 2160 m (7200 ft) in specific microhabitat conditions. Preferred microhabitat is generally characterized by relatively high humidity and soils with specific rock structure, although populations have been found outside these parameters (NMDGF 1994).

The JMS typically occurs on shady, wooded sites at elevations of 2190 to 2800 m (7227 to 9240 ft) (Williams 1973). Such areas are characterized by conifers, including white fir (*Abies concolor*), Engelmann spruce (*Picea engelmanii*), blue spruce (*P. pungens*), and Douglas fir (*Pseudotsuga menziesii*) (Schmitt et al. 1985). Deciduous trees that are present include quaking aspen (*Populus tremuloides*) and Rocky Mountain maple (*Acer glabrum*).

In these habitats, salamanders spend much of the time below the surface, including under rocks and in fallen logs. Old, stabilized talus slopes are important types of cover for this species, especially those with a good covering of damp soil and plant debris (Ramotnik 1985, NMDGF 1988).

JMS are cited by some authors to use elevations between 2200 and 2900 m (7260 and 9570 ft) (Degenhardt et al. 1996).

The salamanders in New Mexico are restricted to coniferous forests at high elevations. The upper montane forest association is characterized by mixed coniferous forests dominated by white fir, Douglas-fir, Engelmann spruce, and blue spruce. Deciduous components include quaking aspen, Rocky Mountain maple, oak (*Quercus* spp.), New Mexico locust (*Robinia meomexicana*), and oceanspray (*Holodiscus dumosus).* Ponderosa pine (*Pinus ponderosa*) stands predominate at the lower elevations, particularly on south-facing slopes. Within the subalpine forest association, Engelmann spruce, Douglas-fir, and white fir are the most common trees. Aspen and Rocky Mountain maple are found to a lesser extent. Aspen groves, talus fields, and open meadows are present at higher elevations. The salamanders show a significant preference for areas with higher densities of large fir and all size classes of spruce (Ramotnik and Scott 1988).

2.4 CHRONOLOGY

JMS are present in their habitat year-round.

2.5 BEHAVIOR

2.5.1 Reproduction

Mating in this species takes place in July and August, with oviposition occurring between then and the following spring (Williams 1972, 1973). The eggs are presumably laid underground, and hatching commences in middle to late July. Sexual maturity is probably reached after two to three years in males and after three years in females. Females oviposit every other year, and only gravid animals take part in mating (NMDGF 1988).

2.5.2 Feeding

The normal food of salamanders of this type consists of various kinds of insects and other small invertebrates (NMDGF 1988). Coleopteran (beetle) larvae and adults were found, in one food study, to make up a combined total of nearly 10% of the diet of the JMS. Members of the mite and tick order (Aacari) made up just over 20%. Ants made up more than 50% (Painter 1996).

3.0 MONITORING JUSTIFICATION, PURPOSE, AND OBJECTIVES

While the JMS no longer has federal protection, due to its prior listing as a federally protected species, and due to its listing as a New Mexico State listed species, it needs to be monitored and protected.

In addition, amphibians are considered an environmental indicator species. Amphibians may be highly sensitive indicators of environmental quality. Their moist skin allows absorption of both air- and water-borne pollutants. Because most of their life cycles include both aquatic and terrestrial stages, degradation in either habitat may negatively affect population viability and fitness. The sensitivity of amphibians and the widespread nature of their declines may reflect global environmental degradation (Jennings 1995).

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change (for example, if the species is newly found at LANL). Some activities are not appropriate to every species (designated as zero). The HMP contains a summary table ranking all species and activities. The following table lists importance rankings for JMS monitoring activities.

Section	Status Tracking	Habitat Analysis and Models	Presence/ Absence surveys	Repro-duction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Ranking	1	1	2	3	3	2	3	3	2

4.1 STATUS TRACKING

This is a level one activity. The regional status of the JMS will be evaluated annually. LANL will remain in contact with the NMDGF concerning the status of the JMS. LANL biologist will remain up to date on information concerning the status of the JMS in New Mexico. All new information will be entered into a current LANL Threatened and Endangered Species Database and used as a reference document.

4.2 HABITAT ANALYSIS AND MODELS

This is a level one activity. Annual field surveys will be conducted on and near LANL to assess potential habitat. Further refinement of the Trippe-Haarmann model (Trippe and Haarmann 1996), which predicts potential habitat, should be initiated.

4.3 PRESENCE/ABSENCE SURVEY

This is a level two activity. Currently, presence/absence surveys are inconsistently conducted at LANL. However, future studies might consider conducting presence/absence to gather more detailed information of locations the JMS are found on LANL.

Generally, the best survey technique for salamanders is ground-truth surveys in wet weather during the activity season of the species. Under proper conditions, they are easy to find and relatively unskilled persons can be quickly trained to survey habitats (Ramotnik and Scott 1988).

4.3.1 Survey Locations

Locations will be conducted in those areas of LANL deemed potential habitat by the Trippe-Haarmann predictive model. Confine each search to one habitat type on one slope. When possible, avoid searches closer than 25 m (82.5 ft) to the border of a sharp habitat discontinuity such as the edge of a meadow or cleared area.

4.3.2 Survey Dates

Surveys will be conducted during July and August within 4 or 5 days of a rainstorm event.

4.3.3 Survey Technique

Surveys will be conducted following LANL-ESH-20-OP-BIO-003, R0 (1996).

Using potato rakes when needed, search for JMS by gently tearing apart large rotten logs and by turning over cover objects such as rocks, bark, fallen branches, litter, and moss mats.

4.3.4 Required Resources

4.3.4.1 Personnel

A minimum of two people is required, and a maximum of five is recommended. Conduct a two person-hour, time-constrained search to survey for the salamanders.

4.3.4.2 Equipment

Potato rakes for all individuals. Standard field equipment as per the LANL operating procedure.

4.3.4.3 Training

All individuals participating in the searches will complete the LANL operating procedure self-study document, and receive on-the-job training by qualified individuals.

4.3.4.4 Permitting

A permit is not required to conduct surveys on LANL property; however, a permit for collection has been issued to LANL by the NMDGF. Permission must be obtained before conducting surveys in areas under jurisdiction of other agencies.

4.4 REPRODUCTIVE MONITORING

This is a level three activity. Little is known about the reproductive biology of the JMS. LANL may want to consider this type of study in the future. This should be done in cooperation with the NMDGF and US Forest Service.

4.5 CONTAMINANT STUDIES

This is a level three activity. Currently, there are no JMS contaminant studies currently being planned at LANL. However, because amphibians are considered good indicators of overall environmental health, LANL may wish to consider a JMS contaminant study.

4.6 ECORISK STUDY

This is a level two activity. There are plans to conduct ecorisk studies on JMS.

4.7 PREY-BASE STUDIES

This is a level three activity. Currently, there are no JMS prey-base studies being planned at LANL. However, LANL may wish to conduct such a study in the future.

4.8 TRACKING OF INDIVIDUALS

This is a level three activity. Currently, there are no JMS tracking studies being planned at LANL. LANL tracks other individual amphibian species, and may wish to track individual JMS if the need arises in the future.

4.9 REGIONAL STUDIES

This is a level two activity. Currently, LANL works in cooperation with the NMDGF in conducting JMS surveys. This cooperation will continue between the agencies, with future plans to increase the number of studies done cooperatively.

5.0 ANALYSIS AND REPORTING

Report all findings to the NMDGF State Herpetologist. Detailed information concerning the survey locations, date, description of location characteristics, etc. should be included.

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Back To "Other"

Monitoring Plan

for the

New Mexico

Meadow Jumping Mouse

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

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These plans contain sensitive information concerning potential habitat for threatened and endangered species. For that reason, these documents are controlled and will be issued only to persons who have a "need to know" and are trained by LANL's Ecology Group on the elements of the AEI Site Plan. All maps and associated materials should be considered sensitive and maintained as sensitive information.

If you need further information concerning the Endangered Species Program, these AEI Site Plans, or allowable activities, call the Ecology Group or DOE Los Alamos Area Office.

MONITORING PLAN FOR THE NEW MEXICO MEADOW JUMPING MOUSE

1.0 INTRODUCTION

The monitoring of Federal and State-listed species and local species of concern is an integral piece of the Threatened and Endangered Species Habitat Management Plan (HMP). This monitoring plan provides background information and establishes monitoring protocols for the New Mexico meadow jumping mouse (*Zapus hudsonius luteus*) at Los Alamos National Laboratory (LANL). This species has been identified as potentially occurring or is known to occur in habitats found either within LANL boundaries or in the vicinity of LANL.

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

The meadow jumping mouse occurs locally in the San Juan, Jemez, and Sacramento Mountains and in the central-northern and the central Rio Grande Valley (Hafner et al. 1981). The New Mexico meadow jumping mouse is the only subspecies verified in New Mexico (NMDGF 1990). From 1985 to 1989, surveys produced records of the subspecies persistence at each of its historically documented localities. It was also found at sites in the Jemez and Sacramento Mountains, Rio Grande Valley, and lower Rio Chama Valley. In 1992, the subspecies *Z. h. luteus*, was found at eight new sites in the Jemez Mountains. All were in the upper Guadalupe River drainage, suggesting that meadow jumping mice may have once existed all along this river system. Two new sites were identified in the Rio Grande Valley in the vicinities of Isleta and Española. The classification of the New Mexico meadow jumping mouse is as follows:

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, SUBCLASS	Mammalia, Theria
ORDER, AND SUBORDER	Rodentia, Myomorpha
FAMILY, SUBFAMILY	Zapodidae, Zapodinae
GENUS	*Zapus*
SPECIES	*hudsonius*
SUBSPECIES	*luteus*

2.2 STATUS

The New Mexico meadow jumping mouse was listed as a Federal Candidate Category 2 species. However, in 1996 the USFWS changed the listing status of "Federal Candidate" species where species formerly designated as Category 2 and Category 3 are no longer considered Federal Candidate species and therefore, no longer have and Federal protection under the "Candidate" listing. Although these species may no longer receive protection status under the “Candidate” listing, they may retain other Federal or State designated protections (Federal Reg., Feb. 28, 1996). Also in 1996, the species, *Zapus hudsonius* and the subspecies *Z. h. luteus*, were listed by the New Mexico Natural Heritage Program as "Tracked" whereby data were being actively collected and stored by the Heritage Program. In 1995, this species was listed under the Natural Heritage Global Rank "G5T3" indicating the species was "Uncommon or Restricted." On July 22, 1983, the New Mexico meadow jumping mouse was listed by New Mexico as Endangered (group 2) (NMDGF 1988). In 1996, it was recommended that the New Mexico Department of Game and Fish (NMDGF) should continue to encourage land managers to protect and enhance known or potential areas of occurrence.

Because of its restricted range and documented loss of natural riparian habitat, it was believed that *Z. h. luteus* was approaching extinction in New Mexico; no extant populations were found along the Rio Grande Valley between 1930 and 1976 (Hafner et al. 1981). By 1988, jumping mice probably declined in range and numbers in the Southwest, which was especially serious for the meadow jumping mouse of the region. However, the distribution and status of the genus within the Southwest had not been well documented and little was known about its habitat requirements or sensitivity to habitat loss. It is suspected that isolated populations are being threatened by agricultural and industrial development along major rivers, and by recreational development and range management activities in montane areas (Morrison 1992).

2.3 HABITAT DESCRIPTION

Known populations of meadow jumping mouse in New Mexico have been found close to permanent free-flowing water, in riparian zones along steams and ditches, and wet meadows near cattail marshes associated with major rivers (Morrison 1990, 1992). Soil is damp or moist with no standing water and with dense, tall vegetation (.5 m [1.6 ft] or greater) dominated by grasses and forbs that provide thick cover and food sources.

Key habitat areas include along the Rio Cebolla in the Jemez Mountains and in the vicinity of Española. In both the Jemez Mountains and the Rio Grande Valley, Morrison (1990) found that preferred habitat for the meadow jumping mouse contained permanent streams, moderate to high soil moisture, and dense and diverse streamside vegetation consisting of grasses, sedges, and forbs. Such habitats are characterized by wet meadows in the Jemez Mountains, while they included the edges of permanent ditches and cattail stands in the Rio Grande Valley (NMDGF 1988).

2.4 CHRONOLOGY

This species breeds in New Mexico from May to September with litters numbering 3 to 4 young. They likely breed once per year in the northern part of the State, whereas two litters may be produced in the central Rio Grande Valley. In New Mexico, the major period of activity for this species in the Jemez Mountains-Española area is June through September (NMDGF 1997) and may hibernate from October through May. By contrast, animals in the middle Rio Grande Valley (Isleta and Bosque del Apache National Wildlife Refuge) appear to be active in the period May through October, perhaps longer (NMDGF 1988).

Meadow jumping mice are active both day and night, foraging by grazing and scavenging on the ground. Their home range is about 0.06 to 0.44 ha (0.15 to 1.10 ac) in size (NMDGF 1997).

2.5 BEHAVIOR

2.5.1 Nesting

The meadow jumping mouse nests in dry higher ground near waterways that provide protected locations for nesting and hibernation. These areas are typically protected from flooding along the stream channel and provide materials and soils necessary for nesting. The nests are in a primary or secondary cavity, which they excavate. They also nest on the ground, in grasses or shrubs and use grasses to build the nest.

2.5.2 Feeding Habits

The diet of jumping mice is varied, including both vegetal (e.g., seeds and fruits) and animal (e.g., insects) components (Burt and Grossenheider 1976). In most places these jumping mice are known to feed on fruits, seeds, insects, snails, slugs, and millipedes. As more seeds became available, they are more frequently consumed (NMDGF 1997).

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

The New Mexico meadow jumping mouse is not federally listed as endangered or threatened and therefore carries no protective status. However, it is considered to be a species that requires continued monitoring to justify its delisting. Furthermore, the State of New Mexico considers this species endangered (group 2) and recommends further monitoring/surveys to establish its current status in the State.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with a one being an activity that must be done, a two indicates an activity that should be done, a three indicating an activity that may be done, and a four indicating an activity that may occur in the future should conditions change (i.e., if the species is newly found at LANL). Activities that are not appropriate to a species are assigned a ranking of zero. The HMP contains a summary table that ranks all species and activities. The following table lists importance rankings for New Mexico meadow jumping mice.

Section								
Status Tracking	Habitat Analysis and Models	Presence/ Absence Surveys	Reproduction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
1	2	2	4	3	3	3	4	3

4.1 STATUS TRACKING

The New Mexico meadow jumping mouse is currently not federally listed for protection. However, because it is a State listed species with the potential for Federal listing, its status must be continually monitored on an annual basis to ensure no changes in its status has occurred. Status tracking for this species is considered a level 1 activity.

4.2 HABITAT ANALYSIS AND MODELS

Because the method of survey is a removal technique, surveys will only take place in the event a project may impact habitat that has been identified by a model as suitable New Mexico meadow jumping mouse habitat. The model development will be based on habitat characteristics of known locations where this species has been found during previous surveys within the Jemez Mountains (Morrison 1990, 1992). Habitat variables will then be measured at sites on LANL property potentially matching the known locations. Variables will include vegetation type (by genus and species), coverage amount (percent plant cover), plant height, size of occupied habitat (width and/or length of riparian area, marsh, etc.), distance of riparian area, marsh, etc. to drier upland areas (habitat used for denning), and type of water source (stream channel, pond, etc.). Once these variables have been measured at the potentially suitable sites for this species, they will be input into the geographic information system (GIS) for comparison to the habitat suitability model. The model will then be used to determine the potential of the site to support meadow jumping mice and whether a field survey will be warranted.

4.3 PRESENCE/ABSENCE

As mentioned above, survey techniques for this species generally require the removal of individuals from the population, therefore, surveys should only take place in the event a proposed project will impact or may impact potential habitat for this species as identified during the modeling procedure described in Section 4.1 above. Presence/absence surveys for this species is considered a level 2 activity.

4.3.1 Survey Locations

The locations of survey for New Mexico meadow jumping mice will be determined through use of the habitat modeling procedure described in Section 4.1 above.

4.3.2 Survey Dates

The New Mexico meadow jumping mouse hibernates from about October/November through April/May (NMDGF 1988). The major activity period for this species in the Jemez Mountains-Española area is June through September with breeding occurring between May and September. Survey periods must coincide with the major activity period of June through September and is best to survey during years of “normal precipitation” events (non-drought periods). Surveys should be conducted a minimum of two consecutive years at each selected site. Thereafter, surveys should be conducted every other year to ensure meadow jumping mice have not emigrated into presently uninhabited areas.

4.3.3 Survey Technique

Trapping shall take place during summer months, preferably during and immediately following summer rains. Snaptrapping is the preferred method as jumping mice are not prone to entering a live trap. A minimum of four consecutive nights of snaptrapping is used. Traps are spaced at 10-m (33-ft) intervals along a stream channel or within other appropriate habitat. Traps should be placed along runways, under vegetation, or near prominent grass clumps. Mark each trap location with colored construction flagging or a pin flag. Label the marker with the appropriate trap station number. Bait traps with a small amount of sweet feed placed on the treadle. Check traps early in the morning. Sketch a map of the trapping area that includes the streams and/or ponds, trap locations, and any other pertinent information. Put this with field notes. Verify the survey location for entry into the GIS.

Live traps may be used although it is not preferred. Trap stations are spaced 10 m (33 ft) apart with three traps at each station, each facing a different direction. Aluminum 9- by 3- by 12-in. Sherman live traps baited with sweet feed are used. Traps are baited in late afternoon and set on a level surface under cover for protection from exposure to heat and precipitation. Traps are left open over night to capture animals, then checked as early the next morning as possible. Close traps during the day to prevent animals from entering traps and perishing during hot periods of the day.

If a meadow jumping mouse is caught, either from snaptrapping or live trapping, the goal of the trapping session has been met. Therefore, finish collecting data on other species that have been caught in the trapping session, then discontinue trapping so as to avoid trapping any other meadow jumping mice. If a meadow jumping mouse is caught or suspected but identification unconfirmed, keep it as a voucher specimen for later confirmation. All specimens will be submitted to the Museum of Southwestern Biology at the University of New Mexico (UNM MSB). Any subsequent animal that is caught and is still alive, collect relevant data and release it. Refer to the Ecology Group, Biology Team Operating Procedure “Surveying for Meadow Jumping Mouse” for further details.

4.3.4 Required Resources

4.3.4.1 Personnel

Setting up trap grids/lines will require a team of 4 to 6 persons, depending on the size of area to be surveyed and whether snaptrapping or live-trapping will be used. The size of area and number of people used will be determined during a preliminary field site check. Data analysis and report writing for each survey will require one staff member for 20 hours.

4.3.4.2 Equipment

- US Geological Survey topographic maps of the area (a marked copy to be attached to survey data sheet).
- Standardized survey form.
- 100 to 300 snaptraps, depending on size of grid, for each sampling site, or
- 300 to 600 livetraps, depending on size of grid, for each sampling site.
- Ample mixture of peanut butter and sweet feed for bait.
- Personal protective equipment for checking traps (see Biggs and Bennett 1995).
- One-gallon reclosable plastic bags for collection/storage of specimens.
- State collecting permit.
- Camera and film for documenting possible meadow jumping mouse captures.
- Pin-flagging and survey flagging for marking grid and trap locations.

4.3.4.3 Training

All members of the trapping team must sign off on required operating procedures (LANL-ESH-20-SOP-001, LANL-ESH-20-OP-HCP/BIO-026, and LANL-ESH-20-OP-BIO-023 [in process]) before participation in surveys. At least one member of trapping team must be able to accurately identify jumping mice to genus. Collected voucher specimens will be confirmed by the UNM MSB. At least one member of the trapping team must be experienced in setting up trapping grids.

4.3.4.4 Permitting

A New Mexico State permit must be obtained from the NMDGF before surveying for this species.

4.3.5 Analysis and Reporting

Data collected during the habitat modeling phase described under Presence/Absence protocol will be entered into the GIS database for subsequent modeling procedure applications. This data will be analyzed using the modeling capabilities of the GIS. A map delineating the potential suitable habitat(s) for the New Mexico meadow jumping mouse will be produced and included within a full report describing the proposed project, potential for impact to the species, the area surveyed (if appropriate based on the modeling procedure) and vegetation/abiotic data collected, and the results of the survey and/or modeling application procedure. The report will also include a summary of all interactions with the NMDGF (and if applicable, other State and Federal agencies).

4.4 REPRODUCTIVE MONITORING

The purpose of reproductive monitoring is to: (1) determine the breeding status of established jumping mouse populations, (2) establish population trends in the occupied habitat, and (3) describe habitat characteristics and habitat use patterns.

A reproductive monitoring program will be developed in cooperation with the NMDGF only if an individual is found and it is deemed necessary by the State.

4.5 CONTAMINANT STUDIES

Because no individuals of this species have been found on LANL property, associated potential contamination issues can not be identified at this time. Contaminant studies are a level 3 activity and may be conducted only if individuals are found to be present on LANL property.

4.6 ECORISK STUDIES

No ecorisk studies will be developed for this species at this time. If individuals are found on LANL property and contaminants are identified as a potential issue of concern, then an ecorisk study may be designed at that time.

4.7 PREY BASE STUDIES

No prey base studies will be developed for this species at this time. If individuals are found on LANL property, then a study identifying food habits and availability of food sources may be designed at that time.

4.8 TRACKING OF INDIVIDUALS

Tracking of individuals will not be determined unless presence has been established.

4.9 REGIONAL STUDIES

All individuals found on LANL property will be reported to the NMDGF. Data will be collected on habitat characteristics, number of individuals found, and other pertinent data and will be provided to the Department as well. No studies outside of LANL property are proposed at this time.

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Back To "Mammals"

Monitoring Plan

for the

Yellow Lady's Slipper

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

The HMP has two associated documents: Area of Environmental Interest (AEI) Site Plans and Monitoring Plans. The AEIs are areas of LANL that are being managed and protected because of their biological or other significance. Habitats of threatened and endangered species that occur or may occur on LANL are designated as AEIs. The essential element of the AEI Site Plan is the management of each species-specific potential habitat through the allowable activities within the AEI. These allowable activities may be both spatially and time constrained and based on occupancy or non-occupancy of the habitat by the species.

These plans contain sensitive information concerning potential habitat for threatened and endangered species. For that reason, these documents are controlled and will be issued only to persons who have a "need to know" and are trained by LANL's Ecology Group on the elements of the AEI Site Plan. All maps and associated materials should be considered sensitive and maintained as sensitive information.

If you need further information concerning the Endangered Species Program, these AEI Site Plans, or allowable activities, call the Ecology Group or DOE Los Alamos Area Office.

MONITORING PLAN FOR THE YELLOW LADY'S SLIPPER

1.0 INTRODUCTION

The monitoring of Federal and State-listed species and local species of concern is an integral piece of the Threatened and Endangered Species Habitat Management Plan (HMP). This monitoring plan provides background information and establishes monitoring protocols for the lady's slipper at Los Alamos National Laboratory (LANL).

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

The lady's slipper has the following taxonomy

FAMILY	Orchidaceae
GENUS,	*Cypripedium*
SPECIES	*calceolus*
VAR.	*pubescens*

2.2 STATUS DESCRIPTION

The lady's slipper is considered endangered by the State of New Mexico. It is an S2 on the New Mexico Natural Heritage Program database, indicating it is considered imperiled in the State because of rarity. However, it is a G5 on the list for global ranking and is considered secure globally, though it is rare in parts of its range. The yellow lady's slipper has been found in the Jemez Mountains and in Bandelier National Monument above 2400 m (8000 ft) (Foxx et al. 1998; Foxx and Hoard 1985).

2.3 HABITAT

The yellow lady's slipper is generally found in canyons with perennial water. Sightings have generally been above 2400 m (8000 ft), within the moist canyon bottoms that are dominated by mixed conifer (Martin and Hutchins 1980). This plant is considered a facultative wetland species, one which usually occurs in wetlands (67% to 99% of the time), but can occasionally be found in nonwetlands (Reed 1988).

2.4 CHRONOLOGY

This plant blooms in late June or early July.

2.5 BEHAVIOR

Not applicable.

3.0 MONITORINGJUSTIFICATION/PURPOSE/OBJECTIVES

The yellow lady's slipper is a State-listed endangered species. To comply with State regulations related to endangered plants, we need to determine its presence on land or survey for it when projects are in the adjacent forests.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change (for example, if the species is newly found at LANL). Activities that are not appropriate to a species are assigned a ranking of zero. The HMP contains a summary table ranking all species and activities. The following table lists importance rankings for the yellow lady's slipper.

Section	Status Tracking	Habitat Analysis and Models	Presence/ Absence Surveys	Reproduction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Ranking	1	2	3	4	4	0	0	3	4

4.1 STATUS TRACKING

The regional status of the yellow lady's slipper should be evaluated annually. A listing from the State of New Mexico Department of Forestry should be obtained. Other listings should be checked including the New Mexico Natural Heritage Program database. This ranks a 1.

4.2 HABITAT ANALYSIS AND MODELS

To date, the plant has not been found on LANL land. If it is located at LANL, a habitat analysis should be done. This task ranks a 2.

4.3 PRESENCE/ABSENCE SURVEY

The purpose of this type of survey is to determine the presence or absence of the yellow lady's slipper. When projects are within the upper canyons of LANL, spot checks for yellow lady's slipper should be done. This task ranks a 3.

4.3.1 Survey Locations

Upper canyons should be checked in association with projects if they will impact canyon bottoms where there are perennial stretches of water. This task ranks a 3.

4.3.2 Survey Dates

Surveys should be done in late June or early July when the plant is blooming.

4.3.3 Survey Technique

Walking surveys along stream channels where there is running water should be conducted.

4.3.4 Required Resources

4.3.4.1 Personnel

Surveying will require two persons for about two hours. Data analysis and report writing will require one person for two hours.

4.3.4.2 Equipment

- US Geological Survey topographic maps of the area (a marked copy to be attached to survey data sheet). Be sure to ALWAYS submit a copy of a topographic map with the survey.
- Standardized survey form (bring more copies than you think you need).
- Clipboard and permanent (waterproof) ink pen (we recommend recording survey results directly on the survey data form, to assure that you collect and record all required data).
- Plant field guide.

The following equipment is recommended:

- Camera and film (for habitat photos).
- Global positioning system unit--for determining survey coordinates and verifying location of survey plots on topographic maps.
- Survey flagging (conservative earth-tone colors)--for marking survey sites and/or areas where yellow lady's slippers are found.

4.3.4.3 Training

At least one of the surveyors should have knowledge of plant taxonomy.

4.3.4.4 Permitting

No permits are required.

4.3.5 Analysis and Reporting

The information about location should be incorporated into a plant database.

4.4 REPRODUCTIVE MONITORING

Report blooming dates and put the information into a plant database. This task ranks a 3.

4.5 CONTAMINANT STUDIES

If the yellow lady's slipper is found, soils adjacent to the plant can be taken for contaminant studies. This task ranks a 4.

4.6 ECORISK STUDY

Not applicable. This task ranks a 0.

4.7 PREY-BASE STUDIES

Not applicable. This task ranks a 0.

4.8 TRACKING OF INDIVIDUALS

If populations are located, they should be monitored on a yearly basis. This task ranks a 3.

4.9 REGIONAL STUDIES

This is a Level 2 activity. Any data collected on the yellow lady's slipper should be reported to the State of New Mexico Department of Forestry. This task ranks a 4.

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Back To "Plants"

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Back To Reference Lists

Monitoring Plan

for the

Northern Goshawk

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

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These plans contain sensitive information concerning potential habitat for threatened and endangered species. For that reason, these documents are controlled and will be issued only to persons who have a "need to know" and are trained by LANL's Ecology Group on the elements of the AEI Site Plan. All maps and associated materials should be considered sensitive and maintained as sensitive information.

If you need further information concerning the Endangered Species Program, these AEI Site Plans, or allowable activities, call the Ecology Group or DOE Los Alamos Area Office.

MONITORING PLAN FOR THE NORTHERN GOSHAWK

1.0 INTRODUCTION

The word "goshawk" is derived from the European word "goose-hawk." This species is called goose-hawk because of its fondness of large game birds like the Canadian goose. There was once an expensive bounty paid for the destruction of these raptors. The monitoring of Federal and State-listed species and local species of concern is an integral piece of the Threatened and Endangered Species Habitat Management Plan. This monitoring plan provides background information and establishes monitoring protocols for the northern goshawk (*Accipiter gentilis*) at Los Alamos National Laboratory (LANL).

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

The southwestern form of the northern goshawk found in Arizona, New Mexico, and possibly western Texas southward at least to Jalisco, Mexico, has been assigned by many authorities to the subspecies *A. g. atricapillus* (Wilson 1812; type locality near Philadelphia, PA), which is the breeding form of most of North America. However, other workers recognize the southern segment of this population (i.e., that from southeastern Arizona through Mexico) as a distinct subspecies, *A. g. apache* (van Rossem 1938; type locality Paradise, [Chiricahua Mts.,] Cochise County, Arizona).

Based on analysis of wing length in the northern goshawk of North America, the following breeding populations are thought to be distinct:

> A short-winged group that occurs disjunctly in central and eastern Canada and the northeastern United States from at least southern Alaska to northern California (collectively, eastern and western are recognized as *Accipiter gentilis atricapillus* [Wilson]; *A. g. striatulus* [Ridgway] is an apparent synonym);
>
> A medium-winged group extending from the Yukon and parts of Alaska southward to at least central-eastern California and central-northern New Mexico (Interior and Southwestern samples -- recognized as *A. g. henshawi* [Nelson]).
>
> A long-winged group extending from the Mogollon Plateau of Arizona and New Mexico southward to at least Jalisco and probably Guerrero (Madrean sample -- recognized as *A. g. apache* [van Rossem] -- this includes those of the Mogollon Plateau).
>
> A fourth group with even shorter wings breeding on the coastal islands of British Columbia is recognized as *A. g. laingi* (Taverner). This population and that of the Madrean region also differ from others in North America in having at least a tendency toward darker plumage. Nonbreeding males of the pale, short-winged race *A. g. atricapillus* (including *A. g. striatulus*) regularly disperse as far as southern Arizona and New Mexico, originating from breeding populations that may be as near as California or as far away as Alaska and Canada.

In New Mexico, goshawks occur as residents in the northern Mogollon and Sacramento highlands and migrate and winter almost statewide in the highlands. Migrant and winter records occur from San Juan, Rio Grande, Pecos and Guadalupe valleys. At Randall Davey Audubon center in Santa Fe, the northern goshawk occurs casually in summer and rarely in winter. It is found on the Zuni Indian Reservation. The goshawk is found in the Jemez Mountains (Sandoval and Los Alamos Counties) during the breeding season. An adult and an immature were trapped in May 1990 in the Sandia Mountains (Bernalillo County), and two adults/six immatures were captured in October 1990–1991 in the Manzano Mountains (Torrance County). Southward dispersal definitely occurs among presumed goshawks. Birds also occur on and near the Mogollon Plateau, and these may include both southward dispersers and possibly local breeders. Border ranges of goshawks of interior/southwestern populations include the Santa Rita, Peloncillo, and especially the Chiricahua Mountains. The species, *A. gentilis*, breeds and winters extensively in North America, but with some populations wintering south of the US border.

The northern goshawk is known to exist or has the potential to exist on LANL lands (Hinojosa 1997).

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, SUBCLASS	Aves, Neornithes
ORDER, SUBORDER	Falconiformes, Accipitres
FAMILY, SUBFAMILY	Accipitridae, Accipitrinae
GENUS,	*Accipiter*
SPECIES	*gentilis*
SUBSPECIES	*atricapillus, apache* (NM, AZ)

The northern goshawk is the largest North American member of the genus *Accipiter*. Both adult and juvenile goshawks are about the same size as a red-tailed hawk. The adult goshawk plumage is blue-gray on the back and wings, while the breast has fine gray streaks and black feather shafts on a background of dull white or gray. Juvenile goshawks have brown backs and wings, while the under parts have drop-shaped chocolate-colored markings on a rich cream-colored background. Special morphological adaptations that give members of this genus the necessary maneuverability to hunt in forests include short, rounded wings and a long tail.

Statistical comparisons show that wing lengths of male and female goshawks differ significantly within populations. This study found no significant differences in wing length between adults and immatures (within populations and sexes), contrary to the reports of other workers.

Sexes in northern goshawks are best distinguished externally by size—although adult females also tend to be more coarsely vermiculated below than males. In terms of wing length, Storer (1966; in Hubbard 1992) found no overlap in a sample of 67 adults from eastern North America—with males (N = 25) in the range 309 to 338 mm (12.4 to 13.5 in.) and females (N = 42) 339 to 374 mm (13.5 to 15 in.).

In general, means of samples in this study show a cline in which wing length increases first from the Atlantic and Pacific coasts to the interior of North America and thence from north to south. The extreme differences in means (largest versus smallest are 25.9 mm (1 in.) (8.3%) in males (Madrean versus Western region) and 31.5 mm (1.25 in.) (9.3%) in females (Madrean vs. Eastern). When adjacent regions are compared, male and female means are significantly different between two sets of samples (larger vs. smaller): Interior compared to Eastern/Western and Madrean to Southwestern. In the first of these, the means in the Interior sample exceed those in the Eastern and Western by 12.5/8.2 mm (4.0%/2.6%) in males and 12.4/16.1 mm (3.6%/4.8%) in females. In the other comparison, means in the Madrean sample exceed those in the Southwestern by 12.0 mm (0.48 in.) (3.6%) in males and 16.0 mm (0.64 in.) (4.5%) in females. Mann-Whitney U tests of these comparisons have probabilities of <.05, and minimal overlap exists between samples in individual measurements. Dark goshawks range farther north in New Mexico than the Mogollon Plateau.

Five immature *A. g. apache* did not differ significantly in darkness and width of ventral streaking as compared to a like number of *A. g. atricapillus*. However, the former did average darker in upper part coloration. In three adult *A. g. apache*, one was found to have darker upper parts than the ten *A. g. atricapillus* in that collection.

Snyder and Snyder indicated that dark goshawks were occasionally present among birds breeding in southeastern Arizona and adjacent New Mexico, and they produced a color photograph of an essentially black-backed, adult male at a nest (Hubbard 1992).

2.2 STATUS DESCRIPTION

1991: The northern goshawk, *A. gentilis*, and the Apache northern goshawk, *A. g. apache*, were placed by the November 21, 1991, Federal Register, in Category 2 (USFWS 1991). {The subspecies *A. g. apache* was first listed as a Federal Candidate and has a better chance of being Proposed Threatened or Endangered, than the 'species'—as opposed to a subspecies listing because it is isolated to a smaller area than the species as a whole.}

1992: The Apache northern goshawk (*A. g. apache*) found in New Mexico, Arizona, and Mexico was listed as a Category 2 candidate by the Office of Endangered Species (USDI). Goshawk was listed as a sensitive species by US Forest Service (USFS) Region 3. A sensitive species status was recommended for this hawk based on its vulnerability to disturbance, its dependence on large stands of old growth forest, and the potential for fragmentation of goshawk habitat due to timber harvesting (Finch 1992).

1992: Because of concerns over the effects of timber harvesting, the goshawk was listed as a "Sensitive Species" by the Southwestern Region of the Forest Service, US Department of Agriculture in 1982 (Reynolds et al. 1992).

1992: Only an export permit was required for international trade of northern (USFWS 1992).

1994: The northern goshawk was listed in the Federal Register, November 15, 1994, as a Category 2 species for consideration to be listed as a threatened or endangered species (USFWS 1994).

1994: The northern goshawk species, including the "Apache" subspecies of southwest New Mexico, were listed as Federal Notice of Review Category 2 taxa (NMDGF 1994).

1995: *Accipiter gentilis* was listed under the Natural Heritage Global Rank "G4" ("G4" = "Apparently Secure"). The subspecies, *A. g. apache*, was listed "G5T3" ("G5" = "Demonstrably Secure"; "T3" = [subspecies listed] "Uncommon or Restricted"). The subspecies, *A. g. atricapillus*, was listed "G4T4" ("G4" = [species listed] "Apparently Secure"; "T4" = [subspecies listed] "Apparently Secure") (AGFD 1995).

1995: The species, *Accipiter gentilis*, was being "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program. Neither *A. g. apache* nor *A. g. atricapillus* were listed with regard to being "Tracked" (AGFD 1995).

1996: The US Fish and Wildlife Service (USFWS) changed the listing status of "Federal Candidate" species. This classification formerly included three subclassifications: Federal Candidate: Category 1, Category 2, and Category 3. There are no longer "Category" designations. This species was listed as a Federal Candidate Category 2 species. Species formerly designated Category 2 and Category 3 are no longer considered Federal candidate species, and so no longer have any Federal protection under the "Candidate" listing. However, such species may retain other federal or state designated protections (USFWS 1996).

1996: The complete Natural Heritage Global Rank for the species *Accipiter gentilis* was listed "G5" (CNHP 1996).

1996: The northern goshawk was listed as a Sensitive Species in USFS Region 2 (CNHP 1996).

1996: The species, *Accipiter gentilis*, was listed by a New Mexico Natural Heritage Program list as "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (NMNHP 1996).

1996 (March): Former C2 species were reclassified as Federal: "Species of Concern" (Jahrsdoerfer 1996).

NEW MEXICO

In 1991, the New Mexico Department of Game and Fish (NMDGF) imposed a moratorium on the take of northern goshawk (*Accipiter gentilis*) nestlings for the sport of falconry (NMDGF

1992). This action was taken because of concern for the well-being of the State's relatively small breeding goshawk population (NMDGF 1992).

1992: The most recent inventory figures available to the NMDGF indicate about 50 to 70 territories were active in New Mexico in 1992 (NMDGF 1994).

1991: Concern for the survival of goshawks breeding in New Mexico reached a peak in 1991, when a coalition of conservation groups petitioned the USFWS to list the goshawk in the southwestern states as endangered under the federal Endangered Species Act; that petition was subsequently amended to include all populations breeding throughout the forested western United States.

By the end of 1991, 89 goshawk breeding territories had been documented in New Mexico. With increased survey effort during the early 1990s, the number of documented breeding territories gradually increased to 126 by 1994 and to at least 132 by 1996 (data for 1996 are essentially, but not entirely, complete). This total is a minimum estimate of the statewide population and represents an unknown proportion of that population; however, it also represents the sum of all historically known territories plus the discoveries resulting from the massive survey effort, especially on the part of the USFS, undertaken during the early 1990s (Williams 1997).

1992: the USFWS ruled that goshawks in the western United States did not constitute a "listable entity;" the issue was not settled until 1996, when the USFWS ruled that the petition did not present sufficient information that goshawks throughout the western United States warranted listing under the Act (Williams 1997).

1994 Recommendation: The northern goshawk was recommended for addition to the New Mexico state list as Group 4 (= Of Concern) (NMDGF 1994).

1997: "Recently, the New Mexico falconry community requested that the Department review the 1992 Policy on Take of Nestling Goshawks for Falconry. At issue is whether the current status of New Mexico's breeding goshawks is sufficient to allow take of nestling goshawks for falconry. Our review, using data gathered largely by the USFS during the 6-year period 1991-1996, indicates that over the past 3 years, NM's goshawks have suffered declines both in territorial occupancy by breeding pairs as well as in overall productivity of young. Given these observed declines, I have chosen the conservative approach of maintaining the current moratorium on the take of nestling goshawks for the 1997 season" (Maracchini 1997).

2.3 HABITAT

Goshawks are found in Douglas fir, Hemlock-Sitka spruce, redwood, ponderosa pine, larch/white pine, lodgepole pine, fir-spruce, aspen (hardwoods), and piñon-juniper forest types. The principal forest types occupied by the goshawk in the Southwest are ponderosa pine, mixed-species, and spruce-fir. Breeding habitat includes pine-oak woodlands in southwestern North America.

2.4 CHRONOLOGY

Goshawks select large, older trees for nest sites, and sites are often reused from year to year. Goshawks nest in forested areas. Breeding season is from May through August. Nesting home range is about 2400 ha (6000 ac). The nesting home range consists of three components: (1) nest area (approximately 12 ha [30 ac]), which may include more than one nest, is typically located on a northerly aspect in a drainage or canyon, and is often near a stream. Nest areas contain one or more stands of large, old trees with a dense canopy cover. A goshawk pair occupies the nest area from early March until late September. The nest area is the center of all movements and behaviors associated with breeding from courtship through fledging. Most goshawks have two to four alternate nest areas within their home range; alternate nest areas may be used in different years, and some may be used for decades. (2) The post fledging-family area (PFA)(approximately 160 ha [420 ac]) surrounds the nest area.

The PFA appears to correspond to the territory of a goshawk pair, and represents an area of concentrated use by the family from the time the young leave the nest until they are no longer dependent on the adults for food (up to two months).

The breeding season for the goshawk begins in April and ends in August. Goshawk nest stands have relatively high tree canopy cover and a high density of large trees. They have a gestation and incubation period of 1 to 2 months (29 to 60 days) and the young are cared for for an additional 1 to 2 months. There are usually 3 to 4 young produced in a breeding season and will only nest one a season. The nest is usually built of sticks in a tree near the base of the branches next to the trunk. The average nest tree height is 15 m (50 ft) with a diameter breast height of 30.6 to 50.8 cm (12.1 to 20 in.). The young are Altricial at birth and both parents care for the young. Adult goshawks are monogamous and pair for life.

Data analysis for the six years 1991 to 1996 revealed declining occupancy of known territories by any goshawk and by pairs of goshawks. Dividing the six years into two three-year periods (1991 to 1993 and 1994 to 1996) allowed for roughly equal sample sizes between the two periods and revealed that occupancy for any goshawk and occupancy for pairs declined from 79% and 71%, respectively, in 1991 to 1993 to 61% and 42% in 1994 to 1996 (Williams 1997). Reproduction by New Mexico goshawks also declined considerably over the same six-year period. Indeed, the three-year period 1994 to 1996 witnesses alarmingly low productivity, especially when compared to the previous three-year period 1991 to 1993. The averages for these two three-year periods were: 1991 to 1993 sample size = 139, brood size = 1.83, success rate = 85.6%, productivity = 1.57 young per pair; 1994 to 1996 sample size = 89, brood size = 1.71, success rate = 31.4%, productivity = 0.54 young per pair. Taken together, the declines observed in both occupancy and productivity are cause for concern and caution (Williams 1997). New Mexico, at the southern edge of the goshawk's general breeding distribution, has the smallest known breeding population among the western states (Williams 1997).

2.5 BEHAVIOR

2.5.1 Nesting

Goshawks apparently prefer to nest within 0.4 km (0.25 mi) of water in forest blocks >80 ha (200 ac) in size which contain small openings (Kennedy 1988). This bird of prey usually lays 2 to 4 unmarked, whitish eggs. A goshawk's nest is a large stick platform, and it is often lined with bark. The nest is constructed by the male and is built high in the crotch of a coniferous tree. The incubation period for goshawks is about 31 days. About a week after the chicks have hatched, they have their first coat of down and can regulate their body heat on their own for short periods of time. The brood rearing period lasts about 40 days. During the incubation and brood rearing periods the female rarely leaves the nest. Even after fledging the female remains close to the chicks.

The fledgling period in late June, or post-fledging dependency period, for goshawks lasts between 45 to 60 days. During this period, the young and the adult female continue to be supplied with food by the adult male. For the first 3 to 4 days after fledging, the chicks hop around on branches in the nest tree and sometimes make short flights back and forth from nearby trees.

In general, nest sites have large trees, dense canopies, and, in the southern portion of the goshawk's range, are typically on slopes with northerly aspects.

Large trees (>45 cm [18 in.] in diameter) provide viable nesting trees for goshawks.

2.5.2 Feeding

Prey may be captured on the ground, in trees, or in the air. A single goshawk may consume one to two prey per day.

Goshawks are "short-sit-and-wait-short-flight" predators. That is, they search their immediate surroundings for prey from a tree-perch for a short period (seconds) and then make a short flight to a new perch.

Northern goshawks show a preference for foraging in mature forests.

Northern goshawks may also prey on other northern goshawks.

Goshawks are predators of forest birds and mammals. These species are important food items of goshawks in the Southwest:

- BIRDS: American robin, band-tailed pigeon, blue grouse, hairy woodpecker, mourning dove, northern flicker, red-naped sapsucker, Steller's jay, and Williamson's sapsucker.
- MAMMALS: chipmunks (*Tamias* spp.), cottontails (*Sylvilagus* spp.), mantled ground squirrel, red squirrel, and tassel-eared squirrel.

Snags, downed logs, woody debris, openings, large trees, herbaceous and shrubby understories, and interspersion of vegetation structure stage are important features as relates to the presence and condition of prey populations.

Downed logs (>30 cm [12 in.] in diameter and 240 cm [8 ft] long) provide cover, feeding, and nest sites for a great variety of species (including several woodpeckers, chipmunks, mantled ground squirrels, cottontail rabbits, red squirrels, and blue grouse—all of which are prey species of the goshawk).

Forest openings of >1.6 ha (4 ac) will benefit blue grouse, chipmunks, and mantled ground squirrels while minimizing the effects on other interior forest prey species of the goshawk.

Large trees (>45 cm [18 in.] in diameter) provide important habitat for goshawk prey species (e.g., squirrels, large woodpeckers, and grouse). Large trees also provide hunting perches for goshawks.

Limited radiotelemetry evidence suggests that goshawks prefer mature forests for foraging.

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

The northern goshawk is a Federal and State species of concern. In order for DOE to comply with the Endangered Species Act, we must know the status of the northern goshawk at LANL. The northern goshawk does not currently have Federal protection, however, its future Federal listing requires us to maintain a working knowledge of the goshawk on LANL lands. We first need to determine if the northern goshawk is present at LANL, and if so, its breeding status.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 1 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change. Some activities are not appropriate to every species. The HMP contains a summary table ranking all species and activities.

	Status Tracking	Habitat Analysis and Models	Presence/ Absence Surveys	Reproduction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Goshawk	1	1	1	1	2	1	3	3	2

4.1 STATUS TRACKING

The regional status of the northern goshawk should be evaluated annually. Surveyors should attend status update meetings sponsored by the USFWS. This is a level one activity.

4.2 HABITAT ANALYSIS AND MODELS

LANL forested areas have been evaluated as possible northern goshawk habitat. Only those in the western portion of LANL have been found to be large enough to provide suitable habitat. Habitat analysis is a level one activity.

4.3 PRESENCE/ABSENCE SURVEY

The purpose of this type of survey is to determine the presence or absence of northern goshawks. A presence/absence survey is a level one activity.

4.3.1 Survey Locations

Surveys will be conducted in the western portion of LANL and cooperative research locations on USFS land to the west of LANL.

4.3.2 Survey Dates

Surveys will be conducted between April and August. Surveys conducted in April and May will have the best likelihood of goshawk detection.

4.3.3 Survey Technique

Surveys take place from April to July to coincide with the incubation, nesting, and fledgling-dependency stages of the goshawk nesting season (Kennedy 1988). Surveyors conduct surveys along canyon edges and all main and side drainages of suitable northern goshawk habitat. Transects were based on the method recommended by Kennedy and Stahlecker (1993) with a difference of 150 m (495 ft) between calling stations during incubation and 200 m (660 ft) during early nestling to fledgling-dependency. Distances were measured by pacing. At each station, a broadcast of the goshawk alarm call taped from commercial recordings was played and amplified.

Any vocal or aggressive response from any accipiter would lead to an intensive nest search in the response area (Reynolds et al. 1992). The search area would cover approximately 2500 m^2 (radius of 800 m) and vary in shape according to terrain and vegetation (Sinton and Kennedy 1993). Each tree in the immediate area would be scanned with binoculars for an active nest until the nest was located. In addition, surveyors look for the plucked remains of prey, feces, molted feathers, and inactive stick nests. If no nest was found, additional calling would be conducted to find nest sites (Sinton and Kennedy 1993).

A minimum of two years of inventory needs to be conducted to complete the inventory and minimize the number of unsuccessful territories missed during a survey. Other raptors seen during surveys should be recorded.

4.3.4 Required Resources

4.3.4.1 Personnel

Surveying will require two persons for about 40 hours. Data analysis and report writing will require one person for 8 hours.

4.3.4.2 Equipment

- US Geological Survey topographic maps of the area to be surveyed.
- A field note book to record sightings of all raptors and location information.

- Lightweight tape player (with adequate volume to carry well; use portable speakers if necessary).
- Extra tape player and batteries (dirt, water, dust, and heat often cause equipment failure, and having backup equipment helps avoid aborting a survey due to equipment loss).
- Northern goshawk tapes; two or more tapes per surveyor (tapes do get damaged and wear out in the field, extra tapes are very important).
- Clipboard and permanent (waterproof) ink pen.
- A compass to triangulate goshawk locations if necessary.
- Binoculars and bird field guide.

The following equipment is recommended:

- Camera and film (for habitat photos—especially at sites where goshawks are found).
- Global positioning system unit—for determining survey coordinates and verifying location of survey plots on topographic maps.
- Survey flagging (conservative earth-tone colors)—for marking survey sites and/or areas where goshawks are detected.

4.3.4.3 Training

At least one of the surveyors on the team must have participated in a goshawk survey with a person familiar with the goshawk and other accipiters from the area. It is also advisable that the lead surveyor has accompanied more experienced surveyors before leading a survey. Surveyors should also be familiar, by sight and vocalizations, with other species likely to be found in survey areas that may be confused with northern goshawks. Surveyors should also be able to identify other common raptors likely to be seen in the area.

4.3.4.4 Permitting

No permit is required for the surveying of this species.

4.3.5 Analysis and Reporting

Reports of the survey routes and results should be shared with other regional agencies to build a regionwide picture of this species distribution.

4.4 REPRODUCTIVE MONITORING

The purpose of reproductive monitoring is to:

- determine the breeding status of resident goshawks,
- collect productivity and breeding biology information, and
- describe habitat characteristics and habitat use patterns.

Reproductive monitoring is a level one activity.

Determining the breeding status of any resident goshawks can be accomplished with little disturbance to the goshawk, and so does not require a permit. Collecting productivity and breeding biology information requires nest monitoring which can disturb the birds, therefore special care should be taken.

4.4.1 Survey Locations

Survey locations are areas where northern goshawks were detected during the tape-playback survey.

4.4.2 Survey Dates

Survey dates are after April 1 and before August 1 (April and May will give the best results).

4.4.3 Survey Technique

The best way to determine whether a pair is present and breeding is to move a short distance away from where the bird was sighted, find a good vantage point, and sit or lie quietly to watch for signs of breeding activity. Signs of breeding activity include:

- observation of another "unchallenged" northern goshawk in the immediate vicinity (indicates possible pair),
- calls between nearby goshawks (indicates possible pair),
- interaction calls between nearby goshawks (indicates possible pair),
- physical aggression against another goshawk or bird species (suggests territorial defense),
- physical aggression against other raptors (suggests nest defense),
- observation of goshawks copulating,
- goshawks carrying nest material (verifies nesting attempt, but not nest outcome),
- goshawk carrying food (verifies nest with young, but not nest outcome),
- locating an active nest if sticks are present near the base of a branch high in a conifer tree, and
- observation of adult goshawks feeding fledged young (verifies successful nesting).

4.4.4 Required Resources

4.4.4.1 Personnel

Two surveyors for 40 hours.

4.4.4.2 Equipment

Same as in Section 4.3.4.2.

4.4.4.3 Training

Save as in Section 4.3.4.3.

4.4.4.4 Permitting

Same as in Section 4.3.4.4.

4.4.4.5 Analysis and Reporting

Same as in Section 4.3.4.5.

4.5 CONTAMINANT STUDIES

This is a level two activity. Studies of prey species in addition to the ongoing measurement of contaminant levels in water and sediment could be useful. Such studies might include the collection and analysis of common bird and mammal species that use the same habitat and are a prey base for the northern goshawk.

4.6 ECORISK STUDY

This is a level one activity. There is currently no ecorisk activity at LANL associated with the northern goshawk. The general approach for performing an assessment like this is to make a quantitative appraisal of the potential effects that soil contaminants might have on the species when introduced through the soil ingestion pathways using the quotient method prescribed by the US Environmental Protection Agency.

4.7 PREY-BASE STUDIES

This activity is a level three. It may be possible to determine the predominant families of prey taken by local raptors by intensive nest monitoring of nestling feeding. This would be supplemented by baseline counts of mammals and birds at LANL. Analysis of stomach contents is not indicated due to the high risk of take during the procedure.

4.8 TRACKING OF INDIVIDUALS

This is a level three activity. Individual northern goshawks can be uniquely marked with highly visible colored and numbered bands. The presence of marked individuals opens the door to a wide range of studies, including studies on territory size and plasticity, polygamy, double-brooding, return rate, and migration. The risk of take versus the benefit derived by marking individuals may be too high to recommend this procedure at this time.

4.9 REGIONAL STUDIES

This is a level two activity. Any data collected on northern goshawk must be reported to USFWS and USFS.

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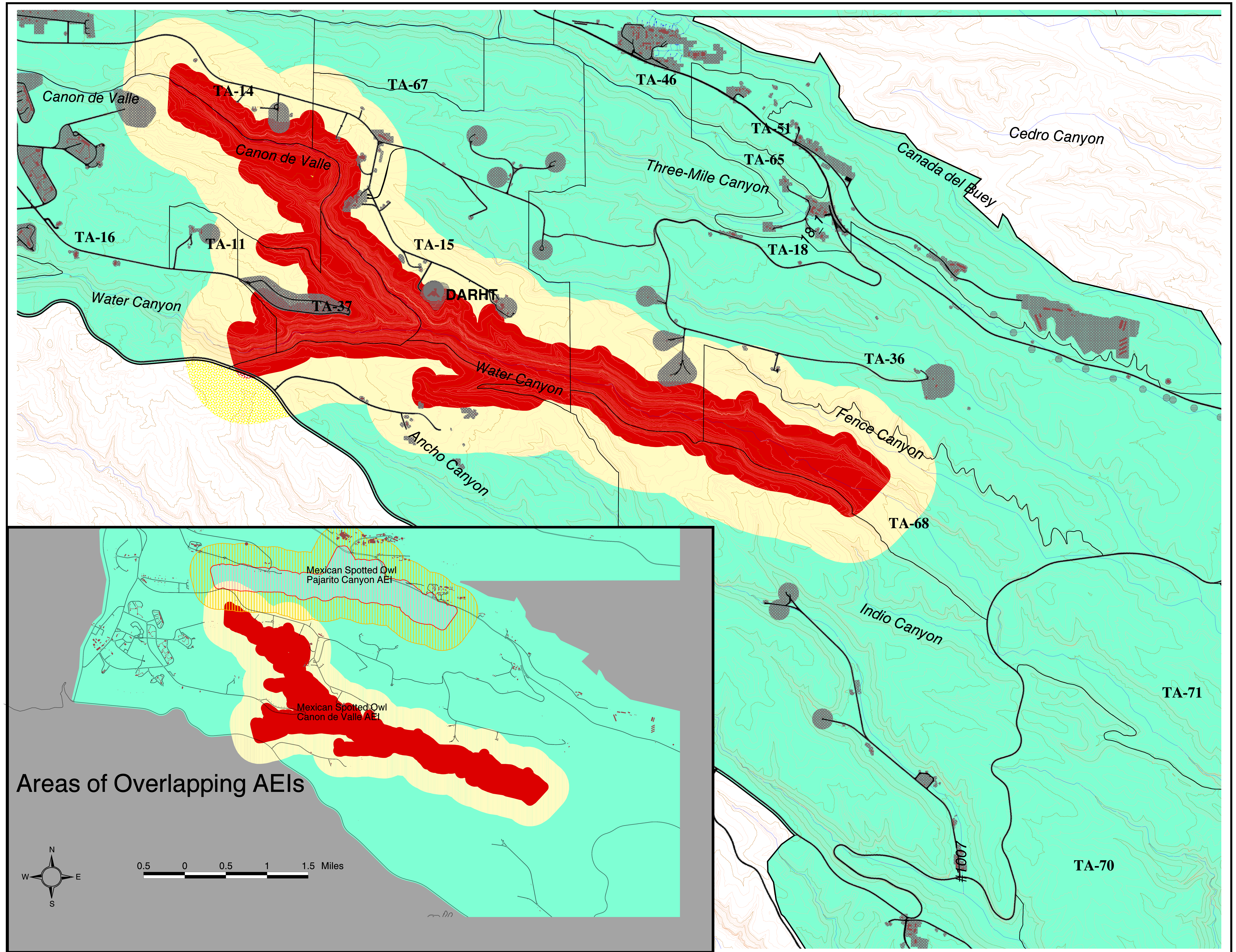
Back To
"Birds"

Overview of Mexican Spotted Owl Canon de Valle AEI



- LANL
- Technical Area Boundary
- Developed Areas
- Recent BAs
- Roads
- Buildings
- Contours, 20 ft
- Contours, 100 ft
- Drainage

Mexican Spotted Owl
Canon de Valle AEI

- Core Zone
- Buffer
- Core Zone , Off-Site
- Buffer, Off-Site

N W E S

1:17099

0.5 0 0.5 1 Miles

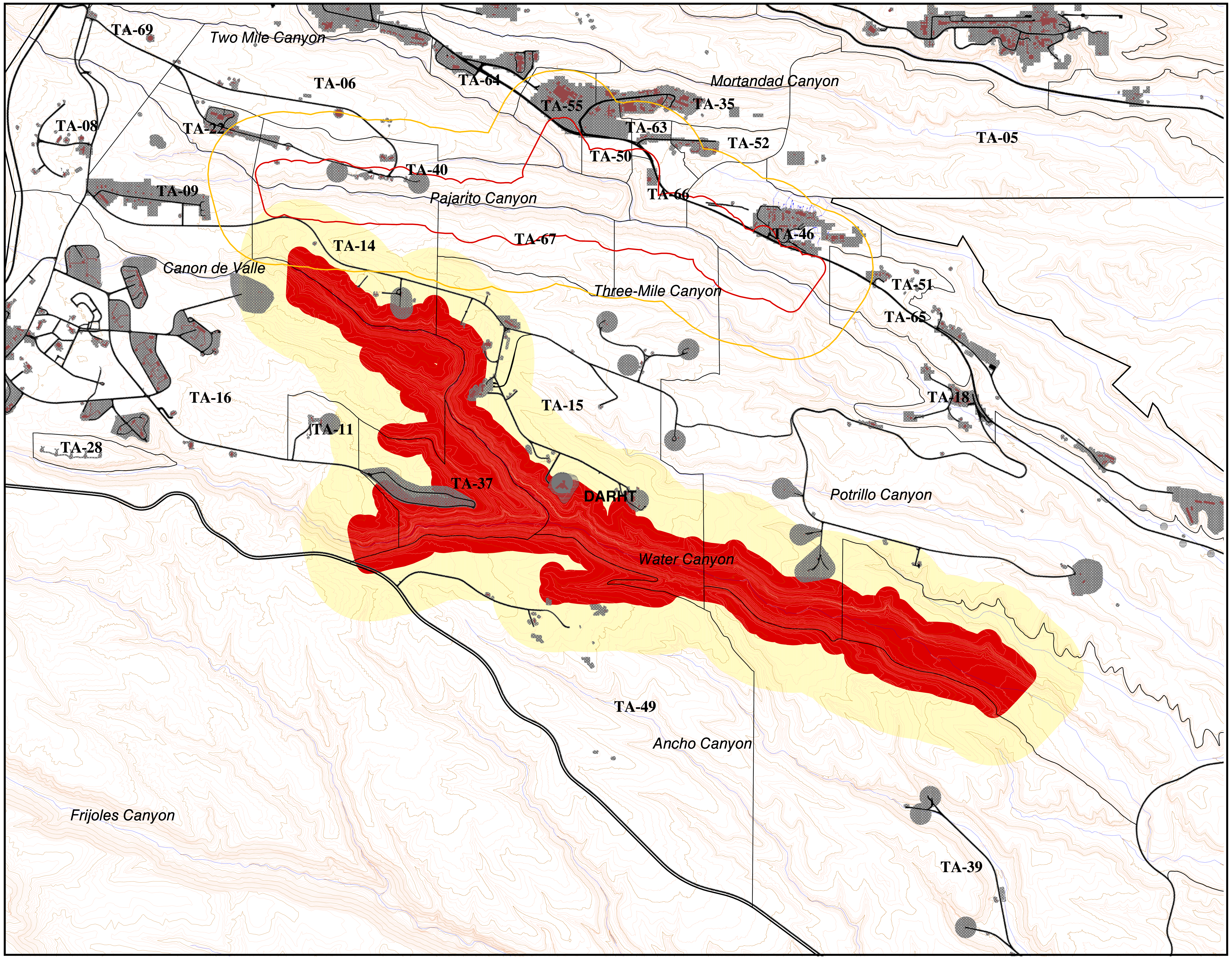
0.5 0 0.5 1 Kilometers

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett, Mary Salisbury and Marjorie Wright
Date: January 27,1998
Rev 4.0
Revised: December 13, 1999
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Back



Detailed View of Mexican Spotted Owl Canon de Valle AEI

- LANL
- Technical Area Boundary
- Developed Areas
- Recent BAs
- Roads
- Buildings
- Contours, 20 ft
- Contours, 100 ft
- Drainage

Mexican Spotted Owl
Canon de Valle AEI

- Core Zone
- Buffer Zone

Areas of Overlapping AEIs

- Spotted Owl Core Zone
- Spotted Owl Buffer Zone

N
W E
S

1:16446

0.8 0 0.8 Miles

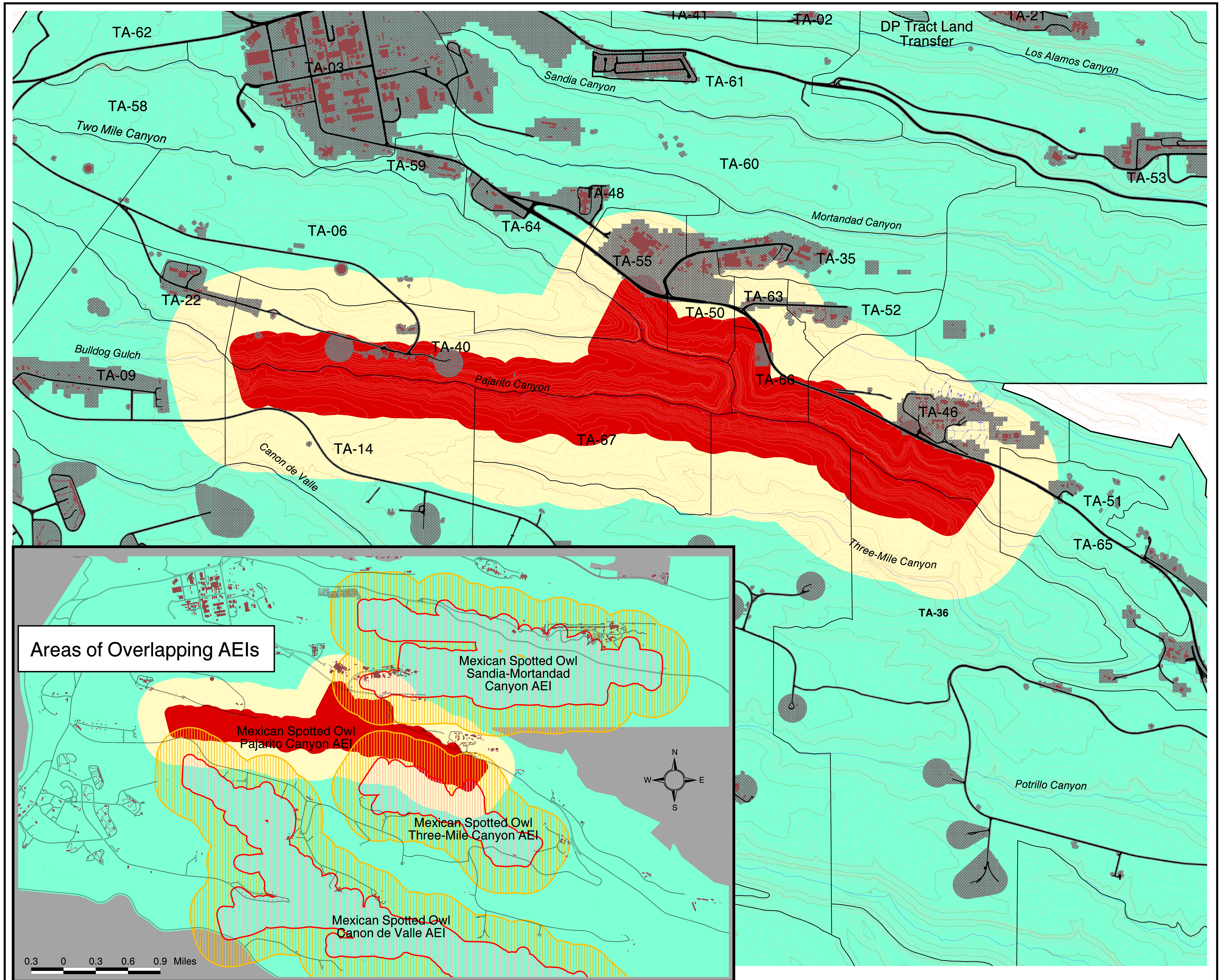
1 0 1 2 Kilometers

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett, Mary Salisbury and Marjorie Wright
Date: January 27,1998
Rev. 4.0
Revised December 13, 1999
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Back



Overview of Mexican Spotted Owl Pajarito Canyon AEI

- LANL
- Technical Area Boundary
- Developed Areas
- Recent BAs
- Roads
- Buildings
- Contours, 20 ft
- Contours, 100 ft
- Drainage

Mexican Spotted Owl
Pajarito Canyon AEI

- Core Zone
- Buffer

N
W E
S

1:14095

0.4 0 0.4 0.8 Miles

0.5 0 0.5 1 Kilometers

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett, Mary Salisbury and Marjorie Wright
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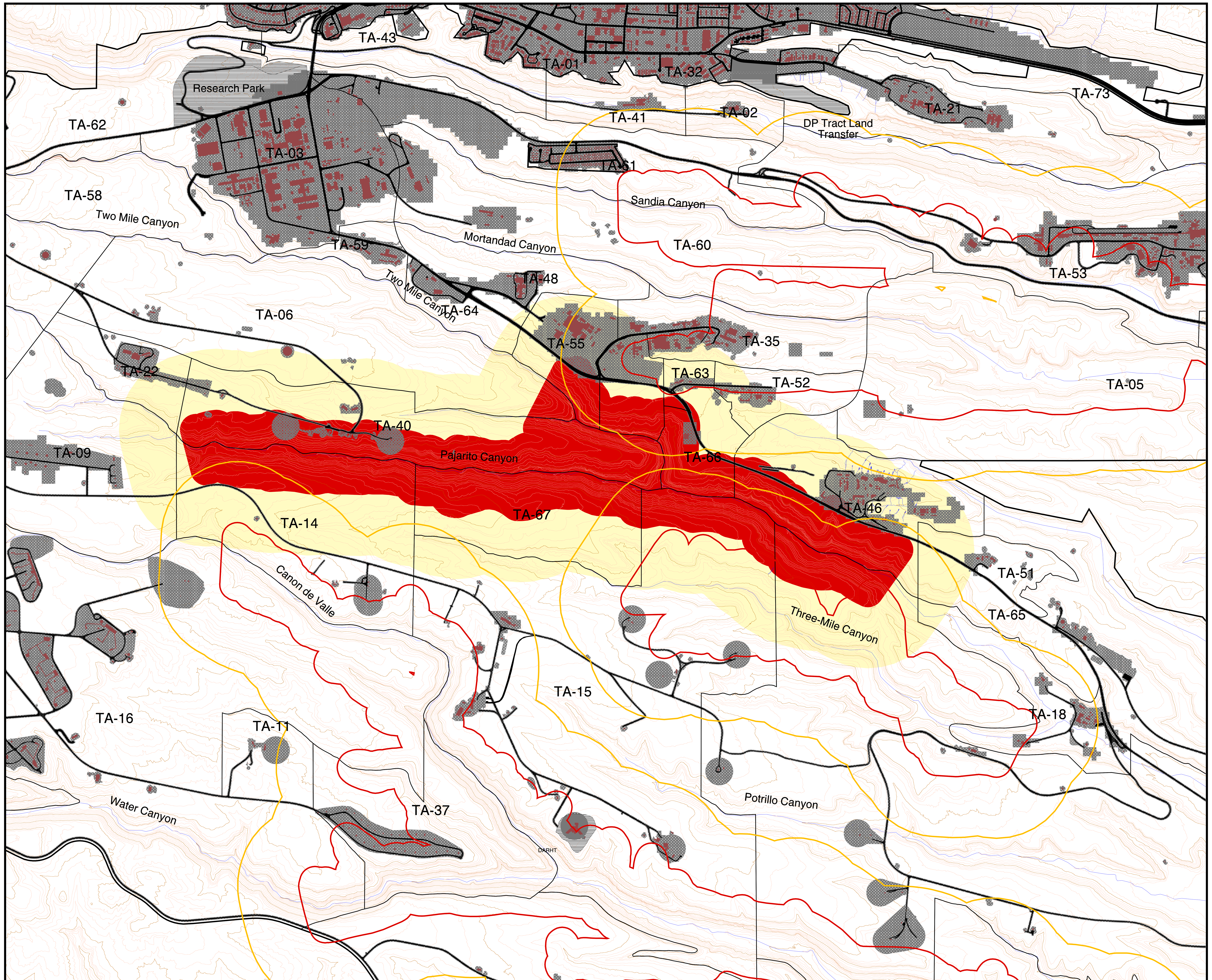
Back

Detailed View of Mexican Spotted Owl Pajarito Canyon AEI



LANL
Technical Area Boundary
Developed Areas
Recent BAs
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Mexican Spotted Owl Pajarito Canyon AEI
Core Zone
Buffer Zone

Areas of Overlapping AEIs
Spotted Owl Core Zone
Spotted Owl Buffer Zone

N
W E
S

1:13250

0.3 0 0.3 Miles

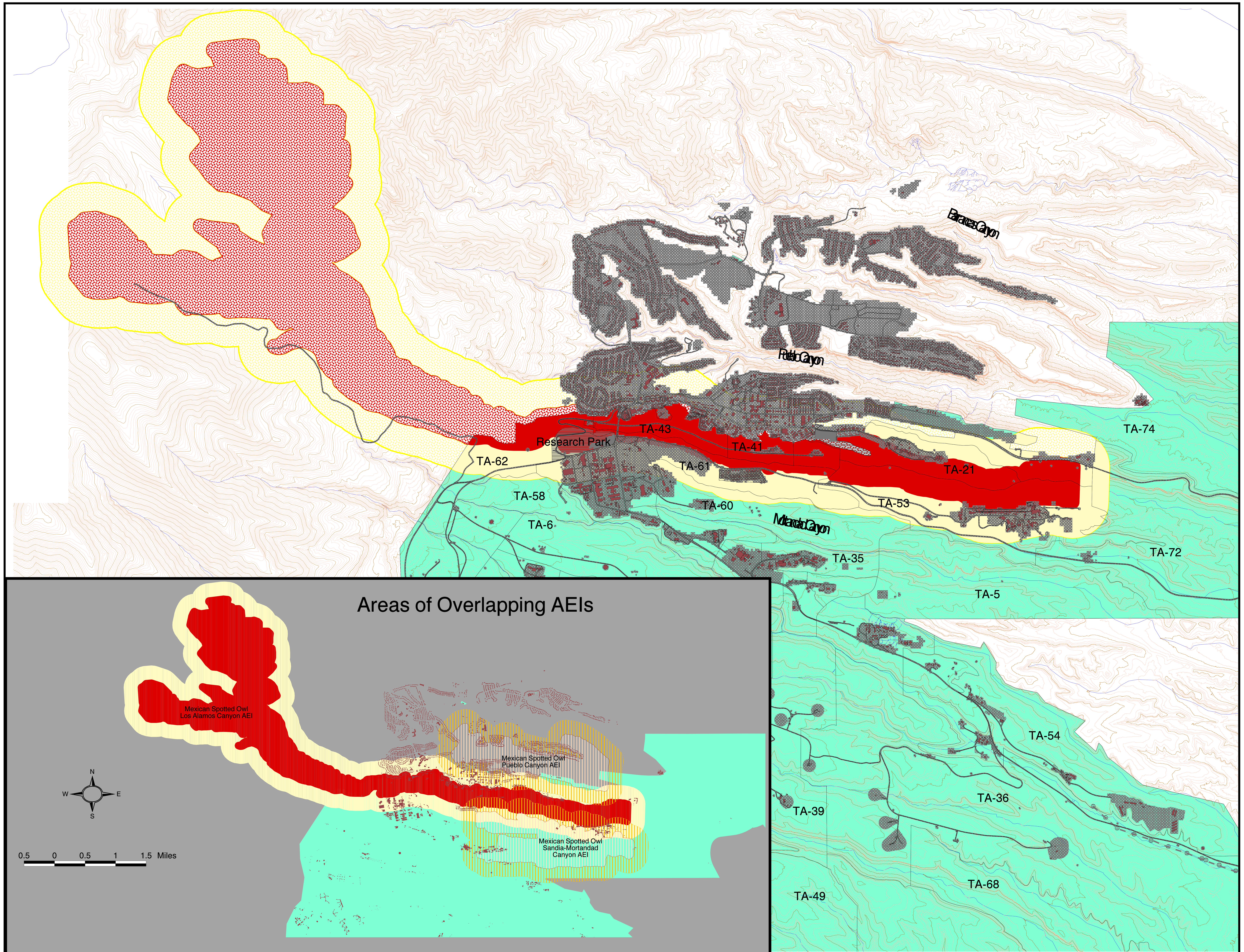
0.3 0 0.3 0.6 0.9 1.2 Kilometers

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett, Mary Salisbury and Marjorie Wright
Date: January 27,1998
Rev. 3.0
Revised: December 13, 1999
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Overview of Mexican Spotted Owl Los Alamos Canyon AEI



- LANL
- Technical Area Boundary
- Developed Areas
- Recent BAs
- Roads
- Buildings
- Contours, 20 ft
- Contours, 100 ft
- Drainage

Mexican Spotted Owl
Los Alamos Canyon AEI

- Core Zone
- Buffer Zone
- Core Zone , Off-Site
- Buffer Zone, Off-Site

N W E S

1:25668

0.8 0 0.8 1.6 Miles

0.9 0 0.9 1.8 Kilometers

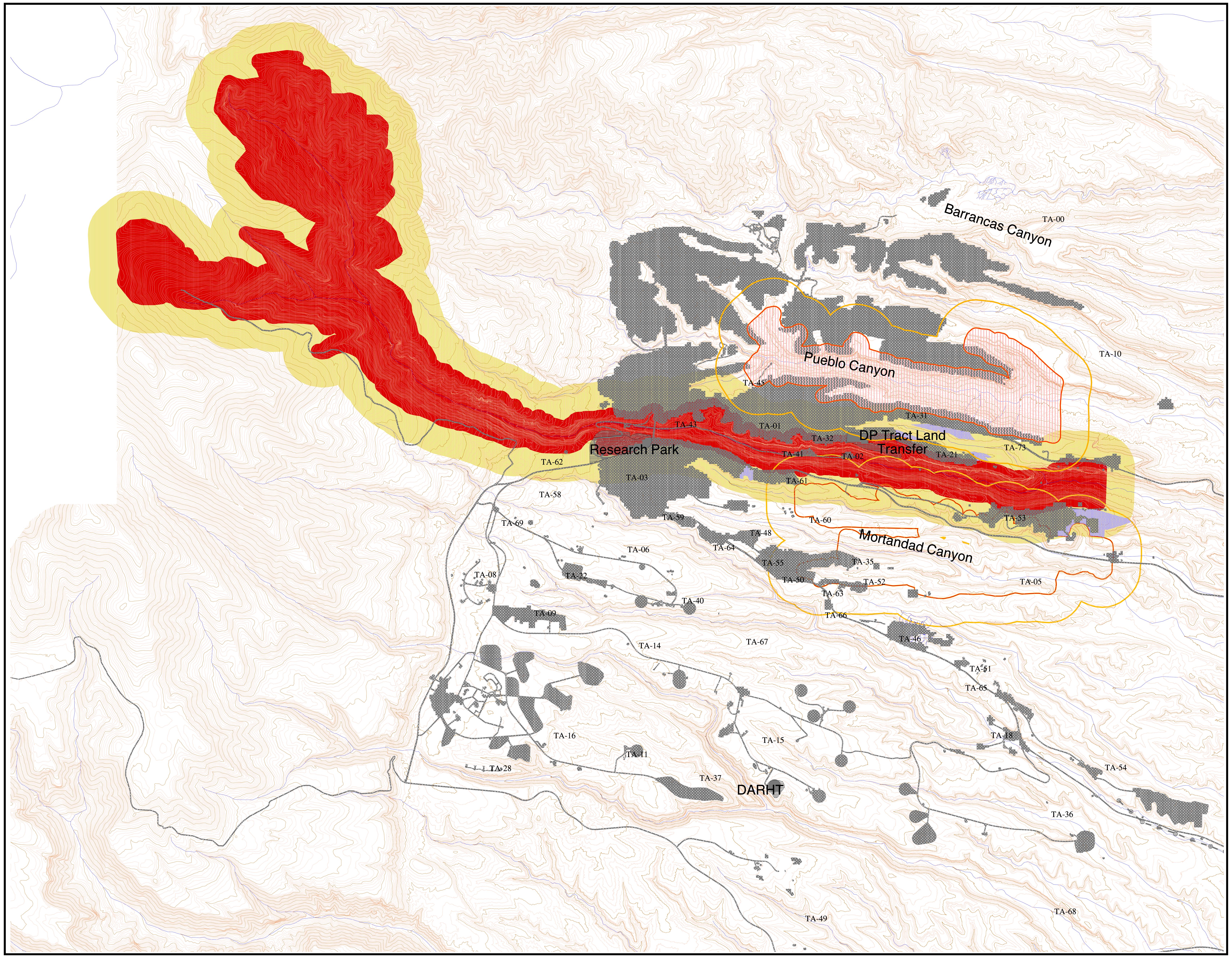
State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett, Mary Salisbury, and Marjorie Wright
Date: January 27,1998
Rev. 2.0
Revised: July 27, 1998
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Back

Detailed View of Mexican Spotted Owl Los Alamos Canyon AEI



LANL
Technical Area Boundary
Developed Areas
Potential Areas for Development within the AEI
Recent BAs
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Mexican Spotted Owl
Los Alamos Canyon AEI
Core Zone
Buffer Zone

Areas of Overlapping AEIs
Spotted Owl Core Area
Spotted Owl Buffer Area

N
W E
S

1:24941

0.5 0 0.5 1 1.5 Miles

1 0 1 2 3 Kilometers

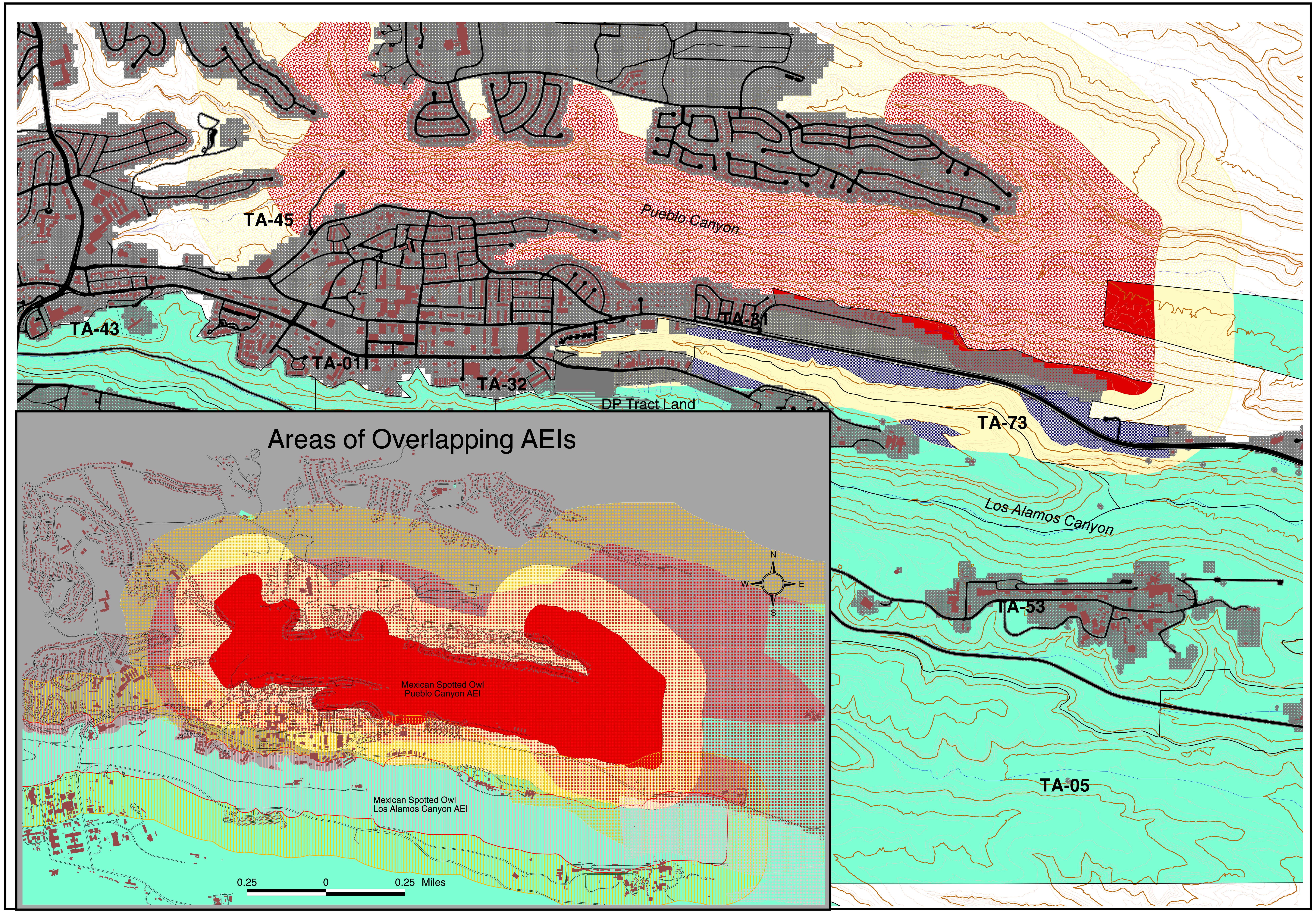
State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett, Mary Salisbury, and Marjorie Wright
Date: January 29,1998
Rev. 4.0
Revised: December 13, 1999
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Back

Overview of Mexican Spotted Owl Pueblo Canyon AEI



LANL
Technical Area Boundary
Developed Areas
Potential Areas of Development
Recent BAs
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Mexican Spotted Owl Pueblo Canyon AEI
Core Zone
Buffer
Core Zone , Off-Site
Buffer, Off-Site

N
W E
S

1:10605

0.4 0 0.4 0.8 Miles

0.6 0 0.6 1.2 Kilometers

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett and Mary Salisbury, and Marjorie Wright
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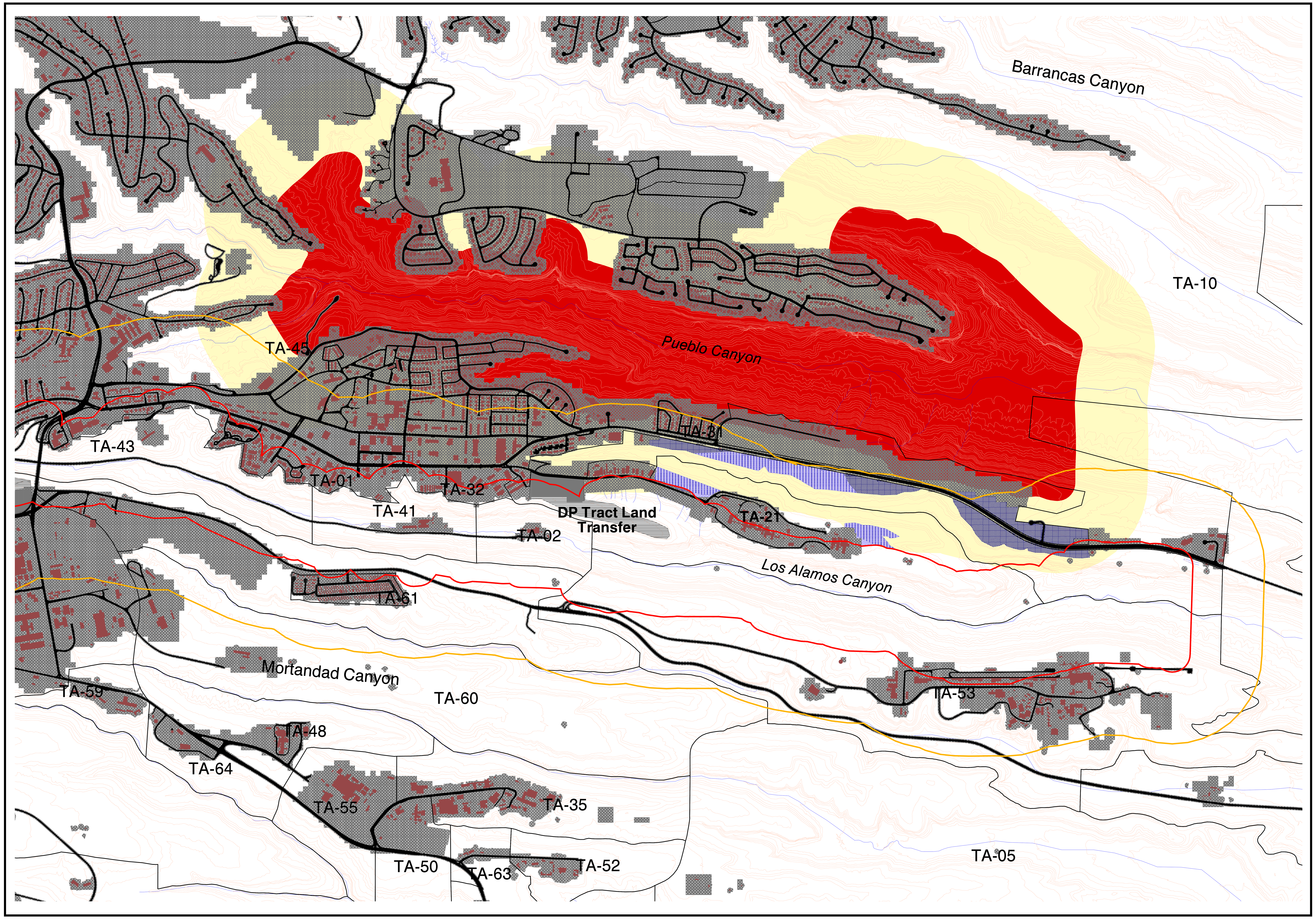
Rev. 5.0
Revised: December 15, 1999
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Back

Detailed View of Mexican Spotted Owl Pueblo Canyon AEI



LANL
Technical Area Boundary
Developed Areas
Potential Areas of Development within the AEI
Recent BAs
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Mexican Spotted Owl Pueblo Canyon AEI
Core Zone
Buffer Zone

Areas of Overlapping AEIs
Spotted Owl Core Area
Spotted Owl Buffer Area

N W E S

1:11497

0.5 0 0.5 Miles
0.7 0 0.7 Kilometers

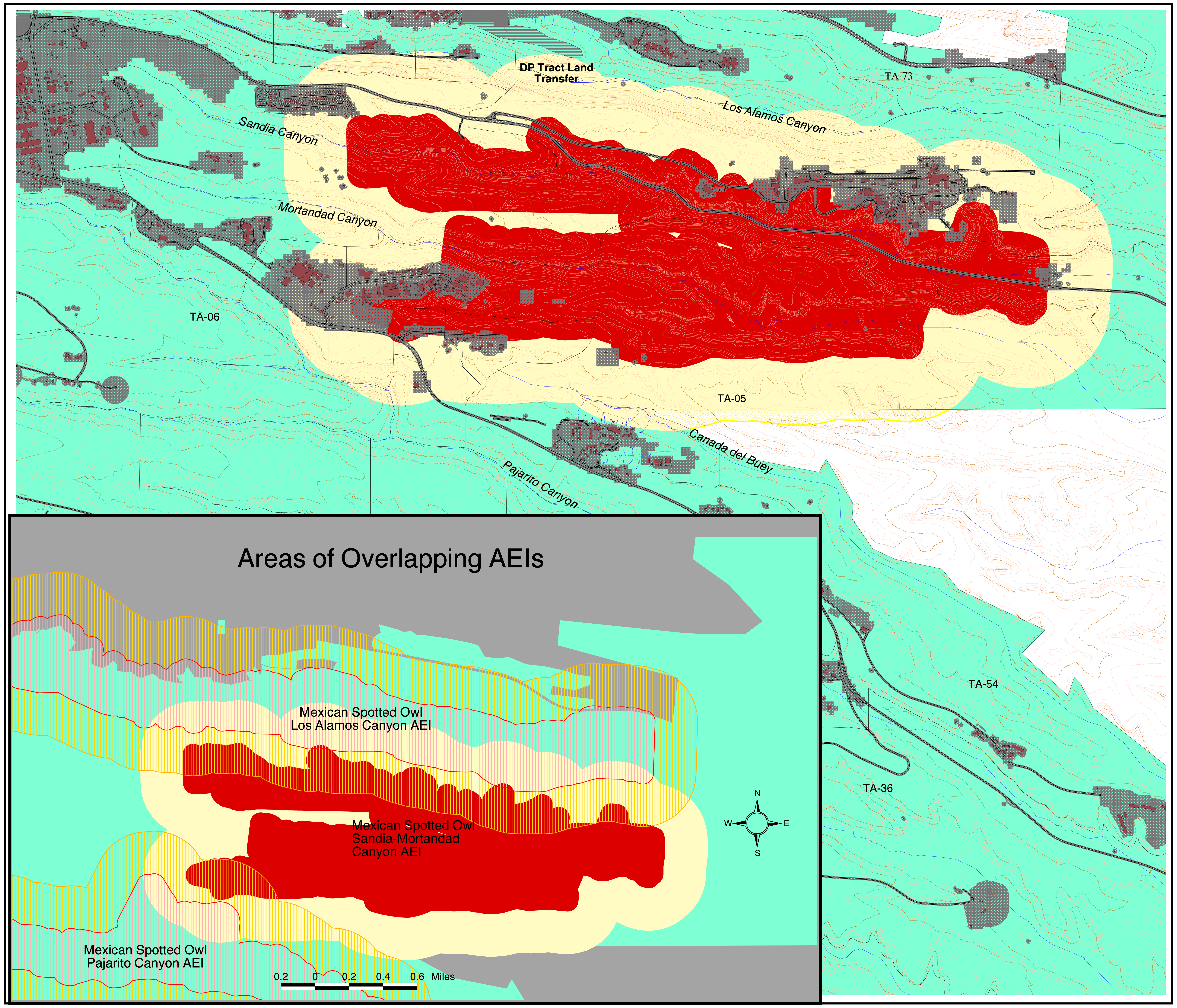
State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett, Mary Salisbury, and Marjorie Wright
Date: January 27,1998
Rev. 5.0
Revised: December 14, 1999
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Back

Overview of Mexican Spotted Owl Sandia and Mortandad Canyon AEI



LANL
Technical Area Boundary
Developed Areas
Recent BAs
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Mexican Spotted Owl
Sandia-Mortandad Canyon AEI

Core Zone, On-Site
Buffer Zone, On-Site
Buffer Zone, Off-Site

N W E S

1:13394

0.33 0 0.33 0.66 0.99 Miles

0.5 0 0.5 1 1.5 Kilometers

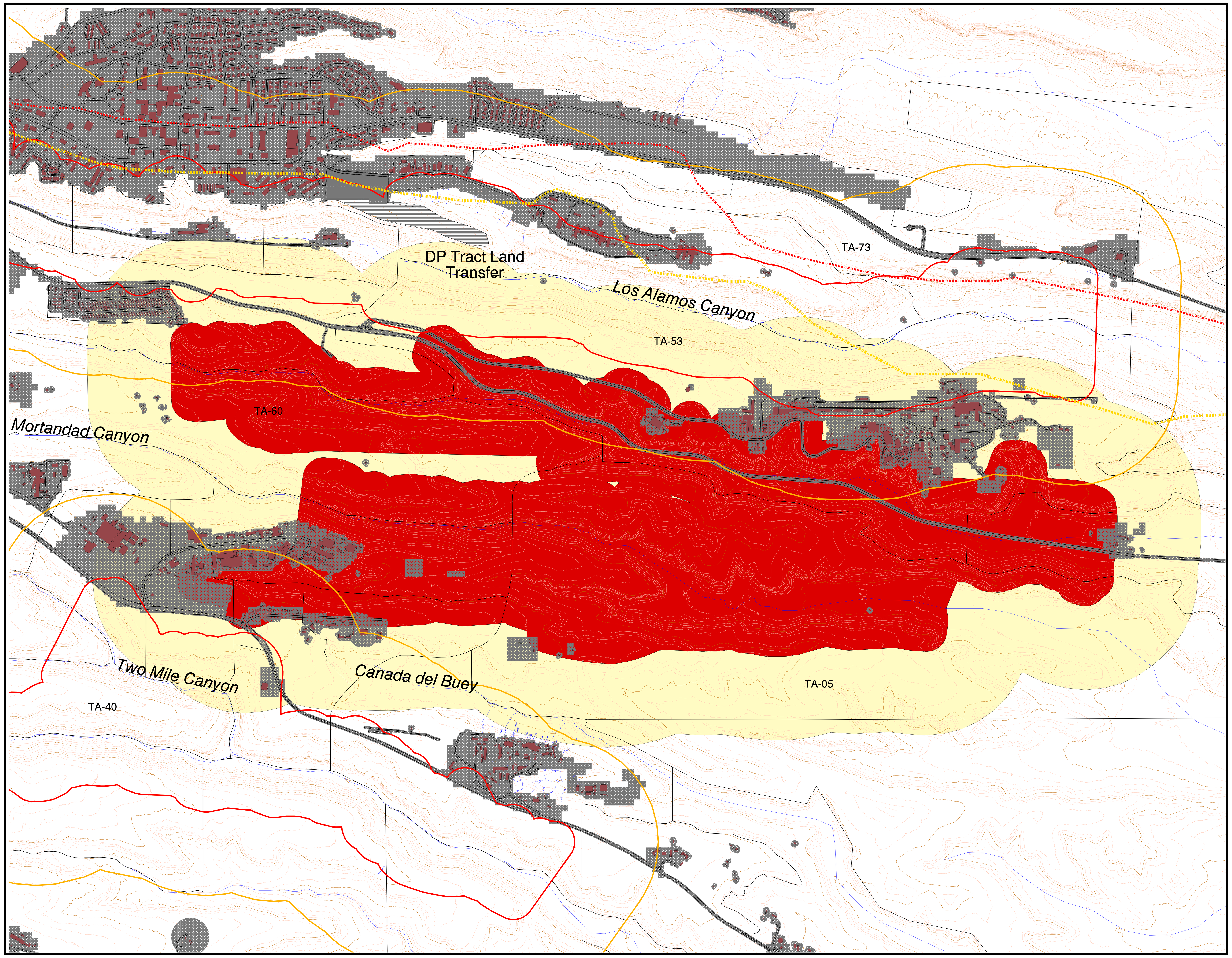
State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett, Mary Salisbury, and Marjorie Wright
Date: January 27,1998
Rev. 3.0
Revised: August 28, 2000
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Back

Detailed View of Mexican Spotted Owl Sandia and Mortandad Canyon AEI



LANL
Technical Area Boundary
Developed Areas
Recent BAs
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Mexican Spotted Owl
Sandia-Mortandad Canyon AEI
Core Zone
Buffer Zone

Areas of Overlapping AEIs
Peregrine Falcon Core Area
Peregrine Falcon Buffer Area
Peregrine Falcon Alt. Habitat
Spotted Owl Core Zone
Spotted Owl Buffer Zone

N
W E
S

1:9345

0.5 0 0.5 Miles

0.7 0 0.7 Kilometers

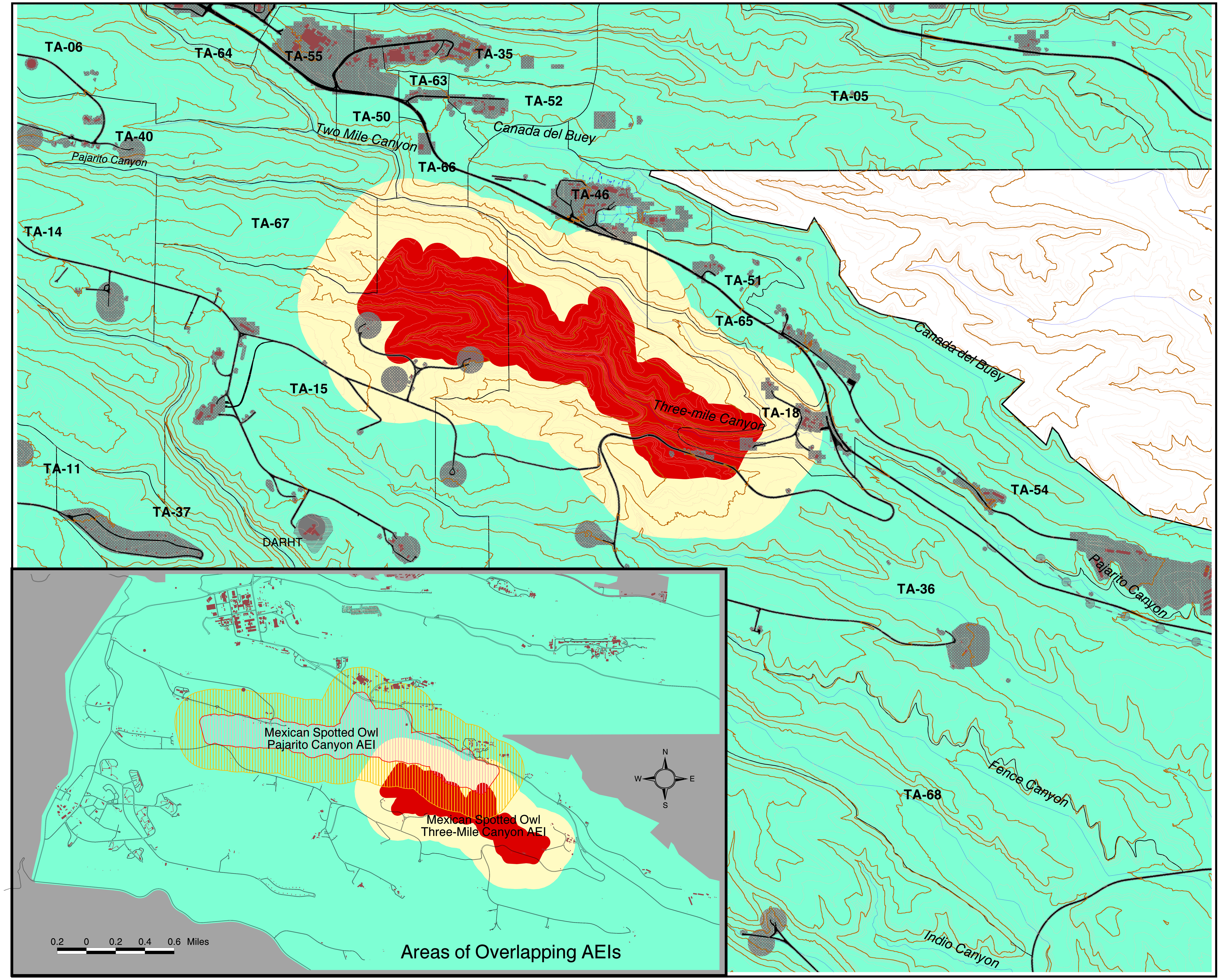
State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett and Mary Salisbury, and Marjorie Wright
Date: January 29,1998
Rev. 3.0
Revised: August 28, 2000
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Back

Overview of Mexican Spotted Owl Three-Mile Canyon AEI



LANL
Technical Area Boundary
Developed Areas
Recent BAs
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Mexican Spotted Owl
Three-Mile Canyon AEI
Core Zone
Buffer

N
W E
S

1:13417

0.4 0 0.4 0.8 Miles

0.5 0 0.5 1 Kilometers

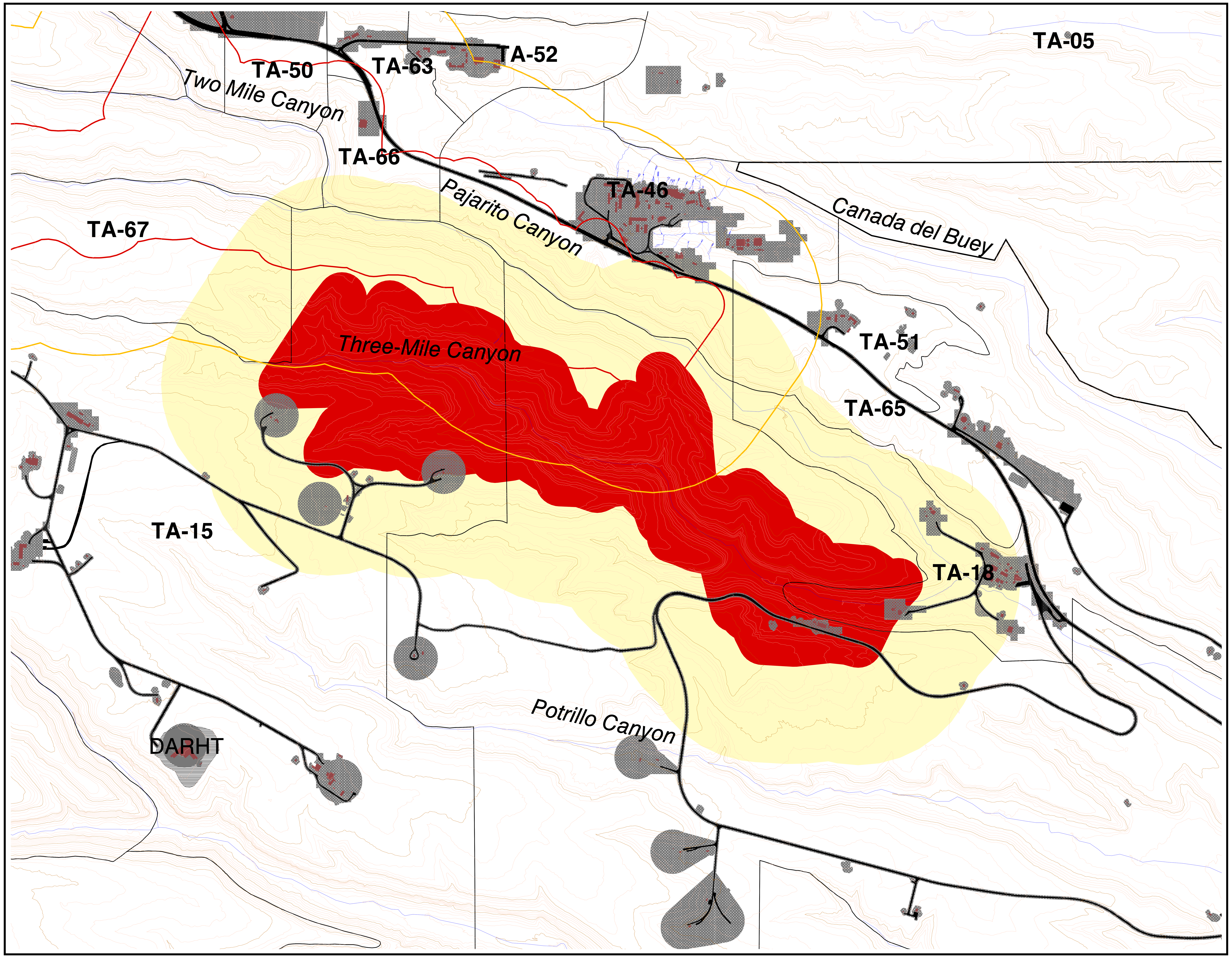
State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett, Mary Salisbury, and Marjorie Wright
Date: January 27,1998
Rev. 3.0
Revised December 10, 1999
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Back

Detailed View of Mexican Spotted Owl Three-Mile Canyon AEI



LANL
Technical Area Boundary
Developed Areas
Recent BAs
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Mexican Spotted Owl
Three-Mile Canyon AEI
Core Zone
Buffer Zone

Areas of Overlapping AEIs
Spotted Owl Core Area
Spotted Owl Buffer Area

N
W E
S

1:7921

0.2 0 0.2 Miles

0.2 0 0.2 0.4 0.6 0.8 Kilometers

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

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Back

Monitoring Plan

for the

Mexican Spotted Owl

Profile

Site Plan

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is “to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved.” To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

The HMP has two associated documents: Area of Environmental Interest (AEI) Site Plans and Monitoring Plans. The AEIs are areas of LANL that are being managed and protected because of their biological or other significance. Habitats of threatened and endangered species that occur or may occur on LANL are designated as AEIs. The essential element of the AEI Site Plan is the management of each species-specific potential habitat through the allowable activities within the AEI. These allowable activities may be both spatially and time constrained and based on occupancy or non-occupancy of the habitat by the species.

These plans contain sensitive information concerning potential habitat for threatened and endangered species. For that reason, these documents are controlled and will be issued only to persons who have a “need to know” and are trained by LANL’s Ecology Group on the elements of the AEI Site Plan. All maps and associated materials should be considered sensitive and maintained as sensitive information.

If you need further information concerning the Endangered Species Program, these AEI Site Plans, or allowable activities, call the Ecology Group or DOE Los Alamos Area Office.

MONITORING PLAN FOR THE MEXICAN SPOTTED OWL

1.0 INTRODUCTION

The monitoring of Federal and State-listed species and local species of concern is an integral piece of the Threatened and Endangered Species Habitat Management Plan (HMP). This monitoring plan provides background information and establishes monitoring protocols for the Mexican spotted owl (*Strix occidentalis lucida*) at Los Alamos National Laboratory (LANL).

2.0 SPECIES DESCRIPTION

2.1 Taxonomy and Range

The range of the Mexican spotted owl extends from the southern Rocky Mountains in Colorado and the Colorado Plateau in southern Utah, southward through Arizona and New Mexico and, discontinuously, through the Sierra Madre Occidental and Oriental to the mountains at the southern end of the Mexican Plateau (USFWS 1993). The Mexican spotted owl has the largest geographic range of the three spotted owl subspecies. Before 1928, spotted owls were known from most of the major New Mexico mountain ranges including the Sangre de Cristo, Jemez, Manzano, Sacramento, Mogollon, Tularosa, San Francisco, San Mateo, and Black Range (USFWS 1993). In the Rocky Mountain region, the Mexican spotted owl is uncommon to rare, local in distribution, and relatively habitat specific (Finch 1992).

In 1990, 91% of Mexican spotted owls occurred on national forests, 4% occurred on Indian reservations, 4% occurred on national parks, and 1% occurred on Bureau of Land Management lands (USFWS 1993). The Mexican spotted owl is known to exist or has the potential to exist on Los Alamos National Laboratory lands (Hinojosa 1997).

The Mexican subspecies is a distinguishable taxon based on allozyme electrophoresis. Additional DNA analysis demonstrates that the current taxonomy of the three subspecies is, at a minimum, valid (Gutierrez et al. 1995).

<u>Scientific designation:</u>

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, SUBCLASS	Aves, Neornithes
ORDER, AND SUBORDER	Strigiformes
FAMILY, AND SUBFAMILY	Strigidae
GENUS, AND SUBGENUS	*Strix*
SPECIES	*occidentalis*
SUBSPECIES	*lucida*

2.2 STATUS DESCRIPTION

The Mexican spotted owl was Proposed Threatened in the November 21, 1991, Federal Register (USFWS 1991). On April 15, 1993, the US Fish and Wildlife Service (USFWS) determined the Mexican spotted owl to be a threatened species under the authority of the Endangered Species Act of 1973, as amended. A Federal Recovery Plan was completed for this subspecies in 1995 (AGFD 1995).

In 1995, the species was listed "Threatened" in Mexico. The subspecies, *S. o. lucida*, was not independently listed in Mexico (AGFD 1995).

The subspecies was listed under the Natural Heritage Global Rank "G3T3" ("G3" = [species listed] "Uncommon or Restricted"; "T3" = [subspecies listed] "Uncommon or Restricted") in 1995 (AGFD 1995).

The spotted owl was recommended for addition to the New Mexico State list as Group 2 (= threatened) in 1994, but has not been currently been listed (NMDGF 1994).

In 1993, spotted owl records for New Mexico total 129 pairs and 85 single birds (USFWS 1993). The USFWS estimated a 1990 population of Mexican spotted owls in the southwestern United States of 806 pairs and 548 singles. The total estimated population was 2160 owls (USFWS 1993).

Mexican spotted owl habitat at LANL has been surveyed each spring beginning in 1994 following the protocol described in this plan. Surveyors found one pair of Mexican spotted owls in each year of the surveys. Based on nest location, surveyors believe this to be the same pair of owls each year.

2.3 HABITAT

These owls may use different forest types for different habits. It appears that mature forests are important to Mexican spotted owls (Ganey and Balda 1994). At the northern edge of their range in northeast Arizona, southwest Colorado, and Utah, Mexican spotted owls may occur year-round at 1320 to 2040 m (4400 to 6800 ft) within the piñon-juniper zone below mixed conifer forests. Mexican spotted owls use a variety of forest types ranging from deciduous riparian woodlands, through piñon-juniper, pine-oak, mixed conifer, and spruce-fir. Fletcher reported 1,346,000 ha (3,365,000 ac) of currently suitable habitat existing in New Mexico and Arizona national forests (USFWS 1993).

Mexican spotted owl nesting occurred most frequently in the mixed conifer community type (16) followed by the pine-oak community type (3). The remaining three nest sites occurred in riparian (2) and white fir (1) communities. The mixed conifer and pine-oak community types were used significantly more than expected based on availability. No nests were found in the ponderosa pine community type although it makes up 40% of Forest Service-estimated suitable habitat in Arizona and New Mexico.

Of 22 nest sites for which sufficient data were available to analyze, none occurred in the ponderosa pine type. Of 83 day roost sites with sufficient data to analyze, only one occurred in the ponderosa pine type. The pine-oak community type, which provides only 8% of the estimated owl habitat, had 18% of the nest sites and 19% of the roost trees. Based on previous studies, the pure ponderosa pine land cover type appears to provide only marginal conditions for nest and roost.

"Witches-broom" and tree stick platforms were the most frequently used nesting substrates (12); tree cavities, mostly in Gambel's oak, were also used frequently (8), and two nests were on cliff ledges. Tree species used were Douglas fir (9), Gambel's oak (6), white fir (3), and ponderosa pine (1) (USFWS 1993). Spotted owls are found in various forest types including: Douglas fir, Hemlock-Sitka spruce, redwood, ponderosa pine, western white pine-larch, lodgepole pine, fir-spruce, aspen/hardwood, and piñon-juniper forests (USDA 1991).

Mexican spotted owl habitat in south-central Chihuahua, Mexico, has become excessively fragmented due to forest overexploitation. For Mexican spotted owls roosting on a study site in south-central Chihuahua, Mexico, the major tree species present included oak (50%), Mexican white pine (15.5%), Douglas fir (13.7%), and Arizona pine (8%) among others. A nesting site in the same area included Mexican white pine (38%), Arizona pine (24%), and aspen (38%) (Tarango 1994).

In a study carried out on three sites in northern Arizona, Mexican spotted owls generally foraged more than or as frequently as expected in virgin mixed conifer and ponderosa pine forests, and less than expected in managed forests. Some of these owls showed a preference for foraging in either virgin mixed conifer or ponderosa pine forests (or both), however, all studied owls roosted primarily in virgin mixed conifer forests. Because roosting owls showed the strongest affinity for these virgin mixed conifer forests, their association with this habitat type may, therefore, be driven primarily by availability of suitable roosting (and nesting) habitat. This habitat type may be more limiting than suitable foraging habitat in northern Arizona. Owls roosted primarily in decadent stands with closed-canopy, high densities of trees and snags, and numerous big logs. Meanwhile, foraging was not limited to such sites. This also suggests a greater selectivity for roosting habitat (Ganey and Balda 1994).

The summer and winter ranges remain the same for all spotted owl subspecies. Only altitudinal migration occurs. Generally, such winter migration is to lower- (though occasionally higher-) elevation forests/woodlands not normally used for breeding. Owls from some areas may move into habitats already occupied by established resident owls (Gutierrez et al. 1995).

Mexican spotted owls are dependent on the presence of large trees, snags, down logs, dense canopy cover, and multistoried conditions within predominantly mixed conifer and pine-oak habitats (AGFD 1996). Mexican spotted owls often use virgin forests in northern Arizona. They consistently avoid managed forests. Such avoidance is more definitive than is the preference for virgin forests. Typically, the managed stands used in this study were uneven-aged (resulting from partial overstory harvests) (Ganey and Balda 1994).

The spotted owl is most common in mature and old growth forests throughout much of its range (Ganey 1992). Habitat characteristics highly sought by Mexican spotted owls include high canopy closure, high stand density, a multilayered canopy, uneven-aged stands, numerous snags, and downed woody matter. These are best expressed in old-growth mixed conifer forests (usually more than 200 years old). These characteristics may also develop in younger stands that are unmanaged or minimally managed, especially when the stands contain remnant large trees or patches of large trees from earlier stands (USFWS 1993).

The vegetative communities occupied by the Mexican spotted owl consist primarily of warm-temperate and cold-temperate forests and, to a lesser extent, woodlands and riparian deciduous forest. The mixed conifer community appears to be most frequently used. The most common overstory trees associated with these owls in these communities are white fir, Douglas fir, and ponderosa pine. Less common species are southwestern white pine, limber pine, aspen, and cork bark fir. The understory, providing important roosting sites for Mexican spotted owls, usually contains the same conifer species found in the overstory plus Gambel's oak, maples, and New Mexico locust. Montane riparian canyon bottoms used by owls in the mixed conifer zone may contain box elder, narrowleaf cottonwood, maples, and alders (USFWS 1993).

Riparian woodlands in the southwest before the 20th century may have satisfied many of the structural and thermal requirements of owl nest and roost sites. Dense cottonwood canopies and willow/mesquite understories may provide the necessary multistoried structure and cool microclimate. High diversity and abundance of prey items in these habitats may have made them suitable breeding sites. Loss of riparian habitat has been most extensive at low and middle elevations. In the last century, Arizona has lost 90% of its low-elevation riparian habitat, and New Mexico has lost 33% of its wetlands, including low-elevation riparian habitat. The importance of low- and mid-elevation riparian woodlands to the owl is unknown. Less high-elevation, montane riparian habitat has been lost than lower elevation habitat, with correspondingly lower impacts to owls. Winter use of low-elevation riparian habitat has been documented. Its importance as a seasonal portion of the home range is unclear. Riparian habitat also may provide significant dispersal corridors between the semi-isolated montane habitat regions. Current studies of dispersal and winter elevational movements will identify the extent and importance of riparian habitat for the owl (USFWS 1993). Ganey and Balda found an average of 398 ha (995 ac) of old-growth forest within the 837-ha (2092-ac) average home range for three pairs of radio-monitored owls in northern Arizona. Fletcher reported an average of 62 ha (154 ac) of old-growth forest within the management territories of 359 spotted owls or owl pairs in Arizona and New Mexico (USFWS 1993). The breeding range (or distribution) of spotted owls is limited to forest communities. Spotted owls are associated with late seral stage conifer forests of high commercial value. Primary spotted owl habitat consists of mixed conifer dominated by Douglas fir, pine, or true fir (*Abies*), and pine-oak forests. Secondarily selected habitats include such features as steep, narrow canyons with cliffs and a perennial water source. Such canyon habitats generally include conifer or riparian forests, or clumps of trees, but also may be sparsely vegetated. Areas chosen for their contiguous forests are strongly selected for old-growth forests or forests that have more complex structure than surrounding forest (Gutierrez et al. 1995).

The winter habitats of Mexican spotted owls include lower-elevation piñon-juniper woodlands. In six studies, eight of 64 radio-marked owls were reported to migrate between breeding and winter ranges. One of the eight, in Utah, moved up in elevation for the winter. Migration distances range from 20 to 50 km (32 to 80 mi) with vertical displacements of 1000+ m (3300+ ft). Migration is variable within areas and among years, and dates varied between individuals. No members of pairs in this study migrated or wintered together. Migration is usually rapid and direct. Other habitats are open mountain-shrub habitat or higher-elevation conifer forests. Radio-marked Mexican spotted owls used unlogged forest more than expected and selectively logged forest less than expected. Thermoregulation has been advanced as a hypothesis for the owl's use of mature and old-growth forest (Gutierrez et al. 1995). Spotted owls generally use forests more and meadows less than great horned owls. This difference was most pronounced for foraging use, as great horned owls frequently foraged along meadow edges (Ganey et al. 1997). The Mexican spotted owl is most common along canyons and steep slopes in old growth mixed conifer or broad-leaved forests, but is also sometimes found in oak or spruce-fir forests (Finch 1992).

Mexican spotted owls may use different forest types for different habits. Spotted owls inhabit canyons, forests, pine-oak woodlands and riparian areas (Hubbard 1978). Mexican spotted owls are found in both xeric and mesic forests (Ganey 1992). Spotted owls may also be found in abandoned mines.

Mexican spotted owls are found in two series of Madrean Evergreen Woodland: the upper oak-pine occurs at 1550 to 2160 m (5500 to 7200 ft), and the lower evergreen oak (encinal) occurs at 1500 to 1950 m (5000 to 6500 ft). Steep slopes typically provide superior spotted owl habitat by virtue of the owl's preference for the topography, rock outcrops and/or cliffs, and the generally cooler microclimates often supporting multilayered mixed conifer forest (USFWS 1993).

The Mexican spotted owl is threatened by destruction and modification of habitat caused by timber harvest and fires, increased predation associated with habitat fragmentation, and lack of adequate protective regulations. Endangered status would not be appropriate because the available data do not indicate that extinction throughout all or a significant portion of the range is an imminent possibility. Approximately 20% of owl habitat has been rendered no longer suitable, with one-half of this habitat loss occurring within the last decade, representing a habitat loss rate close to 1% a year (USFWS 1993).

Roosting Mexican spotted owls studied in south-central Chihuahua, Mexico, showed preferences for pine-oak associations located in northwest- and northeast-facing slopes with an average slope of 71º, average canopy closure of 68%, and presence of downed trees and stumps greater than 90 cm (36 in.) in diameter.

Roosting sites of Mexican spotted owls possess the following characteristics: big logs, high canopy closure (preferably closed), greater densities and basal areas of both trees and snags than random sites; as well as greater canopy closure, big logs, and greater densities of both trees and snags than at foraging sites. The high snag densities found in most roost areas (within the northern Arizona study area) may be a result of the overall decadence of these areas, and not directly tied to owl roosting behavior. Although we have observed some of these owls foraging from and particularly calling from snags, we have rarely observed them to roost in snags (Ganey and Balda 1994). In northern Arizona, consistent selection of dense, closed-canopy forests for roosting may indicate that owls were seeking favorable microclimatic conditions, as suggested by Barrows (Ganey 1992). Frequent cave use, as well as use of north-facing cliffs, by at least one population of the owls in this region, is consistent with this interpretation (Ganey and Balda 1994).

Mexican spotted owls in northern Arizona were generally found to forage in more than one habitat type per night. The northern spotted owl tends to stick to one stand per foraging night (Ganey and Balda 1994). Movement out of canyons indicates a shift during winter from summer-use areas inside the canyons and on cool slopes to warmer areas. In northern Arizona, spotted owls showed that home range sizes (for single owls) varied from 280 to 955 ha (702 to 2386 ac) with an average of 640 ha (1601 ac). The combined home ranges occupied by pairs averaged 837 ha (2092 acres). An average of 66% of a pair's home range was used by both owls. The areas of overlap were the nest area, the primary roost, and the foraging areas. Within the home range, owls appear to have core areas that are consistently used. Core areas of individuals (i.e., where 60% of radio responses occurred) averaged 135 ha (336 ac), and core areas for pairs averaged 164 ha (398 ac). High-use areas tended to correspond to steep slopes. Most Mexican spotted owls remained within their summer home ranges throughout the year. On the Lincoln National Forest, the mean home range size of four pairs was 1164 ha (2909 ac) during winter and spring 1990–1991. Males provide food for the female and young until the owlets are about two weeks old. The female then assists in capturing food for the young (USFWS 1993). In Arizona, home range sizes correlate positively with elevation, percentage of old-growth forest in home range, and total amount of old forest in home range for owls occupying forested habitat. In canyon habitat, home ranges are apparently influenced by topographic features (Gutierrez et al. 1995).

2.4 CHRONOLOGY

Spotted owls are monogamous. A pair begins roosting and interacting together about four to six weeks before egg laying (February to March). Copulation begins two to three weeks before nesting, and occurs frequently before egg laying. Copulation is initiated by the male giving four-note location calls near the female. The female responds with contact calls leading to copulation. The male probably initiates nest site selection before egg laying in March-April.

The Mexican spotted owl most commonly lays eggs in April, but eggs have been found as early as March 2. Clutch size varies from one to three eggs (rarely four) with most broods containing one or two owlets. There is typically only one brood per season, and rarely will a pair re-nest if the first nest fails. Most eggs hatch by the end of May, after approximately 30 days incubation (USFWS 1993). Only the female who roosts at the nest until three to six days before the young fledge carries out incubation. She leaves the nest only briefly during incubation to defecate, regurgitate pellets, defend against conspecifics, or receive prey from the male. The male feeds the female during incubation and the early brooding period. Most young fledge in June, 34 to 36 days after hatching. Hatchlings are nidicolous and altricial, and are covered with white natal down. Eyes open at five to nine days, and juvenile (mesoptile) plumage begins to replace natal down at 10 to 20 days. Activity levels pick up about this time as well. Males provide food for the female and young until the owlets are about two weeks old. The female then assists in capturing food for the young. Young fledge at about 34 to 36 days post-hatching (usually between mid-May and the end of June). Fledgling weights range from about 400 to 450 g (14 to 16 oz.) (in California) at time of nest departure. Young are "semi-independent" by late August or early September (USFWS 1993). Young are fully independent by early October. Both parents care for and roost near young through August (about 60 to 90 days post-fledging).

Immediately after hatching, only the female broods the young. During this time the male brings food to the female. She in turn feeds the young. She broods for 8 to 10 days continuously, then begins leaving young to forage for progressively longer periods. As nestlings age, the female broods less and begins to roost outside of, but near, the nest for longer periods. At this time both male and female feed young directly, though the female will often take food from the male to feed the young. There is little or no nest cleaning. Fecal matter and prey remains are left in place. Spotted owls occasionally breed in their first year. Most pairs do not breed every year; some pairs will not breed for five or six years (Gutierrez et al. 1995).

Spotted owls aggressively respond to imitated vocalizations throughout the breeding season, suggesting that the species is highly territorial with respect to unknown intruders. Territorial disputes between neighbors are rare. Individuals are not as aggressive in rebuffing intruders of the opposite sex and occasionally roost with a member of the opposite sex other than their mate. They will occasionally roost near members of the same sex. Pairs of birds roost together most frequently from March to June, gradually tapering off to rarely roosting together in November to January; after that, roosting together increases again. Other than interacting with mates, spotted owls are solitary. There is a strong territorial defense between barred owls and spotted owls (Gutierrez et al. 1995).

Young sibling spotted owls often roost together, but as they mature, siblings may roost progressively farther apart. Within three days of fledging, young can climb or glide (in steeper terrain) into neighboring trees. Young that leave the nest early, however, may spend up to 10 days on the ground. By August and September, young are able to capture their own prey (though clumsily). Before dispersal (which is obligate), young may unsuccessfully pursue their parents for food. Parents appear to actively avoid young at this stage. By late summer young are independent and they disperse in apparently random directions from natal areas in September and October. By that time they have reached adult weight. Through their first winter, the young tend to wander, remaining in one area for several weeks before moving again or establishing a territory. The young may remain as "floaters" in the territory of a spotted owl pair until the same-sex member of the pair dies. At this point a floater becomes the new holder of the territory (Gutierrez et al. 1995).

2.5 BEHAVIOR

2.5.1 Nesting

Spotted owls do not build their own nests, but depend on suitable naturally occurring nest sites or on nests built by other animals. The female scrapes out a shallow depression in the existing debris of an existing structure. She may add a few feathers. Spotted owls will use artificial nest structures (e.g., artificial cavities). Canopy closure directly over northern spotted owl nests averaged 85% to 95%.

Mexican spotted owls nest in tree cavities and on platforms in Arizona. About 59% of Mexican spotted owls use mistletoe brooms as nests in the Tularosa Mountains of New Mexico. The subspecies also uses cliff nests (i.e., ledges, potholes) more than other subspecies. All of the nest locations found in the Jemez Mountains have been cliff nests.

Though there is documentation of fairly strong fidelity to breeding sites, some spotted owl pairs use alternate nests. There is evidence of strong fidelity to an historic breeding site even when a pair does not nest. Distances between alternate nest sites range from 50 m to 1.2 km (165 ft to .75 mi). Pairs bond generally long-term with sharing of home range throughout the year. Divorce occurs relatively infrequently in northern spotted owl; possibly more common in the Mexican subspecies. A dead or fleeing pair-member is usually replaced (Gutierrez et al. 1995).

2.5.2 Feeding

Spotted owls generally select a perch on which to wait, watch, and listen for prey. Prey is captured by the owl pouncing and grabbing it with talons. Prey may be taken from the ground, from limbs, or from the trunks of trees. Occasionally an owl will hawk for insects and moths; or will hawk and capture bats on the wing. Roosting owls may opportunistically take prey during the day. Prey may be killed either on the ground or on a nearby perch by severing cervical vertebrae with the bill. They frequently mantle prey that has been caught on the ground (Gutierrez et al. 1995).

Spotted owls may select the largest, most available prey but are probably opportunistic to some degree. They cache surplus prey for later use. Such prey is kept in places that offer a cooler microclimate than the surrounding environment during hotter weather. Owls will sometimes roost next to cached prey. They may frequently look about and move to several potential sites before caching. A caching event is usually completed with the owl sitting upright, staring at the cached prey, and slowly walking away backward (Gutierrez et al. 1995).

Most of the owl's activities during the breeding season are believed to occur in the canyons (USFWS 1993).

Woodrats (*Neotoma* spp.) are the most important prey, especially in rock canyon country. Ganey and Balda observed that Mexican spotted owls hunted mainly by moving from tree to tree, spending from a few seconds to several hours watching and listening for prey. They launch their attack at relatively short distances from their prey (USFWS 1993). Another study in progress on the Lincoln National Forest has identified *Peromyscus maniculatus* and *Microtus* spp. as important prey in that forest (USFWS 1993). Small mammals dominate the diet of spotted owls in Arizona, with a few species comprising the bulk of the diet. This was also generally true in other areas where food habits of spotted owls were studied. In Arizona, the most common prey groups were woodrats, white-footed mice, and voles (Ganey 1992).

The range of average prey masses in Arizona (63 to 118 g [2.2 to 4.1 oz]) fell within the range reported by Forsman et al. for spotted owls in different regions in Oregon (54 to 150 g [1.9 to 5.25 oz]). Barrows reported an average prey mass of >100 g (>3.5 oz.) for spotted owls in California (Ganey 1992). The relative abundance of woodrats in the diet appears to vary as a function of habitat. Spotted owls in Oregon preyed heavily on woodrats in xeric forests. In more mesic forests, where woodrats were uncommon, northern flying squirrels (*Glaucomys sabrinus*) comprised the bulk of the diet. In northern Arizona, spotted owls ate fewer woodrats and more voles in mesic high-elevation forest areas (San Francisco Peaks and White Mountains) than in more xeric areas dominated by rocky canyons (Walnut Canyon and Black Mesa). Most woodrats taken were probably either Mexican (*N. mexicana*) or white-throated (*N. albigula*) woodrats, based on distribution and habitat use of these species. These species are most abundant around rock outcrops and cliffs. Most voles taken were probably Mexican (*M. mexicanus*) or long-tailed (*M. longicaudus*) voles, species that are more abundant in the grassy understories of forests in some regions. Annual variation in the diet may indicate that spotted owls respond to changes in prey availability among years (Ganey 1992).

Abundance and availability of food may be a key factor influencing habitat selection in birds in general and in owls in particular. Prey abundance has also been implicated as an important influence on reproduction in many owls. In many areas, only two or three species of prey comprise 70% to 90% of prey biomass in spotted owl diets (Ganey 1992).

The diet of Mexican spotted owls studied in Arizona included at least 19 species of mammals, seven species of birds, two species of reptiles, and an unknown number of insect species. Vertebrates dominated the diet in all five regions studied, comprising 84% to 96% of total prey and 99% of prey biomass. Mammals accounted for 73% to 96% of total prey and 91% to 99% of prey biomass. Owls consumed prey ranging in mass from beetles (*Coleoptera*) and moths (*Lepidoptera*) to adult cottontail rabbits (*Sylvilagus* spp.). Mean prey mass ranged from 63 to 118 g (2.2 to 4.1 oz) in various regions. Woodrats, white-footed mice, and voles accounted for 61% to 83% of the total prey and 59% to 88% of total biomass in various regions. Cottontails and pocket gophers (*Thomomys* spp.) accounted for another 3% to 14% of total prey and 7% to 36% of total biomass. Birds and reptiles contributed little to prey numbers or biomass except in southeast Arizona. Insects were relatively common in the diet (3% to 16% of total prey) but contributed little to prey biomass. Diurnally active mammals such as squirrels and chipmunks (*Sciuridae*) accounted for <3% of total prey or biomass (Ganey 1992).

In general, in the Arizona study, fewer bats and insects were taken during the non-breeding season (September 1 to February 28; Ganey 1992) than during the breeding season, whereas the most common mammalian taxa were taken in relatively high numbers in both seasons.

Neotoma species dominate diets of Mexican spotted owls with regard to biomass. *Peromyscus*, rabbits (*Sylvilagus* spp.), voles (*Microtus* spp.), and bats (*Chiroptera*) can be locally important in specific years or areas (Gutierrez et al. 1995).

Spotted owls occasionally hawk for insects and moths and will hawk and capture bats on the wing. Roosting owls opportunistically take prey during the day. They may use several different sites from which to forage in a single night. Such movement is highest in spring and summer, and lowest during fall and winter (Gutierrez et al. 1995).

Spotted owls eat screech owls (Gutierrez et al. 1995). Foraging sites of Mexican spotted owls possess the following characteristics: more big logs, higher canopy closure, greater densities, and basal areas of both trees and snags than random sites (Ganey and Balda 1994).

At spring/summer roosts, pellet regurgitation is most frequently seen in late afternoon and early evening. The owls may also cast pellets at night while foraging. Most winter pellets are cast at night, away from diurnal roost. Frequency of defecation is unknown, but often an owl defecates just before taking flight. Roosts are frequently identifiable by extensive "whitewash," a sign that defecation is common at diurnal roosts (Gutierrez et al. 1995).

Spotted owls drink from small seeps and creeks.

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

The Mexican spotted owl is a federally listed threatened species. In order for DOE to comply with the Endangered Species Act, we must know the status of the Mexican spotted owl at LANL. We first need to determine if the Mexican spotted owl is present at LANL, and if so, its breeding status.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 1 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change. Some activities are not appropriate to every species and have a ranking of zero. The HMP contains a summary table ranking all species and activities. The following table lists importance rankings for Mexican spotted owl monitoring activities.

Section	Status Tracking	Habitat Analysis and Models	Presence/Absence Surveys	Repro-duction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Ranking	1	1	1	1	1	1	1	3	2

4.1 STATUS TRACKING

The regional status of the Mexican spotted owl should be evaluated annually. Surveyors should attend status update meetings sponsored by the USFWS. Status tracking is a level one activity.

4.2 HABITAT ANALYSIS AND MODELS

LANL canyons with mixed conifer and pine oak habitat have been evaluated as possible Mexican spotted owl habitat. The Mexican spotted owl site plan describes this area in more detail. Habitat analysis is a level one activity.

4.3 PRESENCE/ABSENCE SURVEY

The purpose of this type of survey is to determine the presence or absence of spotted owls. A presence/absence survey is a level one activity. Survey protocols for this region are subject to change as regional protocols are modified.

4.3.1 Survey Locations

Surveys will be conducted in the core areas of the Mexican spotted owl areas of environmental interest annually.

4.3.2 Survey Dates

At least four surveys will be conducted in each field season between April 1 and August 31 of any given year. No more than one survey can be conducted before April 16 of any given year for any particular survey location. The first complete survey must be completed before July 1 of any given year for any given area of habitat. At least three surveys must be completed before August 1 of any given year for any given area of habitat. A survey of one area of habitat must be completed within seven days. The next complete survey can not happen for at least five days and must be started before 21 days has elapsed (e.g., If a survey is completed on May 5, the next compete survey can not begin before May 11 and must begin before May 26). At least two surveys must be completed before the discontinuation of surveys when owls are detected in an area.

Surveys can only be completed when the survey is likely to be effectively completed. Do not conduct field surveys during existing or predicted wind (>15 mph) or during stormy weather. Do not do surveys when there are access problems due to snow or poor road conditions.

4.3.3 Survey Technique

There are three primary techniques that can be used to survey for the Mexican spotted owl. The choice of the calling technique should be based on the best way to cover all of the suitable habitat. The three calling techniques are point, continuous, and leapfrog calling.

In point calling a tape is played at a fixed point. The observer will spend at least 15 minutes at a point and alternate between playing the tape of the owl and listening for a response. The primary four-note location call of the Mexican spotted owl should be the major call played back during surveys. However, the surveyor should occasionally use other types of calls to elicit a response. All owls heard should be noted as to when the call was heard and where the owl is located. Compass triangulation may be required to locate some owls. Once a point is completed, move on to the next point. Points should be approximately 0.8 km (0.5 mi) apart and cover all of the suitable habitat to within 0.8 km (0.5 mi). Point calling is usually done on a road by car in suitable habitat.

In continuous calling a surveyor will walk a route (e.g., the edge of a canyon) and stop irregularly and play the tape and wait for a response. The distance between points is much shorter than in point calling and much less time is spent at each point. All owl responses should be noted.

In leapfrog calling, two people will do a continuous calling route with one vehicle. The first person will begin alternating between calling and listening as the second person drives approximately 0.8 km (0.5 mi) up the road to begin their calling route. Once the first person reaches the vehicle they drive another 0.8 km (0.5 mi) down the road to begin the process over again. This technique will cover more area more quickly. All owl responses should be noted.

The best time to perform calls is at night with the best time being the two hours before sunrise and the two hours after dark. However, the time of the calling and the route through the habitat should be varied to cover the habitat at all times of night.

4.3.4 Required Resources

4.3.4.1 Personnel

Each survey will require two persons for about eight hours. All of the Mexican spotted owl surveys will require two persons for about 200 hours.

Data analysis and report writing will require one person for 10 hours.

4.3.4.2 Equipment

- US Geological Survey (USGS) topographic maps of the area (a marked copy to be attached to survey data sheet). Be sure to ALWAYS submit a copy of a topographic map with the survey area and Mexican spotted owl sightings clearly marked.
- Standardized survey form (bring more copies than you think you need).
- Lightweight tape player (with adequate volume to carry well; use portable speakers if necessary).
- Extra tape player and batteries (dirt, water, dust, and heat often cause equipment failure, and having backup equipment helps avoid aborting a survey due to equipment loss).
- Mexican spotted owl tapes; two or more tapes per surveyor (tapes do get damaged and wear out in the field, extra tapes are very important).
- Clipboard and permanent (waterproof) ink pen (we recommend recording survey results directly on the survey data form, to assure that you collect and record all required data).
- Binoculars and bird field guide.
- Flashlights or headlamps for walking at night.
- Radio or cellular phone for emergencies.

The following equipment is recommended:

- Camera and film (for habitat photos–especially at sites where owls are found).
- Global positioning system unit–for determining survey coordinates and verifying the location of survey plots on topographic maps.
- Survey flagging–for marking survey sites and/or areas where owls are detected.

4.3.4.3 Training

At least one of the surveyors on the team must have taken the USFWS/USFS Mexican spotted owl survey training. It is also advisable that the lead surveyor has accompanied more experienced surveyors before leading a survey. Surveyors should also be familiar, by sight and vocalizations, with other species likely to be found in survey areas that may be confused with Mexican spotted owls. Surveyors should also be able to identify the spotted owl's biggest predators, the great horned owls and northern goshawks, by sight and sound.

4.3.4.4 Permitting

A USFWS permit is required for surveys.

4.3.5 Analysis and Reporting

From USFWS permit: "Fill in all appropriate information on the Mexican spotted owl survey form while still in the field, and mark the location of detections on a copy of the USGS topographic map. Complete nest detection forms and daytime follow-up forms if spotted owls are detected. Record the nest location in UTM coordinates as accurately as possible. Whenever a Mexican spotted owl or its nest site is confirmed, notify the USFWS or appropriate state wildlife agency as soon as you return from the field.

Complete a survey form for each site surveyed, whether or not spotted owls are detected. "Negative data" (e.g., a lack of detections) is important to document absence of spotted owls and to help determine what areas have already been surveyed. Make and retain a copy of each survey form, and submit the original. Survey forms must be returned to the USFWS and/or the appropriate wildlife agency by the specified deadline. Contact the appropriate agency each year to find out the submission deadline date. Timely submission of survey data is a permit requirement, and will ensure the information is included in annual statewide and regional reports."

Ecology Group staff will first notify DOE of any finding or negative data. DOE is responsible for timely notification of USFWS or appropriate State wildlife agency.

4.4 REPRODUCTIVE MONITORING

Reproductive monitoring is a level one activity.

The purpose of reproductive monitoring is to

- determine the breeding status of resident Mexican spotted owls,
- collect productivity and breeding biology information, and
- describe habitat characteristics and habitat use patterns.

Determining the breeding status of resident spotted owls can be accomplished with little disturbance to the spotted owl, and so does not require an additional permit. Collecting productivity and breeding biology information requires nest disturbance that can affect the bird's behavior; therefore additional permitting by USFWS is required.

4.4.1 Survey Locations

Survey locations are areas where Mexican spotted owls were detected during the tape-playback survey.

4.4.2 Survey Dates

Survey dates are between April 1 and August 31.

4.4.3 Survey Technique

To determine the presence of Mexican spotted owls, follow the protocols described in Section 4.3.3. Once the presence of owls has been verified, determine the breeding status of the resident owls.

The protocol for determining the breeding status of resident spotted owls requires locating the nest and mousing (e.g., feeding a mouse to an owl and following the owl and noting its behavior) to determine the presence of young. Daytime follow-up and nest detection forms should be used in the locating of spotted owl nests.

4.4.4 Required Resources

4.4.4.1 Personnel

Each survey will require two persons for about eight hours. All of the Mexican spotted owl surveys will require two persons for about 200 hours.

Data analysis and report writing will require one person for 10 hours.

4.4.4.2 Equipment

Same as in Section 4.3.4.2.

4.4.4.3 Training

Same as in Section 4.3.4.3.

4.4.4.4 Permitting

Same as in Section 4.3.4.4.

4.4.4.5 Analysis and Reporting

Same as in Section 4.3.4.5.

4.5 CONTAMINANT STUDIES

This is a level one activity. The prey of the Mexican spotted owls should be tested to determine any possible chances of contamination from eating prey. The water is sampled for contaminants and this, in addition to prey, should be used to analyze the possible food web pathways for contamination reaching this species.

4.6 ECORISK STUDY

This is a level one activity. An ecological risk assessment on the Mexican spotted owl at LANL has been prepared. The general approach for performing this assessment is to make a quantitative appraisal of the potential effects that soil contaminants might have on the species when introduced through the soil ingestion pathways using the quotient method prescribed by the US Environmental Protection Agency.

4.7 PREY-BASE STUDIES

This activity is a level one activity. Through the collection of owl pellets, an analysis of the food that has been eaten by the spotted owl is currently under way. Although this will not give a complete picture of the diet of the spotted owl, it will give a good estimation of the varieties of food being eaten by the spotted owl at LANL.

4.8 TRACKING OF INDIVIDUALS

This is a level three activity. Individual Mexican spotted owls can be uniquely marked with highly visible colored and numbered bands. The presence of marked individuals opens the door to a wide range of studies, including studies on territory size and plasticity, polygamy, double-brooding, return rate, and migration. The risk of take versus the benefit derived by marking individuals may be too high to recommend this procedure at this time. It is also possible to photograph the owls each year and attempt to determine individuals from this record.

4.9 REGIONAL STUDIES

This is a level two activity. Any data collected on Mexican spotted owl must be reported to USFWS.

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Back To "Birds"

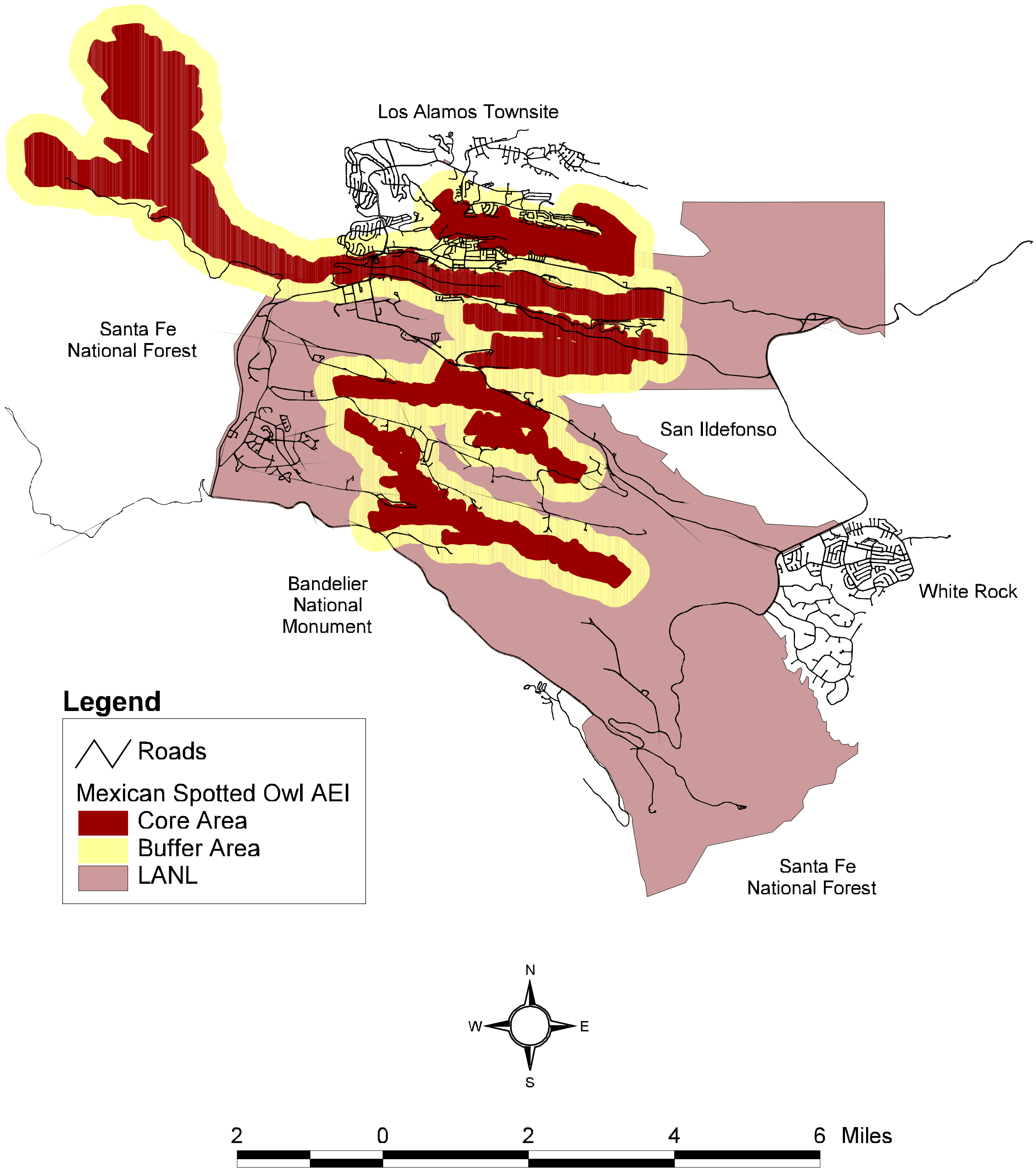
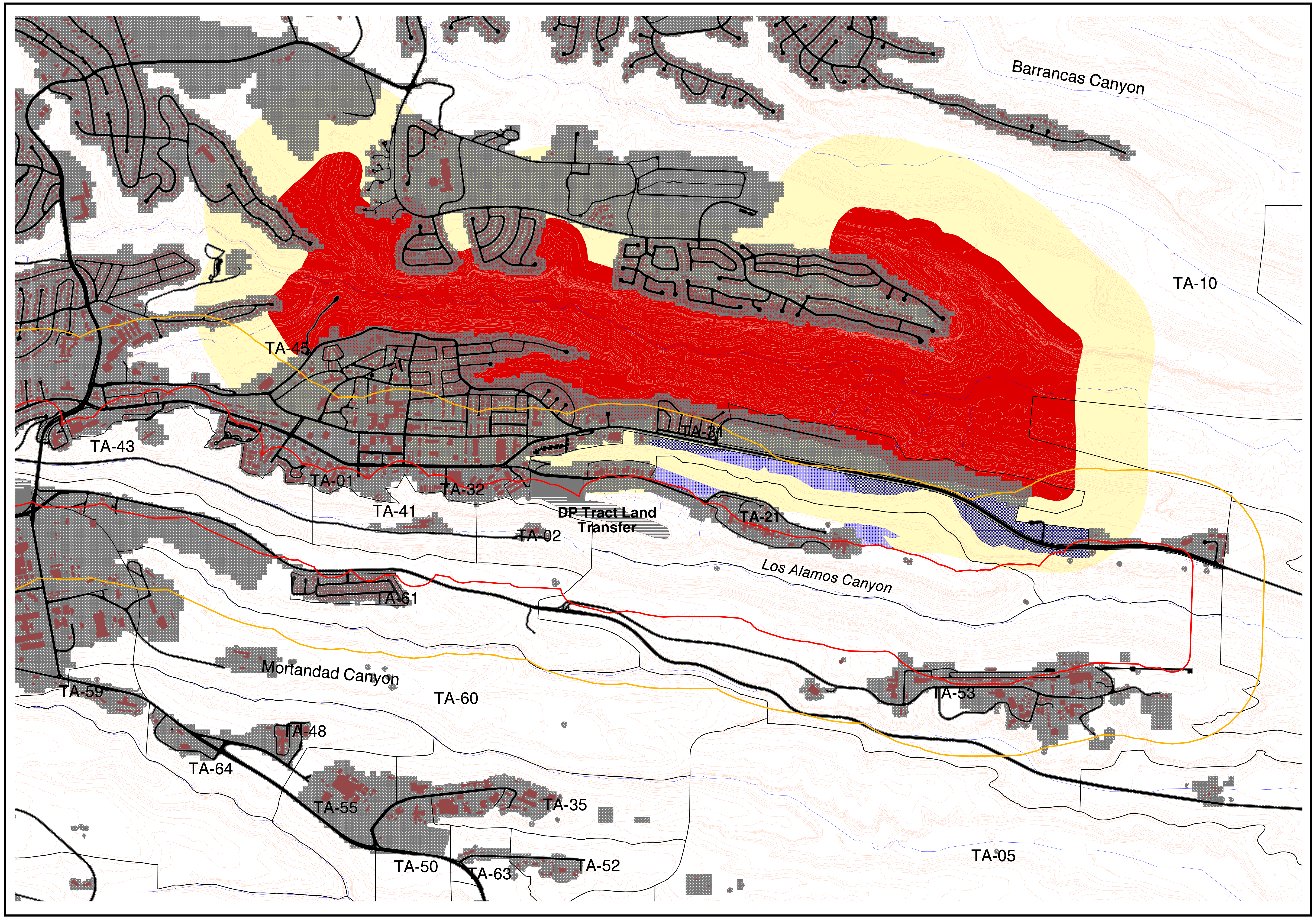


Figure 3.1. Location of Mexican Spotted Owl AEIs.

Back

Detailed View of Mexican Spotted Owl Pueblo Canyon AEI



State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Produced by: Kathryn Bennett, Mary Salisbury, and Marjorie Wright
Date: January 27,1998
Rev. 5.0
Revised: December 14, 1999
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Back

Threatened and Endangered Species Habitat Management Plan

Area of Environmental Interest

Site Plan

for the

Mexican Spotted Owl

Los Alamos National Laboratory
Ecology Group (ESH-20)

April 2000

CONTENTS

LIST OF FIGURES

LIST OF TABLES

Tables in Text

Tables in Appendix

LIST OF MAPS

AREA OF ENVIRONMENTAL INTEREST
SITE PLAN FOR THE MEXICAN SPOTTED OWL

1.0 SPECIES DESCRIPTION—MEXICAN SPOTTED OWL

1.1 STATUS

On March 16, 1993, the United States Fish and Wildlife Service (USFWS) determined the Mexican spotted owl (*Strix occidentalis lucida*) to be a threatened species under the authority of the Endangered Species Act of 1973 (ESA), as amended. The effective date of this listing of the Mexican spotted owl was April 15, 1993 (USFWS 1993). In 1995, the USFWS released its final recovery plan for the spotted owl (USFWS 1995).

1.2 GENERAL BIOLOGY

The Mexican spotted owl is found in northern Arizona, southeastern Utah, and southwestern Colorado south through New Mexico, west Texas, and into Mexico. It is the only subspecies of spotted owl recognized in New Mexico (USFWS 1995).

The Mexican spotted owl generally inhabits mixed conifer and ponderosa pine (*Pinus ponderosa*)-Gambel oak (*Quercus gambelli*) forests in mountains and canyons. High canopy closure, high stand diversity, multilayered canopy resulting from an uneven-aged stand, large, mature trees, downed logs, snags, and stand decadence as indicated by the presence of mistletoe are characteristic of Mexican spotted owl habitat. Some spotted owls have been found in second-growth forests, i.e., younger forests that have been logged; however, these areas were found to contain characteristics typical of old-growth forests. No spotted owls were found in forests less than 36 years of age (USFWS 1995). Mexican spotted owls in the Jemez Mountains seem to prefer cliff faces in canyons for their nest sites (Johnson and Johnson 1985, T. Johnson, pers. comm.). The recovery plan for the Mexican spotted owl recommends that mixed conifer and pine-oak woodland types on slopes greater than 40% be protected for the conservation of this owl.

A mated pair of adult spotted owls may use the same home range and general nesting areas throughout their lives. A pair of owls requires approximately 800 ha of suitable nesting and foraging habitat to ensure reproductive success. Incubation is carried out by the female. The incubation period is approximately 30 days, and most eggs hatch by the end of May. Most owlets fledge in June, 34 to 36 days after hatching (USFWS 1995). The owlets are "semi-independent" by late August or early September, although juvenile begging calls have been heard as late as September 30. Young are fully independent by early October. The nonbreeding season runs from September 1 through February 28 (Ganey 1992). Although seasonal movements vary among owls, most adults remain within their summer home ranges throughout the year.

The diet of the Mexican spotted owl consists primarily of small rodents and rabbits with lesser amounts of reptiles, birds, and insects. A majority of the prey consumed by the Mexican spotted owl during the nesting season probably comes from a relatively small area surrounding the nest site. Ganey and Balda (1994) found core areas of individuals (i.e., where owls spent 60% of their time) averaged 134 ha, and core areas for pairs averaged 160 ha. High use areas tended to correspond to steep slopes. Common Mexican spotted owl prey species in the mixed conifer cover types in canyons with cliffs in the Los Alamos National Laboratory (LANL) area and their general abundance are listed in Table A.1.1 in the appendix (D. Keller unpub. data).

1.3 THREATS

The Mexican spotted owl was listed as threatened because of destruction and modification of habitat caused by timber harvest and fires, increased predation on owls associated with habitat fragmentation, and a lack of adequate protective regulations (USFWS 1993).

2.0 IMPACT OF HUMAN ACTIVITIES

2.1 INTRODUCTION

The primary threats to Mexican spotted owl on LANL property are (1) impacts on habitat quality from LANL operations and (2) disturbance of nesting spotted owls. In this section, we review and summarize scientific knowledge of the effects of various types of human activities on Mexican spotted owl and provide an overview of the current levels of activities at LANL.

2.2 IMPACTS ON HABITAT QUALITY

2.2.1 Development

The type of habitats used by Mexican spotted owls, late seral stage forests with large trees, are usually not found in large quantities near developed areas or near areas that have had recent agricultural or forest product extraction land uses. Therefore, Mexican spotted owls are generally not found near developments. Whether it is the development itself or a lack of suitable habitat that discourages colonization of these areas by Mexican spotted owls is not known.

Property at LANL varies from remote isolation to heavily developed and/or industrialized. Most of the large developed areas at LANL are found on mesa tops, generally in the northern and western portion of LANL. There has been a limited amount of development by LANL in Los Alamos Canyon and by the County of Los Alamos in Pueblo Canyon. LANL is bounded by developed residential, industrial, and retail areas along its northern boundary (the town of Los Alamos) and by residential and retail development along a portion of its eastern boundary (the town of White Rock). Three major paved roads traverse LANL from northeast to southwest. Pueblo, Sandia, and Pajarito Canyons have paved roads along at least a portion of each canyon.

2.2.2 Contaminants

There is no specific information on the impact of contaminants on Mexican spotted owl, although experience with other raptor species suggests that exposure to polychlorinated biphenyls (PCBs), DDT and its derivatives, and other organophosphate or organochlorine pesticides would probably be harmful (Cain 1988). Exposure to other contaminants could be harmful (Cain 1988).

In describing general conditions of contaminants at LANL, we have used the Environmental Surveillance and Compliance Report containing data from 1996 (ESP 1997). LANL conducts annual monitoring of air quality, surface water, groundwater, sediments, soils, and foodstuffs for levels of radionuclides, metals, and some organics (ESP 1997).

2.2.2.1 *Air Monitoring*

Air quality is monitored for tritium; americium-241; plutonium-238 and -240; and uranium-234, -235, and -238. During 1996, air concentrations of these radionuclides were well below applicable guides and limits.

2.2.2.2 *Groundwater Monitoring*

Groundwater samples are taken from the main aquifer underlying Los Alamos and from water supply wells. Trace levels of tritium are present in test wells in a few areas where former or present liquid waste discharges occurred. These include Los Alamos, Pueblo, and Mortandad

Canyons. The highest level of tritium detected was about 2% of the drinking water standard, and is not believed to pose a health risk. Waters near former or present effluent discharge areas show the effects of these discharges; however, radionuclide activities are below Department of Energy (DOE) dose concentration guidelines for public exposure.

2.2.2.3 *Surface Water Monitoring*

The Laboratory Environmental Surveillance Program annually surveys surface water for levels of radionuclides, water quality parameters, and metals (ESP 1997). All radionuclide results for 1996 were below the DOE derived concentration guides for public dose. None of the surface water chemistry results exceeded water quality guidelines except for some pH measurements above 8.5. High levels of barium were detected in Water Canyon, Cañada del Buey, and Ancho Canyon. Mercury levels above New Mexico wildlife habitat stream standards were detected in DP Canyon. Aluminum, iron, and manganese concentrations exceed Environmental Protedtion Agency (EPA) secondary drinking water standards at most locations attributed to naturally occurring metals. Selenium values exceeded the New Mexico wildlife habitat stream standard at numerous locations. High explosives were detected in Frijoles and Water Canyons.

2.2.2.4 *Sediment Monitoring*

Sediments also are annually collected and tested for radionuclides and metals, and some samples are tested for organics. The majority of sediment samples collected outside known radioactive effluent release areas were within background levels that reflect worldwide fallout. Sediment samples from effluent release areas, including Acid, Pueblo, DP, Los Alamos, and Mortandad Canyons, exceeded worldwide fallout levels for tritium, strontium-90, cesium-137, plutonium, and americium-241. Sediments from Cochiti Lake had detections or possible detections of strontium-90, cesium-137, and plutonium. The only radioactive contaminant level that exceeded screening action levels was cesium-137 in Mortandad Canyon. Screening action levels identify the presence of contaminants at levels of concern to human health and are derived from toxicity values and exposure parameters using data from the EPA (ESP 1997). None of the sediment samples tested for organics (approximately 1/6 of the samples) showed any significant accumulations of metals or organic compounds (including PCBs). Testing outside of the surveillance program has detected PCBs in Sandia Canyon (Fresquez 1992, Bennett and Biggs unpub. data).

2.2.2.5 *Biota Monitoring*

Wildlife such as large game animals, small mammals, birds, and other species are sampled for contaminants on a project-specific basis. Results of projects that are applicable to specific Areas of Environmental Interest (AEIs) will be discussed in an AEI's description.

2.2.2.6 *Potential Contaminant Release Sites*

LANL's Environmental Restoration (ER) Project is responsible for characterizing potential threats to human health and the environment from past LANL operations and mitigating those threats through corrective actions that comply with applicable environmental regulations. The ER Project has identified over 2000 sites on LANL that potentially are a source of contaminants. These potential release sites (PRSs) were identified from historical records, area surveys, aerial photos, and interviews with current and former Laboratory employees. PRSs represent potential areas of legacy wastes from historical operations that have been discontinued. They do not represent current permitted and regulated operations. Most PRSs are regulated under the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation, and Liability Act. Descriptions of specific AEIs contain a list of the PRSs occurring in or near that AEI, the type of PRS, and their current status. The data presented come from the ER Project database maintained in the Facility for Information Management, Analysis, and Display at LANL.

2.2.2.7 *Ecorisk Assessment*

Gallegos et al. (1997) and Gonzales et al. (1997b) conducted a preliminary screening risk assessment of the Mexican spotted owl at LANL using soil contaminant data collected for the ER Project. These samples were analyzed for inorganic, organic, and radioactive contaminants. The Mexican spotted owl risk assessment used toxicity reference values (TRVs) obtained from the literature and laboratory studies to quantify the risk of nonradionuclide contaminants to animals. However, these TRVs are not available for radionuclides. Therefore, human risk standards were used. Gallegos et al. (1997) estimated that these standards are 185 to 3650 times more protective of biota than standards proposed by the International Atomic Energy Agency. However, the assumption that wildlife species are adequately protected if humans are has not been tested (Gallegos et al. 1997a).

The Mexican spotted owl risk assessments were centered around the Cañon de Valle Mexican Spotted Owl AEI and the Los Alamos Canyon Mexican Spotted Owl AEI. A hazard index (HI) <1.0 indicates no appreciable impacts from contaminants, and a HI between 1.0 and 10.0 indicates a small potential for impacts from contaminants. The range in mean HI values for different foraging scenarios was 0.06 to 0.9. These values represent the mean for 100 nest sites. The maximum HI for any one nest site was 1.24. The highest mean HI of 0.9 indicates an acceptably low risk of impact in the areas examined. We are currently verifying the accuracy and latest findings of ER Program sampling data upon which the risk estimations are based.

2.2.3 Disturbance

2.2.3.1 *Pedestrians and Vehicles*

We do not have any specific information on the reactions of Mexican spotted owls to pedestrians and vehicles. Based on work with other raptors, Mexican spotted owls would probably be disturbed by the approach of either pedestrians or vehicles. At an equal distance, pedestrians are frequently more disturbing to raptors than vehicles (Grubb and King 1991).

Many canyon bottoms and mesa tops at LANL have dirt roads traversing them. Most of these roads are gated. However, many of these roads are accessible to LANL employees and the public on foot or by bike. Some areas, such as Los Alamos Canyon and the portion of LANL east of State Road 4, are frequently used by hikers and people exercising dogs.

2.2.3.2 *Aircraft*

Ground-based disturbances appear to impact raptor reproductive success more than aerial disturbances (Grubb and King 1991). In studies of raptor reaction to aircraft noise not previously experienced, researchers found that the birds flushed when the stimuli were an average of 60 m from the nest or roost location (Craig and Craig 1984). Delaney et al. (1997) found for Mexican spotted owls that chainsaws consistently elicited higher response rates than helicopters at similar distances. Responding to helicopters, 50% of owls flushed at 30 m, 19% at 60 m, 14% at 105 m, and none at distances greater than 105 m. Owls showed no response to helicopters at all when helicopters were >660 m away. Owl flush rates did not differ between nesting and non-nesting seasons. Distance was generally a better predictor of spotted owl response to helicopter overflights than sound level.

LANL is restricted airspace, and it is very unlikely that planes would be flying less than 2000 ft above ground level except in an emergency situation, such as wildfire. The County of Los Alamos operates an airport along the northern edge of LANL. The airport is located on the southern rim of Pueblo Canyon. Currently there are no scheduled commercial flights from the airport, although that may change. Most flights approach and depart to the east of the airport, over the Rio Grande.

2.2.3.3 *Explosives*

We do not have any specific information on the reaction of Mexican spotted owls to explosives detonation. Andersen et al. (1990) found that when a variety of diurnal raptors were exposed to military training exercises (including helicopter overflights, simulation of heavy weapons firing, and encampments of up to several hundred people) in August, birds shifted the centers of their home ranges, and some birds abandoned the area altogether. Explosive blasts set off 120 to 140 m from active prairie falcon (*Falco mexicanus*) nests caused perched prairie falcons to flush from perches 79% of the time, and in 26% of the cases, caused incubating prairie falcons to flush from nests. Measured sound levels at aerie entrances during blasts ranged from 129 to 141 dB. Explosives blasting for dam construction 560 to 1000 m from active prairie falcon nests caused a change in behavior 26% of the time, and birds flushed in 17% of all cases. No incubating birds flushed (Holthuijzen et al. 1990). Impulse sound levels over 110 dB may cause physical discomfort for humans (Bowles 1995). Holthuijzen et al. (1990) found that a 167-g charge of Kinestik produced noise levels between 138 and 141 dB at 100 m, and that a 500-g charge of TNT produced noise levels between 144 and 146 dB at 100 m. A 20-kg charge of TNT produced noise levels that measured 163 dB at 100 m (Paakkonen 1991).

Measurements of noise levels during explosives testing (quantities of high explosives ranged from 4.5 to 67.5 kg of TNT during six shots) were made at three locations at LANL. Noise levels increased during the test from a background level of 31 dB(A)[1] to a range between 64 and 71 dB(A) during shots at a distance of 1.8 km. At a distance of 4.3 km, noise levels rose from a background range of 35 to 64 dB(A) to a range of 60 to 63 dB(A) (Vigil 1995). At a distance of 6.7 km, noise levels rose from a background range of 38 to 51 dB(A) to a range of 60 to 71 dB(A) (Burns 1995). Keller and Risberg (1995) estimated that the noise from a shot at the Dual-Axis Radiographic Hydrodynamic Test (DARHT) facility would be 150 dB(A) at the source and 80 dB(A) at 400 m.

2.2.3.4 *Other Sources of Noise*

We do not have good information on the effects of noise on the owls. Delaney et al. (1997) reported that using chainsaws and helicopters as noise sources, Mexican spotted owl flush frequency increased as distance of the stimulus from the owl decreased, regardless of the stimulus type or season. They recorded no flushes when the stimulus was >105 m from the owl, again regardless of the stimulus type.

Delaney et al. (1997) tested the response of Mexican spotted owls to chainsaws and helicopters at varying distances from nest and roost sites. They found that the duration of the response of owls to chainsaws was consistently longer than for helicopters, and the time to alert was 3 to 10 times faster for chainsaws than for helicopters. Owls flushed 83% of the time when chainsaws were <30 m away, 67% of the time when chainsaws were 31 to 45 m away, 30% of the time between 46 and 60 m away, and 6% of the time 61 to 105 m away. No owls flushed when chainsaws were >105 m away.

Construction and maintenance operations at LANL are fairly common. In addition, a need for increased monitoring of groundwater has resulted in the drilling of shallow and deep test wells. Future planned fuels management operations will require the use of chainsaws.

Major noise-producing activities at LANL include automobile and truck traffic and noise associated with office buildings, construction activities, a live-fire range, and explosives testing.

[1] Sound can be measured as decibels (dB), C-weighted dB (dB(C)), or A-weighted dB (dB(A)). The dB(A) measurement best resembles the response of the human ear by filtering out lower and higher frequency sound not normally heard by the human ear.

In addition, there is noise associated with aircraft traffic at the County airport. Huchton et al. (1997) conducted a study of noise levels in canyons at LANL. They found that the primary sources of noise exceeding 55 dB(A) were cars and trucks. Readings taken near flowing water were up to 11 dB(A) higher than readings taken elsewhere. The average dB(A) in canyons near paved roads ranged from 41 to 62 dB(A), with maximum values ranging from 62 to 74 dB(A). Away from paved roads 1.6 km or more, average dB(A) in canyons ranged from 37 to 50 dB(A), with all but one average beneath 45 dB(A). Maximum dB(A) away from paved roads ranged from 38 to 76 dB(A) (76 dB(A) was measured during a thunder clap). A bird singing in a canyon was measured at 43 dB(A), relative to a background measurement of 37 to 40 dB(A) (Keller and Risberg 1995).

Keller and Foxx (1997) made sound measurements at successive distances from an industrial area near a canyon rim, into the canyon, and to the opposite rim. Background dB(A) values ranged from 61 at the canyon rim, to 60 within the canyon, and to 62 at the bottom of the canyon near a stream. A truck horn blown at the rim of the canyon created a source sound of 121 dB(A). Sound levels measured during the horn blowing approached background levels at 50 m down the slope of the canyon. A similar test on a mesa top near a developed area found that the noise from the truck horn decreased to near-background (61 dB(A)) levels within 40 m from the source. Keller and Risberg (1995) estimated the maximum noise associated with construction operation of heavy machinery would be 110 dB(A) at the source, and average construction noise levels would be 93 dB(A) at the source.

Noise measurements taken at the Los Alamos County Airport (near the runway) during the maximum use time (06:30 to 07:30) had background values averaging 54 dB(A). Noise during plane arrivals ranged from 47 to 63 dB(A). No measurements were taken during take-offs. The maximum A-weighted sound level for Lear jets, the noisiest airplane currently using the airport, has been estimated as 94.7 dB(A) on approach and 84.7 dB(A) on take-off (USDOT 1996). Sound measurements made in the bottoms of Pueblo and Bayo Canyons ranged from 37 to 40 dB(A) in most areas of the canyon. At the sewage plant parking lot during a working day, the average dB(A) during a three-minute period was 46 (range 45 to 49), and, at the intersection of the road going into Pueblo Canyon with State Road 502, the average dB(A) during a three-minute period was 60 (range 41 to 70).

Overall, these studies appear to show that areas adjacent to or within developed areas or paved roads are likely to have daytime average background noise levels between 40 and 63 dB(A). More undisturbed areas are likely to have average background noise levels between 30 and 50 dB(A). Higher noise levels may be associated with the airport, explosives testing, or construction activity.

2.2.3.5 *Artificially Produced Light*

We have no information on the effects of artificially produced light on Mexican spotted owls. Under the Los Alamos County Code, commercial site development plans are reviewed to ensure that lighting serves the intended use of the site while minimizing adverse impacts to adjacent residential property (Section 17.14.040G). Section 17.40.060 of the County Code includes light source measurement limitations in terms of strength of light in foot-candles (ftc). The code allows off-site light to be 0.5 ftc in residential areas. By comparison, full moonlight measures 0.1 ftc. A crescent moon was measured at 0.01 ftc.

Preliminary surveys were conducted for light levels within Los Alamos Canyon at the Omega Reactor (Keller and Foxx 1997). Omega Reactor is brightly lighted for purposes of security; therefore, total light intensity is greater than the average street lighting. Measurements were made at a light pole with an open parking lot at the reactor as the source. Trees did not obscure the area. Using the relationship of light intensity reducing as a square of the distance, calculations using the field data (Table A.2.1) indicate that at 30 m the light levels would be equivalent or nearly equivalent to full moonlight.

3.0 AEI GENERAL DESCRIPTION FOR MEXICAN SPOTTED OWL

3.1 DESCRIPTION OF A MEXICAN SPOTTED OWL AEI

An AEI consists of two areas—a core area and a buffer area. The core of the habitat is defined as suitable canyon habitat from rim to rim and 100 m out from the top of the canyon rim. The buffer area is 400 m wide extending outward from the edge of the core area. Although adult Mexican spotted owls may be found within their home range anytime throughout the year, the primary threat from disturbance to the owls is during the breeding season when owl pairs are tied to their nest sites. Therefore, management of disturbance in Mexican spotted owl AEIs is concentrated on the breeding season.

3.2 METHOD FOR IDENTIFYING A MEXICAN SPOTTED OWL AEI

The location of each Mexican spotted owl AEI was identified using habitat models and ground truthing. Johnson (1988) developed a model to classify nesting and roosting habitat for Mexican spotted owls in the Jemez Mountains based on topographic characteristics and vegetative diversity. Topographic characteristics were calculated from a 30-m resolution Digital Elevation Model, and vegetative diversity was estimated from Landsat satellite imagery. Pixels were 30 m by 30 m. Johnson's model used scores from 18 known owl nest or roost locations in nine territories to classify areas of unknown quality. To additionally verify the model, we compared Johnson's results to a different model that identified slopes >40% in mixed conifer and ponderosa pine cover types at LANL. We concluded that areas in Johnson's model that were over five contiguous pixels and above 1980 m in elevation were potentially suitable habitat for Mexican spotted owls on LANL. In cases where previous knowledge caused us to believe that areas identified as suitable were not because of the forest cover (for example, in the La Mesa burn area), we conducted ground surveys to determine actual cover type. Where suitable habitat was identified, we used a canyon rim coverage on the geographic information system (GIS) to draw core areas extending outward 100 m on mesa tops from the canyon rims.

3.3 LOCATION AND NUMBER OF MEXICAN SPOTTED OWL AEIs

There are six Mexican spotted owl AEIs on LANL (Figure 3.1). In general, the AEI cores are centered in canyons on the western side of LANL. The canyons with AEIs are Cañon de Valle, Pajarito, Los Alamos, Pueblo, Sandia-Mortandad, and Three-Mile.

4.0 AEI MANAGEMENT

4.1 OVERVIEW

This AEI management section provides guidelines for LANL operations to reduce or eliminate the threats to Mexican spotted owls from (1) habitat alterations that reduce habitat quality and (2) disturbance of breeding or potentially breeding owls. Habitat alterations are considered for all AEIs and for both core and buffer areas. Activities causing disturbance—hereafter referred to as "disturbance activities"—to owls are considered only for occupied AEIs and only for impacts on core areas. Developed areas (see definition below) that have ongoing baseline levels of activities and are not suitable habitat for Mexican spotted owls have different restrictions than undeveloped core or buffer areas. Therefore, the location of the disturbance activity within the AEI, the occupancy status of the AEI, and the type of activity all affect whether or not the activity is allowable. Remember, AEIs for different species may overlap, and an activity must meet the guidelines of all applicable site plans to be allowable. Protective measures are described as management practices that should be followed when working in AEIs.

4.2 DEFINITION AND ROLE OF OCCUPANCY IN AEI MANAGEMENT

Summary: **The occupancy status of an AEI affects what disturbance activities are allowable in different areas (core, buffer, developed) of the AEI. All Mexican spotted owl AEIs are considered occupied during 1 March through 31 August or until surveys show the AEI to be unoccupied. See the Activity Table (Section 4.8.2) for restrictions on occupied undeveloped core and buffer areas, and see the developed area section (Section 4.3) for restrictions on developed areas.**

Occupancy simply refers to whether or not an AEI is occupied during a species' period of sensitivity. For Mexican spotted owls, we are primarily concerned with protecting the owls from disturbance during the breeding season. Because individuals may colonize suitable habitat, all Mexican spotted owl AEIs are treated as though they are occupied from 1 March through 31 August or until surveys show an AEI to be unoccupied. Spotted owl surveys are conducted during April, May, and June. In general, surveys in areas with ongoing or proposed projects are completed by May 15. If a nest is located during surveys, then the AEI can be treated as unoccupied except for the area within a 400-m radius of the nest site. Because spotted owls are not as sensitive to disturbance during the nonbreeding season, Mexican spotted owl AEIs are treated as unoccupied from 1 September to 28 February.

The occupancy status of an AEI affects what activities are allowable in the AEI. Although activities causing habitat alterations are restricted in all AEIs, disturbance activities are restricted only in occupied AEIs. The Activity Table (Section 4.8.2) tells when and what level of disturbance activities are allowed in occupied Mexican spotted owl AEIs under the guidelines of this site plan. Contact the Ecology Group (1-505-665-8961) or DOE (1-505-667-8690) to find out the current occupancy status of an AEI.

4.3 DEFINITION AND ROLE OF DEVELOPED AREAS IN AEI MANAGEMENT

Summary: **Habitat alteration is not restricted in developed areas unless it impacts undeveloped core areas of an AEI (e.g., noise and light impacts on a core). Current ongoing disturbance activities are not restricted in developed areas. Disturbance activities not currently ongoing are restricted when impacts occur to undeveloped occupied core areas of an AEI.**

Developed areas include all building structures, paved roads, improved gravel roads, paved and unpaved parking lots, and firing sites. The current extent of developed areas in each AEI was determined using two methods. First, we placed a 15-m border around all buildings and parking lots. For paved and improved gravel roads, the developed area was defined as the area to a roadside fence, if one exists within 9 m of the road, or 4.5 m (15 ft) on each side of the road, if there is no fence within 9 m. If an area of highly fragmented habitat was enclosed by roads, a security fence, or connected buildings, that area was also classified as developed. Developed areas at firing sites were defined as a circle with a 91.4-m radius from the most centrally located firing pad. Second, we overlaid scanned orthophotos on a base map of the Los Alamos area and digitized by hand all areas that appeared developed. These two information sources were overlaid and combined, so that areas that were classified as developed by either method were considered developed in our final maps and analyses. Some areas were ground-truthed, such as the firing sites. Developed areas are contained in the Habitat Management Plan GIS database, and are designated as gray on maps prepared for the Habitat Management Plan.

Developed areas are located in the core and/or buffer of some AEIs. However, developed areas do not constitute suitable habitat for Mexican spotted owl. Current ongoing activities in developed areas constitute a baseline condition for the AEIs at this time and are not restricted. New activities including further development within already existing developed areas are not restricted unless they impact undeveloped portions of an AEI core. For example, if light or noise from a new office building in a developed area were to raise levels in an undeveloped core area, those light and noise levels would be subject to the guidelines on habitat alterations. If a proposed action within a developed area does not meet site plan guidelines, it must be individually reviewed for ESA compliance.

Building a new structure or clearing land within a previously designated developed area in an AEI core does not add to the size of the developed area. New structures in core areas will not be given any developed-area border unless they are individually reviewed for ESA compliance.

Development occurring in the developed area in an AEI buffer can be given a 15-m developed-area border at the discretion of the project leader or facility manager. To add to the size of a developed area in a buffer based on new developments, contact the Ecology Group (1-505-665-8961). Any land that is added to a developed area will be subtracted from the cumulative total development allowed in the buffer area for that AEI.

4.4 GENERAL DESCRIPTION OF BUFFER AREAS AND ALLOWABLE BUFFER AREA DEVELOPMENT

Summary: **Limited future development is allowed in the currently undeveloped DOE-controlled buffer area under the guidelines of this site plan as long as it does not alter habitat in the undeveloped AEI core (including light and noise guidelines). Development beyond the cap established for each AEI, or greater than 2 ha (5 ac) in size, including the developed-area border, requires independent review for ESA compliance. New development projects in AEI buffer areas must be reported to the Ecology Group for tracking.**

The purpose of buffer areas is to protect core areas from undue disturbance or habitat degradation. The current levels of development in buffer and core areas represent baseline conditions for this site plan. No further development is allowed in the core area under the guidelines of this site plan. A limited amount of development is allowed in buffer areas. Development caps have been established for each AEI buffer area based on the current amount of development in the buffer and on the potential effects of buffer development on the species. Under the guidelines of this site plan, individual development projects are limited to 2 ha (5 ac) in size, including a 15-m developed-area border around structures and a 4.5-m (15-ft) developed-area border around paved and improved gravel roads. Projects greater than 2 ha (5 ac) in area require individual review for ESA compliance (see exception for fuels management activities in Section 4.7.2). New development projects in AEI buffer areas must be reported to the Ecology Group for tracking. Once the developed area in the buffer of an AEI reaches the cap for that AEI, all further development in that buffer area will require individual review for ESA compliance. Descriptions of each of the AEIs give the total area in each buffer available for development.

4.5 EMERGENCY ACTIONS

Summary: **Contact DOE and the Ecology Group as soon as possible.**

If safety and/or property is immediately threatened by something occurring within an AEI (for example, wildfire, water line breakage, etc.) please contact the Ecology Group (1-505-665-8961) and DOE (1-505-667-8690) as soon as possible. If the emergency occurs outside of regular business hours, contact the Emergency Management Office (1-505-667-6211). This office will then communicate with the appropriate LANL and DOE personnel.

4.6 INTRODUCTION TO AEI MANAGEMENT GUIDELINES

Summary: **The habitat alterations section and the activities section give the guidelines for habitat alteration and disturbance activities, respectively, for Mexican spotted owl AEIs. The flow chart (Figure 4.1) provides a quick reference to determine what, if any, guidelines need to be consulted for a specific activity. Protective measures give management practices that should be applied when working or considering work in AEIs. Ecology Group personnel (1-505-665-8961) are available to answer questions and provide advice.**

Sections 4.7 and 4.8 provide the guidelines for habitat alterations and allowable activities in AEI core and buffer areas. The flow chart (Figure 4.1) provides a quick reference that should be used to determine whether a project or activity will affect an AEI, and what sections of the site plan need to be consulted. The section on habitat alterations (Section 4.7) describes what and where habitat alterations are allowed under the guidelines of this site plan. The section and table on allowable activities (Section 4.8) describes what, when, and where disturbance activities are allowed in occupied AEIs under the guidelines of this site plan. If an activity does not meet the restrictions given in the guidelines, the activity must be individually reviewed for ESA compliance. This site plan only provides guidelines for Mexican spotted owl AEIs. If an activity is desired in an area with overlapping AEIs, all applicable site plans must be consulted. AEI maps show the location of all AEIs in an area. The section on protective measures (Section 4.9) describes management practices that should be applied when working or considering work in an AEI. Ecology Group personnel (1-505-665-8961) are always available to help interpret site plans and answer questions.

4.7 DEFINITION OF AND RESTRICTIONS ON HABITAT ALTERATIONS

4.7.1 Definition of Habitat Alterations

Habitat alteration includes any action that alters over the long-term the soil structure, vegetative components necessary to the species, prey quality and quantity, water quality, hydrology, or noise or light levels in undeveloped areas of an AEI. Long-term means the alteration lasts for more than one year. For physical disturbances, in general, any activity that can be accomplished by one person with a hand tool is generally not considered habitat alteration; any activity that requires mechanized equipment on a landscape is habitat alteration. An actual activity may take place outside of the AEI and will be considered habitat alteration if consequences of the activity have effects inside the AEI core.

The habitat components most important to Mexican spotted owls include vegetative structure, food quality and quantity, and disturbance levels, including noise and light. The forest structure within a canyon designated as a Mexican spotted owl AEI is important because it provides roost sites and a suitable habitat for nesting and foraging. Trees along the canyon rim are used for foraging and territorial calling, and they shelter the canyon interior from light and noise disturbances.

A long-term change in light or noise levels within the undeveloped core of an AEI is considered to be a habitat alteration if it increases average noise levels by $\geq$6 dB(A) during any portion of the 24-hour day, or it increases average light levels by $\geq$0.05 ftc at night. Changes in noise and light levels are measured at the core area boundary if the source is outside the core area, or at 10 m from the source if the source is in the undeveloped core area. Impacts of changes in developed areas on undeveloped cores are measured at the developed area boundary if it is within a core, or at the core area boundary if the developed area is outside of the core.

4.7.2 Fuels Management Practices to Reduce Wildfire Risk

The recovery plan for Mexican spotted owl lists stand-replacing wildfires as a primary threat to spotted owl habitat, and encourages land managers to reduce fuel levels and abate fire risks in ways compatible with spotted owl presence on the landscape (USFWS 1995). Within undeveloped core areas, on slopes >40%, in the bottoms of steep canyons, and within 30 m of a canyon rim, thinning of trees <22.4 cm diameter breast height, treatment of fuels, and prescribed and natural prescribed fires are allowed. Exceptions allowing trees >22.4 cm to be thinned within 30 m of buildings are made to protect facilities (see below). Large logs (>30 cm midpoint diameter) and snags should be retained. Thinning within core areas not meeting the characteristics listed above and in buffer areas may include trees of any size to achieve a 7.6-m spacing between tree crowns. However, clearcutting is not allowed in undeveloped core areas.

For health and safety reasons, any trees within 30 m of buildings but outside a developed area, may be thinned to achieve a 7.6-m spacing between crowns. Habitat alterations including thinning are not restricted in developed areas. However, we encourage the retention of trees and snags along canyon rims if the rim is in a developed area. Because of the extreme fire danger associated with firing sites and the potential impact of a fire on Mexican spotted owl habitat, firing sites and burn areas are treated separately for the purposes of fuels management. Trees within 380 m of firing sites and burn areas in both core and buffer areas may be thinned to a 15-m spacing between trees everywhere except on slopes >40% or in the bottoms of steep canyons. Any tree over 22.4 cm diameter breast height within 380 m of a firing site may be delimbed to a height of 1.8 m to help prevent crown fires.

In historically occupied core areas, fuels treatments may not exceed 10% of the undeveloped core area, and are not allowed within 400 m of nesting areas. In occupied core areas forest management activities must take place during the nonbreeding season (1 September to 28 February) (USFWS 1995). Fuels management activities that are allowable in core areas have to be reported for either core or buffer areas. Ecology Group foresters are available to provide guidance and mark trees for thinning (1-505-665-8961).

4.7.3 Utility Corridors

Habitat alterations such as cutting down trees that threaten power lines are allowed within 8 m of either side of an existing utility line in all areas of an AEI (Trujillo and Racinez 1995). New utility lines and utility lines requiring clearance of a right-of-way greater than 16 m total must be individually reviewed for ESA compliance. Disturbance activities must follow the guidelines given in the Activities Table for occupied AEIs.

4.7.4 Restrictions on Habitat Alterations

Summary: **Habitat alterations other than fuels management practices and utility corridor maintenance are not allowed in undeveloped core areas. Habitat alterations in buffer areas are restricted to 2 ha per project, with a maximum cap on development in the buffer for each AEI. Habitat alterations other than fuels management and utility corridor maintenance must be reported to the Ecology Group (1-505-665-2869) for tracking.**

Habitat alterations other than the fuels management practices and utility corridor maintenance described above are not allowed in undeveloped core areas under the guidelines of this site plan. If a project or activity is planned that would alter habitat in an undeveloped core area, it must be individually evaluated for ESA compliance. Habitat alterations in undeveloped buffer areas other than the fuels management activities and utility corridor maintenance described above are restricted to 2 ha in area per project and are subject to other restrictions including light and noise effects in the core (see Section 4.4). Projects in the buffer over 2 ha in size will require individual ESA compliance review.

Habitat alterations in a buffer area other than the fuels management and utility corridor maintenance described above must be reported to LANL's Ecology Group for tracking. There is a cumulative maximum area that can be developed in each AEI's buffer. Once that cumulative area is reached, all habitat alterations in a buffer will require individual ESA reviews for compliance.

4.8 DEFINITION OF AND RESTRICTIONS ON DISTURBANCE ACTIVITIES

4.8.1 Definitions of Disturbance Activities

We considered six categories of activities that might cause disturbance in an AEI. Most of the categories were first identified in the document "Peregrine Falcon Habitat Management in the National Forests of New Mexico," prepared for the United States Forest Service (Johnson 1994). We added explosives detonation, other light production, and other noise production to try and provide the most comprehensive list of activities possible, thereby reducing the need for individual review of activities for ESA compliance. The categories of activities are people, vehicles, aircraft, other light production, other noise production, and explosives detonation. We have defined low, medium, and high levels of impact for these activities except for explosives detonation. Activity levels for explosives detonation have been designed to follow the guidelines agreed upon by LANL, DOE, and USFWS in the DARHT Biological Assessment (BA) (Keller and Risberg 1995). Restrictions on explosives detonation are described in the definition of the activity, but are not included in the Activity Table. These six categories of activities are restricted only in AEIs that are classified as occupied.

People—includes any entry of people into an AEI on foot.

- Low impact is the presence of three or fewer people per project and duration of one day or less during a breeding season.
- Medium impact is the exceedance of either the number of people or the duration criteria.
- High impact is the exceedance of both the number of people and the duration criteria.

Vehicles—includes the entry of any two-axle highway vehicle, all-terrain vehicle, or motorized machinery into an AEI by any route other than a paved road or an improved gravel road.

- Low impact is the presence of two or fewer vehicles per project and duration of one day or less during a breeding season.
- Medium impact is the exceedance of either the number of vehicles or the duration criteria.
- High impact is the exceedance of both the number of vehicles and the duration criteria.

Aircraft—includes the operation of any aircraft below an elevation of 600 m (2000 ft) above the highest ground level in the local vicinity.

- Low impact is the presence of one single-engine airplane and the duration of one day or less during a breeding season.
- Medium impact is the exceedance of either the number of aircraft or the duration criteria.
- High impact is the exceedance of both the number of aircraft and the duration criteria.

Any use of helicopters, jet airplanes, and propeller airplanes with two or more engines is classified as medium impact or above, depending on duration.

Other Light Production—includes any activity not previously listed that causes additional light to occur in an AEI core area. For example, plans for construction of a new building at the edge of a developed area may call for lighting at night to facilitate nighttime work that impacts an undeveloped core area.

- Low impact is the increase of light intensity by ≤0.05 ftc and a duration of one night or less per project per breeding season.
- Medium impact is the exceedance of either the intensity or duration criteria.
- High impact is the exceedance of both the intensity and duration criteria.

Measurements for increases in light are taken at the AEI core area boundary closest to the light source if the source is outside the core, and at 10 m from the source if the source is inside the core. Light measurements for developed areas are taken at the edge of the developed area if the developed area is within an AEI core, or at the closest core boundary if the developed area is outside of an AEI core.

Other Noise Production–includes any activity not previously listed except for explosives detonation that causes additional noise to occur in an AEI. For example, operation of machinery creates noise.

- Low impact is increasing noise levels in an AEI core by 6 dB(A) or less for one day or less per project per breeding season.
- Medium impact is the exceedance of either the level or the duration criteria.
- High impact is the exceedance of both the level and the duration criteria.

Measurements for increases in noise are taken at the AEI core boundary closest to the noise source if the source is outside the core, and at 10 m (33 ft) from the source if the source is inside the core. Noise measurements for developed areas are taken at the edge of the developed area if the developed area is within an AEI core, or at the closest core boundary if the developed area is outside of an AEI core.

Explosives Detonation—includes the use of high explosives for any purpose. We did not define low, medium, and high levels of this activity because of the difficulty of determining levels for a shot before actually doing the shot. For the purpose of explosives detonation near Mexican spotted owl AEIs, occupied habitat is defined as the area within 400 m of the current year's nest/roost sites or the previous year's nest site if a current site has not been identified. No explosives detonation will take place within 400 m of nest/roost sites in occupied habitat between 1 March and 31 August. Explosives detonation at night at sites within 400 to 800 m of a nest site in occupied habitat is restricted to once a month from 1 March to 31 August. There are no restrictions on daytime explosives testing between 400 and 800 m. There are no restrictions between 1 September and 28 February or in unoccupied habitat. Explosives detonation adjacent to AEIs that have not previously been recorded by LANL as occupied will have no restrictions unless surveys detect Mexican spotted owls. Explosives tests not allowed under the guidelines of this site plan must be individually reviewed for ESA compliance before they are allowed to go forward.

4.8.2 Activity Table

The dates shown in the Activity Table (Table 4.1) are the dates between which the activity in the row is restricted under the guidelines of this site plan. All AEIs are considered occupied from 1 March to 31 August or until surveys show an AEI to be unoccupied. If owls are detected, AEIs are considered occupied until 31 August within 400 m of the nest site. Consult the Ecology Group (1-505-665-8961) to find out occupancy status of AEIs and what locations are within 400 m of nest sites.

4.9 PROTECTIVE MEASURES

Summary: **This section provides a list of management practices to apply in AEIs.**

- Timing of projects must take into account that projects in core areas or that violate restrictions for occupied buffer areas must stop on 28 February each year until occupancy status of the AEI is determined.
- Every reasonable effort should be made to reduce the noise from explosives testing within 800 m of occupied habitat. Methods to reduce noise could include contained shots, noise shields in the direction of AEI cores, etc. For night shots, every reasonable effort should be made to limit the amount of light directed into AEI core areas.
- Put signs on dirt roads and trails leading into AEIs labeling them as restricted access areas and providing a number to contact for access restrictions.
- Keep disturbance and noise to a minimum.
- Avoid unnecessary disturbance to vegetation (e.g., excessive parking areas or equipment storage areas, off-road travel, materials storage areas, crossing of streams or washes).
- Avoid removal of vegetation along drainage systems and stream channels.
- Avoid all vegetation removals not absolutely necessary.
- Appropriate erosion and runoff controls should be employed to reduce soil loss. The controls must be put in place and periodically checked throughout the life of projects.
- All exposed soils must be revegetated as soon as feasible after construction to minimize erosion.
- In the Los Alamos Canyon AEI, development should be focused away from undeveloped areas on the western end of the AEI.

5.0 MEXICAN SPOTTED OWL AEI DESCRIPTIONS

5.1 CAÑON DE VALLE MEXICAN SPOTTED OWL AEI

5.1.1 Environmental Description

5.1.1.1 *Location*

This AEI is located in Cañon de Valle and Water Canyon (Map 5.1.1), LANL, Los Alamos County, New Mexico. This AEI is in Technical Areas (TAs) 9, 11, 14, 15, 16, 36, 37, 39, and 49. DOE controls 98% of the AEI. The National Park Service controls the other 2%. The Cañon de Valle Mexican Spotted Owl AEI is 1355.2 ha in size, with 553.2 ha in the core and 802.1 ha in the buffer.

5.1.1.2 *Overlapping AEIs*

This AEI overlaps the Pajarito Canyon Mexican Spotted Owl AEI.

Table 4.1. Restrictions on Activities in Undeveloped Occupied Mexican Spotted Owl AEIs.

		Core	Buffer
People			
	Low	No Restrictions*	No Restrictions
	Medium	Mar 1 to Aug 31	No Restrictions
	High	Mar 1 to Aug 31	No Restrictions
Vehicles			
	Low	No Restrictions	No Restrictions
	Medium	Mar 1 to Aug 31	No Restrictions
	High	Mar 1 to Aug 31	No Restrictions
Aircraft			
	Low	Mar 1 to Aug 31	No Restrictions
	Medium	Mar 1 to Aug 31	Mar 1 to May 15
	High	Mar 1 to Aug 31	Mar 1 to Aug 31
Other Light Production			
	Low	Mar 1 to Aug 31	No Restrictions**
	Medium	Mar 1 to Aug 31	No Restrictions**
	High	Mar 1 to Aug 31	No Restrictions**
Other Noise Production			
	Low	Mar 1 to Aug 31	No Restrictions**
	Medium	Mar 1 to Aug 31	No Restrictions**
	High	Mar 1 to Aug 31	No Restrictions**
Explosives Detonation-see text (Section 4.8.1)			

*Entry is restricted in core areas that are occupied within 400 m of the nest site from March 1 to August 31. If the current nest has not been located, entry is restricted within 400 m of the previous year's nest site.
**Noise or light production in the buffer is restricted if the activity would violate core area restrictions on noise or light.

5.1.1.3 *Topography*

This Mexican spotted owl AEI contains two canyon systems, Cañon de Valle and Water Canyon, and several mesas (including Three-Mile Mesa and Mesita del Potrillo). The mesa top elevations within this AEI vary from 2250 m at the western border to 2160 m on the eastern border. The canyon bottom elevation ranges from 2190 m in the west to 2040 m in the east. Water Canyon varies from 2190 m at its eastern AEI boundary to 2010 m at its western boundary.

5.1.1.4 *Vegetation*

Table 5.1 describes the vegetation types present in this AEI. Slopes greater than 40% in the mixed conifer cover type compose 27.7 ha of this AEI, and occur only in the core area.

Table 5.1. Vegetation Types in the Cañon de Valle Mexican Spotted Owl AEI.

Land Cover Type	Area in Core	Area in Buffer	AEI Total
Bare Ground	1.4 ha	2.9 ha	4.3 ha
Mixed Conifer	56.2 ha	5.1 ha	61.3 ha
Aspen	2.9 ha	1.1 ha	3.9 ha
Ponderosa Pine	315.4 ha	304.4 ha	619.8 ha
Piñon-Juniper	116.1 ha	273.2 ha	389.3 ha
Juniper Savannah	1.5 ha	1.3 ha	2.8 ha
Grassland	43.4 ha	161.9 ha	205.3 ha
Developed Area	16.3 ha	52.2 ha	68.5 ha

5.1.2 Human Impacts

5.1.2.1 *Existing Developments*

The Cañon de Valle Mexican Spotted Owl AEI has existing developments in the buffer area and a small amount of development in the core area. Currently there are 68.5 ha of this AEI developed with 16.3 ha in the core and 52.2 ha in the buffer. Mesa tops within this AEI contain buildings of TAs 9, 11, 14, 15, 16, 36, 37, 39, and 49 (Map 5.1.2). Overall, 2.9% of the core and 6.5% of the buffer is developed. Developed areas include LANL office buildings, light industrial areas, and roads. Development has occurred primarily on the mesa containing the LANL operation centers. Currently there is an unimproved dirt road that goes up Water Canyon from east to west and can be driven to the mouth of Cañon de Valle. This road is gated against entry by unauthorized vehicles at all times along State Road 4, and is not accessible to the public on foot or bicycle. A high-voltage power line crosses Water Canyon west of its junction with Cañon de Valle.

5.1.2.2 *Contaminants*

The ER Project at LANL has identified the known PRSs in or near the Cañon de Valle Mexican Spotted Owl AEI. A list of these PRSs is provided in Table A.5.1.1. There are one sediment sampling station and two water sampling stations in or near this AEI (ESP 1997). In 1995 and 1996, water samples taken from Water Canyon within the AEI had relatively high levels of barium (520 μg/L and 400 μg/L, respectively). These levels are lower than the New Mexico Water Quality Control Commission groundwater limit of 1,000 μg/L. However, the presence of barium along with elevated nitrates suggested possible high explosives contamination. In 1996 high explosives were detected in the surface water sample from Water Canyon (4.92 μg/L of HMX and 0.76 μg/L of RDX). The sediment sample taken from below the AEI at Water Canyon and State Road 4 did not have any significant accumulations of radiochemicals, trace metals, or organics, including high explosives.

In their ecotoxicological risk model, Gallegos et al. (1997) and Gonzales et al. (1997b) ran weighted and unweighted foraging scenarios with different methods of nest placement. For the risk assessment centered around Cañon de Valle, no scenario produced a mean risk HI >0.1. A mean HI of 1.0 is the threshold for a small potential for impacts from contaminants. Therefore, the ecorisk model indicated on a preliminary screening level that the risk from contaminants to Mexican spotted owls in Cañon de Valle was acceptably low.

5.1.2.3 *Noise*

There are several firing sites within the AEI, including the DARHT facility and the facility for Pulsed High-Energy Radiographic Machine Emitting X-Rays. Most of the firing sites are located close to the boundary between the core and buffer. Some are located within the core. Detailed information on the use of these sites is not available for security reasons. There is periodic construction associated with the DARHT facility. See Section 2.2.3 on noise for further information on sound levels associated with explosives testing and construction.

5.1.2.4 *Light*

Light information has not been collected in Cañon de Valle. Because the Cañon de Valle Mexican Spotted Owl AEI is surrounded by very few buildings, there is little light spillage into the AEI. Additionally, parts of the canyon are also extensively vegetated with ponderosa pine, which would tend to mask light from developed areas.

5.1.2.5 *Access*

The AEI is accessible by a dirt road for DOE and LANL personnel who have a key to the gate at the bottom of Water Canyon. Entry into this AEI is strictly controlled by LANL because of the testing of explosives that occur near this area. All maintenance and clean up access to this AEI is coordinated with LANL's Ecology Group biologists to minimize impacts to the Mexican spotted owl. Activities in this AEI are scheduled to take place following surveys or following the breeding season.

5.1.2.6 *Outfalls*

Table A.5.1.2 lists the LANL outfalls that may affect the Mexican spotted owl in the Cañon de Valle Mexican Spotted Owl AEI.

5.1.2.7 *Activities*

Activities surrounding this AEI include general office building-associated activities and explosives testing. There are monitoring wells at the west and east ends of Cañon de Valle that are sampled on an annual basis. Sampling of the wells is coordinated with Ecology Group personnel to ensure that sampling does not take place in occupied habitat. There is a firebreak on the west rim of Cañon de Valle that is cleared infrequently, usually during a fire danger situation.

5.1.3 Allowable Habitat Alteration in the Buffer Area

There are 16.3 ha (2.9%) of the core developed and 52.2 ha (6.8%) of the DOE-controlled buffer developed. The recommendations for this AEI are that only an additional 25.30 ha of this AEI buffer be developed. Once this ceiling is reached or a large-scale project is proposed in the buffer, additional consultation with USFWS will be required. No more of the core of this AEI can be developed without a BA.

5.1.4 Recommendations

- We recommend that a study be conducted on contaminant levels in Mexican spotted owl prey species that reside in Cañon de Valle.

5.2 PAJARITO CANYON MEXICAN SPOTTED OWL AEI

5.2.1 Environmental Description

5.2.1.1 *Location*

This AEI is located in Pajarito Canyon, LANL, Los Alamos County, New Mexico (Map 5.2.1). This AEI is controlled entirely by the DOE. This AEI is in TAs 6, 9, 14, 22, 40, and 67. The Pajarito Canyon Mexican Spotted Owl AEI is 791 ha in area with 284.3 ha in the core and 506.6 ha in the buffer.

5.2.1.2 *Overlapping AEIs*

This AEI overlaps the Three-Mile Canyon Mexican Spotted Owl AEI and the Cañon de Valle Mexican Spotted Owl AEI.

5.2.1.3 *Topography*

This Mexican spotted owl AEI contains two canyon systems, Pajarito Canyon and Two-Mile Canyon, and several mesas, including Two-Mile, Pajarito, and Three-Mile Mesas (Map 5.2.2). The mesa top elevations within this AEI vary from 2280 m at the western border to 2100 m at the eastern border. The canyon bottom elevation ranges from 2190 m in the west to 2040 m in the east.

5.2.1.4 *Vegetation*

Table 5.2 describes the vegetation types present in this AEI. Slopes greater than 40% in the mixed conifer cover type compose 47.6 ha of this AEI with 44.5 ha in the core and 3.1 ha in the buffer.

Table 5.2. Vegetation Types in the Pajarito Canyon Mexican Spotted Owl AEI.

Land Cover Type	Area in Core	Area in Buffer	AEI Total
Bare Ground	0.9 ha	3.0 ha	3.9 ha
Mixed Conifer	56.5 ha	17.7 ha	74.2 ha
Aspen	1.8 ha	0.4 ha	2.3 ha
Ponderosa Pine	159.2 ha	305.8 ha	464.4 ha
Piñon-Juniper	34.7 ha	88.6 ha	123.3 ha
Juniper Savannah	0.2 ha	1.4 ha	1.5 ha
Grassland	15.6 ha	24.0 ha	39.6 ha
Developed Area	15.5 ha	66.3 ha	81.8 ha

5.2.2 Human Impacts

5.2.2.1 *Existing Developments*

Currently 81.8 ha of this AEI are developed, including 15.5 ha of the core and 66.3 ha of the buffer. There are 5.5% of the core developed and 13.1% developed in the buffer. Developed areas include LANL office buildings, light industrial areas, and paved roads. Pajarito Road, a heavily traveled road connecting Los Alamos to White Rock, runs along the northern edge of the core on the rim of the canyon. Development has occurred primarily on the mesa containing the LANL operation centers. There are firing sites within the core of this AEI along the canyon rim. There is no road access to the canyon bottom, and only LANL-authorized personnel have foot access in this area. A power line cuts from west to east across the westernmost tip of the core area and from north to south across a “bump” along the north side of the AEI.

5.2.2.2 *Contaminants*

The ER Project at LANL has identified the known PRSs in or near the Pajarito Canyon Mexican Spotted Owl AEI (Table A.5.2.1). There are no sediment sampling stations near the AEI. There are three surface water sampling stations (ESP 1997). Americium-241 (0.055 ± 0.017 pCi/L) was detected in Cañada del Buey, a sampling station located north of Pajarito Canyon, in 1995. The station was not sampled in 1996 because there was no water. No significant accumulations of radiochemicals, metals, or organics were reported in 1996.

5.2.2.3 *Noise*

Noise information has not been collected within the Pajarito Canyon Mexican Spotted Owl AEI. There are firing sites within the core along the north rim of Pajarito Canyon. There is noise associated with Pajarito Road along the eastern half of the AEI.

5.2.2.4 *Light*

Light information has not been collected within the Pajarito Canyon Mexican Spotted Owl AEI. TA-55 is a high-security area with extensive lighting located in the buffer of this AEI. There are street lights located along sections of Pajarito Road. Ambient light within the canyon bottom may be greater than caused by natural sources of light at night. Parts of the canyon are also extensively vegetated with ponderosa pine, which would tend to mask light from developed areas.

5.2.2.5 *Access*

The canyon bottom is not accessible by road, and foot access is strictly controlled. Entry into this AEI is restricted by LANL because of the testing of explosives that occur near this area. All maintenance and clean up access to this AEI is coordinated with the Ecology Group biologists to minimize impacts to the Mexican spotted owl.

5.2.2.6 *Outfalls*

Table A.5.2.2 lists the LANL outfalls that may affect the Mexican spotted owl in the Pajarito Canyon Mexican Spotted Owl AEI. Table A.5.2.3 describes the National Pollutant Discharge Elimination System (NPDES) permit exceedances listed in Table A.5.2.2.

5.2.2.7 *Activities*

Activities surrounding this AEI include general office building-associated activities and explosives testing. There are monitoring wells at the east end of Pajarito Canyon that are sampled on an annual basis. Sampling of the wells is coordinated with the Ecology Group to ensure that sampling takes place out of critical times of the year. Pajarito Road is used by LANL employees for commuting, and is occasionally closed for the transport of radioactive materials from TA-55 to TA-3.

5.2.3 <u>Allowable Habitat Alteration in the Buffer Area</u>

There are 15.5 ha (5.5%) of the core developed and 66.3 ha (13.1%) developed in the buffer. We recommend only an additional 35.0 ha of the buffer be developed before additional USFWS consultations take place. We also recommend that no additional developments take place outside the currently developed area in the core of this AEI. Once the cap is reached or a single large-scale project is proposed, additional consultation will be required.

5.2.4 <u>Recommendations</u>

- None specific to this AEI.

5.3 LOS ALAMOS CANYON MEXICAN SPOTTED OWL AEI

5.3.1 <u>Environmental Description</u>

5.3.1.1 *Location*

This AEI is located in Los Alamos Canyon, Los Alamos County, New Mexico (Map 5.3.1). The DOE portion of this AEI is in TAs 0, 2, 3, 41, 43, 61, 62, 53, and 73. This AEI currently has 3329.9 ha in area with 1653.1 ha in the core and 1676.8 ha in the buffer. DOE controls 916.6 ha of this AEI with 434.0 ha in the core and 482.7 ha in the buffer.

5.3.1.2 *Overlapping AEIs*

This AEI overlaps the Sandia-Mortandad Canyon Mexican Spotted Owl AEI and the Pueblo Canyon Mexican Spotted Owl AEI.

5.3.1.3 *Topography*

This Mexican spotted owl AEI contains one canyon system, Los Alamos Canyon, and the surrounding mesas (Map 5.3.2). The mesa top elevations within this AEI vary from 2940 m at the western border to 2160 m at the eastern border. The canyon bottom elevation ranges from 2580 m in the west to 2070 m in the east.

5.3.1.4 *Vegetation*

Table 5.3 describes the vegetation present in this AEI. This AEI has 659.6 ha of slopes greater than 40% in the mixed conifer land cover type in the core and 219.8 ha in the buffer.

Table 5.3. Vegetation Types in the Los Alamos Canyon Mexican Spotted Owl AEI.

Land Cover Type	Area in Core	Area in Buffer	AEI Total
Bare Ground	12.8 ha	11.7 ha	24.5 ha
Mixed Conifer	968.9 ha	735.5 ha	1701.41 ha
Aspen	122.6 ha	47.5 ha	170.0 ha
Ponderosa Pine	293.4 ha	372.1 ha	665.5 ha
Piñon-Juniper	84.3 ha	141.4 ha	225.7 ha
Juniper Savannah	0.9 ha	3.5 ha	4.32 ha
Grassland	60.0 ha	41.5 ha	101.4 ha
Developed Area	109.6 ha	323.7 ha	433.3 ha

5.3.2 Human Impacts

5.3.2.1 *Existing Developments*

The eastern end of the Los Alamos Canyon Mexican Spotted Owl AEI has extensive developments in the buffer area and smaller amounts of development in the core area. Currently 193.3 ha of this AEI on DOE lands are developed, including 57.3 ha of the core and 136.0 ha of the buffer. There are 13.2% of the DOE-controlled core developed and 28.2% developed in the DOE-controlled buffer. Developed areas include LANL and County office buildings, light industrial areas, and roads. On DOE property, development has occurred primarily on mesa containing the LANL operation centers. However, there are two TAs in the bottom of Los Alamos Canyon. Currently there is a road that runs the length of Los Alamos Canyon and can be driven a majority of the length of the AEI. A portion of the road from TA-2 to the DOE boundary is paved; the remainder of the road is dirt. This road is gated against entry by unauthorized vehicles at all times along State Road 4. However, this road is accessible to the public by foot and bicycle. The townsite of Los Alamos is adjacent to Los Alamos Canyon, and there is a great deal of private development along the north side of the canyon rim. There is a major gas line that runs through the eastern portion of the canyon bottom of the AEI and continues to run along the south rim of the canyon. Sewer and power lines also cross the canyon.

5.3.2.2 *Contaminants*

In the past, Los Alamos Canyon received treated and untreated industrial effluents containing some radionuclides (ESP 1997). In the upper reach of Los Alamos Canyon there were releases of treated and untreated radioactive effluents during the earliest Manhattan Project operations at TA-1 (late 1940s) and some released from the research reactors at TA-2. Los Alamos Canyon also received discharges from the sanitary sewage lagoon system at TA-53, the Los Alamos Neutron Science Center. An industrial liquid waste treatment facility that served the old plutonium processing facility at TA-21 discharged effluent containing radionuclides into DP Canyon, a tributary of Los Alamos Canyon. The reach of Los Alamos Canyon within LANL boundaries currently carries flow from the Los Alamos Reservoir, as well as NPDES-permitted effluents from TA-2, TA-53, and TA-21. The ER Project at LANL has identified the known PRSs in or near the Los Alamos Canyon Mexican Spotted Owl AEI (Table A.5.3.1).

There are four water sampling stations and eight sediment sampling stations in or near the Los Alamos Canyon Mexican Spotted Owl AEI (ESP 1997). All radiochemical results for surface water samples were below DOE derived concentration guides for drinking water in Los Alamos Canyon. Mercury levels (0.3 µg/L) exceeded detection limits (0.2 µg/L) and the New Mexico Wildlife Habitat stream standard (0.012 µg/L) at one location in DP Canyon, a tributary of Los Alamos Canyon. Lead values (17 and 45 µg/L) above the EPA action level (15 µg/L) were found in runoff samples. Because the runoff samples were unfiltered, the EPA standard is not directly applicable to these samples. The New Mexico Livestock Watering Limit is 100 µg/L. Concentrations of radiochemicals in sediment samples from Los Alamos Canyon did not exceed the ER Project’s screening action levels, but were above background levels. None of the samples showed any significant accumulations of trace metals.

In their ecotoxicological risk model, Gallegos et al. (1997) and Gonzales et al. (1997b) ran weighted and unweighted foraging scenarios with different methods of nest placement. For the risk assessment centered around Los Alamos Canyon, no scenario produced a mean risk HI >1.0 (Gonzales et al. 1997b). A mean HI of 1.0 is the threshold for a small potential for impacts from contaminants. Two scenarios had individual nest site HIs above 1.0. The proportion of 100 nests sites that had individual HIs greater than 1.0 was 18% for one scenario and 35% for another. Based on the preliminary screening results, the ecorisk model indicated that the risk from contaminants to Mexican spotted owls in Los Alamos Canyon was acceptably low.

5.3.2.3 *Noise*

Keller and Foxx (1997) made sound measurements at successive distances from an industrial area near a canyon rim, into the canyon, and to the opposite rim in Los Alamos Canyon. Background dB(A) values ranged from 61 at the canyon rim, to 60 within the canyon, and to 62 at the bottom of the canyon near a stream. A truck horn blown at the rim of the canyon created a source sound of 121 dB(A). Sound levels measured during the horn blowing approached background levels at 50 m down the slope of the canyon. A similar test on a mesa top near a developed area found that the noise from the truck horn decreased to near-background (61 dB(A)) levels within 40 m from the source.

Shot testing areas of LANL are greater than 2.0 km from the Los Alamos Canyon Mexican Spotted Owl AEI, and are not likely to impact spotted owls that may occur within the AEI. Noise measurements taken at the Los Alamos County Airport (near the runway) during the maximum use time (06:30 to 07:30) had background values averaging 54 dB(A). Noise during plane arrivals ranged from 47 to 63 dB(A). No measurements were taken during take-offs. The maximum A-weighted sound level for Lear jets, the noisiest airplane currently using the airport, has been estimated as 94.7 dB(A) on approach and 84.7 dB(A) on take-off (USDOT 1996).

5.3.2.4 *Light*

Preliminary surveys were conducted for light levels within Los Alamos Canyon at the Omega Reactor (Keller and Foxx 1997). Omega Reactor is brightly lighted for purposes of security; therefore, total light intensity is greater than the average street lighting. Measurements were made at a light pole with an open parking lot at the reactor as the source. Trees did not obscure the area. Using the relationship of light intensity reducing as a square of the distance, calculations using the field data (Table A.2.1) indicate that at 30 m the light levels would be equivalent or nearly equivalent to full moonlight.

Los Alamos Canyon Mexican Spotted Owl AEI is surrounded by many developed areas. Part of the townsite of Los Alamos is adjacent to the canyon rim, and is not controlled by DOE. A majority of this AEI is probably currently significantly impacted by light.

5.3.2.5 *Access*

The AEI is accessible by a paved public road in the western portion and by a dirt road for DOE and LANL personnel who have a key to the gate at the eastern DOE boundary in Los Alamos Canyon. However, portions of this AEI are heavily used for recreation, and people have full access to this area by foot and bicycle.

5.3.2.6 *Outfalls*

Table A.5.3.2 shows the LANL outfalls that may affect the Mexican spotted owl in the Los Alamos Canyon Mexican Spotted Owl AEI. Table A.5.3.3 describes the NPDES-permit exceedances listed in Table A.5.3.2.

5.3.2.7 *Activities*

Activities surrounding this AEI include general office building-associated activities, residential activities, road travel, and recreational use of the canyon bottom. There are monitoring wells at the west and east ends of Los Alamos Canyon that are sampled on an annual basis. Sampling of the wells is coordinated with the Ecology Group to ensure that sampling takes place out of critical times of the year. There are paved and dirt roads around the majority of the Los Alamos Canyon Mexican Spotted Owl AEI.

5.3.3 <u>Allowable Habitat Alteration in the Buffer Area</u>

There are 57.3 ha of the core developed and 136.0 ha developed in the buffer. Under this AEI recommendations, we recommend only an additional 28.6 ha (5.9%) of the DOE owned buffer be developed before additional USFWS consultations take place. Because this AEI is so heavily developed, additional development is restricted to a few selected areas within the buffer. Developable areas are shown on Map 5.3.2. Development outside of these areas requires individual review for ESA compliance. No additional developments can take place outside the currently developed area in the core of this AEI without a BA.

5.3.4 <u>Recommendations</u>

- We recommend that a study be conducted on contaminant levels in Mexican spotted owl prey species that reside in Los Alamos Canyon.

5.4 PUEBLO CANYON MEXICAN SPOTTED OWL AEI

5.4.1 <u>Environmental Description</u>

5.4.1.1 *Location*

This AEI is located in Pueblo, Walnut, and Acid Canyons, Los Alamos County, New Mexico (Map 5.4.1). The DOE, the County of Los Alamos, and private landowners control or own this AEI. Of the core area, 93% is either privately owned or controlled by the County of Los Alamos.

The DOE portions of this AEI are in TAs 01, 31, 45, and 73. This AEI is 979.9 ha in area with 423.0 ha in the core and 556.9 ha in the buffer. DOE controls 27.6 ha of the core and 92.1 ha of the buffer.

5.4.1.2 *Overlapping AEIs*

This AEI overlaps the Los Alamos Canyon Mexican Spotted Owl AEI.

5.4.1.3 *Topography*

The Pueblo Canyon Mexican Spotted Owl AEI includes three canyons, Pueblo, Acid, and Walnut Canyons, and four mesas, Barranca Mesa, Kwage Mesa, North Mesa, and the mesa on which the commercial centers of Los Alamos are located (Map 5.4.2). The mesa top elevations within the AEI vary from 2230 m at the west end of the AEI to 2130 m at the east end of Kwage Mesa. The canyon bottom elevations vary from 2100 m at the west end of Pueblo Canyon to 1980 m east of Kwage Mesa.

5.4.1.4 *Vegetation*

Table 5.4 describes the vegetation present in this AEI. This AEI has 28.3 ha with a slope of greater than 40% in mixed conifer, which includes 25.9 ha in the core and 2.4 ha in the buffer.

Table 5.4. Vegetation types in the Pueblo Canyon Mexican Spotted Owl AEI.

Land Cover Type	Area in Core	Area in Buffer	AEI Total
Bare Ground	10.99 ha	7.0 ha	18.0 ha
Mixed Conifer	40.5 ha	9.0 ha	49.5 ha
Aspen	2.40 ha	0.6 ha	3.0 ha
Ponderosa Pine	181.6 ha	160.4 ha	342.0 ha
Piñon-Juniper	76.0 ha	74.9 ha	150.9 ha
Juniper Savannah	5.53 ha	0.74 ha	6.2 ha
Grassland	8.51 ha	25.7 ha	34.2 ha
Developed Area	97.6 ha	278.5 ha	376.1 ha

5.4.2 Human Impacts

5.4.2.1 *Existing Developments*

The Pueblo Canyon Mexican Spotted Owl AEI has extensive developments in the buffer area and smaller amounts of development in the core area. Currently, 33.3 ha of this AEI on DOE lands are developed, including 15.6 ha of the core and 18.1 ha of the buffer. There is 56.5% of the DOE-controlled core and 19.2% of the DOE-controlled buffer developed. The percentage of development in the whole buffer is 65.8% and in the core is 17.5%. Developed areas include LANL and County office buildings, light industrial areas, and roads. This AEI also has a local airport operating in the buffer directly to the south of the AEI. Development has occurred primarily on the mesa containing the Los Alamos County facilities and private homes. However, there is a sewage treatment facility in the bottom of Pueblo Canyon to the east of this AEI. Currently, there is a road that runs the length of Pueblo Canyon and can be driven a majority of the length of the AEI. This road is gated against entry by unauthorized vehicles at all times from lower Pueblo Canyon. However, this road is accessible to the public by foot and bicycle during all times of the year.

5.4.2.2 *Contaminants*

Acid Canyon, a small tributary of Pueblo Canyon, was the original disposal site for liquid wastes generated by research on the Manhattan Project. Acid Canyon received untreated radioactive industrial effluent from 1943 to 1951, and treated effluents that contained residual radionuclides from 1951 to 1964. Most of the residual radioactivity from these releases is now associated with the sediments in Pueblo Canyon. The estimated total plutonium inventory in Acid Canyon, Pueblo Canyon, and lower Pueblo Canyon is about 246 mCi (calculated by geometric mean of samples). About two-thirds of this total is in the DOE-controlled portion of lower Pueblo Canyon. Levels of tritium, strontium-90, cesium-137, plutonium, americium-241, and alpha, beta, and gamma activities in Pueblo Canyon exceed worldwide fallout and natural background levels (ESP 1997). The ER Project at LANL has identified the known PRSs in or near the Pueblo Canyon Mexican Spotted Owl AEI (Table A.5.4.1).

There are four surface water sampling and four sediment sampling locations in or near the AEI (ESP 1997). Although Pueblo Canyon has above-background levels of several radionuclides, none of the values exceeded DOE's Derived Concentration Guides for drinking water systems. A selenium value (18 μg/L) exceeding the New Mexico Wildlife Habitat stream standard (2 μg/L) was detected below the County of Los Alamos' sewage treatment plant in Pueblo Canyon. Sediment samples from Pueblo Canyon also exceed radiochemical background values, but did not exceed the ER Project's screening action levels. No significant accumulation of metals or organics was detected.

5.4.2.3 *Noise*

Shot testing areas of LANL are greater than 2.0 km from the Pueblo Canyon Mexican Spotted Owl AEI, and are not likely to impact spotted owls that may occur within the AEI. Noise measurements taken at the Los Alamos County Airport (near the runway) during the maximum use time (06:30 to 07:30) had background values averaging 54 dB(A). Noise during plane arrivals ranged from 47 to 63 dB(A). No measurements were taken during take-offs. The maximum A-weighted sound level for Lear jets, the noisiest airplane currently using the airport, has been estimated as 94.7 dB(A) on approach and 84.7 dB(A) on take-off (USDOT 1996). Sound measurements made in the bottoms of Pueblo and Bayo Canyons ranged from 37 to 40 dB(A) in most areas of the canyon. At the sewage plant parking lot during a working day, the average dB(A) during a three-minute period was 46 (range 45 to 49), and, at the intersection of the road going into Pueblo Canyon with State Road 502, the average dB(A) during a three-minute period was 60 (range 41 to 70).

5.4.2.4 *Light*

Light information has not been collected in Pueblo Canyon. Many developed areas surround the Pueblo Canyon Mexican Spotted Owl AEI. Artificial light from residential and commercial areas in the town of Los Alamos probably impacts a majority of this AEI.

5.4.2.5 *Access*

The AEI is accessible by a Los Alamos County road in the eastern portion of the AEI for various personnel (County of Los Alamos, NM Department of Transportation, LANL, DOE) who have a key to the gate at the bottom of Pueblo Canyon. Entry into this AEI is blocked to other vehicular traffic. However, all portions of this AEI are heavily used for recreation, and people have full access to this area by foot and bicycle at all times of year. The DOE does not control the access to the County portions of this AEI.

5.4.2.6 *Outfalls*

Table A.5.4.2 lists the LANL outfalls that may affect the Mexican spotted owl in the Pueblo Canyon Mexican Spotted Owl AEI. Table A.5.4.3 describes the NPDES-permit exceedances listed in Table A.5.4.2.

5.4.2.7 *Activities*

Activities surrounding this AEI include general office building-associated and residential activities, highway travel, and the noise associated with the airport. There are monitoring wells in Pueblo Canyon that are sampled on an annual basis. Sampling of the wells is coordinated with Ecology Group personnel to ensure that sampling takes place out of critical times of the year. There is an emergency landing strip in the bottom of Pueblo Canyon that is cleared on an annual basis.

5.4.3 Allowable Habitat Alteration in the Buffer Area

Under this AEI recommendation, we recommend only an additional 11.1 ha of the buffer be developed before additional USFWS consultations take place. Because this AEI is so heavily developed, additional development is restricted to a few selected areas within the buffer. Developable areas are shown on Map 5.4.2. Development outside of these areas requires individual review for ESA compliance. No additional developments can take place outside the currently developed area in the core of this AEI without a BA.

5.4.4 Recommendations

- None specific to this AEI

5.5 SANDIA-MORTANDAD CANYON MEXICAN SPOTTED OWL AEI

5.5.1 Environmental Description

5.5.1.1 *Location*

This AEI is located in Sandia and Mortandad Canyons, LANL, Los Alamos County, New Mexico (Map 5.5.1). The DOE controls 99% of this AEI. This AEI is in TAs 5, 35, 46, 50, 52, 53, 55, 60, 61, 63, and 66. This AEI is 1033.8 ha in area with 472.0 ha in the core and 561.8 ha in the buffer. This AEI has 1019.0 ha on DOE lands with 472.0 ha in the core and 547.4 ha in the buffer.

5.5.1.2 *Overlapping AEIs*

This AEI overlaps with the Pajarito Canyon Mexican Spotted Owl AEI and the Los Alamos Canyon Mexican Spotted Owl AEI.

5.5.1.3 *Topography*

This Mexican spotted owl AEI is comprised of two canyon systems, Sandia and Mortandad Canyons, and a common mesa between them that contains the buildings of TAs 35, 52, 53, 55 and 60 (Map 5.5.2). The mesa top elevations within this AEI vary from 2190 m at the western border to 2100 m on the eastern border. The canyon bottom elevation ranges from 2160 m in the west to 2010 m in the east.

5.5.1.4 *Vegetation*

Table 5.5 describes the vegetation present in this AEI. This AEI has 38.8 ha with a slope of greater than 40% in mixed conifer which includes 4.5 ha in the core and 34.3 ha in the buffer. The buffer area of this AEI overlaps the core areas of the Pajarito Canyon Mexican Spotted Owl AEI and the Los Alamos Canyon Mexican Spotted Owl AEI.

Table 5.5. Vegetation types in the Sandia-Mortandad Canyon Mexican Spotted Owl AEI.

Land Cover	Area in Core	Area in Buffer	AEI Total
Bare Ground	5.1 ha	9.9 ha	15.1 ha
Mixed Conifer	25.8 ha	47.0 ha	72.8 ha
Aspen	1.3 ha	0.1 ha	1.4 ha
Ponderosa Pine	215.2 ha	190.7 ha	406.0 ha
Piñon-Juniper	140.9 ha	189.5 ha	330.3 ha
Juniper	1.5 ha	1.6 ha	3.1 ha
Grassland	36.7 ha	44.9 ha	81.5 ha
Developed Area	45.5 ha	77.9 ha	123.4 ha

5.5.2 Human Impacts

5.5.2.1 *Existing Developments*

The Sandia-Mortandad Canyon Mexican Spotted Owl AEI has existing developments. Currently 116.9 ha of this AEI on DOE lands are developed, including 45.5 ha of the core and 71.4 ha of the buffer. There is 9.6% of the DOE-controlled core developed and 13.2% developed in the buffer. Developed areas include LANL office buildings, light industrial areas, and roads. All development in the AEI is on DOE lands. Development has occurred primarily on the mesa containing the LANL operation centers, although East Jemez Road, a major commuter and transportation route for LANL and the towns of Los Alamos and White Rock, runs through the bottom of Sandia Canyon through much of the AEI. Currently there is an unimproved dirt road that goes up a majority of Mortandad Canyon from east to west and can be driven to the mouth of the canyon. This road is gated against entry by unauthorized vehicles during nonwork hours for the eastern portion of the canyon. The western region of the canyon is open to vehicle access at all times. There is a County landfill and rubble landfill in Sandia Canyon west of the AEI. There is also a live-fire range at the eastern end of Sandia Canyon, located at the boundary of the core and buffer. Power lines and a gas line cross the AEI. The western ends of these canyons are heavily industrialized.

5.5.2.2 *Contaminants*

Sandia Canyon has a small drainage area that heads at TA-3. This canyon receives water from the cooling tower at the TA-3 power plant and treated effluents from the TA-46 sanitary waste water system. Mortandad Canyon also has a small drainage area that heads at TA-3. This canyon receives discharge from a number of NPDES outfalls including discharges from the Radioactive Liquid Waste Treatment Facility at TA-50, which began operations in 1963. In addition to the radionuclides, nitrates are released into this canyon that often exceed the New Mexico groundwater standard of 10 mg/L (nitrate as nitrogen) (ESP 1997). The ER Project at LANL has identified the PRSs in or near the Sandia-Mortandad Canyon Mexican Spotted Owl AEI (Table A.5.5.1).

There are five surface water sampling locations and eleven sediment sampling locations in or near the AEI (ESP 1997). In 1996 effluent releases from the TA-50 Radioactive Liquid Waste Treatment Facility exceeded the DOE derived concentration guides for americium-241 and plutonium-238. A committed effective dose equivalent (CEDE) was calculated for human ingestion of water from the outfall and the stream in Mortandad Canyon. The calculated CEDE was 1.2 mrem per liter of water ingested from the outfall and 0.048 mrem per liter of water from the stream. Three sediment sampling stations in Mortandad Canyon had cesium-137 concentrations that exceeded the screening action levels established by the ER Project. Levels of tritium, plutonium-238, -239, and -240, and americium-241 were also relatively high in Mortandad Canyon, although they did not exceed screening action levels. None of the results showed any significant accumulations of metals.

In 1991 PCBs were found in five soil samples taken adjacent to a building in TA-3. Concentrations ranged from 1.6 to 9600 ppm, higher than the ER Project screening action level of 0.09 ppm. Above-background levels of mercury were also detected (471 ppb), although these levels were below RCRA action levels (20 ppm) (Fresquez 1992). TA-3 is located at the head of Sandia Canyon. Nine of thirty small mammals (*Microtus* spp., *Reithrodontomys* spp., *Peromyscus* spp.) sampled in Sandia Canyon in 1997 had detectable levels of PCBs in their critical organs (K. Bennett and J. Biggs, unpub. data). Of the nine animals with detectable levels, the mean concentration in critical organs was 685 µg/kg (range 49 to 2500). Although three locations west of the AEI were trapped, small mammals with detectable levels of PCBs were found only in the location farthest away from the AEI.

5.5.2.3 *Noise*

Sound measurements were taken at one-mile intervals at five sites in Mortandad Canyon during 1997 (Huchton et al. 1997). Mean dB(A) at the four sites ranged from 37 to 47. Minimum dB(A) was 35 to 36 at each site, and the maximum ranged from 45 to 76 (a thunderclap). The nearest shot testing area of LANL is approximately 1.6 km from the edge of the Sandia-Mortandad Canyon Mexican Spotted Owl AEI buffer area. Shot testing is not likely to impact spotted owls inhabiting this AEI. There probably is significant noise in Sandia Canyon associated with East Jemez Road and the live-fire range during the day.

5.5.2.4 *Light*

Light information has not been collected in Sandia-Mortandad Canyon. The Sandia-Mortandad Canyon Mexican Spotted Owl AEI is surrounded by many developed areas. A majority of this AEI probably is currently impacted by light.

5.5.2.5 *Access*

The AEI is accessible by a LANL road throughout the Mortandad Canyon portion of this AEI for all traffic. However, all portions of this AEI are heavily used for recreation, and people have full access to this area by foot and bicycle.

5.5.2.6 *Outfalls*

Table A.5.5.2 lists the LANL outfalls that may affect the Mexican spotted owl in the Sandia-Mortandad Canyon Mexican Spotted Owl AEI. Table A.5.5.3 describes the exceedances listed in Table A.5.5.2.

5.5.2.7 *Activities*

Activities include general work associated with offices and indoor laboratory work. The bottom of Mortandad Canyon is the location of several biological, geological, and hydrological experiments. However, no large outdoor experimentation takes place in this AEI.

This AEI is accessed daily for maintenance activities associated with the building complexes in this AEI. The hydrological monitoring wells and biological research locations are visited infrequently in the bottom of Mortandad Canyon. The top of Sandia Canyon is heavily visited in association with the landfills and the biological and hydrological monitoring associated with those landfills. The mid portion of Sandia Canyon is visited infrequently, once a year on average, for maintenance on a pipeline going through the middle of the suitable habitat in this canyon. The unimproved roads in the bottom of Mortandad Canyon are maintained infrequently.

5.5.3 <u>Allowable Habitat Alteration in the Buffer Area</u>

Currently 116.9 ha of this AEI on DOE lands are developed, including 45.5 ha (9.6%) of the core and 71.4 ha (13.2%) of the buffer. Under these AEI recommendations, we recommend only an additional 38.1 ha of the buffer be developed before additional USFWS consultations take place. We also recommend that no additional developments take place outside the currently developed area in the core of this AEI. Once this cap is reached or a single large-scale project is proposed, additional consultation will be required.

5.5.4 Recommendations

- We recommend that a study be conducted on contaminant levels in Mexican spotted owl prey species that reside in Sandia-Mortandad Canyons.

5.6 THREE-MILE CANYON MEXICAN SPOTTED OWL AEI

5.6.1 Environmental Description

5.6.1.1 *Location*

This AEI is located in Three-Mile Canyon, LANL, Los Alamos County, New Mexico (Map 5.6.1). The DOE controls both the core area and the buffer area. This AEI is in TAs 15 and 67. This AEI is 510.2 ha in area with 168.8 ha in the core and 341.4 ha in the buffer.

5.6.1.2 *Overlapping AEIs*

This AEI overlaps the Pajarito Canyon Mexican Spotted Owl AEI.

5.6.1.3 *Topography*

This Mexican spotted owl AEI contains Three-Mile Canyon and several mesas (including Three-Mile, Potrillo, and Pajarito Mesas) that contain the buildings of TAs 15 and 67 (Map 5.6.2). The mesa top elevations within this AEI vary from 2190 m at the western border to 2070 m on the eastern border. The canyon bottom elevation ranges from 2100 m in the west to 2040 m in the east.

5.6.1.4 *Vegetation*

Table 5.6 describes the vegetation present in this AEI. This AEI has 7.4 ha with a slope of greater than 40% in mixed conifer, which includes 0.0 ha in the core and 7.4 ha in the buffer. The buffer area of this AEI overlaps the core area of the Mexican Spotted Owl Pajarito Canyon AEI.

5.6.2 Human Impacts

5.6.2.1 *Existing Developments*

The Three-Mile Canyon Mexican Spotted Owl AEI has existing developments in the buffer area and a small amount of development in the core area. Developed areas are 5.2 ha in the core area and 19.9 ha in the buffer and include office buildings, roads, and one firing site in the buffer. Development has occurred primarily on the mesa tops. There is a paved road that is on Pajarito Mesa to the north of this AEI, passing briefly through the buffer, and gated, paved roads traveling through the south and southeastern edge of the core and buffer. Currently, there is a fire road that bisects this AEI north to south that is maintained. There are no roads traveling along the canyon bottom.

5.6.2.2 *Contaminants*

The ER Project at LANL has identified the known PRSs in or near the Three-Mile Canyon Mexican Spotted Owl AEI (Table A.5.6.1). There are no surface water or sediment sampling locations in or near this AEI (ESP 1997).

5.6.2.3 *Noise*

No noise measurements have been made in Three-Mile Canyon. It probably is not heavily impacted by noise.

Table 5.6. Vegetation types in the Three-Mile Canyon Mexican Spotted Owl AEI.

Land Cover Type	Area in Core	Area in Buffer	AEI Total
Bare	0.8 ha	1.9 ha	2.6 ha
Mixed conifer	7.0 ha	17.0 ha	24.0 ha
Aspen	0.0 ha	1.1 ha	1.2 ha
Ponderosa Pine	77.7 ha	146.4 ha	224.1 ha
Piñon-Juniper	69.3 ha	115.4 ha	184.7 ha
Juniper Savannah	0.6 ha	0.5 ha	1.1 ha
Grassland	8.2 ha	39.2 ha	47.4 ha
Developed Area	5.2 ha	19.9 ha	25.1 ha

5.6.2.4 *Light*

Light information has not been collected in Three-Mile Canyon. TA-18, at the eastern end of the AEI, is brightly lit at night for security. There are streetlights along Pajarito Road on the north side of the AEI.

5.6.2.5 *Access*

Access is controlled into this canyon by the County of Los Alamos and by LANL when ER Project cleanup activities are taking place in the canyon.

5.6.2.6 *Outfalls*

Table A.5.6.2 lists the LANL outfalls that may affect the Mexican spotted owl in the Three-Mile Canyon Mexican Spotted Owl AEI.

5.6.2.7 *Activities*

The dirt road on the mesa above this AEI receives infrequent grading and smoothing in this AEI. The fire road that bisects this AEI is cleared infrequently and usually not unless there is a fire danger. Office activities occur at TA-18.

5.6.3 Allowable Habitat Alteration in the Buffer Area

Currently 25.1 ha of this AEI on DOE lands are developed, including 5.2 ha (3.0%) of the core and 19.9 ha (5.8%) of the buffer. Under this AEI recommendations, we recommend only 64.3 ha additional area of buffer be developed before additional USFWS consultations take place. We also recommend that no additional developments take place outside the currently developed area in the core of this AEI. Once this ceiling is reached or a single large-scale project is proposed, additional consultation will be required.

5.6.4 Recommendations

- None specific to this AEI.

APPENDIX

Table A.1.1. The percentage of each food type found in Mexican spotted owl food remains at LANL.

Species	Relative Abundance
Neotoma spp.	26.22
Peromyscus spp.	10.22
Microtus spp	4.44
Gophers	4.89
Bats	5.78
Chipmunks	0.89
Rabbits	12.89
Shrews	1.33
Small Mammal	1.33
Medium Mammal	1.78
Medium Bird	8.00
Small Bird	4.89
Nocturnal Birds	0.89
Reptiles	4.89
Arthropods	11.56

Table A.2.1. Preliminary light measurements in ftc.

		Distance from Source			
	Source (street light)	5 m	10 m	15 m	20 m
ftc	3.70	2.28	1.20	0.62	0.32

Table A.5.1.1. PRSs identified in the Cañon de Valle Mexican Spotted Owl AEI.

	NFA* Category – PRSs in Core				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
Building		1			1
Burn site			1		1
Burn site and landfill (Area 6)		1			1
Dry well		1			1
Firing site	1		1		2
Wastewater treatment	2	3			5
Landfill	1	1	1		3
Material disposal area			7		7
Non-intentional release	1				1
Operational facility		1			1
Outfall	1	2			3
Septic tank or system		2	3		5
Storage area	2				2
Sump	1	1			2
Surface disposal	1	1	2		4
Underground tank	1		1		2
TOTAL	**11**	**14**	**16**	**0**	**41**
	NFA Category – PRSs in Buffer				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
Building	3	10			13
Burn site		1	8		9
Disposal pit and burn site		1			1
Drop tower			6		6
Firing site	6	5	8		19
Incinerator			1		1
Wastewater treatment	1			1	2
Landfill		1			1
Leachfield		1			1
Material disposal area			2		2

Table A.5.1.1 (Cont.)

PRS Description	NFA Category-PRSs in Core				
	Administrative NFA	**Characterized and/or Remediated**	**Not NFA'd**	**Grand Total**	
Open burning ground		1			1
Operational release	1				1
Outfall	1	1			2
Septic tank or system	3	2	3		8
Soil contamination		3			3
Drainage		1			1
Storage area	3	1		3	7
Sump		1	2		3
Surface disposal	1	1	3		5
Surface impoundment		1			1
Tank and/or associated equipment		1			1
Trough			4		4
Underground tank	4	1		1	6
TOTAL	**23**	**33**	**37**	**5**	**98**

*NFA is an acronym for no further action. Administrative NFAs are areas that were identified during a first cut as potential release sites, but further investigation has found no evidence of contaminants at the site. Characterized and/or remediation means that the site does not requires further action at this time. Not NFA'd means that the site requires further action for cleanup.

Table A.5.1.2. Outfall identification, description, number of exceedances between 11/95 and 7/97, and current status for outfalls potentially affecting the Cañon de Valle Mexican Spotted Owl AEI.

Outfall Identification	Description	Number of Exceedances	Status
03A – 028	Treated cooling water	None	Active
03A – 185	Treated cooling water	None	Not Online
04A – 092	Non-contact cooling water discharge	None	Deleted
05A – 053	High-explosive wastewater discharge	None	Deleted
05A – 071	High-explosive wastewater discharge	None	TBD[a]
05A – 096	High-explosive wastewater discharge	None	TBD
05A – 097	High-explosive wastewater discharge	None	Active
05A – 055	High-explosive wastewater discharge	None	Active
06A – 123	Photo waste water discharge	None	Deleted

[a]TBD = to be deleted. This outfall is scheduled to be deleted from the National Pollutant Discharge Elimination System (NPDES) permit pending EPA approval

Table A.5.2.1 PRSs identified in the Pajarito Canyon Mexican Spotted Owl AEI.

	NFA Category - PRSs in Core				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
Aboveground tank				1	1
Basket pit	1				1
Building		4			4
Burn sites			1	1	2
Container storage	4	2			6
Decontamination facility			1		1
Disposal pit	1				1
Drain line		1	1		2
Effluent discharge			1		1
Electric manhole	1				1
Firing site			4	1	5
High-explosive storage area				1	1
Landfill			2		2
Material disposal area		1	2		3
Operational release	1	1	2	2	6
Outfalls		1	3		4
Pipe		1			1
Pole duplicate of 12-004(a)	1				1
Radiation test facility		1			1
Septic tank or system	2	5	5		12
Settling tank			1		1
Soil contamination		2	1		3
Storage area	3	1	6	2	12
Storm drain			2		2
Surface disposal			1		1
Surface impoundment		1			1
Underground tanks	2		5		7
Usage site	1				1
Waste lines		2	1		3
Waste treatment facility	1		1		2
TOTAL	**9**	**12**	**23**	**2**	**46**

Table A.5.2.1. (Cont.)

	NFA Category - PRSs in Buffer				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under another Authority**	**Grand Total**
Aboveground tank		1			1
Air exhaust system		1			1
Building	1	7	16	1	25
Burn sites	1				1
Canyon disposal		1			1
Cement plant	1				1
Container storage	4	3		1	8
Containment area	1				1
Decontamination facility		3			3
Disposal pit			1		1
Disposal shaft			1		1
Drain line		4	2		6
Evaporator	2				2
Filtration unit	1				1
Firing site		10	2		12
Glass breaker	1				1
Incinerator		4			4
Wastewater treatment		2			2
Liquid waste treatment/storage				1	1
Manhole	1				1
Non-intentional release	1				1
One-time spill			1		1
Open burning	1				1
Operational release		10	1		11
Outfalls	7	8	9		24
Rad waste storage area	2				2
Reduction site		1			1
Satellite storage area				7	7
Septic tank or system	9	5	10		24
Settling tank	1	3	15		19

Table A.5.2.1 (Cont.)

PRSs Description	NFA Category – PRSs in Core				
	Administrative NFA	Characterized and/or Remediated	Not NFA'd	Regulated Under Another Authority	Grand Total
Soil contamination	1	1			2
Solvent spills	1				1
Stack emissions		3			3
Storage area	4	3	7	6	20
Storm drain			1	5	6
Sump	8	3	4		15
Surface disposal	1		2		3
Surface impoundment	1	2	3		6
Thermal combustion unit	1				1
Transformer	1				1
UHTREX equipment		4			4
Underground tanks	1	1			2
Waste lines	1		1		2
Waste oil treatment	1				1
TOTAL	**33**	**26**	**43**	**18**	**120**

Table A.5.2.2. Outfall identification, description, number of exceedances between 11/95 and 7/97, and current status for outfalls potentially affecting the Pajarito Canyon Mexican Spotted Owl AEI.

Outfall Identification	Description	Number of Exceedances	Status
03A – 042	Treated cooling water discharge	None	TBD[a]
03A – 181	Treated cooling water discharge	3	Active
06A – 079	Photo wastewater discharge	None	TBD
06A – 080	Photo wastewater discharge	None	TBD
06A – 081	Photo wastewater discharge	None	TBD
06A – 082	Photo wastewater discharge	None	Deleted
06A – 100	Photo wastewater discharge	None	TBD
06A – 132	Photo waste water discharge	None	TBD

[a]TBD = to be deleted. This outfall is scheduled to be deleted from the NPDES permit pending EPA approval.

Table A.5.2.3. Details of exceedances for outfalls potentially affecting the Pajarito Canyon Mexican Spotted Owl AEI.

Outfall	Results/Limits	1997 Exceedances[a]	Results/Limits
03A – 181	N/A	pH 9.3 su 10-30-97	pH max. 9.3/9.0 su
	N/A	V(T) 0.28 mg/L 10-30-97	V(T) max. 0.28/0.10 mg/L
	N/A	V(T) 0.01 mg/L 10-30-97	V(T) avg. 0.15/0.10 mg/Lw

[a] An exceedance can occur when values for a water quality parameter exceeds the maximum allowed under the NPDES permit (max.), or when the average value over a period of time exceeds the maximum average value allowed (avg.). Values measured in mg/L have been transformed to mg/L for comparison to the allowed limits.

Table A.5.3.1. PRSs investigated in the Los Alamos Canyon Mexican Spotted Owl AEI.

	NFA Category – PRSs in Core				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
Aboveground tank		2	1		3
Acid tank			2		2
Building	1	2	1		4
Burn sites	1				1
Carcass storage	1				1
Container storage	3	3	2		8
Disposal pit			6		6
Drain line	10	11			21
Dry well	1		1		2
Filter house		10			10
Holding tank			1		1
Incinerator		3	1		4
Wastewater treatment	1	3	8		12
Laboratory		1			1
Landfill	1	1	1		3
Machinery		1	1		2
Material disposal area		1	3		4
Non-intentional release		2	5		7
One-time spill		2	1	3	6
Operational facility	2				2
Outfalls	3	4	4	3	14

Table A.5.3.1. (Cont.)

	NFA Category – PRSs in Core				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
Radioactive liquid storage	1				1
Reactor facility			10		10
Satellite storage area				1	1
Septic tank or system	7	23	12	2	44
Soil contamination	2	12			14
Storage area	2	4		1	7
Storm drain			6		6
Sump	1		1		2
Surface disposal	4	7	5	1	17
Systematic release			1		1
Tank	1	2	3		6
Transformer	1		1	4	6
Underground tanks	2	2	1		5
Waste lines			7		7
Waste storage	1				1
Waste treatment facility			1		1
TOTAL	**14**	**27**	**26**	**6**	**73**

	NFA Category – PRSs in Buffer				
PRS Description	**Administrative NFA**	**Characterized and/or remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
<90 day storage			1		1
Aboveground tank	11	4	13	1	29
Building	1	1			2
Container storage	2	1	2		5
Disposal lagoon			2		2
Disposal pit	1	1	1		3
Drain line	2	3			5
Drum storage	5				5
Equipment storage		1			1
Filter house		5			5
Firing site	2				2

Table A.5.3.1. (Cont.)

	NFA Category – PRSs in Core				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
Gas trap	1				1
Incinerator		3			3
Wastewater treatment		18	4		22
Laboratory		1			1
Landfill	1		1		2
Material disposal area			6		6
Non-intentional release		1	1		2
Oil metal bin			1		1
Oil spill				1	1
One-time spill			4		4
Operational facility	1				1
Operational release	3	2	1		6
Outfalls	2	1	3	5	11
Satellite storage area	3	1		1	5
Separation site			1		1
Septic tank or system	9	8			17
Silver recovery unit	3				3
Soil contamination	1	4		1	6
Storage area	15	12	4	3	34
Storage tank				1	1
Storm drain		1		1	2
Sump	3		1		4
Surface disposal	4	2	1		7
Surface impoundment	1		1		2
Systematic release	1	3			4
Tank	1	3	2		6
Transformer		1	1	17	19
Underground tanks	3	7	6	2	18
Vehicle decontamination facility		1			1
Warehouse	1	1			2
Waste lines	1	1	7		9
Waste oil tank	1		1		2
Waste treatment facility			9		9
TOTAL	**35**	**36**	**33**	**25**	**129**

Table A.5.3.2. Outfall identification, description, number of exceedances between 11/95 and 7/97, and current status for outfalls potentially affecting the Los Alamos Canyon Mexican Spotted Owl AEI.

Outfall Identification	Description	Number of Exceedances	Status
05S	TA.21 Sewer Plant[a]	2	Active
02S		None	Eliminated
03A – 040	Treated cooling water discharge	None	TBD[b]
03A – 048	Treated cooling water discharge	4	Active
03A – 049	Treated cooling water discharge	7	Active
03A – 113	Treated cooling water discharge	2	Active
03A – 125	Treated cooling water discharge	None	TBD
03A – 145	Treated cooling water discharge	None	Deleted
03A – 158	Treated cooling water discharge	None	Active[c]
04A – 182	Non-contact cooling water discharge	None	TBD
04A – 186	Otowi Well #4	None	Active

[a]05S (TA.21 Sewage Plant) is no longer active and is to be eliminated from the NPDES permit.

[b]TBD = to be deleted. This outfall is scheduled to be deleted from NPDES permit pending EPA approval.

[c]Cooling tower is offline during the winter but an unidentified source continues to discharge.

Table A.5.3.3. Details of exceedances for outfalls potentially affecting the Los Alamos Canyon Mexican Spotted Owl AEI.

Outfall	1996 Exceedances[a]	Results/Limits	1997 Exceedances	Results/Limits
03A-048	As[b] 66.1 mg/L	As max. 0.066/0.04 mg/L	As 51 mg/L	As max. 0.05/0.04 mg/L
	As 40.1 mg/L	As avg. 0.053/0.04 mg/L		
	As 87.33 mg/L	As max. 0.08/0.04 mg/L		
03A-049	As 87.33 mg/L	As max. 0.087/0.04 mg/L	As 49 mg/L	As max. 0.05/0.04 mg/L
	As 36.9 mg/L	As avg. 0.062/0.04 mg/L		
	As 68.0 mg/L	As max. 0.068/0.04 mg/L		
		As avg. 0.068/0.04 mg/L		

Table A.5.3.3. (Cont.)

Outfall	**1996 Exceedances**[a]	**Results/Limits**	**1997 Exceedances**	**Results/Limits**
	Cl_2[c]1.66 mg/L	Cl_2 max. 1.7/0.5 mg/L		
		Cl_2 avg. 0.7/0.2 mg/L		
03A.113	Cl_2 2.47 mg/L 2-20-97	Cl_2 max. 2.5/0.5 mg/L		
		Cl_2 avg. 0.6/0.2 mg/L		
05S	Fecal Coliform 36,000/100 mL	Fecal Coliform max. 36,000/500/100 mL		
		Fecal Coliform log mean (avg.) 36,000/500/100 mL		

[a]An exceedance can occur when values for a water quality parameter exceeds the maximum allowed under the NPDES permit (max.), or when the average value over a period of time exceeds the maximum average value allowed (avg.). Values measured in mg/L have been transformed to mg/L for comparison to the allowed limits.

[b]As = arsenic.

[c]Cl_2 = chlorine.

Table A.5.4.1. PRSs identified in the Pueblo Canyon Mexican Spotted Owl AEI.

	NFA Category				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
Aboveground tank	2	3	12	2	19
Acid tank			1		1
Airport building outfalls			2		2
Asphalt and tar remnant site		1			1
Building		3	1		4
Cistern		1			1
Container storage	1	4	4		9
Disposal pit		8	6		14
Drain line		5			5
Drain lines and outfall	2	9			11
Drum storage	1				1
Dry well			1		1
Effluent discharge, ball fields		2			2
Exhaust emissions off-gas		2			2
Filter houses/exhaust stacks		15			15
Firing range		1			1
Firing site		4			4
Holding tank (near reactor water			1		1
Incinerator		6	1		7
Incinerator surface disposal			1		1
Industrial or sanitary wastewater	1	3	5		9
Laboratory		2			2
Landfill	2	2	3		7
Leach field		2			2
Machinery and tanks		1	1		2
Manholes		2			2
Material disposal area		1	9		10
Mortar impact area		2			2
Non-intentional release		3	6		9
Oil spill				1	1
One-time spill	1	2	5		8

Table A.5.4.1. (Cont.)

Outfalls	2	4	5	1	12
Reactor facility			5		5
Reactor facility acid pit TA.2-53			1		1
Reactor facility effluent storage			3		3
Reactor facility equipment building			1		1
Sanitary sewer outfall		1			1
Satellite storage area	3			1	4
Septic system	5	26	11	2	44
Septic tank	3	17	1		21
Sludge bed wastewater treatment		1			1
Sludge bed wastewater treatment		1			1
Soil contamination	2	18		1	21
Steam cleaning plant			1		1
Storage area	2	7	1	1	11
Storm drain and outfall			7		7
Storm drainage (nonPCB				1	1
Sump	1		2		3
Surface disposal	4	11	6	1	22
Surface soil, 2 10x10 foot plots,		1			1
Systematic leak		1	1		2
Tank and/or associated equipment	3	8	5		16
Transformer storage area	1		1		2
Underground distribution tank	1				1
Underground tank		8	1		9
Vehicle decontamination facility		1			1
Warehouse		1			1
Waste line		2	13		15
Waste treatment facility			9		9
Waste treatment laboratory			1		1
Waste water treatment facility		2	3		5
Grand Total	**37**	**194**	**137**	**11**	**379**

Table A.5.4.2. Outfall identification, description, number of exceedances between 11/95 and 7/97, and current status for outfalls potentially affecting the Pueblo Canyon Mexican Spotted Owl AEI.

Outfall Identification	**Description**	**Number of Exceedances**	**Status**
02A.129	Neutralized demineralizer regeneration brine and boiler blowdown	None	Active
03A-047	Cooling tower blowdown	None	Active
03A-048	Cooling tower blowdown	3	Active
03A-049	Cooling tower blowdown	7	Active
03A.158	Cooling tower	None	Active [a]
04A.186	Otowi Well #4	None	Active
05S	Sanitary sewer outfall	2	Inactive [b]

[a]Cooling tower is offline during the winter but an unidentified source continues to discharge.

[b]05S (TA.21 Sewage Plant) is no longer active and is to be eliminated from the NPDES permit.

Table A.5.4.3. Details of exceedances for outfalls potentially affecting the Pueblo Canyon Mexican Spotted Owl AEI.

Outfall	1996 Exceedancesa	Resultsb/Limitsc	1997 Exceedances	Results/Limits
03A-048	Asd 66.1 □g/L	As max. 0.066/0.04 mg/L	As 51 □g/L	As max. 0.05/0.04
	As 40.1 □g/L	As avg. 0.053/0.04 mg/L		
	As 87.33 □g/L	As max. 0.08/0.04 mg/L		
03A-049	As 87.33 □g/L	As max. 0.087/0.04 mg/L	As 49 □g/L	As max. 0.05/0.04
	As 36.9 □g/L	As avg. 0.062/0.04 mg/L		
	As 68.0 □g/L	As max. 0.068/0.04 mg/L		
		As avg. 0.068/0.04 mg/L		
	Cl2e 1.66 □g/L	Cl2 max. 1.7/0.5 mg/L		
		Cl2 avg. 0.7/0.2 mg/L		
05S	Fecal coliform 36,000/100 mL	Fecal coliform max. 36,000/500/100 mL		
		Fecal coliform log mean (avg.) 36,000/500/100		

aIndividual exceedance values are reported as measured, in □g/L or number/100 mL.

[b]An exceedance can occur when values for a water quality parameter exceeds the maximum allowed under the NPDES permit (max.), or when the average value over a period of time exceeds the maximum average value allowed (avg.). Values measured in □g/L have been transformed to mg/L for comparison to the allowed limits.

[c]The bolded figures are the limits allowed for each water quality parameter under the NPDES or state permit.

[d]As = arsenic. [e]Cl_2 = chlorine.

Table A.5.5.1. PRSs identified in the Sandia-Mortandad Canyon Mexican Spotted Owl AEI.

	NFA Category - PRSs in Core				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
Aboveground tank			1		1
Calibration chamber			1		1
Canyon disposal			1		1
Container storage	9	3			12
Decontamination facility			1		1
Discharge headwall			1		1
Disposal pit			1		1
Drain line			5		5
Drifting mud pit	1				1
Effluent discharge			1		1
Firing site			1		1
Former building location	4	1			5
Former transformer site	1				1
Former UST site	3				3
French drain			1		1
Wastewater treatment	2	4	13		19
Landfill		1			1
Leaking drum		1			1
MDA	1	1	1		3
One-time spill				3	3
Operational facility	1				1
Operational release	2	2	1	2	7
Outfalls		1	7	2	10
Sanitary lagoon			4		4
Sediment traps			1		1
Septic tank or system	2	6	4		12
Soil contamination		3	4		7
Storage area	4	7	1	2	14
Storm drain			3		3
Sump	2				2
Surface disposal			1		1
Surface impoundment		2			2

Table A.5.5.1. (Cont.)

PRS Description	Administrative NFA	Characterized and/or Remediated	Not NFA'd	Regulated Under Another Authority	Grand Total
	NFA Category – PRSs in Core				
Systematic release		1			1
Transformer	1	1		3	5
Underground tanks	3		5		8
Waste lines		3	1		4
Waste oil treatment	1	1			2
Waste treatment facility	1		2		3
TOTAL	**38**	**38**	**62**	**12**	**150**
	NFA Category - PRSs in Buffer				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
Aboveground tank	1	1			2
Canyon disposal		1			1
Container storage	1				1
Decontamination facility		2			2
Drain line				1	1
Evaporator	1				1
Firing site			3		3
Former building location	1				1
Former transformer site	2				2
Glass breaker	1				1
Incinerator		4			4
Oil spill			1	1	2
Operational release	1	1		1	3
Outfalls		1	1	3	5
Radioactive waste storage	2				2
Reduction site		1			1
Septic tank or system	3	1	1		5
Soil contamination		1	3		4
Storage area	8	2			10
Storm drain		1	1	4	6
Sump	4				4

Table A.5.5.1. (Cont.)

	NFA Category – PRSs in Buffer				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
Surface disposal			1		1
Surface impoundment		2			2
Thermal combustion unit	1				1
Transformer				1	1
UHTREX equipment		4			4
Underground tanks		2	1	1	4
TOTAL	**26**	**24**	**12**	**12**	**74**

Table A.5.5.2. Outfall identification, description, number of exceedances between 11/95 and 7/97, and current status for outfalls potentially affecting the Sandia-Mortandad Canyon Mexican Spotted Owl AEI.

Outfall Identification	Description	Number of Exceedances	Status
03A – 047	Treated cooling water discharge	None	Active
03A – 048	Treated cooling water discharge	4	Active
03A – 049	Treated cooling water discharge	7	Active
03A – 113	Treated cooling water discharge	2	Active
03A – 125	Treated cooling water discharge	None	TBD[a]
03A – 145	Treated cooling water discharge	None	Deleted
03A – 181	Treated cooling water discharge	3	Active
03A – 160	Treated cooling water discharge	1	Inactive
04A – 166	Pajarito Well #5	None	Active
06A – 132	Photo wastewater discharge	None	TBD
051 – 051	Radioactive Waste Treatment Plant	3	Active

[a]TBD = to be deleted. This outfall is scheduled to be deleted from the NPDES permit pending EPA approval.

Table A.5.5.3. Details of exceedances for outfalls potentially affecting the Sandia-Mortandad Canyon Mexican Spotted Owl AEI.

Outfall	1996 Exceedances[a]	Results[b]/Limits[c]	1997 Exceedances	Results/Limits
03A-048	As[d] 66.1 mg/L	As max. 0.066/0.04 mg/L	As 51 mg/L	As max. 0.05/0.04 mg/L
	As 40.1 mg/L	As avg. 0.053/0.04 mg/L		
	As 87.33 mg/L	As max. 0.08/0.04 mg/L		
03A-049	As 87.33 mg/L	As max. 0.087/0.04 mg/L	As 49 mg/L	As max. 0.05/0.04 mg/L
	As 36.9 mg/L	As avg. 0.062/0.04 mg/L		
	As 68.0 mg/L	As max. 0.068/0.04 mg/L		
		As avg. 0.068/0.04 mg/L		
	Cl_2[e] 1.66 mg/L	Cl_2 max. 1.7/0.5 mg/L		
		Cl_2 avg. 0.7/0.2 mg/L		
03A.113	Cl_2 2.47 mg/L 2-20-97	Cl_2 max. 2.5/0.5 mg/L		
		Cl_2 avg. 0.6/0.2 mg/L		
03A.181			pH 9.3 su 10-30-97	pH max. 9.3/9.0 su
			V(T) 0.28 mg/L 10-30-97	V(T) max. 0.28/0.10 mg/L
			V(T) 0.01 mg/L 10-30-97	V(T) avg. 0.15/0.10 mg/Lw
03A- 160	TSS 54 mg/L 10-30-96	TSS avg. 54/30 mg/L		
051-051	COD 145 mg/L 7-1-96	COD max. 145/125 mg/L	pH 5.9 su 4-8-97	pH min. 5.9/6.0 su
	COD 130 mg/L 9-25-96	COD max. 130/125 mg/L		

[a]Individual exceedance values are reported as measured in µg/L or number/100 mL.

[b]An exceedance can occur when values for a water quality parameter exceeds the maximum allowed under the NPDES permit (max.), or when the average value over a period of time exceeds the maximum average value allowed (avg.). Values measured in mg/L have been transformed to mg/L for comparison to the allowed limits.

[c]The bolded figures are the limits allowed for each water quality parameter under the NPDES or state permit.

[d]As = arsenic.

[e]Cl_2 = chlorine.

Table A.5.6.1. PRSs identified in the Three-Mile Canyon Mexican Spotted Owl AEI.

	NFA Category – PRSs in Core				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
Buried armored vehicle (does not exist)	1				1
Drop tower		1			1
Firing site			2		2
Outfall		1			1
Pipe		1			1
Pole duplicate of 12-004 (a)	1				1
Radiation test facility		1			1
Septic tank or system	1	1	1		3
Storage area	1				1
Storm drainages			1		1
Sump		1			1
Surface disposal	1		1		2
TOTAL	**5**	**6**	**5**	**0**	**16**
	NFA Category – PRSs in Buffer				
PRS Description	**Administrative NFA**	**Characterized and/or Remediated**	**Not NFA'd**	**Regulated Under Another Authority**	**Grand Total**
Firing site		5	1		6
Industrial or sanitary wastewater treatment	1				1
Laboratory		1			1
Manhold bunker	1				1
Outfall	1	5		1	7
Septic tank or system	4	3	4		11
Settling pit			1		1
Shaft			1	1	2
Storage area		2		1	3
Storage pipe			1		1
Sump		1			1
Surface disposal		1			1
Surface impoundment			1		1
Transformer	3				3
Underground tank		1			1
Waste lines containment		1			1
Waste tank		1			1
TOTAL	**10**	**21**	**9**	**4**	**44**

Table A.5.6.2. Outfall identification, description, number of exceedances between 11/95 and 7/97, and current status for outfalls potentially affecting the Three-Mile Canyon Mexican Spotted Owl AEI.

Outfall Identification	Description	Number of Exceedances	Status
04A – 143	Non-contact cooling water	None	TBD[a]
06A - 106	Photo waste water discharge	None	TBD

[a]TBD = to be deleted. This outfall is scheduled to be deleted from the NPDES permit pending EPA approval.

Back To
"Site Plans"

Monitoring Plan

for the

American Peregrine Falcon

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

The HMP has two associated documents: Area of Environmental Interest (AEI) Site Plans and Monitoring Plans. The AEIs are areas of LANL that are being managed and protected because of their biological or other significance. Habitats of threatened and endangered species that occur or may occur on LANL are designated as AEIs. The essential element of the AEI Site Plan is the management of each species-specific potential habitat through the allowable activities within the AEI. These allowable activities may be both spatially and time constrained and based on occupancy or non-occupancy of the habitat by the species.

These plans contain sensitive information concerning potential habitat for threatened and endangered species. For that reason, these documents are controlled and will be issued only to persons who have a "need to know" and are trained by LANL's Ecology Group on the elements of the AEI Site Plan. All maps and associated materials should be considered sensitive and maintained as sensitive information.

If you need further information concerning the Endangered Species Program, these AEI Site Plans, or allowable activities, call the Ecology Group or DOE Los Alamos Area Office.

MONITORING PLAN FOR THE AMERICAN PEREGRINE FALCON

1.0 INTRODUCTION

The Threatened and Endangered Species Habitat Management Plan (HMP) will be partially implemented through the monitoring of Federal and State-listed species and local species of concern.

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

The peregrine falcon (*Falco peregrinus*) is a member of the order Falconiformes and family Falconidae, and is distributed worldwide, except Antarctica, with three subspecies occurring in North America. The historic breeding range of the American peregrine falcon (*F. p. anatum*) extended from central Mexico to subarctic Alaska and Canada, including central Alaska and almost all of the lower 48 states. This subspecies now breeds in most of its historic range in the western United States, but was extirpated in the eastern United States, where hybrids of other subspecies of the peregrine falcon have been introduced. The American peregrine falcon migrates and winters from the southern US to Central and South America. The arctic peregrine falcon (*F. p. tundrius*) breeds in the extreme northern part of the continent and migrates though the United States. It is not distinguishable from the American peregrine falcon in the field. Peale's falcon (*F. p. pealei*) breeds and largely resides in coastal areas of the northwest.

2.2 STATUS

The American peregrine falcon had been federally listed as endangered since passage of the Endangered Species Act in 1973. On August 25, 1999, the American peregrine falcon was removed from the federal list of protect species. As a result, the "by similarity of appearance" protection given to the Arctic peregrine falcon was also removed from the federal list. The New Mexico Department of Game and Fish (NMDGF) reclassified the American peregrine falcon from endangered to threatened in 1996. New Mexico currently has retained the state threatened status for this species. Occupancy of nesting habitat in New Mexico has increased dramatically since the early 1980s, but the rate of increase has slowed, and occupancy has not yet reached the 85% level that characterizes a fully recovered population (Johnson 1997). Reproduction continues to be depressed by pesticide residues, has been declining for more than a decade, and is now only slightly above the level required to maintain the population.

2.3 HABITAT

Peregrine breeding habitat is composed of nesting areas and foraging areas. Nest sites are typically located in cliff cavities, which can be defended against enemies, offer protection from weather, and provide a soil substrate in which a nesting depression can be formed. The quality of foraging habitat surrounding nesting areas is an important part of the breeding habitat. Peregrine falcons forage almost entirely for birds, which are attacked and caught in the air, often at high speeds. Avian prey is vulnerable when it is without cover, which may occur in a large gulf of air, as found over a canyon, or over large grasslands or bodies of water.

2.4 CHRONOLOGY

Peregrine falcons breed in New Mexico from early March through mid-August. After a courtship period, eggs are usually laid in early to mid-April, but may be laid as early as mid-March and as late as mid-May. Incubation lasts almost five weeks, young are in the nest about six weeks, and fledged young remain in the nesting area at least four weeks. Adults remain on their breeding territory until late September or mid-October.

2.5 BEHAVIOR

Behavior of the American peregrine falcon varies with the phase of breeding, but constants through the breeding season include vocal and physical defense of the nesting area against other raptors and humans that venture too close. Males usually arrive in the nesting area before females, and courtship is characterized by joint vocalizations at prospective nest ledges. The male does most of the foraging during courtship, incubation, and the early nestling periods, and provides food for the female, which grows sedentary and puts on weight before egg-laying. The adults take turns at incubation, but the female generally remains in the nesting area and broods, feeds, and guards the young after hatching. When food demands of the female and young exceed the male’s ability to provide for them, the female begins to forage. The adults may forage separately or together, making joint attacks on prey. The female again guards the nesting area at fledging, until the young have learned to fly, after which both adults again concentrate on providing food, which is often transferred in mid air. Fledglings engage in periods of much vocalization and practice flight, and gradually spend more time away from the nesting area. Adults enter a quiet period after young have dispersed, but begin a mock courtship period in September, which is characterized by nest ledge displays.

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

The American peregrine falcon was Federally listed as endangered and State listed as threatened. LANL and the Department of Energy (DOE) have obligations under the Endangered Species Act and the New Mexico Wildlife Conservation Act to ensure that their programs do not adversely affect individual peregrines, and to promote recovery of the species. The purposes of monitoring are (1) to gather local occupancy, reproductive, and behavioral data to verify whether the HMP is maintaining viable peregrine habitat around LANL, and (2) to contribute occupancy and reproductive data to the statewide monitoring program. . As part of the Endangered Species Act, federal institutions are required to monitor species for five years that have been de-listed from the federal list. This monitoring does not entail protecting this species from indirect disturbance as was required as a listed species. But, this species is currently protected under the Migratory Bird Treaty Act from pursuing, hunting, killing, capturing, possessing, buying, selling, purchasing, or bartering, including the feathers or other parts, nests, eggs, or products made from this bird. The monitoring objectives are to determine occupancy, nesting chronology reproductive success, and observe behavior at two designated suitable nesting areas for which DOE has primary Federal responsibility.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change (for example, if the species is newly found at LANL). Activities that are not appropriate to a species are assigned a ranking of zero. The HMP contains a summary table ranking all species and activities. The following table lists importance rankings for peregrine falcon activities.

Section	Status Tracking	Habitat Analysis and Models	Presence/ Absence Surveys	Repro-duction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Ranking	1	2	1	1	2	2	2	2	2

4.1 STATUS TRACKING

The regional status of the peregrine falcon should be evaluated annually. Statewide status reports produced by the NMDGF should be checked annually. Status tracking is a level one activity.

4.2 HABITAT ANALYSIS AND MODELS

Habitats in the Los Alamos area were evaluated for suitability as nesting areas and identified in an interagency agreement signed in 1985. The Ecology Group will not actively model peregrine falcon habitat except as needed for post de-listing species monitoring activity.. Habitat analysis is a level two activity.

4.3 PRESENCE/ABSENCE SURVEY

The purpose of this type of survey is to determine the presence or absence of peregrine falcons near suitable nesting sites. A presence/absence survey is a level one activity for post de-listing monitoring.

4.3.1 Survey Locations

Surveys will be conducted annually in Pueblo Canyon and White Rock Canyon . The US Forest Service will be contacted each year before initiating surveys in White Rock Canyon, and data from the surveys will be provided to them if requested.

4.3.2 Survey Dates

One survey will be conducted between March 15 and April 15, and a second survey will be conducted between May 1 and May 15, unless a pair is found on the first survey.

4.3.3 Survey Technique

Suitable nesting areas in New Mexico are monitored for occupancy and nesting activity by observing with binoculars and spotting scope from a position with an open view at a distance of typically 450 m (1485 ft). This allows complete aural and visual observation of nesting activity and resolution of individual plumage characteristics with minimal disturbance (Johnson 1988). Surveys are strictly observational, and will begin at sunrise and last up to five hours.

4.3.4 Required Resources

4.3.4.1 Personnel

Surveying and reporting will require one person for up to 24 hours.

4.3.4.2 Equipment

- 10 by 40 binoculars.
- 25 by 60 or more powerful spotting scope and tripod.
- Field notebook and pen.
- Adequate gear and clothing for comfort in cold weather.

4.3.4.3 Training

Nearly all peregrine falcon monitoring in New Mexico during the last two decades has been coordinated through the NMDGF and has been accomplished by four persons with a combined total of about 70 years of experience. This level of experience has ensured consistency of the data and guaranteed that no disturbance occurs.

4.3.4.4 Permitting

Authorization from the NMDGF is required to ensure that peregrine falcon monitoring is conducted according to accepted standards and to avoid disturbance.

4.3.5 Analysis and Reporting

Results of monitoring will be reported to the Ecology Group and appropriate State and Federal agencies as requested. Results of monitoring White Rock Canyon will be reported to US Forest Service if requested.

4.4 REPRODUCTIVE MONITORING

The purpose of reproductive monitoring is to:

- determine the breeding status of peregrine falcons and
- collect nesting chronology, productivity, and breeding biology information.

Reproductive monitoring is a level one activity for post de-listing monitoring..

4.4.1 Survey Locations

Survey locations are suitable nesting areas where peregrine falcons were found during presence/absence surveys.

4.4.2 Survey Dates

Due to individual variability, no strict schedule can be followed, but surveys will be conducted as often as necessary to determine laying, hatching, and fledging success.

4.4.3 Survey Technique

Survey techniques are the same as for the presence/absence surveys, but with frequent use of a high-powered spotting scope to view the nest ledge from distant superior positions during the nestling phase.

4.4.4 Required Resources

4.4.4.1 Personnel

Surveying and reporting will require one person for up to 18 hours for each occupied suitable nesting area.

4.4.4.2 Equipment

Same as in Section 4.3.4.2, but a more powerful spotting scope is better.

4.4.4.3 Training

Same as in Section 4.3.4.3.

4.4.4.4 Permitting

Same as in Section 4.3.4.4.

4.4.4.5 Analysis and Reporting

Same as in Section 4.3.4.5.

4.5 CONTAMINANT STUDIES

This is a level two activity. Suitable peregrine falcon habitat at LANL is in and near canyons that received historic hazardous and radioactive waste releases. Studies in addition to the ongoing measurement of contaminant levels in water and sediment could be useful. Such studies might include the collection and analysis of suitable prey species that use the same habitat as peregrine falcon. This protocol will be defined once a decision is made to implement this activity.

4.6 ECORISK STUDY

This is a level two activity. A preliminary ecological risk assessment of the peregrine falcon at LANL has been completed (Gallegos et al. 1997, Gonzales et al. 1997). The general approach for performing this assessment is to make a quantitative appraisal of the potential effects that soil contaminants might have on the species when introduced through the soil ingestion or food chain bioaccumulation pathways using the quotient method prescribed by the US Environmental Protection Agency. The preliminary ecological risk assessment concluded that there is a small potential for impact from contaminants to the peregrine falcon.

4.7 PREY-BASE STUDIES

This activity is a level two. LANL already conducts surveys of breeding bird presence and abundance in different habitat types. Observations could be made at nest sites to identify prey items, but this procedure carries a high risk of disturbance. Prey remains could be collected from nest sites after peregrine falcons have left the region. Analysis of stomach contents is not indicated due to the high risk of take during the procedure. This protocol will be defined once a decision is made to implement this activity.

4.8 TRACKING OF INDIVIDUALS

This is a level two activity. Individual peregrine falcons can sometimes be identified by plumage characteristics. The presence of known individuals allows evaluation of turnover rates in breeding pairs and at nest sites. This information is most useful combined with the regional and statewide data collected on this species.

4.9 REGIONAL STUDIES

This is a level two activity. Any data collected on peregrine falcon must be reported to USFWS. Since other agencies near LANL (National Park Service, US Forest Service) own peregrine falcon habitat, we may desire to collaborate on regional recovery efforts and studies with them.

5.0 LITERATURE CITED

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Back To "Birds"

Monitoring Plan

for the

Goat Peak Pika

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

The HMP has two associated documents: Area of Environmental Interest (AEI) Site Plans and Monitoring Plans. The AEIs are areas of LANL that are being managed and protected because of their biological or other significance. Habitats of threatened and endangered species that occur or may occur on LANL are designated as AEIs. The essential element of the AEI Site Plan is the management of each species-specific potential habitat through the allowable activities within the AEI. These allowable activities may be both spatially and time constrained and based on occupancy or non-occupancy of the habitat by the species.

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MONITORING PLAN FOR THE GOAT PEAK PIKA

1.0 INTRODUCTION

The monitoring of Federal and State-listed species and local species of concern is an integral piece of the Threatened and Endangered Species Habitat Management Plan (HMP). This monitoring plan provides background information and establishes monitoring protocols for the Goat Peak pika (*Ochotona princeps nigrescens*) at Los Alamos National Laboratory (LANL). This species has been identified as potentially occurring or is known to occur in habitats found either within LANL boundaries or in the vicinity of LANL.

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

The type locality was reported by Bailey in 1931 as Goat Peak at the head of Santa Clara Creek (NMDGF 1997). However, it is unknown exactly which peak he was referring to, but the species was commonly found on several peaks in the area which may include Chicoma, or Tschicoma Mountain, Cerro Pelado, Caballo Mountain, Cerro Rubio, Pajarito Peak, and Redondo Peak (Hafner 1994, 1995). Swickard et al. (1972) reported the occurrence of Goat Peak pika at the head of Frijoles Canyon, Cerro Grande, and Pajarito Mountain. Specimens have been collected from Chicoma Mountain, Pajarito Mountain, Cerro Grande, Rabbit Mountain, the head of Frijoles Creek, Redondo Peak, and Cerros del Abrigo. Areas most heavily populated by Goat Peak pikas are the Chicoma Mountain and eastern rim of the Valles Caldera, Rabbit Mountain, Redondo Peak, and Cerros del Abrigo (Hafner, pers. comm.).

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, SUBCLASS	Mammalia, Theria
ORDER, SUBORDER	Lagomorpha
FAMILY, SUBFAMILY	Ochotonidae
GENUS, SUBGENUS	*Ochotona*
SPECIES	*princeps*
SUBSPECIES	*nigrescens*

2.2 STATUS

In 1991, the Goat Peak pika was listed as Category 2 species on the Federal Register. However, in 1996, the United States Fish and Wildlife Service changed the listing status of “Federal Candidate” species where species formerly designated as Category 2 and 3 are no longer considered Federal Candidate species and therefore, no longer have and Federal protection under the "Candidate" listing. Although these species may no longer receive protection status under the “Candidate” listing they may retain other Federal or State designated protections (Federal Register, Feb. 28, 1996). In 1996, this species was listed by the New Mexico Natural Heritage Program as "Tracked” whereby data were being actively collected and stored by the Heritage Program. This species is listed as a “species of concern” by the State of New Mexico.

Historical range of the Goat Peak pika includes only New Mexico and is not found beyond the State's borders (NMDGF 1997). This species has been commonly found on talus slopes in the Jemez Mountains down to 2640 m (8800 ft) and is likely more common than previously believed (Hafner, pers. comm.).

2.3 HABITAT DESCRIPTION

Pikas occur commonly within the Jemez Mountains on patches of large talus slopes of higher peaks, small rocky areas at the head of Frijoles Canyon, older talus slopes of Cerro

Grande, and exposed ski slopes of Pajarito Mountain (Swickard et al. 1971; Hafner, pers. comm.). Areas most heavily populated by Goat Peak pikas are the Chicoma Mountain and eastern rim of the Valles Caldera, Rabbit Mountain, Redondo Peak, and Cerros del Abrigo. Activities exposing talus such as logging and ski slope construction, have produced suitable habitat for pikas. Distribution of pikas in the Jemez Mountains coincides with past and present distribution of alpine permafrost conditions, which produce and maintain appropriate talus-slope habitat (Hafner 1994).

2.4 CHRONOLOGY

Goat Peak pikas breed one to two times in late April through July with an average litter size of about three young, and they may use the same nest every year or every other year (NMDGF 1997). Pikas do not actually hibernate but rather remain active beneath the snow throughout the winter. Pikas are less active during the mid-day in the Jemez Mountains (Hafner 1995).

2.5 BEHAVIOR

2.5.1 Nesting

Pikas generally nest under rocks where their nests are well hidden (NMDGF 1997). The nests are about 22.5 cm (9 in.) high and 47.5 cm (19 in.) in diameter at the base, and consist of grasses, forbs, sticks, and leaves. The home range varies from about 300 m^2 (1080 ft^2) to as high as 1200 or more m^2 (4320 ft^2).

2.5.2 Feeding Habits

Pikas feed on vegetal material and store hay-like forage within their nests over winter (Martin et al. 1961). Food sources include a variety of grasses (fescuegrass, foxtail, sweetgrass, timothy, redtop, awn grass, wild rye), forbs (fireweed, penstemon, cinquefoil, groundsel, aster, yarrow, geranium, clover), sedges, and willow, among others (Martin et al. 1961, Bailey 1971).

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

The Goat Peak pika is not federally listed as endangered or threatened and therefore carries no protective status. However, it is considered to be a species of concern by the State of New Mexico and the Federal government and is being actively monitored to further determine its status within New Mexico.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with a one being an activity that must be done, a two indicates an activity that should be done, a three indicating an activity that may be done, and a four indicating an activity that may occur in the future should conditions change (i.e., if the species is newly found at LANL). Activities that are not appropriate to a species are assigned a ranking of zero. The HMP contains a summary table that ranks all species and activities. The following table lists importance rankings for the Goat Peak pika.

Section								
Status Tracking	Habitat Analysis and Models	Presence/Absence Surveys	Reproduction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
1	2	2	4	4	4	4	4	3

4.1 STATUS TRACKING

The Goat Peak pika is currently not federally listed for protection. However, because it is a State listed species with the potential for Federal listing, its status must be continually monitored on an annual basis to ensure no changes in its status has occurred. Status tracking for this species is considered a level 1 activity.

4.2 HABITAT ANALYSIS AND MODELS

Habitat currently known to support this species will be delineated on a global indexing system overlay coverage. Information collected will include elevation, vegetation, type of slope, aspect, and soil/geological substrate. Data on these habitats will then be used to model other areas of the Pajarito Plateau, including LANL, with similar habitat. Surveys will only be conducted if proposed LANL activities will take place within or near habitat potentially supporting Goat Peak pikas as identified by the habitat model.

4.3 PRESENCE/ABSENCE

Surveys should only take place in the event a proposed project will impact or may impact potential habitat for this species as identified during the modeling procedure described in Section 4.1 above. Presence/absence surveys for this species is considered a level 2 activity.

4.3.1 Survey Locations

The locations of survey for Goat Peak pika will be determined through use of the habitat modeling procedure described in Section 4.1 above.

4.3.2 Survey Dates

If, following evaluation of a habitat model, a field survey is deemed necessary, surveys will take place between April and August. These dates coincide with the major activity period of this species.

4.3.3 Survey Technique

Habitat that could potentially support this species or is known to support this species on the Pajarito Plateau, will be mapped using the GIS. Following model application, if a proposed project is expected to impact this species then a field survey will be conducted. The Goat Peak pika is typically nocturnal, possibly to avoid predation by hawks. However, Dave Hafner (pers. comm.) has described diurnal “transect” surveys in which individuals of this species were frequently observed when walking through the appropriate habitat. Transects will be established in the appropriate habitat. The length of transect will depend on the size of area to be surveyed but a minimum of at least 100 m (330 ft) will be used. If the habitat is less than 100 m (330 ft) in length, then the transect will be divided into lengths equaling 100 m (330 ft) (i.e., two 50-m [165-ft] transects). The entire area of potential impact will be surveyed.

4.3.4 Required Resources

4.3.4.1 Personnel

Setting up transects will require a team of four to six persons, depending on the size of area to be surveyed. The size of area and number of people used will be determined during a preliminary field site check. Data analysis and report writing for each survey will require one staff member for 20 hours.

4.3.4.2 Equipment

- US Geological Survey topographic maps of the area (a marked copy to be attached to survey data sheet)
- Standardized survey form
- Camera and film for documenting possible pika sightings
- Pin-flagging and survey flagging for marking transects

4.3.4.3 Training

All members of the survey team must sign off on required operating procedures (LANL-ESH-20-HCP/OP-001 and LANL-ESH-20-HCP/OP-BIO-026) before participation in surveys. At least one member of the survey team must be able to accurately identify pikas. At least one member of the survey team must be experienced in setting up and conducting small mammal surveys.

4.3.4.4 Permitting

A New Mexico State permit must be obtained from the New Mexico Department of Game and Fish (NMDGF) before surveying for this species.

4.3.5 Analysis and Reporting

A map delineating the potential suitable habitat(s) for the Goat Peak pika will be produced and included within a full report describing the proposed project, potential for impact to the species, the area surveyed (if appropriate based on the modeling procedure) and vegetation/abiotic data collected, and the results of the survey and/or modeling application procedure. The report will also include a summary of all interactions with the NMDGF (and if applicable, other State and Federal agencies).

4.4 REPRODUCTIVE MONITORING

The purpose of reproductive monitoring is to (1) determine the breeding status of established pika populations, (2) establish population trends in the occupied habitat, and (3) describe habitat characteristics and habitat use patterns.

4.5 CONTAMINANT STUDIES

Because no individuals of this species have been found on LANL property, associated potential contamination issues can not be identified at this time. Contaminant studies are a level 4 activity and may be conducted only if individuals are found to be present on LANL property.

4.6 ECORISK STUDIES

No ecorisk studies will be developed for this species at this time. If individuals are found on LANL property and contaminants are identified as a potential issue of concern, then an ecorisk study may be designed at that time.

4.7 PREY BASE STUDIES

No prey base studies will be developed for this species at this time. If individuals are found on LANL property, then a study identifying food habits and availability of food sources may be designed at that time.

4.8 TRACKING OF INDIVIDUALS

Tracking of individuals will not be determined unless presence has been established.

4.9 REGIONAL STUDIES

Since Goat Peak pika distribution and abundance is more widespread than previously thought, this species may not be in any immediate threat with respect to population numbers. In addition, habitat of known populations includes characteristics generally absent from LANL property. However, because of the proximity of known populations to LANL, habitat delineation and protection for this species should be considered. Therefore, once further data on habitat requirements and distribution of this species are obtained, models will be developed to identify all areas of potential occurrence.

Loss of appropriate habitat can occur by increasing moisture in dry areas, which promotes invasion of vegetation that fills the talus slopes. Goat Peak pikas do not appear to be in any immediate danger from human activities. This is a common species within its required habitat and is more common than previously recognized for this area. If new activities result in disturbance of presently undisturbed ground, there will likely be a low potential for impact to habitat for this species.

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Back To "Mammals"

Monitoring Plan

for

Songbirds

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

The HMP has two associated documents: Area of Environmental Interest (AEI) Site Plans and Monitoring Plans. The AEIs are areas of LANL that are being managed and protected because of their biological or other significance. Habitats of threatened and endangered species that occur or may occur on LANL are designated as AEIs. The essential element of the AEI Site Plan is the management of each species-specific potential habitat through the allowable activities within the AEI. These allowable activities may be both spatially and time constrained and based on occupancy or non-occupancy of the habitat by the species.

These plans contain sensitive information concerning potential habitat for threatened and endangered species. For that reason, these documents are controlled and will be issued only to persons who have a "need to know" and are trained by LANL's Ecology Group on the elements of the AEI Site Plan. All maps and associated materials should be considered sensitive and maintained as sensitive information.

If you need further information concerning the Endangered Species Program, these AEI Site Plans, or allowable activities, call the Ecology Group or DOE Los Alamos Area Office.

MONITORING PLAN FOR SONGBIRDS

1.0 INTRODUCTION

The monitoring of Federal and State-listed species and local species of concern is an integral piece of the Threatened and Endangered Species Habitat Management Plan (HMP). This monitoring plan provides background information and establishes monitoring protocols for songbirds breeding at Los Alamos National Laboratory (LANL).

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

All birds are members of the Phylum Chordata, and Class Aves. Songbirds breeding at LANL belong to the Order Passeriformes. Other birds besides passerines are detected during surveys, including woodpeckers (Order Piciformes), pigeons (Order Columbiformes), and owls (Order Strigiformes).

Birds breeding at LANL may be year-round residents or long-distance migrants who only spend the breeding season in North America. Their breeding ranges vary from just a few states to the whole western United States. Travis (1992) found 112 breeding bird species in Los Alamos County. Of these, 39 were resident species, 59 were migratory summer residents, and the rest were very-short-distance migrants.

2.2 STATUS DESCRIPTION

A number of species that can be detected during songbird surveys are considered threatened enough to justify monitoring populations for changes. These include mountain plover (*Charadrius montanus*), Virginia's warbler (*Vermivora virginae*), and gray vireo (*Vireo vicinior*) (Watchlist 2000). None of the species warrant protection under the Endangered Species Act, but some of them have been considered candidates. In addition, many species detected during surveys may face some threat to their populations.

Songbird surveys have been conducted at LANL for a number of years, and the results from some have been published (Foxx et al. 1995, Koch and Nelson 1997). In 1997, both a small-scale bird banding study and a contaminant exposure study were initiated at Technical Area (TA) 15. A contaminant study involving western bluebirds (*Sialia mexicana*) was also initiated in 1997 (Fair and Myers 1997).

2.3 HABITAT

LANL has almost 50% of its area in the piñon-juniper cover type, and about 30% in ponderosa pine cover type (Koch et al. 1997). A general bird population study would occur mainly in these cover types. If a study was initiated on a particular species, then the habitat associated with that species would be utilized.

2.4 CHRONOLOGY

The passerines will be building nests in April to June, and fledging young from June to August.

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

The broad group of birds that can be detected during songbird surveys includes some that have the potential for listing. We may be able to avoid or reduce project delays should a species of concern become listed if we have already conducted appropriate surveys. Migratory songbirds are protected under the Migratory Bird Treaty between Canada, Mexico, and the US.

Songbirds can also act as so-called indicator species. They have the potential to serve as indicators of community or ecosystem condition in their roles as mid- to high-trophic-level predators. Changes in songbird populations may be indicative of natural or anthropogenic perturbations in the communities and ecosystems in which they occur, and are likely to be evident before changes at lower trophic levels. Songbird surveys are also relatively inexpensive, thereby providing high-quality and -quantity data at low cost.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change (for example, if the species is newly found at LANL). Activities that are not appropriate to a species are assigned a ranking of zero. The HMP contains a summary table ranking all species and activities. The following table lists importance rankings for songbird monitoring activities.

Section	Status Tracking	Habitat Analysis and models	Presence/ Absence surveys	Reproduction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Ranking	1	2	2	3	3	2	3	2	3

4.1 STATUS TRACKING

The listing status of songbirds should be evaluated annually by checking for their presence on Federal and State lists. Status tracking is a level one activity.

4.2 HABITAT ANALYSIS AND MODELS

Songbirds occur throughout LANL. Should a species become a new species of concern, then monitoring protocols should be evaluated to confirm the inclusion of the species habitat association. This is a level two activity.

4.3 PRESENCE/ABSENCE SURVEY

The purpose of this type of survey is to determine the presence or absence of the different species of songbirds. A presence/absence survey is a level two activity. This protocol uses the point-count method.

4.3.1 Survey Locations

Point count locations will be placed 0.8 km (0.5 mi) apart on as many secondary and tertiary roads on LANL property as possible.

4.3.2 Survey Dates

The period for point counts will begin May 5 and end July 31.

4.3.3 Survey Technique

Point counts involve an observer standing in one spot (the station) and recording all birds seen or heard. Counts will begin at official sunrise and end four hours later. At each station, birds detected will be recorded on a data sheet or a spreadsheet on a palmtop computer.

Counts will last for six minutes. Detections will be separated into three segments: the first three minutes, the next two minutes, and the final one-minute period. That is, when a bird is recorded, note during which of the three segments it was detected. Counts will begin immediately when the observer reaches the census station.

Bird distance from the observer will be estimated and placed into one of five categories: 0–25 m; 25–50 m; 50–75 m; 75–100 m; >100 m.

Censusing will take place only on calm days when it is not raining. Weather conditions will be recorded at the first and last census points of the day, including amount of cloud cover, temperature, and wind speed. A bird flushed within 50 m (165 ft) of a station's center, as an observer approaches or leaves a station, should be counted as being at the station if the observer feels that this individual was not seen during the count period. If a flock is encountered during a census period, it may be followed after the end of the period to determine its composition and size. An observer should follow such a flock for no more than 10 minutes. A bird giving an unknown song or call may be tracked down after the count period for confirmation. No attracting devices or recordings should be used. Additional information on techniques can be found in Ralph et al. (1993) and Ralph et al. (1995).

If a gray vireo, loggerhead shrike, or mountain plover are found, the song survey should be interrupted and the bird followed and observed. Attempt to discern its breeding status. Mark its location with flagging for follow-up searches.

4.3.4 Required Resources

4.3.4.1 Personnel

One survey visit to each station will require two persons for about 25 hours. Additional station visits (up to three) will provide better results and is recommended.

Data analysis and report writing will require one person for four hours.

4.3.4.2 Equipment

- Standardized survey form.
- Clipboard and permanent (waterproof) ink pen.
- Binoculars and bird field guide.
- Watch or stopwatch.
- Flagging.

4.3.4.3 Training

The surveyors must be trained in identifying birds by sight and sound. The quality of the survey is highly dependent on the expertise of the surveyors. Surveyors should be particularly knowledgeable about the sight and sounds of mountain plover, Virginia's warbler, gray vireo, and loggerhead shrike. Surveyors must also be competent in estimating distances to singing birds.

4.3.4.4 Permitting

No permit is required for surveys.

4.3.5 Analysis and Reporting

Summary statistics, species density in each cover type, and population change over time will be calculated.

4.4 REPRODUCTIVE MONITORING

The purpose of reproductive monitoring is to

- determine the breeding status of various bird species,
- collect productivity and breeding biology information, and
- describe habitat characteristics and habitat use patterns.

Reproductive monitoring is a level three activity. This is a labor-intensive activity and the protocols will vary depending on the species of interest to be studied. Ralph et al. (1993) describe several possible protocols. Permitting is required to implement any protocol that includes trapping birds. This protocol will be defined once a decision is made to implement this activity.

4.5 CONTAMINANT STUDIES

This is a level three activity. This protocol will be defined once a decision is made to implement this activity.

4.6 ECORISK STUDY

This is a level two activity. An ecological risk assessment on songbirds at LANL would follow protocols similar to the assessment already completed on peregrine falcon (*Falco peregrinus*). The general approach for performing this assessment is to make a quantitative appraisal of the potential effects that soil contaminants might have on the species when introduced through the soil ingestion pathways using the quotient method prescribed by the US Environmental Protection Agency.

4.7 PREY-BASE STUDIES

This activity is a level three. It may be possible to determine the predominant families of invertebrates taken by breeding birds by intensive nest monitoring of nestling feeding. This would be supplemented by baseline counts of flying invertebrates. Analysis of stomach contents is another possible technique. Permitting is required to implement any protocol that includes trapping birds. This protocol will be defined once a decision is made to implement this activity.

4.8 TRACKING OF INDIVIDUALS

This is a level two activity. Individual birds can be uniquely marked with highly visible colored and numbered bands. The presence of marked individuals opens the door to a wide range of studies, including studies on territory size and plasticity, polygamy, double-brooding, return rate, and migration. The protocol for marking songbirds is well developed and has been implemented at TA-15 as part of a current mitigation action plan. Should this activity be expanded, a similar protocol would be used. Permitting is required to implement any protocol that includes trapping birds.

4.9 REGIONAL STUDIES

This is a level three activity. Since other agencies near LANL (such as the National Park Service, National Forest Service, Bureau of Land Management, State of New Mexico, San Ildefonso Pueblo, Cochiti Pueblo) manage similar habitats, we may desire to collaborate on regional recovery efforts and studies with them.

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Back To "Birds"

SITE PLAN INTRODUCTION

The Threatened and Endangered Species Habitat Management Plan (HMP) was prepared to fulfill the requirements of the Department of Energy's (DOE) Record of Decision related to the Environmental Impact Statement for the Laboratory's Dual-Axis Radiographic Hydrodynamic Test (DARHT) Facility (USDOE 1995). The impact statement and the Record of Decision identified and discussed measures that would mitigate potential adverse effects from DOE's facility construction and operation. Among these measures is the Department's commitment to develop and implement a habitat management plan for threatened and endangered species occurring not only around the DARHT facility but throughout Laboratory land and surrounding areas. The mitigating measures set forth in the impact statement are incorporated into the site plans and monitoring plans for the three federally protected species potentially occurring within Laboratory boundaries.

ROLE OF SITE PLANS IN THE HABITAT MANAGEMENT PLAN

The purpose of the HMP is to provide for the protection of threatened and endangered species and their habitats on Los Alamos National Laboratory (LANL) lands. Site plans are one of three components making up the HMP. The other two components are "An Overview of the Habitat Management Plan" and monitoring plans. The LANL Ecology Group has been tasked by DOE to help implement the HMP.

Currently, there are site plans for each of the following federally threatened or endangered species occurring or potentially occurring at LANL: bald eagle (*Haliaeetus leucocephalus*), Mexican spotted owl (*Strix occidentalis lucida*), and southwestern willow flycatcher (*Empidonax trailii extimus*). The purpose of site plans is to provide guidelines that ensure LANL operations do not adversely affect these species or their habitats. Suitable habitats for these three species, along with a protective buffer area surrounding the habitats, have been designated as Areas of Environmental Interest (AEIs). AEIs are the geographical units at LANL that are managed for the protection of a particular species. Site plans provide information on the location of AEIs and guidelines for their management.

DESCRIPTION OF THE SITE PLAN

Site plans show the locations of AEIs at LANL and identify restrictions on activities within these AEIs. Allowable activities are activities that the U.S. Fish and Wildlife Service (USFWS) has reviewed and has concurred with DOE's determination that these activities are not likely to adversely affect the three federally protected species. Activities discussed in site plans include day-to-day activities, such as access into an AEI, as well as longer-term projects, such as levels of habitat alteration in the buffer area of an AEI.

IMPLEMENTATION OF SITE PLANS

Roles and Responsibilities

***Summary:* Facility management and operational staff are responsible for ensuring that activities are reviewed for compliance with the guidelines of all applicable site plans. If activities follow all guidelines, the activity does not require any additional Endangered Species Act (ESA) regulatory compliance. However, National Environmental Policy Act, cultural resources, wetlands, or other regulatory compliance actions may still be required.**

Before the existence of the HMP, all LANL projects and activities were required to be reviewed individually for compliance with the ESA. Projects and activities that had the potential to affect threatened or endangered species or their habitats required biological assessments and concurrence from the USFWS before they could go forward.

Site plans identify the particular areas of LANL where operations might impact threatened and endangered species. They also provide a broad list of activities which, if they are conducted in accordance with the guidelines in the site plan, will not adversely affect threatened or endangered species. By providing this information in site plans, the HMP reduces the number of projects and activities that need to be individually reviewed for compliance with the ESA. If an activity or project is occurring outside of all LANL AEIs and will not impact habitat within the AEI, it does not have to be reviewed for ESA compliance unless it is a large project. Projects over 2 ha (5 ac) in size or costing more than $5 million require an individual ESA compliance review even if they are not located in an AEI.

Facility managers, with the assistance of their staff, are responsible for determining if operations within their facility management unit comply with the guidelines in these site plans. Each of the site plans describes the locations of AEIs and guidelines for a specific species. All of the site plans need to be consulted to evaluate the compliance status of an activity. If activities follow all guidelines, the activity does not require any additional ESA regulatory compliance action prior to going forward. However, National Environmental Policy Act, cultural resources, wetlands, or other regulatory compliance actions may still be required. It is the responsibility of the project leader or facility management staff to ensure that all requirements are satisfied. Contact the designated natural/cultural/biological (NCB) reviewer in your facility or division for a requirements review. If you have any questions, contact the Ecology Group (1-505-665-8961)

Be aware that a single facility may have one to several AEIs within its boundary, and the AEIs may be for different species. Some AEIs overlap. In overlapping areas you must follow the guidelines for AEIs of all involved species.

If an Activity does not Meet Site Plan Guidelines

***Summary:* Activities or projects that do not meet all applicable site plan guidelines must be assessed individually by DOE and the Ecology Group for compliance with the ESA.**

If the NCB reviewer determines that an activity or project can not meet the guidelines in applicable site plans, the Ecology group and DOE must assess each activity individually for compliance with the ESA. Please note this is the same procedure that took place for all projects and activities before development of the HMP. DOE may consult with the USFWS. The Ecology Group Operating Procedure "Threatened and Endangered Species Review Process" provides the criteria the Ecology Group uses to decide upon recommendations made to the DOE.

This assessment may result in (1) a DOE determination that there is no possibility of adverse effects and the activity can proceed, (2) suggestions for modifications of the action to avoid adverse effects so that it can proceed, or (3) a decision to prepare a Biological Assessment (BA) for the activity and submit it to the USFWS for determination of concurrence. Field research and preparation of a BA can take up to six months with an additional two months or more for DOE and USFWS concurrence.

Dissemination of Information

Although information about threatened or endangered species is not legally classified, it is still considered sensitive information. It is in the best interests of threatened and endangered species to restrict specific knowledge about their locations. These documents will be issued only to DOE and LANL personnel who have a "need to know" and are trained by LANL's Ecology Group on the elements of AEI site plans. Please do not hang site plan maps on walls or discuss the location of threatened or endangered species in causal conversation.

DATA MANAGEMENT

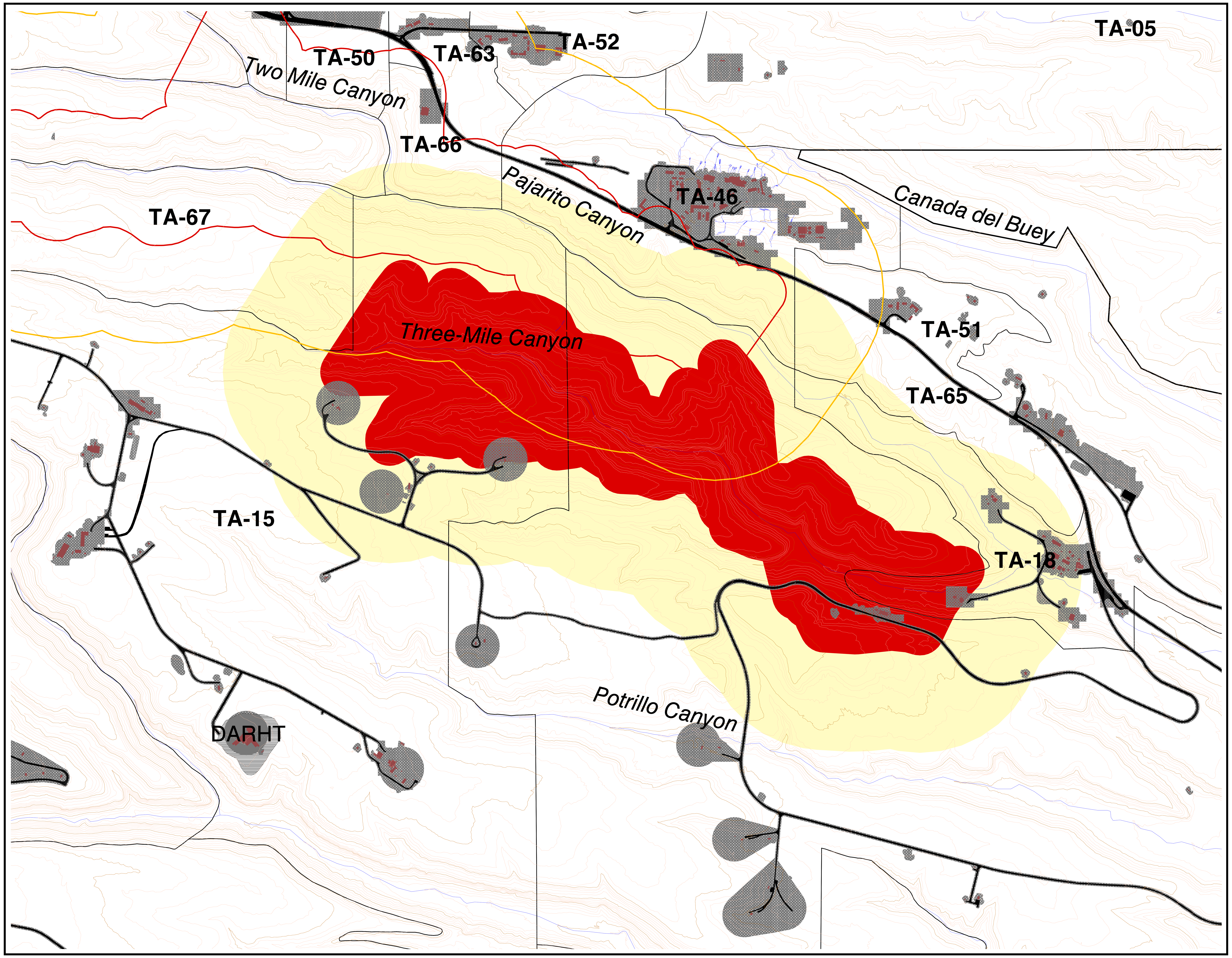
The biological data used in creation of the HMP is stored in a Geographic Information System (GIS) database. The GIS runs on an HP 900 series 735 workstation running HP-UX ver.9.0. The GIS software itself is ARC/INFO ver. 8.0 and ArcView ver. 3.2, developed by Environmental Systems Research Institute, Inc. This system allows us to display, query, analyze, and model biological data. Analysis is supplemented with infrastructure and geophysical data maintained by the Geoanalysis Group.

DETERMINATION UNDER THE ENDANGERED SPECIES ACT

There are three potential levels of determination under the Endangered Species Act: "no effect," "may affect, not likely to adversely affect," or "may affect, likely to adversely affect." If all components of the HMP are followed, we believe the impact of activities outlined in these site plans will be discountable and insignificant on threatened or endangered species. Therefore, our determination is that activities outlined under these plans “may affect, but are not likely to adversely affect” any threatened or endangered species that lives on or near the Laboratory.

Go To
Site Plans

Detailed View of Mexican Spotted Owl Three-Mile Canyon AEI



LANL
Technical Area Boundary
Developed Areas
Recent BAs
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage
Mexican Spotted Owl Three-Mile Canyon AEI
Core Zone
Buffer Zone
Areas of Overlapping AEIs
Spotted Owl Core Area
Spotted Owl Buffer Area

N E S W

1:7921

0.2 0 0.2 Miles

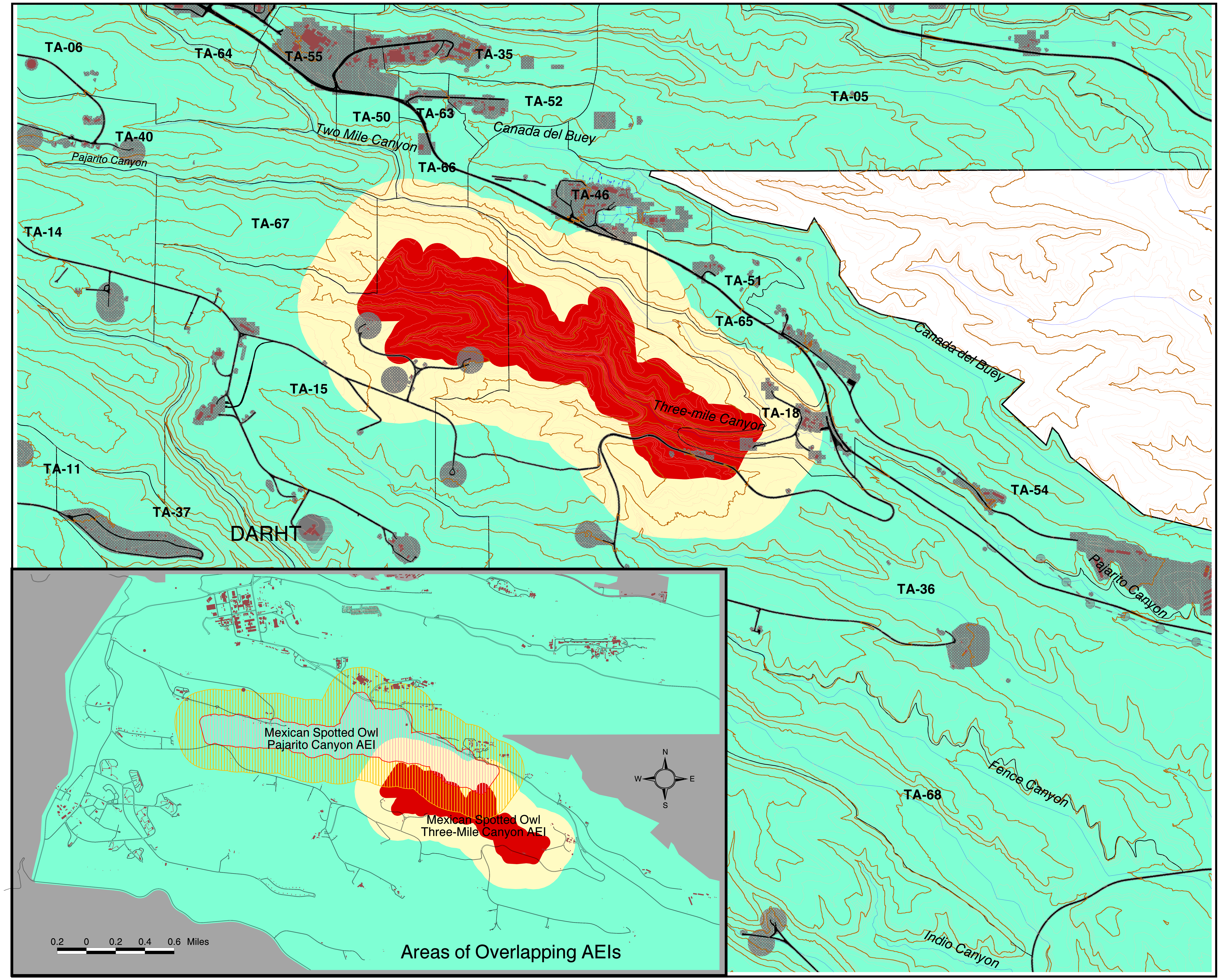
0.2 0 0.2 0.4 0.6 0.8 Kilometers

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett, Mary Salisbury, and Marjorie Wright
Date: January 29,1998
Rev. 3.0
Revised December 10, 1999
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Overview of Mexican Spotted Owl Three-Mile Canyon AEI



LANL
Technical Area Boundary
Developed Areas
Recent BAs
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Mexican Spotted Owl Three-Mile Canyon AEI
Core Zone
Buffer

N W E S

1:13417

0.4 0 0.4 0.8 Miles

0.5 0 0.5 1 Kilometers

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett, Mary Salisbury, and Marjorie Wright
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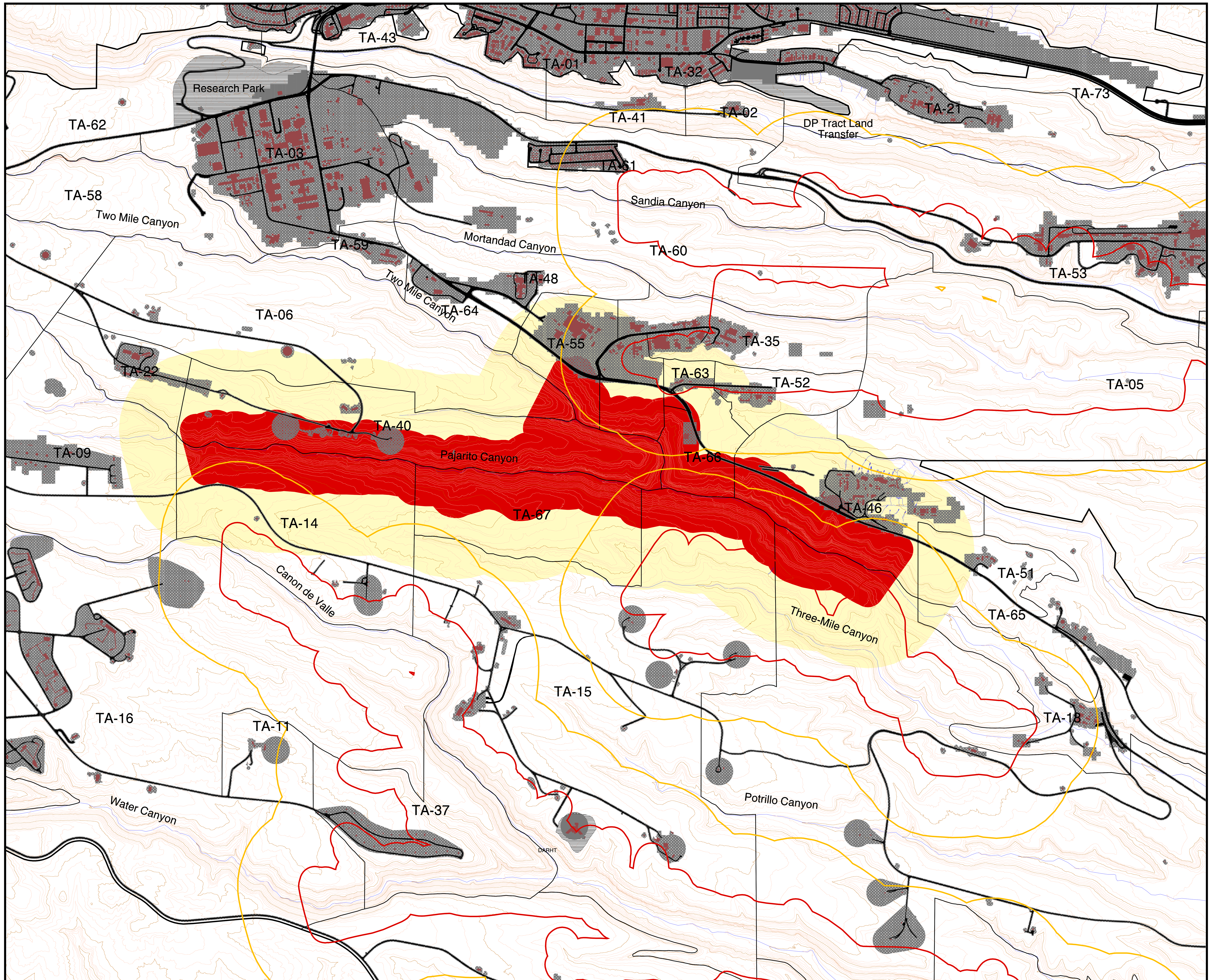
Rev. 3.0
Revised December 10, 1999
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Detailed View of Mexican Spotted Owl Pajarito Canyon AEI



LANL
Technical Area Boundary
Developed Areas
Recent BAs
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Mexican Spotted Owl
Pajarito Canyon AEI
Core Zone
Buffer Zone

Areas of Overlapping AEIs
Spotted Owl Core Zone
Spotted Owl Buffer Zone

N
W E
S

1:13250

0.3 0 0.3 Miles

0.3 0 0.3 0.6 0.9 1.2 Kilometers

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

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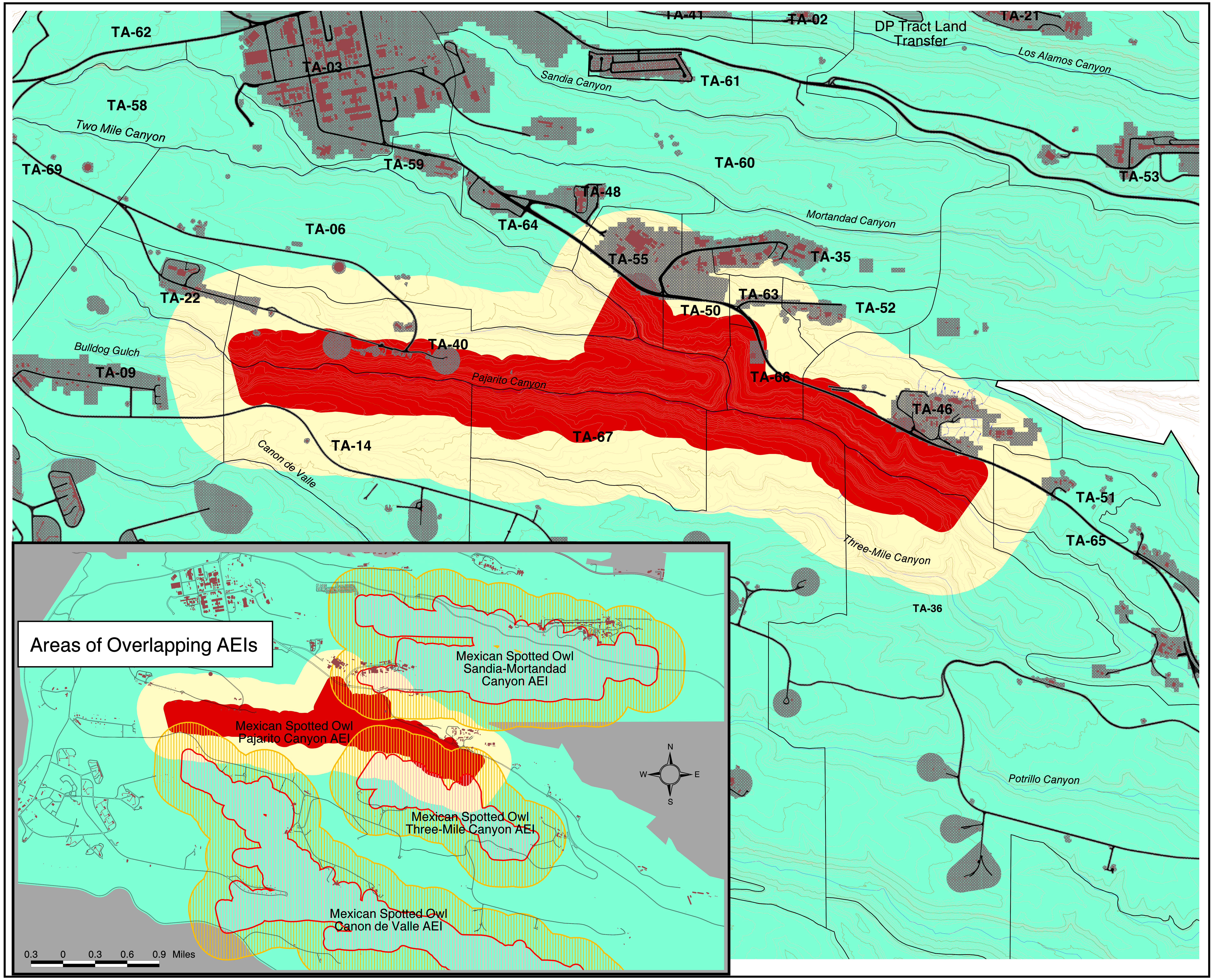
Overview of Mexican Spotted Owl Pajarito Canyon AEI



LANL
Technical Area Boundary
Developed Areas
Recent BAs
Roads
Buildings
Contours, 20 ft
Contours, 100 ft
Drainage

Mexican Spotted Owl Pajarito Canyon AEI
Core Zone
Buffer

N W E S

1:14095

0.4 0 0.4 0.8 Miles

0.5 0 0.5 1 Kilometers

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

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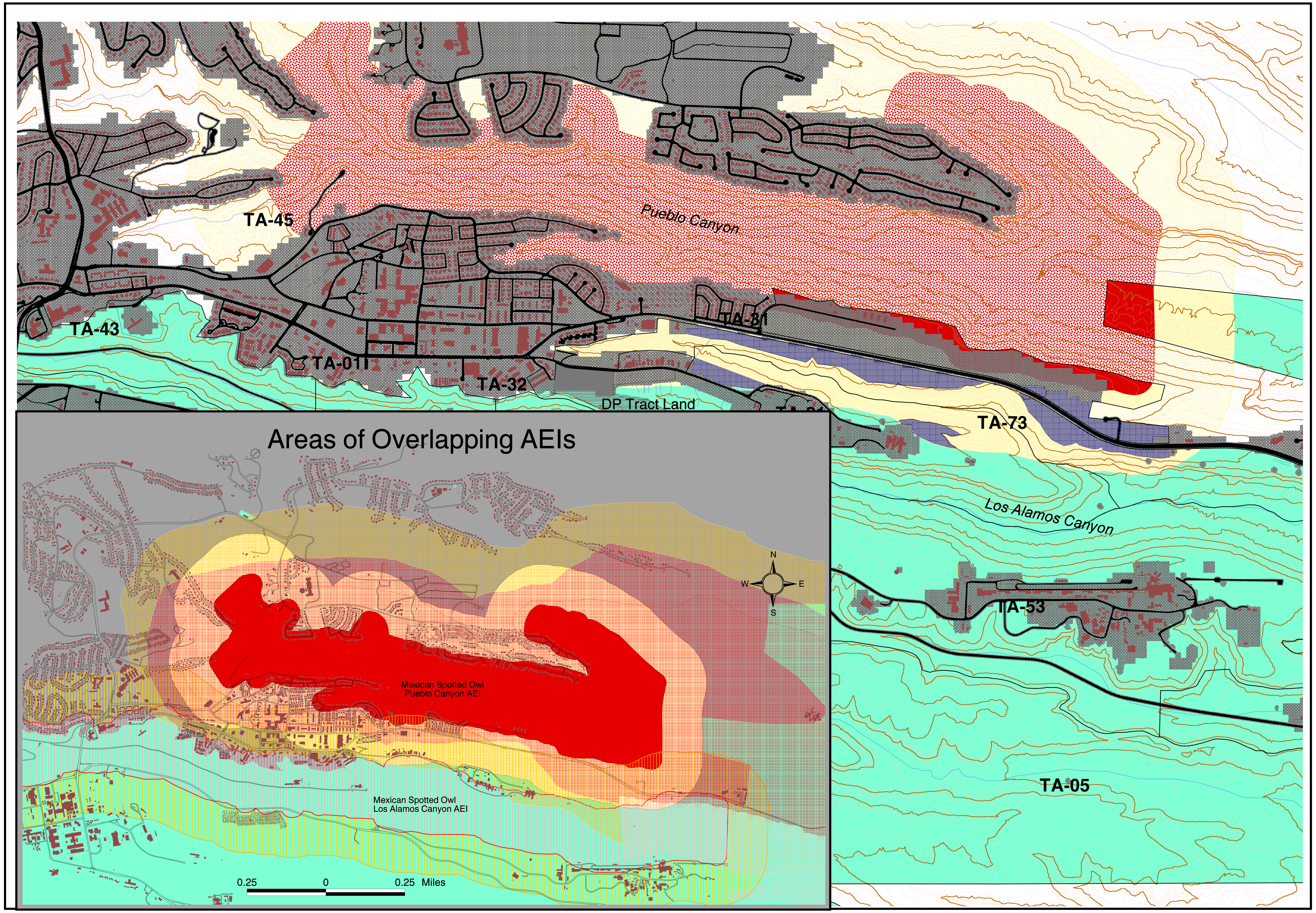
Overview of Mexican Spotted Owl Pueblo Canyon AEI



- LANL
- Technical Area Boundary
- Developed Areas
- Potential Areas of Development
- Recent BAs
- Roads
- Buildings
- Contours, 20 ft
- Contours, 100 ft
- Drainage

Mexican Spotted Owl Pueblo Canyon AEI

- Core Zone
- Buffer
- Core Zone , Off-Site
- Buffer, Off-Site

N
W E
S

1:10605

0.4 0 0.4 0.8 Miles

0.6 0 0.6 1.2 Kilometers

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum
Provisional data subject to change.

Threatened and Endangered Species Habitat Management Plan

Produced by: Kathryn Bennett and Mary Salisbury, and Marjorie Wright
Date: January 28,1998
Rev. 5.0
Revised: December 15, 1999
Facilities Data Managed by FIMAD
Biological Data Managed by Ecology Group

Monitoring Plan

for the

Southwestern Willow Flycatcher

Profile

Site Plan

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

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These plans contain sensitive information concerning potential habitat for threatened and endangered species. For that reason, these documents are controlled and will be issued only to persons who have a "need to know" and are trained by LANL's Ecology Group on the elements of the AEI Site Plan. All maps and associated materials should be considered sensitive and maintained as sensitive information.

If you need further information concerning the Endangered Species Program, these AEI Site Plans, or allowable activities, call the Ecology Group or DOE Los Alamos Area Office.

MONITORING PLAN FOR THE SOUTHWESTERN WILLOW FLYCATCHER

1.0 INTRODUCTION

The monitoring of Federal and State-listed species and local species of concern is an integral piece of the Threatened and Endangered Species Habitat Management Plan (HMP). This monitoring plan provides background information and establishes monitoring protocols for the southwestern willow flycatcher (*Empidonax traillii extimus*) at Los Alamos National Laboratory (LANL).

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

The historic range of the southwestern willow flycatcher included Arizona, California, Colorado, New Mexico, Texas, Utah, and Mexico. Currently, this flycatcher breeds in riparian habitats from southern California to Arizona and New Mexico, plus southern Utah and Nevada. In winter it is found in southern Mexico, Central America, and northern South America.

The southwestern willow flycatcher is one of four sub-species of the willow flycatcher.

PHYLUM, SUBPHYLUM	Chordata, Vertebrata
CLASS, SUBCLASS	Aves, Neornithes
ORDER, SUBORDER	Passeriformes, Tyranni
FAMILY, SUBFAMILY	Tyrannidae, Fluvicolinae
GENUS,	*Empidonax*
SPECIES	*traillii*
SUBSPECIES	*extimus*

2.2 STATUS DESCRIPTION

In 1991, the United States Fish and Wildlife Service (USFWS) designated the southwestern willow flycatcher as a candidate category 1 species (USFWS 1991). In 1993, the southwestern subspecies was proposed to be listed as an endangered species, and in 1995 the songbird was listed as a Federal Endangered species. Also in 1995 *Empidonax traillii extimus* was listed under the Natural Heritage Global Rank "G5T2" indicating that the listed subspecies was considered "Rare." The US Forest Service (USFS) listed the southwestern willow flycatcher as a Sensitive Species in USFS Region 2 (NMDGF 1997).

The NM Department of Game and Fish (NMDGF) listed the southwestern willow flycatcher as Threatened in 1988. Its status was upgraded from Threatened to Endangered in 1996 (NMDGF 1997).

At the time of state listing in 1988, NMDGF estimated that fewer than 200 pairs remained in New Mexico. Cooperative surveys in 1993-95 found only about 100 pairs, with some 75% occurring in one local area (NMDGF 1997). There are only 75 known breeding sites throughout the southwest. The current known population of southwestern willow flycatchers in the United States is estimated at between 300 and 500 pairs (Sogge et al. 1997). This indicates a critical population status, with more than 75% of the locations where flycatchers are found having five or fewer territorial birds and up to 20% of the locations having single, unmated individuals. The distribution of breeding groups is highly fragmented, with groups often separated by considerable distances. This sub-species has suffered declines attributed to extensive loss of its cottonwood-willow habitat and to poor productivity resulting from brood parasitism by brown-headed cowbirds (*Molothrus ater*) (USFWS 1995 and 1997).

Willow flycatcher habitat at LANL has been surveyed each spring beginning in 1995 following the protocol described in this plan. One male willow flycatcher was found in 1997 but not on subsequent surveys, indicating that he was a migrant.

2.3 HABITAT

The southwestern willow flycatcher is a riparian obligate bird. That is, it only nests along rivers, streams, and other wetlands. It is found in close association with dense stands of willows (*Salix* spp.), arrowweed (*Pluchea* spp.), buttonbush (*Cephalanthus* spp.), tamarisk (*Tamarix* spp.), Russian olive (*Eleagnus angustifolia*), and other riparian vegetation, often with a scattered overstory of cottonwood (*Populus* spp.). The flycatcher builds its nest in shrubs and small trees in willow thickets and deciduous woodlands along streams, lakes, and bogs. These riparian communities provide both nesting and foraging habitat (Phillips 1948, King 1955, Zimmerman 1970, Hubbard 1987, Unitt 1987, Brown and Trosset 1989, Finch 1992, USFWS 1995). The size of vegetation patches or habitat mosaics used by southwestern willow flycatchers varies considerably and ranges from as small as 0.8 ha (2 ac) to several hundred hectares. However, narrow linear riparian patches only one to two trees deep that have no potential (absent limiting factors) to increase in depth are not considered breeding habitat, although they may be used by southwestern willow flycatchers during migration (USFWS 1997).

The wetland vegetation in Pajarito Canyon includes rushes (*Juncus* spp.), cattails (*Typha latifolia*), thin-leaf alder (*Alnus tenuifolia*), boxelder (*Acer negundo*), Rocky Mountain maple (*Acer glabrum*), water birch (*Betula occidentalis*), narrow-leaf cottonwood (*Populus angustifolia*), Rio Grande cottonwood (*Populus fremontii*), and coyote willow (*Salix exigua*).

2.4 CHRONOLOGY

Willow flycatchers are present in New Mexico from early May through mid-September, and breed from late May through late July. The flycatcher's nesting cycle is approximately 28 days. Three or four eggs are laid at one-day intervals, and incubation begins when the clutch is complete (Bent 1963, Walkinshaw 1966). Eggs are incubated by the female for approximately 12 days, and the young fledge about 13 days after hatching (King 1955, Harrison 1979). Southwestern willow flycatchers typically raise one brood per year.

2.5 BEHAVIOR

2.5.1 Nesting

The southwestern willow flycatcher nests in thickets of trees and shrubs approximately 2 to 15 m (6.6 to 49.5 ft) tall, with a high percentage of canopy cover and dense foliage up to 4 m (13 ft) above ground. The nest site plant community can vary from monotypic exotics to native broadleaf dominated, and from simple, single stratum patches to complex, multiple strata (Sogge et al. 1997). Regardless of the plant species composition or height, occupied sites always have dense vegetation in the patch interior (Sogge et al. 1997). Nest height varies depending on the height of the nest plant, overall canopy height, and/or the height of the vegetation strata that contains small twigs and live growth. Nests have been found from 0.6 to 15 m (2 to 49.5 ft) above the ground (Sogge et al. 1997).

Nests are collections of grasses and forbs, lined with small fibers and typically placed 1.5 to 6.0 m (5 to 20 ft) (mean 2.7 m [8.9 ft]) above the ground in willows and other woody plants (Hubbard 1987). They are constructed in a fork or on a horizontal branch, 1 to 4.5 m (3.2 to 15 ft) above ground in a medium-sized bush or small tree, with dense vegetation above and around the nest (Brown 1988, USFWS 1993). The eggs are buffy-white with brownish speckles and spots (concentrated at the larger end), and average 18 by 14 mm (0.7 by 0.5 in.) (Reed 1965). The clutch size in New Mexico is 1 to 4 eggs, with the average 2.25 (Hubbard 1987).

2.5.2 Feeding

The southwestern willow flycatcher is an insectivore. It forages within and occasionally above dense riparian vegetation, taking insects on the wing and gleaning them from foliage (Bent 1963, USFWS 1993). The flycatcher's prey includes flies, bees, wasps, ants, beetles, moths, butterflies, grasshoppers, crickets, dragonflies, damselflies, and spiders (NMDGF 1997).

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

The southwestern willow flycatcher is a Federal and State-listed endangered species. LANL and the Department of Energy have obligations under the Endangered Species Act and the New Mexico Wildlife Conservation Act to ensure that their programs do not adversely affect individual willow flycatchers, and to promote recovery of the species. The purposes of monitoring are (1) to gather local occupancy, reproductive, and behavioral data to verify whether the HMP is maintaining viable willow flycatcher habitat at LANL, and (2) to contribute occupancy and reproductive data to the statewide monitoring program. The monitoring objectives are to determine occupancy, nesting chronology, reproductive success, and observe behavior in suitable nesting areas at LANL.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change (for example, if the species is newly found at LANL). Activities that are not appropriate to a species are assigned a ranking of zero. The HMP contains a summary table ranking all species and activities. The following table lists importance rankings for southwestern willow flycatcher monitoring activities.

Section	Status Tracking	Habitat Analysis and Models	Presence/ Absence Surveys	Reproduction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Ranking	1	1	1	1	2	1	3	3	2

4.1 STATUS TRACKING

The regional status of the southwestern willow flycatcher should be evaluated annually. Surveyors should attend status update meetings sponsored by the USFWS. The official southwestern willow flycatcher web site (http://ifw2es.fws.gov/swwf/) should be checked annually. Status tracking is a level one activity.

4.2 HABITAT ANALYSIS AND MODELS

LANL wetlands have been evaluated as possible southwestern willow flycatcher habitat. Only those in lower Pajarito Canyon have been found to be large enough and dense enough to provide suitable habitat. These wetlands were mapped by Bennett and Foxx in 1994. The Southwestern Willow Flycatcher Area of Environmental Interest (AEI) Site Plan describes this area in more detail. Habitat analysis is a level one activity.

4.3 PRESENCE/ABSENCE SURVEY

The purpose of this type of survey is to determine the presence or absence of male willow flycatchers. A presence/absence survey is a level one activity. Survey protocols for this region are specified by USFWS. The following protocols are subject to change as regional protocols are modified.

4.3.1 Survey Locations

Surveys will be conducted in the core areas of the southwestern willow flycatcher AEI.

4.3.2 Survey Dates

Conduct a minimum of one survey in each of the following survey periods:

May 15 to May 31, June 1 to June 21, and June 22 to July 10.

Surveys must be at least five days apart. The surveys will start at first light and continue until the entire AEI has been surveyed.

4.3.3 Survey Technique

This protocol is primarily a tape-playback survey. At each site, surveyors broadcast recorded vocalizations of southwestern willow flycatchers. Sogge et al. (1997) describe the survey methods in detail. Their paper should be read completely as they also discuss equipment, identification, and preparation. If a flycatcher is found, it should be observed and its behavior recorded. If it is found in survey periods 2 or 3, then its breeding status should be determined. Use the protocol described in the "Determining the breeding status" section.

4.3.4 Required Resources

4.3.4.1 Personnel

Surveying will require two persons for about 18 hours.

Data analysis and report writing will require one person for 8 hours.

4.3.4.2 Equipment

From Sogge et al. (1997):

- US Geological Survey (USGS) topographic maps of the area (a marked copy to be attached to survey data sheet). Be sure to always submit a copy of a topographic map with survey area and flycatcher sightings clearly marked.
- Standardized survey form (bring more copies than you think you need).
- Lightweight tape player (with adequate volume to carry well; use portable speakers if necessary).
- Extra tape player and batteries (dirt, water, dust, and heat often cause equipment failure, and having backup equipment helps avoid aborting a survey due to equipment loss).
- Willow flycatcher tapes; two or more tapes per surveyor (tapes do get damaged and wear out in the field, extra tapes are very important). One tape per surveyor can be obtained through the contacts listed in the back of this protocol (you will have to make your own copies).
- Clipboard and permanent (waterproof) ink pen (we recommend recording survey results directly on the survey data form, to assure that you collect and record all required data).
- Binoculars and bird field guide.

The following equipment is recommended:

- Camera and film (for habitat photos—especially at sites where flycatchers are found).
- Global positioning system unit—for determining survey coordinates and verifying location of survey plots on topographic maps.

- Survey flagging (conservative earth-tone colors)—for marking survey sites and/or areas where flycatchers are detected.

4.3.4.3 Training

At least one of the surveyors on the team must have taken the USFWS/PIF willow flycatcher survey training. It is also advisable that the lead surveyor has accompanied more experienced surveyors before leading a survey. Surveyors should also be familiar, by sight and vocalizations, with other species likely to be found in survey areas that may be confused with southwestern willow flycatchers. Surveyors should also be able to identify brown-headed cowbirds.

4.3.4.4 Permitting

A USFWS permit is required for surveys.

4.3.5 Analysis and Reporting

From Sogge et al. (1997):

"Fill in all appropriate information on the willow flycatcher survey form while still in the field, and mark the location of detections on a copy of the USGS topographic map. Make a habit of reviewing the form before you leave any site--trying to remember specific information and recording it later leads to missing and inaccurate data. Put the location of the sighting on an aerial photograph or sketch of the site. Whenever a willow flycatcher territory or nest site is confirmed, notify the USFWS or appropriate state wildlife agency as soon as you return from the field. Complete a survey form for each site surveyed, whether or not flycatchers are detected. "Negative data" (e.g., a lack of detections) is important to document absence of willow flycatchers and help determine what areas have already been surveyed. Make and retain a copy of each survey form, and submit the original. Survey forms must be returned to the USFWS and/or the appropriate wildlife agency by the specified deadline. Contact the appropriate agency each year to find out the submission deadline date. Timely submission of survey data is a permit requirement, and will ensure the information is included in annual statewide and regional reports."

4.4 REPRODUCTIVE MONITORING

The purpose of reproductive monitoring is to

- determine the breeding status of resident willow flycatchers,
- collect productivity and breeding biology information, and
- describe habitat characteristics and habitat use patterns.

Reproductive monitoring is a level one activity.

Determining the breeding status of resident willow flycatchers can be accomplished with little disturbance to the flycatcher, and so does not require an additional permit. Collecting productivity and breeding biology information requires nest monitoring that can disturb the birds, therefore additional permitting by USFWS is required.

The protocol for determining the breeding status of resident willow flycatchers is described in detail by Sogge et al. (1997). USFWS will provide the nest monitoring protocol should a southwestern willow flycatcher nest be found.

4.4.1 Survey Locations

Areas where male willow flycatchers were detected during the tape-playback survey.

4.4.2 Survey Dates

After June 1.

4.4.3 Survey Technique

The best way to determine whether a pair is present and breeding is to move a short distance away from where the bird was sighted, find a good vantage point, and sit or lie quietly to watch for signs of breeding activity. Signs of breeding activity include:

- observation of another "unchallenged" willow flycatcher in the immediate vicinity (indicates possible pair),
- whitt calls between nearby flycatchers (indicates possible pair),
- interaction twitter calls between nearby flycatchers (indicates possible pair),
- countersinging or physical aggression against another flycatcher or bird species (suggests territorial defense),
- physical aggression against cowbirds (suggests nest defense),
- observation of willow flycatchers copulating,
- flycatcher carrying nest material (verifies nesting attempt, but not nest outcome),
- flycatcher carrying food or fecal sac (verifies nest with young, but not nest outcome),
- locating an active nest (see Sogge et al. 1997), and
- observation of adult flycatchers feeding fledged young (verifies successful nesting).

4.4.4 Required Resources

4.4.4.1 Personnel

Two surveyors for 12 hours.

4.4.4.2 Equipment

Same as in Section 4.3.4.2.

4.4.4.3 Training

Same as in Section 4.3.4.3.

4.4.4.4 Permitting

Same as in Section 4.3.4.4.

4.4.4.5 Analysis and Reporting

Same as in Section 4.3.4.5.

4.5 CONTAMINANT STUDIES

This is a level two activity. Suitable willow flycatcher habitat at LANL is downstream of a hazardous waste storage facility (Area G), and studies in addition to the ongoing measurement of contaminant levels in water and sediment could be useful. Such studies might include the collection and analysis of flying invertebrates or the taking and analysis of common bird species that use the same habitat and prey base as willow flycatcher. This protocol will be defined once a decision is made to implement this activity.

4.6 ECORISK STUDY

This is a level one activity. A preliminary ecological risk assessment on the southwestern willow flycatcher at LANL has been developed (Gonzales et al. 1998). The general approach for performing this assessment is to make a quantitative appraisal of the potential effects that soil contaminants might have on the species when introduced through the soil ingestion pathways using the quotient method prescribed by the US Environmental Protection Agency.

4.7 PREY-BASE STUDIES

This activity is a level three. It may be possible to determine the predominant families of invertebrates taken by local flycatchers by intensive nest monitoring of nestling feeding. This would be supplemented by baseline counts of flying invertebrates present in the wetlands. Analysis of stomach contents is not indicated due to the high risk of take during the procedure. This protocol will be defined once a decision is made to implement this activity.

4.8 TRACKING OF INDIVIDUALS

This is a level three activity. Individual willow flycatchers can be uniquely marked with highly visible colored and numbered bands. The presence of marked individuals opens the door to a wide range of studies, including studies on territory size and plasticity, polygamy, double-brooding, return rate, and migration. The risk of take versus the benefit derived by marking individuals may be too high to recommend this procedure at this time. This protocol will be defined once a decision is made to implement this activity.

4.9 REGIONAL STUDIES

This is a level two activity. Any data collected on southwestern willow flycatcher must be reported to USFWS. Since other agencies near LANL (National Park Service, National Forest Service, Bureau of Land Management, State of New Mexico, San Ildefonso Pueblo, Cochiti Pueblo) own willow flycatcher habitat, we may desire to collaborate on regional recovery efforts and studies with them.

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Back To "Birds"

Threatened and Endangered Species Habitat Management Plan

Area of Environmental Interest

Site Plan

for the

Southwestern Willow Flycatcher

Los Alamos National Laboratory
Ecology Group

April 2000

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF MAPS

AREA OF ENVIRONMENTAL INTEREST
SITE PLAN FOR THE SOUTHWESTERN WILLOW FLYCATCHER

1.0 SPECIES DESCRIPTION—SOUTHWESTERN WILLOW FLYCATCHER

1.1 STATUS

In 1995 the United States Fish and Wildlife Service (USFWS) designated the southwestern subspecies of the willow flycatcher (*Empidonax traillii extimus*) as a federally endangered species. The US Forest Service (USFS) has listed the southwestern willow flycatcher as a sensitive species in USFS Region 2 (NMDGF 1997). The New Mexico Department of Game and Fish listed the southwestern willow flycatcher as threatened in 1988. Its state status was changed from threatened to endangered in 1996 (NMDGF 1997).

1.2 GENERAL BIOLOGY

The southwestern willow flycatcher is one of four subspecies of the willow flycatcher. The historic range of the southwestern willow flycatcher included Arizona, California, Colorado, New Mexico, Texas, Utah, and Mexico. Currently, this flycatcher breeds in riparian habitats from southern California to Arizona and New Mexico, plus southern Utah and Nevada. In winter it is found in southern Mexico, Central America, and northern South America.

Willow flycatchers are present in New Mexico from early May through mid-September and breed from late May through late July. The flycatcher's nesting cycle is approximately 28 days. Three or four eggs are laid at one-day intervals, and incubation begins when the clutch is complete (Bent 1963, Walkinshaw 1966). The female incubates eggs for approximately 12 days, and the young fledge about 13 days after hatching (King 1955, Harrison 1979). Southwestern willow flycatchers typically raise one brood per year.

The southwestern willow flycatcher only nests along rivers, streams, and other wetlands. It is found in close association with dense stands of willows (*Salix* spp.), arrowweed (*Pluchea* spp.), buttonbush (*Cephalanthus* spp.), tamarisk (*Tamarix* spp.), Russian olive (*Eleagnus angustifolia*), and other riparian vegetation, often with a scattered overstory of cottonwood (Phillips 1948, King 1955, Zimmerman 1970, Hubbard 1987, Unitt 1987, Brown and Trosset 1989, Finch 1992, USFWS 1995). The size of vegetation patches or habitat mosaics used by southwestern willow flycatchers varies considerably and ranges from as small as 0.8 ha to several hundred hectares. The southwestern willow flycatcher nests in thickets of trees and shrubs approximately 2 to 15 m tall, with a high percentage of canopy cover and dense foliage from 0 to 4 m above ground. Regardless of the plant species composition or height, occupied sites always have dense vegetation in the patch interior (Sogge et al. 1997).

The southwestern willow flycatcher is an insectivore. It forages within and occasionally above dense riparian vegetation, taking insects on the wing and gleaning them from foliage (Bent 1963, USFWS 1993). The flycatcher's prey includes flies, bees, wasps, ants, beetles, moths, butterflies, grasshoppers, crickets, dragonflies, damselflies, and spiders (NMDGF 1997).

1.3 THREATS

The current known population of southwestern willow flycatchers in the United States is estimated at between 300 and 500 pairs (Sogge et al. 1997). This indicates a critical population status, with more than 75% of the locations where flycatchers are found having five or fewer territorial birds and up to 20% of the locations having single, unmated individuals. The distribution of breeding groups is highly fragmented, with groups often separated by considerable distances. This subspecies has suffered declines attributed to extensive loss of its cottonwood (*Populus* spp.)–willow habitat and to poor productivity resulting from brood-parasitism by brown-headed cowbirds (*Molothrus ater*) (USFWS 1995 and 1997).

2.0 IMPACT OF HUMAN ACTIVITIES

2.1 INTRODUCTION

The primary threats to the southwestern willow flycatcher on Los Alamos National Laboratory (LANL) property are (1) impacts on habitat quality from LANL operations and (2) disturbance of nesting flycatchers. In this section, we review and summarize scientific knowledge of the effects of various types of human activities on southwestern willow flycatcher and provide an overview of the current levels of activities at LANL.

2.2 IMPACTS ON HABITAT QUALITY

2.2.1 Development

Throughout the southwest, riparian habitats tend to be rare, small, and separated by vast expanses of arid lands. The southwestern willow flycatcher has experienced extensive loss and modification of its habitat resulting from urban and agricultural development, water diversion and impoundment, channelization, livestock grazing, off-road vehicle and other recreational uses, and hydrological changes resulting from these and other land uses (USFWS 1993). River and stream impoundments, groundwater pumping, and overuse of riparian areas have altered as much as 90% of the flycatcher's habitat (USFWS 1995). Loss of cottonwood-willow riparian forests has had widespread impact on the distribution and abundance of bird species associated with that forest type (Hunter et al. 1987, Hunter et al. 1988, Rosenberg et al. 1991, USFWS 1993). Development itself may be tolerated if the habitat is left intact. Southwestern willow flycatchers do nest near roads, bridges, and railroad tracks (Leal, pers. comm., 1998).

Because watercourses at LANL tend to be intermittent to ephemeral, riparian habitat is fairly rare. The Rio Grande provides the only reliable source of perennial water. There has been extensive degradation of the riparian zone along the Rio Grande caused by cattle grazing and flood control operations of Cochiti Lake. There are other riparian/wetland areas on LANL associated with canyon bottoms, the most significant one being Pajarito wetlands in the lower end of Pajarito Canyon. A major paved road travels through the wetlands area in Pajarito Canyon. Outfalls releasing water into the canyons at LANL may be another source of small wetlands in Sandia and Mortandad Canyons. Buildings on LANL tend to be concentrated on the mesa tops surrounding these canyons.

2.2.2 Contaminants

There is no specific information on the impact of contaminants on southwestern willow flycatcher.

In describing general conditions of contaminants at LANL, we have used the Environmental Surveillance and Compliance Report containing data from 1996 (ESP 1997). LANL conducts annual monitoring of air quality, surface water, groundwater, sediments, soils, and foodstuffs for levels of radionuclides, metals, and some organics (ESP 1997).

2.2.2.1 *Air Monitoring*

Air quality is monitored for tritium; americium-241; plutonium-238 and -240; and uranium-234, -235, and -238. During 1996, air concentrations of these radionuclides were well below applicable guides and limits.

2.2.2.2 *Groundwater Monitoring*

Groundwater samples are taken from the main aquifer underlying Los Alamos and from water supply wells. Trace levels of tritium are present in test wells in a few areas where former or present liquid waste discharges occurred. These include Los Alamos, Pueblo, and Mortandad Canyons. The highest level of tritium detected was about 2% of the drinking water standard, and is not believed to pose a health risk. Waters near former or present effluent discharge areas show the effects of these discharges; however, radionuclide activities are below Department of Energy (DOE) dose concentration guidelines for public exposure.

2.2.2.3 *Surface Water Monitoring*

The Laboratory Environmental Surveillance Program annually surveys surface water for levels of radionuclides, water quality parameters, and metals (ESP 1997). All radionuclide results for 1996 were below the DOE derived concentration guides for public dose. None of the surface water chemistry results exceeded water quality guidelines except for some pH measurements above 8.5. High levels of barium were detected in Water Canyon, Cañada del Buey, and Ancho Canyon. Mercury levels above New Mexico wildlife habitat stream standards were detected in DP Canyon. Aluminum, iron, and manganese concentrations exceed Environmental Protection Agency (EPA) secondary drinking water standards at most locations due to naturally occurring metals. Selenium values exceeded the New Mexico wildlife habitat stream standard at numerous locations. High explosives were detected in Frijoles and Water Canyons.

2.2.2.4 *Sediment Monitoring*

Sediments also are annually collected and tested for radionuclides and metals, and some samples are tested for organics. The majority of sediment samples collected outside known radioactive effluent release areas were within background levels that reflect worldwide fallout. Sediment samples from effluent release areas, including Acid, Pueblo, DP, Los Alamos, and Mortandad Canyons, exceeded worldwide fallout levels for tritium, strontium-90, cesium-137, plutonium, and americium-241. Sediments from Cochiti Lake had detections or possible detections of strontium-90, cesium-137, and plutonium. The only radioactive contaminant level that exceeded screening action levels was cesium-137 in Mortandad Canyon. Screening action levels identify the presence of contaminants at levels of concern to human health and are derived from toxicity values and exposure parameters using data from the EPA (ESP 1997). None of the sediment samples tested for organics (approximately 1/6 of the samples) showed any significant accumulations of metals or organic compounds (including PCBs). Testing outside of the surveillance program has detected PCBs in Sandia Canyon (Fresquez 1992, Bennett and Biggs, unpub data).

2.2.2.5 *Biota Monitoring*

Wildlife such as large game animals, small mammals, birds, and other species are sampled for contaminants on a project-specific basis. Results of projects that are applicable to specific Areas of Environmental Interest (AEIs) will be discussed in the description for that specific AEI.

2.2.2.6 *Potential Contaminant Release Sites*

LANL's Environmental Restoration (ER) Project is responsible for characterizing potential threats to human health and the environment from past LANL operations and mitigating those threats through corrective actions that comply with applicable environmental regulations. The ER Project has identified over 2000 sites on LANL that potentially are a source of contaminants. These potential contaminant release sites (PRSs) were identified from historical records, area surveys, aerial photos, and interviews with current and former Laboratory employees. PRSs represent potential areas of legacy wastes from historical operations that have been discontinued. They do not represent current permitted and regulated operations. Most PRSs are regulated under the Resource Conservation and Recovery Act or the Comprehensive Environmental Response, Compensation, and Liability Act. The data presented comes from the ER Project database maintained in the Facility for Information Management, Analysis, and Display at LANL.

2.2.2.7 *Ecorisk Assessment*

An ecotoxicological risk assessment for southwestern willow flycatcher, centered on Pajarito wetlands, found that between 7 and 16 per cent of 100 hypothetical nest sites examined had hazard indices >1.0 and <10.0, depending on the foraging scenario (Gonzales et al. 1998). This indicates a small potential for impacts from contaminants. The primary contaminants driving the risk scenario were pentachlorophenol, aluminum, radium-226, calcium, and thorium-228.

2.2.3 Disturbance

2.2.3.1 *Pedestrians and Vehicles*

We do not have any specific information on the reactions of southwestern willow flycatchers to pedestrians and vehicles. Southwestern willow flycatchers do nest near roads, bridges, and railroad tracks (Leal, pers. comm., 1998).

Many canyon bottoms at LANL have paved or dirt roads traversing them. Most of the dirt roads are gated. However, many of these roads are accessible to LANL employees and the public on foot, bike, and horseback.

2.2.3.2 *Aircraft*

We do not have any specific information on the reaction of southwestern willow flycatchers to aircraft.

LANL is restricted airspace, and it is very unlikely that planes would be flying less than 2000 ft above ground level except in an emergency situation, such as wildfire. The County of Los Alamos operates an airport along the northern edge of LANL. The airport is located on the southern rim of Pueblo Canyon. Currently there are no scheduled commercial flights from the airport, although that may change. Most flights approach and depart to the east of the airport, over the Rio Grande.

2.2.3.3 *Explosives*

We do not have any specific information on the reaction of southwestern willow flycatchers to explosives detonation.

Measurements of noise levels during explosives testing (quantities of high explosives ranged from 4.5 to 67.5 kg of TNT during six shots) were made at three locations at LANL. Noise levels increased during the test from a background level of 31 dB(A) to a range between 64 and 71 dB(A) during shots at a distance of 1.8 km. At a distance of 4.3 km, noise levels rose from a background range of 35 to 64 dB(A) to a range of 60 to 63 dB(A) (Vigil 1995). At a distance of 6.7 km, noise levels rose from a background range of 38 to 51 dB(A) to a range of 60 to 71 dB(A) (Burns 1995). Keller and Risberg (1995) estimated that the noise from a shot at the Dual-Axis Radiographic Hydrodynamic Test facility would be 150 dB(A) at the source and 80 dB(A) at 400 m.

2.2.3.4 *Other Sources of Noise*

We do not have good information on the effects of noise, including machinery operation, on southwestern willow flycatchers. However, southwestern willow flycatchers do nest near roads, bridges, and railroad tracks (Leal, pers. comm., 1998).

Construction and maintenance operations at LANL are fairly common. In addition, a need for increased monitoring of groundwater has resulted in the drilling of shallow and deep test wells. Future planned fuels management operations will require the use of chainsaws.

Major noise-producing activities at LANL include automobile and truck traffic, noise associated with office buildings, construction activities, a live-fire range, and explosives testing. In addition, there is noise associated with aircraft traffic at the County airport. Huchton et al. (1997) conducted a study of noise levels in canyons at LANL. They found that the primary sources of noise exceeding 55 dB(A) were cars and trucks. Readings taken near flowing water were up to 11 dB(A) higher than readings taken elsewhere. The average dB(A) in canyons near paved roads ranged from 41 to 62 dB(A), with maximum values ranging from 62 to 74 dB(A). Away from paved roads 1.6 km or more, average dB(A) in canyons ranged from 37 to 50 dB(A), with all but one average beneath 45 dB(A). Maximum dB(A) away from paved roads ranged from 38 to 76 dB(A) (76 dB(A) was measured during a thunder clap). A bird singing in a canyon was measured at 43 dB(A), relative to a background measurement of 37 to 40 dB(A) (Keller and Risberg 1995).

Keller and Foxx (1997) made sound measurements at successive distances from an industrial area near a canyon rim, into the canyon, and to the opposite rim. Background dB(A) values ranged from 61 at the canyon rim, to 60 within the canyon, and to 62 at the bottom of the canyon near a stream. A truck horn blown at the rim of the canyon created a source sound of 121 dB(A). Sound levels measured during the horn blowing approached background levels at 50 m down the slope of the canyon. A similar test on a mesa top near a developed area found that the noise from the truck horn decreased to near-background (61 dB(A)) levels within 40 m from the source. Keller and Risberg (1995) estimated the maximum noise associated with construction operation of heavy machinery would be 110 dB(A) at the source, and average construction noise levels would be 93 dB(A) at the source.

Noise measurements taken at the Los Alamos County Airport (near the runway) during the maximum use time (06:30 to 07:30) had background values averaging 54 dB(A). Noise during plane arrivals ranged from 47 to 63 dB(A). No measurements were taken during take-offs. The maximum A-weighted sound level for Lear jets, the noisiest airplane currently using the airport, has been estimated as 94.7 dB(A) on approach and 84.7 dB(A) on take-off (USDOT 1996). Sound measurements made in the bottoms of Pueblo and Bayo Canyons ranged from 37 to 40 dB(A) in most areas of the canyon. At the sewage plant parking lot during a working day, the average dB(A) during a three-minute period was 46 (range 45 to 49), and, at the intersection of the road going into Pueblo Canyon with State Road 502, the average dB(A) during a three-minute period was 60 (range 41 to 70).

Overall, these studies appear to show that areas adjacent to or within developed areas or paved roads are likely to have daytime average background noise levels between 40 and 63 dB(A). More undisturbed areas are likely to have average background noise levels between 30 and 50 dB(A). Higher noise levels may be associated with the airport, explosives testing, or construction activity.

2.2.3.5 *Artificially Produced Light*

We have no information on the effects of artificially produced light on southwestern willow flycatcher.

Under the Los Alamos County Code, commercial site development plans are reviewed to ensure that lighting serves the intended use of the site while minimizing adverse impacts to adjacent residential property (Section 17.14.040G). Section 17.40.060 of the County Code includes light source measurement limitations in terms of strength of light in foot-candles (ftc). The code allows off-site light to be 0.5 ftc in residential areas. By comparison, full moonlight measures 0.1 ftc. A crescent moon was measured at 0.01 ftc.

Preliminary surveys were conducted for light levels within Los Alamos Canyon at the Omega Reactor (Keller and Foxx 1997). Omega Reactor is brightly lighted for purposes of security; therefore, total light intensity is greater than the average street lighting. Measurements were made at a light pole with an open parking lot at the reactor as the source. Trees did not obscure the area. Using the relationship of light intensity reducing as a square of the distance, calculations using the field data (Table A.2.1) indicate that at 30 m the light levels would be equivalent or nearly equivalent to full moonlight.

3.0 AEI GENERAL DESCRIPTION FOR SOUTHWESTERN WILLOW FLYCATCHER

3.1 DESCRIPTION OF THE SOUTHWESTERN WILLOW FLYCATCHER AEI

The AEI consists of two types of areas—core areas and buffer areas. Core areas represent wetland areas with suitable vegetation for nesting, primarily dense willows. The buffer area is the area within 100 m of core areas. The Southwestern Willow Flycatcher AEI on LANL consists of two disjunct core areas. For purposes of this site plan, both core areas and associated buffers are considered one AEI unit.

3.2 METHOD FOR IDENTIFYING THE SOUTHWESTERN WILLOW FLYCATCHER AEI

The core areas were defined by the presence of riparian habitat and suitable wetland vegetation. These areas were identified by K. Bennett and T. Foxx in 1994 during a survey of wetlands at LANL and mapped using a global positioning system receiver (K. Bennett and T. Foxx, pers. comm.) and confirmed by ground surveys in 1998 (S. Koch, pers. comm.). Wetlands without stands of dense willows at least 2 m tall and 30 m wide were removed from the AEI.

3.3 LOCATION OF THE SOUTHWESTERN WILLOW FLYCATCHER AEI

LANL has one AEI for southwestern willow flycatcher. It is composed of two core areas with associated buffers. The AEI core areas are located in the bottom of Pajarito Canyon, on the eastern side of LANL (Figure 3.1) adjacent to Pajarito Road and State Road 4.

4.0 AEI MANAGEMENT

4.1 OVERVIEW

This AEI management section provides guidelines for LANL operations to reduce or eliminate the threats to southwestern willow flycatcher from (1) habitat alterations that reduce habitat quality and (2) disturbance of breeding or potentially breeding flycatchers. Habitat alterations are considered for all AEIs and for both core and buffer areas. Activities causing disturbance—hereafter referred to as “disturbance activities”—to flycatchers are considered only for occupied AEIs and only for impacts on core areas. Developed areas (see definition below) that have ongoing baseline levels of activities and are not suitable habitat for southwestern willow flycatchers have different restrictions than undeveloped core or buffer areas. Therefore, the location of the disturbance activity within the AEI, the occupancy status of the AEI, and the type of activity all affect whether or not the activity is allowable. Remember, AEIs for different species may overlap, and an activity must meet the guidelines of all applicable site plans to be allowable. Protective measures are described as management practices that should be followed when working in AEIs.

4.2 DEFINITION AND ROLE OF OCCUPANCY IN AEI MANAGEMENT

Summary: **The occupancy status of an AEI affects what disturbance activities are allowable in different areas (core, buffer, developed) of the AEI. The Southwestern Willow Flycatcher AEI is considered occupied during 15 May through 15 September or until the surveys show the AEI to be unoccupied. See the Activity Table (Section 4.8.2) for restrictions on occupied undeveloped core and buffer areas, and see the developed area section (Section 4.3) for restrictions on developed areas.**

Occupancy simply refers to whether or not an AEI is occupied during a species' period of sensitivity. For southwestern willow flycatchers, we are primarily concerned with protecting the birds from disturbance during the breeding season. Because individuals may colonize suitable habitat, the Southwestern Willow Flycatcher AEI is treated as though it is occupied from 15 May through 15 September or until surveys show an AEI to be unoccupied. Southwestern willow flycatcher surveys are conducted during May, June, and July. In general, surveys in areas with ongoing or proposed projects are completed by June 15. Because southwestern willow flycatchers migrate south for the winter, the AEI is treated as unoccupied from 16 September to 14 May.

The occupancy status of an AEI affects what activities are allowable in the AEI. Although activities causing habitat alterations are always restricted, disturbance activities are restricted only in occupied AEIs. The Activity Table (Table 4.1) tells when and what level of disturbance activities are allowed in the occupied Southwestern Willow Flycatcher AEI under the guidelines of this site plan. Contact the Ecology Group (1-505-665-8961) or DOE (1-505-667-8690) to find out the current occupancy status of an AEI.

USFWS has recommended a 100-m buffer around riparian areas for management of the southwestern willow flycatcher (USFWS 1993). Therefore, the buffer area is the area within 100 m of the core areas.

4.3 DEFINITION AND ROLE OF DEVELOPED AREAS IN AEI MANAGEMENT

Summary: **Habitat alteration is not restricted in developed areas unless it impacts undeveloped core areas of an AEI (e.g., noise and light impacts on a core). Current ongoing disturbance activities are not restricted in developed areas. Disturbance activities not currently ongoing are restricted when impacts occur to undeveloped occupied core areas of an AEI.**

Developed areas include all building structures, paved roads, improved gravel roads, paved and unpaved parking lots, and firing sites. The current extent of developed areas in each AEI was determined using two methods. First, we placed a 15-m border around all buildings and parking lots. For paved and improved gravel roads, the developed area was defined as the area to a roadside fence, if one exists within 9 m of the road, or 4.5 m (15 ft) on each side of the road, if there is no fence within 9 m. If an area of highly fragmented habitat was enclosed by roads, a security fence, or connected buildings, that area was also classified as developed. Developed areas at firing sites were defined as a circle with a 91.4-m radius from the most centrally located firing pad. Second, we overlaid scanned orthophotos on a base map of the Los Alamos area and digitized by hand all areas that appeared developed. These two information sources were overlaid and combined, so that areas that were classified as developed by either method were considered developed in our final maps and analyses. Some areas were ground-truthed, such as the firing sites. Developed areas are contained in the Habitat Management Plan geographic information system database, and are designated as gray on maps prepared for the Habitat Management Plan.

Developed areas are located in the core and/or buffer of some AEIs. However, developed areas do not constitute suitable habitat for southwestern willow flycatcher. Current ongoing activities in developed areas constitute a baseline condition for the AEIs at this time and are not restricted. New activities including further development within already existing developed areas are not restricted unless they impact undeveloped portions of an AEI core. For example, if light or noise from a new office building in a developed area were to raise levels in an undeveloped core area, those light and noise levels would be subject to the guidelines on habitat alterations. If a proposed action within a developed area does not meet site plan guidelines, it must be individually reviewed for ESA compliance.

Building a new structure or clearing land within a previously designated developed area in an AEI core does not add to the size of the developed area. New structures in core areas will not be given any developed-area border unless they are individually reviewed for ESA compliance.

Development occurring in the developed area in an AEI buffer can be given a 15-m developed-area border at the discretion of the project leader or facility manager. To add to the size of a developed area in a buffer based on new developments, contact the Ecology Group (1-505-665-8961). Any land that is added to a developed area will be subtracted from the cumulative total development allowed in the buffer area for that AEI.

4.4 GENERAL DESCRIPTION OF BUFFER AREAS AND ALLOWABLE BUFFER AREA DEVELOPMENT

***Summary:* Limited future development is allowed in selected areas of currently undeveloped DOE-controlled buffer area under the guidelines of this site plan as long as it does not alter habitat in the undeveloped AEI core (including light and noise guidelines). Development beyond these selected areas established for this AEI, or greater than 2 ha (5 ac) in size, including the developed-area border, requires independent review for ESA compliance. New development projects in AEI buffer areas must be reported to the Ecology Group for tracking.**

The purpose of buffer areas is to protect core areas from undue disturbance or habitat degradation. The current levels of development in buffer and core areas represent baseline conditions for this site plan. No further development is allowed in the core area under the guidelines of this site plan. A limited amount of development is allowed in selected portions of the buffer area. Under the guidelines of this site plan, individual development projects are limited to 2 ha (5 ac) in size, including a 15-m developed-area border around structures and a 4.5-m (15-ft) developed-area border around paved and improved gravel roads. Projects greater than 2 ha (5 ac) in area require individual review for ESA compliance (see exception for fuels management activities in Section 4.7.2). New development projects in AEI buffer areas must be reported to the Ecology Group for tracking. Development in areas other than those mentioned as allowable in this site plan, or greater than 2 ha (5 ac) in size, including the developed-area border, require independent review for ESA compliance.

4.5 EMERGENCY ACTIONS

***Summary:* Contact DOE and the Ecology Group as soon as possible.**

If safety and/or property is immediately threatened by something occurring within an AEI (for example, wildfire, water line breakage, etc.) please contact the Ecology Group (1-505-665-8961) and DOE (1-505-667-8690) as soon as possible. If the emergency occurs outside of regular business hours, contact the Emergency Management Office (1-505-667-6211). This office will then communicate with the appropriate LANL and DOE personnel.

4.6 INTRODUCTION TO AEI MANAGEMENT GUIDELINES

***Summary:* The habitat alterations section (Section 4.7) and the activities section (Section 4.8) give the guidelines for habitat alteration and disturbance activities, respectively, for the Southwestern Willow Flycatcher AEI. The flow chart (Figure 4.1) provides a quick reference to determine what, if any, guidelines need to be consulted for a specific activity. Protective measures give management practices that should be applied when working or considering work in AEIs. Ecology Group personnel (1-505-665-8961) are available to answer questions and provide advice.**

Sections 4.7 and 4.8 provide the guidelines for habitat alterations and allowable activities in AEI core and buffer areas. The flow chart (Figure 4.1) provides a quick reference that should be used to determine whether a project or activity will affect an AEI and what sections of the site plan need to be consulted. The section on habitat alterations (Section 4.7) describes what and where habitat alterations are allowed under the guidelines of this site plan. The section and table on allowable activities (Section 4.8) describes what, when, and where disturbance activities are allowed in occupied AEIs under the guidelines of this site plan. If an activity does not meet the restrictions given in the guidelines, the activity must be individually reviewed for ESA compliance. This site plan only provides guidelines for the Southwestern Willow Flycatcher AEI. If an activity is desired in an area with overlapping AEIs, all applicable site plans must be consulted. AEI maps show the location of all AEIs in an area. The section on protective measures (Section 4.9) describes management practices that should be applied when working or considering work in an AEI. Ecology Group personnel (1-505-665-8961) are always available to help interpret site plans and answer questions.

4.7 DEFINITION OF AND RESTRICTIONS ON HABITAT ALTERATIONS

4.7.1 Definition of Habitat Alterations

Habitat alteration includes any action that alters over the long-term the soil structure, vegetative components necessary to the species, prey quality and quantity, water quality, hydrology, or noise or light levels in undeveloped areas of an AEI. Long-term means the alteration lasts for more than one year. Habitat alteration includes any activity that removes vegetative components important to the southwestern willow flycatcher (primarily trees and shrubs). An actual activity may take place outside of the AEI and will be considered habitat alteration if consequences of the activity have effects inside the AEI core.

The habitat components most important to flycatchers include vegetative structure, food quality and quantity, and disturbance levels, including noise and light. The thickets of certain trees and shrubs along wetlands are important because they provide roost sites and a suitable habitat for nesting and foraging.

A long-term change in light or noise levels within the undeveloped core of an AEI is considered to be a habitat alteration if it increases average noise levels by ≥6 dB(A) during any portion of the 24-hour day, or it increases average light levels by ≥0.05 ftc at night. Changes in noise and light levels are measured at the core area boundary if the source is outside the core area, or at 10 m from the source if the source is in the undeveloped core area. Impacts of changes in developed areas on undeveloped cores are measured at the developed area boundary if it is within a core, or at the core area boundary if the developed area is outside of the core.

4.7.2 Fuels Management Practices to Reduce Wildfire Risk

Thinning within undeveloped buffer areas may include trees of any size to achieve a 7.6 m spacing between tree crowns. However, clear cutting is not allowed in undeveloped buffer areas. No fuels management practices are allowed in core areas. Habitat alterations including thinning are not restricted in developed areas. All fuels management activities must follow the guidelines in the Activity Table (Table 4.1) if the AEI is occupied. Ecology Group foresters are available to provide guidance and mark trees for thinning (1-505-665-8961).

4.7.3 Utility Corridors

Habitat alterations such as cutting down trees that threaten power lines are allowed within 8 m of either side of an existing utility line in all areas of an AEI (Trujillo and Racinez 1995). New utility lines and utility lines requiring clearance of a right-of-way greater than 16 m total must be individually reviewed for ESA compliance. Disturbance activities must follow the guidelines given in the activities table for occupied AEIs.

4.7.4 Restrictions on Habitat Alterations

Summary: **Habitat alterations other than utility corridor maintenance are not allowed in undeveloped core areas. Habitat alterations in buffers are limited. Habitat alterations must be reported to the Ecology Group (1-505-665-8961) for tracking.**

Habitat alterations other than the utility corridor maintenance described above are not allowed in undeveloped core areas under the guidelines of this site plan. If a project or activity is planned that would alter habitat in an undeveloped core area, it must be individually evaluated for ESA compliance. Habitat alterations in undeveloped buffer areas other than the fuels management and utility corridor maintenance activities described above are restricted to the areas described in Section 4.4. Habitat alterations in a buffer area other than fuels management activities or utility corridor maintenance must be reported to LANL's Ecology Group for tracking.

4.8 DEFINITION OF AND RESTRICTIONS ON DISTURBANCE ACTIVITIES

4.8.1 Definition of Disturbance Activities

We considered six categories of activities that might cause disturbance in an AEI. Most of the categories were first identified in the document "Peregrine Falcon Habitat Management in the National Forests of New Mexico" prepared for the USFS (Johnson 1994). We added other light production and other noise production to try and provide the most comprehensive list of activities possible, thereby reducing the need for individual review of activities for ESA compliance. The categories of activities are people, vehicles, aircraft, other light production, and other noise production. We did not consider explosives detonation for this species because there are no explosives testing sites within 2 km of potential nesting habitat. We have defined low, medium, and high levels of impact for these activities. These five categories of activities are restricted only in AEIs that are classified as occupied.

People—includes any entry of people into an AEI on foot.

- Low impact is the presence of three or fewer people per project and duration of one day or less during a breeding season.
- Medium impact is the exceedance of either the number of people or the duration criteria.
- High impact is the exceedance of both the number of people and the duration criteria.

Vehicles—includes the entry of any two-axle highway vehicle, all-terrain vehicle, or motorized machinery into an AEI by any route other than a paved road or an improved gravel road.

- Low impact is the presence of two or fewer vehicles per project and duration of one day or less during a breeding season.
- Medium impact is the exceedance of either the number of vehicles or the duration criteria.
- High impact is the exceedance of both the number of vehicles and the duration criteria.

Aircraft—includes the operation of any aircraft below an elevation of 600 m (2000 ft) above the highest ground level in the local vicinity.

- Low impact is the presence of one single-engine airplane and a duration of one day or less during a breeding season.
- Medium impact is the exceedance of either the number of aircraft or the duration criteria.
- High impact is the exceedance of both the number of aircraft and the duration criteria.

Any use of helicopters, jet airplanes, and propeller airplanes with two or more engines is classified as medium impact or above, depending on duration.

Other Light Production—includes any activity not previously listed that causes additional light to occur in an AEI core area. For example, plans for construction of a new building at the edge of a developed area may call for lighting at night to facilitate nighttime work that impacts an undeveloped core area.

- Low impact is the increase of light intensity by up to 0.05 ftc and a duration of one night or less per project per breeding season.
- Medium impact is the exceedance of either the intensity or duration criteria.
- High impact is the exceedance of both the intensity and duration criteria.

Measurements for increases in light are taken at the AEI core area boundary closest to the light source if the source is outside the core, and at 10 m from the source if the source is inside the core. Light measurements for developed areas are taken at the edge of the developed area if the developed area is within an AEI core, or at the closest core boundary if the developed area is outside of an AEI core.

Other Noise Production–includes any activity not previously listed except for explosives detonation that causes additional noise to occur in an AEI. For example, operation of machinery causes noise.

- Low impact is increasing noise levels in an AEI core by 6 dB(A) or less for one day or less per project per breeding season.
- Medium impact is the exceedance of either the level or the duration criteria.
- High impact is the exceedance of both the level and the duration criteria.

Measurements for increases in noise are taken at the AEI core boundary closest to the noise source if the source is outside the core, and at 10 m (33 ft) from the source if the source is inside the core. Noise measurements for developed areas are taken at the edge of the developed area if the developed area is within an AEI core, or at the closest core boundary if the developed area is outside of an AEI core.

4.8.2 Activity Table

Disturbance activities are of concern only when southwestern willow flycatchers occupy an AEI. The AEI is always considered occupied between 15 May and 15 September, or until surveys show the AEI to be unoccupied. The Southwestern Willow Flycatcher AEI is always considered unoccupied between 16 September and 14 May, when flycatchers have migrated for the winter.

For occupancy status of an AEI after completion of surveys, contact the Ecology Group (1-505-665-8961).

4.9 PROTECTIVE MEASURES

***Summary:* This section provides a list of management practices to apply.**

- No wetland vegetation will be removed outside of developed areas.
- Appropriate erosion and runoff controls should be employed to reduce soil loss.
- Avoid unnecessary disturbance to vegetation (e.g., excessive parking areas or equipment storage areas, off-road travel, materials storage areas, crossing of streams or washes).
- Avoid removal of vegetation along drainage systems and stream channels.
- Avoid all vegetation removals not absolutely necessary.
- Appropriate erosion controls must be put in place and periodically checked throughout the life of any projects.
- All exposed soils must be revegetated as soon as feasible after disturbance to minimize erosion.

Table 4.1. Restrictions on activities in undeveloped occupied Southwestern Willow Flycatcher AEI. Dates indicate the time period during which the activity is restricted.

		Core	**Buffer**
Restrictions on Occupied Habitat			
People			
	Low	No Restriction	No Restriction
	Medium	May 15 to Aug. 15	No Restriction
	High	May 15 to Sep. 15	No Restriction
Vehicles			
	Low	May 15 to Sep. 15	No Restriction
	Medium	May 15 to Sep. 15	No Restriction
	High	May 15 to Sep. 15	No Restriction
Aircraft			
	Low	No Restriction	No Restriction
	Medium	May 15 to Aug. 15	May 15 to Aug. 15
	High	May 15 to Sep. 15	May 15 to Sep. 15
Other Light/noise Production			
	Low	May 15 to Sep. 15	No Restriction*
	Medium	May 15 to Sep. 15	No Restriction*
	High	May 15 to Sep. 15	No Restriction*

*Noise or light production in the buffer is restricted if the activity would violate core area restriction on noise or light.

5.0 SOUTHWESTERN WILLOW FLYCATCHER AEI DESCRIPTION

5.1 PAJARITO CANYON SOUTHWESTERN WILLOW FLYCATCHER AEI

5.1.1 Environmental Description

5.1.1.1 *Location*

The Southwestern Willow Flycatcher AEI is located in lower Pajarito Canyon, Technical Area (TA) 36, at LANL. The canyon is bounded on the north by Mesita del Buey and on the south by Potrillo Mesa. Most of the AEI is in Pajarito Canyon, but part of the westernmost buffer zone includes the cliff face between the canyon and Mesita del Buey and extends up onto the mesa (Map 5.1). The AEI consists of two disjunct core/buffer areas. There are a total of 6.1 ha of core areas and 32.9 ha of buffer areas.

5.1.1.2 *Overlapping AEIs*

No other AEIs overlap the Southwestern Willow Flycatcher AEI.

5.1.1.3 *Topography*

Lower Pajarito Canyon ranges from 300 to 480 m in width and from 1950 to 2010 m in elevation. Mesita del Buey ranges from 1992 to 2052 m in elevation.

5.1.1.4 *Vegetation*

The Southwestern Willow Flycatcher AEI encompasses open water, wetland vegetation, and uplands. The wetland vegetation includes rushes (*Juncus* spp.), cattails (*Typha latifolia*), thin-leaf alder (*Alnus tenuifolia*), box elder (*Acer negundo*), Rocky Mountain maple (*Acer glabrum*), water birch (*Betula occidentalis*), narrowleaf cottonwood (*Populus angustifolia*), Rio Grande cottonwood (*Populus fremontii*), and coyote willow (*Salix exigua*). Piñon pine (*Pinus edulis*) and one-seed juniper (*Juniperus monosperma*) dominate the upland areas.

5.1.1.5 *Hydrology*

Pajarito Canyon has a large drainage area (27.6 km^2) that heads on the flanks of the Sierra de los Valles. The stream that flows through the AEI is intermittent (Devaurs and Purtymun 1985). A deep aquifer underlies the Pajarito Plateau. LANL and nearby communities derive their drinking water from this aquifer. In addition to the deep aquifer, a perched alluvial aquifer underlies Pajarito Canyon. Springs that feed Pajarito wetlands likely derive from this perched groundwater. It is recharged by snowmelt, thunderstorm runoff, and some National Pollutant Discharge Elimination System (NPDES) -permitted effluents.

5.1.2 Human Impacts

5.1.2.1 *Existing Developments*

A two-lane road, Pajarito Road, runs through the AEI buffer zone. The east end of the AEI is bounded by State Road 4 and the town of White Rock. Two dirt roads also pass through the AEI. Mesita del Buey, the mesa north of Pajarito Canyon, is developed and is mainly used as a low-level radioactive waste disposal area, known as TA-54 or Area G. This site has numerous buildings and storage areas. A high-voltage power line runs through the AEI. There is 0.05 ha of developed area in the core.

5.1.2.2 *Contaminants*

Groundwater is monitored through observation wells for radionuclides as well as nonradiochemical constituents, such as minerals, salts, and organics. In 1985, three shallow wells were constructed to determine whether disposal activities on the adjacent mesa were affecting the quality of shallow groundwater. No constituents were found to be at any concentrations of concern. Most constituents measured in groundwater were at least an order of magnitude below the relevant action level (ESP 1997).

Surface water is monitored in two ways: (1) through surface water grab samples collected annually from locations where effluent discharges or spring flows maintain stream flow and (2) runoff samples collected during or shortly after precipitation events. Again, both radiochemical and nonradiochemical constituents were measured. No constituents were found to be at any concentrations of concern. Most constituents measured in surface water were at least an order of magnitude below the relevant action level (ESP 1997).

Because sediment transport associated with surface water runoff is a significant mechanism for contaminant movement, sediments are sampled at six locations on intermittent streams running down from Mesita del Buey into Pajarito Canyon. Some of these stations exceeded background levels for plutonium-238, -239, and -240, but all of these levels were at least two orders of magnitude less than the screening action level (ESP 1997). Screening action levels are used by LANL's ER Project to identify the presence of contaminants at levels of concern. Screening action level values are derived from toxicity values and exposure parameters using data from the EPA.

The ER Project at LANL identified five PRSs in lower Pajarito Canyon, which contains the Southwestern Willow Flycatcher AEI. All five PRSs have been classified as administrative no further actions (NFAs) or characterized and/or remediated. NFAs have been dismissed from further consideration by the ER Program because thorough investigations indicate that no contaminating operations ever occurred there or because levels of contamination are below current standards.

5.1.2.3 *Noise*

Huchton et al. (1997) conducted a study of noise levels in canyons at LANL. They found that the primary source of noise exceeding 55 dB(A) were cars and trucks. Readings taken near flowing water were up to 11 dB(A) higher than readings taken elsewhere. The average dB(A) level in canyons near paved roads ranged from 41 to 62 dB(A), with maximum values ranging from 62 to 74 dB(A). The noisiest times in Pajarito Canyon are during the morning and evening rush hours, 6:30 a.m. to 9 a.m. and 4 p.m. to 6 p.m. Although southwestern willow flycatchers do breed in habitat adjacent to highways, bridges, and train tracks (Leal, pers. comm. 1998), no studies have been conducted relating noise level to flycatcher well-being.

5.1.2.4 *Light*

The light from sources on Mesita del Buey and TA-18 produce levels below 0.01 ftc in the riparian areas of Pajarito Canyon.

5.1.2.5 *Access*

The presence of a major road through the Southwestern Willow Flycatcher AEI allows public access to the AEI. The riparian core areas are behind fences with unlocked gates.

5.1.2.6 *Outfalls*

Although there are no NPDES outfalls within the AEI, there is a drinking water well directly upstream of the AEI that is flushed out each spring. The water dumps into the Pajarito Canyon streambed at a rate of 4940 L/min (1300 gal./min) for up to 720 min.

5.1.2.7 *Activities*

The AEI is entered regularly for retrieval of water samples from observation wells.

5.1.3 Allowable Habitat Alteration in the Buffer Area

Since the purpose of the buffer area is to help maintain the core area as suitable willow flycatcher habitat, habitat alteration in the buffer area will be extremely limited. There are two areas in which restrictions on habitat alteration are relaxed.

1. The mesa top of Mesita del Buey. This mesa top can be developed as long as restrictions on impacts to the core area are met. All development projects should pass through the ESH-ID process.

2. Pajarito Road within the AEI. The mowing of upland vegetation is allowed up to 4.5 m from Pajarito Road, or to the fence, if the fence is within 9 m. Vegetation must cover the roadsides to prevent sediment runoff, so mowed plants should be at least 5 cm high. We encourage the growth of willow throughout the AEI—even the area along Pajarito Road—to enhance habitat. If, within this area, it is absolutely necessary to remove new willow growth (i.e., to improve visibility for human safety), we recommend that only willows at or above the level of the roadway surface be mowed.

5.1.4 Recommendations

- Should nests be found, study the reproductive output, paying particular attention to issues of nest predation and brood parasitism. Any decrease of southwestern willow flycatcher reproductive success should initiate either a predator reduction program or a cowbird reduction program.
- Stocking of livestock on LANL property should not be allowed because of the extreme sensitivity of the southwestern willow flycatcher to reproductive failure brought on by cowbird brood parasitism.
- Using aerial photographs, perform a time-series analysis on the changes in quantity and quality of riparian vegetation in Pajarito Canyon.
- Document the water budget for the Pajarito wetlands, including the significant hydrologic inflows and their seasonal timing.
- Initiate a study on the impacts to riparian vegetation of elk grazing in Pajarito Canyon.
- Use these studies to design a wetlands management plan with the purpose, at the very least, to maintain the current wetland extent.
- Conduct experimental habitat manipulations in areas of Pajarito wetlands that are currently not classified as suitable habitat to see if dense willow stands could be established and maintained.

APPENDIX

Table A.2.1. Preliminary light measurements in ftc.

		Distance from Source			
	Source (street light)	5 m	10 m	15 m	20 m
ftc	3.70	2.28	1.20	0.62	0.32

Back To
"Site Plans"

Monitoring Plan

for the

Whooping Crane

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

The HMP has two associated documents: Area of Environmental Interest (AEI) Site Plans and Monitoring Plans. The AEIs are areas of LANL that are being managed and protected because of their biological or other significance. Habitats of threatened and endangered species that occur or may occur on LANL are designated as AEIs. The essential element of the AEI Site Plan is the management of each species-specific potential habitat through the allowable activities within the AEI. These allowable activities may be both spatially and time constrained and based on occupancy or non-occupancy of the habitat by the species.

These plans contain sensitive information concerning potential habitat for threatened and endangered species. For that reason, these documents are controlled and will be issued only to persons who have a "need to know" and are trained by LANL's Ecology Group on the elements of the AEI Site Plan. All maps and associated materials should be considered sensitive and maintained as sensitive information.

If you need further information concerning the Endangered Species Program, these AEI Site Plans, or allowable activities, call the Ecology Group or DOE Los Alamos Area Office.

MONITORING PLAN FOR THE WHOOPING CRANE

1.0 INTRODUCTION

The monitoring of Federal and State species and local species of concern is an integral part of the Threatened and Endangered Species Habitat Management Plan (HMP). This particular monitoring plan provides background information and establishes monitoring protocols for the whooping crane (*Grus americana*) at Los Alamos National Laboratory (LANL).

The majority of the information in this document was taken from NMDGF 2000, unless otherwise noted.

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

PHYLUM, AND SUBPHYLUM	Chordata, Vertebrata
CLASS, AND SUBCLASS	Aves, Neornithes
ORDER	Gruiformes
FAMILY, AND SUBFAMILY	Gruidae, Gruinae
GENUS	*Grus*
SPECIES	*americana*

Although whooping crane now occurs in New Mexico (the result of the so-called Grays Lake National Wildlife Refuge experiment), the only indication of prior occurrence is in the form of unverified reports in Dona Ana County in the 1850s, Roosevelt County in 1938, and Union County in the 1960s.

2.2 STATUS

The whooping crane was first listed as endangered in 1967 (NMDGF 1988, USFWS 1990). During 1978, critical habitat for the whooping crane was designated (OSU 1993). The US Whooping Crane Recovery Plan was approved January 23, 1980 (USFWS 1996), and revised December 23, 1986 (USFWS 1996). In 1987, whooping cranes were listed as federally endangered without critical habitat (USFWS 1987). During 1992, both import and export permits were required for international trade of whooping cranes (USFWS 1992). During 1993, whooping crane remained on the Federal Endangered list (USFWS 1993). Then in February 11, 1994, the US Whooping Crane Recovery Plan was again revised. The recovery plan’s criteria for down listing the whooping crane from the endangered to threatened category required maintaining a population level in excess of 40 pairs in the Aransas/Wood Buffalo Population and establishing two additional, self-sustaining populations each consisting of at least 25 nesting pairs (USFWS 1996).

During 1994, critical habitat was designated in part 17.95(b) of the Endangered Species Act (USFWS 1994). During 1995, according to Jim Lewis of the US Fish and Wildlife Service (USFWS) (Albuquerque, NM), critical habitat for the whooping crane was designated in Bosque del Apache National Wildlife Refuge. However, he pointed out that the USFWS had proposed that the New Mexico population be given Experimental/Nonessential status, and thereby justify elimination of the designated critical habitat in the State (Lewis 1995).

In 1995, *Grus americana* was listed under the Natural Heritage Global Rank "G1" (G1 = Very Rare) (AGFD 1995).

During 1996, the USFWS proposed to designate the whooping crane population in the Rocky Mountains as an experimental nonessential population and to remove whooping crane critical habitat designations from four national wildlife refuges; Bosque del Apache in New Mexico, Monte Vista and Alamosa in Colorado, and Grays Lake in Idaho (USFWS 1996).

During 1996, the complete Natural Heritage Global Rank for the species *Grus americana* was listed "G1" (CNHP 1996).

Later that year, the species, *Grus americana*, was listed by a New Mexico Natural Heritage Program list as "Tracked": data were being actively accumulated and entered into computerized and manual files by the Heritage Program (NMNHP 1996).

NEW MEXICO

In 1975, whooping crane was listed as New Mexico Status—Endangered (group 2), first listed Dec. 5, 1975 (NMDGF 1988).

During 1994, the Biologist's Recommendation for no change in the New Mexico state-listing status was recommended for the taxon at this time (NMDGF 1994).

In 1996, Biologist's Recommendation for no change in the legal status of the whooping crane was recommended by the NMDGF. It was stated, however, that although the experimental flock was unsuccessful, the Department should continue to cooperate with other agencies in the protection of the remaining whooping cranes of the flock wintering in New Mexico and in research (using that flock) that was currently underway. With the expected extirpation of the experimental flock, procedures of the Wildlife Conservation Act should be initiated to delist this species (NMDGF 1996).

In 1998, the New Mexico status changed to nonessential experimental and critical habitat designation removed (Jahrsdoerfer, 1998)

2.3 HABITAT

This species apparently ranged rather widely in North America when first encountered by Europeans, both geographically and ecologically. Even the last two known breeding populations demonstrated this, one being found in the muskegs of northwestern Canada—migrating to winter on the Gulf Coast—and the other being resident in the coastal marshes of Louisiana—where they are now extirpated. In New Mexico, whooping cranes occupy the same habitats as their foster-parent sandhill cranes (*Grus canadensis*) (Hubbard 1985).

Foraging areas are generally agricultural fields and valley pastures, particularly where there is waste grain or sprouting crops. Both sandhill and whooping cranes roost together, typically on sandbars in the Rio Grande. So far, none of the Idaho whoopers have yet paired and bred—although this is hoped to occur some time in the future. Once this occurs, the mated pairs may set themselves apart and defend extensive winter territories—as the species does in Texas. Adults pair for life and return to their old wintering and breeding territories in subsequent years (NMDGF 1988). Cranes can occur in woodlands, especially of cottonwoods, that occur where desert streams provide sufficient moisture for a narrow band of trees and shrubs along the margins (USDA 1991).

2.4 CHRONOLOGY

Birds from Idaho migrate to New Mexico in the autumn, and most winter in the central Rio Grande Valley (Hubbard 1985). Occasional birds occur in the nearby Uvas Valley (Dona Ana-Luna Counties) and probably near Deming; a vagrant was also present in migration near Las Vegas. Possible records elsewhere (e.g., Clayton) cannot be verified and are probably unlikely. Previously, the only records likely of this species in the State were from near Hatch (Dona Ana County) in the mid-1850s and near Portales in 1938.

The whooping crane and the sandhill crane migrate together, south through Taos County at the end of September through mid-November. Then migrate north through Taos County the third week in January through mid-February (Schmitt 1993).

Natural occurrence of whooping cranes in New Mexico is not certain, although reports from the Hatch and Portales areas in the 1850s and 1930s, respectively, were likely this species (NMDGF 1994).

The principal use areas of the Rocky Mountains whooping crane population include the middle Rio Grande Valley of New Mexico, the lower San Luis Valley of Colorado, and summering areas in southeastern Idaho and western Wyoming. Southeastern Arizona, northeastern Utah, southwestern Montana, northwestern Colorado, and northern New Mexico are only occupied temporarily during migration or infrequently by a single whooping crane in summer or winter. The portion of the middle Rio Grande Valley involved includes a few miles on either side of the Rio Grande ranging from the town of Belen, New Mexico, to Bosque del Apache National Wildlife Refuge, 24 km (15 mi) south of Socorro, New Mexico. The portion of the San Luis Valley involved is 24 km (15 mi) on either side of a line running north-northwest from Capulin, Colorado to Saguache, Colorado. The middle Rio Grande area is used as a wintering ground from November to February. In February and March they migrate north to south-central Colorado where they spend 4 to 6 weeks in the San Luis Valley before continuing north into southeastern Idaho and western Wyoming. The main crane use area in the valley is Monte Vista National Wildlife Refuge, 10 km (6 mi) south of the town of Monte Vista. The whooping cranes spend April to September on their summer grounds in southeastern Idaho and western Wyoming. In September and October, before migration, they flock with sandhill cranes at Grays Lake and other wetlands and pastures before migrating southeast through northeastern Utah and western Colorado where they remain in the San Luis Valley for 4 to 6 weeks. They migrate through northern New Mexico and arrive at the wintering area in early November (USFWS 1996).

In New Mexico the whooping cranes generally stay on Bosque del Apache National Wildlife Refuge or state game refuges during fall and winter (USFWS 1996).

During migration, the cranes pass over LANL property (Hinojosa 1997).

2.5 BEHAVIOR

2.5.1 Breeding

These birds are able to breed after three years, and mate for life. Nest building begins in late April. Nests are made with bullrush and are placed in tall vegetation near water. Two eggs each year make up a typical clutch. Both parents provide care for the young, which will stay with their parents during their first winter (OSU 1993).

Whooping crane mating is characterized by monogamous lifelong pair bonds. Individuals remate following death of a mate. Fertile eggs are occasionally produced at three years of age, but more typically at four years of age. Experienced pairs may not breed every year, especially when habitat conditions are poor. Whooping cranes ordinarily lay two eggs. They will renest if their first clutch is destroyed or lost before mid-incubation. Although two eggs are laid, whooping cranes infrequently fledge two chicks (USFWS 1996).

2.5.2 Feeding

Foraging areas are generally agricultural fields and valley pastures, particularly where there is waste grain or sprouting crops (NMDGF 1988).

Whooping cranes eat small grains (corn, wheat, sorghum, and barley), alfalfa, winter wheat, aquatic plants, insects, crustaceans, and small vertebrates (USFWS 1987).

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

The whooping crane is a Federal and State-listed endangered species.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change (for example, if the species is newly found at LANL). Some activities are not appropriate to every species (designated as zero). The HMP contains a summary table ranking all species and activities. The following table lists importance rankings for whooping crane activities.

Section	Status Tracking	Habitat Analysis and Models	Presence/ Absence surveys	Repro- duction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Ranking	1	3	3	0	0	0	0	0	3

4.1 STATUS TRACKING

This is a level one activity. The regional status of the whooping crane will be evaluated annually. Surveyors will attend status update meetings sponsored by the USFWS. LANL biologist will remain up to date on information concerning the status of the whooping crane in New Mexico. All new information will be entered into a current LANL Threatened and Endangered Species Database and used as a reference document.

4.2 HABITAT ANALYSIS AND MODELS

This is a level three activity. No formal, annual field surveys will be conducted on LANL since this species is a migrant. However, in the future, LANL biologists should continue to assess the potential use of LANL by whooping cranes, and perhaps initiate a habitat study related to whooping crane.

4.3 PRESENCE/ABSENCE SURVEY

This is a level three activity. Currently, there are no formal presence/absence surveys conducted at LANL. However, future studies might consider conducting presence/absence surveys during migration periods to gather more detailed information on baseline dates that whooping crane migrates over LANL property.

4.4 REPRODUCTIVE MONITORING

This is a level zero activity. There are no whooping crane reproductive monitoring studies being planned at LANL. There is no perceived need for this type of study in the future.

4.5 CONTAMINANT STUDIES

This is a level zero activity. Currently, there are no whooping crane contaminant studies being planned at LANL. There is no perceived need for this type of study in the future.

4.6 ECORISK STUDY

This is a level zero activity. Currently, there are no whooping crane ecorisk studies being planned at LANL. There is no perceived need for this type of study in the future.

4.7 PREY-BASE STUDIES

This is a level zero activity. Currently, there are no whooping crane prey-base studies being planned at LANL. There is no perceived need for this type of study in the future.

4.8 TRACKING OF INDIVIDUALS

This is a level zero activity. Currently, there are no whooping crane tracking studies being planned at LANL. There is no perceived need for this type of study in the future.

4.9 REGIONAL STUDIES

This is a level three activity. Any data collected on whooping crane must be reported to USFWS. Since other agencies near LANL (National Park Service, US Forest Service, Bureau of Land Management, State of New Mexico, San Ildefonso Pueblo, Cochiti Pueblo) have whooping crane issues, we may desire to collaborate on regional recovery efforts and studies with them.

5.0 ANALYSIS AND REPORTING

Because there will be no formal studies done at LANL on whooping crane, analysis and reporting will not be required.

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Back To "Birds"

Monitoring Plan

for the

Woodlily

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

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MONITORING PLAN FOR THE WOODLILY

1.0 INTRODUCTION

The monitoring of Federal and State-listed species and local species of concern is an integral piece of the Threatened and Endangered Species Habitat Management Plan (HMP). This monitoring plan provides background information and establishes monitoring protocols for the woodlily (*Lilium philadelphicum andinum*) at Los Alamos National Laboratory (LANL).

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

The Woodlily has the following taxonomy

FAMILY	Liliaceae
GENUS,	*Lilium*
SPECIES	*philadelphicum*
VAR.	*andinum*

2.2 STATUS DESCRIPTION

The woodlily is considered endangered by the State of New Mexico. It is an S3 on the New Mexico Natural Heritage Program database, indicating that it is rare and uncommon. However, it ranks a G5 on the list for global ranking and is considered secure globally, though it is rare in parts of its range. The woodlily has been found in the Jemez Mountains, both in Bandelier National Monument and the Santa Fe National Forest above 2400 m (8000 ft) (Foxx et al. 1998).

2.3 HABITAT

The woodlily is generally found in canyons with perennial water (Martin and Hutchins 1980). Sightings have generally been above 2400 m (8000 ft), within the moist canyon bottoms that are dominated by mixed conifer (Foxx and Hoard 1995). This plant is considered a facultative wetland species, one which usually occurs in wetlands (67% to 99% of the time), but can occasionally be found in nonwetlands (Reed 1988).

2.4 CHRONOLOGY

This plant blooms in late June or early July.

2.5 BEHAVIOR

Not applicable.

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

The woodlily is a State listed endangered species. To comply with State regulations related to endangered plants, we need to determine its presence on LANL land or survey for it when projects are in the adjacent forests.

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change (for example, if the species is newly found at LANL). Activities that are not appropriate to a species are assigned a ranking of zero. The HMP contains a summary table ranking all species and activities. The following table lists importance rankings for the woodlily.

Section	Status Tracking	Habitat Analysis and models	Presence/ Absence surveys	Reproduction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Ranking	1	2	3	4	4	0	0	3	4

4.1 STATUS TRACKING

The regional status of the woodlily should be evaluated annually. A listing from the State of New Mexico Department of Forestry should be obtained. Other listings should be checked including the New Mexico Natural Heritage Program database.

4.2 HABITAT ANALYSIS AND MODELS

To date, the plant has not been found on LANL property. If it is located on LANL a habitat analysis should be done. This task ranks a two.

4.3 PRESENCE/ABSENCE SURVEY

The purpose of this type of survey is to determine the presence or absence of the woodlily. When projects are within the upper canyons of LANL, spot checks for woodlily should be done. This task ranks a three.

4.3.1 Survey Locations

Upper canyons should be checked in association with projects if they will impact canyon bottoms where there are perennial stretches of water. This task ranks a three.

4.3.2 Survey Dates

Surveys should be done in late June or early July when the plant is blooming.

4.3.3 Survey Technique

Walking surveys along stream channels where there is running water should be conducted.

4.3.4 Required resources

4.3.4.1 Personnel

Surveying will require two persons for about two hours. Data analysis and report writing will require one person for two hours.

4.3.4.2 Equipment

- US Geological Survey topographic maps of the area (a marked copy to be attached to survey data sheet). Be sure to ALWAYS submit a copy of a topographic map with survey.
- Standardized survey form (bring more copies than you think you need).
- Clipboard and permanent (waterproof) ink pen (we recommend recording survey results directly on the survey data form, to assure that you collect and record all required data).
- Plant field guide.

The following equipment is recommended:

- Camera and film (for habitat photos).

- Global positioning survey unit (for determining survey coordinates and verifying location of survey plots on topographic maps).
- Survey flagging (conservative earth-tone colors) (for marking survey sites and/or areas where woodlilys are found).

4.3.4.3 Training

At least one of the surveyors should have knowledge of plant taxonomy.

4.3.4.4 Permitting

No permits are required.

4.3.5 Analysis and Reporting

The information about location should be incorporated into a plant database.

4.4 REPRODUCTIVE MONITORING

Report blooming dates and put the information into a plant database. This ranks a four.

4.5 CONTAMINANT STUDIES

If the woodlily is found, soils adjacent to the plant can be taken for contaminant studies. This ranks a four.

4.6 ECORISK STUDY

Not applicable. This ranks a zero.

4.7 PREY-BASE STUDIES

Not applicable. This ranks a zero.

4.8 TRACKING OF INDIVIDUALS

If specimens are located, they should be monitored on a yearly basis. This ranks a three.

4.9 REGIONAL STUDIES

Any data collected on woodlily should be reported to the State of New Mexico Department of Forestry. This ranks a four.

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Back To "Plants"

Monitoring Plan

for the

Zone-Tailed Hawk

Profile

PREFACE

Under the Endangered Species Act (ESA), Federal agencies must provide a mechanism to protect threatened and endangered species and to assist in the recovery of such species. The goal of the ESA is “to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved.” To comply with the letter and the spirit of the ESA, the Department of Energy (DOE) has developed a Threatened and Endangered Species Habitat Management Plan (HMP) that will provide protection of habitats at Los Alamos National Laboratory (LANL) lands in the Jemez Mountains, on which the threatened and endangered species depend. This plan is consistent with the Ecosystem Management approach to Natural Resource Management and the National Environmental Research Park designation of LANL.

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MONITORING PLAN FOR THE ZONE-TAILED HAWK

1.0 INTRODUCTION

The monitoring of Federal and State-listed species and local species of concern is an integral piece of the Threatened and Endangered Species Habitat Management Plan (HMP). This monitoring plan provides background information and establishes monitoring protocols for the zone-tailed hawk (*Buteo albonotatus*) at Los Alamos National Laboratory (LANL).

2.0 SPECIES DESCRIPTION

2.1 TAXONOMY AND RANGE

In the US, the zone-tailed hawk is most commonly found in southern and central Arizona and New Mexico. The species is known to breed in Los Alamos County, on both LANL property and in Bandelier National Monument (BNM). The breeding population in the Jemez Mountains is isolated, as none are known to breed in either the Sandia Mountains or the Mount Taylor area (Johnson 1998). These breeding birds represent the northern limit of the species distribution, with only 5% of its range occurring in the US (Kennedy et al. 1995). They winter south of the US border.

PHYLUM, AND SUBPHYLUM	Chordata, Vertebrata
CLASS, AND SUBCLASS	Aves, Neornithes
ORDER, AND SUBORDER	Falconiformes, Accipitres
FAMILY, AND SUBFAMILY	Accipitridae, Accipitrinae
GENUS, AND SUBGENUS	*Buteo*
SPECIES	*albonotatus*

2.2 STATUS DESCRIPTION

The zone-tailed hawk is neither a federally listed species nor a New Mexico State-listed species, but they are listed as a threatened species in Texas. They are also listed as a US Forest Service Sensitive species. The NM Natural Heritage Program classifies them as ‘S3’ meaning rare or uncommon. It has been estimated that only 80 to 100 nest stands of this species are known in the region (Kennedy et al. 1995). LANL, BNM, and nearby portions of Santa Fe National Forest were surveyed in 1990-1992 by Kennedy et al. (1995) and 10 nests were located in six territories.

2.3 HABITAT

Zone-tailed hawks are most commonly found in mountainous areas and lowland riparian zones, often associated with steep terrain (Kennedy et al. 1995). Nest stands are located in the bottom or on the slopes of steep-walled canyons, frequently close to cliffs. Birds are usually associated with ponderosa pine forests and deciduous riparian forests.

2.4 CHRONOLOGY

Zone-tailed hawks arrive in northern New Mexico between late March and mid-April. Eggs are laid between April 1 and May 17. Incubation period is about 35 days, with fledging occurring 38 to 42 days later (Kennedy et al. 1995).

2.5 BEHAVIOR

2.5.1 Nesting

The dominant vegetation near nests is ponderosa pine with oak or Douglas fir (Kennedy et al. 1995). Kennedy found that nest trees were between 18 to 30 m (59 to 99 ft) in height and

50 to 70 cm (20 to 28 in.) in diameter. Nests are located in the upper portion of the canopy at an average height of 18 to 28 m (59 to 92 ft). Nests are constructed of sticks and lined with green vegetation.

2.5.2 Feeding

The zone-tailed hawk diet consists of mammals (especially *Tamias* spp.), birds, and reptiles (Kennedy et al. 1995). In flight, it mimics the turkey vulture (*Cathartes aura*), allowing it to approach unsuspecting prey.

3.0 MONITORING JUSTIFICATION/PURPOSE/OBJECTIVES

The zone-tailed hawk has the potential for becoming a listed species. It is already state listed in Texas and considered a sensitive species by the US Forest Service. By maintaining current knowledge of the zone-tailed hawk at LANL, we may be able to avoid or reduce project delays should the species become listed. As a raptor, the zone-tailed hawk is protected under the Migratory Bird Treaty between Canada, Mexico, and the US. The hawk also has the potential to serve as an indicator of community or ecosystem condition due to its role as a high-trophic-level predator. Changes in raptor populations may be indicative of natural or anthropogenic perturbations in the communities and ecosystems in which they occur, and are likely to be evident before changes at lower trophic levels (Lehman and Bates 1997).

4.0 EXISTING PROTOCOLS AND PROPOSED STUDIES

This section contains protocols for monitoring and descriptions of related activities. Each activity has been ranked on a scale from 0 to 4, with ones being activities that must be done, twos are activities that should be done, threes are activities that may be done, and fours are activities that may occur in the future should conditions change (for example, if the species is newly found at LANL). Activities that are not appropriate to a species are assigned a ranking of zero. The HMP contains a summary table ranking all species and activities. The following table lists importance rankings for zone-tailed hawk activities.

Section	Status Tracking	Habitat Analysis and models	Presence/ Absence surveys	Reproduction	Contaminant Studies	EcoRisk	Prey Base	Individual Tracking	Regional Studies
Ranking	1	2	2	3	3	2	3	3	3

4.1 STATUS TRACKING

The regional status of the zone-tailed hawk should be evaluated annually. The BISON database (NMDGF 1997) should be checked annually and the literature searched for the latest publications. Status tracking is a level one activity.

4.2 HABITAT ANALYSIS AND MODELS

On LANL property, zone-tailed hawks have historically been found in Ancho, Pueblo, and Bayo Canyons. Los Alamos, Fence, Potrillo, and Water Canyons, and Cañada del Buey also have characteristics of nesting habitat. This is a level two activity.

4.3 PRESENCE/ABSENCE SURVEY

The purpose of this type of survey is to determine the presence or absence of zone-tailed hawks. A presence/absence survey is a level two activity. This protocol is subject to modification as additional information is collected.

4.3.1 Survey Locations

Surveys will be conducted in upper Ancho Canyon, middle and lower Water Canyon, Fence Canyon, middle Potrillo Canyon, lower and upper Cañada del Buey, Los Alamos Canyon, and middle and lower Bayo Canyon.

4.3.2 Survey Dates

Surveys will be conducted between April 1 and April 15, June 15 and July 1, and July 1 and July 15. Surveys are not conducted between April 15 and June 15 in order to avoid disturbing nesting zone-tailed hawks. Each canyon in which a zone-tailed hawk is found will also be surveyed the following year. Each canyon in which a hawk is not found will be surveyed every other year. Surveys the first year must include at least Ancho and Bayo Canyons.

4.3.3 Survey Technique

Canyons will be surveyed on foot or by truck if budget and personnel availability does not allow walking every canyon. If by truck, then surveyors will drive slowly and exit the vehicle to survey every 0.4 km (0.25 mi). Surveyors will search for signs of zone-tailed hawk nesting activity. Zone-tailed hawks are easily disturbed and will usually fly and vocalize when a person walks nearby. The coordinates of the nest or sighting location will be determined by using a global positioning system (GPS) receiver. Three surveys, one each during each of the three survey periods, will be required to make a reasonable inference of absence that year.

4.3.4 Required Resources

4.3.4.1 Personnel

Surveying will require two persons for about 100 hours if every canyon is walked or a minimum of 40 hours if driving.

Data analysis and report writing will require one person for four hours.

4.3.4.2 Equipment

- US Geological Survey topographic maps of the area (a marked copy to be attached to survey data sheet).
- Standardized survey form.
- Clipboard and permanent (waterproof) ink pen.
- Binoculars and bird field guide.

The following equipment is recommended:

- Camera and film (for habitat photos—especially at sites where hawks are found).
- GPS unit—for determining survey coordinates and verifying location of survey plots on topographic maps.
- Survey flagging (conservative earth-tone colors)—for marking survey sites and/or areas where hawks are detected.

4.3.4.3 Training

The surveyors should be trained in raptor identification, particularly in distinguishing the turkey vulture from the zone-tailed hawk.

4.3.4.4 Permitting

No permit is required for surveys.

4.3.5 Analysis and Reporting

Sighting locations, behavior, date, and time will be entered into a geographic information system database.

4.4 REPRODUCTIVE MONITORING

The purpose of reproductive monitoring is to

- determine the breeding status of zone-tailed hawks,
- collect productivity and breeding biology information, and
- describe habitat characteristics and habitat use patterns.

Reproductive monitoring is a level three activity. This protocol will be defined when more information is collected and once a decision is made to implement this activity.

4.5 CONTAMINANT STUDIES

This is a level three activity. The biomagnification of contaminants in the diets of high-trophic-level predators exposes them to increased risk from contaminants. A contaminant study on the hawk's prey base would be one technique for evaluating contaminant risk. This protocol will be defined once a decision is made to implement this activity.

4.6 ECORISK STUDY

This is a level two activity. An ecological risk assessment on the zone-tailed hawk at LANL would follow protocols similar to the assessment already completed on peregrine falcon (*Falco peregrinus*). The general approach for performing this assessment is to make a quantitative appraisal of the potential effects that soil contaminants might have on the species when introduced through the soil ingestion pathways using the quotient method prescribed by the US Environmental Protection Agency.

4.7 PREY-BASE STUDIES

This activity is a level three. Kennedy et al. (1995) conducted an investigation into prey use by zone-tailed hawks in the Jemez Mountains and found that mammals were favored, particularly *Tamias* spp., as well as reptiles and birds.

4.8 TRACKING OF INDIVIDUALS

This is a level three activity. This protocol will be defined once a decision is made to implement this activity.

4.9 REGIONAL STUDIES

This is a level three activity. Since other agencies near LANL (such as the National Park Service, National Forest Service, Bureau of Land Management, State of New Mexico, San Ildefonso Pueblo, Cochiti Pueblo) may manage zone-tailed hawk habitat, we may desire to collaborate on regional recovery efforts and studies with them.

5.0 LITERATURE CITED

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Back To "Birds"