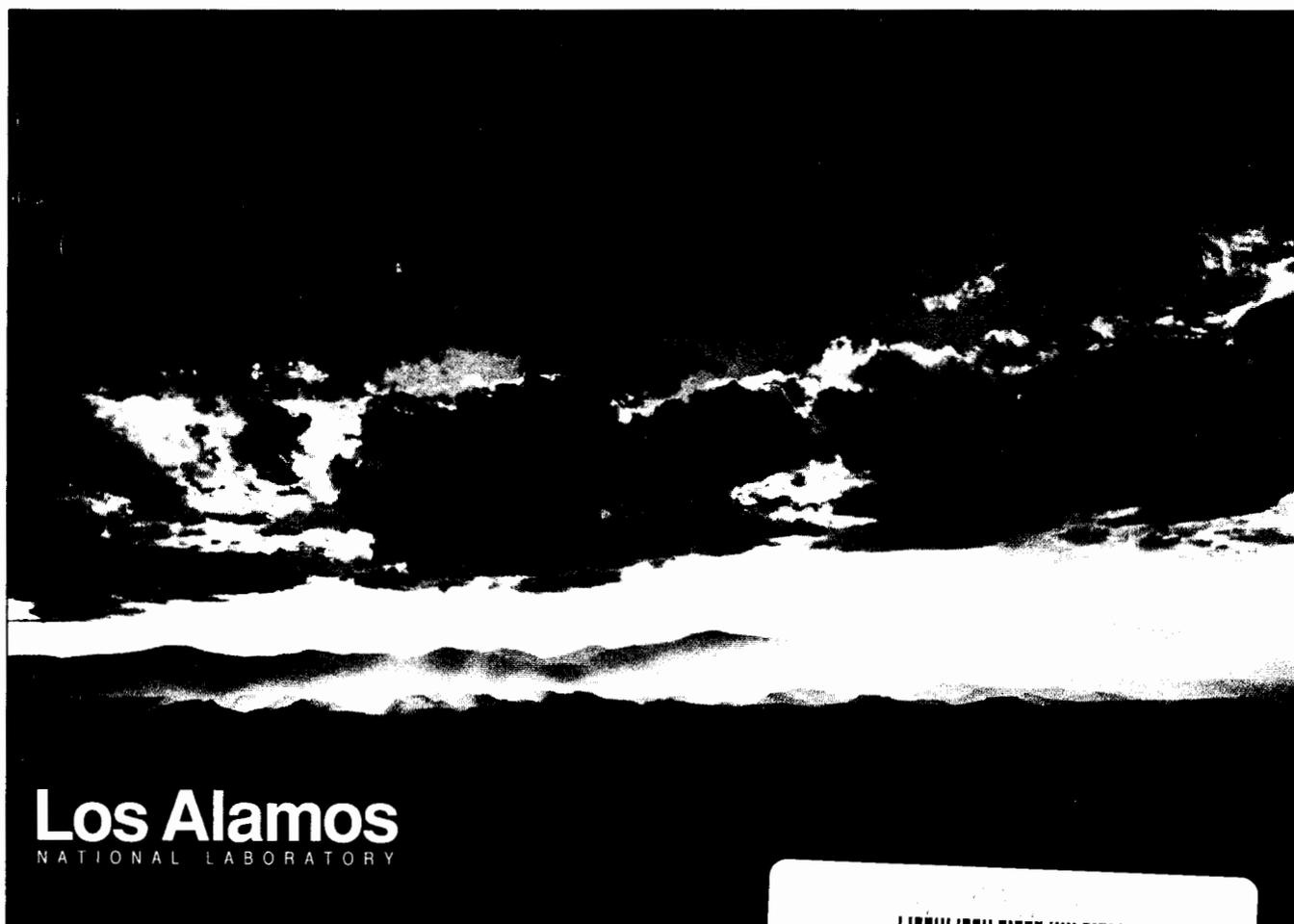


Title

*Biological Assessment for
Environmental Restoration Program
Operable Unit 1148
TA-54 and TA-51*

Authors

Alethea Banar



Los Alamos
NATIONAL LABORATORY

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Environmental Restoration Program
Operable Unit 1148
TA-54 and TA-51*

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**BIOLOGICAL ASSESSMENT
FOR ENVIRONMENTAL RESTORATION PROGRAM
OPERABLE UNIT 1148, TA-54 AND TA-51**

by
Alethea Banar

ABSTRACT

The Los Alamos National Laboratory's (LANL) Biological Resource Evaluation Team (BRET) conducted Level 2 (habitat evaluation) and Level 3 (species-specific) surveys during the summer of 1991 to provide information for a site-characterization plan. The purpose of the surveys was threefold: to determine if species protected by the state or federal government were present before soil sampling took place; to determine if sensitive habitats were present; and to gather baseline data for future studies on plant and wildlife species in Operable Unit (OU) 1148. The information gathered from the field surveys was compared with habitat requirements of potentially occurring protected species (threatened or endangered) for the purpose of compliance with Federal Endangered Species Act, New Mexico's endangered species laws, and the Floodplain and Wetland Executive Orders 11990 and 11988.

Survey data indicated that potential habitat existed in OU 1148 for two protected species: the peregrine falcon and the spotted bat. Although the presence of these species has not been confirmed, mitigation measures are required to ensure no adverse impacts affect these species should they be present in this area.

BRET used the National Wetland Inventory Maps and field checks to record all floodplains and wetlands. BRET can be contacted to ensure sampling activities remain outside wetland areas.

Best management practices should be conducted to minimize impacts to nonsensitive species as well. Information has been provided to aid in revegetating any area disturbed by site characterization activities. This includes any disturbance caused by off-road vehicular travel.

EXECUTIVE SUMMARY

During the summer months of 1991, field surveys were conducted by the Biological Resource Evaluations Team (BRET) of the Environmental Protection Group (EM-8) for Operable Unit (OU) 1148, Technical Areas (TAs) 54 and 51. The Environmental Restoration Program of LANL has proposed to conduct site characterization studies, which consist primarily of soil sampling, to determine the nature and extent of hazardous waste releases from solid waste management units.

The purpose of BRET's surveys was threefold. The first was to determine the presence or absence, prior to site characterization sampling, of any state or federal threatened, endangered, or sensitive plant or wildlife species or their critical habitats within the OU boundaries. Second, surveys were conducted to identify the presence or absence of any sensitive areas, such as floodplains and wetlands, that are present within the sites to be sampled, as well as the extent of such areas, and their general characteristics. The third purpose was to provide additional plant and wildlife species data to help define the habitat types within the OU. Data from these surveys will provide further baseline information about the biological components of the sites chosen for site characterization sampling. The data will also aid in determining pre-sampling conditions which can be compared to data collected at the same locations in future similar studies. Furthermore, this information is necessary to support National Environmental Policy Act (NEPA) documentation and possible subsequent determination of a Categorical Exclusion for the site characterization sampling plan.

These surveys were conducted to meet compliance with the Federal Endangered Species Act of 1973; the New Mexico Wildlife Conservation Act (WCA); the New Mexico Endangered Plant Species Act; Federal Executive Orders 11990, "Protection of Wetlands"; and 11988, "Floodplain Management"; Department Of Energy (DOE) Order 10 CFR 1022, and finally, DOE Order 5400.1.

BRET conducted a Level 2 (habitat evaluation) survey after searching an EM-8 database. The database contained the habitat requirements for all state and federally listed threatened, endangered, and sensitive (TES) plant and animal species known to occur within the boundaries of the Laboratory and surrounding areas. Level 2 surveys were conducted using a combination of line transects and Daubenmire plots. These techniques are designed to gather data on the percentage of cover, density, and frequency of both understory and overstory components of the plant community.

The habitat information gathered during field surveys was compared with the habitat requirements for each species of concern identified in the database search. If habitat requirements were not met for any species of concern, then no further surveys were conducted and the site was considered cleared with no expected impact to state or federally listed species. If habitat requirements were met, site-specific surveys for the species of concern were conducted. The species-specific surveys were conducted in accordance with pre-established survey protocols, which often require certain meteorological or seasonal conditions to complete.

In each location to be sampled, all wetlands and floodplains within the survey area were noted using the National Wetland Inventory Maps followed by field checks. Characteristics of wetlands, floodplains, and riparian areas are noted using criteria outlined in the "Federal Manual For Delineating Jurisdictional Wetlands." However, wetland boundaries were not delineated during these surveys due to their continual fluctuation. BRET can be contacted to ensure drilling locations remain outside of wetland areas. If drilling is required in a wetland, a dredge and fill permit may be needed.

Databases containing historical information and biological reports of any previous surveys within or near the area to be sampled were reviewed and are summarized within this document to provide background information concerning the site. These summaries provide inventory information that can be used in future ecological risk assessments and pathways analysis.

Most of the canyon systems within OU 1148 are relatively undisturbed. However, there are locations of varying disturbance on the mesa that include roads, drainages, cleared fields, and LANL facilities. The only major disturbance within the canyons is a major DOE roadway located in Pajarito Canyon.

The terrain of OU 1148 has essentially two types of topographic features: moderately steep to steep canyons and the adjacent mesa top. The canyon systems are Cañada del Buey and Pajarito Canyon. Level 2 surveys were conducted on the north-facing slope in Cañada del Buey and on the south-facing slope in Pajarito Canyon. The canyon bottom surveys were conducted in Cañada del Buey. The mesa top surveyed was Mesita del Buey near TA-54, Area G.

The mesa-top portions of the OU were primarily within a piñon-juniper community. Mid and understory species include big sagebrush, wax current, and four-wing saltbush. Although concentrated at the west end of the OU, the ponderosa pine, and to a lesser degree, other species of the mixed conifer community were found primarily along the north-facing slope. As this slope extends eastward, the dominant overstory changes to a ponderosa and juniper community. Common mid and understory species include Gamble oak, mock orange, squawbush, mountain mahogany, and New Mexico hops. Dominant species along Cañada del Buey bottom include one-seed juniper, ponderosa pine, piñon pine, Gamble oak, wavy-leafed oak, squawbush, and rubber rabbit brush. The south-facing slope was dominated by a piñon-juniper community but included narrow-leafed cottonwood due to the transects proximity to a stream channel. Mid and understory species included blue grama grass, mock orange, big sagebrush, bluegrass, sand dropseed, firewheel, horseweed, fleabane, cryptantha, wheatgrass, white sweet clover, mullein, geranium, and willow.

Database searches indicated that potential species of concern for this OU (based on habitat and/or known occurrences) are the black hawk, bald eagle, Mississippi kite, peregrine falcon, broad-billed hummingbird, willow flycatcher, spotted bat, Say's pond snail, meadow jumping mouse, Wright fishhook cactus, Santa Fe cholla, grama grass cactus, sessile-flowered false carrot, threadleaf horsebrush, Plank's chertilly, Santa Fe milkvetch, Mathew's woolly milkvetch, cyanic milkvetch, tufted sand verbena, Taos milkvetch, and Pagosa phlox. As a result of a habitat evaluation of the OU, two of these species appear to have a moderate to high potential for occurrence in the area: the peregrine falcon and the spotted bat. The results of the field habitat evaluation indicates that the habitat elements needed for these species are present.

The peregrine falcon occupies steep cliffs, usually adjacent to canyons. This species has been recorded as nesting within Laboratory boundaries in an historic nest site in Pueblo Canyon, but this site has not been used by the falcon for the last ten years. The peregrine falcon is not expected to utilize OU 1148 for nesting purposes. The falcon may, however, be using the area as a feeding ground. If presence of the peregrine falcon is suspected, excessive damage (any area over one-tenth acre) to vegetation should be avoided and any tree removal approved by BRET.

The spotted bat occupies caves and rock crevices in piñon-juniper, ponderosa, mixed conifer, and riparian areas. Pajarito Canyon has habitat requirements for this species: roost sites and a source of water. No adverse impact to the spotted bat (if present) should occur as long as small caves and rock crevices are not disturbed, and the water source within the canyon is not altered.

The wood lily occurs in moist shaded areas. This species has been found in Los Alamos County, but is very rare. If extensive sampling will be conducted within riparian areas the BRET team must be contacted to conduct a site-specific survey of the area prior to sampling. If heavy equipment or vehicles will be taken off established roads (paved or dirt), personnel from BRET must be notified to conduct a walk through to determine presence or absence of these lilies.

The Helleborine orchid is found in damp woods near seeps, springs, streams, and riparian areas. This species has been found in Los Alamos County. If extensive sampling will be conducted within riparian areas, contact the BRET team for a site-specific survey of the area prior to sampling. If heavy equipment or vehicles will be taken off established roads (paved or dirt), personnel from BRET must be notified to conduct a walk through to determine presence or absence of the orchid.

Surface sampling of this OU should not cause any adverse impacts to any known critical habitat or sensitive areas if conducted in accordance with this document. No significant release of contaminants into the environment is expected to occur during sampling. However, should release of contaminants rise above the predetermined action level, workers must cease operations, shut down the site, and reassess the sampling procedure.

1 INTRODUCTION

BRET conducted a biological assessment for the site characterization or "sampling phase" of the Environmental Restoration program for OU 1148, TA-54 and -51 to determine presence or absence of TES species, and of floodplains and wetlands. The assessment is designed to provide baseline information on the plant and wildlife communities occurring in the sites to be sampled for use in long-term monitoring.

The Environmental Restoration Program proposes to sample sites within OU 1148 for purposes of characterizing particular sites. The sampling will consist of removing soil samples by way of hand-held auger drills or by using auger-mounted heavy machinery.

BRET evaluated the proposed site sampling for its impact on TES species and of floodplains and wetlands. This was done in accordance with the 1973 Federal Endangered Species Act, the New Mexico Wildlife Conservation Act, the New Mexico Endangered Plant Species Act, Federal Floodplain and Wetland Executive Orders (EOs) 11990 and 11988, DOE's Order 5400.1 (Environmental Compliance), 10 CFR 1022, and the National Environmental Policy Act.

Section 7 of the Federal Endangered Species Act requires all federal agencies to ensure that their activities or programs will not jeopardize the continued existence of a federally listed threatened or endangered species or its designated critical habitat (if applicable). New Mexico's Wildlife Conservation Act (WCA) and Endangered Plant Species Act (EPSA) also require federal agencies to ensure that their activities and programs will not jeopardize species that are state protected. Implementation of Section 7, as well as New Mexico's WCA and EPSA, is done within the framework of the National Environmental Policy Act (NEPA).

There are three possible outcomes of a Biological Assessment for threatened and endangered species:

1. There are no TES species utilizing habitat within the proposed project area;
2. There are TES species utilizing habitat within the proposed project area, but there are no expected adverse impacts to the species; or

3. There are TES species utilizing habitat within the proposed project area and adverse impacts to the species are expected to occur as a result of the proposed project.

If the biological evaluation indicates that the proposed project is expected to jeopardize a listed species, consultation with the appropriate state and federal agency is initiated. Formal consultation efforts could result in modifications, alternatives, or complete abandonment of the proposed project to avoid potential adverse impacts to protected species.

Two executive orders provide protection for floodplains and wetlands. Executive Order 11988, "Floodplain Management," calls for protection of floodplains and mandates that potential effects of any federally funded action in a floodplain be evaluated for impact to the environment and potential health and safety problems arising from any construction on the floodplain. Executive Order 11990, "Protection of Wetlands," requires all federally funded agencies to issue or amend procedures to ensure wetlands be protected from loss and/or degradation.

Code of Federal Regulations 10 CFR 1022 outlines the procedures for DOE compliance with the executive orders and provides the means for public review of floodplain and wetland impacts. The CFR requires that all DOE actions will be assessed for impacts to floodplains and wetlands. This CFR does not include a specific minimum size. Public review of potential impacts is provided through NEPA documentation or Federal Register Notification. If there is a potential for impact to floodplains or wetlands, a floodplain and wetland assessment must be conducted to determine if the impacts would be considered adverse.

Additionally, under Section 404 of the Clean Water Act, the degradation of wetlands and floodplains are also controlled by limiting the discharge of fill into these sensitive areas. The Corp of Engineers (COE) oversees fill discharge limits and issues two types of permits depending on the size of the floodplain or wetland that will undergo impact. Nationwide permits apply to areas where the impact is less than 10 acres. If the impact is greater than 10 acres, individual permits must be issued on a case by case basis before activities can be initiated.

In addition to the previously discussed regulations, DOE Order 5400.1 requires an environmental survey (a "pre-operational" survey) prior to the start-up of a new site, facility, or process, which has the potential for adverse environmental impact. The survey should begin no less than one year, and preferably two years, before the proposed project start-up date to evaluate the biotic communities under varied seasonal changes. These baseline data support the "Environmental Setting" portion of the work plans for site investigation and are also an important aspect for the evaluation of environmental impacts of corrective measures.

2 PROJECT DESCRIPTION

2.1 Background

Research activities conducted at Los Alamos National Laboratory (LANL) since its existence, have resulted in the formation of a large number of Solid Waste Management Units (SWMUs). SWMUs at LANL are defined as "any discernible unit which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste" (LANL, 1990). These SWMUs are located at various technical areas throughout the 43-square-mile facility and consist of various contaminants released from Laboratory facilities.

The US Environmental Protection Agency (EPA) is the regulatory authority in charge of SWMUs and derives its authority through the Resource Conservation and Recovery Act (RCRA). In accordance with the requirements of RCRA, LANL must develop corrective actions for all released hazardous waste material into the environment.

The Environmental Restoration (ER) Group (EM-13) is the responsible party for the development and implementation of corrective actions for SWMUs at LANL. The corrective action process is divided into four phases: 1) Site assessment, 2) Site characterization, 3) Development of proposed corrective actions, and 4) Selecting and performing corrective actions (LANL, 1990).

This Biological Assessment has been prepared for use with the site characterization phase. Biological Assessments for other phases may be required.

2.2 SWMUs and Proposed Sampling

SWMUs are located throughout TAs in OU 1148 and are associated with the following:

- Surface Waste Storage
- Disposal Pits
- Disposal Shafts
- Treatment Tanks
- Septic Systems and Tanks
- Materials Disposal
- Waste Oil Storage Tanks
- TRU Waste Packaging
- Truck-Washing Pits

Sampling of the SWMUs and sites down gradient from the SWMUs, will be conducted to determine the type, quantity, and extent of any environmental contamination. The sampling will be primarily in drainages leading to Pajarito Canyon and Cañada del Buey. Surface and subsurface soils will be sampled. Sampling will vary from surface samples of 10-inch (25.4-cm) depths with hand spades to core drilling to depths of greater than 200 ft (60.96 m).

3 ENVIRONMENTAL SETTING

3.1 General Setting

OU 1148 lies within the boundaries of LANL in Los Alamos, New Mexico. The Laboratory is located in north-central New Mexico approximately 160 km (100 mi.) by road north of Albuquerque and 72 km (45 mi.) by road northwest of Santa Fe (Fig. 1).

The Los Alamos National Laboratory is located on the Pajarito Plateau on the east-central edge of the Jemez mountains. These mountains are formed by a complex pile of volcanic rocks along the northwest margin of the Rio Grande rift in north-central New Mexico. The plateau, which forms an apron of volcanic sedimentary rocks along the eastern flank of the mountains, is aligned approximately north-south and is about 20 to 25 mi. (32 to 40 km) in length and 5 to 10 mi. (8 to 16 km) wide. The plateau slopes gently eastward from an elevation of about 7500 ft (2286 m) near the mountains toward the Rio Grande where it terminates at an elevation of about 6200 ft (1889 m) in steep slopes formed by the down-cutting of the Rio Grande which lies at 5400 ft (1645 m). The plateau has been dissected into a number of narrow mesas by southeast-trending intermittent streams.

The apron-like plateau at the base of the mountains extends into finger-like mesas separated by deep canyons. Geological substrate Bandelier Tuff was deposited from volcanic eruptions in the Jemez Mountains about 1.1 to 1.4 million years ago (LANL 1988). The tuffs overlap other volcanics which are underlain by the conglomerate of the Puye Formation (LANL 1988). This conglomerate intermixes with Chino Mesa basalts along the Rio Grande.

The area is characterized by a semiarid, temperate mountain climate with summer temperatures typically ranging from 50° F to 80° F (10° C to 22° C) during a 24-hr period (Bowen 1990). Winter temperatures generally range from the teens to about 50° F (-6° C to 10° C) during a 24-hr period. The annual precipitation in the vicinity of Los Alamos ranges from 13 to 18 in (32 to 46 cm) with much of it occurring during summer rain showers in July and August.

Meteorological conditions during the 1991 field season are summarized in Figure 2.

3.2 Description of OU 1148

OU 1148 is located in the eastern central portion of the Laboratory and is bounded on the north by Cañada del Buey and on the south by Pajarito Canyon. It extends northwest and southeast along the Laboratory boundary with Sandoval and Santa Fe counties (IT Corp, 1990) (Fig. 3). The unit is located in Township 19 North, Range 7 East, Section 31. This is an approximation only for this section and may include portions of additional sections. UTM Coordinates for the area are:

<u>Zone</u>	<u>Easting</u>	<u>Northing</u>
NW	387,210	3,966,180
SW	387,210	3,965,940
NE	387,980	3,965,940
SE	387,980	3,965,570

The OU encompasses Mesita del Buey and portions of Cañada del Buey and Pajarito Canyon. The elevation of the mesa ranges from approximately 6600 ft (2012 m) at its eastern edge to about 6900 ft (1203 m) at its western edge. The entire OU ranges from approximately 6400 ft to 6900 ft (1950 to 1203 m). The topography is varied ranging from steep precipitous canyon walls to gently-sloping mesa tops.

The geology of the study area is along the eastern edge of the Pajarito Plateau (Purtymun and Kennedy, 1971). OU 1148 is underlain by welded Bandelier Tuff with overlying Tesuque and Puye formations (Ferenbaugh et al., 1982). Soil compositions in the area consist of Hackroy sandy loam, Totavi gravelly loam, Nyjack loam, Hackroy-Rock outcrop complex, Servilleta loam, Penistaja sandy loam, Prieta silt loam, and rock outcrop (Nyhan et al., 1978). The potentiometric surface of the main aquifer in the Los Alamos area lies about 5680 to 5880 feet asl at the location of TA-54. Over 700 ft (213 m) of unsaturated tuff and volcanic rock separate the surface from the aquifer (IT Corp., 1987). Pajarito Canyon, south of TA-54, acts as a drainage for the flanks of the Jemez Mountains. Spring and summer thunderstorms recharge a thin perched aquifer confined to the alluvium in the canyon. To the north, Cañada del Buey has a small drainage area insufficient to maintain perched water in the alluvium (Purtymun et al., 1990).

4 PREVIOUS STUDIES

Prior to the 1991 surveys, several site-specific studies had been completed within or immediately adjacent to TA-54. These studies include information gathered at sites of proposed Laboratory activities for threatened and endangered species, and vegetation and wildlife baseline and inventory data.

Much of the species information in this section is extrapolated for use only as a general description of the biological makeup of the project area. The most recent vegetation surveys were necessary to determine more complete and accurate information on plant and wildlife species for the proposed sampling sites.

4.1 Previous Vegetation Studies

A number of vegetation analyses and surveys have been conducted within portions of the canyons and mesa tops of OU 1148 (Table 1). The surveys include previous Environmental Assessments of Pajarito Canyon and Cañada del Buey, a vegetation analysis of Mesita del Buey and the adjacent canyons, and smaller studies of floristic composition within the TA-54 site. All of these studies and surveys were conducted after 1979 and prior to 1992. A complete checklist of plant species identified during these surveys, in addition to the most recent field surveys, is given in Appendix A.

4.2 Previous Wildlife Studies

Several studies and surveys describing the fauna in the vicinity have been conducted within or adjacent to the OU and are given in Table 2. These studies are discussed below with species lists provided in Appendix B.

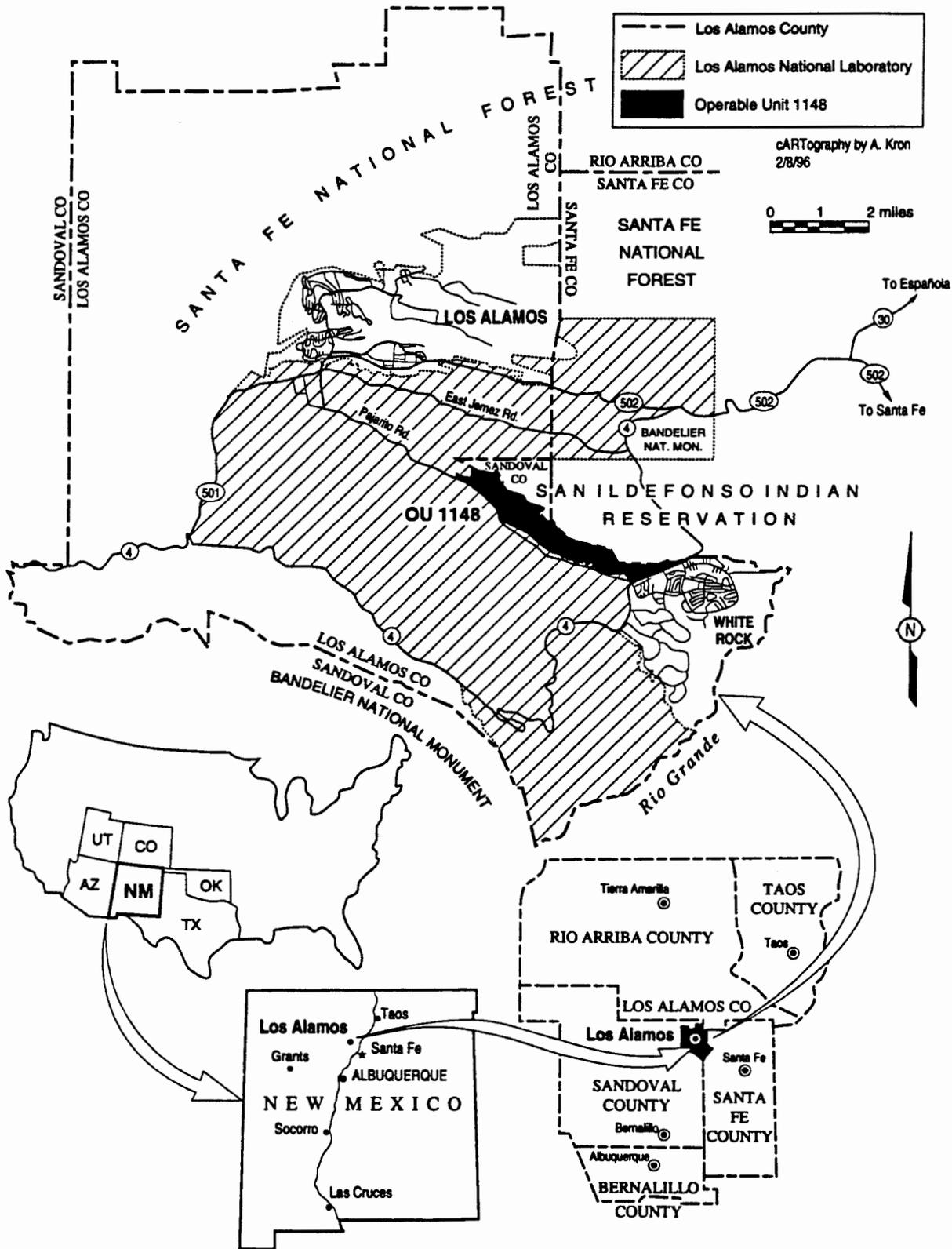


Figure 1. Location of Los Alamos National Laboratory within New Mexico.

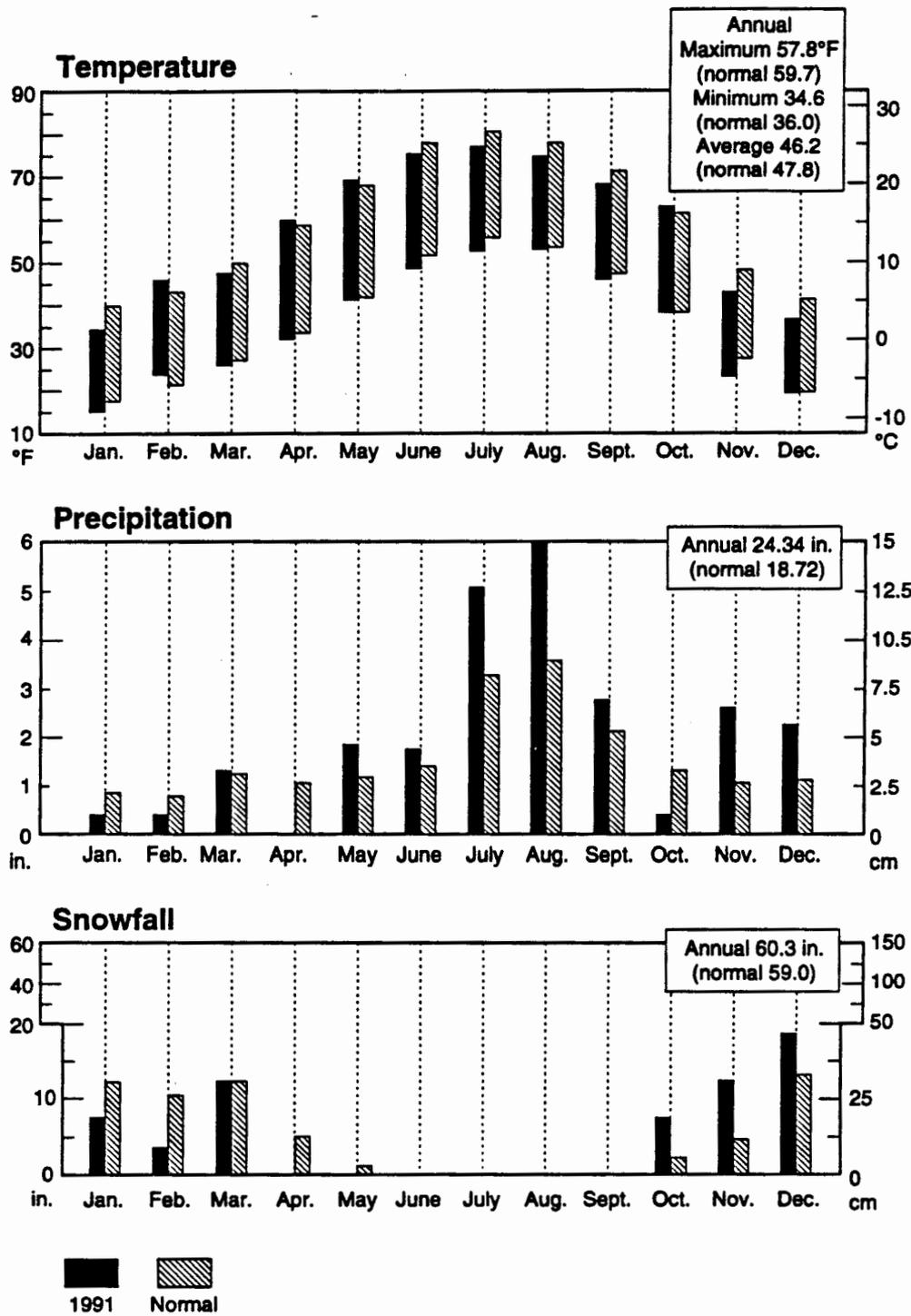


Figure 2. Meteorological conditions for 1991.

SANTA FE NATIONAL FOREST

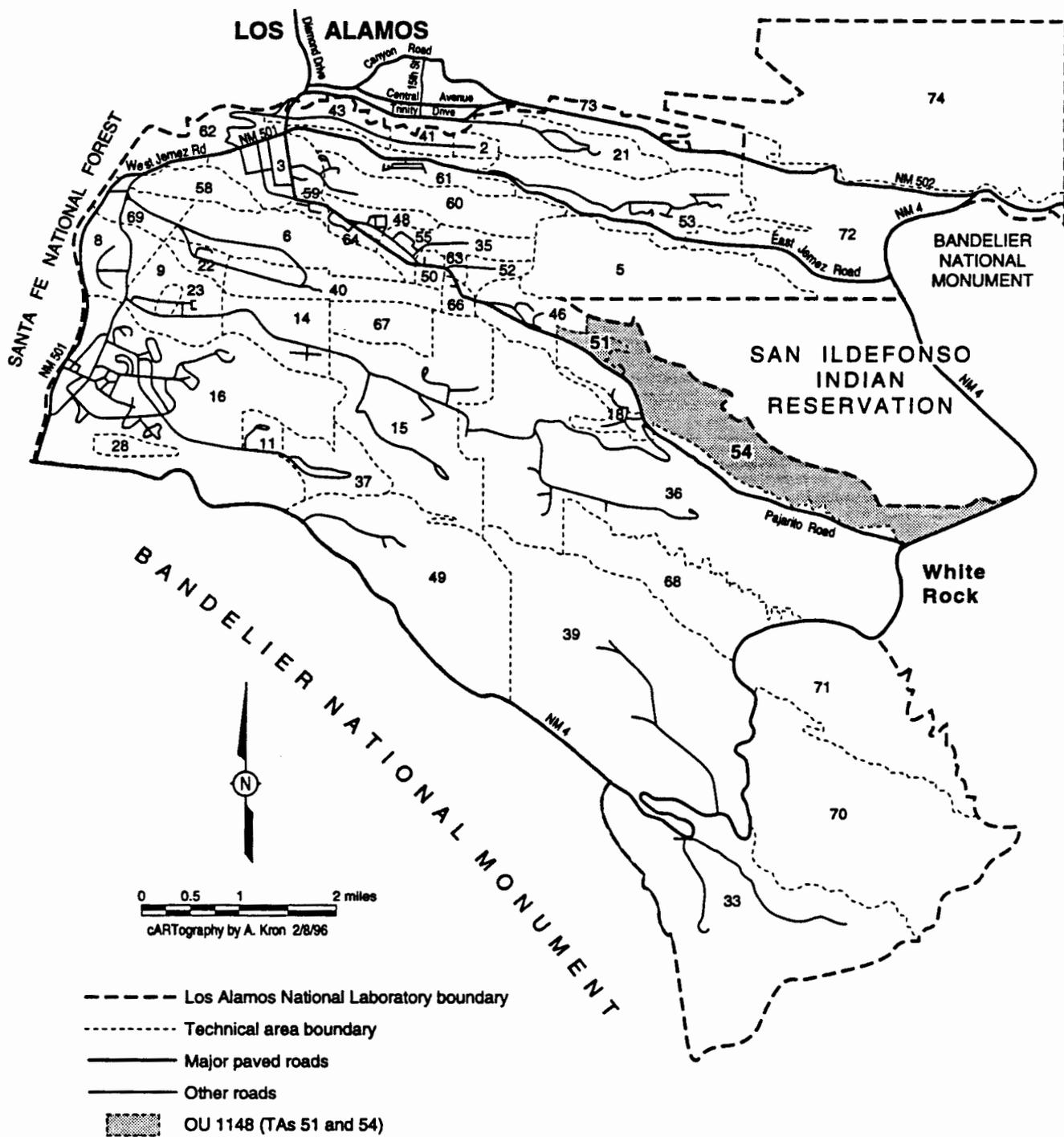


Figure 3. The location of Operable Unit 1148 within Los Alamos National Laboratory.

Table 1. Documents and surveys previously completed containing information on plant species within or near OU 1148.

PROJECT	REFERENCE
Floristic Composition Study of Area G	Foxx and Tierney 1980
Biological Survey of Area C	Foxx and Tierney 1980
Floristic Composition Study of Area G	Foxx and Tierney 1982
Floristic Composition Study of TA-51	Foxx and Tierney 1982
Flora of Los Alamos Lab	Foxx and Tierney 1984
Flora of Los Alamos Lab	Foxx and Tierney 1985
Biological Survey of Mesita del Buey	Foxx and Tierney 1985
Biological Survey of Area L	Foxx 1985
Overstory Survey of Area L	Foxx and Tierney 1986
Vegetation/Ecology Survey for the Animal Care Facility	Foxx 1987
Vegetation/Ecology Survey of Upper Mesita del Buey, Area L & J TRU-Waste Plant	Foxx and Tierney 1987
Vegetation/Ecology Survey of Cañada del Buey	Foxx and Tierney 1988
Biological Survey for Sanitary Waste Water Consolidation	Foxx and Tierney 1988
Ecological Survey for White Rock Visitor Center	Foxx and Bennett 1990

Table 2. Documents and surveys previously completed containing information on wildlife species within or near OU 1148.

PROJECT	REFERENCES
Pajarito and Cañada del Buey Small Mammal Data	Biggs and Raymer 1991
The Amphibians and Reptiles of Los Alamos National Environmental Research Park	Bogart 1978
Summary of Small Mammal Trapping	Felthouser 1980
Breeding Bird Census	Kent and Hickman 1986, 1987
Small Mammal Survey	Kent 1986
The Ants of Los Alamos County	Mackay, et al. 1986
Mammal Surveys at Waste Disposal Sites	Martin et al. 1971
Small Mammal Surveys	Morrison 1990
Bird surveys	Morrison 1990
Atlas of Breeding Birds of Los Alamos County	Travis 1992

4.2.1 Insects

No insect studies have been completed within OU 1148. However, one insect study has been conducted on Laboratory property that could have limited application to this OU based on similarity of habitats. MacKay et al. (1986) collected ants in Los Alamos County, including specific sites within TA-54 during the summer of 1986. He also supplied data from previously conducted studies in these and nearby areas. Appendix B lists those species found at the TA-54 site and in habitats similar to what is found in OU 1148.

4.2.2 Mollusks

No extensive or formal field surveys have been conducted for mollusks in this OU.

4.2.3 Reptiles and Amphibians

In 1978, Charles Bogart, consultant to LANL, conducted a survey of reptiles and amphibians within the boundaries of the Laboratory. Studies conducted in 1982 by Bowker and Ferenbaugh recorded additional species in this area. Appendix B lists the species of reptiles and amphibians potentially or actually (confirmed) occurring within OU 1148.

4.2.4 Birds

A list of bird species potentially and actually (confirmed) occurring within or near OU 1148 was extracted from the "Atlas of Breeding Birds of Los Alamos County, New Mexico". The most complete data on actual presence of bird species is taken from Morrison (1990) who established line transects in several canyons, including Pajarito and Cañada del Buey, both of which are within or near the OU. Of note is the possibility of the Cooper's hawk utilizing areas of OU 1148. The Cooper's hawk has been seen in upper Cañada del Buey, but no nest structures have been observed although the habitat is suitable for nesting by this species. Appendix B lists actually and potentially occurring bird species in the vicinity of OU 1148.

4.2.5 Fish

There are no suitable fish habitats located within OU 1148, therefore no fish species are expected to occur in this unit. Due to flow patterns and sources of water for the area (ephemeral runoff and spring-fed marshes), these waters are not expected to support fish.

4.2.6 Mammals

4.2.6.1 Small Mammals

Appendix B lists those species captured in the study sites and species visually observed or captured in related studies. Additional species were identified by Morrison (1990), Martin et al. (1971), Felthausen (1980), and Kent (1986) and are included in the species list.

4.2.6.2 Large Mammals

Studies done by White defined the wintering and summering range of the elk for 1981. Pellet transects set up by BRET in Cañada del Buey and Pajarito Canyon have also indicated year round use of the OU 1148 area. In addition, entries into the Wildlife Observation Database maintained by BRET indicate that deer have occasionally been observed in the area.

4.3 Previous Threatened, Endangered, and Sensitive Species

4.3.1 Vegetation

In 1984 a biological survey was conducted in association with the New Mexico Plant Protection Advisory Committee. The state endangered grama grass cactus (*Toumeyia papyracantha*) was found in Los Alamos county. This species has habitat requirements that are present within the OU 1148 site. No other species of concern have been previously found within the unit.

4.3.2 Wildlife

No extensive or formal previous field studies for threatened or endangered wildlife were found for OU 1148 and the TA-54 area.

4.4 Previous Wetland Studies

The Environmental Protection Agency (EPA) required a determination of all wetlands within the watershed of lands owned by the DOE/LANL for the LANL/DOE Resource and Conservation Recovery Act (RCRA) and Hazardous and Solid Waste Act (HSWA) part B permit. Consequently, a project to map and characterize those wetlands was undertaken in 1990. The wetlands mapping was done by the USFWS in accordance with the National Wetlands Inventory (NWI). The national inventory of wetlands includes all wetlands and deep-water habitats throughout the United States, including rivers, lakes, streams, marshes, bogs and ponds. In cooperation with other Federal and States agencies, private organizations and individuals, the USFWS developed a wetland definition for conducting an inventory of the nation's wetlands. This definition was published in the "Classification of Wetlands and Deep-Water Habitats of the United States" (Cowardin, et al. 1979). In the NWI, wetlands are defined as "lands transitional between aquatic and terrestrial systems where the water table is usually at or near the surface, or the land is covered by shallow water." In addition, the definition requires that the land support predominantly hydrophytes and the substrate is drained hydric soils (Dunke, et al. 1989).

The NWI maps are broad in scope and are meant to only provide guidance but not proprietary jurisdiction. The method for classification is a hierarchical system and is solely based on aerial photography. Aerial maps typically reflect conditions during the specific year and season they were taken. A detailed on-the-ground survey of single sites is being undertaken for each OU.

4.5 Previous Floodplains Studies

Under existing permit requirements, the EPA stipulates that facilities regulated by the RCRA must delineate all 100-year floodplain elevations within their boundaries. McLin (1992) did floodplain computational mapping using the COE's computer-based Flood Hydrograph Package (HEC-1) and HEC-2 (McLin 1992). HEC-1 generates storm hydrographs at selected channel locations within each ungaged watershed, HEC-2 defines the floodplain. He used the approach to define the 100-year, 6-hour-design storm event for Los Alamos. Total basin areas for each canyon were 10.3 square miles (26.86 sq. km) for Cañada del Buey and 13.60 square miles (35.22 sq. km) for Pajarito Canyon. The total runoff volumes (acre-feet) calculated for 6-hour storm events were 135 and 169, respectively.

5 METHODOLOGY

Three levels of surveys are conducted to determine the presence or lack of presence of species of concern or sensitive habitats that could be impacted by the site characterization sampling.

5.1 Level 1 (Reconnaissance) Survey

The Level 1 (reconnaissance) survey is the initial survey conducted to determine placement location of line transects, the extent of potential impact, the presence or lack of presence of water or floodplains, and the presence or lack of presence of disturbance.

After the initial field reconnaissance, we searched the TES species database developed by BRET. The database contains the latest information concerning individual threatened and endangered species occurring in Los Alamos and surrounding counties as supplied through the New Mexico Department of Game and Fish, New Mexico Energy and Minerals and Natural Resources Department, New Mexico Plants Protection Advisory Committee (1984), and the U.S. Fish and Wildlife Service (50 CFR 17.11 and 17.12). The habitat match generated a listing of potential state and federally threatened, endangered, candidate and sensitive species which could occur within the OU (Appendix C).

5.2 Level 2 (Habitat Evaluation) Survey

Based on the results of the Level 1 survey, a Level 2 survey (habitat evaluation) was conducted. The use of a Level 2 survey was deemed necessary due to portions of the canyon walls and canyon bottoms being relatively undisturbed and therefore potential habitat for threatened and endangered species.

After we generated a list of species of concern, we began the Level 2 survey to quantitatively measure the habitat, document the habitat parameters, and determine if habitat parameters for any known sensitive species were present. The habitat evaluation can also be used for environmental settings to develop habitat evaluation procedures and to provide baseline information on the biotic communities. Once data from the vegetation transects are collected, we can use a hierarchical classification system to group species information into "mapping units." This provides the baseline information used to map vegetation onto Geographic Information Systems such as ARC-INFO. We classified the following units using Brown et al., (1982) and USFS Habitat Types (Moir and Ludwig 1979 see also Appendix D): Vegetation Type, Formation Type, Climatic (Thermal) Zone, Biotic Community, Series, Habitat Type, and Phase. Definitions for each classification are as follow:

Vegetation Type: Vegetation established under an existing climate and includes one of two types: upland or wetland.

Formation Type: Formations that are vegetative responses to various environmental factors, primarily available soil moisture, includes the following:

Upland	Wetland
Tundra	Wet tundra
Forest and Woodland	Forest
Scrub land	Swamp scrub
Grass land	Marshland
Desert land	Strand
Non-vascular	Submergent

Climatic Zone: One of the four world climatic zones in which minimum temperature is the primary factor for separating formation types. These include Arctic-Boreal, Cold Temperate, Warm Temperate, and Tropical-Subtropical.

Biotic Community: A unit characterized by a distinct evolutionary history within a formation and centered in a biogeographical region that has a particular precipitation pattern or climatic regime.

Series: Principal plant and animal communities within each biotic community. These are based on distinct climax plant dominants.

Habitat Type: Based on the occurrence of a particular dominant species that is local or regional in distribution.

Phase: Based on data collection used in determining co-dominants, understory species, and other species information.

BRET used standard ecological techniques in the habitat evaluation to measure cover, density, and frequency of the vegetative component and to calculate importance indexes for each species in the overstory and understory components. The importance indexes given in the tables for tree and shrub species are calculated by averaging the relative cover, density, and frequency of each species encountered in the line transects. To obtain the importance index for understory species, only the relative cover and frequency are averaged.

5.2.1 Overstory Evaluation

BRET used circular plot and line intercept techniques to measure the overstory components of the forest, woodland, and riparian communities.

Circular plots are used primarily in multi-stemmed piñon-juniper woodlands and along some riparian zones. The line intercept method is used primarily in taller, single-stemmed overstory habitats, such as ponderosa pine communities and riparian zones.

The total length of each transect was based on a "species area curve" or when a maximum of 1000 ft (304.8 m) was reached. The species area curve was calculated by comparing the total number of individual plant species recorded along a transect with the total number of plots along the same transect. The total length of the transect is then considered adequate when the curve becomes relatively level.

5.2.1.1 Circular Plots

We used the circular plot technique to measure the overstory components in most riparian zones and woodlands. A transect line was placed within the habitat that is to be evaluated (maximum 1000 ft [304.8 m] or until species area curve had leveled out). Circular plots were established every 100 ft (30.48 m) along the transect (Fig. 4) starting at the first 50-ft (15.24-m) mark. All multi-stemmed trees (such as piñon and juniper) within a 30-ft (9.14-m) radius of the center point (from the transect line) were measured for basal diameter; all single-stemmed trees (such as ponderosa pine) were measured at diameter at breast height (DBH). We determined cover of species by dividing the circle into four equal subplots and estimating the individual species cover within each of the subplots.

5.2.1.2 Line Intercept

We used the line intercept method to measure single-stemmed overstory components within some riparian zones and most taller woodlands (i.e., ponderosa pine, mixed-conifer). For this method we placed a transect line within the habitat to be evaluated and separated it into 50-ft (15.24-m) quadrats. All trees and shrubs within 10 ft (3.05 m) of either side of the transect line and equal to or greater than 3 ft (0.91 m) in height were recorded (Fig. 5). The transect distance at which the midpoint of the species occurred was also recorded and a DBH was taken. Any species overlapping the transect line was also measured to estimate canopy cover. The canopy cover was measured from the point at which it first crosses the transect line to the point where it terminates coverage along the line without any breaks of the canopy in between. If the canopy extends into the next 50-ft (15.24-m) section, then the measurement is counted separately in the two sections. When the canopy cover is overlapping, the canopy cover measurement for each particular species can include more than one individual as long as both are the same species. A species area curve, or a maximum of a 1000-ft (304.8-m) transect, is also used.

5.2.2 Understory

We used the quadrat method, with a Daubenmire plot of 20 x 50 cm (Daubenmire 1959), to measure the cryptogamic and herbaceous layer, the percent bare soil, litter, and woody species less than 3 ft (0.91 m) tall. Visual estimates of foliar cover were used to determine percent cover and species composition. We placed quadrats every 10 ft (3.05 m) along the same transect line established for overstory evaluation (Fig. 6). Quadrats were placed along the line and read until the number of species within the plots had not increased (species area curve) or a maximum of 1000 ft (304.8 m) had been reached for a single transect.

All plants were identified using Martin and Hutchins (1980), Foxx and Hoard (1984), and Foxx and Tierney (1985). When necessary, voucher specimens were collected and archived in the EM-8 Herbarium. Any identifications that were questionable were taken to the University of New Mexico Herbarium for confirmation.

5.3 Level 3 (Species-Specific) Surveys

Based on the results of the Level 1 and Level 2 surveys and on consultation with experts, BRET concluded that no Level 3 surveys were necessary for a specific species. Several studies were established to determine the presence or absence of mammal and insect species. Level 2 surveys were used as presence or absence for plant species.

5.3.1 Mammals

5.3.1.1 Small Mammals

Small mammal live-trapping sessions were conducted in OU 1148 for Cañada del Buey. Capture/release methods were used in order to obtain information on species composition, abundance, and habitat utilization. In Cañada del Buey a trapping grid was established consisting of 102 to 104 traps set out in 10 lines running from a canyon side across the canyon bottom to the opposite canyon side. Trap stations were spaced 32.81 ft (10 m) apart. All studies used ventilated aluminum 9x3x12-in (23x8x30-cm) Sherman live traps baited with a mixture of oats and peanut butter. For nocturnal mammals, traps were baited in late afternoon and set on a level surface under cover for protection from exposure to heat and precipitation. Traps were set at dusk to capture animals and checked just after dawn the next morning. Information on species, sex, body weight, and tail and body length were recorded for each capture. The animal was then released at the site of capture. The grid was only run for one week at any given time. When necessary, voucher specimens of small mammals were taken for identification purposes. Species captured are listed in Appendix B.

5.3.1.2 Large Mammals

Large mammal surveys conducted in OU 1148 consisted of pellet count transects to establish a species inventory, relative abundance of species, distribution, and habitat utilization. Plots were placed every 65.62 ft (20 m) along straight lines or transects. A total of 50 circular plots were placed in each study area; Cañada del Buey and Pajarito Canyon. Circular plots of 11.78 ft (3.59 m) were placed every 65.62 ft (20 m) along straight lines or transects and marked with 2-ft 3/4-in (0.61-m 1.91-cm) angle iron pounded into the ground. These were painted blue, and labeled sequentially with a number and a letter corresponding to the transect.

Transect lines were marked every 65.62 ft (20 m) with the plot angle iron and pin flagged 32.81 ft (10 m) from each angle iron. Blue paint was sprayed on the ground around the pin flag to mark its location should the pin be lost. Pin flags were labeled with the transect letter and the adjacent angle iron number plus 0.5. Plots, and 3.28 ft (1 m) to each side of the center transect line between plots, are searched for pellet groups.

The first time a transect is searched, each pellet group (5 pellets or more) is recorded by age, which is judged by moisture content, color, and texture then noted as 'A' for ancient, 'O' for old, and 'N' for new. All pellets are then removed from the plot by tossing, kicking or rubbing them out.

Pellet counts were conducted every three to four weeks throughout the year, each time removing the pellets from the plots and transects after recording them. Transects have been set up in Cañada del Buey and Pajarito Canyon as part of a continuing survey. The data from these surveys is in the process of being analyzed.

In addition, observations of mammal species were made during field activities by visual sightings, and noting tracks and scat.

5.3.2 Birds

Although no systematic surveys were conducted for birds within OU 1148 during the 1991 field season, surveys were conducted in 1986 and 1990 as described in the "Previous Studies" section. The point count or similar methodology was used and is described below.

Counts were started 656.17 ft (200 m) from the transect beginning point to avoid bias. There were at least 30 points, each 656.17 ft (200 m) apart, on each transect. At each point the observer remained

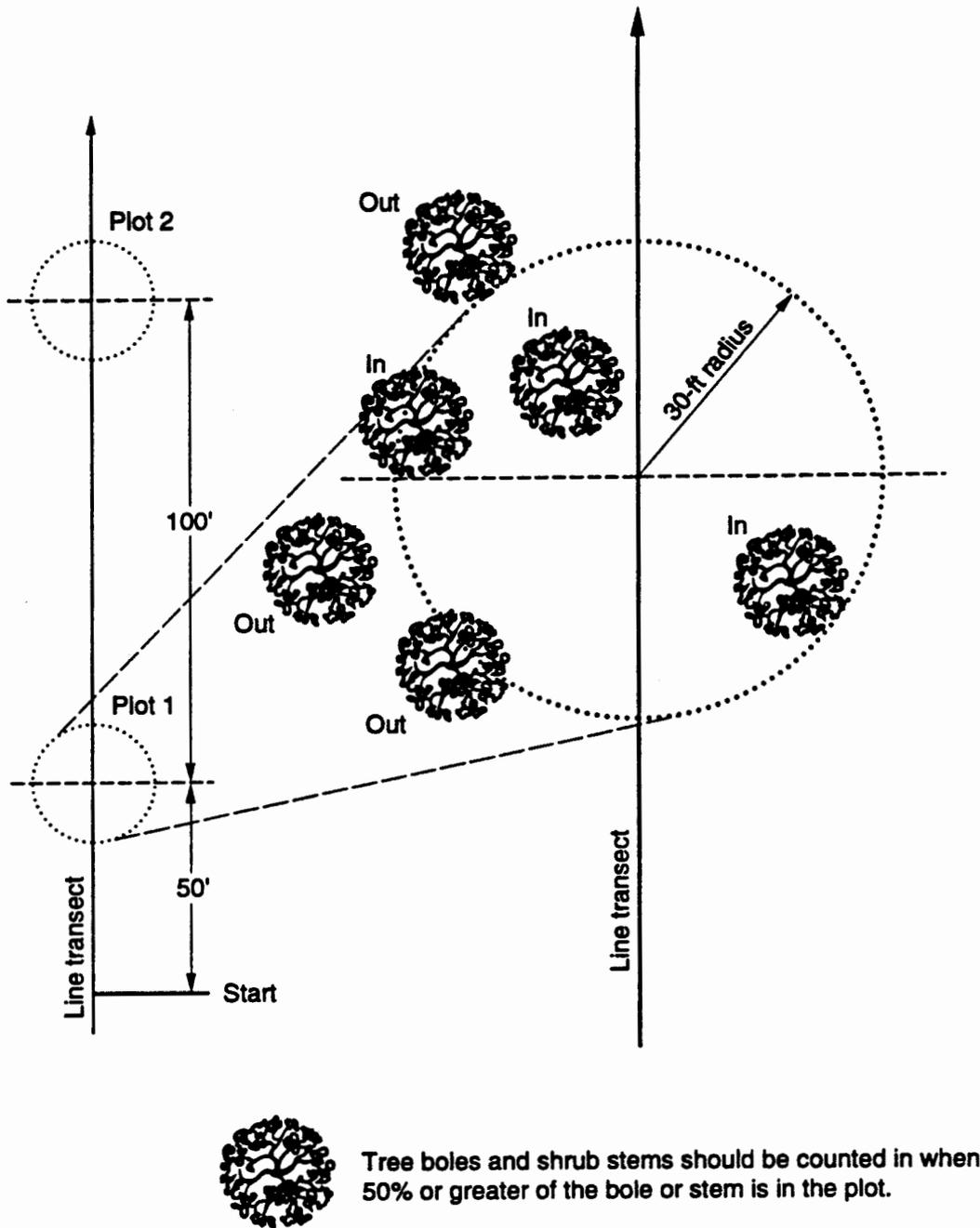
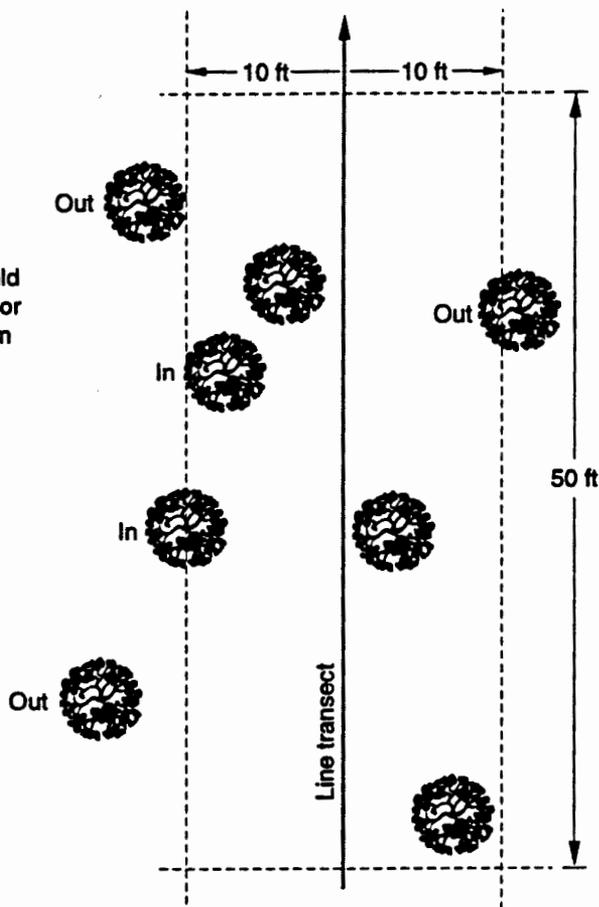


Figure 4. Circular plot method diagram for trees and shrubs.

(a)

Tree boles or stems should be counted in when 50% or greater of the bole or stem is in the plot



(b)

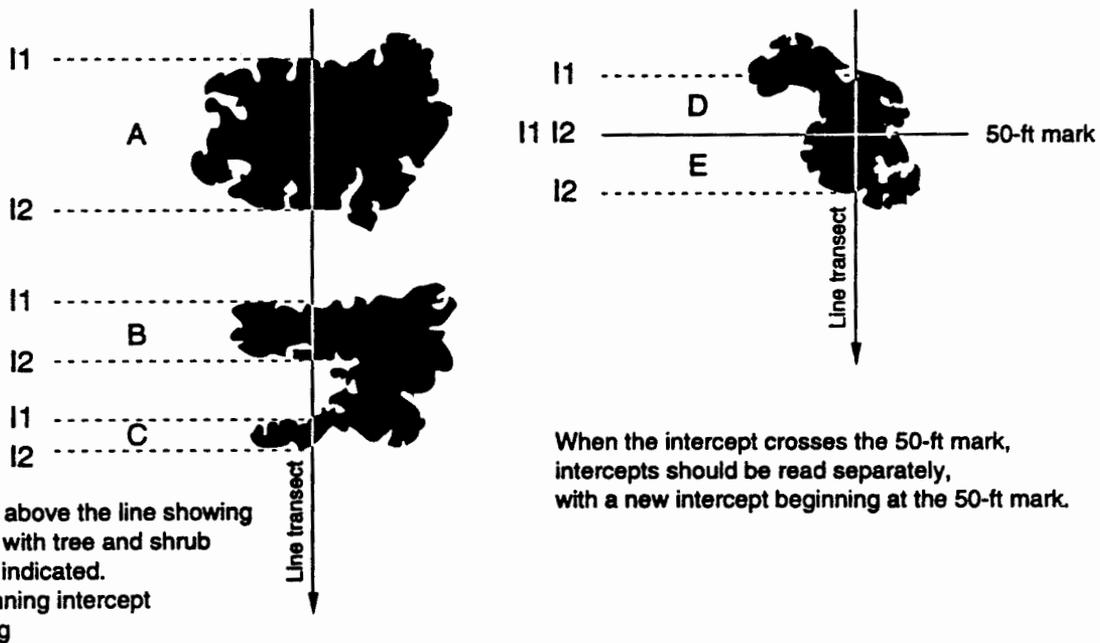


Figure 5. (a) Line transect method of tree bole measurements and stem counts; (b) reading foliar intercepts.

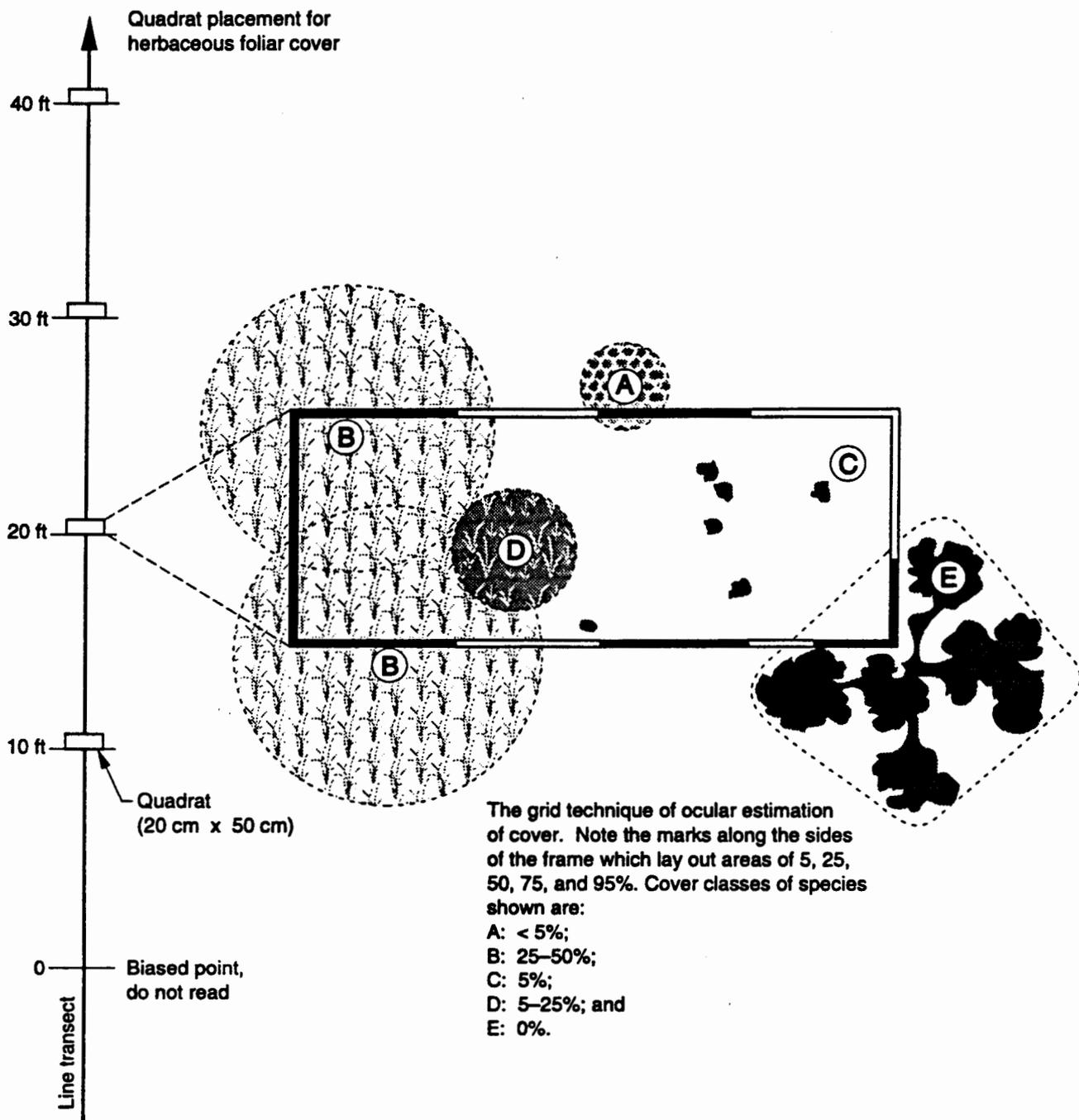


Figure 6. Diagram illustrating foliar intercept readings.

stationary for 6 minutes and counted all birds seen and heard. Additional data on age and sex of birds were recorded if time permitted. Birds were recorded as being less than 25 ft (7.62 m) from the observer or more than 25 ft (7.62 m) from the observer. Researchers made identifications using Robbins, et al. (1983) and Peterson (1990). Bird species identified during the field season are included in Appendix B.

5.3.3 Amphibians and Reptiles

BRET conducted no systematic surveys of amphibians or reptiles in OU 1148. However, we did record any encountered during field work. If possible, with the exception of rattlesnakes, the animals were captured by hand, identified, photographed, weighed, and measured, then released. All identifications were made using Stebbins (1985).

A continuing study of amphibians and reptiles has been established in Pajarito Canyon as part of adjacent OU 1093. Due to some similar habitat on the south edge of OU 1148, species recorded in Pajarito Canyon are included in Appendix B.

5.3.4 Mollusks (Snails and Bivalves)

No systematic surveys were conducted for snails or bivalves within the OU. However, if any were observed in the field, they were recorded.

5.3.5 Insects

5.3.5.1 Ground Dwelling

No formal survey was conducted for ground-dwelling terrestrial insects within the OU prior to 1991; however a survey in an adjacent OU within Pajarito Canyon (OU 1093) provided a list of species found within similar habitats in both units. The following methodology was used to trap for insects:

Pit trap arrays were placed in varying habitats within Pajarito Canyon. We utilized cups (16- to 20-oz volume) which we buried with soil packed around the cup to the lip. We filled an internal cup to approximately half-full with 70% ethanol and placed it inside the buried cup. This allows for at least a biweekly collection of the insects. All insects collected were placed in a scintillation vial containing 70% ethanol and labeled according to array number, trap number and date. The data from the surveys is in the process of being analyzed.

5.3.5.2 Aquatic

No surveys were conducted for aquatic insects.

5.3.6 Fish

No fish habitat existed within OU 1148, therefore no fish surveys were conducted.

5.3.7 Threatened, Endangered, and Sensitive Species

5.3.7.1 Peregrine Falcon

Formal field surveys were not conducted for this species by BRET. However, Terrell Johnson, a noted authority, has been subcontracted to develop a habitat management plan for the peregrine falcon in Los Alamos County. The document includes a discussion of the peregrine with information on both previous surveys and current status.

5.3.7.2 Spotted Bat

There were no spotted bat surveys conducted in the OU. However, information from bat surveys conducted elsewhere on the laboratory is incorporated into this report with the methodology described below.

Bat surveys were conducted using mist nets. This method is not specific to spotted bats and therefore collected general inventory data on bat species. Nets were set up and opened at dusk and run until 2 a.m. or dawn. Nets were closely monitored and checked every few minutes to determine if any bats were caught. When a bat was caught, the net was carefully removed by holding the bat gently, and pulling the net strands away from its body and wings. Species were identified, sexed, photographed, and released immediately. Only rabies-immunized researchers from the University of New Mexico conducted mist netting. To prevent unnecessary handling and possible injury to the bats, they were not weighed, measured or marked during the survey. Researchers made identifications using Whitaker (1980) and Burt and Grossenheider (1980). As yet, the spotted bat has not been found on Laboratory property.

5.4 Floodplain and Wetland Assessment Techniques

Wetlands: The Federal Manual for Identifying and Delineating Wetlands has three mandatory technical criteria for wetland identification: 1) hydrophytic vegetation, 2) hydric soils, and 3) hydrology.

An area is considered to have wetland hydrology when, during the growing season, there is 1) permanent or periodic inundation or soil saturation for a significant period (usually a week or more); 2) a water table less than 0.5 to 1.5 feet (0.15 to 0.46 m) from the surface for one week or more; or 3) an area inundated through ponding or flooding for one week or more. Various information can be used to determine direct or indirect evidence of inundation or soils saturation including field observations, recorded data, aerial photographs, and field indicators.

Hydric soils are formed when prolonged inundation caused anaerobic soil conditions. This changes the iron oxides and manganese oxides affecting solubility, movement, and aggregation of the oxides. This becomes reflected in soil color and physical characteristics. These changes in color and physical characteristics indicate inundation and is used as a field indicator of wetlands.

Soil samples were taken along the stream within Pajarito Canyon and along a transect crossing the canyon bottom from north to south in Cañada del Buey. Soil pits at least 18 inches in depth were dug to determine the field indicators of soil saturation, soil color, mottling, gleying, and aquic or peraquic moisture regimes. Soil color was determined with a Munsell soil color chart.

Another key parameter in determining wetland status is the presence of hydrophytic vegetation. Such plants are adapted to inundation or periodic saturation and can withstand anaerobic soil conditions. Vegetation can be classified in 5 different categories: obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), and obligate upland (UPL). Hydrophytic vegetation is indicated when under normal circumstance: 1) more than 50% of the composition of the dominant species from all strata (trees, shrubs, herbs) are obligate wetland, facultative wetland and/or facultative species; 2) a frequency analysis of all species within the community yields a prevalence index of less than 3 (where OBL=1, FACW=2, FAC=3, FACU=4 and UPL=5) (National List of Plant Species That Occur in Wetlands: Southwest Region 7). Hydric vegetation was noted during the habitat evaluations as part of the Level 2 surveys.

Floodplains: Floodplains are identified as "lowlands adjoining inland and coastal water and relatively flat areas." The base floodplain is defined as the 100-year (1.0 %) floodplain. The critical action floodplain is defined as the 500-year (0.2 %) floodplain. Floodplains are protected under EO 19900 form disturbance. Floodplain maps generated by McLin (1992) indicate the base floodplain or 100-year floodplain.

6. RESULTS

6.1 Level 1 (Reconnaissance) Survey

Reconnaissance surveys were conducted at Pajarito Canyon, Mesita del Buey, and Cañada del Buey to determine potential habitats, identify sampling locations, and determine access for conducting field surveys. All sampling locations were readily accessible, either by vehicle or a relatively brief walk.

We reviewed the TES database, containing information based on previously documented occurrences, and existing habitat to determine whether any TES plant and animal species potentially exist within the project area (Table 3). Appendix C provides a printout of the actual database.

Based on the Reconnaissance surveys, the following plant communities were defined and used for search criteria:

- Piñon pine-juniper
- Ponderosa pine-piñon pine
- Ponderosa pine
- Riparian
- Wetland

Table 3: Threatened, Endangered and Sensitive Species List	
WILDLIFE	
Federal Listed	
Northern goshawk	<i>Accipiter gentilis</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Peregrine falcon	<i>Falco peregrinus</i>
White-faced ibis	<i>Plegadis chihi</i>
Willow flycatcher	<i>Epidonax trailii</i>
Spotted bat	<i>Euderma maculatum</i>
Meadow jumping mouse	<i>Zapus hudsonius</i>
State Listed	
Common black hawk	<i>Buteogallus anthracinus</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Mississippi kite	<i>Ictinia mississippiensis</i>
Peregrine falcon	<i>Falco peregrinus</i>
Broad-billed hummingbird	<i>Cynanthus latirostris</i>
Willow flycatcher	<i>Epidonax trailii</i>
Spotted bat	<i>Euderma maculatum</i>
Say's pond snail	<i>Lymnaea capterea</i>
Meadow jumping mouse	<i>Zapus hudsonius</i>
PLANTS	
Federal Listed	
Wright fishhook cactus	<i>Mammillaria wrightii</i>
Santa Fe cholla	<i>Opuntia viridiflora</i>
Gramma grass cactus	<i>Toumeyia papyracantha</i>
Tufted sand verbena	<i>Abronia bigelovii</i>
State Listed	
Helleborine orchid	<i>Epipactis gigantea</i>
Wright fishhook cactus	<i>Mammillaria wrightii</i>
Santa Fe cholla	<i>Opuntia viridiflora</i>
Gramma grass cactus	<i>Toumeyia papyracantha</i>

Table 3 (cont.)

State Sensitive	
Sessile-flowered false carrot	<i>Aletes sessiliflorus</i>
Threadleaf horsebush	<i>Tetradymia filifolia</i>
Plank's catchfly	<i>Silene plankii</i>
Santa Fe milkvetch	<i>Astragalus feensis</i>
State Sensitive	
Mathew's wooly milkvetch	<i>Astragalus mollissimus</i>
Taos milkvetch	<i>Astragalus puniceus</i>
Cyanic milkvetch	
<i>Atragalus cyaneus</i>	
Tufted sand verbena	<i>Abronia bigelovii</i>
Pagosa phlox	<i>Phlox caryophylla</i>

Although these community delineations may differ from habitats discussed in latter sections, they include all habitat types identified in this document.

6.1.1 Plants

Federally Listed Species: No federal endangered or threatened plant species were listed as potentially occurring in the OU. However, the following first four federal candidate plant species (including 3C) and the fifth, a state sensitive candidate, meet the search criteria.

Candidate

Wright fishhook cactus	<i>Mammillaria wrightii</i>
Santa Fe cholla	<i>Opuntia viridiflora</i>
Grama grass cactus	<i>Toumeyia papyracantha</i>
Tufted sand verbena	<i>Abronia bigelovii</i>
Plank's catchfly	<i>Silene plankii</i>

State Listed Species: The following three plant species listed as state threatened or endangered also meet the Federal candidate species search criteria (New Mexico Natural Heritage Program 1991).

Endangered

Wright fishhook cactus	<i>Mammillaria wrightii</i>
Santa Fe cholla	<i>Opuntia viridiflora</i>
Grama grass cactus	<i>Toumeyia papyracantha</i>

6.1.2 Sensitive Species

Under the Federal Endangered Species Act and state statutes, only those species that are listed, or are candidates for listing, are protected. New Mexico has listed those species occurring within the state that are considered rare because of restricted distribution or low numerical density. These rare plants are sensitive to long-term or cumulative land use impacts and are vulnerable to biological or climatic events. These species are monitored by the state to determine if they should be elevated to endangered status. The following species are listed as state sensitive:

Sessile-flowered false carrot	<i>Aletes sessiliflorus</i>
Threadleaf horsebrush	<i>Tetradymia filifolia</i>
Plank's catchfly	<i>Silene plankii</i>
Santa Fe milkvetch	<i>Astragalus feensis</i>

Mathew's woolly milkvetch	<i>Astragalus mollissimus</i>
Taos milkvetch	<i>Astragalus puniceus</i>
Cyanic milkvetch	<i>Astragalus cyaneus</i>
Tufted sand verbena	<i>Abronia bigelovii</i>
Pagosa phlox	<i>Phlox caryophylla</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Mississippi kite	<i>Ictinia mississippiensis</i>
Peregrine falcon	<i>Falco peregrinus</i>
Broad-billed hummingbird	<i>Cynanthus latirostris</i>
Willow flycatcher	<i>Empidonax trailii</i>
Spotted bat	<i>Euderma maculatum</i>
Say's pond snail	<i>Lymnaea captera</i>
Meadow jumping mouse	<i>Zapus hudsonius</i>

6.1.3 Wildlife

Federally Listed Species: Two federal endangered and three federal candidate species met the search criteria (U. S. Fish and Wildlife Service 1990):

Endangered

Bald eagle	<i>Haliaeetus leucocephalus</i>
Peregrine falcon	<i>Falco peregrinus</i>

Candidate

Willow flycatcher	<i>Empidonax trailii</i>
Spotted bat	<i>Euderma maculatum</i>
Meadow jumping mouse	<i>Zapus hudsonius</i>

State Listed Species: Species listed as endangered or threatened in the state of New Mexico that met the search criteria are as follows (New Mexico Department of Game and Fish 1988):

Endangered

Common black hawk	<i>Buteogallus anthracinus</i>
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The Migratory Bird Treaty Act (16 USC 703-711) provides federal protection for all wild birds except resident game birds, English sparrows, starlings, and feral pigeons. The Bald Eagle Protection Act further protects eagles, including the golden eagle. These species are protected from being collected and maimed, and from having their nests disturbed.

6.2 Level 2 (Habitat Evaluation) Surveys

We established vegetation transects in Cañada del Buey, Pajarito Canyon, and Mesita del Buey to evaluate the understory and overstory components of the following general habitats and locations:

LOCATION	HABITAT
Pajarito Canyon	South-facing slope
Cañada del Buey	North-facing slope
	Canyon bottom
Mesita del Buey	Mesa top

In general, OU 1148 is located in the Rocky Mountain Montane Conifer Forest and the Great Basin Conifer Woodland communities. More specifically, much of the vegetation within the unit is characterized as being in the Ponderosa Pine Series and the Piñon-juniper Series with varying vegetation complexes found throughout each. This unit is comprised primarily of two canyon systems and a mesa. Pajarito Canyon and Cañada del Buey are the major systems found in the unit. We established line

intercept and circular plot transects within both systems to evaluate the overstory component. A further breakdown and discussion of vegetation is given below (see Appendix F for raw data summaries).

6.2.1 Overstory

Following a reconnaissance survey of OU 1148, we placed vegetation transects in general habitats that displayed vegetational differences. North-facing slopes, south-facing slopes, canyon bottoms, and mesa tops were each identified as having vegetatively different species composition. Each site selected appeared to be representative of the overall habitat of OU 1148. Specific site characteristics (dominant species, relative density, cover, etc.) are discussed and comparisons made when possible.

These locations are relative to one another within the OU and do not necessarily represent the entire length of the canyon systems.

6.2.1.1 North-Facing Slope: Cañada del Buey

Typically, north-facing slopes are more densely vegetated than south-facing slopes and other terrain aspects because of their capacity to retain more moisture. Piñon pine and juniper are the dominant overstory species along the north-facing canyon slope of Cañada del Buey below TA-54 Area G (Table 4). Ponderosa pine and Rocky Mountain juniper were present with more than 10% frequency in the transect. Piñon was highest in the importance index (81.68%). Further west in Cañada del Buey, the overstory vegetation of the north-facing slope changes to a mixed-conifer composition with ponderosa pine and Douglas fir as the dominant overstory. However, no transects were conducted in this mixed-conifer area of OU 1148. Surveys have been conducted for adjacent OUs in upper Cañada del Buey. The vegetation found in those surveys is included in the species list of Appendix A.

SPECIES	TRANSECT		
	North-Facing Slope (1)	South-Facing Slope (2)	Canyon Bottom (3)
Rocky Mountain Juniper			
Average DBH (in)	3.3	1.58	-
Relative Cover (%)	13.84	5.3	-
Relative Density (%)	13.89	3.23	-
Relative Frequency (%)	13.89	14.29	-
Importance Index (%)	13.87	7.61	-
One-seed juniper			
Average DBH	6.71	4.96	3.38
Relative Cover	58.30	23.10	77.55
Relative Density	66.67	15.32	66.67
Relative Frequency	66.67	28.57	66.67
Importance Index	63.88	22.33	70.29
Piñon pine			
Average DBH	4.35	1.60	.10
Relative Cover	83.94	11.63	0.00
Relative Density	80.56	2.42	22.22
Relative Frequency	80.56	14.29	22.22
Importance Index	81.68	9.44	14.81
Ponderosa Pine			
Average DBH	5.94	5.80	2.90
Relative Cover	27.86	34.43	22.45
Relative Density	19.44	3.23	11.11
Relative Frequency	19.44	14.29	11.11
Importance Index	22.25	17.31	14.89

Table 4 (cont.)

SPECIES	TRANSECT		
	North-Facing Slope (1)	South-Facing Slope (2)	Canyon Bottom (3)
Narrowleaf Cottonwood			
Average DBH	0.92	-	-
Relative Cover	25.54	-	-
Relative Density	75.81	-	-
Relative Frequency	28.57	-	-
Importance Index	43.30	-	-
A dash (-) indicates the species was not recorded at this site. 1 = Cañada del Buey 2 = Pajarito Canyon 3 = Cañada del Buey			

6.2.1.2 South-Facing Slope: Pajarito Canyon

In order to identify some of the riparian species in the OU, the survey of the south-facing slope in Pajarito Canyon included an area adjacent to the stream channel. Narrowleaf cottonwood was the dominant overstory species overall (43.30% importance index)(Table 4). One-seed juniper and narrowleaf cottonwood occurred most frequently in the transect (28.57% and 28.57% occurrence, respectively); however, ponderosa pine had the highest cover value (34.43% cover). Other species encountered in the transect were piñon pine and Rocky Mountain juniper.

6.2.1.3 Canyon Bottom: Cañada del Buey

One-seed juniper was the dominant overstory species recorded along the bottom of Cañada del Buey (Table 4). Juniper had more than half the cover in the transect (77.55%). Ponderosa pine and piñon pine were common, but with considerably lower importance index values. Piñon pine did not have any cover in the transect but occurred more frequently than ponderosa pine (22.22% and 11.11%, respectively). It should be noted that the piñon pine individuals were fairly small with an average DBH of less than one inch.

6.2.1.4 Mesa Top: Mesita del Buey

Within the TA-54 area, the three transects conducted had very similar overstory vegetation (Table 5). One-seed juniper and piñon pine were the only species recorded for each transect. The cover for juniper was higher than piñon in the first (51.29 and 69.46%) and third (30.54 and 48.71%) transects. In the second transect, the frequency and cover for piñon was greater, as was the importance index value. There was no overstory data for the transect conducted in the TA-51 area.

Table 5: Overstory vegetation characteristic of the tree canopy layer species recorded in OU 1148 for Mesita del Buey

SPECIES	TRANSECT		
	Mesa top NE	Mesa top Area G	Mesa top SW
One-seed Juniper			
Average DBH (in)	4.50	4.97	4.40
Relative Cover (%)	48.71	34.78	30.54
Relative Density (%)	42.03	64.06	47.47
Relative Frequency (%)	42.03	64.06	47.47
Importance Index (%)	44.26	54.30	41.83
Piñon Pine			
Average DBH	4.99	4.47	5.06
Relative Cover	51.29	65.22	69.46
Relative Density	57.97	35.94	52.53

Table 5 (cont.)

SPECIES	TRANSECT		
	Mesa top NE	Mesa top Area G	Mesa top SW
Relative Frequency	57.97	35.94	52.53
Importance Index	55.74	45.70	58.17
A dash (-) indicates the species was not recorded at this site.			

6.2.2 Shrubs

For purposes of determining overstory content in line intercepts and circular plots, we separated woody species into trees and shrubs. There were also cases of overlap into the quadrats during measurement of understory species due to presence of woody species less than three feet in height.

6.2.2.1 North-Facing Slopes: Cañada del Buey

The north-facing slope of Cañada del Buey was dominated by Gambel oak shrub cover (80.82%) (Table 6). All other species had a cover value of less than 10%. For most species, frequency values were higher than 10%. Mock orange had the second highest frequency (22.43%). Only New Mexico locust and wax current occurred in less than 10% in the transect. Other species found on the north-facing slope were squawbush, mountain mahogany, and New Mexico hops.

Table 6: Overstory vegetation characteristics of the shrub canopy layer species recorded in OU 1148.

SPECIES	TRANSECT		
	North-Facing Slope (1)	South-Facing Slope (2)	Canyon Bottom (3)
Apache Plume			
Stems per Acre	-	1.70	-
Relative Cover	-	32.90	-
Relative Density	-	58.93	-
Relative Frequency	-	26.09	-
Importance Index	-	39.12	-
Big Sagebrush			
Stems per Acre	-	1.90	151.18
Relative Cover	-	46.97	19.18
Relative Density	-	13.10	7.73
Relative Frequency	-	26.09	30.85
Importance Index	-	28.72	19.26
Gambel Oak			
Stems per Acre	211.58	-	46.12
Relative Cover	36.23	-	36.69
Relative Density	29.31	-	2.36
Relative Frequency	29.33	-	21.27
Importance Index	46.37	-	20.11
Mock Orange			
Stems per Acre	161.79	-	-
Relative Cover	3.17	-	-
Relative Density	22.41	-	-
Relative Frequency	22.43	-	-
Importance Index	16.01	-	-

Table 6 (cont)

SPECIES	TRANSECT		
	North-Facing Slope (1)	South-Facing Slope (2)	Canyon Bottom (3)
Mountain Mahogany			
Stems per Acre	136.9	-	-
Relative Cover	4.38	-	-
Relative Density	18.97	-	-
Relative Frequency	18.98	-	-
Importance Index	14.11	-	-
New Mexico Hops			
Stems per Acre	112.01	-	-
Relative Cover	2.09	-	-
Relative Density	15.52	-	-
Relative Frequency	15.53	-	-
Importance Index	11.05	-	-
New Mexico Locust			
Stems per Acre	6.22	-	-
Relative Cover	1.71	-	-
Relative Density	0.86	-	-
Relative Frequency	0.86	-	-
Importance Index	1.15	-	-
Rubber Rabbit Brush			
Stems per Acre	-	1.00	10.25
Relative Cover	-	8.29	5.28
Relative Density	-	3.98	0.52
Relative Frequency	-	17.39	6.39
Importance Index	-	9.89	4.06
Skunkbush Sumac			
Stems per Acre	74.67	65.93	1396.48
Relative Cover	7.74	2.39	38.85
Relative Density	10.34	3.14	71.43
Relative Frequency	10.35	8.70	26.59
Importance Index	9.48	4.74	45.62
Wax Current			
Stems per Acre	18.67	-	351.04
Relative Cover	0.44	-	0.00
Relative Density	2.59	-	17.96
Relative Frequency	2.59	-	14.89
Importance Index	1.87	-	10.95
Willow			
Stems per Acre	-	1.00	-
Relative Cover	-	9.46	-
Relative Density	-	21.38	-
Relative Frequency	-	21.74	-
Importance Index	-	17.53	-
A dash (-) indicates the species was not recorded at this site.			
1 = Cañada del Buey 2 = Pajarito Canyon 3 = Cañada del Buey			

6.2.2.2 South-Facing Slope: Pajarito Canyon

Big sagebrush and Apache plume were the major shrub species for the south-facing slope in Pajarito Canyon. Both occurred with the same frequency (26.09%) in the transect (Table 6). Big sagebrush had the highest cover value (46.97%), however, Apache plume had the highest importance index value. Other species in the transect were rubber rabbit brush, willow, and squawbush.

6.2.2.3 Canyon Bottom: Cañada del Buey

Squawbush and Gambel oak were recorded as the dominant species in the transect. Both had close cover values with squawbush having the slightly higher value (38.85%)(Table 6). Big sagebrush occurred most frequently in the transect (30.85%). Squawbush had the highest importance index value. Other species recorded for the canyon bottom were rubber rabbit brush and wax current.

6.2.2.4 Mesa Top: Mesita del Buey

In the TA-54 area, big sagebrush, wax current, and four-wing saltbush were all common shrub species recorded in the three transects (Table 7). The only species in the northeastern transect was big sagebrush which had 100% cover.

All three species were recorded for the middle transect. Big sagebrush had both the highest cover and frequency values (72.17% and 76.92% respectively). Wax current had a higher cover value (25.22%) than four-wing saltbush (2.61%) but occurred with less frequency (7.69% and 15.38 respectively).

In the southwest transect, wax current had 100% cover but a lower frequency (33.33%). No cover was recorded for big sagebrush in the transect but the frequency value was 66.67%. Wax current had the higher importance index value.

Table 7 : Overstory vegetation characteristics of the shrub canopy layer species recorded in OU 1148 for Mesita del Buey

SPECIES	TRANSECT		
	Mesa Top NE	Mesa Top Area G	Mesa Top SW
Big Sagebrush			
Relative Cover	100	72.17	0.00
Relative Density	100	35.48	66.68
Relative Frequency	100	76.92	66.67
Importance Index	100	61.53	44.45
Four-Wing Saltbush			
Stems per Acre	-	6.22	-
Relative Cover	-	2.61	-
Relative Density	-	6.45	-
Relative Frequency	-	15.38	-
Importance Index	-	8.15	-
Wax Current			
Stems per Acre	-	56.01	6.53
Relative Cover	-	25.22	100
Relative Density	-	58.06	33.32
Relative Frequency	-	7.69	33.33
Importance Index	-	30.32	55.55

A dash (-) indicates the species was not recorded at this site.

6.2.3 Understory

6.2.3.1 North-Facing Slope: Cañada del Buey

In Cañada del Buey, moss/lichen had the greatest relative cover and frequency (30.46% and 24.03%, respectively)(Table 8). The more common species covering more than 10% included: an unknown grass (17.10%), Wright's muhly grass (16.59%), and grama grass (15.24%). For frequency, the unknown grass only occurred 9.09%; Louisiana wormwood occurred 12.99%. Moss/lichen had the greater overall importance index value.

Some of the additional species found on the Cañada del Buey north-facing slope included mountain muhly, bluegrass, fleabane, oak, cactus, snakeweed, mock orange, and soil crusts.

6.2.3.2 South-Facing Slope: Pajarito Canyon

In Pajarito Canyon, the dominant species for both cover and frequency (39.78% and 32.63%, respectively), was blue grama grass (Table 8). Mock orange, big sagebrush, and bluegrass had the next highest values for cover (15.58%, 13.53%, and 9.84%, respectively); however the mock orange and sage occurred with less than 10% frequency. Bluegrass had the second highest frequency of all species in the transect. All other species occurred with less than 10% cover and frequency. Blue grama had the greatest importance index value.

Species found on the south-facing slope of Pajarito Canyon included sand dropseed, horseweed, fleabane, James cryptantha, wheatgrass, white sweet clover, mullein, geranium, and willow.

6.2.3.3. Canyon Bottom: Cañada del Buey

Blue grama made up nearly half of the relative plant cover; most of the remaining common species covered less than 10% (Table 8). Silver sagebrush and an unidentified grass had the next highest cover values (10.44% and 11.34%, respectively). Relative frequency for these species varied slightly. The blue grama grass occurred most frequently (28.63%), but in contrast to the relative cover values, silver sagebrush had a higher frequency value than the unknown grass (11.89% and 6.61%, respectively). All other species had a cover and frequency of less than 10%. Blue grama grass had the greatest importance index value for all species in the transect.

SPECIES	TRANSECT		
	North-Facing Slope (1)	South-Facing Slope (2)	Canyon Bottom
Beardtongue			
Relative Cover	-	-	0.30
Relative Frequency	-	-	0.88
Importance Index	-	-	0.59
Bluegrass			
Relative Cover	1.07	9.84	0.01
Relative Frequency	1.95	10.53	0.88
Importance Index	1.51	10.18	1.27
Blue Grama			
Relative Cover	15.24	39.78	43.85
Relative Frequency	14.29	32.63	28.63
Importance Index	14.76	36.21	36.24
Bluestem			
Relative Cover	-	-	3.33
Relative Frequency	-	-	6.17
Importance Index	-	-	4.75

Table 8 (cont.)

SPECIES	TRANSECT		
	North-Facing Slope (1)	South-Facing Slope (2)	Canyon Bottom
Bottlebrush Squirrletail			
Relative Cover	-	0.41	0.01
Relative Frequency	-	1.05	0.44
Importance Index	-	0.73	0.22
Brome Grass			
Relative Cover	-	-	1.52
Relative Frequency	-	-	4.85
Importance Index	-	-	3.18
Downy Chess			
Relative Cover	-	-	2.42
Relative Frequency	-	-	3.08
Importance Index	-	-	2.75
False Tarragon			
Relative Cover	0.27	0.41	0.60
Relative Frequency	0.65	1.05	1.76
Importance Index	0.46	0.73	1.18
Firewheel			
Relative Cover	-	0.41	3.48
Relative Frequency	-	1.05	5.29
Importance Index	-	0.73	4.38
Fleabane			
Relative Cover	-	-	0.46
Relative Frequency	-	-	1.76
Importance Index	-	-	1.11
Fleabane Daisy			
Relative Cover	0.53	-	-
Relative Frequency	1.30	-	-
Importance Index	0.92	-	-
Horsemint			
Relative Cover	-	-	0.15
Relative Frequency	-	-	0.88
Importance Index	-	-	0.52
Horseweed			
Relative Cover	-	0.08	-
Relative Frequency	-	1.05	-
Importance Index	-	0.57	-
Golden Aster			
Relative Cover	0.27	-	1.21
Relative Frequency	0.65	-	1.32
Importance Index	0.46	-	1.27
Indian Rice Grass			
Relative Cover	0.53	-	-
Relative Frequency	0.65	-	-
Importance Index	0.59	-	-

Table 8 (cont.)

SPECIES	TRANSECT		
	North-Facing Slope (1)	South-Facing Slope (2)	Canyon Bottom
James Geranium			
Relative Cover	-	0.49	-
Relative Frequency	-	2.11	-
Importance Index	-	1.30	-
James Hiddenflower			
Relative Cover	-	0.82	0.76
Relative Frequency	-	2.11	0.88
Importance Index	-	1.46	0.82
Louisiana Wormwood			
Relative Cover	4.56	-	-
Relative Frequency	12.99	-	-
Importance Index	8.78	-	-
Lupine			
Relative Cover	-	-	0.61
Relative Frequency	-	-	1.76
Importance Index	-	-	1.18
Mountain Muhly			
Relative Cover	1.60	-	1.51
Relative Frequency	1.30	-	2.64
Importance Index	1.45	-	2.08
Moss and Lichen			
Relative Cover	30.46	0.41	0.91
Relative Frequency	24.03	1.05	3.52
Importance Index	27.24	0.73	2.22
Mullein			
Relative Cover	-	1.31	-
Relative Frequency	-	3.16	-
Importance Index	-	2.24	-
Needlegrass			
Relative Cover	0.27	-	-
Relative Frequency	0.65	-	-
Importance Index	0.46	-	-
Ocean-Spray			
Relative Cover	-	0.82	-
Relative Frequency	-	1.05	-
Importance Index	-	0.94	-
Pale Trumpet			
Relative Cover	-	0.01	-
Relative Frequency	-	1.05	-
Importance Index	-	0.53	-
Prickly Pear Cactus			
Relative Cover	0.81	-	-
Relative Frequency	1.95	-	-
Importance Index	1.38	-	-

Table 8 (cont.)

SPECIES	TRANSECT		
	North-Facing Slope (1)	South-Facing Slope (2)	Canyon Bottom
Red Top			
Relative Cover	-	0.41	-
Relative Frequency	-	1.05	-
Importance Index	-	0.73	-
Sand Dropseed			
Relative Cover	-	2.95	-
Relative Frequency	-	5.26	-
Importance Index	-	4.11	-
Soil Crust			
Relative Cover	1.07	-	4.84
Relative Frequency	2.60	-	6.61
Importance Index	1.83	-	5.72
Snakeweed			
Relative Cover	0.80	0.82	-
Relative Frequency	1.30	1.05	-
Importance Index	1.50	0.94	-
Spike Muhly			
Relative Cover	16.59	-	7.41
Relative Frequency	18.83	-	5.73
Importance Index	17.71	-	6.73
Spreading Fleabane			
Relative Cover	-	1.23	-
Relative Frequency	-	3.16	-
Importance Index	-	2.19	-
Western Wheatgrass			
Relative Cover	-	4.92	-
Relative Frequency	-	6.32	-
Importance Index	-	5.62	-
White Sweet Clover			
Relative Cover	-	3.28	-
Relative Frequency	-	8.42	-
Importance Index	-	5.85	-
Wormwood			
Relative Cover	-	-	10.44
Relative Frequency	-	-	11.89
Importance Index	-	-	11.17
Other (woody species that were under 3 ft tall)			
Apache Plume			
Relative Cover (%)	0.27	15.58	-
Relative Frequency (%)	0.65	7.37	-
Importance Index (%)	0.46	11.48	-
Big Sage			
Relative Cover	-	13.53	-
Relative Frequency	-	6.32	-
Importance Index	-	9.92	-

Table 8 (cont.)

SPECIES	TRANSECT		
	North-Facing Slope (1)	South-Facing Slope (2)	Canyon Bottom
Gambel Oak			
Relative Cover	4.01	0.41	0.60
Relative Frequency	1.95	1.05	0.44
Importance Index	2.98	0.73	0.52
Mockorange			
Relative Cover	0.54	-	-
Relative Frequency	1.30	-	-
Importance Index	0.92	-	-
One-seed Juniper			
Relative Cover	1.34	-	-
Relative Frequency	0.65	-	-
Importance Index	0.99	-	-
Piñon Pine			
Relative Cover	1.60	-	0.01
Relative Frequency	0.65	-	0.44
Importance Index	1.13	-	0.20
Willow			
Relative Cover	-	2.05	-
Relative Frequency	-	1.05	-
Importance Index	-	1.55	-
A dash (-) indicates the species was not recorded at this site.			
1=Cañada del Buey 2=Pajarito Canyon 3=Cañada del Buey			

Other common species in the canyon bottom were muhly grass, hairy golden aster, beardtongue, firewheel, bromegrass, soil crust, bluegrass, moss and lichen, lupine, and fleabane.

6.2.3.4 Mesa Top: Mesita del Buey

Of the three transects conducted in TA-54 between areas G and J, blue grama grass, soil crust, and prickly pear cactus had the higher cover values (Table 9). In the northeast transect, soil crust had the highest cover value and blue grama grass the second highest (43.91% and 33.64%, respectively). However, blue grama grass occurred more frequently (40.74%) and had a higher importance index value than did soil crust. Prickly pear had a frequency of 12.96% in the transect. All other species had less than 10% cover and frequency values.

In the middle transect, blue grama grass made up more than half the cover and frequency (64.38% and 57.14%, respectively). Prickly pear cactus, with a cover value of less than 10%, occurred with 14.29% frequency. All other species in this transect had less than 10% cover and frequency values.

The southern transect was covered mostly by blue grama grass and soil crust (43.94% and 42.51%, respectively); however soil crust does not occur with as much frequency (27.14%) as does blue grama grass (44.29%) which also has the highest importance index value. All other species in this transect had less than 10% cover and frequency values.

Table 9: Understory vegetation characteristics of plant species recorded in OU 1148 for Mesita del Buey				
SPECIES	TRANSECT			
	Mesa top NE	Mesa top Area G	Mesa top SW	Mesa top TA-15
Bottlebrush Squirreltail				
Relative Cover	0.30	-	0.71	-
Relative Frequency	0.93	-	1.43	-
Importance Index	0.61	-	1.07	-
Blue Grama				
Relative Cover	33.64	64.38	43.94	40.01
Relative Frequency	40.74	57.14	44.29	46.34
Importance Index	37.19	60.76	44.11	43.17
Bluegrass				
Relative Cover	3.03	3.14	-	-
Relative Frequency	6.48	3.17	-	-
Importance Index	4.75	3.16	-	-
Bluegrass sp.				
Relative Cover	-	3.66	2.85	-
Relative Frequency	-	3.17	5.71	-
Importance Index	-	3.42	4.28	-
Fendler's Senecio				
Relative Cover	-	-	-	19.91
Relative Frequency	-	-	-	9.76
Importance Index	-	-	-	14.83
Fleabane				
Relative Cover	-	-	-	3.66
Relative Frequency	-	-	-	7.32
Importance Index	-	-	-	5.49
Horseweed				
Relative Cover	-	-	-	0.04
Relative Frequency	-	-	-	2.44
Importance Index	-	-	-	1.24
Hymenoxys				
Relative Cover	-	-	-	1.81
Relative Frequency	-	-	-	2.44
Importance Index	-	-	-	2.21
Leafy Golden Aster				
Relative Cover	0.01	-	-	-
Relative Frequency	0.93	-	-	-0.46
Importance Index	0.47	-	-	-

Table 9 (cont.)

SPECIES	TRANSECT			
	Mesa top NE	Mesa top Area G	Mesa top SW	Mesa top TA-15
Mammalaria				
Relative Cover	-	0.01	-	-
Relative Frequency	-	1.59	-	-
Importance Index	-	0.80	-	-
Moss/Lichen				
Relative Cover	5.15	-	0.74	-
Relative Frequency	2.78	-	4.29	-
Importance Index	3.96	-	2.51	-
Mountain Muhly				
Relative Cover	-	-	-	5.47
Relative Frequency	-	-	-	4.88
Importance Index	-	-	-	5.17
Pingue				
Relative Cover	1.51	3.14	-	-
Relative Frequency	2.78	4.76	-	-
Importance Index	2.15	3.95	-	-
Prickly Pear Cactus				
Relative Cover	9.10	8.91	7.08	27.15
Relative Frequency	12.96	14.29	8.57	17.07
Importance Index	11.03	11.60	7.83	22.11
Side-Oats Grama				
Relative Cover	-	-	-	5.43
Relative Frequency	-	-	-	2.44
Importance Index	-	-	-	3.93
Snakeweed				
Relative Cover	3.33	5.77	1.44	-
Relative Frequency	1.85	7.94	5.71	-
Importance Index	2.59	6.85	3.58	-
Soil Crust				
Relative Cover	43.91	8.90	42.51	-
Relative Frequency	25.93	4.76	27.14	-
Importance Index	34.92	6.83	34.83	-
Three-Awn Grass				
Relative Cover	0.01	-	-	-
Relative Frequency	0.93	-	-	-
Importance Index	0.47	-	-	-

Table 9 (cont.)

SPECIES	TRANSECT			
	Mesa top NE	Mesa top Area G	Mesa top SW	Mesa top TA-15
Wild Chrysanthemum				
Relative Cover	-	-	-	5.50
Relative Frequency	-	-	-	9.76
Importance Index	-	-	-	7.63
Other (woody species that were under 3 ft tall)				
One-Seed Juniper				
Relative Cover	-	-	-	0.07
Relative Frequency	-	-	-	4.88
Importance Index	-	-	-	2.48
Piñon Pine				
Relative Cover	-	1.05	0.72	-
Relative Frequency	-	1.59	2.86	-
Importance Index	-	1.32	1.79	-

A dash (-) indicates the species was not recorded at this site.

Other species found on the mesa top in these transects were snakeweed, pingue, leafy golden aster, moss and lichen, three-awn grass, bottlebrush squirreltail, bluegrass, piñon pine, false tarragon, and a species of mammillaria cactus.

In comparison, a fourth transect conducted further west on the mesa in TA-51 had two similar dominant species of blue grama grass and prickly pear (40.01% and 27.15% cover). The species composition of the area differed slightly from the TA-54 transects. Ragleaf bahia was the only other species to have both a cover value (19.91%) and importance index value of more than 10%. Blue grama had the highest importance index value.

Other species found in this transect were mountain muhly, groundsel, horseweed fleabane, side-oats grama, fleabane, and hymenoxys.

6.3 Level 3 (Species-Specific) Surveys

6.3.1 Vegetation

BRET conducted no Level 3 (Species-Specific) surveys for vegetation. However, while conducting the transects for Level 2 surveys, no TES plant species were found.

6.3.2 Insects

A number of terrestrial-dwelling species were collected in pit traps in Pajarito Canyon as part of the adjacent OU 1093. The specimens are in the process of being identified. No aquatic invertebrate studies were conducted in OU 1148.

6.3.3 Amphibians and Reptiles

A number of species were observed during field surveys and captures in pit traps in Pajarito Canyon (adjacent OU 1093). These species are listed in Appendix B.

6.3.4 Small Mammals

During the 1991 season, seven species of small mammals were captured: least chipmunk (*Eutamias minimus*), Colorado chipmunk (*Eutamias quadrivittatus*), white-throated woodrat (*Neotoma albigula*), Mexican woodrat (*Neotoma mexicana*), brush mouse (*Peromyscus boylii*), deer mouse (*Peromyscus maniculatus*), and rock squirrel (*Citellus variegatus*). The capture rate was broken down for each habitat and area. Brush mice were more common on habitats of greater cover in each area and deer mice were more common in habitats of less vegetative and rock cover. Brush mice were the most commonly captured species in all areas and chipmunks the second most frequently captured. Both species of woodrats and the rock squirrel were captured infrequently and therefore not included in analysis.

6.3.5 Large Mammals

Evidence of elk activity within the OU was noted from tracks, scat, and visual sightings. In Cañada del Buey and Pajarito Canyon, elk pellet groups were more common than deer pellet groups. From the numbers of pellet groups observed in OU 1148, we conclude that elk use both canyons more frequently than deer and elk use Pajarito Canyon more frequently than Cañada del Buey.

6.4 Identification of Wetlands

Both floodplains and wetlands are located within OU 1148. Wetlands are restricted to Pajarito Canyon, located on the southern boundary of the OU and continuing into adjacent OU 1093. Both the Cañada del Buey and Pajarito Canyon bottoms should be considered floodplains.

Three factors needed to declare an area a wetland were examined: hydrology, hydric soils, and hydrophytic plants.

Pajarito Canyon appears to be interrupted or has near perennial reaches as a result of springs, seeps, and rain runoff. Recorded (historical) data, aerial photographs, and field observations indicate a wetland hydrology. The NWI identified two wetland types within Pajarito Canyon, however, only one of these occurs in OU 1148 (Fig. 7). Palustrine wetlands were identified in the areas between TA-18 and State Route 502. A stream channel and several small marshes overlap the boundary of OU 1148 and adjacent OU 1093. Hydric soils were found within the areas defined as wetlands by the NWI. Plant species associated with hydric soils found in the marsh and stream areas include cattails, Mexican rush, coyote willow, narrowleaf cottonwood, and salt cedar.

Any stream flow in Cañada del Buey is the result of intermittent runoff. The alluvium is thin and contains no perennial water, possibly due to a small drainage area and a small amount of runoff. Field observations, however, indicate that during heavy rains, runoff can be quite heavy. The NWI maps do not indicate any areas that met the wetland criteria from the aerial mapping protocol. The stream channel is not well defined, braiding out in places along the canyon floor and no hydric soils were found from the soil pits. A previous study conducted by McLin (1992) has identified Cañada del Buey as a floodplain (Fig. 8). Hydrophytic vegetation criteria was also not met in this canyon.

7 DISCUSSION

7.1 Level 2 (Habitat Evaluation) Survey

The classification breakdown for both upland and wetland vegetation types for the Pajarito Plateau is given in Appendix D. This list includes known and potential habitat types and phases based on Brown, et al. (1982) and Moir and Ludwig (1979). No attempt was made to develop new habitat types for this area. If a study area did not fit within one of the designated habitat types previously defined for northern New Mexico, the habitat type was considered "potential." Further studies are necessary to make a complete and accurate determination.

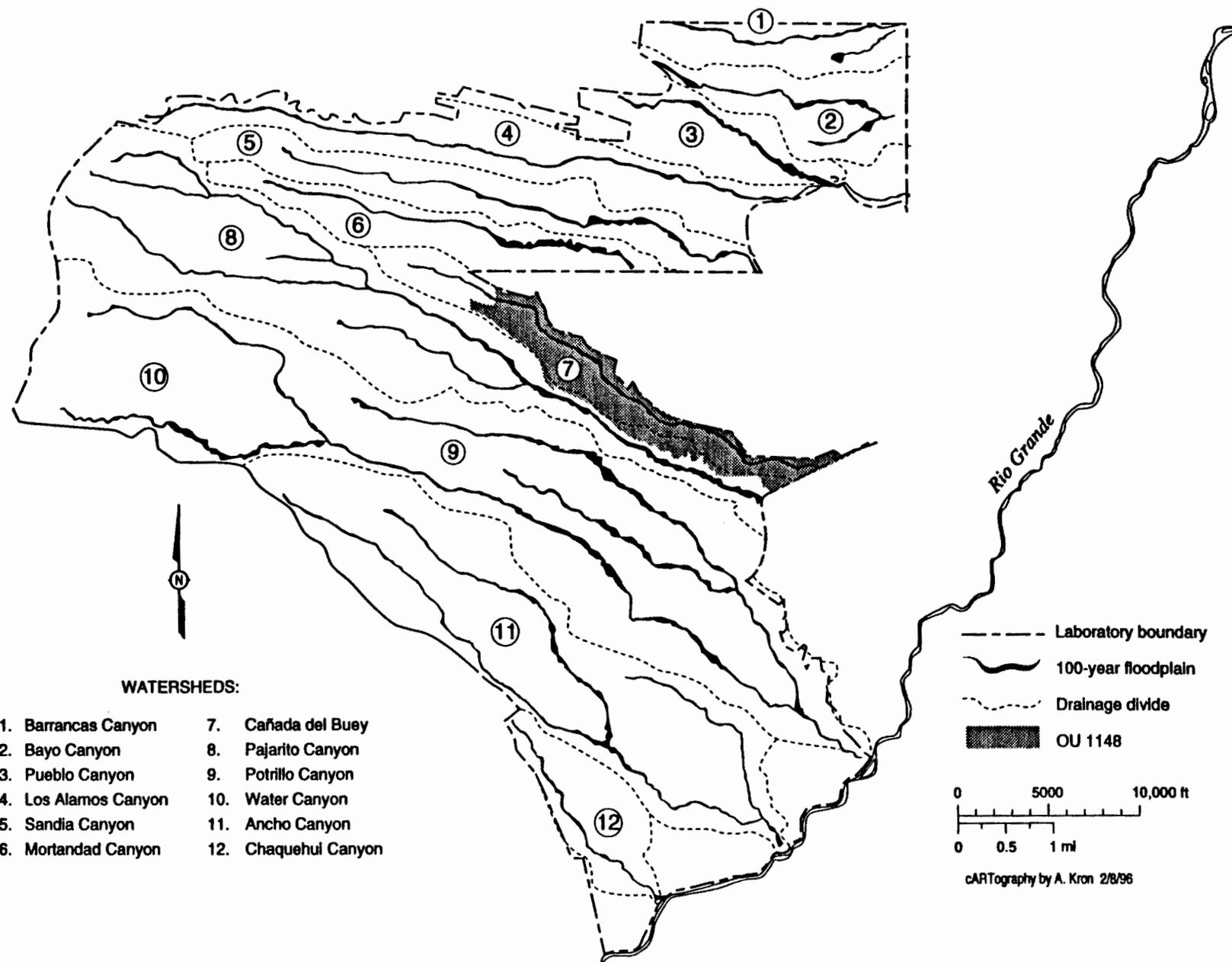


Figure 8. 100-year floodplain map for Los Alamos National Laboratory.

The vegetation surveys indicated there are primarily three vegetation communities present within or adjacent to OU 1148: the Rocky Mountain Montane Conifer Forest, the Great Basin Conifer Woodland, and the Rocky Mountain Riparian Forest community. These communities can be further separated into series and, more specifically, habitat types.

Based on the species composition of the transects and their locations within the OU, it could be seen that differences in species dominance were associated with topographic differences such as slope and aspect (north-, south-, east-, or west-facing).

7.1.1 Rocky Mountain Montane Conifer Forest Community

This community consisted of primarily one vegetation series, ponderosa pine. Of the habitat types in the ponderosa pine series, two were present in the OU. The lower portions of the canyon are mostly rock, dominated only by the shrub layer of Gambel oak and mountain mahogany. The ponderosa pine/Gambel oak habitat type is found on north-facing slopes towards the upper portions of Cañada del Buey. In the far west end of the canyon, the community changes to mixed-conifer with a ponderosa pine/Douglas fir/Gambel oak habitat type.

7.1.2 Great Basin Conifer Woodland Community

The Great Basin Conifer Woodland is found in the middle and lower portions of the OU and is characterized as being within the piñon-juniper series. Several habitat types of this community were located in the areas surveyed. North-facing slopes in the mid-portion of Cañada del Buey can be described as being within a piñon pine/oak/skunkbush sumac habitat type. The canyon bottom of Cañada del Buey and the mesa top both have vegetation in the piñon pine/juniper habitat type.

7.1.3 Rocky Mountain Riparian Forest Community

Surveys conducted in Pajarito Canyon on the south-facing slope included areas adjacent to the stream channel in order to record riparian vegetation. The community consisted of primarily one vegetation series; cottonwood/willow. This overlapped to a small degree with the piñon pine/juniper series.

7.2 Level 3 (Species-Specific) Surveys

We compared habitat information collected from the Levels 1 and 2 field surveys to the habitat information in the database for each sensitive species, the threats to the taxon, and previous data. Based on that information, species were either dismissed from further consideration or additional Level 3 (Species-Specific) surveys were conducted to confirm the presence or absence of the species within that habitat.

7.2.1 Species Dismissed from Further Consideration

Based on the information gained from the Level 1 and Level 2 field surveys and previous data, we concluded that the following species are not present in this OU, or are not expected to be impacted by the proposed project.

7.2.1.1 Vegetation

None of the following species have been previously recorded for OU 1148. Due to the low potential for occurrence within this site, the following species are being dismissed from further consideration:

Wright fishhook cactus occurs on gravelly or sandy hills or plains, desert grasslands, and piñon-juniper zones. Although there is potential habitat for this species within the OU, it has not been found in Los Alamos County. There were none found during the field surveys.

Santa Fe Cholla has only been found in Santa Fe County in an urban area. They appear to be strongly associated with south- and west-facing slopes in piñon-juniper woodlands at about 7,200 ft (New Mexico Native Plants Protection Advisory Committee, 1984). No specimens of this cacti were found within the OU during Level 1 and Level 2 surveys.

Plank's catchfly is found in piñon-juniper habitat, with its known distribution within the mountains along the Rio Grande. It is found in crevices and pockets in protected cliff faces of igneous rock. This species has not yet been found in Los Alamos County and was not found during the surveys.

Tufted sand verbena is restricted to todilto gypsum or derivatives of this gypsum in piñon-juniper habitats. It has not been found in Los Alamos County and was not found during the surveys.

The sessile-flowered false carrot inhabits rocky canyons and slopes and is usually found in basaltic or sandstone areas. It was not found during the Level 1 or Level 2 surveys and has not yet been recorded for Los Alamos County.

Threadleaf horsebrush occurs on limestone or highly gypseous soils. This species was not found during the surveys nor has it been recorded for Los Alamos County.

The Santa Fe milkvetch is found on dry slopes of piñon-juniper woodlands. It has not yet been found in Los Alamos County and it was not found during the surveys.

Mathew's woolly milkvetch occurs on open slopes and ridges and occasionally in canyons. It has not been previously recorded for Los Alamos County and was not found during the surveys.

Taos milkvetch inhabits loose soil in open areas of piñon pine and juniper. This species also has not yet been recorded for Los Alamos County and was not found during the surveys.

The cyanic milkvetch occurs on sandy or gravelly hillsides between 5,500 and 6,500 ft. It has not been found in Los Alamos County and was not found during the surveys.

Pagosa phlox is found on open slopes in mountain woodlands and forests. It was not recorded during the Level 1 or Level 2 surveys and has not been previously recorded for Los Alamos County.

Grama grass cactus is found in piñon-juniper dominated habitats in sandy soil and basalt outcrops. This species has not been found on Laboratory property in recent years but has been recorded in the past as occurring on Laboratory lands. The grama grass cactus only occurs in Los Alamos County on basalt outcrops. Extensive surveys, past and present, and walkthroughs of OU 1148 have not encountered this species and it is not believed to occur in this OU.

7.2.2.2 Wildlife

Bald eagles winter along the Rio Grande. Winter roosts have been observed at Cochiti Lake. Mortandad Canyon, northeast of OU 1148, has some suitable roosting areas but no confirmed roosting sites. Suitable roosting sites consist of large trees and protection from wind near permanent water sources. Within the survey area there are a few stands of large ponderosa pines associated with the canyon bottoms or intermixed with Douglas fir, however, the riparian areas and streams are limited in size. No bald eagles

were seen within Cañada del Buey, Pajarito Canyon, or Mesita del Buey during the surveys. Bald eagles are more likely to occur southeast of the survey area nearer to the Rio Grande.

Willow flycatchers breed through central New Mexico and occur statewide in spring and autumn migrations. They are confined in breeding season to riparian woodlands dominated by cottonwoods. During migration willow flycatchers are seen statewide. Cottonwoods are present only in Pajarito Canyon, but are relatively sparse in the survey area.

Common black hawks are found in cottonwoods and other woodlands along permanent lowland streams. They have occurred in small numbers in the Rio Grande Valley but no verified reports of vagrants have been made for Los Alamos County. Riparian areas are found within Pajarito Canyon but are relatively small, limited in distribution, and at times only intermittently flowing. The common black hawk is most often found in lower elevations than occur within these OUs. Therefore, habitat is marginal at best.

Mississippi kites generally inhabit the lower Rio Grande and Pecos Valleys in riparian zones and shelter belts with permanent streams. They are also common around manicured environments such as parks and golf courses. Riparian areas in the OU consist of a few large trees, willows and other riparian vegetation but are limited in size and extent. This species has not been reported for the Los Alamos area.

Meadow jumping mouse is a state endangered species that breeds in wetland areas, and is confined to holarctic regions, mesic habitats, permanent streams and wet meadows. This species has a small potential for occurring in the Pajarito Canyon wetland area shared by OU 1148 and OU 1093. The meadow jumping mouse has been recorded for Los Alamos county in the past, however, no individuals have been captured in BRET surveys. Morrison, the state expert on meadow jumping mouse, does not list this OU area as prime habitat.

Broad-billed hummingbirds are found in riparian woodlands often characterized by cottonwood, sycamore, or white oak, and breed primarily in the southern part of the state of New Mexico. They have been identified in the riparian woodlands of Bandelier National Monument and occasionally occur as vagrants near Los Alamos. Bird surveys conducted by Joan Morrison in 1990 in Cañada del Buey and Pajarito Canyon did not reveal any sightings of the broad-billed hummingbird. In addition, the only riparian area in OU 1148 has few scattered trees and does not fulfill this species' requirements for a riparian woodland.

Say's pond snail is known to occur only in the Cerro la Jara area of the Jemez Mountains in Sandoval County which is the key habitat area in the state. The Say's pond snail is found in vegetated ditches, marshes, streams, and ponds that are seasonally dry or in areas of perennial water. It is not expected to occur in Los Alamos County; however, a small quantitative survey was conducted without success.

7.2.2 Species for which Level 3 Surveys were Conducted

Based on the Levels 1 and 2 surveys and data collected from previous studies, habitat requirements for the spotted bat, meadow jumping mouse, peregrine falcon, and grama grass cactus were found to exist within the OU. Where possible, species-specific surveys were conducted to help establish the presence or lack of presence of the species within the OU.

The peregrine falcon has little probability of occurring within OU 1148, except to utilize the area for feeding. They do, however, migrate through and winter statewide throughout New Mexico. Peregrines occupy steep cliffs in wooded or forested habitats; breeding territories center on cliffs. As discussed in Section 4.3, peregrine falcons have been observed in and near Pueblo Canyon, and have been recorded as nesting along the cliffs of this canyon. Johnson (1992) examined locations in Los Alamos County and does not believe the peregrine will use Cañada del Buey, Mesita del Buey, or Pajarito Canyon for nesting. He did state, however, that the numerous cavities along the primarily north-facing slopes of canyon(s) could provide shelter and nest sites. There is a moderate to high potential for its reoccurrence in Pueblo

Canyon, and from there, it would utilize areas of OU 1148 as feeding grounds. A habitat management plan developed by Johnson (1992) discusses the past and present status of the peregrine falcon within and near this OU.

Spotted bat is a state endangered species found in piñon-juniper, ponderosa, mixed conifer, and riparian habitats. This species requires a source of water with standing pools and roost sites such as caves in cliffs or rock crevices. Suitable roost sites are present in portions of Pajarito Canyon, open water sources are somewhat limited and include a narrow flowing stream. Mist net surveys on Laboratory land were conducted for this species. No spotted bats were captured. In addition, surveys conducted in lower Pajarito Canyon (1992) resulted in no captures. This does not necessarily suggest the spotted bat does not occur in the OU.

7.3 Wetland and Floodplain Assessments

7.3.1 Wetland Survey

The springs and perennial reaches of streams below the springs met wetland criteria. NWI aerial maps provide a general definition of the wetland. Special precautions should be taken if sampling will be done within these areas.

7.3.2 Floodplain Studies

Floodplains have been identified within TA-54 in the canyon bottom of Cañada del Buey. It should be noted that during the heavy rainstorms experienced during the summer months, flooding does occur. Floodplain protection laws are designed to protect life and property. Since all facilities are on the mesa top and not within the floodplain, floodplains should not present any problems with sampling.

Riparian zones are generally associated with floodplains. In arid areas of the Southwest, these zones have a higher diversity of plants and animals, providing cover, food, and breeding areas. Riparian areas are characterized by an abundance of deciduous and moisture-loving species. Although not protected by law, best management practices within these zones should be followed.

8 IMPACTS

8.1 Non-Sensitive Species

8.1.1 Plants

Due to the topographic features and existing riparian zones of the project area and the potential use of heavy machinery, the following impacts could result:

Removal of, or excessive disturbance to, existing vegetative cover could result in an increase or initiation of erosion and alterations of drainage patterns both within the canyon bottoms (including stream channels) and along the canyon slopes.

Disturbance or damage to riparian vegetation could result in partial or complete loss of wetlands which could further result in partial loss of the associated riparian vegetation.

8.1.2 Wildlife

Due to the suitable nesting, foraging, and perching habitat within the OU for a variety of bird species, and the suitable foraging and wintering areas for large mammals (in addition to suitable habitat for other wildlife species), excessive disturbance or disturbance during critical periods could result in one or a combination of the following:

Direct removal of nesting, perching, cover, and similar habitats, both along the canyon slopes and within the riparian zones or canyon bottoms.

Nest abandonment by birds resulting in nest failure.

Depending on the time of year that the sampling takes place, excessive noise or other disturbance resulting in an interference with critical periods such as the breeding period for wildlife species.

Contamination of wildlife water sources from fuel spills or leaks from vehicles, machinery, etc.

8.2 Threatened, Endangered, and Sensitive Species

Site characterization activities, which include surface sampling and core drilling, could result in impacts to peregrine falcon habitat. Although the species has not been recently observed in the Los Alamos County area, excessive damage to potential foraging habitat could affect densities of associated prey species.

Any core drilling and sampling to be done inside delineated wetlands may cause damage to the habitat as stated in section 8.3. Damage to a riparian or wetland area will reduce habitat for the meadow jumping mouse by possible removal of vegetation and backfilling of stream channels.

The spotted bat is affected by removal of roosting sites and available water sources. Destruction of caves in cliffs and rock crevices by heavy equipment will reduce the available habitat for the spotted bat. Use of any equipment larger than hand augers may adversely affect nearby streams or water sources.

Grama grass cactus is impacted primarily by over collection, overgrazing, and urbanization. Any off-road traveling of vehicles or heavy equipment could present a threat to this species.

8.3 Wetlands and Floodplains

Sampling within the OU may include surface samples to a depth of 6 inches or deep core drilling up to more than 200 ft. No impact is expected from surface sampling. However, if heavy equipment and coring is used, sampling should remain outside of wetland areas. If sampling is to take place within or near wetlands or within the floodplain, the following impacts could occur:

Disturbance to the stream channel or smaller drainages leading into the stream channel could result in an alteration of existing wetlands causing partial or complete loss of those wetlands.

Excessive disturbance to vegetation and the surface could also result in an alteration of the water flow and/or widening of the channel.

Disturbance along the drainages as well as the steeper slopes could result in increased or initiation of soil erosion. This could also cause localized alterations in the existing wetlands.

Hazardous fuel spills or leakage from vehicles could negatively affect water quality in the riparian areas and could result in negative changes to vegetation within these areas.

9 MITIGATION

No significant release of contaminants into the environment is expected to occur during the sampling. However, should release of contaminants rise above the predetermined action levels, workers must cease operations, shut down the site, and reassess the sampling.

9.1 Non-Sensitive Species

9.1.1 Plants

Sampling and subsequent corrective actions could require mitigation of a site by revegetation if loss of vegetation initiates erosion. Survey results indicate that a mixture of native grasses, forbs, and other herbaceous plants could be used for revegetation. Species listed in Tables 7, 8, and 9, represent a few of the species that could be used. Further consultation with BRET or state or federal agencies can help determine use of other species. Additional mitigation measures include:

- Avoid unnecessary disturbance (i.e., parking areas, equipment storage areas, off-road travel, etc.) to surrounding vegetation during both actual sampling and travel into sampling sites.
- Avoid removal of vegetation along riparian areas and along drainage and stream channels.
- Avoid disturbance to vegetation along canyon slopes and especially to existing drainages.

In addition to best management practices, mitigation provided for wetlands and floodplains will also help reduce potential impacts to vegetation.

9.1.2 Wildlife

Most potential impacts to wildlife species should be non-adverse and result in only temporary avoidance of the sampling sites during the period of actual disturbance. However, if heavy machinery use is expected, then the following mitigation measures should further reduce the potential for impact:

- Avoid crossing drainages with existing water; utilize existing roads or cross over level areas that are dry or less vegetated.
- Avoid sampling from March 1 to August 1. Sampling that requires less than 60 days should be scheduled outside this time restriction.
- If sampling will take more than 60 days and can not be conducted outside the time restriction of March to August, BRET must be notified at least 60 days prior to the end of May to survey the sampling area for nesting birds.

Disturbance to wintering species should be relatively minor, and mitigation provided for vegetation, and wetlands and floodplains will help to further reduce impact to wildlife species.

9.2 Threatened, Endangered, and Sensitive Species

9.2.1 Plants

There are no threatened, endangered, or sensitive plant species of concern for OU 1148.

9.2.2 Wildlife

If the peregrine falcon is present, or if presence is suspected for using the area as a hunting ground, excessive damage to vegetation should be minimized to ensure prey species. Any tree removal (live or snag) must be approved by BRET.

The two critical requirements for the spotted bat are found in this OU. Pajarito Canyon provides a potential source of water and suitable roost sites in caves in cliffs and rock crevices. No spotted bats have been reported from mist net surveys in the area to date. No adverse impact will occur to this species

(if present) as long as small caves and rock crevices are not disturbed and the water sources within the canyon are not altered.

9.3 Wetlands and Floodplains

Sampling for site characterization could range from surface sampling to core drilling. Sampling with heavy equipment should remain outside wetland areas. BRET should be contacted to determine what areas can be considered wetlands. This will allow for greater accuracy to ensure sampling occurs outside of areas that have wetland criteria. If sampling will be done in a wetland, a dredge and fill permit may be necessary.

Sampling and subsequent corrective actions could require mitigation of a site by revegetation. From survey information gathered, available seed lists, and lists prepared by Foxx and Tierney (1982) and Pierce and Foxx (1991), a listing of species that can be used for revegetation can be compiled. Personnel from BRET should be contacted for assistance with a species list for revegetation. Best management practices should be followed while sampling. Management practices suggested include:

Avoid unnecessary disturbance (i.e. parking areas, equipment storage areas, off-road travel) to surrounding vegetation during sampling and travel to sampling sites.

Avoid removal of vegetation along riparian and wetland areas as well as drainage and stream channels.

Avoid disturbance to vegetation along canyon slopes and especially existing drainages along these slopes.

10 CONCLUSIONS

To provide background information concerning the site, historical information and biological reports of previous site surveys in the area were summarized. These summaries provide inventory information that may be used in future ecological risk assessments and pathway analyses.

BRET conducted Levels 1 and 2 field surveys within OU 1148. In addition, the TES species database was searched for a list of species that had a potential to occur in the habitats associated with this OU. As a result, a number of species on the state and federal protection list were shown as occurring in habitats described for Los Alamos County and surrounding areas.

BRET conducted a habitat evaluation (Level 2) survey to determine if the specific requirements of the listed species could be met in the sampling locations. Level 3 (Species-Specific) surveys of areas outside OU 1148 were used to gain additional information to determine the status of the spotted bat in the sampling area.

Terrell Johnson was subcontracted to determine the status of the peregrine falcon, and develop a habitat management plan. Although the peregrine falcon is not currently present in the project area, it could utilize the area as a feeding ground. Mitigation measures to reduce impact include (1) minimizing vegetation destruction, and (2) BRET approval of all tree removal.

Although the spotted bat has not been recorded within OU 1148, it cannot be ruled out as a resident species. Mitigation measures to reduce impact on possible habitat include (1) avoiding use of heavy equipment on or near caves in cliffs and rock crevices, and (2) avoiding altering water sources in the area.

BRET used NWI maps combined with field surveys to locate all wetlands and floodplains within the OU. Characteristics of wetlands, floodplains, and riparian areas were noted using criteria outlined in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (Dunke et al., 1989). Because wetland systems and their boundaries undergo continual changes, delineation of wetland boundaries was not completed during these surveys. Boundary delineation will be conducted just prior to sampling to assure all sampling is conducted outside of areas that meet wetland criteria.

Mitigation measures (or best management practices) to reduce the impacts to non-sensitive wildlife and plant species are similar to mitigation measures used for TES species. These consist primarily of the timing of sampling and avoiding excessive disturbance to the habitat.

11 DEFINITIONS

Biological Resources Evaluations Team (BRET): Persons within the Environmental Protection Group (EM-8) responsible for the biological assessments.

Critical Habitat: Any air, land, or water area and constituent elements, the loss of which would appreciably decrease the likelihood of survival and recovery of a listed species or a distinct segment of its population.

Facultative: Equally likely to occur in wetlands or non wetlands (estimated probability 34 to 66%).

Facultative Upland: Plants that usually occur in non wetlands (estimated probability 67 to 99%), but occasionally are found in wetlands (estimated probability 1 to 33%).

Facultative Wetland: Plants that usually occur in wetlands (estimated probability 67 to 99%), but are occasionally found in non wetlands.

Federal Candidate (C1) Species: Taxa for which the USFWS has on file enough substantial information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.

Federal Candidate (C2) Species: Taxa for which information now in the possession of the USFWS indicates that proposing to list as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat are not currently available.

Federally Endangered Species: Any species that is in danger of extinction throughout all or a significant portion of its range.

Federally Threatened Species: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Floodplains: Lowlands adjoining inland and coastal waters, relatively flat areas, and flood-prone areas of offshore islands including, at a minimum, areas with 1 percent or greater chance of flood in any given year. The base floodplain is defined as the 100-year (1.0 percent) floodplain. The critical action floodplain is defined as the 500-year (0.2 percent) floodplain.

Hydric soil: Soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part.

Hydrology: The presence of, distribution of, and circulation of water.

Hydrophyte: Any plant that grows in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content; plants typically found in wetlands and other aquatic habitats.

Level 1 Survey: A reconnaissance survey to determine if a proposed project is in a developed technical area of the Laboratory or a disturbed area. Nonquantitative data about the area is obtained.

Level 2 Survey: A detailed quantitative vegetation survey used to evaluate critical habitat requirements for a threatened and endangered species that may be present at the proposed project area.

Level 3 Survey: A survey to obtain information on a specific threatened or endangered species, floodplain or wetland.

National Environmental Policy Act (NEPA): A major environmental law which became effective in 1970 that requires all projects and programs receiving federal funds to be evaluated for environmental impacts.

Nationwide Permits (NWP): Permits issued by the Corps of Engineers that pertain to specific conditions stated in the regulations.

Obligate Upland: When species almost always occur (estimated probability >99%) under natural conditions in nonwetlands in the region specified, but can also occur in wetlands in another region. If a species does not occur in wetlands in any region, it is not on the "National List."

Obligate Wetland: When species almost always occur (estimated probability >99%) under natural conditions in wetlands.

Riparian: Green belts along streams, lakes, or other wet areas. These areas are only marginally protected by state and federal law, but concern is increasing.

Solid Waste Management Unit (SWMU): Any discernible unit at which solid wastes have been placed at any time, whether or not the unit was intended for the management of solid or hazardous wastes.

Species Area Curve: Calculated by comparing total number of individual plant species recorded along a transect by total number of plots.

State Endangered Plant: A plant which has been listed on New Mexico's endangered list. The plant is rare in numbers or occurrences and its further existence in the state is threatened without protection.

State Endangered Group 1: Any wildlife species or subspecies whose prospects of survival or recruitment in New Mexico are in jeopardy.

State Endangered Group 2: Any wildlife species or subspecies whose prospects of survival or recruitment in New Mexico are likely to be in jeopardy within the foreseeable future. These species are protected by state law.

State Endangered Plant (1): The taxon is listed as threatened or endangered under the provisions of the Federal Endangered Species Act, or is being considered under the tenets of the act.

State Endangered Plant (2): The taxon is a rare plant across its entire range and of such limited distribution and population size that unregulated collection could adversely impact it and jeopardize its survival in New Mexico.

State Endangered Plant (3): The taxon may be widespread in its distribution and may occur in adjacent states or Mexico, but because its numbers are being significantly reduced, the survival of this species in New Mexico is jeopardized.

State Sensitive Plant: A plant species whose numbers or occurrences are low in the state. These species are monitored by the state to see if their status needs to be upgraded to endangered. Currently, state sensitive plants are not protected by state law.

Threatened, Endangered and Sensitive (TES) Species Database: A database constructed by LANL that list and provides information on all state and federal threatened, endangered, and sensitive species in Los Alamos County and surrounding counties.

Wetlands: Lowland areas that, when inundated by surface or ground water, can support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflow, mud flats, and natural ponds.

12 SUMMARY OF PERTINENT REGULATIONS

Executive Order 11990: Protection of Wetlands. In furtherance of the National Environmental Policy Act of 1969 this EO calls for avoidance, "to any extent possible, the long and short term adverse impacts associated with the destruction or modification of wetlands...avoid direct or indirect support of new construction in wetlands.."

Executive Order 11998: "Floodplain Management": This EO was initiated to "protect lives and property with the need to restore and preserve natural and beneficial floodplain values...."

National Environmental Policy Act: Declares a national policy to encourage a productive and enjoyable harmony between man and his environment. Section 102 requires "that presently unquantified environmental amenities and values may be given appropriate consideration in decision-making along with economic and technical considerations...."

Section 404 Clean Water Act: Provides for issuance of "permits, after notice and opportunity for public hearings of discharge of dredged or fill materials into navigable waters..."

The Endangered Species Act (16 SC 1531 *et. seq.*): Declares the intention of Congress to conserve threatened and endangered species and the ecosystems on which those species depend.

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15 APPENDICES

APPENDIX A. Plant Species Checklist

APPENDIX B. Wildlife Species Checklist

APPENDIX C. Threatened, Endangered, and Sensitive Species Database Printout

APPENDIX D. Vegetarian Heirarchical Classification System

APPENDIX E. Plant Species Code List

APPENDIX F. Raw Data Summaries for OU 1148

Appendix A: Plant Species Checklist for OU 1148

FAMILY	SCIENTIFIC NAME	COMMON NAME STATUS	INDICATOR
ACERACEAE	<i>Acer negundo</i>	Boxelder mapleNW,FAC	FACW
ANACARDIACEAE	<i>Rhus radicans</i> <i>Rhus trilobata</i>	Poison Ivy Squawbush	NW,FAC
BERBERIDACEA	<i>Berberis fendleri</i>	Colorado barberryNW	NW
BORAGINACEAE	<i>Cryptantha jamesii</i> <i>Lappula sp.</i> <i>Lappula redowskii</i> <i>Lithospermum multiflorum</i>	James hiddenflower Stickseed Stickseed Puccoon	NW COL NW
CACTACEAE	<i>Coryphantha vivipara</i> <i>Opuntia spp.</i> <i>Opuntia imbricata</i> <i>Opuntia polyacantha</i> <i>Campanula rotundifloia</i>	Pincushion cactucNW Prickly Pear Cactus Walkingstick cactus Prickly pear Harebell	 ECO ECO NW,FAC, UPL
CELESTRACEA	<i>Pachystima myrsinites</i>	Myrtle boxleaf NW	
CHENOPODIACEAE	<i>Atriplex canesans</i> <i>Chenopodium sp.</i> <i>Chenopodium album</i> <i>Kochia scoparia</i>	Fourwing saltbushNW Lamb's quarters Lamb's quartersECO,FAC, Summer cypressECO,UPL,	FACU FAC
COMPOSITAE	<i>Salsola kali</i> <i>Antennaria parviflora</i> <i>Ambrosia sp.</i> <i>Artemisia cana</i> <i>Artemisia carruthii</i> <i>Artemisa dracunculus</i> <i>Artemisa filifolia</i> <i>Artemisia ludoviciana</i> <i>Artemisia tridentata</i> <i>Aster sp.</i> <i>Aster bigelovii</i>	Russian thistle Pussytoes Ragweed Silver sagebrushNW,FACU, Wormwood False Tarragon NW Sand sagebrush ECO Louisiana wormwood Big sagbrush Aster Bigelow aster	NW FACW NW ECO

APPENDIX A. Plant Species Checklist

	<i>Bahia dissecta</i>	Wild Chrysanthemum	NW
	<i>Brickellia sp.</i>	Brickelbush	
	<i>Chrysopsis villosa</i>	Hairy golden aster	
	<i>Chrysopsis filiosa</i>	Leafy golden aster	
	<i>Chrysothamnus nauseosus</i>	Chamisa	ECO
	<i>Cichorium intybus</i>	Chicory	
	<i>Cirsium sp.</i>	Thistle	
	<i>Conyza canadensis</i>	Horseweed fleabane	ECO,UPL, FAC,FACU NW,FAC
	<i>Cosmos parviflorus</i>	Cosmos	
	<i>Erigeron divergens</i>	Fleabane Daisy NW	
	<i>E. flagellaris</i>	Trailing FleebaneNW,FAC, FACU	
	<i>Gaillardia pulchella</i>	Firewheel	
	<i>Grindelia aphanactis</i>	Gumweed	NW
	<i>Gutierrezia microcephala</i>	Snakeweed	ECO
	<i>Gutierrezia sarothrae</i>	Snakeweed	ECO
	<i>Helianthus petiolaris</i>	Praire sunflower	ECO
	<i>Hymenopappus filifolius</i>	Yellow cut-leaf	NW
	<i>Hymenoxys argentea</i>	Perky Sue, bitterweed	
	<i>Hymenoxys richardsonii</i>	Bitterweed	NW
	<i>Iva xanthifolia</i>	Marsh-elder	ECO,FAC, FACU
	<i>Kuhnia chlorolepis</i>	False boneset	
	<i>Senecio sp.</i>	Groundsel	
	<i>Senecio fendleri</i>	Groundsel	NW
	<i>Senecio multicapitatus</i>	Groundsel	NW
	<i>Solidago sp.</i>	Goldenrod	
	<i>Taraxacum officinale</i>	Common dandelion	ECO,FACU
	<i>Thelesperma trifidum</i>	Greenthread	
	<i>Townsendia exscapa</i>	Easter daisy	
	<i>Tragopogon dubius</i>	Salisfy, Goatsbeard	ECO
	<i>Viguiera multiflora</i>	Goldeneye	
CRUCIFERAE	<i>Capsella bursa-pastoris</i>	Shepherd's purse	ECO,FAC, FACU
	<i>Descurainia sp.</i>	Tansey mustard	
	<i>Erysimum capitatum</i>	Western wallflower	
CUPRESSACEAE	<i>Juniperus monosperma</i>	One-Seeded juniper	NW

CYPERACEAE	<i>Juniperus scopulorum</i>	Rocky mountain juniper	NW
	<i>Carex sp.</i>	Sedge	
	<i>Scripus sp.</i>	Rush	
ERICACEAE	<i>Pterospora andromedea</i>	Pinedrops	NW
EUPHORBIACEAE	<i>Euphorbia dentata</i>	Wild poinsetta	ECO
FAGACEAE	<i>Quercus gambelii</i>	Gambel oak	NW
	<i>Quercus undulata</i>	Wavyleaf oak	NW
GERANIACEAE	<i>Geranium caespitosum</i>	James geranium	
GRAMINEAE	<i>Agropyron sp.</i>	Wheat grass	
	<i>Agropyron smithii</i>	Western wheatgrass	NW,FAC,
		UPL	
	<i>Agrostis alba</i>	Redtop	FACW,OBL
	<i>Andropogon scoparius</i>	Little bluestem	NW
	<i>Aristida sp.</i>	Three-awn hairy dropseed	
	<i>Aristida divaricata</i>	Poverty three-awn	NW
	<i>Blepharoneuron tricholepis</i>	Pine dropseed	NW
	<i>Bouteloua curtipendula</i>	Side-oats grama	NW
	<i>Bouteloua gracilis</i>	Blue grama	NW
	<i>Bromus anomalus</i>	Nodding brome	NW
	<i>Bromus tectorum</i>	Downy chess	ECO
	<i>Buchloe dactyloides</i>	Buffalograss	
	<i>Eriogonum alatum</i>	Winged wild buckwheat	
	<i>Eriogonum cernuum</i>	Nodding buckwheat	
	<i>Festuca sp.</i>	Fescue	
	<i>Hordeum sp.</i>	Barley	
	<i>Koeleria cristata</i>	Junegrass	NW
	<i>Oryzopsis hymanoides</i>	Rice grass	NW,UPL, FAC,FACU
	<i>Lelium perenne</i>	Perennial rye	
	<i>Muhlenbergia montana</i>	Mountain muhly	NW
	<i>Muhlenbergia torreyi</i>	Ring Muhly	NW
	<i>Muhlenbergia wrightii</i>		NW,FACU
	<i>Phleum pratense</i>	Common timothy	COL,FACU
	<i>Poa sp.</i>	Bluegrass	
	<i>Poa fendleriana</i>	Bluegrass	NW
	<i>Sitanion hystrix</i>	Bottlebrush squirreltail	NW
	<i>Stipa sp.</i>	Needlegrass	

	<i>Sporobolus cryptandrus</i>	Sand dropseed	NW,FAC, FACU,UPL
LABIATAE	<i>Monarda menthaefolia</i>	Horsemint	
	<i>Monarda pectinata</i>	Ponymint	NW
LEGUMINOSAE	<i>Glycyrrhiza lepidota</i>	Licorice	ECO,UPL, FAC
	<i>Lotus wrightii</i>	Deervetch	NW
	<i>Lupinus sp.</i>	Lupine	
	<i>Lupinus caudatus</i>	Lupine	NW
	<i>Melilotus sp.</i>	Sweet clover	
	<i>Melilotus albus</i>	White sweet clover	COL,FACU
	<i>Melilotus officialis</i>	Yellow Blossom clover	FAC COL,FACU, FAC
	<i>Robinia neomexicana</i>	New Mexico locust	NW
	<i>Thermopsis pinetorum</i>	Big goldenpea	NW
	<i>Trifolium repens</i>	White clover	COL,FACU, FAC
	<i>Vicia americana</i>	American vetch	NW,FAC
LILIACEAE	<i>Allium cernuum</i>	Nodding onion	ECO
	<i>Smilacina racemosa</i>	False Solomon's seal	NW,FACU, FAC
	<i>Yucca angustissima</i>	Narrowleaf yucca	NW
	<i>Yucca baccata</i>	Banana yucca	ECO
LINACEAE	<i>Linum neomexicanum</i>	New Mexico flax	
LOASACEAE	<i>Mentzelia pumila</i>	golden blazing star	NW
MALVACEAE	<i>Sphaerlacea sp.</i>	Globe mallow	
OLEACEAE	<i>Forestiera neomexicana</i>	New Mexico olive	NW,FACU, FAC
ONAGRACEAE	<i>Epilobium sp.</i>	Willowweed	
	<i>Oenothera sp.</i>	Evening primrose	
	<i>Oenothera coronopifolia</i>	Evening primrose	NW
	<i>Oenothera hookeri</i>	Hooker's evening	
	primrose		NW
PINACEAE	<i>Pinus edulis</i>	Pinon pine	NW
	<i>Pinus ponderosa</i>	Ponderosa pine	NW,FACU, FAC,UPL
	<i>Pseudotsuga menziesii</i>	Douglas fir	NW

PLANTAGINACEAE	<i>Plantago major</i>	Rippleseed plaintain	ECO,FACU, FACW	
POLEMONIACEAE	<i>Ipomopsis aggregata</i>	Scarlet trumpet	NW	
POLYGONACEAE	<i>Ipomopsis longiflora</i>	Blue gilia	NW	
	<i>Eriogonum jamesii</i>	Antelope sage	NW	
	<i>Eriogonum polycladon</i>	Sorrel wild buckwheat	NW	
	<i>Polygonum convolvulus</i>	Black bindweed	ECO,FACU, FAC	
PRIMULACEAE	<i>Androsace septentrionalis</i> var. <i>subulifera</i>	Western rock jasmine	NW,FAC	
RANUNCULACEAE	<i>Clematis pseudoalpina</i>	Rocky mountain clematis		
	<i>Thalictrum fendleri</i>	Meadowrue	NW,UPL, FAC,FACU	
ROSACEAE	<i>Cercocarpus montanus</i>	Mountain mahogany	NW	
	<i>Fallugia paradoxa</i>	Apache plume	NW	
	<i>Fragaria americana</i>	Wild strawberry		
	<i>Prunus virginia</i> var. <i>melanocarpa</i>	Western blackchokecherry	NW,FAC, FACU	
	<i>Rosa</i> sp.	Wild rose		
	<i>Rosa woodsii</i>	Wild rose	NW,FAC, UPL,FACU	
		<i>Rubus strigosus</i> var. <i>arizonicus</i>	Wild raspberry	FACU,FAC, FACW
	RUBIACEAE	<i>Galium</i> sp.	Bedstraw	
	SALICACEAE	<i>Populus angustifolia</i>	Aspen	NW,FAC, FACW
SAXIFRAGACEAE	<i>Jamesia americana</i>	Cliffbush	NW,UPL, FAC,FACU	
SCROPHULARIACEAE	<i>Philadelphus microphyllus</i>	Mockorange	NW	
	<i>Ribes cereum</i>	Wax current	NW,FACU	
	<i>Castilleja integra</i>	Foothills paintbrush	NW	
	<i>Penstemon</i> sp.	Beardtonge		
	<i>Penstemon secundiflorus</i>	Beardtonge	NW	
	<i>Verbascum thapsus</i>	Mullein	ECO	
UMBELLIFERAE	<i>Ozmorhiza obtusa</i>	Bluntseed sweet cicely		
VITACEAE	<i>Parthenocissus inserta</i>	Virginia creeper		
MOSESSES	<i>Ceratodon purpureus</i>	Purple horned		
	toothed moss			

LICHENS	<i>Cladonia sp.</i> <i>Rhizocarpon sp.</i> <i>Usnea sp.</i> <i>Xanthroparmelia sp.</i> rock lichen	Crustose rock lichen Old man's beard lichen Green foliose
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* INDICATOR CODES

NW	=Non-weedy	
COL	=Colonizing	
ECO	=Economic	
FAC	=Facultative plants are equally likely to occur in	wetlands or
nonwetlands		
FACW	=Facultative wetland plants usually occur in	wetlands.
FACU	=Facultative upland plants usually occur in	
nonwetlands.		
OBL	=Obligate wetland plants occur almost always in	
wetlands.		
UPL	=Obligate upland plants occur almost always in	
nonwetlands.		

Checklist of Mammals: Canada del Buey and Mesita del Buey

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
CANIDAE	<i>Canis latrans</i>	Coyote	5
	<i>Urocyon cinereoagenteus</i>	Gray fox	4
CERVIDAE	<i>Cervus elaphus</i> subsp. <i>canadensis</i>	Elk	5
	<i>Odocoileus hemionus</i>	Mule deer	5
COATI	<i>Procyon lotor</i>	Raccoon	6
CRICETIDAE	<i>Microtus</i> spp.	Vole	2
	<i>Microtus longicaudus</i>	Long-tailed vole	4
	<i>Microtus montanus</i>	Montane vole	3
	<i>Neotoma albigula</i>	White-throated woodrat	4
	<i>Neotoma mexicana</i>	Mexican woodrat	3, 4
	<i>Peromyscus boylii</i>	Brush mouse	1, 4
	<i>P. leucopus</i>	White-footed mouse	4
	<i>P. maniculatus</i>	Deer mouse	1, 2, 4
	<i>P. truei</i>	Pinon mouse	1, 2, 4
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	1, 2, 4
FELIDAE	<i>Felix rufus</i>	Bobcat	5
GEOMYIDAE	<i>Thomomys bottae</i>	Botta's pocket gopher	3

LEPORIDAE	<i>Sylvilagus</i> spp.	Cottontail	5
SUIURIDAE	<i>Eutamias minimus</i>	Least chipmunk	4
	<i>Eutamias quadrivittatus</i>	Colorado chipmunk	1,2,3,4
	<i>Sciurus aberti</i>	Abert's squirrel	4
	<i>Spermophilus variegatus</i>	Rock squirrel	3,4
URSIDAE	<i>Ursus americanus</i>	Black bear	5

1=Kent 2=Felthouser 3=Morrison 4=Biggs&Raymer 5=Foxx
6=Findley

Checklist of Reptiles and Amphibians of TA-54

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
	SNAKES		
COLUBRIDAE	<i>Elphae guttata</i>	Corn snake	1
	<i>Pituophis melanoleucus</i>	Gopher snake	2
	<i>Thamnophis elegans</i>	Western terrestrial garter snake	1,2
VIPERIDAE	<i>Crotalus viridis</i>	Prairie rattlesnake subspecies viridis	1,2
	LIZARDS AND SKINKS		
IGUANIDAE	<i>Phrynosoma douglassi</i>	Short-horned lizard	1,2
	<i>Sceloporus undulatus</i>	Eastern fence lizard	1,2
	<i>Sceloporus undulatus tristichus</i>	Southern Plateau Lizard	
SCINCIDAE	<i>Eumeces multivirgatus</i>	Many-lined skink	2
TEIIDAE	<i>Cnemidophorus velox</i>	Plateau striped whiptail	1,2
	FROGS/TOADS/SALAMANDERS		
AMBYSTOMATIDAE	<i>Ambystoma tigrinum</i>	Tiger salamander	1,2
BUFONIDAE	<i>Bufo woodhousei</i>	Woodhouse's Toad	1,2
	<i>Bufo punctatus</i>	Red Spotted Toad	1,2

HYLIDAE	<i>Pseudacris triseriata</i>	Striped chorus frog	1,2
	<i>Hyla arenicolor</i>	Canyon tree frog	1,2
PALOBATIDAE	<i>Scaphiopus multiplicatus</i>	Southern spadefoot	1,2

1=Bogart

2=BRET observations

Checklist of Birds: TA-54

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
ACCIPITRIDAE	<i>Accipiter cooperii</i>	Cooper's hawk	1
	<i>Accipiter striatus</i>	Sharp-shinned hawk	1
	<i>Buteo albonatus</i>	Zone-tailed hawk	1
	<i>B. jamaicensis</i>	Red-tailed hawk	1,2
AEGITHALIDAE	<i>Psaltriparus minimus</i>	Bushtit	1,3
APODIDAE	<i>Aeronautes saxatalis</i>	White-throated swift	1
CAPRIMULGIDAE	<i>Chordeiles minor</i>	Common nighthawk	1,2,3
	<i>Phalaenoptilus nuttallii</i>	Common poorwill	1
CARTHARTIDAE	<i>Cathartes aura</i>	Turkey vulture	1
COLUMBIDAE	<i>Zenaida macroura</i>	Morning dove	1
CORVIDAE	<i>Amphelocoma coerulescens</i>	Scrub jay	1,2,3
	<i>Corvus corax</i>	American crow	1
	<i>Cyanocitta stelleri</i>	Steller's jay	1,2,3
	<i>Corvus corax</i>	Common raven	1,2
	<i>Gymnorhinus cyanocephalus</i>	Pinyon jay	1
	<i>Nucifraga columbiana</i>	Clark's nutcracker	1
EMBERIZIDAE	<i>Agelaius phoeniceus</i>	Red winged blackbird	1

	<i>Carduelis pinus</i>	Pine siskin	1
	<i>Chondestes grammacus</i>	Lark sparrow	1
	<i>Dendroica caerulescens</i>	Black-throated blue warbler	3
	<i>Dendroica coronata</i>	Yellow-rumped warbler	1
	<i>Dendroica digrescens</i>	Black-throated gray warbler	1, 3
	<i>D. graciae</i>	Grace's warbler	1, 2
	<i>Euphagus cyanocephalus</i>	Brewer's blackbird	1
	<i>Guiraca caerulea</i>	Blue Grosbeak	1
	<i>Junco hyemalis</i>	Dark-eyed junco	1, 3
	<i>Icterus galbula galbula</i>	Northern oriole	1
	<i>Melospiza lincolnii</i>	Song sparrow	1
	<i>Molothrus aster</i>	Brown-headed cowbird	1, 2, 3
	<i>Oporonis tolmiei</i>	Macgillivray's warbler	1
	<i>Passerina amoena</i>	Lazuli bunting	1
	<i>Pheucticus melanocephalus</i>	Black-headed grosbeak	1, 2
	<i>Pheucticus erythrophthalmus</i>	Rufous-sided towhee	1, 2, 3
	<i>Pipilo chlorurus</i>	Green-tailed towhee	1
	<i>Pipilo fuscus</i>	Canyon towhee	1, 3

	<i>Piranga flava</i>	Hepatic tanager	1
	<i>Piranga ludoviciana</i>	Western tanager	1,2
	<i>Poocetes gramineus</i>	Vesper sparrow	1
	<i>Spizella passerina</i>	Chipping sparrow	1,2,3
	<i>Vermivora celata</i>	Orange-crowned warbler	1
	<i>Vermivora virginiae</i>	Virginia's warbler	1,2,3
	<i>Vireo gilvius</i>	Warbling vireo	1,2
	<i>Vireo solitarius</i>	Solitary vireo	1,2
FALCONIDAE	<i>Falco sparverius</i>	American kestrel	1
FRINGILLIDAE	<i>Carduelis pinus</i>	Pine siskin	1
	<i>Carduelis psaltria</i>	Lesser goldfinch	1,2
	<i>Carduelis mexicanus</i>	House finch	1,2
	<i>Carpodacus cassinii</i>	Cassin's finch	1,3
	<i>Hesperiphona vespertina</i>	Evening grosbeak	1
	<i>Loxia curvirostra</i>	Red crossbill	1,2
HIRUNDINIDAE	<i>Tachycineta thalassina</i>	Violet-green swallow	1,2,3
MIMIDAE	<i>Catharus guttatus</i>	Hermit thrush	1,2
	<i>Mimus polyglottos</i>	Northern mockingbird	1
MUSCICAPIDAE	<i>Polioptila caerulea</i>	Blue-gray gnatcatcher	1,2

	<i>Myadestes townsendi</i>	Townsend's solitaire	1
	<i>Regulus satrapa</i>	Golden-crowned kinglet	3
	<i>Sialis currucoides</i>	Mountain bluebird	1,2,3
	<i>Sialis mexicana</i>	Western bluebird	1,2
	<i>Turdus migratorius</i>	American robin	1,2,3
PASSERIDAE	<i>Passer domesticus</i>	House sparrow	1
PARIDAE	<i>Parus gambeli</i>	Mountain chickadee	1,2,3
	<i>Parus inornatus</i>	Plain titmouse	1,2,3
PICIDAE	<i>Colaptes auratus</i>	Northern flicker	1,2,3
	<i>Melanerpes formicivorus</i>	Acorn woodpecker	1
	<i>Picoides pubescens</i>	Downy woodpecker	1
	<i>Picoides villosus</i>	Hairy woodpecker	1,2
	<i>Sphyrapicus nuchalis</i>	Red-naped sapsucker	2
	<i>Sphyrapicus varius</i>	Yellow-bellied sapsucker	2
	<i>Sphyrapicus thyroideus</i>	Williamson's sapsucker	1
SITTIDAE	<i>Sitta carolinensis</i>	White-breasted nuthatch	1,2,3
	<i>Sitta pygmaea</i>	Pygmy nuthatch	1,2,3
STURNIDAE	<i>Sturnus vulgaris</i>	European starling	1
TROCHILIDAE	<i>Archilocus alexandri</i>	Black-chinned hummingbird	1

	<i>Selasphorus playtcerus</i>	Broad-tailed hummingbird	1,2,3
TROGLODYTIDAE	<i>Catherkes mexicanus</i>	Canyon wren	1,2
	<i>Salpinctes obsoleuts</i>	Rock wren	1,2
	<i>Troglodytes aedon</i>	House wren	1,2
	<i>Thryomanes bewickii</i>	Bewick's wren	1,2
TYRANNIDAE	<i>Contopus sordidulus</i>	Western wood-pewee	1,2
	<i>Empidonax hammondii</i>	Hammond's flycatcher	1,2
	<i>E. oberholseri</i>	Dusky flycatcher	1
	<i>E. occidentalis</i>	Cordilleran flycatcher	1
	<i>E. wrightii</i>	Gray flycatcher	1,2
	<i>Myiarchus cinerascens</i>	Ash-throated flycatcher	1,2
	<i>Sayornis nigricans</i>	Black Phoebe	1
	<i>Sayornis saya</i>	Say's Phoebe	1,2
	<i>Tyrannus vociferans</i>	Cassin's kingbird	1
TYTONIDAE	<i>Buto virginianus</i>	Great horned owl	1
	<i>Otus flammeolus</i>	Flammulated owl	1
VIREONIDAE	<i>Vireo gilvus</i>	Warbling vireo	1,2
	<i>V. solitarius</i>	Solitary vireo	1,3

1=Breeding Bird Atlas

2=Morison, 1990

3=Hickman, 1986,1987

ENDANGERED SPECIES PRINTOUT FOR TA-54

PLANT COMMUNITIES: PINON-JUNIPER, PONDEROSA-PINON, RIPARIAN ZONES,
AND WETLANDS

ANIMALS

BIRD

FAMILY ACCIPITRIDAE

SCIENTIFIC NAME: Buteogallus anthracinus

COMMON NAME: COMMON BLACK HAWK

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico Endangered (Group 2). First listed
1/24/75 (NMGF Reg. 563).

DISTRIBUTION: Lower elevations in Gila, San Francisco and
Mimbres drainage. Has also occurred in smaller
numbers in Rio Grande Valley.

SPECIFIC REQUIREMENTS: In the Southwest, in cottonwoods and other
woodlands along permanent streams.

HABITAT: RIPARIAN ZONES BREEDING HABITAT: RIPARIAN ZONES

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON: DESTRUCTION OF RIPARIAN HABITAT AND SHOOTING HAWK.

BRIEF KEY DESCRIPTION: Medium-sized raptor, mainly black. Broader wings
than the Zone-Tail. Adults have bill black, iris
dark brown and cere and legs yellow. Length is
500-600 m.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE: N/A

GENERAL MAP LOCATION: N/A

COMMENTS:

REFERENCE: NM DEPT. OF GAME AND FISH, HANDBOOK OF SPECIES ENDANGERED.

ANIMALS

BIRD

FAMILY ACCIPITRIDAE

SCIENTIFIC NAME: *Haliaeetus leuccephalus*

COMMON NAME: BALD EAGLE

STATUS: FEDERALLY-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico endangered (group 2). First listed 1/24/75 (NMGF Reg. 563). Federally protected since 03/11/67.

DISTRIBUTION: Migrates and winters from the northern border, southward regularly to Gila, Lower Rio Grande, Middle Pecos and Candian Valleys, Rio Arriba and Sandoval Co.

SPECIFIC REQUIREMENTS: Found near streams, lakes and sometimes dry land. Also found in riparian areas.

HABITAT: RIPARIAN ZONES BREEDING HABITAT: RIPARIAN ZONES

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON: PESTICIDES AND STREAM DEGRADATION.

BRIEF KEY DESCRIPTION: Huge wingspan 2-2.4 m, white head and tail, iris, cere, bill and legs yellow. Immature resemble golden eagles.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: YES

LA REFERENCE OF OCCURRENCE: FIELD SIGHTINGS, 1991-1992

GENERAL MAP LOCATION: NEAR ANCHO CANYON IN WHITE ROCK CANYON

COMMENTS: Winter roost at Cochiti Lake and in Montoso Canyon. Mortandad Canyon appears to have some suitable roosting areas, but no confirmed roost. Suitable roost sites consist of protection from wind and large trees.

Potential roosting area has been found on LANL property near the Rio Grande River. A bald eagle was seen in the area in February 1992. Surveys efforts are underway to confirm.

REFERENCE: NM DEPT. OF GAME AND FISH, HANDBOOK OF SPECIES ENDANGERED.

ANIMALS

BIRD

FAMILY ACCIPITRIDE

SCIENTIFIC NAME: *Ictinia mississippiensis*

COMMON NAME: MISSISSIPPI KITE

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico Endangered (Group 2). First listed in
Jan. 24, 1975 (NMGF Reg. 563).

DISTRIBUTION: In New Mexico summers regularly and breeds in the
Covis region, Portales, and Hobbs. Small numbers
occur in middle and lower Rio Grande and lower
Pecos valleys.

SPECIFIC REQUIREMENTS: Riparian zones, shelterbelts and golf courses.

HABITAT: RIPARIAN ZONES

BREEDING HABITAT: RIPARIAN ZONES

MINIMUM ELEVATION: 0

MAXIMUM ELEVATION: 0

THREATS TO TAXON: DESTRUCTION OF RIPARIAN ZONES.

BRIEF KEY DESCRIPTION: Small raptor with length 335 mm and wingspan 1 m,
long. Has long pointed and notched wings. Has
whitish to black plumage.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE: N/A

GENERAL MAP LOCATION: N/A

COMMENTS:

REFERENCE: NM DEPT OF GAME AND FISH, HANDBOOK OF SPECIES ENDANGERED.

ANIMALS

BIRD

FAMILY FALCONIDAE

SCIENTIFIC NAME: Falco Peregrinus

COMMON NAME: PEREGRINE FALCON

STATUS: FEDERALLY-ENDANGERED

FEDERAL/STATE REFERENCE: NM: Endangered (group 1), 1/24/75, (NM Reg. 563);
Federal "American", F.p. antum, Endangered 6/2/70;
Tundra F.P. tundrius, Threatened 3/20/84.

DISTRIBUTION: New Mexico subspecies "American" breeds locally in mountainous areas, and it occurs in migration and winter statewide.

SPECIFIC REQUIREMENTS: Breeding territories center on cliffs that are wooded/forested habitats.

HABITAT: PONDEROSA-PINON BREEDING HABITAT: PONDEROSA-PINON

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON: DDT, DESTRUCTION OF HABITAT

BRIEF KEY DESCRIPTION: Typical falcon, long pointed wings and long tails, moderate size, 380-500 mm in length, wingspan 1.0-1.5 m, gray above, whitish below, tail is dark gray.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: YES

LA REFERENCE OF OCCURRENCE: LA-6898-PR, PP.94

GENERAL MAP LOCATION: PUEBLO CANYON

COMMENTS: Two young males seen in the spring of 1990.

REFERENCE: NM DEPT. OF GAME AND FISH, HANDBOOK OF SPECIES ENDANGERED

ANIMALS

BIRD

FAMILY TROCHILIDAE

SCIENTIFIC NAME: *Cynanthus latirostris*

COMMON NAME: BROAD-BILLED HUMMINGBIRD

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico: Endangered (Group 2), 1/24/75 (NMGF Reg. 563).

DISTRIBUTION: Summers in Guadalupe Canyon (Hisalgo co.), Vagrants near Los Alamos, Bandelier National Monument, Las Vegas, Truth of Consequences, Las Cruces and Carlsbad Caverns.

SPECIFIC REQUIREMENTS: Riparian woodlands, low to moderate elevations.

HABITAT: RIPARIAN ZONES BREEDING HABITAT: RIPARIAN ZONES

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON: DESTRUCTION OF HABITAT

BRIEF KEY DESCRIPTION: Adult males have orange-red bills. Females and immatures similar to the violet-crowned hummingbird, but have small white line behind the eye. Upperparts of the hummingbird are greenish, the wings are blackish, and feet and eyes are dark. The tail is slightly forked.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: YES
LA REFERENCE OF OCCURRENCE: NM DEPT. OF GAME AND FISH, HANDBOOK OF ENDANGERED
GENERAL MAP LOCATION:

COMMENTS:

REFERENCE: NM DEPT. OF GAME AND FISH, HANDBOOK OF SPECIES ENDANGERED

ANIMALS

BIRD

FAMILY TYRANNIDAE

SCIENTIFIC NAME: Empidonax trailii

COMMON NAME: WILLOW FLYCATCHER

STATUS: CANDIDATE FOR FEDERAL REGISTER

FEDERAL/STATE REFERENCE: New Mexico: "Southwestern", E.T. extimus, only.
Endangered, Group 2, 01/09/88 (NMGF reg 657).
Federal: Notice of Review as
Endangered/Threatened.

DISTRIBUTION: Breeds through central New Mexico. Species occurs
statewide in spring and autumn migration. E.t.
extimus breeds in Chama, Rio Grande, Zuni, Gila,
San Francisco.

SPECIFIC REQUIREMENTS: Confined to riparian woodlands in breeding
seasons. Riparian areas are dominated by
cottonwoods.

HABITAT: RIPARIAN ZONES BREEDING HABITAT: RIPARIAN ZONES

MINIMUM ELEVATION: 3700 MAXIMUM ELEVATION: 8900

THREATS TO TAXON: LOSS OF RIPARIAN HABITAT

BRIEF KEY DESCRIPTION: Small, double wingbars and eyering. Upperparts
are dark olive-brown, crown paler and more grayish
or brownish. Breast is light grayish-olive and
post. is pale yellow.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO
LA REFERENCE OF OCCURRENCE: N/A
GENERAL MAP LOCATION: N/A

COMMENTS:

REFERENCE: NM DEPT OF GAME AND FISH, HANDBOOK OF SPECIES ENDANGERED

ANIMALS

MAMMAL

FAMILY VESPERTILIONIDAE

SCIENTIFIC NAME: *Euderma maculatum*

COMMON NAME: SPOTTED BAT

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico :Endangered (Group 2), 01/09/88 (NMGF Reg. 657). Federal: Notice of review as endangered/threatened.

DISTRIBUTION: Rio Grande Valley westward, occurring regularly in the Jemez Mountains and on Mt. Taylor. Records also at Ghost Ranch and Lake Roberts.

SPECIFIC REQUIREMENTS: Riparian, Pinon-juniper, ponderosa, spruce-fir. Roost in cliffs or rock cervices. Needs a good source of water, a small area of standing water to slow moving water. Key food is moths.

HABITAT: PINON-JUNIPER

BREEDING HABITAT: PINON-JUNIPER

MINIMUM ELEVATION: 0

MAXIMUM ELEVATION: 0

THREATS TO TAXON: POSSIBLY PESTICIDES

BRIEF KEY DESCRIPTION: Upperparts are black with large white, roughly circular spots on the shoulders and another at the base of the tail, plus a small patch at the posterior base of each ear. Has very large ears (45-50 mm). Ears are naked, pinkish-red in color.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE: N/A

GENERAL MAP LOCATION: N/A

COMMENTS: Note: Habitat can be varied--Riparian, Ponderosa, Spruce-Fir.

REFERENCE: NM DEPT. OF GAME AND FISH, HANDBOOK OF SPECIES ENDANGERED.

ANIMALS

MOLLUSK

FAMILY LYMNAEIDAE

SCIENTIFIC NAME: *Lymnaea captera*

COMMON NAME: SAY'S POND SNAIL

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico: Endangered (Group 1), first listed
07/22/83 (NMGF Reg. 624).

DISTRIBUTION: The species is known to occur only in the Cerro la
Jara area, Jemez Mountains (Sandoval Co.).

SPECIFIC REQUIREMENTS:

HABITAT: WETLAND

BREEDING HABITAT: WETLANDS

MINIMUM ELEVATION: 3700

MAXIMUM ELEVATION: 8600

THREATS TO TAXON: OVERGRAZING, POLLUTION, DEVELOPMENT AND DEATERING

BRIEF KEY DESCRIPTION: Medium sized (20 mm), absence of operculum on the
foot, shell is elongated and right spiralled.
Spiral length is greater than width of aperture.
Color is brown to brown-gray.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE: N/A

GENERAL MAP LOCATION: N/A

COMMENTS:

REFERENCE: NM DEPT. OF GAME AND FISH, HANDBOOK OF SPECIES ENDANGERED

PLANTS

CACTUS

FAMILY CACTACEAE

SCIENTIFIC NAME: *Mammillaria wrightii*, Engelm.

COMMON NAME: WRIGHT FISHHOOK CACTUS

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: Listed as an E2 for state status on nm Natural Heritage Program plant list 2/06/90. State Rank Date 12/22/89.

DISTRIBUTION: Bernalillo, Catron, Dona Ana, Guadalupe, Lincoln, McKinley, Sandoval, Santa Fe, Socorro, Torrance, and Valencia Counties in New Mexico.

SPECIFIC REQUIREMENTS: Gravey hills or sandy hills or plains, desert grassland to pinyon-juniper.

HABITAT: PINON-JUNIPER

BREEDING HABITAT: N/A

MINIMUM ELEVATION: 3000

MAXIMUM ELEVATION: 7000

THREATS TO TAXON: POPULATIONS DECLINING - OVERCOLLECTION, HABITAT ALTERATION.

BRIEF KEY DESCRIPTION: Stems solitary, 10 cm tall and 5 cm wide; spines 10-15/cluster, outer spines tan or gray, central ones reddish and hooked; flowers pink-purple with yellowish tinge.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE: N/A

GENERAL MAP LOCATION: N/A

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

CACTUS

FAMILY CACTACEAE

SCIENTIFIC NAME: *Opunita viridiflora*, Britt. and Rose.

COMMON NAME: SANTA FE CHOLLA

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: Federal register as a C2. Information obtained from the 1991 natural Heritage Program Plant List.

DISTRIBUTION: Santa Fe County, New Mexico.

SPECIFIC REQUIREMENTS:

HABITAT: PINON-JUNIPER

BREEDING HABITAT: N/A

MINIMUM ELEVATION: 7200

MAXIMUM ELEVATION: 8000

THREATS TO TAXON: ROAD CONSTRUCTION, VANDALISM, EXPANSION OF CITY PARKS.

BRIEF KEY DESCRIPTION: Low-growing, branched shrub; stems cylindric, 30-100 cm tall; spines variable in number; flowers not open widely, pink with green/yellow outside.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE: N/A

GENERAL MAP LOCATION: N/A

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

CACTUS

FAMILY CACTACEAE

SCIENTIFIC NAME: *Toumeyia papyracantha*, (Engelm.) Britt. & Rose

COMMON NAME: GRAMMA GRASS CACTUS

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: Federal Register, 15 December 1980, candidate for federal protection. Currently listed as a 2C in the Federal Register--still should be considered in mangement activities.

DISTRIBUTION: Bernalillo, Cibola, Dona Ana, Grant, Los Alamos, Otero, Rio Arriba, Sandoval, Santa Fe, Socorro, Tarrant, and Valencia counties, New Mexico.

SPECIFIC REQUIREMENTS: Usually found in basalt outcrops and where the soil is sandy.

HABITAT: PINON-JUNIPER

BREEDING HABITAT: N/A

MINIMUM ELEVATION: 5000

MAXIMUM ELEVATION: 7300

THREATS TO TAXON: OVERCOLLECTION, OVERGRAZING AND URBANIZATION.

BRIEF KEY DESCRIPTION: Stems solitary ribbed, 2.5 - 20 cm tall; cantral spines short, straight; flowers white, not spreading; fruit round, tan, dry; flowers from April to June.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: YES

LA REFERENCE OF OCCURRENCE:

GENERAL MAP LOCATION:

COMMENTS:

REFERENCE: NM NATIVE PLANT PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

FORB

FAMILY APIACEAE

SCIENTIFIC NAME: *Aletes sessiliflorus*, Theobald and Tseng

COMMON NAME: SESSILE-FLOWERED FALSE CARROT

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Mckinley, Rio Arriba, Sandoval, and Taos Counties.

SPECIFIC REQUIREMENTS: Rocky canyons and slopes, usually in basaltic or sandstone areas.

HABITAT: PINON-JUNIPER

BREEDING HABITAT: N/A

MINIMUM ELEVATION: 6500

MAXIMUM ELEVATION: 8100

THREATS TO TAXON: NONE KNOWN

BRIEF KEY DESCRIPTION: Densely tufted perennial, 10-20 cm tall; leaves bright green, long pinnately divided into 5-9 narrow segments that have 3 lobes; flowers tiny pale yellow.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE:

GENERAL MAP LOCATION:

COMMENTS:

REFERENCE: NM NATIVE PLANT PROTECTION ADVISORY COMMITTEE, 1984

PLANTS

FORB

FAMILY ASTERACEAE

SCIENTIFIC NAME: *Tetradymia filifolia*, Greene

COMMON NAME: THEADLEAF HORSEBRUSH

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Lincoln, Otero, Sandoval, Socorro, and Valencia.

SPECIFIC REQUIREMENTS: Limestone or highly gypseous soils.

HABITAT: PINON-JUNIPER

BREEDING HABITAT: N/A

MINIMUM ELEVATION: 6000

MAXIMUM ELEVATION: 7000

THREATS TO TAXON: NONE KNOWN

BRIEF KEY DESCRIPTION: Much-branched grayish shrub (1 m tall); leaves narrow and 1-2 in. long, often with hairs; flowers heads very narrow, yellow, with 4 flowers; rays absent.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE:

GENERAL MAP LOCATION:

COMMENTS:

REFERENCE: NM NATIVE PLANT PROTECTION ADVISORY COMMITTEE, 1984

PLANTS

FORB

FAMILY CARYOPHYLLACEAE

SCIENTIFIC NAME: *Silene plankii*

COMMON NAME: PLANK'S CATCHFLY

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE: Was a candidate for Federal Register, ruled a 3C.
No longer proposed.

DISTRIBUTION: Mountains along the Rio Grande.

SPECIFIC REQUIREMENTS:

HABITAT: PINON-JUNIPER

BREEDING HABITAT: N/A

MINIMUM ELEVATION: 0

MAXIMUM ELEVATION: 0

THREATS TO TAXON: NONE KNOWN

BRIEF KEY DESCRIPTION:

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE:

GENERAL MAP LOCATION:

COMMENTS: Similar in appearance to other species in our
area.

REFERENCE: TIERNERY, G.D., 1987

PLANTS

FORB

FAMILY FABACEAE

SCIENTIFIC NAME: Astragalus feensis M.E. Jones

COMMON NAME: SNATA FE MILKVETCH

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Bernalillo, Santa Fe, and Tarrant Counties, New Mexico.

SPECIFIC REQUIREMENTS: Dry slopes.

HABITAT: PINON-JUNIPER

BREEDING HABITAT: N/A

MINIMUM ELEVATION: 5000

MAXIMUM ELEVATION: 6500

THREATS TO TAXON: NONE KNOWN

BRIEF KEY DESCRIPTION: Lossely tufted; stems spreading upward, 10 cm long; leaves long, pinnately compound, 7-19 obovate blunt leaflets; flowers pealike, reddish purple.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE: N/A

GENERAL MAP LOCATION: N/A

COMMENTS:

REFERENCE: NEW MEXICO NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984

PLANTS

FORB

FAMILY FABACEAE

SCIENTIFIC NAME: *Astragalus mollissimus* Torr. var. *mathewsii* (Wats)

COMMON NAME: MATHEW'S WOOLLY MILK-VETCH

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Cibola, McKinley, Santa Fe, and Sandoval counties,
New Mexico.

SPECIFIC REQUIREMENTS: Open slopes and ridges in pinyon pine forest, but
sometimes in canyons.

HABITAT: PINON-JUNIPER

BREEDING HABITAT: N/A

MINIMUM ELEVATION: 5000

MAXIMUM ELEVATION: 6000

THREATS TO TAXON: NONE KNOWN

BRIEF KEY DESCRIPTION: Perennial herb, stems silky-hairy, tufted to 15
cm; leaves pinnately compound, blunt leaflets;
flowers pea-like, long pale purple or
yellow-purple; pod curved.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE: N/A

GENERAL MAP LOCATION: N/A

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984

PLANTS

FORB

FAMILY FABACEAE

SCIENTIFIC NAME: *Astragalus puniceus* Osterh. var. *gertudis* (Green)

COMMON NAME: TAOS MILK-VETCH

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Rio Arriba and Taos counties, New Mexico.

SPECIFIC REQUIREMENTS: On open, loose soil among pinyon and juniper.

HABITAT: PINON-JUNIPER

BREEDING HABITAT: N/A

MINIMUM ELEVATION: 7000

MAXIMUM ELEVATION: 0

THREATS TO TAXON: NONE KNOWN

BRIEF KEY DESCRIPTION: Perennial herb, stems spreading; leaves pinnately compound, oval leaflets; flowers pea-like, pale to bright pink; pod spreading, fleshy when green, red spotted-ripe.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE: N/A

GENERAL MAP LOCATION: N/A

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

FORB

FAMILY FABACEAE

SCIENTIFIC NAME: Astragalus cyaneus, Gray

COMMON NAME: CYANIC MILK-VETCH

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Adjacent to the Rio Grande in Bernalillo, Rio Arriba, Santa Fe, and Taos Counties New Mexico.

SPECIFIC REQUIREMENTS: Sandy or gravelly hillsides.

HABITAT: PINON-JUNIPER

BREEDING HABITAT: N/A

MINIMUM ELEVATION: 5500

MAXIMUM ELEVATION: 6500

THREATS TO TAXON: NONE KNOWN

BRIEF KEY DESCRIPTION: Low, tufted, covered with grayish hairs, stems to 6 cm; leaves 6-18cm, pinnately compiound, with 15-29 elliptic leaflets; flowers pea-like, pinkish-purple.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE: N/A

GENERAL MAP LOCATION: N/A

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

APPENDIX D. Vegetation Hierarchical Classification System

Hierarchy Order

Vegetation Type
 Formation Type
 Climatic (thermal) Zone
 Biotic Community
 Series
 Habitat Type (association)
 Phase

Definitions

Vegetation Type: Refers to the vegetation established under existing climate and includes upland or wetland.

Formation Type: Refers to the formations that are vegetative responses to various environmental factors, primarily available soil moisture, and includes the following:

Upland	Wetland
tundra	wet tundra
forest and woodland	forest
scrubland	swamp scrub
grassland	marshland
desert land	strand
nonvascular	submergent

Climatic Zone: Refers to one of the four world climatic zones where minimum temperature is the primary determining factor in separation of formation types. These include Arctic-Boreal, Cold Temperate, Warm Temperate, and Tropical-Subtropical.

Biotic Community: Refers to a unit characterized by a distinctive evolutionary history within a formation and centered in a biogeographical region that has a particular precipitation pattern or climatic regime.

Series: Refers to principal plant and animal communities within each of the Biotic Communities. These are based on distinctive climax plant dominants.

Habitat Type: Based on the occurrence of particular dominant species that are local or regional in distribution.

Phase: Based on detailed data collection to determine dominants, understory species, and other species information.

For purposes of BRET application, only those formations, climatic zones, communities, etc., that occur at Los Alamos National Laboratory will be provided in this classification system. For a more complete description of all formations, etc., see Brown *et al.* (1982).

The following classification system is separated into the two vegetation types, upland and wetland.

APPENDIX D. Vegetation Hierarchical Classification System

Upland Vegetation

Formation

 Climatic Zone

 Community

 Series

 Habitat Type (HT)

 Phase

Forest and Woodland Formation

 Boreal Forests and Woodlands Climatic Zone

 Rocky Mountain Subalpine Conifer Forest and Woodland Community

 Picea engelmannii Series

 Picea engelmannii (Pien)/Moss HT

 Pien/Vaccinium scoparium/Polemonium HT

 Picea engelmannii Phase

 Abies lasiocarpa Phase

 Pien/Erigeron eximius HT

 Pien/Geum rosii HT

 Pien/Ribes montigenum HT

 Pien/Elymus sp. HT

 Pien/Acer glabrum HT

 Abies lasiocarpa Series

 Abies lasiocarpa (Abla)/Acer glabrum HT

 Abla/Erigeron eximius HT

 Abla/Vaccinium HT

 Typic Phase

 Linnae borealis Phase

 Rubus parviflora Phase

 Abla/Vaccinium/Linnea borealis HT

 Abla/Rubus parviflorus HT

 Vaccinium Phase

 Acer glabrum Phase

 Abla/Erigeron superbus HT

 Abla/Juniperus communis HT

 Abla/Sanjuisorboides HT

 Abla/Lathyrus arizonicus HT

 Abla/Mertensia ciliata HT

 Abla/Moss HT

 Cold Temperate Forests and Woodlands Climatic Zone

 Rocky Mountain Montane Conifer-Forest Community

 Picea pungens Series

 Picea pungens (Pipu)/Carex foenea HT

 Pipu/Cornus stolonifera HT

 Pipu/Arctostaphylos uva-ursi HT

 Pipu/Erigeron eximius HT

 Typic Phase

 Pinus ponderosa Phase

 Pipu/Festuca arizonica HT

 Pipu/Linnaea borealis HT

 Pipu/Poa pratensis HT

PLANTS

FORB

FAMILY NYCTAGINACEAE

SCIENTIFIC NAME: *Abronia bigelovii*, Heimerl

COMMON NAME: TUFTED SAND VERBENA

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE: Federal Register, 15 Dec. 1980, Candidate for federal protection. 1991 Natural Heritage plant checklist indicates status changed to 3C---no longer in consideration for protection.

DISTRIBUTION: Sandoval, Santa Fe, and Rio Arriba Counties, New Mexico.

SPECIFIC REQUIREMENTS: This species is entirely restricted to todilto gypsum or the derivative of.

HABITAT: PINON-JUNIPER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 6000 MAXIMUM ELEVATION: 0

THREATS TO TAXON: GYPSUM MINING.

BRIEF KEY DESCRIPTION: Tufted perennial herb, stems short; leaves mostly at the base, linear to oblong; flowers stems erect, clusters of flowers at top, pink tube-small white lobes.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE: N/A

GENERAL MAP LOCATION: N/A

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

FORB

FAMILY POLEMONIACEAE

SCIENTIFIC NAME: Phlox caryophylla, Wherry

COMMON NAME: PAGOSA PHLOX

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Rio Arriba County, New Mexico.

SPECIFIC REQUIREMENTS: Open slopes in open woods in mountains.

HABITAT: PONDEROSA-PINON BREEDING HABITAT: N/A

MINIMUM ELEVATION: 6500 MAXIMUM ELEVATION: 7500

THREATS TO TAXON: NONE KNOWN

BRIEF KEY DESCRIPTION: Erect perennial, leaves narrow, 50 mm long;
flowers in loose clusters, bright pink or purple,
flower parts united in a tube. Flowers from late
May to July.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: NO

LA REFERENCE OF OCCURRENCE: N/A

GENERAL MAP LOCATION: N/A

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

APPENDIX D. Vegetation Hierarchical Classification System

Abies concolor Series**Abies concolor (Abco)/Acer glabrum HT****Abco/Quercus gambelii HT****Quercus gambelii Phase****Festuca arizonica Phase****Abco/Arctostaphylos uva-ursi HT****Abco/Berberis repens HT****Abco/Erigeron eximius HT****Abco/Festuca arizonica HT****Festuca arizonica Phase****Poa fendleriana Phase****Quercus gambelii Phase****Abco/Lathyrus arizonicus HT****Abco/Robinia neomexicana HT****Robinia neomexicana Phase****Carex foenea Phase****Abco/Symphoricarpos HT****Pinus ponderosa Phase****Pinus flexilis Phase****Abco/Vaccinium myrtillus HT****Pseudotsuga menziesii Series****Pseudotsuga menziesii (Psme)/Berberis repens HT****Psme/Bromus ciliatus HT****Psme/Festuca arizonica HT****Typic Phase****Pinus aristata Phase****Pinus flexilis Phase****Populus tremuloides Phase****Psme/Muhlenbergia montana HT****Pinus edulis Phase****Pinus flexilis Phase****Psme/Quercus gambelii HT****Quercus gambelii Phase****Festuca arizonica Phase****Muhlenbergia virescens Phase****Psme/Physocarpus monogynus HT****Pinus flexilis (Pifl) Series****Pifl/Arctostaphylos uva-ursi HT****Pinus ponderosa (Pipo) Series****Pipo/Artemisia arbuscula HT****Pipo/Arctostaphylos uva-ursi HT****Pipo/Bouteloua gracilis HT****Bouteloua gracilis Phase****Schizachyrium scoparium Phase****Andropogon hallii Phase****Artemisia tridentata Phase****Quercus gambelii Phase****Pipo/Cowania mexicana HT****Pipo/Festuca arizonica HT****Danthonia parryi Phase****Festuca arizonica Phase**

APPENDIX D. Vegetation Hierarchical Classification System

- Quercus gambelii Phase
- Bouteloua gracilis Phase
- Pipo/Muhlenbergia montana HT
- Pipo/Poa HT
- Pipo/Oryzopsis hymenoides HT
- Pipo/Quercus gambelii HT
 - Quercus gambelii Phase
 - Festuca arizonica Phase
 - Pinus edulis Phase
 - Muhlenbergia montana Phase
- Pipo/Quercus undulata HT
- Pipo/Rockland HT
- Pipo/Juniperus HT
- Great Basin Conifer-Woodland Community
 - Pinyon (Pied)-Juniper (Jumo) Series
 - Pied/Andropogon hallii HT
 - Pied/Arctostaphylos pungens HT
 - Pied/Artemisia tridentata HT
 - Juniperus osteosperma Phase
 - Juniperus monosperma Phase
 - Juniperus scopulorum Phase
 - Pied/Bouteloua gracilis HT
 - Hill slope Phase
 - Juniperus osteosperma Phase
 - Juniperus monosperma Phase
 - Pied/Cowania mexicana HT
 - Cowania mexicana Phase
 - Artemisia tridentata Phase
 - Pied/Chrysothamnus nauseosus-Fallugia paradoxa HT
 - Pied/Cercocarpus montanus HT
 - Quercus undulata Phase
 - Quercus gambelii Phase
 - Pied/Festuca arizonica HT
 - Pied/Poa fendleriana HT
 - Pied/Purshia tridentata HT
 - Pied/Quercus gambelii HT
 - Pied/Quercus undulata HT
 - Pied/Stipa columbiana HT
 - Pied/Jumo/Bouteloua gracilis HT
 - Pied/Jumo/Muhlenbergia montanus HT
 - Jumo/Andropogon hallii HT
 - Jumo/Artemisia tridentata HT
 - Jumo/Bouteloua curtipendula HT
 - Jumo/Bouteloua gracilis HT
 - Jumo/Ceratoides lanata HT
 - Jumo/Chrysothamnus nauseosus-Fallugia paradoxa HT
 - Jumo/Quercus undulata

APPENDIX D. Vegetation Hierarchical Classification System

Scrub land Formation

- Arctic-Boreal Scrubland Climatic Zone
 - Rocky Mountain Alpine and Subalpine Scrub Community
 - Willow Series Spruce elfinwood Series
 - Bristle cone pine elfinwood Series
- Cold Temperate Scrubland Climatic Zone
 - Great Basin Montane Scrub Community
 - Oak scrub Series
 - Mountain mahogany Series
 - Maple scrub Series
 - Serviceberry Series
 - Bitterbrush Series
 - Mixed deciduous Series
 - Plains Deciduous Scrub Community
 - Oak scrub Series
 - Sumac Series
 - Mixed deciduous Series

Grassland Formation

- Arctic-Boreal Grassland Climatic Zone
 - Rocky Mountain Alpine and Subalpine Grassland Community
 - Sedge-Forb-Grass Series
- Cold Temperate Grasslands Climatic Zone
 - Plains Grassland Community
 - Blue grama (Bogr) grass Series
 - Bogr/Western wheatgrass HT
 - Bogr/Buffalo grass HT
 - Bogr/Galleta HT
 - Bogr/Black grama HT
 - Bogr/Needlegrass HT
 - Bogr/Winterfat HT
 - Mixed grama Series
 - Sideoats grama (Bocu)/Bluestem/Jumo HT
 - Bocu/Bogr HT Bocu/Black grama HT
 - Bocu/Curly mesquite HT
 - Bocu/Metcalf muhly/Jumo HT
 - Bocu/Bluestem HT
 - Mixed grama/Jumo HT
 - Buffalo grass/Blue grama Series
 - Shrub-Grass disclimax Series
 - Great Basin Shrub Grassland Community
 - Wheatgrass Series
 - Mixed bunchgrass Series
 - Rice grass/Galleta Series
 - Galleta/Rice grass/Jumo HT
 - Rice grass/Sagebrush Series
 - Galleta/Sagebrush HT
 - Western wheatgrass/Sagebrush HT
 - Sacaton/Saltbush Series
 - Sacaton/Shadscale/Fourwing HT
 - Mixed grama/western wheatgrass Series

APPENDIX D. Vegetation Hierarchical Classification System

Mixed grama/Juno HT
Cheatgrass disclimax Series
Rocky Mountain Montane Grassland Community
Fescue Series
Thurber fescue/Arizona fescue HT
Arizona fescue/Mountain muhly HT
Mumo/Pine dropseed Series
Carex/Tufted hairgrass Series
Mixed Meadow Series
Rush Series
Fern Series
Iris disclimax Series

Wetland Vegetation

Formation

Climatic Zone

Community

Series

Habitat Type

Phase

Forest Formation

Cold Temperate Swamp and Riparian Forest Climatic Zone

Plains and Great Basin Riparian-Deciduous Forest Community

Cottonwood/Willow Series

Fraxinus pennsylvanicus (Frpe) Series

Juglans major/Platanus wrightii Series

Platanus wrightii Series

Platanus wrightii/Frpe Series

Populus fremontii Series

Populus fremontii/Salix goodingii Series

Salix bonplandiana Series

Sapindus saponaria/Juglans major Series

Rocky Mountain Riparian-Deciduous Forest Community

Cottonwood/Willow Series

Mixed broadleaf Series

Acer negundo Series (? HT)

Acer negundo/Mixed deciduous Series (? HT)

Alnus oblongifolia Series (? HT)

Juglans major Series (? HT)

Acer grandidentatum/Abies concolor Series (? HT)

Picea pungens Series (? HT)

Populus angustifolia Series (? HT)

Swamp-Scrub Formation

Arctic-Boreal Swamp-Scrub Climatic Zone

Rocky Mountain Alpine and Subalpine Swamp and Riparian-Scrub Community

Alnus tenuifolia Series

APPENDIX D. Vegetation Hierarchical Classification System

Alnus tenuifolia/Mixed deciduous Series
Salix bebbiana Series
Salix exigua Series
Salix irrorata Series
Salix scouleriana Series
Plains and Great Basin Riparian-Scrub Community
Willow Series
Hymenoclea monogyra Series
Juglans microcarpa Series
Salt cedar discimax Series
Rocky Mountain Riparian-Scrub Community
Willow/Dogwood Series

Marshland Formation

Arctic-Boreal Marshland Climatic Zone
Rocky Mountain Alpine and Subalpine Marshland Community
Rush Series
Manna Grass Series
Plains Interior Marshland Community
Rush Series
Bur-reed Series
Cattail Series
Bulrush Series
Rocky Mountain Montane Marshland Community
Rush Series
Great Basin Interior Marshland Community
Rush Series
Saltgrass Series

Strand Formation

Arctic-Boreal Strand Climatic Zone
Rocky Mountain Alpine and Subalpine Stream and
Lake Strand Community
Cold Temperate Strand Climatic Zone
Plains Interior Strand Community
Annual Series
Rocky Mountain Montane Stream and Lake Strand Community
Annual Series
Great Basin Interior Strand Community
Annual Series

APPENDIX E. Plant Species Code List

Plant species code list for 1991 surveys in Operable Unit 1148

SCIENTIFIC NAME	CODE	COMMON NAME
<i>Agropyron smithii</i>	Agsm	Western wheatgrass
<i>Agropyron trachycaulum</i>	Agtr	Slender wheatgrass
<i>Agrostis alba</i>	Agal	Red top
<i>Andropogon sp.</i>	Andx	Bluestem
<i>Andropogon gerardii</i>	Ange	Big bluestem
<i>Andropogon scoparius</i>	Ansc	Little bluestem
<i>Antennaria parvifolia</i>	Anpa	Pussytoes
<i>Aristida longiseta</i>	Arlo	Red three-awn
<i>Artemisia carruthii</i>	Arca	Wormwood
<i>Artemisia dracunculus</i>	Ardr	False tarragon
<i>Artemisia ludoviciana</i>	Arlu	Louisiana wormwood
<i>Bahia dissecta</i>	Badi	Wild chrysanthemum
<i>Blepharoneuron tricholepis</i>	Bltr	Pine dropseed
<i>Bouteloua curtipendula</i>	Bocu	Side-oats grama
<i>Bouteloua gracilis</i>	Bogr	Blue grama
<i>Bromus anomalus</i>	Bran	Nodding brome
<i>Bromus sp.</i>	Brox	Bromegrass
<i>Bromus tectorum</i>	Brte	Downy chess
<i>Carex sp.</i>	Carx	Sedge
<i>Castilleja integra</i>	Cain	Foothills paintbrush
<i>Cercocarpus montanus</i>	Cemo	Mountain mahogany
<i>Chenopodium graveolens</i>	Chgr	Chenopodium
<i>Chrysopsis foliosa</i>	Chfo	Leafy golden aster
<i>Chrysopsis villosa</i>	Chvi	Hairy golden aster
<i>Cirsium sp.</i>	Cirx	Thistle
<i>Coryza canadensis</i>	Coca	Horseweed
<i>Cryptantha jamesii</i>	Crja	James hiddenflower
<i>Erigeron divergens</i>	Erdi	Spreading fleabane
<i>Erigeron sp.</i>	Erix	Daisy
<i>Erigeron jamsii</i>	Erja	Fleabane daisy
<i>Fallugia paradoxa</i>	Fapa	Apache plume
<i>Gaillardia pulchella</i>	Gapu	Firewheel
<i>Geranium caespitosum</i>	Geca	James geranium
<i>Gilia sp.</i>	Gili	Gilia
<i>Gutierrezia sarothrae</i>	Gusa	Snakeweed
<i>Holodiscus australis</i>	Hoau	Ocean-spray
<i>Hymenoxys sp.</i>	Hymx	Hymenoxys
<i>Hymenoxys richardsonii</i>	Hyri	Pingue
<i>Ipomopsis longiflora</i>	Iplo	Pale trumpet
<i>Juniperus monosperma</i>	Jumo	One-seeded juniper
<i>Lupinus sp.</i>	Lupine	Lupine
<i>Mammalaria sp.</i>		Mammalaria
<i>Melilotus albus</i>	Meal	White sweet clover
<i>Monarda menthaefolia</i>	Mome	Horesmint
<i>Monarda pectinata</i>	Mope	Ponymint
<i>Muhlenbergia montana</i>	Mumo	Mountain muhly

<i>Muhlenbergia wrightii</i>	Muwr	Spike muhly
<i>Munroa squarrosa</i>	Musq	False Buffalo grass
<i>Mustard</i>		Mustard
<i>Opuntia sp.</i>	Opux	Prickly pear cactus
<i>Oryzopsis hymenoides</i>	Orhy	Indian ricegrass
<i>Penstemon sp</i>	Penx	Beardtongue
<i>Philadelphus microphyllus</i>	Phmi	Mockorange
<i>Pinus edulis</i>	Pied	Pinyon pine
<i>Poa sp.</i>	Poax	Bluegrass
<i>Poa fendleriana</i>	Pofe	Bluegrass
<i>Populus angustifolia</i>	Poan	Narrowleaf cottonwood
<i>Pinus ponderosa</i>	Pipo	Ponderosa pine
<i>Pseudotsuga menziesii</i>	Psme	Douglas fir
<i>Ptelae trifoliata</i>	Pptr	New Mexico hops
<i>Quercus gambelii</i>	Quga	Gambel oak
<i>Quercus undulata</i>	Quun	Wavyleaf oak
<i>Rhus trilobata</i>	Rhtr	Skunkbush
<i>Ribes cerceum</i>	Rice	Wax current
<i>Robinia neomexicana</i>	Rone	New Mexico locust
<i>Salix sp.</i>	Salix	Willow
<i>Salsola kali</i>	Saka	Russian thistle
<i>Senecio fendleri</i>	Sefe	Fendler's senecio
<i>Senecio longilobus</i>	Selo	Groundsel threadleaf
<i>Sitanion hystrix</i>	Sihy	Bottlebrush squirreltail
<i>Sporobolus cryptandrus</i>	Spcr	Sand dropseed
<i>Stipa sp.</i>	Stipa	Needlegrass
<i>Verbascum thapsus</i>	Veth	Mullein

APPENDIX F. Raw Data Summaries for OU 1148

OVERSTORY

Canada del Buey, North Facing Slope

Species	Species	Ave. DBH	Trees/Acre	Rel Density	Rel %Cover	Rel %Cover	Rel Freq	Rel Freq	Importance Index
JUMO	JUMO	6.708333	74.67	66.67	9.39	58.30	1.71	66.67	63.88
PIPO	PIPO	5.942857	21.78	19.44	4.49	27.86	0.50	19.44	22.25
JUSC	JUSC	3.3	15.56	13.89	2.23	13.84	0.36	13.89	13.87
PIED	PIED	4.351724	90.23	80.56	13.51	83.94	2.07	80.56	81.68

Total = Total = 15.95 112.01 100.00 16.10 100.00 2.57 100.00 100.00

Species	Species	Stems/Acre	Rel Density	Rel Cover	Rel Cover	Rel Freq	Rel Freq	Importance Index
CEMO	CEMO	136.90	18.97	1.97	4.38	3.14	18.98	14.11
PTTR	PTTR	112.01	15.52	0.94	2.09	2.57	15.53	11.05
QUGA	QUGA	211.58	29.31	36.23	80.46	4.86	29.33	46.37
RHTR	RHTR	74.67	10.34	3.49	7.74	1.71	10.35	9.48
RONE	RONE	6.22	0.86	0.77	1.71	0.14	0.86	1.15
RICE	RICE	18.67	2.59	0.20	0.44	0.43	2.59	1.87
PHMI	PHMI	161.79	22.41	1.43	3.17	3.71	22.43	16.01

Total = Total = 721.84 100.00 45.03 100.00 16.56 100.07 100.02

Pajarito, South Facing Slope

	#Stems	# Stems/A	Rel Density	Rel AVG DBH	Rel %Cover	Rel Cover	Rel % Freq	Rel Freq	Import Index

Trees									
JUMO	19	41.75824	15.32	4.96	7.55	23.10	0.857142	28.57	22.33
PIED	3	6.593406	2.42	1.60	3.80	11.63	0.428571	14.29	9.44
JUSC	4	8.791208	3.23	1.58	1.73	5.30	0.428571	14.29	7.61
POAN	94	206.5934	75.81	0.92	8.34	25.54	0.857142	28.57	43.30
PIPO	4	8.791208	3.23	5.80	11.25	34.43	0.428571	14.29	17.31

Total = 124 272.5274 100 14.85107 32.67777 100 3 100 100

Shrubs

FAPA	557	1224.175	58.39	1.70	35.13	32.90	0.857142	26.09	39.12
ARTR	125	274.7252	13.10	1.90	50.15	46.97	0.857142	26.09	28.72
CHNA	38	83.51648	3.98	1.00	8.85	8.29	0.571428	17.39	9.89
SALX	204	448.3516	21.38	1.00	10.10	9.46	0.714285	21.74	17.53
RHTR	30	65.93406	3.14	0.20	2.55	2.39	0.285714	8.70	4.74

Total = 954.00 2096.70 100.00 5.80 106.78 100.00 3.29 100.00 100.00

Canada del Buey, Canyon Bottom

Species	Avg DBH	Trees/		Rel		Rel		Rel Importance	
		Acre	Density	%Cover	%Cover	Freq	Freq	Index	
JUMO	3.83	18.67	66.67	1.09	77.55	0.43	66.67	70.29	
PIED	0.10	6.22	22.22	0.00	0.00	0.14	22.22	14.81	
PIPO	2.90	3.11	11.11	0.31	22.45	0.07	11.11	14.89	

Total =	6.83	28.00	100.00	1.40	100.00	0.64	100.00	100.00	

Species	Stems/		Rel		Rel		Rel Importance	
	Acre	Density	Cover	Cover	Freq	Freq	Index	
CHNA	10.25	0.52	0.63	5.28	0.35	6.39	4.06	
QUGA	46.12	2.36	4.37	36.69	1.18	21.27	20.11	
ARTR	151.18	7.73	2.29	19.18	1.71	30.85	19.26	
RICE	351.04	17.96	0.00	0.00	0.82	14.89	10.95	
RHTR	1396.48	71.43	4.63	38.85	1.47	26.59	45.62	

Total =	1955.07	100.00	11.91	100.00	5.53	100.00	100.00	

TA-54, Area G, NE transect

Species	Avg DBH	Trees/		Rel		Rel		Rel Importance	
		Acre	Density	%Cover	%Cover	Freq	Freq	Index	
JUMO	4.50	126.32	42.03	13.17	48.71	2.90	42.03	44.26	
PIED	4.99	174.24	57.97	13.87	51.29	4.00	57.97	55.74	

Total =	9.49	300.56	100.00	27.04	100.00	6.90	100.00	100.00	

Species	Stems/		Rel		Rel		Rel Importance	
	Acre	Density	Cover	Cover	Freq	Freq	Index	
ARTR	2.18	100.00	0.16	100.00	0.05	100.00	100.00	

Total =	2.18	100.00	0.16	100.00	0.05	100.00	100.00	

TA-54, Area G

Species	Avg DBH	Trees/ Acre	Rel Density	%Cover	Rel %Cover	Freq	Rel Freq	Rel Importance Index
JUMO	4.97	127.57	64.06	6.86	34.78	2.93	64.06	54.30
PIED	4.47	71.56	35.94	12.86	65.22	1.64	35.94	45.70

Total =	9.45	199.13	100.00	19.71	100.00	4.57	100.00	100.00

Species		Stems/ Acre	Rel Density	Cover	Rel Cover	Freq	Rel Freq	Rel Importance Index
RICE		56.01	58.06	0.41	25.22	0.14	7.69	30.32
ARTR		34.23	35.48	1.19	72.17	1.43	76.92	61.53
ATCA		6.22	6.45	0.04	2.61	0.29	15.38	8.15

Total =		96.45	100.00	1.64	100.00	1.86	100.00	100.00

TA-54, Area G, SW transect

Species	Avg DBH	Trees/ Acre	Rel Density	%Cover	Rel %Cover	Freq	Rel Freq	Rel Importance Index
JUMO	4.04	102.37	47.47	9.98	30.54	2.35	47.47	41.83
PIED	5.06	113.26	52.53	22.70	69.46	2.60	52.53	58.17

Total =	9.11	215.62	100.00	32.68	100.00	4.95	100.00	100.00

Species		Stems/ Acre	Rel Density	Cover	Rel Cover	Freq	Rel Freq	Rel Importance Index
RICE		6.53	33.32	0.09	100.00	0.05	33.33	55.55
ARTR		13.07	66.68	0.00	0.00	0.10	66.67	44.45

Total =		19.60	100.00	0.09	100.00	0.15	100.00	100.00

UNDERSTORY

Canada del Bucy, North Facing Slope

Species	880	890	900	910	920	930	940	950	960	970	980	990	1000	Plant Cover	Rel. Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	0	45	65	20	0	15	0	0	0	80	0	0	0					
ROCK	0.1	40	25	65			20	94.9	15		70	25	25					
LITTER	99.9	10	5	10	60	65	65	5	75	20	5	25	50					
MUMO														0.30	1.60	0.02	1.30	1.45
MUMR			5	5	15	20	10	0.1	10		5			3.10	16.59	0.29	18.83	17.71
SOIL CRUST														0.20	1.07	0.04	2.60	1.83
MOSS/LICHEN							5				20	50	25	5.70	30.46	0.37	24.03	27.24
BOGR		5												2.85	15.24	0.22	14.29	14.76
ARLU														0.85	4.56	0.20	12.99	8.78
AKDR														0.05	0.27	0.01	0.65	0.46
QUGA														0.75	4.01	0.03	1.95	2.98
GRASS B														3.20	17.10	0.14	9.09	13.10
GRASS C														0.20	1.07	0.03	1.95	1.51
RONE														0.00	0.00	0.00	0.00	0.00
RICE														0.00	0.00	0.00	0.00	0.00
ORHY														0.10	0.53	0.01	0.65	0.59
PHMI														0.10	0.54	0.02	1.30	0.92
POA														0.20	1.07	0.03	1.95	1.51
FAPA														0.05	0.27	0.01	0.65	0.46
ERJA														0.10	0.53	0.02	1.30	0.92
GUSA														0.15	0.80	0.02	1.30	1.05
OPUNTIA														0.15	0.81	0.03	1.95	1.38
PIED														0.30	1.60	0.01	0.65	1.13
GOLDEN ASTER														0.05	0.27	0.01	0.65	0.46
STIPA														0.05	0.27	0.01	0.65	0.46
PHORB 1														0.00	0.01	0.01	0.65	0.33
JUMO					25									0.25	1.34	0.01	0.65	0.99
	100	100	100	100	100	100	100	100	100	100	100	100	100	18.712	100	1.54	100	100

Pajarito, South Facing Slope

Species	580	590	600	610	620	630	640	650	660	670	680	690	700	REL			IMPORT			
														PLANT COVER	PLANT COVER	FREQ		REL FREQ	INDEX	
BARE SOIL	40		50		35	20							35	70	50	0.00	0.00	0.00	0.00	0.00
ROCK					50	50										0.07	0.41	0.01	1.05	0.73
LITTER	10	70	25	40			70	75	25	75	25					0.51	2.95	0.07	5.26	4.11
SPCR																6.93	39.78	0.44	32.63	36.21
BOGR	25		25	5	10	25	5	25	25				25	5		0.07	0.41	0.01	1.05	0.73
ARDR																0.00	0.00	0.00	0.00	0.00
																0.00	0.00	0.00	0.00	0.00
																0.00	0.00	0.00	0.00	0.00
CRTR																0.00	0.01	0.01	1.05	0.53
CUCA																0.01	0.08	0.01	1.05	0.57
GAPU																0.07	0.41	0.01	1.05	0.73
																0.00	0.00	0.00	0.00	0.00
POAX																1.71	9.84	0.14	10.53	10.18
ERDI																0.21	1.23	0.04	3.16	2.19
CRJA																0.14	0.82	0.03	2.11	1.46
AGSM															25	0.86	4.92	0.09	6.32	5.62
VEIH																0.23	1.31	0.04	3.16	2.24
MEAL				5	5	5										0.57	3.28	0.11	8.42	5.85
ARIR									50							2.36	13.53	0.09	6.32	9.92
IPLO																0.00	0.01	0.01	1.05	0.53
GUSA																0.14	0.82	0.01	1.05	0.94
SINY																0.07	0.41	0.01	1.05	0.73
AGAL																0.07	0.41	0.01	1.05	0.73
HOAU																0.14	0.82	0.01	1.05	0.94
GECA																0.09	0.49	0.03	2.11	1.30
FAPA	25	25		50			25			25	15					2.71	15.58	0.10	7.37	11.48
QUGA		5														0.07	0.41	0.01	1.05	0.73
SAEX															25	0.36	2.05	0.01	1.05	1.55
SELO																0.00	0.00	0.00	0.00	0.00
CIRX																0.00	0.00	0.00	0.00	0.00

Canada del Bucy, Canyon Bottom

Species	910	920	930	940	950	960	970	980	990	1000	Plant Cover	Rel. Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	80	70	70	25	70	15	0	10	75	0					
ROCK															
LITTER	5	10	10	25	5	60	35	65	10	25					
GRASS A			10	25	25						3.75	11.34	0.15	6.61	8.97
CHVI											0.40	1.21	0.03	1.32	1.27
MUMO											0.50	1.51	0.06	2.64	2.08
MUWR											2.45	7.41	0.13	5.73	6.57
BOGR	10			25		5	60			70	14.50	43.85	0.65	28.63	36.24
ARCA		10						15			3.45	10.44	0.27	11.89	11.17
LICHEN/MOSS											0.30	0.91	0.08	3.52	2.22
SIHY											0.00	0.00	0.01	0.44	0.22
ERJA		5									0.15	0.46	0.04	1.76	1.11
PENSTEMON											0.10	0.30	0.02	0.88	0.59
BROMUS	5								5		0.50	1.52	0.11	4.85	3.18
BRTE											0.80	2.42	0.07	3.08	2.75
GAPU									5		1.15	3.48	0.12	5.29	4.38
ANDx		5				10				5	1.10	3.33	0.14	6.17	4.75
LUPINE									5		0.20	0.61	0.04	1.76	1.18
PHORB A											0.00	0.01	0.02	0.88	0.44
HYRI											0.00	0.00	0.00	0.00	0.00
SOIL CRUST						5	5	5			1.60	4.84	0.15	6.61	5.72
ARDR						5		5			0.20	0.60	0.04	1.76	1.18
PIED											0.00	0.00	0.01	0.44	0.22
POA											0.55	1.66	0.02	0.88	1.27
PHORB B											0.00	0.00	0.01	0.44	0.22
MOME											0.05	0.15	0.02	0.88	0.52
PHORB C											0.35	1.06	0.02	0.88	0.97
CRJA			5								0.25	0.76	0.02	0.88	0.82
QIGA											0.20	0.60	0.01	0.44	0.52
GILE											0.05	0.15	0.01	0.44	0.30
ARTR											0.40	1.21	0.01	0.44	0.82
MOPE			5								0.05	0.15	0.01	0.44	0.30
TOTAL	100	100	100	100	100	100	100	100	100	100	33.077	100	2.27	100	100

TA-54, Area G, NE transect

Species	790	800	810	820	830	840	850	860	870	890	900	910	920	930	Plant Cover	Rel.		Importance Index	
																Plant Cover	Rel. Freq.		
Bare Soil	0	0	0	45	0	40	40	40	70	60	69.8	70	10	0					
Rock																			
Litter	90	100	95	5	90			25	5	5	10	5	65	100					
BOGR	10		5	25	10	50	50	25	25	20	5	5	5		5.97	33.64	0.47	40.74	37.19
HYRI							10								0.27	1.51	0.03	2.78	2.15
POFE															0.54	3.03	0.08	6.48	4.75
SOIL CRUST				25				10			15	20	20		7.80	43.91	0.30	25.93	34.92
OPUNTIA						10				15					1.62	9.10	0.15	12.96	11.03
GUSA															0.59	3.33	0.02	1.85	2.59
CNFO															0.00	0.01	0.01	0.93	0.47
LICHEN/MOSS															0.91	5.15	0.03	2.78	3.96
ARISTIDA															0.00	0.01	0.01	0.93	0.47
MUSTARD															0.00	0.00	0.00	0.00	0.00
SIHY															0.05	0.30	0.01	0.93	0.61
PHORB A											0.1				0.00	0.02	0.03	2.78	1.40
CYMOPTERUS											0.1				0.00	0.01	0.01	0.93	0.47
Total =	100	100	100	100	100	100	100	100	100	100	100	100	100	100	17.755	100	1.1613	100	100

TA-54, Area G

Species	30	40	50	60	70	80	90	100	10	20	30	40	50	60	70	80	90	100	Rel.		Importance Index			
																			Plant Cover	Plant Cover		Rel. Freq.	Rel. Freq.	
Bare Soil	0	55	90	0	40	0	0	0	70	90	49.9	25	15	0	75	30	90	50						
Rock				50	50	50	50					25	50		10									
Litter	100	25		50		50	50	100	10	10		50		70		10		40						
BOGR		10	10		10				10		25			25	20	15	25	10	10	8.79	64.38	0.51	57.14	60.76
HYRI																				0.43	3.14	0.04	4.76	3.95
GUSA									10				10			25				0.79	5.77	0.07	7.94	6.85
OPUNTIA		10																		1.22	8.91	0.13	14.29	11.60
Soil Crust																				1.21	8.90	0.04	4.76	6.83
POFE																				0.43	3.14	0.03	3.17	3.16
PIED																				0.14	1.05	0.01	1.59	1.32
POA											25			10						0.50	3.66	0.03	3.17	3.42
MAMMALARIA											0.1									0.00	0.01	0.01	1.59	0.80
unknown																10				0.14	1.05	0.01	1.59	1.32
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	13.649	100	0.9	100	100

TA-54, Area G, SW transect

Species	860	870	880	890	900	910	920	930	940	950	960	970	980	990	1000	Plant Cover	Rel. Plant Cover	Rel. Freq.	Importance Index
Bare Soil	75	70	55	90	85	5	25	99.9	40	30	55	80	30	25					
Rock							25												
Litter	5	10	25	5		85	25	0.1						25	10				
SOIL CRUST	10		10	5					50	50	25	10		25	90				
BOGR	10	10	10		10	5	25		10	10	10	10	10			3.00	42.51	0.19	27.14
GUSA		10				5			10							3.10	43.94	0.31	44.29
SIHY							5				10					0.10	1.44	0.04	5.71
LICHEN/MOSS																0.05	0.71	0.01	1.43
ARDR																0.05	0.74	0.03	4.29
POA																0.00	0.00	0.00	0.00
OPUNTIA					5											0.20	2.85	0.04	5.71
PIED										10			10			0.50	7.08	0.06	8.57
Total =	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	7.06	100.00	0.70	100.00

TA-51

TA-51 Sept. 11

Species	270	280	290	300	310	320	330	340	350	360	370	380	390	400	Plant Cover	Rel. Plant Cover	Rel. Freq.	Importance Index
Bare Soil	60	4.9	0	75	59.9	85	0	10	5	80	60	84.9	29.9	0				
Rock		10			35				95	20	40							
Litter	15	80	95	15	0.1	10	100	90				0.1	70	80				
BOGR	5	0.1	5		5	5							0.1	20	2.76	40.01	0.48	46.34
MUMO												15			0.38	5.47	0.05	4.88
OPUNTIA	20	5		5											1.88	27.15	0.18	17.07
BADI															0.38	5.50	0.10	9.76
SEFE				5											1.38	19.91	0.10	9.76
COCA															0.00	0.04	0.03	2.44
EUPHORB															0.00	0.04	0.03	2.44
JUMO															0.01	0.07	0.05	4.88
HYMONOXIS															0.13	1.81	0.03	2.44
BOCU										15					0.38	5.43	0.03	2.44
ERIGERON										5	0.1	5			0.25	3.66	0.08	7.32
Total =	100	100	100	100	100	100	100	100	100	100	100	100	100	100	6.905	100	1.025	100



APPENDIX G. Letter of Concurrence

CONFIRMATION

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Ecological Services
Suite D, 3530 Pan American Highway, NE
Albuquerque, New Mexico 87107

July 8, 1993

Cons. #2-22-93-I-251

Mr. Jerry Bellows
Department of Energy
Los Alamos Area Office
Los Alamos, New Mexico 87544

Dear Mr. Bellows:

This responds to your letter dated June 4, 1993, requesting written concurrence with the no effect findings delineated in four Biological and Floodplain/Wetland Assessment (BA) reports provided by your office. Research activities at Los Alamos National Laboratories have resulted in a large number of Solid Waste Management Units (SWMUs). The proposed action involves the second phase, the Site Characterization Phase (SCP), of the four part Environmental Restoration Program underway at Los Alamos National Laboratories. This phase involves collection of soil and water samples for analysis of SWMUs. Sampling will vary from surface samples of no greater than 10 inches to core drilling to depths of greater than 200 feet. The BAs evaluate portions of Operable Units (OUs) 1071, 1079, 1129, 1147, and 1148. Your geographic area of interest is Los Alamos, New Mexico.

We have used the information in your request to narrow the list of species occurring in the project area to those that may be affected by the proposed action. The following listed and candidate species may be found in the project area:

Endangered Species

American peregrine falcon (Falco peregrinus anatum)
bald eagle (Haliaeetus leucocephalus)

Threatened Species

Mexican spotted owl (Strix occidentalis lucida)

Category 1 Candidates

New Mexican jumping mouse (Zapus hudsonius luteus)
southwestern willow flycatcher (Empidonax traillii extimus)

JUL 12 2 30 PM '93

Category 2 candidates

Goat Peak pika (Ochotona princeps nigrescens)
occult little brown bat (Myotis lucifugus occultus)
spotted bat (Euderma maculatum)
loggerhead shrike (Lanius ludovicianus)
northern goshawk (Accipiter gentilis)
Jemez Mountain salamander (Plethodon neomexicanus)
grama grass cactus (Pediocactus papyracanthus)

The endangered peregrine falcon (Falco peregrinus anatum) is known to occur within the OUs 1071 and 1079. Terrell Johnson, a noted authority, has been subcontracted to develop a habitat management plan for the peregrine falcon. The U.S. Fish and Wildlife Service (Service) concurs with the time restrictions delineated on page 3 of the BA for OU 1079, which states, "... all activities resulting in disturbance within "critical habitat" (sensitive habitat) be scheduled from September 1 through February 28 to avoid breeding and nesting periods." No sampling within sensitive habitat should be conducted outside the schedule mentioned above. Additionally, the Service defines "activities resulting in disturbance" to include any activity within the sensitive habitat area including passage through the area.

Mexican spotted owl surveys should be conducted prior to SCP sampling initiation. All activities within ¼ mile of nest or roost sites should be scheduled from August 31 through February 1 to avoid breeding and nesting periods.

On January 30, 1992, the Service received a petition to list the southwestern willow flycatcher (Empidonax traillii extimus). The Service recently completed a status review for this species and must now determine whether listing is warranted.

Category 1 candidate species are those for which the Service has substantial information to support their listing as endangered or threatened. The development and publication of proposed rules for these species are anticipated. Category 2 candidate species are those for which the Service has information indicating that proposing to list is possibly appropriate, but for which substantial data on biological vulnerability or threats are not currently available to support the immediate preparation of such rules. Candidate species have no legal protection under the Endangered Species Act and are included in this document for planning purposes only. However, the Service is concerned and would appreciate receiving any status information that is available or gathered on these species.

All sample extractions will take place in the presence of a Environmental Protection Agency (EPA) monitor. If at any time the monitor determines that air emission levels exceed EPA standards, sampling will be terminated and the SCP Biological Assessment process will be reinitiated.

Mr. Jerry Bellows

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Based on the information provided and Los Alamos National Laboratories compliance with the above mentioned conditions, the Service concurs with the no effect finding. If we can be of further assistance, please call Elizabeth Cervantes at (505) 883-7877.

Sincerely,

Sonja Jahnsoeberger
for Jennifer Fowler-Propst
Field Supervisor

cc: (wo/enc)

Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Director, New Mexico Energy, Minerals and Natural Resources Department,
Forestry and Resources Conservation Division, Santa Fe, New Mexico