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TITLE: Biological and Floodplain Wetland Assessment for the Environmental Restoration Program Operable Unit 1130, TAs 36, 68 and 71.

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**BIOLOGICAL EVALUATION**  
**FOR**  
**ENVIRONMENTAL RESTORATION PROGRAM**  
**OPERABLE UNIT 1130,**  
**TAs 36, 68, AND 71**

**Los Alamos National Laboratory**  
**Los Alamos, New Mexico**

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**DRAFT April, 1993**

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## 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 1991 to provide information for a site-characterization plan. The purpose of the field 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) 1130. The information gathered from the field surveys was compared with habitat requirements of potentially occurring protected species (both threatened and endangered).

The vegetation surveys indicated primarily two vegetation communities within and adjacent to OU 1130: the Rocky Mountain Montane Conifer Forest and the Great Basin Conifer Woodland communities. Floodplains and wetlands are also located within the canyons. Following a search of BRET's threatened, endangered, and sensitive (TES) species database, and after consulting with state and federal agencies, we listed several plant and wildlife species as potentially occurring in OU 1130. Four species, the goshawk, spotted bat, stream orchid, and grama grass cactus have moderate-to-high potential for inhabiting the OU. Further species-specific studies are required to ascertain their actual existence in the area. However, if BRET monitors the sites before and during sampling, and restricts the period of construction, the potential impacts should be minimal to these species and to nonprotected species of both plants and animals in this OU.

## EXECUTIVE SUMMARY

During 1992, the Biological Resource Evaluations Team (BRET) of the Environmental Protection group (EM-8) conducted field surveys for Operable Unit (OU) 1130. The Environmental Restoration Program of Los Alamos National Laboratory (LANL) proposes 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 (SWMUs)

The purpose of the survey was threefold. The first purpose was to determine before site-characterization sampling if there were any plant or wildlife species or critical habitats within the OU boundaries that are protected by the state or federal government. Second, we surveyed for sensitive areas, such as floodplains and wetlands, within the sites to be sampled, 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 to the of the sites chosen for site-characterization sampling. These data will also aid in determining presampling conditions,

which can be compared to data collected at the same locations in future studies. Furthermore, this information is necessary to support National Environmental Policy Act (NEPA) documentation, and may determine a categorical exclusion for the site-characterization sampling plan.

These surveys were conducted to comply 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 (EO) 11990 "Protection of Wetlands," and EO 11988, "Floodplain Management"; Code of Federal Regulation 10 CFR 1022; and finally, Department of Energy (DOE) Order 5400.1.

BRET conducted a habitat evaluation survey (Level 2) after searching an EM-8 database. The database contains the habitat requirements for all state and federally listed threatened, endangered, and sensitive (TES) plant and animal species known to exist within LANL boundaries and the surrounding areas. We used a combination of line transects and Daubenmire plots to conduct the Level 2 surveys. 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.

We compared the habitat information gathered during field surveys with the habitat requirements for each species of concern that we identified in the database search. If habitat requirements were not met for any species of concern, 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, we conducted specific surveys for the species of concern. 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, we noted all wetlands and floodplains within the survey area using the National Wetland Inventory Maps followed by field checks. We also noted the characteristics of wetlands, floodplains, and riparian areas using the criteria outlined in the "Federal Manual for Delineating Jurisdictional Wetlands." However, wetland boundaries were not delineated during these surveys because of their continual fluctuation. Therefore, wetland boundaries will be delineated just before site sampling to ensure that the disturbance will be outside the areas that meet the wetland criteria (based on hydrophytic plants, hydric soils, and hydrology). Delineations are valid for only two years; therefore, they are most effective when done at the time of sampling.

We searched databases containing historical information and biological reports of any previous surveys within or near the areas to be sampled. This information was reviewed and is summarized in this document as background information that can be used in future ecological risk assessments and pathways analyses.

The OU 1130 terrain has essentially two types of topographic features: canyons and mesas. The canyon system includes Portrillo, Fence, and Water, where topography ranges from fairly level grassy mesa-tops, forested slopes, steep canyon cliffs and canyon bottoms. Level 2 surveys were conducted on mesa tops, north- and south-facing slopes, canyon bottoms, and riparian zones.

In general, OU 1130 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 in the Ponderosa Pine, Piñon-Juniper, and Juniper Grassland series. Among the transects, and dependent on location, the dominant overstory species were ponderosa pine, piñon pine, and one-seed juniper is the dominant; the dominant shrub species were squawbush, wavyleaf oak, mountain mahogany, and rabbitbrush. Blue grama grass is the dominant understory plant, with wormwood, false tarragon, golden aster, sedge, and little blue stem.

Our TES database search and consultation with state and federal agencies indicated that four potential species of concern have a moderate-to-high potential for inhabiting the OU (based on habitat and known occurrences). These include: goshawk, spotted bat, stream orchid, and grama grass cactus. Further species-specific studies are required to ascertain their actual existence in the area. However, if BRET monitors the sites before and during sampling, and restricts the period of construction, the potential impacts should be minimal to these species and to nonprotected species of both plants and animals in this OU.

## 1 INTRODUCTION

During 1992, BRET conducted a biological assessment for the site characterization or "sampling phase" of the Environmental Restoration program for OU 1130. BRET surveyed for threatened, endangered, and sensitive species, and floodplain and wetlands within and near the boundaries of OU 1130, Technical Areas (TA) 36, 68, and 71. These studies are instrumental in evaluating the proposed site-characterization (sampling) phase of the Environmental Restoration Program, and are conducted in order to comply with the Federal Endangered Species Act, New Mexico's endangered species laws, and the Floodplain/Wetlands Executive Orders 11990 and 11988. The sites will be sampled to characterize hazards, waste releases, and constituents from Solid Waste Management Units (SWMUs). The proposed activity was evaluated for its impact on TES species and floodplain and wetlands in accordance with the 1973 Federal Endangered Species Act, New Mexico's Wildlife Conservation Act (WCA), New Mexico's Endangered Plant Species Act (EPSA), Floodplain/Wetland Executive Orders (EOs) 11990 and 11988, Department of Energy (DOE) Order 5400.1 (Environmental Compliance), 10 CFR 1022, and the National Environmental Policy Act.

The sampling will consist of removing soil samples with hand-held auger drills or auger-mounted heavy machinery; additional disturbances may occur. This assessment was also designed to provide baseline information for long-term monitoring of the plant and wildlife communities in the sites.

BRET read 15 transects to quantify the vegetative communities of OU 1130. All understory plant species were analyzed for their cover and frequency. All overstory plants were analyzed for their density, cover, and frequency. In addition, the diameter at breast height (DBH) of all single-stemmed trees, and the basal diameter of all multistemmed trees were measured. We then calculated an importance index for all plant species encountered in the survey. In addition, we summarized previous biological studies conducted in the area; this report includes various species lists generated from those studies.

Current survey data indicated that potential habitat existed in OU 1130 for several protected species including the northern goshawk, spotted bat, and grama grass cactus. The initial surveys have not confirmed the presence of these species. However, mitigation measures are required to ensure that no adverse impacts affect potentially occurring species.

Using the National Wetland Inventory Maps and field checks, we noted wetlands and floodplain areas. Wetland boundary delineation will be conducted prior to site characterization to assure that no sampling is conducted within a wetlands area. This report discusses potential impacts of the sampling program and corrective mitigation measures.

Section 7 of the Federal Endangered Species Act requires that all federal agencies ensure their activities and programs will not jeopardize the continued existence of a federally listed threatened or endangered species or its designated critical habitat. New Mexico's WCA and EPSA also require federal agencies to ensure that their activities and programs will not jeopardize species that are under state protection. Implementation of Section 7 of the Federal ESA, 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 or endangered species:

- 1) There are no TES species found utilizing the proposed project area habitat;
- 2) There are TES species utilizing the proposed project area habitat, but there are no adverse impacts to the species; or
- 3) There are TES species utilizing the proposed project area habitat, and there are adverse impacts to the species.

When no adverse impacts are expected from the proposed project, the biological evaluation will be reviewed by appropriate state or federal agency for concurrence. If the proposed project is

expected to jeopardize a listed species, consultation with the appropriate state or federal agency which could result in project modifications, alternative programs, or complete abandonment of the proposed project to avoid impacting a protected species.

The Migratory Bird Treaty Act (16 USC 703-711) mandates federal protection for wild birds excluding resident game birds, English sparrows, starlings, and feral pigeons. The Act explicitly protects other wild birds from collecting and maiming.

Two executive orders provide protection for floodplains and wetlands. EO 11988, "Floodplain Management," calls for the protection of floodplains and stipulates that the potential effects of any federally funded project in a floodplain be evaluated. EO 11990, "Protection of Wetlands," requires all federally funded agencies to implement or amend proposed procedures to protect wetlands from loss or degradation.

The US Department of Energy (DOE) Code of Federal Regulations 10 CFR 1022, outlines the procedures for DOE compliance with these EOs and requires that all DOE actions be assessed for impacts to floodplains or wetlands. This CFR does not specify a minimum area of the wetland or floodplain. If there is a potential impact to floodplains or wetlands, a floodplain/wetland assessment must be conducted to determine if the impact would be adverse. Public review of potential impacts is provided through NEPA documentation or Federal Register Notification.

Additionally, under Section 404 of the Clean Water Act, the degradation of wetlands and floodplains is controlled by limiting the discharge of fill into these sensitive areas. Two types of permits are issued by the Corps of Engineers (COE), depending on the size of the floodplain or wetland to be impacted. Nationwide Permits are most commonly issued, and are applicable if the impact will affect less than ten acres. If the impact will affect an area larger than ten acres, Individual Permits must be issued before activities can be initiated.

DOE Order 5400.1 requires an environmental pre-operational survey prior to the start-up of a new site, facility, or process that has the potential for significant adverse environmental impact. This survey should begin a minimum of one year, and preferably two years, before the start-up to allow for the evaluation of biotic communities through seasonal change. These baseline data support the "environmental setting" portion of the work plans for site investigation and are important in measuring the environmental impacts of corrective measures.

## **2 PROJECT DESCRIPTION**

### **2.1 Background**

Since LANL's inception, research activities have resulted in the formation of a large number of Solid Waste Management Units (SWMUs). These SWMUs are located at various TAs throughout the 69-square km facility and consist of various contaminants released from Laboratory facilities.

The US Environmental Protection Agency (EPA) is the regulatory authority in charge of SWMUs, deriving its authority from the Resource Conservation and Recovery Act (RCRA). SWMUs at LANL are defined as "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste" (IT 1990). In accordance with the requirements of RCRA, LANL must develop corrective actions for all releases of hazardous waste into the environment.

The Laboratory's Environmental Restoration (ER) group (EM-13) is responsible for developing and implementing 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 (IT 1990).

This biological assessment has been prepared for use with the site-characterization phase, which focuses primarily on soil sampling, although additional disturbances associated with the sampling could occur (Sec. 8-9). Biological assessments for other phases may also be required.

## 2.2 SWMUs and Proposed Sampling

Several types of SWMUs are located within TA-36 and are associated with the following:

- material disposal Area AA ("Lower Slobbovia") and landfills,
- sump,
- septic systems,
- firing sites and test facilities,
- boneyard,
- surface disposal areas,
- waste high explosives container storage areas,
- waste explosive treatment, and
- mortar impact area.

TA-36 contains many firing sites, notably

- Eenie (TA-36-3),
- Meenie (TA-36-6),
- Minie (TA-36-8), and
- Lower Slobbovia (TA-36-12).

The type, quantity, and extent of any environmental contamination will be determined by sampling surface and subsurface soils at SWMUs (Fig. 1) and areas downgradient from SWMUs. Surface soils and near-surface soils will be collected with scoops and hand augers. The required drilling depth will determine the method of obtaining subsurface soils. A hollow stem auger will be used for samples less than 200 ft\* below the surface. Holes surpassing 200 ft in depth will be

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\* To maintain consistency with prescribed construction dimensions, the author will use the American Standard rather than the metric system in this section.

drilled with air or mud rotary coring or Odex drilling (Devaurs, 1991). All soil sampling is expected to occur in previously disturbed areas.

### 3 ENVIRONMENTAL SETTING

#### 3.1 General Setting

OU 1130 is located within the boundaries of LANL in Los Alamos County on the Pajarito Plateau on the east-central edge of the Jemez Mountains, in north-central New Mexico, approximately 160 km by road northwest of Albuquerque and 56 west-northwest of Santa Fe (Fig. 2).

The Jemez mountains are formed of a volcanic rock complex along the northwest margin of the Rio Grande Rift (Burton, 1982). The plateau forms an apron of volcanic and sedimentary rocks along the eastern flank of the mountains. It is aligned approximately north-south ranges from 32-40 km long and 8-16 km wide. From an elevation of approximately 2285 m near the mountains, the plateau slopes gently eastward toward the Rio Grande River. The Pajarito Plateau terminates at an elevation of approximately 1890 m at White Rock Canyon, whose steep slopes were cut by the Rio Grande (currently at 1645 m). The plateau has also been dissected into a number of narrow mesas by southeast-trending intermittent streams.

The Pajarito Plateau extends eastward from the base of the mountains as finger-like mesas separated by deep canyons. A geological substrate of Bandelier Tuff (LANL, 1988) was deposited from volcanic eruptions in the Jemez Mountains ca. 1.1-1.4 million years ago. The tuff overlaps other volcanic layers that are underlain by conglomerate of the Puye Formation (LANL, 1988). This conglomerate intermixes with Chino Mesa basalts along the Rio Grande River (Fig. 3).

The area has a semiarid, temperate mountain climate with summer temperatures typically ranging from a low of 10°C to a high of 22°C during a 24-hr period (Bowen, 1990). Winter temperatures generally range from -10°C to +10°C during a 24-hr period. The annual precipitation in the vicinity of Los Alamos varies between 33 and 46 cm, much of it falling in July and August as rain showers (Fig. 4).

The large diversity of ecosystems in the Los Alamos area is primarily caused by the 1500 m elevation gradient from the Rio Grande to the Jemez Mountains. Studies in 1972 characterized the plant and animal communities of Los Alamos County into six major vegetative types: subalpine grassland, spruce-fir, mixed conifer, ponderosa pine, piñon-juniper, and juniper grassland. Within the boundaries of the Laboratory, the predominant community types are ponderosa pine (2100-2300 m), piñon-juniper (1900-2100 m) and juniper grassland (1700-1900 m). The northern aspects of the canyons have stands of mixed conifer (LANL, no date).

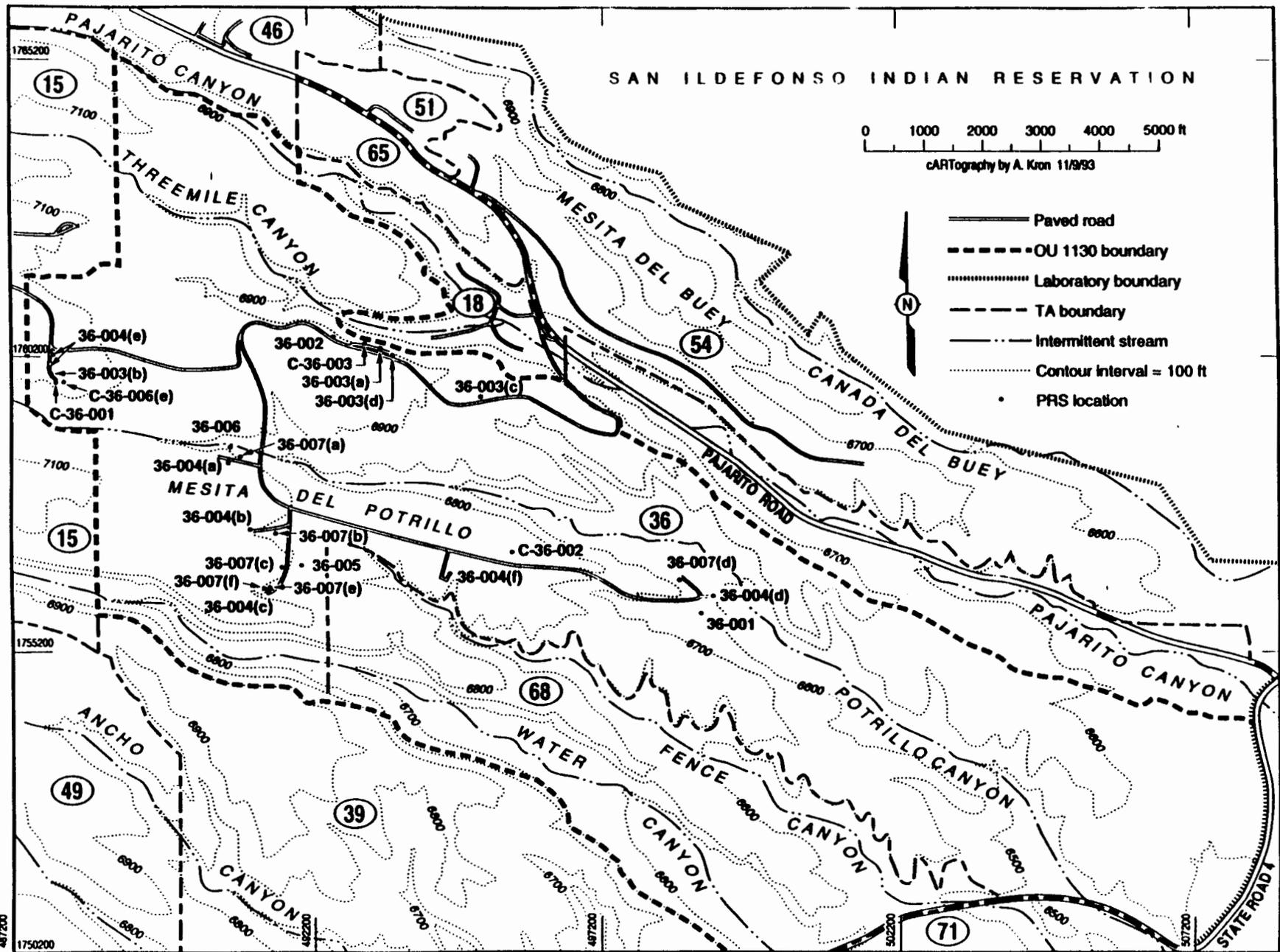


Fig. 1. Location of Potential Release Sites (PRSs) within Operable Unit 1130.

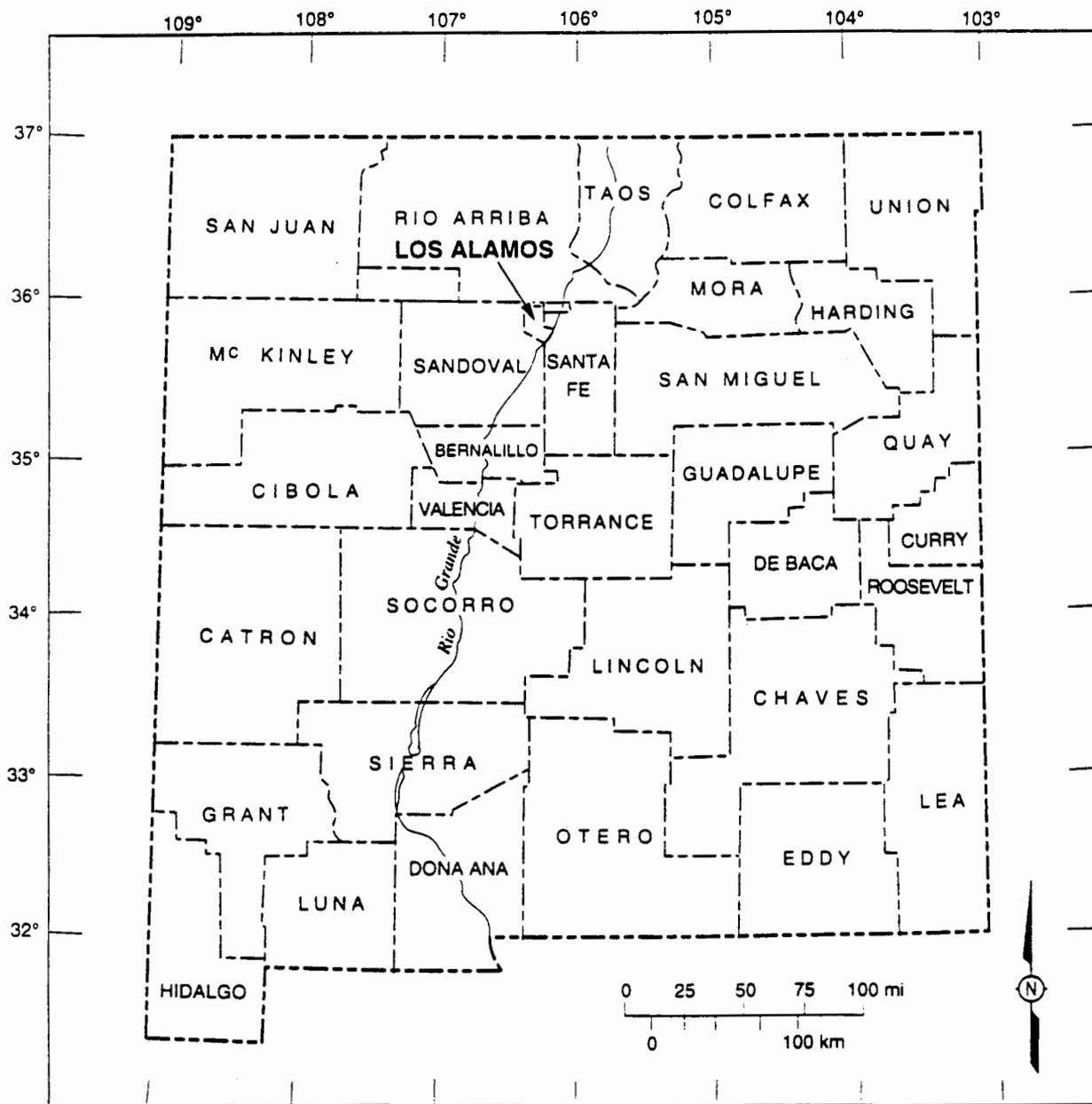


Fig. 2. Location of Los Alamos County within New Mexico.

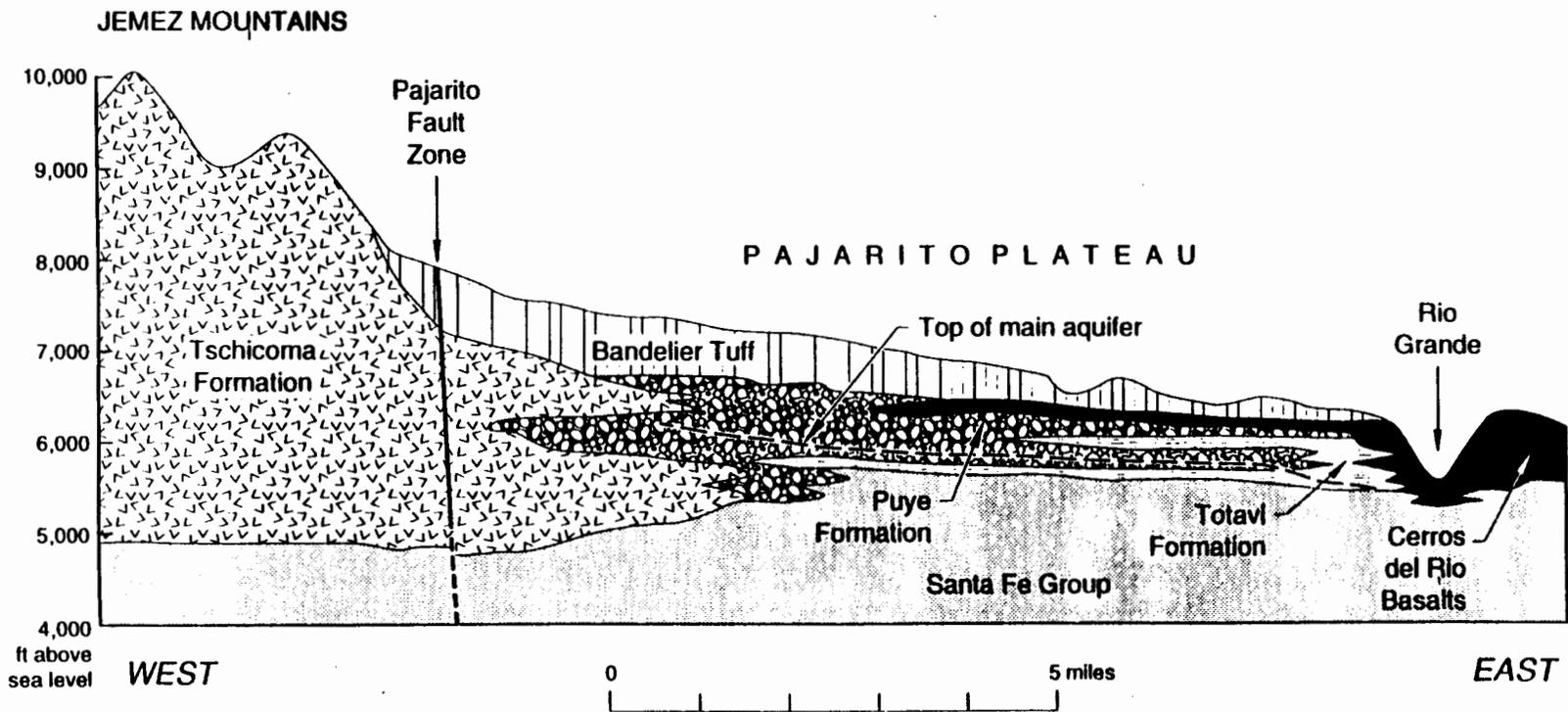


Fig. 3. Generalized cross section of the Pajarito Plateau.

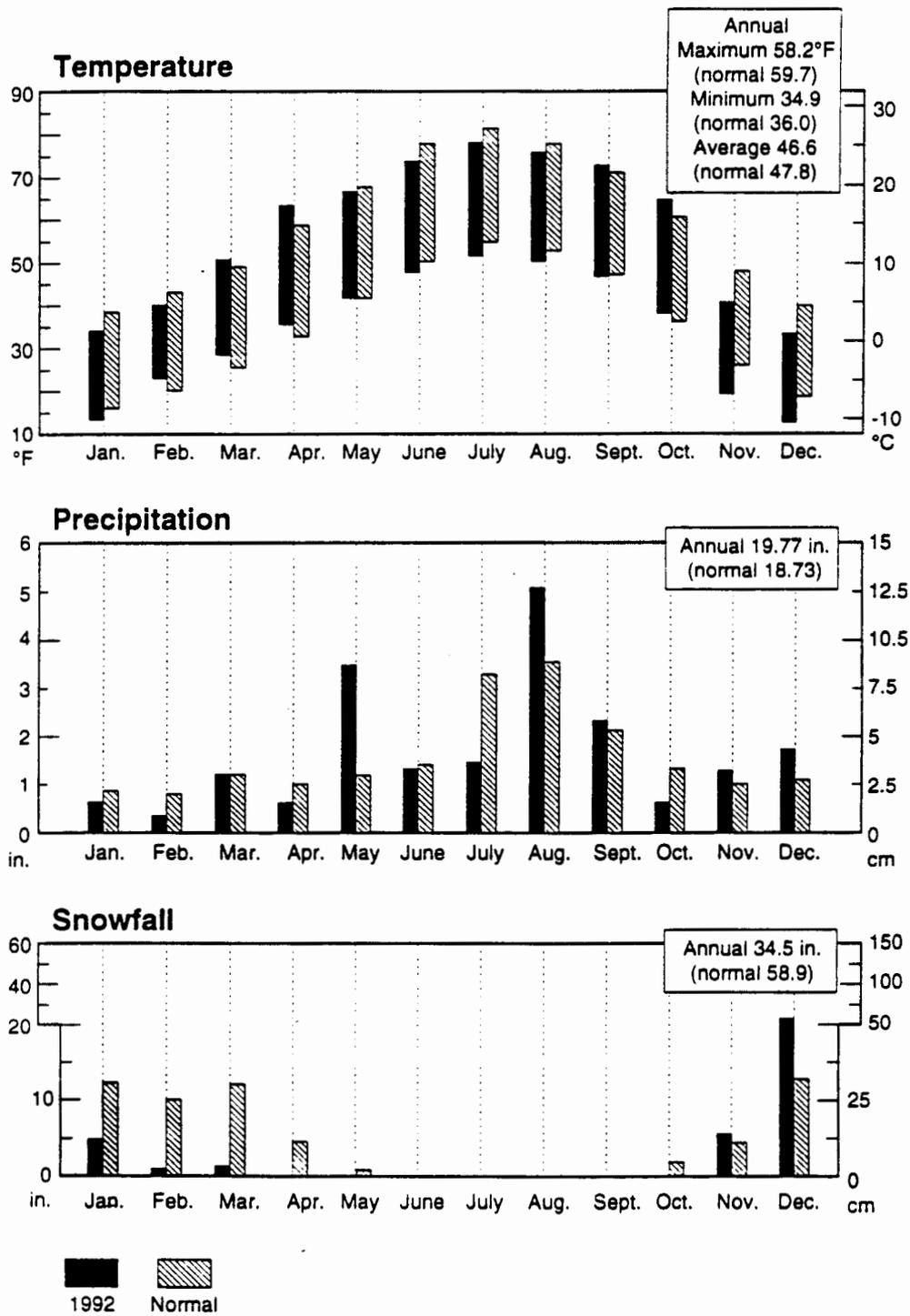


Fig. 4. Meteorological conditions for 1992 at Los Alamos, NM (elevation 7425 ft.).

### 3.2 Description of OU 1130

Located along the southeastern border of the Laboratory (Fig. 5), the northern edge of OU 1130 is near Pajarito Road and the southern edge is slightly south of Water Canyon.

The OU contains lower sections of Potrillo, Fence, and Water Canyons. The elevation ranges between approximately 1768 m at the eastern boundary of TA-71, to 2170 m near the western boundary of TA-36. Topography within the OU includes fairly level grassy mesa-tops, forested slopes, steep canyon cliffs, and canyon bottoms.

TA-68 and TA-71 were established in 1989 when the Laboratory redefined technical area boundaries. These sites are primarily Laboratory buffer zones and have not been used for Laboratory operations. No soil characterization studies are scheduled within TA-68 or TA-71.

The bulk of TA-36 (Kappa Site) is included in OU 1130, although the Pajarito wetlands area is within OU 1093. Excluding the bottom of Pajarito Canyon, which is underlain by alluvium (Nyhan *et al.*, 1978), TA-36 is underlain by welded Bandelier Tuff. The potentiometric surface of the main aquifer under TA-36 lies between 1738 to 1809 m asl. Over 183 m of unsaturated tuff and volcanic rock separate the surface from the aquifer in this area (IT, 1987a). There is little potential for downward flow from the surface because of the low moisture conditions of the tuff (IT, 1987a). Soils in the TA-include Sanjue-Arribe complex, Nyjack loam, Hackroy-Rock outcrop complex, Hackroy sandy loam, Penistaja sandy loam, Prieta silt loam, Servilleta loam, and rock outcrop (Nyhan *et al.*, 1978). Soil sampling for site characterization is expected to occur only in previously-disturbed areas.

No known historic homesteads occur within OU 1130; however, there are many prehistoric Indian ruins, some of which were excavated during the early 1900's (Ellen McGehee, LANL contract archeologist, personal communication). The southwestern portion of the OU was in the Ramon Vigil Grant, and this area may contain undiscovered homesteads and historic ruins from ranching operations.

## 4 PREVIOUS STUDIES

Prior to the 1992 surveys, several site-specific studies were completed within or adjacent to OU 1130. These studies include information about the biological resources of the sites and potentially occurring TES species. Much of the species information presented in this section can be extrapolated for use as a general description of the project area's biological make-up. The 1992 surveys were necessary to characterize the biological community more completely.

#### 4.1 Plants

Since 1977, several plant surveys have been conducted within and near the OU boundaries (Table 1). Appendix A contains a checklist of plant species identified during these and the 1992 surveys.

**Table 1. Previous Vegetation Surveys Conducted within OU 1130**

Authors	Date	Survey Title (Location)
Foxx, T.S., and G.D. Tierney	1977-1978	"Endangered Species Survey" (Water Canyon)
Foxx, T.S., and G.D. Tierney	1980	"Status of the Flora of the Los Alamos National Environmental Research Park" (Water Canyon)
Foxx, T.S., and G.D. Tierney	1982	"Rooting Depth Study" (Fence and Potrillo Canyons)
Foxx, T.S., and G.D. Tierney	1986	"Large Bore Gun" (TA-36)
Foxx, T.S., and G.D. Tierney	1986-1987	"Live Firing Range" (Water Canyon)
Padien, Daniel	1987	"Stand Structure and Nutrient Dynamics in a Piñon-Juniper Community of Northern New Mexico" (Lower Slobbovia)
Foxx, T.S., and G.D. Tierney	1987	"Pulsed Power Assembly Building" (lower Ancho Canyon)
Tierney, G.D.	1987-1988	"PNM Survey, Ole Power Line" (Fence Canyon)
Foxx, T.S., and Naomi Becker	1988	"Watershed Analysis" (Potrillo Canyon)

#### 4.2 Wildlife

A limited number of studies characterizing the fauna of the area have been conducted since 1975. These studies are discussed below by type of organism investigated.

##### 4.2.1 Insects

Hanson and Miera (1974) conducted soil-litter invertebrate studies at a materials disposal area (Lower Slobbovia) in TA-36, and the EF Site firing site in TA-15. They used the Tullgren funnel technique on 97 1-dm<sup>3</sup> samples, but their data does not differentiate the species found in the Lower Slobbovia materials disposal site from those found in the EF site. Nonetheless, a complete list of organisms found in this study is given in Appendix B.

Information in a comprehensive ant study conducted by MacKay (1986) indicates that numerous ant species are likely to be present in ponderosa pine and ponderosa pine-riparian areas similar to those found within OU 1130 (see Appendix C).

In 1991, Haarmann conducted a survey of insects using pitfall traps in Ancho Canyon. A list of identified species is given in Appendix D.

# SANTA FE NATIONAL FOREST

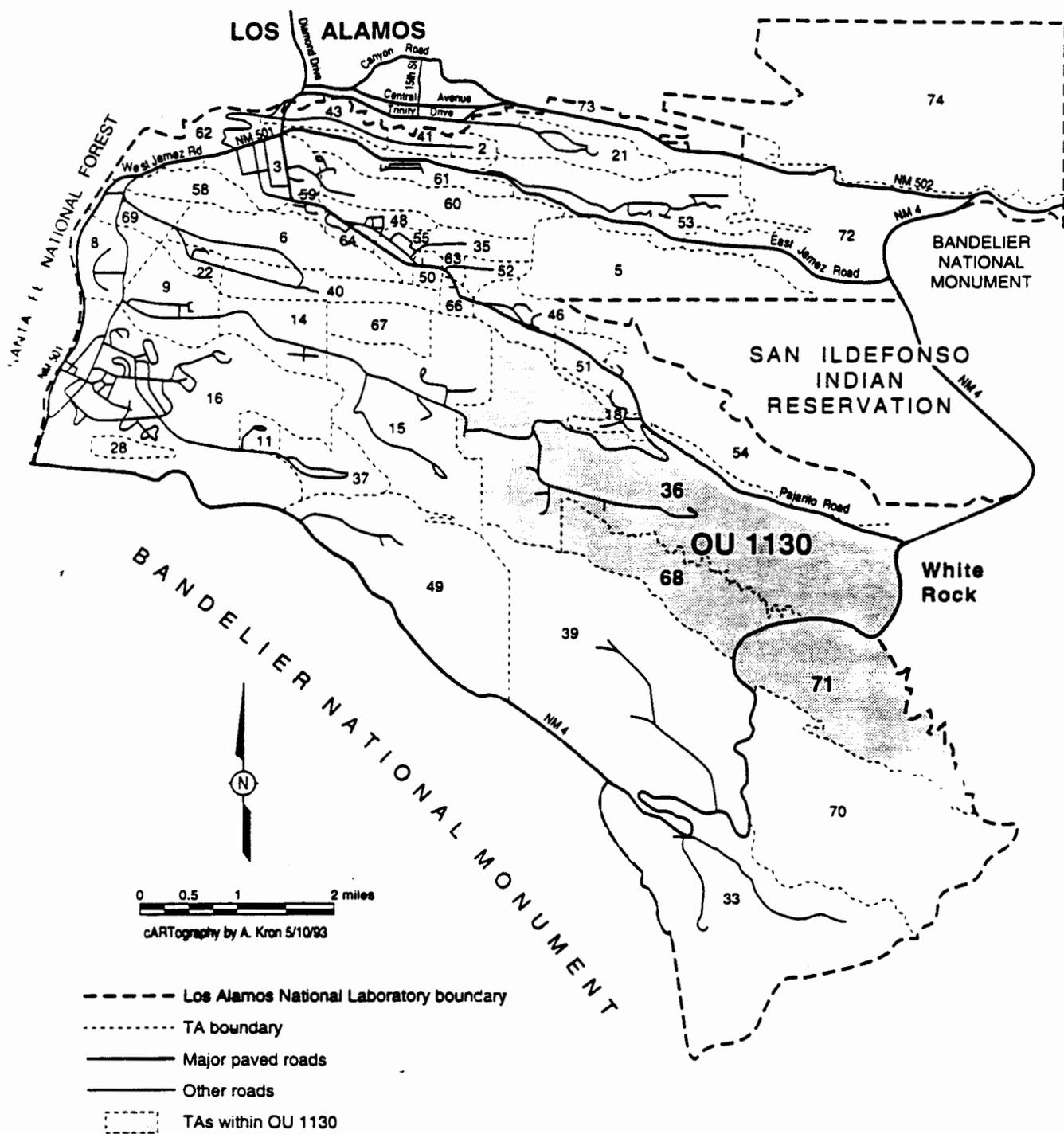


Fig. 5. Location of OU 1130.

#### **4.2.2 Mollusks**

No comprehensive field surveys for mollusks have been conducted within Los Alamos County.

#### **4.2.3 Reptiles and Amphibians**

In 1978, Charles Bogart, consultant to LANL, surveyed the reptiles and amphibians within the boundaries of the Laboratory (Bogart, 1986). His research included three canyons within or adjacent to OU 1130. Appendix E contains a checklist of identified amphibians and reptiles.

#### **4.2.4 Birds**

A county-wide, five-year study of breeding birds was conducted by the Pajarito Ornithological Society (J. Travis, 1992), and is summarized in the *Atlas of the Breeding Birds of Los Alamos County, New Mexico* (see Appendix F). In addition to the Ornithological Society's work, Wenzel and Kent conducted bird surveys in Potrillo Canyon in February and March of 1986 (see Appendix G).

#### **4.2.5 Fish**

The stream reaches within OU 1130 are ephemeral, and no fish occur within these intermittent waters.

#### **4.2.6 Mammals**

In November 1974 and June 1975, Hanson and Miera conducted small-mammal trapping at the Minie firing site and Lower Slobbovia materials disposal site. Wenzel and Kent surveyed the mammals in Potrillo Canyon during February and March, 1986. In April 1986, Olinger surveyed the mammals of Water Canyon (see Appendix H).

### **4.3 Threatened, Endangered, and Sensitive Species**

#### **4.3.1 Plants**

Foxx and Tierney conducted several TES plant species and NEPA compliance surveys for proposed projects (see Table 1) within TA-36. Several stream orchids, *Epipactis gigantea*, were found by a seep within lower Pajarito Canyon near its confluence with the Rio Grande. Specimens of grama grass cactus, *Toumeyia papyracantha*, were discovered within a basalt area near the White Rock overlook. To date, no TES plant species have been found within OU 1130 although suitable habitat is present in TA-71 for both stream orchid and grama grass cactus.

#### **4.3.2 Wildlife**

In 1991, Richard Smartt, invertebrate curator of the New Mexico Museum of Natural History, found several pulmonate snails of the genus *Oreohelix* in lower Pajarito Canyon. These large terrestrial snails may be a previously undescribed endemic species and are certainly rare within New Mexico. However, they have only been found near the Rio Grande and no soil characterization sampling is scheduled for this area.

Terrell Johnson, state peregrine falcon expert, conducted a biological assessment for the potential effects of a proposed firing range in Water Canyon on peregrine falcons (Johnson, 1985). He repeatedly visited the areas in question and used a spotting scope to aid identification. Johnson concluded that peregrine falcons would not be seriously affected by the firing range. A further report includes management guidelines for the falcon's habitat (Johnson, 1992).

For several years, Patricia Kennedy has observed goshawks and Cooper's hawks on LANL property. She used radio-tagged adults to gather data on home range size and activity patterns. Topography and vegetative structure and composition of each nest site was characterized using standard Forest Service silvicultural examination techniques. The study included diet determination, prey identification, and reproductive success monitoring.

## **5 METHODOLOGY**

Three levels of surveys were conducted within and near the OU. The primary purpose of these surveys was to determine if there were any species of concern or sensitive habitats that might be impacted by site characterization sampling.

### **5.1 Level 1 (Reconnaissance) Surveys**

The Level 1 (reconnaissance) survey is a walk-through of the area noting general habitats and site features. It is an initial survey conducted to determine placement of line transects, potential impacts of the transects, presence or absence of water or floodplains, presence or absence of disturbance. From the results of the Level 1 survey of OU 1130, it was determined that Level 2 (habitat evaluation) surveys were required.

### **5.2 Level 2 (Habitat Evaluation) Surveys**

Using Level 1 survey results, Level 2 surveys were undertaken. Level 2 surveys are designed to quantitatively measure the habitat, to document the habitat parameters, and to determine if sensitive species habitats are present. Additionally, the habitat evaluation can be used to determine environmental settings, to run habitat evaluation procedures, and to provide baseline information.

The habitat evaluation survey uses standard ecological techniques to measure cover, density, and frequency of the vegetative components in both overstory and understory habitats. Species information obtained from vegetation transects was summarized for mapping with a hierarchical system of classification, and this data will ultimately be used to map vegetation on Geographic Information Systems.

Table 2 provides a definition for each element of the classification. The classification for both upland and wetland vegetation types for the Pajarito Plateau is contained in Appendix I. This

listing includes known and potential habitat types and phases. It is based on Brown (1982), Moir and Ludwig (1979), and an unpublished U.S. Forest Service document. We made no attempt to develop new habitat types for the area. The designation "potential habitat sites" include any study area that does not fit within a designated habitat type defined for northern New Mexico.

**Table 2. Definitions for Biotic Community Classification.**

**Vegetation Type:** Refers to vegetation established under existing climate and includes one of the two types: Upland and Wetland

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

<b>UPLAND</b>	<b>WETLAND</b>
Tundra	Wet Tundra
Forest and woodland	Forest
Scrubland	Swamp-scrub
Grassland	Marshland
Desertland	Strand
Non-vascular	Submergent

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

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

**Series:** Refers to principal plant-animal communities within each biotic community. These are based on distinct climax plant dominants.

**Habitat type:** This is based on the occurrence of a particular dominant species that are local or regional in distribution.

**Phase:** Based on detailed data collection in determining codominants, understories and other species.

Thirteen sites within TA-36 and two within TA-68 were surveyed. At each site, both understory and overstory components were identified and measured. The transect number is composed of the TA-number, the order in which the transect was read, and a "u" for understory or

a "c" for overstory or canopy layer. For example, transect 36-2c is the second overstory transect read within TA-36 (Fig. 6).

### 5.2.1 Overstory Evaluation

BRET used the line intercept technique (Lindsey, 1955; Woodin and Lindsey, 1954) to measure overstory components within coniferous forest areas. We collected data within a 20-ft\* wide strip centered on a transect line through the habitat (Fig. 7). Within the strip, the team measured the diameter at breast height (DBH) of all single-stemmed trees (i.e., ponderosa pine), and counted all shrub stems. We estimated foliar cover by measuring the total length of vegetation intercept along the transect line. This measurement was made by placing a ground-level tape measure along the transect center line and making a vertical projection of the vegetation canopy onto that line (Fig. 7). Each 50-ft strip segment constituted a plot which was used to determine plant frequency.

The team used a circular plot technique to measure the overstory components within riparian zones and piñon-juniper woodlands. Field technicians placed a transect line within the habitat to be evaluated and established circular plots every 100 ft along the transect (Fig. 8). All trees within a 30-ft radius of the center point on the transect line were measured for basal diameter if multistemmed or DBH if single-trunked. All shrub stems were counted and the cover was estimated within each of the plot's four quarters.

We calculated an importance index for all trees and shrubs within the transects by averaging their relative cover, relative density, and relative frequency. The derived number is a reliable measure of species dominance within a transect.

### 5.2.2 Understory Evaluation

BRET used the quadrat method with a Daubenmire plot of 20 x 50 cm\* (Daubenmire, 1959) to measure cryptogamic and herbaceous layers, percentage of bare soil and litter, and shrubs less than 3 ft in height. We made visual estimates of foliar cover to determine percent cover. Using the transect established for overstory evaluation, quadrats were read at 10-ft intervals (Fig. 9) until the number of species within the plots had not increased (the species area curve had leveled) or a maximum of 100 quadrats along a transect had been read.

All plants were identified using Hitchcock 1950, Martin and Hutchins 1980, Foxx and Hoard 1984, and Foxx and Tierney 1985. When necessary, voucher specimens were collected and archived in the herbarium at EM-8. Any questionable identifications were confirmed at the University of New Mexico Herbarium.

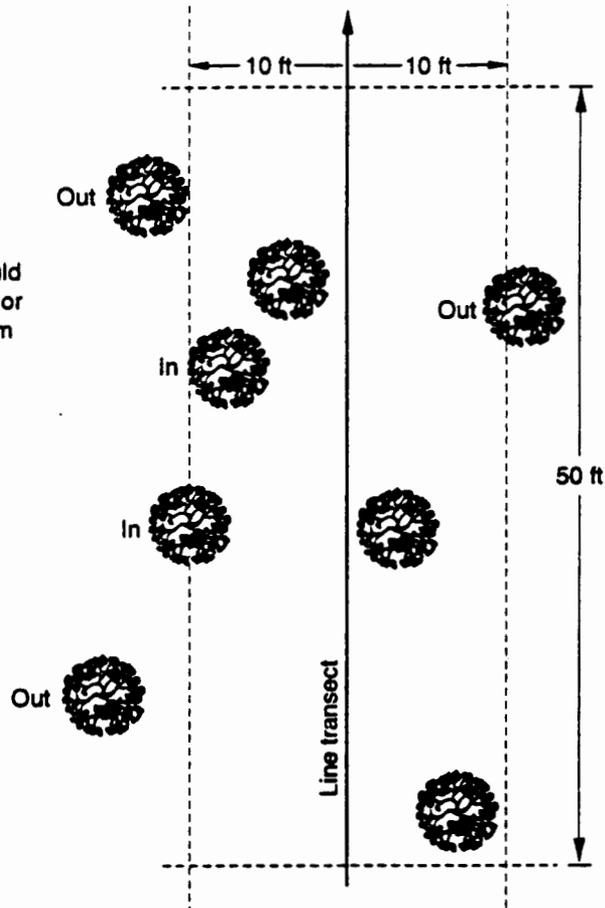
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\* To maintain consistency with prescribed measurements, the author will use the American Standard rather than the metric system in this section.

\* To maintain consistency with prescribed measurements, the author will use both American Standard and metric system in this section.

(a)

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



(b)

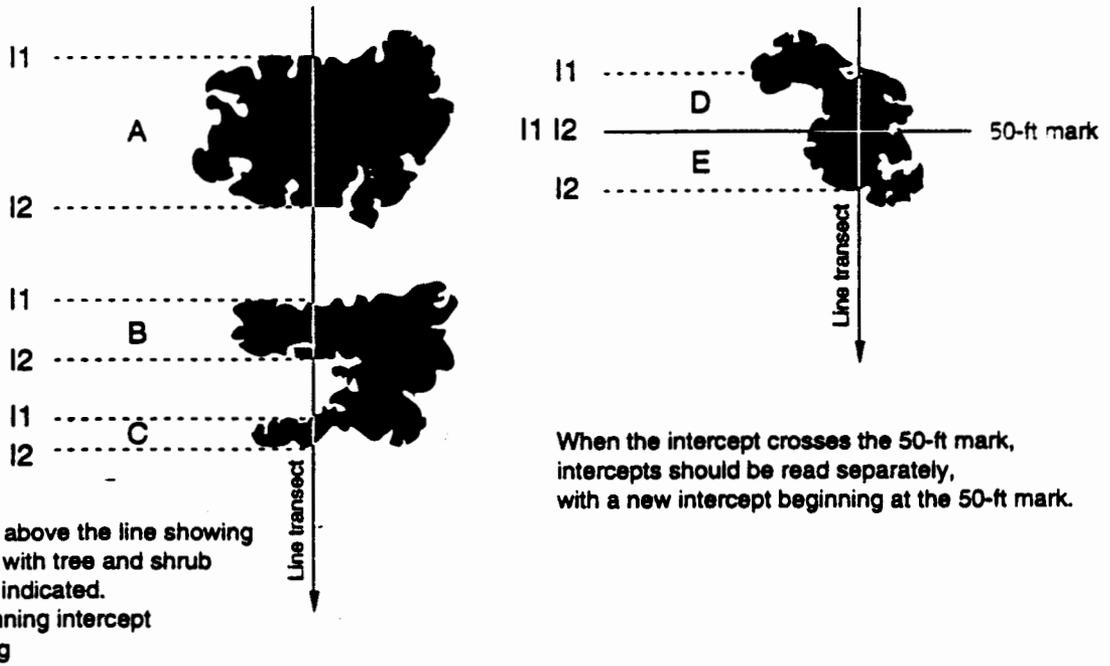
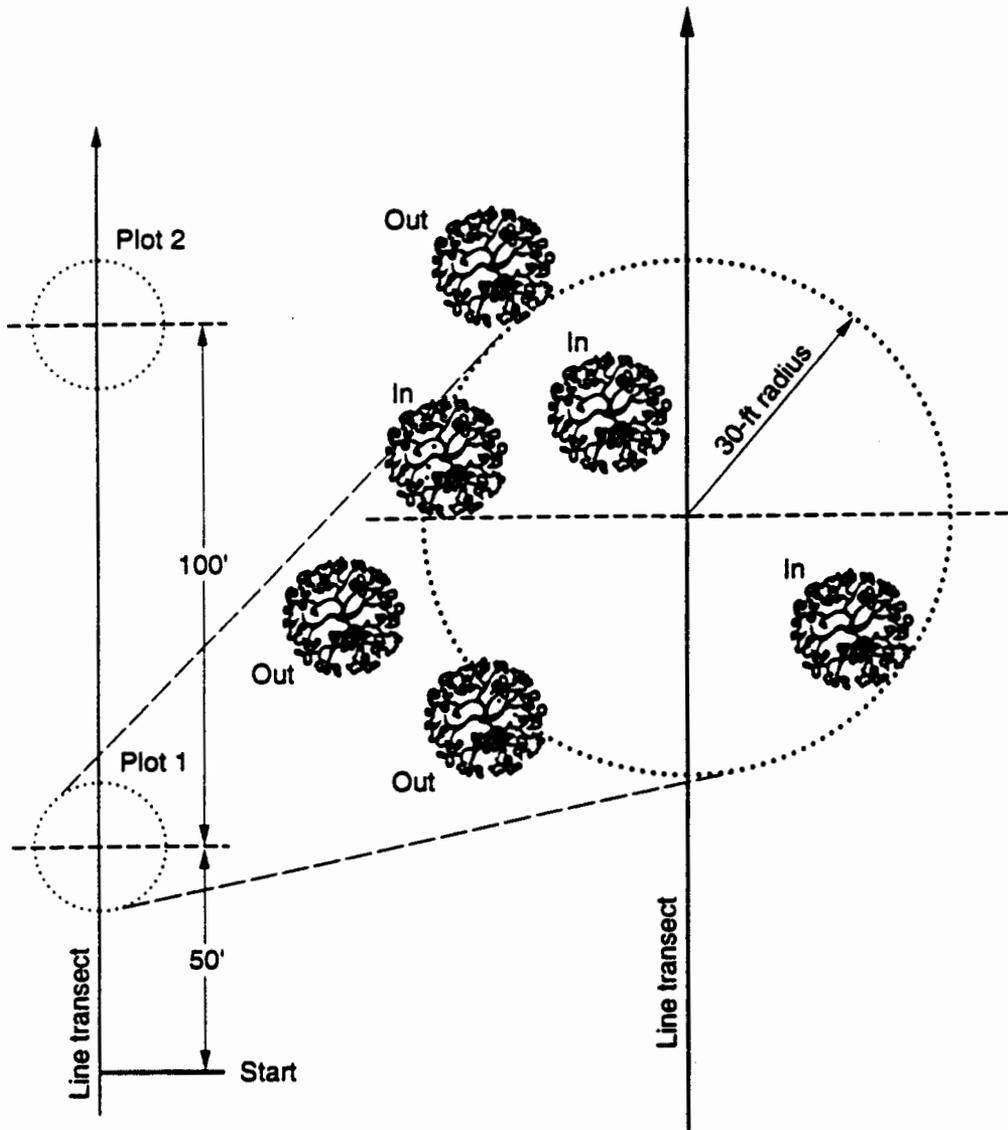


Fig. 7. (a) Line transect method of tree bole measurements and stem counts; (b) reading foliar intercepts.



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

Fig. 8. Circular plot method of overstory evaluation.

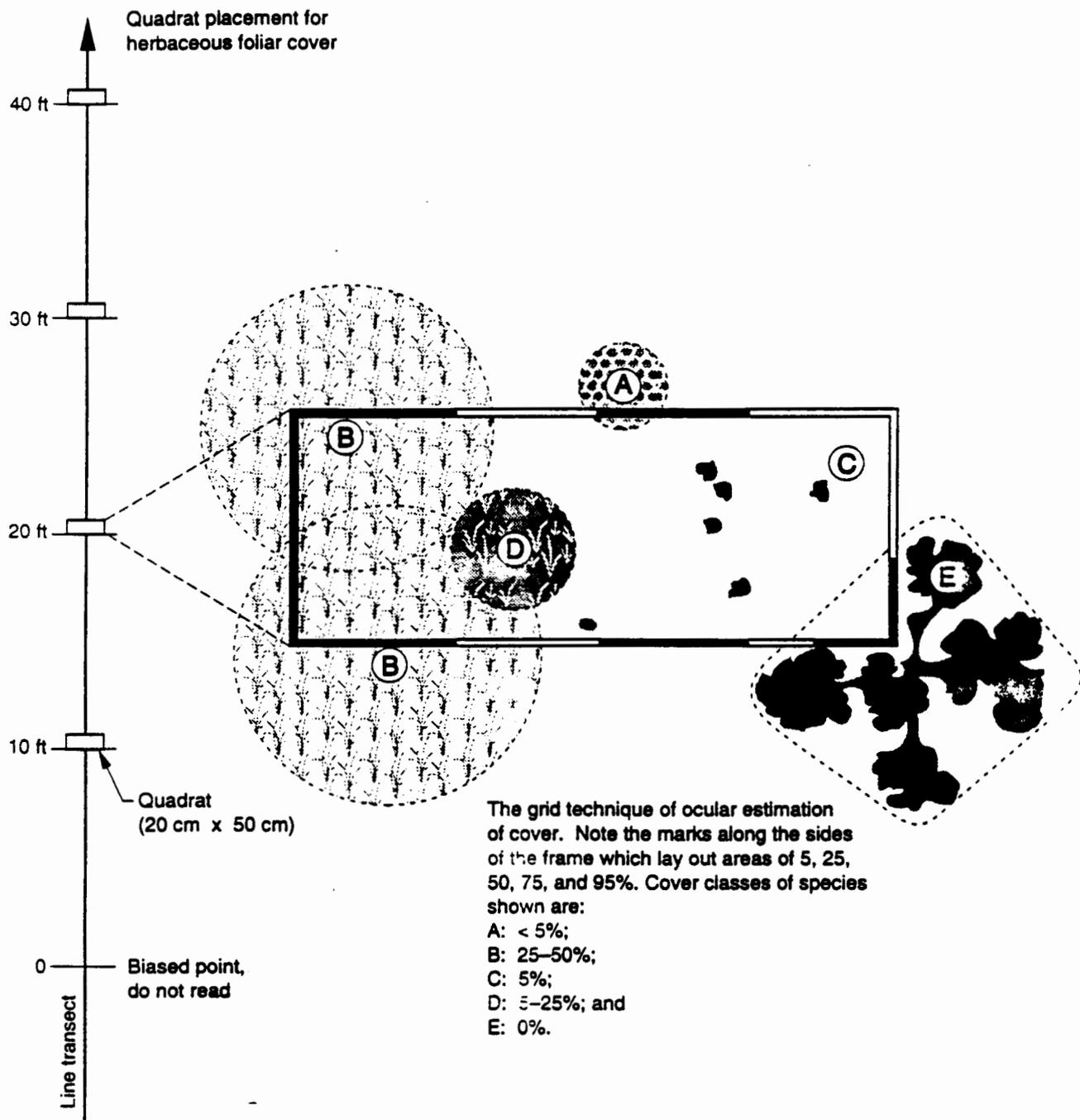


Fig. 9. Location of quadrats for understory transects of herbaceous foliar cover, and the grid technique of ocular estimation of cover (from Daubermire 1973).

### 5.3 Level 3 (Species-Specific) Surveys

A Level 3 (species-specific) survey uses established protocols to search for a single species of concern. These surveys are conducted primarily for TES species.

#### 5.3.1 Spotted Bat

Based on Level 1 and 2 survey results, and on consultation with experts, we conducted Level 3 surveys for the spotted bat (*Euderma maculatum*). Mist nets raised at dusk and run for several hours at night, were closely monitored and checked for bats every few minutes. This method of capture is not specific to spotted bats and allows general inventory data to be collected. When a bat was caught in the net, it was carefully removed by gently holding it while pulling the net strands away from its body and wings. Species were identified, sexed, photographed, and immediately released by rabies-immunized researchers. Identifications were made using Whitaker 1980 and Burt and Grossenheider 1976.

## 6 RESULTS

### 6.1 Wetlands and Floodplains

Floodplains (Fig. 10) and wetlands are located within the OU. Delineation of wetlands was not conducted since exact site characterization sampling locations were not known. However, when the exact sampling plan is determined, strict delineation of the wetlands will be conducted in those areas where applicable.

The wetlands within OU 1130 are riverine, primarily occurring along canyon bottoms. There are two such sites in lower Water Canyon (TA-71) and one in mid-Water Canyon (TA-68). These have been broadly mapped by U.S. Fish and Wildlife Service (Fig. 11) using a hierarchical system described by Cowardin (1979) based solely on aerial photography.

OU 1130 contains a single outfall (NPDES # EPA-06A-106) which is located in TA-36. Its discharge is ephemeral and although the effluent enters Threemile Canyon, it does not reach the main water course of the canyon. This outfall has no distinct channel and hydrophytic vegetation is not present. In 1991, a field team from BRET noted no environmental concerns at the discharge site.

BRET compiled a plant checklist noting the wetlands indicator status (using *Corps of Engineers Wetlands Delineation Manual*, 1987) for each plant species found in the surveys (Appendix K).

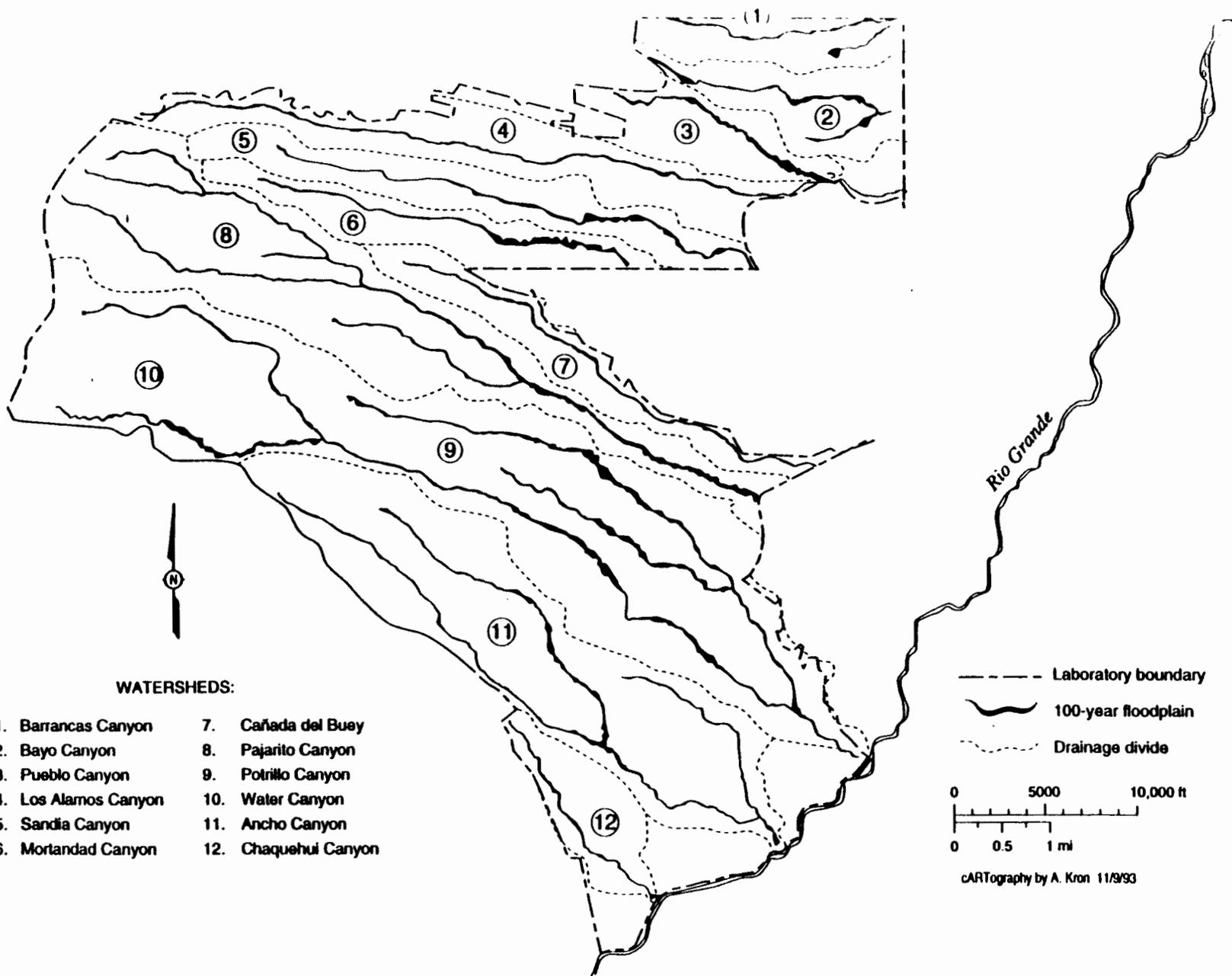


Fig. 10. 100-year floodplain map for Los Alamos National Laboratory.

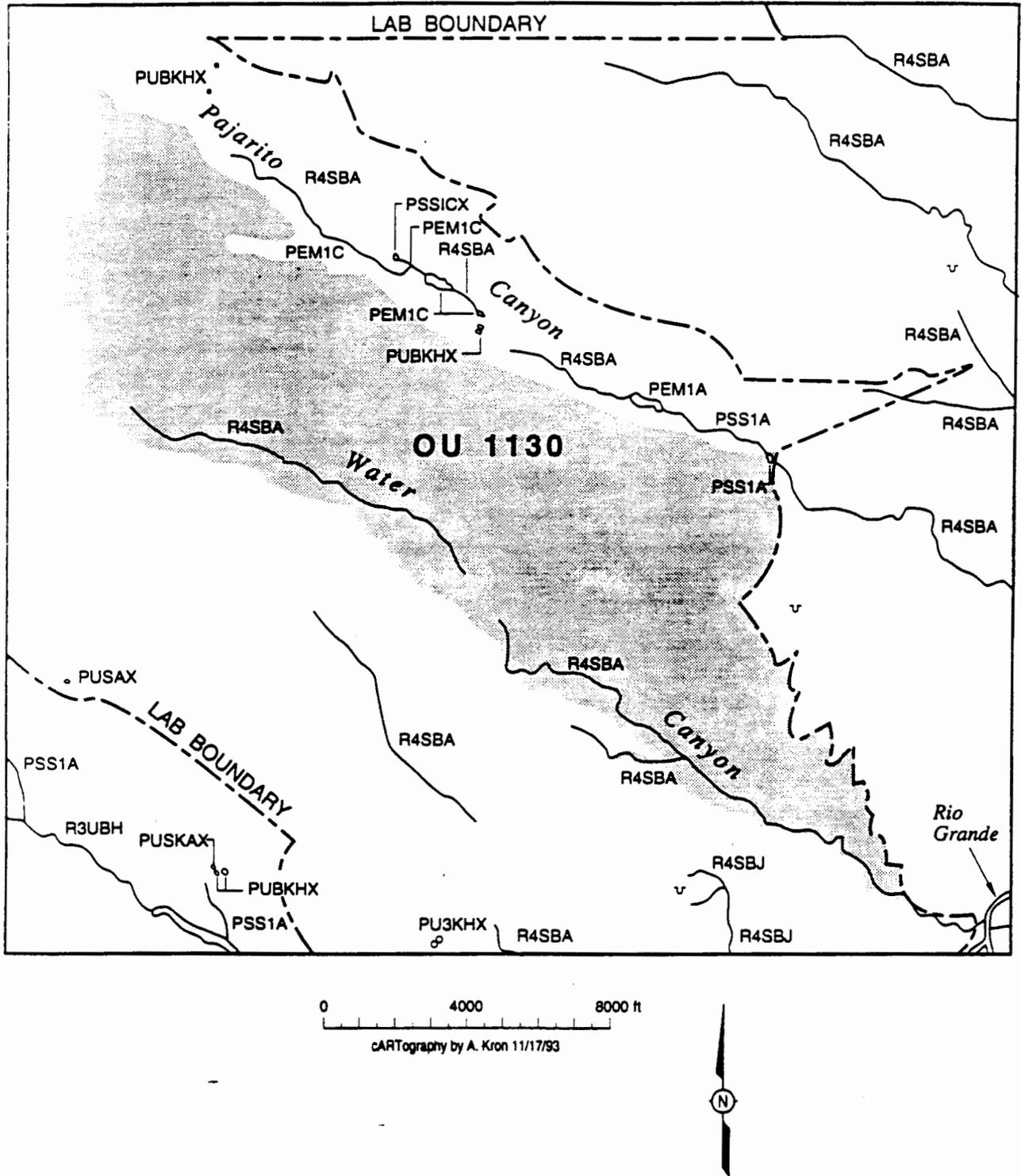


Fig. 11. Locations of wetlands within and surrounding Operable Unit 1130.

## 6.2 Level 1 (Reconnaissance) Surveys

Reconnaissance surveys were conducted within the OU to determine potential habitats, identify sampling locations, determine access, and record seasonal observations. The general plant communities, level of disturbance, terrain, and physical features of the site were noted. All sampling locations were readily accessible, either by vehicle or by a relatively brief walk.

Based on the Level 1 surveys, we defined the following vegetation zones and used them as search criteria:

- Ponderosa
- Ponderosa-piñon pine
- Piñon pine-juniper
- Juniper grassland
- Riparian

We reviewed the TES species database to determine if any threatened, endangered, or sensitive plant or animal species occur within the vegetation zones of OU 1130 (Table 3).

Appendix L provides a printout of the actual database.

**Table 3. Listing of Threatened, Endangered, and Sensitive Species for OU 1130**

SCIENTIFIC NAME	COMMON NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**
<b>ANIMALS</b>				
<i>Accipiter gentilis</i>	Northern goshawk	FC	Ponderosa pine-Gambel's oak; ponderosa	Medium
<i>Ammodramus bairdii</i>	Baird's sparrow	FE SPG2	Juniper grassland	Low
<i>Falco peregrinus</i>	Peregrine falcon	FE SPG2	Ponderosa-pinon; cliffs and rock crevices	Low
<i>Vireo vicinior</i>	Gray vireo	SPG2	Juniper grassland; juniper-oak	Low
<i>Euderma maculatum</i>	Spotted bat	SPG2	Riparian; pinon-juniper; ponderosa; cliffs and rock crevices	Medium
<b>PLANTS</b>				
<i>Mammillaria wrightii</i>	Wright fishhook cactus	SE2	Pinon-juniper; gravelly or sandy hills	Low
<i>Toumeyia papyracantha</i>	Gramma grass cactus	FC SPG1	Pinon-juniper; sandy basalt outcrops	Medium
<i>Aletes sessiliflorus</i>	Sessile-flowered false carrot	SS	Pinon-juniper; rocky canyons and slopes	Low
<i>Silene plankii</i>	Plank's catchfly	SS	Pinon-juniper; crevices and pockets in igneous cliff faces	Low
<i>Astragalus cyaneus</i>	Cyanic milkvetch	SS	Pinon-juniper; sandy or gravelly hillsides	Low
<i>Astragalus feensis</i>	Santa Fe milkvetch	SS	Pinon-juniper; dry slopes	Low

**Table 3. Listing of Threatened, Endangered, and Sensitive Species for OU 1130, cont.**

SCIENTIFIC NAME	COMMON NAME	STATUS*	HABITAT	POTENTIAL FOR OCCURRENCE**
<i>Astragalus puniceus</i> var. <i>gertudis</i>	Taos milkvetch	SS	Pinon-juniper; open, loose soil	Low
<i>Abronia bigelovii</i>	Tufted sand verbena	FC SS	Pinon-juniper; Todilto gypsum or its derivatives	Low
<i>Phlox caryophylla</i>	Pagosa phlox	SS	Ponderosa-pinon	Low
<i>Epipactis gigantea</i>	Stream orchid	SE	Seepage slopes; streams and riparian areas	High

**\* CODES FOR LEGAL STATUS**

FE = Federally endangered area.

FT = Federally threatened

FC = Federal candidate species

SE1 = State protected and listed as threatened or endangered under the provisions of Federal Endangered Species Act.

**\* CODES FOR LEGAL STATUS**

SE2 = State protected, rare across its entire range with limited distribution and population size that unregulated collection could jeopardize its survival in New Mexico.

SE3 = State protected, widespread in adjacent states or Mexico, but its numbers are being significantly reduced to such a degree that its survival within New Mexico is jeopardized.

SPG1 = State protected as a Group 1 species (endangered)

SPG2 = State protected as a Group 2 species (threatened)

SS = State sensitive

**CODES FOR POTENTIAL OF OCCURRENCE**

High = The species is known to occur in the

Medium = The area has some species habitat components.

Low = The area does not have species habitat components.

**6.2.1 Plants**

**Federally Listed Species:** No federal endangered or threatened plant species were listed as potentially occurring in the OU. However, the following two federal candidate plant species met the search criteria (US Fish and Wildlife Service 1991b):

**Candidate**

Santa Fe cholla

Grama grass cactus

*Opuntia viridiflora*

*Toumeyia papyracantha*

**State Listed Species:** Three plant species listed as state endangered met the search criteria (New Mexico Natural Heritage Program 1991):

**Endangered**

Wright fishhook cactus  
Grama grass cactus  
Stream orchid

*Mammillaria wrightii*  
*Toumeyia papyracantha*  
*Epipactis gigantea*

**6.2.2 Sensitive Species**

Under the Federal Endangered Species Act and state statutes, only those plant species that are listed or are candidates for listing are protected. New Mexico also lists species occurring within the state that are considered to be rare due to restricted distribution or low numerical density. Because these plants are considered rare, they are sensitive to long-term or cumulative land-use impacts and vulnerable to threatening biological or climatic events. The state monitors these species to determine if they should be elevated to endangered status. The following species occur in the vegetation zones found within OU 1130 and are listed as state sensitive:

**State Sensitive**

Cyanic milkvetch  
Pagosa phlox  
Plank's catchfly  
Santa Fe milkvetch  
Sessile-flowered false carrot  
Taos milkvetch  
Tufted sand verbena

*Astragalus cyaneus*  
*Phlox caryophylla*  
*Silene plankii*  
*Astragalus feensis*  
*Aletes sessiliflorus*  
*Astragalus puniceus var gertudis*  
*Abronia bigelovii*

**6.2.3 Wildlife**

**Federally listed species:** Two endangered and one candidate species listed by the US Fish and Wildlife Service (1991a-b) met the database search criteria:

**Endangered**

Baird's sparrow  
Peregrine falcon

*Ammodramus bairdii*  
*Falco peregrinus*

**Candidate**

Northern goshawk

*Accipiter gentilis*

**State listed species:** The following species listed as endangered in New Mexico met the search criteria (New Mexico Department of Game and Fish 1988, 1990):

**Endangered**

Baird's sparrow  
Peregrine falcon  
Gray vireo  
Spotted bat

*Ammodramus bairdii*  
*Falco peregrinus*  
*Vireo vicinior*  
*Euderma maculatum*

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 collection, maiming, and nest disturbances.

**6.3 Level 2 (Habitat Evaluation) Surveys**

We established vegetation transects within OU 1130 to evaluate the understory and overstory components. Most of the surveys were conducted within TA-36 near disturbed sites and in canyon bottoms, the major areas of concern. We placed 15 transects to survey a variety of habitat types (see Figure 6).

In general, OU 1130 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 in the Ponderosa Pine, Piñon-Juniper, and Juniper Grassland series. A further breakdown and discussion of vegetation is given below (see Appendix M for raw data summaries).

**6.3.1 Overstory Evaluation**

Following a reconnaissance survey of OU 1130, we placed vegetation transects in habitats displaying different plant compositions. Survey sites were selected to sample areas that would undergo site characterization, and do not necessarily represent the entire length of the canyon systems. North-facing and south-facing canyon walls, mesa tops, and canyon bottoms were chosen as representative of the overall habitat of OU 1130. Locations of the overstory transects for trees are listed in the appropriate sections.

Specific site characteristics (e.g., dominant species, density, cover, frequency) are discussed and compared. Every tree species encountered in the overstory transects is listed in the accompanying tables. Complete data from each transect are contained in Appendix M.

**6.3.1.1 North-Facing Slopes.** Typically, north-facing slopes have denser vegetation than south-facing slopes because of their capacity to retain more moisture. We surveyed north-facing transects near the Minie Site, the junction of Pajarito Road and State Route 4, Water Canyon's intersection with State Route 4, and lower Potrillo Canyon. In TA-36, ponderosa pine and one-seed juniper are the dominant overstory species along the north-facing canyon slopes (Table 4). One transect had a single Rocky Mountain juniper, but this species does not occur in high densities throughout this or any other area surveyed within OU 1130, and in most cases is not present at all.

The single north-facing slope transect surveyed in lower TA-68 contained many ponderosa pine. Overstory vegetation characteristics of north-facing slopes are given in Table 4.

**6.3.1.2 South-Facing Slopes.** South-facing are normally drier than adjacent north-facing slopes and thus usually have a lower vegetative cover. We surveyed south-facing transects near the Eenie Site, the Minie Site, the Ridge Road turn-off, and intersection of Water Canyon and State Route 4. Dominant overstory species are piñon pine, one-seed juniper, and ponderosa pine (Table 5). As on north-facing slopes, ponderosa pine tends to occur in fairly uniform stands.

**Table 4. Overstory Vegetation on North-Facing Slopes**

Transect	Species	Average DBH (inches)	Relative Density	Relative Cover	Relative Frequency	Importance Index
36-1c	One-seed juniper	3.57	39.42	38.44	50.00	42.62
	Piñon pine	5.62	60.58	61.56	50.00	57.38
36-2c	One-seed juniper	6.38	89.47	23.59	60.00	71.25
	Piñon pine	3.50	10.53	17.49	40.00	28.75
36-11c	One-seed juniper	4.73	51.56	32.59	42.86	42.34
	Piñon pine	5.30	46.09	40.48	42.86	43.14
	Ponderosa pine	9.30	2.34	26.93	14.29	14.52
36-14c	One-seed juniper	6.15	46.08	13.52	41.18	37.98
	Rocky Mountain juniper	5.30	0.46	5.00	5.88	5.40
	Piñon pine	4.48	52.53	33.85	41.18	42.52
	Ponderosa pine	22.15	0.92	15.00	11.76	14.10
68-2c	One-seed juniper	1.02	6.58	0.86	15.56	7.67
	Piñon pine	2.00	3.95	0.00	10.37	4.77
	Ponderosa pine	7.33	89.47	99.14	74.07	87.56

**Table 5. Overstory Vegetation on South-Facing Slopes**

Transect	Species	Average DBH (inches)	Relative Density	Relative Cover	Relative Frequency	Importance Index
36-2c	One-seed juniper	5.21	42.50	25.92	46.67	38.36
	Piñon pine	5.12	56.88	40.30	46.67	47.95
	Ponderosa pine	12.20	0.62	15.00	6.67	13.69
36-5c	One-seed juniper	4.33	7.32	0.00	14.53	7.26
	Ponderosa pine	7.41	90.24	100.00	78.63	89.32
	Snag	4.30	2.44	0.00	6.84	3.42
36-8c	One-seed juniper	8.96	13.11	33.20	50.00	32.10
	Piñon pine	5.48	86.89	66.80	50.00	67.90
36-10c	One-seed juniper	7.33	75.38	69.89	54.55	66.61
	Piñon pine	5.23	24.62	30.11	45.45	33.39

**6.3.1.3 Mesa Tops.** Three widely separated mesa tops within TA-36 were surveyed with similar results. Our transects were located near the Minie Site, the Ridge Road turn-off, and the intersection of Pajarito Road and State Route 4. The dominant overstory species were again piñon pine and one-seed juniper (Table 6).

**Table 6. Overstory Vegetation on Mesa Tops**

Transect	Species	Average DBH (inches)	Relative Density	Relative Cover	Relative Frequency	Importance Index
36-3c	One-seed juniper	4.87	65.99	57.02	41.67	54.89
	Piñon pine	6.68	29.93	42.98	41.67	38.19
36-6c	One-seed juniper	6.14	77.78	55.00	38.46	46.76
	Piñon pine	7.28	20.00	45.00	38.46	41.70
	Snag	13.05	2.22	0.00	23.08	11.54
36-13c	One-seed juniper	6.44	44.53	39.93	46.15	43.54
	Piñon pine	5.36	55.47	60.07	53.85	56.46

**6.3.1.4 Canyon Bottoms.** Our transects were located near the Eenie Site, the Ridge Road turn-off, and the intersection of Water Canyon and State Route 4. Species found within the canyon bottoms (Table 7) were similar to those of the north- and south-facing slopes and mesa tops.

**Table 7. Overstory Vegetation in Canyon Bottoms**

Transect	Species	Average DBH (Inches)	Relative Density	Relative Cover	Relative Frequency	Importance Index
36-4c	One-seed juniper	3.97	71.13	49.35	50.00	56.83
	Piñon pine	7.05	28.87	50.65	50.00	43.17
36-7c	One-seed juniper	4.46	15.25	5.50	36.00	20.75
	Piñon pine	1.65	3.39	1.84	8.00	4.92
	Ponderosa pine	8.96	81.36	92.66	56.00	74.33
68-1c	One-seed juniper	4.87	53.85	48.79	44.44	49.03
	Piñon pine	8.00	15.38	15.33	22.22	17.64
	Ponderosa pine	6.63	30.77	35.89	33.33	33.33

**6.3.1.5 Riparian Zones.** The Pajarito Wetlands is not in the OU boundaries, and there are few, if any, true riparian zones within OU 1130.

**6.3.2 Shrubs**

While using the line intercept and circular plot techniques to determine the overstory composition, we separated the woody species into trees and shrubs for purposes of analysis. The

DBH of trees was recorded while the number of stems were counted for shrubs. Complete data from each transect are contained in Appendix M.

**6.3.2.1 North-Facing Slopes.** On the north-facing slopes, the shrubs were much more varied than the trees (Table 8). In four of the five transects, squawbush was most numerous in terms of stems per acre, but in most cases its importance index was low due to a low relative cover value.

**Table 8. Shrub Species on North-Facing Slopes**

Transect	Species	# Stems/ Acre	Relative Density	Relative Cover	Relative Frequency	Importance Index
36-1c	Wavyleaf oak	769	64.94	75.85	40.00	60.26
	Squawbush	6	0.52	0.44	10.00	3.65
	Mountain mahogany	409	34.55	23.71	50.00	36.09
36-2c	Big sagebrush	297	38.03	39.21	40.14	39.67
	Rabbitbrush	2	0.28	0.42	9.86	5.14
	Squawbush	369	47.32	18.54	40.14	29.34
	Four-wing saltbush	112	14.37	41.84	9.86	25.85
36-11c	Oak hybrid	24	25.00	89.47	11.11	41.86
	Big sagebrush	31	31.82	3.51	44.44	26.59
	Squawbush	40	40.91	3.51	33.33	25.92
	Wax currant	2	2.27	3.51	11.11	5.63
36-14c	Apache plume	31	15.38	26.97	6.25	16.20
	Four-wing saltbush	57	28.57	62.92	10.42	33.97
	Squawbush	88	43.96	10.11	12.50	22.19
	Wax currant	24	12.09	0.00	70.83	27.64
68-2c	Gambel's oak	3	1.10	0.00	8.97	3.36
	Rabbitbrush	16	5.49	0.00	8.97	4.82
	Squawbush	193	68.13	76.92	64.10	69.72
	Wax currant	47	16.48	23.08	8.97	16.18
	New Mexico olive	25	8.79	0.00	8.97	5.92

**6.3.2.2 South-Facing Slopes.** South-facing slopes are normally drier than adjacent north-facing slopes and thus usually have a lower vegetative cover. The presence of oak and squawbush thickets within three of the four transects masks this general trend (Table 9).

**6.3.2.3 Mesa Tops.** When compared to both north- and south-facing slopes, the mesa top transects had a lower species diversity and fewer shrub stems (Table 10).

**Table 9. Shrub Species on South-Facing Slopes**

Transect	Species	# Stems/ Acre	Relative Density	Relative Cover	Relative Frequency	Importance Index
36-2c	Big sagebrush	24	50.00	69.86	60.00	59.95
	Squawbush	7	13.64	2.74	20.00	12.13
	Wax currant	18	36.36	27.40	20.00	27.92
36-5c	Wavyleaf oak	385	46.70	100.00	0.25	20.00
	Gambel's oak	4	0.44	0.00	6.67	2.37
	Oak hybrid	316	38.33	0.00	53.33	30.55
	Apache plume	7	0.88	0.08	6.67	2.52
	Squawbush	91	11.01	0.00	6.67	5.89
	Mountain mahogany	22	2.64	0.00	6.67	3.10
36-8c	Wavyleaf oak	1150	86.77	41.90	50.00	59.56
	Gambel's oak	55	4.18	31.39	10.00	15.19
	Oak hybrid	65	4.87	26.37	10.00	13.75
	Squawbush	9	0.70	0.31	10.00	3.67
	Mountain mahogany	46	3.48	0.03	20.00	7.84
36-10c	Big sagebrush	308	26.82	39.66	12.82	26.43
	Rabbitbrush	2	0.19	0.45	2.56	1.07
	Squawbush	723	63.03	14.35	17.95	31.77
	Wax currant	2	0.19	0.45	64.10	21.58
	Four-wing saltbush	112	9.77	45.10	2.56	19.14

**Table 10. Shrub Species on Mesa Tops**

Transect	Species	# Stems/ Acre	Relative Density	Relative Cover	Relative Frequency	Importance Index
36-3c	Wavyleaf oak	12	25.00	100.00	50.00	58.33
	Mountain mahogany	37	75.00	0.00	50.00	41.67
36-6c	Wavyleaf oak	40	27.66	93.00	12.50	52.69
	Oak hybrid	31	21.28	0.00	25.00	12.50
	Wax currant	15	10.64	0.00	12.50	6.25
	Mountain mahogany	58	40.43	7.00	50.00	28.57
36-13c	Big sagebrush	92	100.00	100.00	100.00	100.00

**Table 9. Shrub Species on South-Facing Slopes**

Transect	Species	# Stems/ Acre	Relative Density	Relative Cover	Relative Frequency	Importance Index
36-2c	Big sagebrush	24	50.00	69.86	60.00	59.95
	Squawbush	7	13.64	2.74	20.00	12.13
	Wax currant	18	36.36	27.40	20.00	27.92
36-5c	Wavyleaf oak	385	46.70	100.00	0.25	20.00
	Gambel's oak	4	0.44	0.00	6.67	2.37
	Oak hybrid	316	38.33	0.00	53.33	30.55
	Apache plume	7	0.88	0.08	6.67	2.52
	Squawbush	91	11.01	0.00	6.67	5.89
	Mountain mahogany	22	2.64	0.00	6.67	3.10
36-8c	Wavyleaf oak	1150	86.77	41.90	50.00	59.56
	Gambel's oak	55	4.18	31.39	10.00	15.19
	Oak hybrid	65	4.87	26.37	10.00	13.75
	Squawbush	9	0.70	0.31	10.00	3.67
	Mountain mahogany	46	3.48	0.03	20.00	7.84
36-10c	Big sagebrush	308	26.82	39.66	12.82	26.43
	Rabbitbrush	2	0.19	0.45	2.56	1.07
	Squawbush	723	63.03	14.35	17.95	31.77
	Wax currant	2	0.19	0.45	64.10	21.58
	Four-wing saltbush	112	9.77	45.10	2.56	19.14

**Table 10. Shrub Species on Mesa Tops**

Transect	Species	# Stems/ Acre	Relative Density	Relative Cover	Relative Frequency	Importance Index
36-3c	Wavyleaf oak	12	25.00	100.00	50.00	58.33
	Mountain mahogany	37	75.00	0.00	50.00	41.67
36-6c	Wavyleaf oak	40	27.66	93.00	12.50	52.69
	Oak hybrid	31	21.28	0.00	25.00	12.50
	Wax currant	15	10.64	0.00	12.50	6.25
	Mountain mahogany	58	40.43	7.00	50.00	28.57
36-13c	Big sagebrush	92	100.00	100.00	100.00	100.00

**6.3.2.4 Canyon Bottoms.** The canyon bottoms showed a tremendous variance in number of stems per acre (Table 11).

**Table 11. Shrub Species in Canyon Bottoms**

Transect	Species	# Stems/ Acre	Relative Density	Relative Cover	Relative Frequency	Importance Index
36-4c	Wavyleaf oak	21	25.00	100.00	50.00	58.33
	Mountain mahogany	62	75.00	0.00	50.00	41.67
36-7c	Wavyleaf oak	376	71.60	100.00	66.67	79.42
	Mountain mahogany	56	10.65	0.00	6.67	5.77
	Squawbush	78	14.79	0.00	20.00	11.60
	Apache plume	16	2.96	0.00	6.67	3.21
68-1c	Rabbitbrush	94	2.66	3.74	28.57	11.66
	Squawbush	145	4.09	3.44	7.14	4.89
	Wax currant	18	0.51	0.00	7.14	2.55
	Apache plume	3296	92.75	92.81	57.14	80.90

**6.3.2.5 Riparian Zone.** The Pajarito Wetlands is not included in the OU boundaries, and there are few, if any, true riparian zones within OU 1130.

### 6.3.3 Understory Evaluation.

Appendix M shows the complete data from each transect with tables listing the relative cover, relative frequency, and importance index of all understory species having an importance index value greater than 5.00.

**6.3.3.1 North-Facing Slopes.** Typically, north-facing slopes have denser vegetation than south-facing slopes because of their capacity to retain more moisture. We surveyed north-facing transects near the Minie Site, lower Potrillo Canyon, the junction of Pajarito Road and State Route 4, and Water Canyon's intersection with State Route 4. Within the four transects, the amount of litter-covered ground and bare soil ranged from 73% to 93%. Blue grama grass is a dominant or codominant understory plant in all transects. Other noteworthy species include golden aster, little bluestem, and tarragon (Table 12). Transect 36-2u had the greatest diversity (29 species) of all understory surveys conducted within OU 1130.

**Table 12. Understory Vegetation on North-Facing Slopes**

Transect	Species	Relative Cover	Relative Frequency	Importance Index
36-2u	Wormwood	37.30	30.43	33.87
	Blue grama	39.91	26.09	33.00
	Downy chess	24.10	19.57	21.83
	False tarragon	15.49	15.22	15.35
	Dropseed	8.29	6.52	7.40
	Little bluestem	8.72	3.26	5.99
36-11u	Blue grama	39.30	18.78	29.07
	Little bluestem	11.83	7.51	9.68
	Golden aster	6.44	6.10	6.27
	Bitterweed	5.86	6.10	5.98
	Sand dropseed	6.23	5.16	5.70
	Golden aster	6.44	6.10	6.27
36-14u	Blue grama	12.37	12.24	12.31
	Bluegrass	5.44	6.91	6.17
	Fleabane daisy	3.53	6.91	5.22
68-2u	Blue grama	50.94	33.33	42.14
	Golden aster	8.99	11.11	10.05
	Bluegrass	7.99	9.72	8.86
	Sedge	7.99	8.33	8.16
	Little bluestem	6.99	8.33	7.66
	False tarragon	5.05	8.33	6.69
	Needle and thread grass	4.99	6.94	5.97

**6.3.3.2 South-Facing Slopes.** We surveyed south-facing transects near the Eenie Site, Route 4. As in the north-facing slopes, blue grama was the most important understory species (Table 13). Other species varied greatly between transects and included mountain muhly, little bluestem, bitterweed, prickly pear cactus, oak, deervetch, pine dropseed, and sagebrush. The amount of open ground, i.e. bare soil, rock, and litter, ranged from 85 to 97%.

**6.3.3.3 Mesa Tops.** Our transects were located on three widely separated mesas, near the Minie Site, the Ridge Road turn-off, and the intersection of Pajarito Road and State Route 4. The dominant understory species in all mesa top transects was blue grama which accounted for 47% of the total relative plant cover (Table 14). Bitterweed, oak, prickly pear cactus, mountain muhly, and stickseed were important components in at least one transect while being completely absent in others. Snakeweed, an indicator of past disturbance, was present in all three transects. Open ground ranged from 80 to 92%.

**Table 13. Understory Vegetation on South-Facing Slopes**

Transect	Species	Relative Cover	Relative Frequency	Importance Index
36-1u	Blue grama	52.22	50.00	51.11
	Oak	41.14	12.50	26.81
	Bitterweed	12.38	12.50	12.44
	Mountain muhly	14.39	8.33	11.36
	Prickly pear cactus	12.34	8.33	10.33
	Rock-jasmine	10.28	4.17	7.22
	Snakeweed	4.52	8.33	6.43
	Sedge	8.22	4.17	6.20
	36-5u	Mountain muhly	32.93	37.50
Rock-jasmine		30.51	22.92	26.71
Pine dropseed		12.11	12.50	12.30
Golden aster		5.57	12.50	9.03
36-8u	Blue grama	77.98	58.49	68.24
	Unknown grass	10.69	3.77	7.23
36-10u	Blue grama	60.11	60.00	60.05
	Sagebrush	20.77	6.67	13.72
	Black grama	6.01	8.00	7.01
36-12u	Blue grama	67.81	51.00	59.41
	Deervetch	13.64	20.00	16.82
	Prickly pear cactus	8.26	4.00	6.13
	Pale trumpet	2.47	9.00	5.73

**Table 14. Understory Vegetation on Mesa Tops**

Transect	Species	Relative Cover	Relative Frequency	Importance Index
36-3u	Blue grama	31.81	29.55	30.68
	Oak	25.05	9.09	17.07
	Bitterweed	7.54	9.09	8.32
	Mountain muhly	8.77	6.82	7.79
	Prickly pear cactus	7.52	6.82	7.17
	Rock-jasmine	6.26	4.55	5.40
36-6u	Blue grama	74.98	40.00	57.49
	Bitterweed	14.20	20.00	17.10
	Fleabane daisy	2.66	21.18	11.92
	Mountain muhly	4.57	7.06	5.82
36-13u	Blue grama	59.79	46.70	53.25
	Prickly pear cactus	17.42	13.74	15.58
	Snakeweed	5.27	11.90	8.59
	Stickseed	11.02	3.66	7.34

**6.3.3.4 Canyon Bottoms.** Our transects were located near the Eenie Site, the Ridge Road turn-off, and the intersection of Water Canyon and State Route 4. However, the transect near the Eenie Site (36-4u) was incorrectly read, and its questionable data are not included. The other two transects displayed a remarkable diversity having completely different species lists (Table 15). All species were found in a single transect; there was no species overlap. One transect had the second-highest species diversity (24 species) of all those read in OU 1130 while the other one had the lowest (four species). The high importance indices for transect 36-7u is somewhat misleading since only 2.09% of the ground had any plant cover.

**Table 15. Understory Vegetation in Canyon Bottoms**

Transect	Species	Relative Cover	Relative Frequency	Importance Index
36-7u	Mountain muhly	58.37	51.35	49.84
	Sedge	24.40	27.03	23.39
	Golden aster	13.88	18.92	15.04
68-1u	Blue grama	54.01	31.86	42.93
	Golden aster	9.90	5.31	7.60
	Needle and thread grass	6.47	7.08	6.78
	False tarragon	5.42	6.19	5.80
	Scarlet globe mallow	3.80	7.08	5.44

**6.3.3.5 Riparian Zone.** The Pajarito Wetlands is not included in the OU boundaries, and there are few, if any, true riparian zones within OU 1130.

## 7 DISCUSSION

### 7.1 Level 2 (Habitat Evaluation) Surveys

The classification breakdown for both upland and wetland vegetation types for the Pajarito Plateau is included in Appendix I. This list includes known and potential habitat types and phases based on Brown *et al.* (1982), Moir and Ludwig (1979), and USFS (ND). 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 to be potential. Further studies would be necessary to make a complete and accurate determination.

The vegetation surveys indicated primarily two vegetation communities within and adjacent to OU 1130: the Rocky Mountain Montane Conifer Forest and the Great Basin Conifer Woodland communities. These communities can be further separated into series and, more specifically, habitat types.

### **7.1.1 Rocky Mountain Montane Conifer Forest**

This community consists of one vegetation series, the Ponderosa Pine. The Ponderosa Pine series can be further divided into two habitat types. The ponderosa pine/wavyleaf oak habitat was surveyed on a south-facing slope near the Eenie Site (36-5c) and in a canyon bottom (36-7c). Hybridized oak, squawbush, mountain muhly, and rock-jasmine were also fairly abundant in 36-5c. Ponderosa pine/one-seed juniper habitat was surveyed in a north-facing slope transect (68-2c). Blue grama was the major understory species, but had a low cover value of 3.64.

### **7.1.2 Great Basin Conifer Woodland Community**

Most of OU 1130 falls within the Great Basin Conifer Woodland community, and is characterized within the Piñon-Juniper series. Twelve of our fifteen transects occurred within this series, and all of these occur in the piñon-juniper-blue grama habitat type. There was little shrub understory in the canyon bottoms and on the mesa tops with cover values ranging from 0.03 to 5.63. Both north- and south-facing slopes had higher to significantly higher amounts of cover with an average value of 13.87. The major shrub species on these slopes were wavyleaf oak, mountain mahogany, big sagebrush, and squawbush. Blue grama was the most important understory plant in all transects dominated by piñon and juniper.

## **7.2 Level 3 (Species-Specific) Surveys**

No protected species were found during the Levels 1 and 2 surveys conducted in OU 1130. However, habitat information from those field surveys was compared to database information for each species of concern. Previous data and threats to each taxon were also studied. Based on this information, species were dismissed from further consideration or additional surveys were conducted to confirm the presence or absence of the species within the area.

### **7.2.1 Species Dismissed from Further Consideration**

Based on the information gained from the Level 1 and Level 2 field surveys and previously gathered data, the following species are unlikely to occur within OU 1130:

**7.2.1.1 Plants** The following species are being dismissed from further consideration because none have been found in OU 1130, they are unlikely to occur in the OU, and there is a low potential for impact.

The Wright fishhook cactus (*Mammillaria wrightii*) 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 within Los Alamos County nor was it found during our field surveys.

The Santa Fe cholla (*Opuntia viridiflora*) has been found only in an urban area of Santa Fe County. These plants appear to be strongly associated with south- and west-facing slopes in piñon-juniper woodlands at about 7200 ft (New Mexico Native Plants Protection Advisory

Committee, 1984). Elevations within OU 1130 are lower than this, and no specimens of this cactus were found within the OU during Level 1 or Level 2 surveys. This species was deleted from the state list in 1993.

The grama grass cactus (*Toumeyia papyracantha*) occurs in sandy soils within basalt outcrops. It has been found near the White Rock overlook and has potential habitat in TA-71. If soil sampling is to be conducted near the basalt of TA-71, BRET must conduct a Level 3 survey for grama grass cactus. Adequate advance notice must be given, for this species is noticeable only during its two-week-long flowering period.

The sessile-flowered false carrot (*Aletes sessiliflorus*) occurs in rocky canyons and slopes, usually in areas of basalt or sandstone. This species is found primarily in south-central New Mexico and has not been reported for Los Alamos County.

Plank's flycatch (*Silene plankii*) grows in piñon-juniper habitat and is known to occur in the mountains along the Rio Grande. It is found in crevices and pockets in protected cliff faces of igneous rock. This species has not been found in Los Alamos County.

The cyanic milkvetch (*Astragalus cyaneus*) occurs on sandy or gravelly hillsides within piñon-juniper. Usually growing adjacent to the Rio Grande, this species has not been found in Los Alamos County.

The Santa Fe milkvetch (*Astragalus feenis*) is found on dry slopes of piñon-juniper woodlands. It has not yet been reported for Los Alamos County.

The Taos milkvetch (*Astragalus puniceus* var. *gertudis*) is found in loose soil within open areas of piñon pine and juniper. This species has not been recorded for Los Alamos County.

La Jolla prairie clover (*Dalea scariosa*) inhabits sandy clay banks and bluffs, open sandy areas, and roadsides within juniper grassland habitat. It has not previously been found in Los Alamos County. This species was deleted from the state list in 1993.

The tufted sand verbena (*Abronia bigelovii*) is entirely restricted to Todilto gypsum or its derivatives. These soils do not occur within OU 1130.

The Pagosa phlox (*Phlox caryophylla*) grows on open slopes in mountain woodlands and forests. It has not been recorded for Los Alamos County.

The stream orchid (*Epipactis gigantea*) has been found within lower Pajarito Canyon. It occurs in seepage slopes and very damp woods. In OU 1130, the areas providing sufficient moisture for stream orchids are restricted to TA-71, and no soil characterization work is scheduled here.

**7.2.1.2 Wildlife.** The following species are being dismissed from further consideration because none has been found in the OU, they are unlikely to occur in OU 1130, and there is a low potential for impact.

The bald eagle (*Haliaeetus leucocephalus*) winters along the Rio Grande, and winter roosts have been observed at Cochiti Lake. Large trees protected from the wind form suitable roosting sites. Although this species was not listed on the TES database printout, the bald eagle could pass through the OU's southern-most extension. Impact and mitigation measures are not discussed for this species since no site characterization is scheduled within TA-71.

Baird's sparrow (*Ammodramus bairdii*) occurs in juniper grassland, but in New Mexico it occurs primarily on the eastern plains and southern lowlands. It has not been reported for Los Alamos or adjacent counties.

The gray vireo (*Vireo vicinior*) is found in juniper grassland and juniper-oak habitats. The known habitat area nearest to Los Alamos is in the San Juan Valley below Navajo Lake, and to date, the gray vireo has not been found in Los Alamos County.

The peregrine falcon (*Falco peregrinus*) establishes breeding territories near cliffs within areas of ponderosa and piñon. Optimal habitat includes large nearby "gulfs" of air which permit peregrines to attack their prey from above. A well-established peregrine nest site exists near the Los Alamos town site. Peregrine foraging areas may extend to 30 km from a nest site, but an estimated 90% of foraging occurs within a radius of 15 km. Terrell Johnson, state expert on the peregrine falcon, feels that portions of Ancho and Water Canyons surveyed within the OU are unlikely to receive concentrated use but may provide "moderately attractive foraging habitat for peregrines."

#### 7.2.2 Species for Which Level 3 Surveys were Conducted

The northern goshawk (*Accipiter gentilis*) nests primarily in dense, mature, or old growth coniferous forests and is known to nest in the northwest quadrant of LANL. Studies by Patricia Kennedy (1984-1987) indicate that the highest percentage of nests were in the ponderosa pine-Gambel's oak habitat type. Goshawks have not been found in the OU, but the species could occupy the area in the future because of existing suitable habitat and the goshawk's need for a large foraging area. In 1993, Patricia Kennedy began a comprehensive survey for the northern goshawk. Impacts and mitigation are discussed in Sections 8 and 9.

The spotted bat (*Euderma maculatum*) is found near standing water in riparian, piñon-juniper, ponderosa pine, and spruce-fir areas. They roost in cliffs or rock crevices. Some required habitat components for this species are present in the OU. However, open areas of standing water are, for the most part, absent. No spotted bats were captured in mist-net surveys run at several LANL sites, including two locations along the Pajarito Wetlands which adjoin OU 1130 (Appendix J). Further surveys will be necessary to confirm the presence or absence of this far-ranging species in OU 1130 and in Los Alamos County.

If sampling is proposed within TA-71, a number of Level 3 surveys will be required. Grama grass cactus (*Toumeyia papyracantha*), stream orchid (*Epipactis gigantea*), and a possibly endemic species of pulmonate snail (*Oreohelix* sp.) occur within habitat similar to that found in TA-71. All of these species must be thoroughly investigated before sampling in TA-71 can be approved.

## **8 IMPACTS**

The following section discusses several of the more obvious potential impacts that could be caused by soil characterization procedures or carelessness. It concentrates on sensitive species and habitats and is not intended to be an inclusive listing of all possible impacts to the environment of OU 1130.

To avoid adverse impacts, sampling should be planned so that erosion is not increased. Indiscriminately driving heavy equipment through the area can adversely impact understory ground cover and soil crust.

### **8.1 Wetlands and Floodplains**

Impacts to wetlands and floodplains are primarily associated with soil sampling and related disturbances. Sampling may include core drilling to a depth of 6 inches or deep core drilling to a depth of more than 200 ft. Heavy equipment and coring should remain outside of wetland areas. If sampling or other disturbances occur within or near wetlands or within floodplains, 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, which could lead to partial or complete loss of those wetlands.
- Excessive disturbance to the vegetation and soil surface could result in an alteration of the water flow or a widening of the channel.
- Disturbance along the drainages or on steep slopes could initiate or increase soil erosion. This could also lead to localized alterations in wetlands.
- Hazardous fuel spills or leaks from vehicles could negatively affect water quality in riparian zones and could negatively impact hydrophytic vegetation.

BRET must be given advance notification of all activities, other than soil sampling and associated disturbances, to ensure a thorough review and assessment of their impact on the biological resources.

### **8.2 Threatened, Endangered, and Sensitive Species**

Spotted bats have not been detected within LANL boundaries, but all habitat components necessary to support them are present. Impacts to the bats would include destruction of roosting

sites (rock crevices). However, very little disturbance to rock crevices are anticipated during site characterization. Most sampling will occur along drainages in OU 1130, not on the slopes.

Although some goshawk habitat components are present, raptor surveys have not revealed any goshawks within OU 1130. Impacts to goshawk would include human disturbance and disturbance by heavy equipment during the mating and nesting season (March-August). Sampling with hand augers for site characterization should not produce a significant level of disturbance. However, the use of drill rigs in sampling could greatly increase noise levels. In addition, excessive damage to potential foraging habitat could affect the densities of associated prey species.

Impacts to grama grass cactus (*Toumeyia papyracantha*), stream orchid (*Epipactis gigantea*), and a possibly endemic pulmonate snail (*Oreohelix* sp.) are not discussed since no soil characterization sampling is scheduled for TA-71.

### **8.3 Nonsensitive Species**

#### **8.3.1 Plants**

Heavy machinery could impact topographic features and riparian zones of OU 1130 in the following ways:

- Removal or excessive disturbance to existing vegetative cover could initiate or increase erosion or alter 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.

#### **8.3.2 Wildlife**

Habitat in OU 1130 is suitable for nesting, foraging, and perching for a variety of bird species, large mammals, and other wildlife species. Excessive disturbance or disturbance during critical periods could result in one or more of the following:

- Direct removal of nesting, perching, cover, and similar habitats along the canyon slopes and within riparian zones or canyon bottoms.
- Nest abandonment by birds causing nest failure.
- An interference with critical periods as breeding.
- Contamination of wildlife water sources from fuel spills or leaks from vehicles and machinery.

## **9 MITIGATION**

If Phase II sampling extends into TA-71, more surveys will be necessary to ensure that such sampling will not menace TES species and to delineate wetland and floodplain boundaries. BRET must be notified as soon as phase II sampling procedures are defined. Some of the

necessary biological fieldwork must be conducted at specific times of the year or over an extended period. Considerable delays may result if sufficient advance notice is not provided. BRET also requests notification before disturbances, other than soil sampling, are initiated to allow more accurate and effective mitigation measures to be defined.

### **9.1 Wetlands and Floodplains**

Floodplains occur within the OU in canyon bottoms and isolated wetlands may be present. No impact is expected from surface sampling; however, heavy equipment and coring within a wetland area could discharge fill into the wetland and destroy hydrophytic vegetation. Wetland boundaries will be delineated at the time of sampling, and all sampling must be conducted outside of designated wetlands. These delineations must be done within two years of the sampling; after two years, the delineation is no longer valid and must be redone.

### **9.2 Threatened, Endangered, and Sensitive Species**

#### **9.2.1 Plants**

If sampling sites are confined to TA-36, no mitigation for TES plant species is necessary. If sampling within TA-71 is proposed, potential impacts to grama grass cactus, stream orchid, and possibly endemic species of pulmonate snail must be addressed.

#### **9.2.2 Wildlife**

There are no known occurrences of the spotted bat in Los Alamos County although marginal habitat does exist in OU 1130. In order to avoid adverse impacts to spotted bat habitat, the following mitigation measure is required: If equipment larger than hand augers is to be used on canyon slopes, a biologist from EM-8 must conduct a survey of all rock crevices in the sampling area prior to the initiation of sampling. If any evidence of bats is found in the sampling area, all sampling with heavy equipment on that slope will be canceled.

Although goshawk nests have not been found within OU 1130, many of their required habitat components are present and more surveys will be necessary to confirm their presence or absence. To provide some protection for this potential goshawk habitat, all sampling with heavy equipment (drill rig) must be conducted from September through February, leaving their breeding period, March through August, free from severe disturbance.

### **9.3 Nonsensitive Species**

#### **9.3.1 Plants**

Site sampling could require mitigation by revegetation, especially if vegetation loss increases erosion. Survey results indicate that a mixture of native grasses, forbs, and other

herbaceous plants can be used to effectively revegetate. BRET personnel have lists of appropriate plants and should be contacted for assistance with any proposed revegetation program.

Best management practices should be followed while sampling. Additional mitigation measures include the following:

- Avoid all unnecessary disturbances to stream-side areas and surrounding vegetation during sampling and travel to sampling sites. Such disturbances include parking areas, equipment storage areas, and off-road travel.
- Avoid removal of vegetation and unnecessary soil disturbance along riparian and wetland areas as well as to drainages and stream channels.
- Avoid disturbance to vegetation along canyon slopes and especially along existing drainages on these slopes.
- Avoid indiscriminately driving heavy equipment through the area which can adversely impact understory ground cover and soil crust.

Mitigation measures for wetlands and floodplains will also help to reduce potential impacts to vegetation.

### 9.3.2 Wildlife

Most potential impacts to wildlife species should not be adverse, and it is projected that only during periods of actual disturbance will wildlife avoid the sites. However, if heavy machinery is to be used, the following mitigation measures should further reduce the potential for impact:

- Avoid crossing drainages where there is water; use existing roads that are dry or less vegetated.
- Avoid sampling from March 1 to August 1 when possible.

Disturbances to wintering species should be minor. Mitigation provided for wetlands, floodplains, and plants will further reduce any impact to wildlife species.

## 10 CONCLUSIONS

We summarized historical information and biological reports of previous site surveys to provide background information on OU 1130. These summaries provided inventory information that may be used in future ecological risk assessments and in pathway analyses. Compiled species lists are contained in the appendices to this report.

We conducted Level 1, 2, and 3 field surveys within and near OU 1130. In addition, the TES species database was searched for a listing of potential species that could occur within the OU's habitat types. Species on state or federal protection lists known to occur in ponderosa pine, ponderosa-piñon, piñon-juniper, juniper grasslands, or riparian areas of Los Alamos and surrounding counties were identified.

A habitat evaluation survey was conducted to determine if the specific requirements of the species could be met in the project locations. As a result, a number of species of concern were identified. A 1992 bat survey captured no spotted bats in Los Alamos County, but further surveys are necessary to establish its presence or absence. Previous surveys for the peregrine falcon showed only marginal peregrine habitat available within OU 1130 although Level 3 surveys conducted outside OU 1130 were used to determine its status in the area. There appears to be good foraging habitat for the northern goshawk within the OU, and additional surveys will be required to verify its presence or absence. Surveys for both raptors will be conducted in 1993. Mitigation measures to prevent adverse impacts to potential habitat have been included for the species of concern.

Within the OU, all wetlands and floodplains were noted using the National Wetland Inventory Maps and field checks. Characteristics of wetlands, floodplains and riparian areas were noted using criteria outlined in the *Corps of Engineers Wetlands Delineation Manual* (1987). Delineation of wetland boundaries was not done during these surveys, but will be conducted just prior to sampling. This will assure that all sampling is conducted outside of areas meeting wetland criteria (hydrophytic plants, hydric soils, and hydrology).

Mitigation measures (or best management practices) to reduce impacts to nonsensitive plant and wildlife species include

- (1) determining when sampling should be conducted,
- (2) using preventive measures to avoid excessive disturbance to the habitat, and
- (3) notifying BRET before disturbances other than soil sampling are initiated.

## 11 DEFINITIONS

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

**Colonizing:** A plant that has attributes which enable it to become easily established where it is not wanted or in areas of environmental disturbance..

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

**Facultative:** Plants equally likely to occur in wetlands or non wetlands (estimated probability 34-66%).

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

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

**Federal Candidate (C1) Species:** Taxa for which the USFWS has significant data concerning threat(s) and their biological vulnerability to support proposals to list them as endangered or threatened species.

**Federal Candidate (C2) Species:** Taxa for which current USFWS data indicate that their listing as endangered or threatened may be appropriate, but conclusive data on their biological vulnerability and threatened status are not currently available to support proposed rules.

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

**Federally Proposed as Endangered:** Taxa already proposed to be listed as endangered. Proposed species receive the protection of the Endangered Species Act.

**Federally Proposed as Threatened:** Taxa already proposed to be listed as threatened. Proposed species receive the protection of the Endangered Species Act.

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

**Floodplains:** Lowlands adjoining inland and coastal waters and relatively flat areas, and flood-prone areas of offshore islands including, at a minimum, that area inundated by 1.0% or greater chance of flood in any given year. 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.

**Hydric soil:** A 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 Technical Area which is developed or otherwise disturbed. Non-quantitative data about the area is obtained.

**Level 2 Survey:** A detailed quantitative vegetation survey used to evaluate whether critical habitat requirements for a TES species is present at the proposed project area.

**Level 3 Survey:** A survey aimed at obtaining 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. The law requires all projects/programs which receive 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:** Occur in wetlands in another region, but in Los Alamos County occur almost always (estimated probability >99%) under natural conditions in non wetlands. If a species does not occur in wetlands in any region, it is not on the "National List".

**Obligate Wetland:** Occur almost always (estimated probability >99%) under natural conditions in wetlands.

**Riparian:** Green-belts along streams, lakes, or other wet areas. These have become areas of concern, and are presently marginally protected by state and federal law.

**Solid Waste Management Unit (SWMU):** Any discernible unit at which solid wastes have been placed at any time, irrespective of whether 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 state endangered list. The plant is rare in numbers and/or occurrences and without protection, its further existence in the state is threatened.

**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 (E1):** The taxon is listed as threatened or endangered under the provisions of the Federal Endangered Species Act, or is considered to be proposed as threatened or endangered under the tenets of the act.

**State Endangered Plant (E2):** 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 (E3):** The taxon may be widespread in its distribution and may occur in adjacent states or Mexico, but its numbers are being significantly reduced to such an extent that within the foreseeable future 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.

**TES Species Database:** A database constructed by LANL that lists and provides information on all state and federal endangered/threatened species in Los Alamos County and surrounding counties.

**Wetlands:** Those areas that are inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances does or would 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)** 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)** 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," of discharged of dredged or fill materials into navigable waters..." after notice and opportunity for public hearings.

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

**Migratory Bird Treaty Act (16 USC 703-711)** protects wild birds from collection and maiming. All wild birds are covered by the act except resident game birds, English sparrows, starlings, and feral pigeons.

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Field personnel included Kathryn Bennett (Field Leader), Environmental Scientist; Saul Cross, Botanist, EPA Fellow; Dan Dunham, Botanist; Delia Raymer, Wildlife Biologist (GRA); James Biggs, Wildlife Biologist; Mary Salisbury, Computer Support; and Alethea Banar (UGS).

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Species	#Trees	#Trees Per Acre	Rel. Density	Avg. DBH	%Cover	Rel. %Cover	Freq.	Rel. Freq.	Importance Index
Trees									
JUMO	7.00	25.41	53.85	4.87	4.35	48.79	0.33	44.44	49.03
PIED	2.00	7.26	15.38	8.00	1.37	15.33	0.17	22.22	17.64
PIPO	4.00	14.52	30.77	6.63	3.20	35.89	0.25	33.33	33.33
TOTAL:	13.00	47.19	100.00	19.50	8.92	100.00	0.75	100.00	100.00

Species	#Stems	#Stems Per Acre	Rel. Density	%Cover	Rel. Cover	Freq.	Rel. Freq.	Importance Index
Shrubs								
CHNA	26.00	94.38	2.66	0.42	3.74	0.33	28.57	11.66
RHTR	40.00	145.20	4.09	0.38	3.44	0.08	7.14	4.89
RICE	5.00	18.15	0.51	0.00	0.00	0.08	7.14	2.55
FAPA	908.00	3296.04	92.75	10.33	92.81	0.67	57.14	80.90
Total =	979.00	3553.77	100.00	11.13	100.00	1.17	100.00	100.00

Transect 68-1c  
600 feet  
Line intercept

Lower Water Canyon  
Canyon bottom

Species	#Trees	#Trees Per Acre	Rel. Density	Avg. DBH	%Cover	Rel. %Cover	Freq.	Rel. Freq.	Importance Index
Trees									
JUMO	5.00	15.56	6.58	1.02	0.17	0.86	0.21	15.56	7.67
PIED	3.00	9.33	3.95	2.00	0.01	0.00	0.14	10.37	4.77
PIPO	68.00	211.58	89.47	7.33	19.76	99.14	1.00	74.07	87.56
TOTAL:	76.00	236.47	100.00	10.35	19.93	100.00	1.35	100.00	100.00

Species	#Stems	#Stems Per Acre	Rel. Density	%Cover	Rel. Cover	Freq.	Rel. Freq.	Importance Index
Shrubs								
QUGA	1.00	3.11	1.10	0.00	0.00	0.07	8.97	3.36
CHNA	5.00	15.56	5.49	0.00	0.00	0.07	8.97	4.82
RHTR	62.00	192.91	68.13	0.14	76.92	0.50	64.10	69.72
RICE	15.00	46.67	16.48	0.04	23.08	0.07	8.97	16.18
FONE	8.00	24.89	8.79	0.00	0.00	0.07	8.97	5.92
Total =	91.00	283.14	100.00	0.19	100.00	0.78	100.00	100.00

Transect 68-2c  
700 feet  
Line intercept

Lower Water Canyon  
North-facing slope

	#Stems	#Stems Per Acre	Rel Density	AVG DBH	%Cover	Rel. Cover	%Freq.	Rel. Freq.	Import Index
-----									
Trees									
JUMO	66	145.05	51.56	4.73	8.07	32.59	0.86	42.86	42.34
PIED	59	129.67	46.09	5.30	10.02	40.48	0.86	42.86	43.14
PIPO	3	6.59	2.34	9.30	6.67	26.93	0.29	14.29	14.52
-----									
TOTAL:	128	281.32	100.00	19.33	24.76	100.00	2.00	100.00	100.00
-----									
Shrubs									
QUEX	11	24.18	25.00	0.02	2.55	89.47	0.14	11.11	41.86
ARTR	14	30.77	31.82	0.53	0.10	3.51	0.57	44.44	26.59
RHTR	18	39.56	40.91	0.24	0.10	3.51	0.43	33.33	25.92
RICE	1	2.20	2.27	0.10	0.10	3.51	0.14	11.11	5.63
-----									
Total =	44.00	96.70	100.00	0.89	2.85	100.00	1.29	100.00	100.00

Transect 36-11c  
650 feet  
Circular plot

Lower Potrillo Canyon  
North-facing slope

	#Stems	#Stems Per Acre	Rel Density	AVG DBH	%Cover	Rel. Cover	%Freq.	Rel. Freq.	Import Index
<b>Trees</b>									
JUMO	68.00	149.45	42.50	5.21	11.51	25.92	1.00	46.67	38.36
PIED	91.00	200.00	56.88	5.12	17.89	40.30	1.00	46.67	47.95
PIPO	1.00	2.20	0.62	12.20	15.00	33.79	0.14	6.67	13.69
<b>TOTAL:</b>	<b>160.00</b>	<b>351.65</b>	<b>100.00</b>	<b>22.53</b>	<b>44.39</b>	<b>100.00</b>	<b>2.14</b>	<b>100.00</b>	<b>100.00</b>

<b>Shrubs</b>									
ARTR	11.00	24.18	50.00	0.12	2.55	69.86	0.43	60.00	59.95
RHTR	3.00	6.59	13.64	0.03	0.10	2.74	0.14	20.00	12.13
RICE	8.00	17.58	36.36	0.01	1.00	27.40	0.14	20.00	27.92
<b>Total =</b>	<b>22.00</b>	<b>48.35</b>	<b>100.00</b>	<b>0.16</b>	<b>3.65</b>	<b>100.00</b>	<b>0.71</b>	<b>100.00</b>	<b>100.00</b>

Transect 36-12c  
650 feet  
Circular plot

Lower Potrillo Canyon  
South-facing slope

**APPENDIX A**

**Plant Checklist for OU 1130**

Appendix A

Plant Checklist for OU 1130\*

FAMILY	SCIENTIFIC NAME	CODE	COMMON NAME
ACERACEAE	<i>Acer glabrum</i>	Acgl	New Mexico maple
	<i>Acer negundo</i>	Acne	Boxelder maple
AMARANTHACEAE	<i>Amaranthus retroflexus</i>	Amre	Pigweed
ANACARDIACEAE	<i>Rhus trilobata</i>	Rhtr	Skunk bush
APOCYNACEAE	<i>Apocynum androsaemifolium</i>	Apan	Spreading dogbane
ASCLEPIADACEAE	<i>Asclepias asperula</i>	Asas	Immortal
	<i>Asclepias subverticillata</i>	Assu	Poison milkweed
	<i>Asclepias tuberosa</i>	Astu	Butterflyweed
BERBERIDACEAE	<i>Berberis fendleri</i>	Befe	Colorado barberry
BORAGINACEAE	<i>Cryptantha fendleri</i>	Crfe	Fendler cryptantha
	<i>Cryptantha jamesii</i>	Crja	James hiddenflower
	<i>Hackelia hirsuta</i>	Hahi	Beggarlice
	<i>Lappula echinata</i>	Laec	Stickseed
	<i>Lappula redowskii</i>	Lare	Stickseed
	<i>Lappula texana</i>	Late	Stickseed
	<i>Lappula sp.</i>	Lapx	Stickseed
	<i>Lithospermum incisum</i>	Liin	Fringed puccoon
	<i>Lithospermum multiflorum</i>	Limu	Puccoon
	CACTACEAE	<i>Echinocereus triglochidiatus</i>	Ectr
<i>Echinocereus viridiflora</i>		Ecvi	Strawberry cactus
<i>Opuntia imbricata</i>		Opim	Walkingstick cholla
<i>Opuntia polyacantha</i>		Oppo	Starvation cactus
<i>Opuntia sp.</i>		Opux	Prickly pear cactus
CHENOPODIACEAE	<i>Atriplex canescens</i>	Atca	Fourwing saltbush
	<i>Chenopodium alba</i>	Chal	Lamb's quarters
	<i>Chenopodium graveolans</i>	Chgr	Goosefoot
	<i>Chenopodium leptophyllum</i>	Chle	Goosefoot
	<i>Chenopodium sp.</i>	Chex	Lamb's quarters
	<i>Kochia scoparia</i>	Kosc	Summer cypress

COMPOSITAE	<i>Salsola kali</i>	Saka	Russian thistle
	<i>Achillea lanulosa</i>	Acla	Western yarrow
	<i>Ambrosia artemisiifolia</i>	Amar	Common ragweed
	<i>Ambrosia confertifolia</i>	Amco	Ragweed
	<i>Ambrosia coronopifolia</i>	Amco	Ragweed
	<i>Antennaria parviflora</i>	Anpa	Pussytoes
	<i>Artemisia bigelovii</i>	Arbi	Bigelow sagebrush
	<i>Artemisia cana</i>	Arca	Silver sagebrush
	<i>Artemisia carruthii</i>	Arca	Wormwood
	<i>Artemisia dracunculus</i>	Ardr	False tarragon
	<i>Artemisia filifolia</i>	Arfi	Sand sagebrush
	<i>Artemisia frigida</i>	Arfr	Estafiata
	<i>Artemisia ludoviciana</i>	Arlu	Wormwood
	<i>Artemisia tridentata</i>	Artr	Big sagebrush
	<i>Aster bigelovii</i>	Asbi	Bigelow aster
	<i>Aster hirtifolius</i>	Ashi	Sand aster
	<i>Aster novae</i>	Asno	Aster
	<i>Bahia dissecta</i>	Badi	Wild chrysanthemum
	<i>Berlandiera lyrata</i>	Bely	Lyre leaf
	<i>Bidens tenuisecta</i>	Bite	Sticktight
	<i>Brickellia californica</i>	Brca	California brickellia
	<i>Brickellia sp.</i>	Brix	Bricklebush
	<i>Chicorium intybus</i>	Chin	Chickory
	<i>Chrysopsis foliosa</i>	Chfo	Golden aster
	<i>Chrysopsis villosa</i>	Chvi	Golden aster
	<i>Chrysothamnus nauseosus</i>	Chna	Chamisa, Rabbitbrush
	<i>Conyza canadensis</i>	Coca	Horseweed
	<i>Erigeron canus</i>	Erca	Fleabane
	<i>Erigeron divergens</i>	Erdi	Fleabane daisy
	<i>Erigeron sp.</i>	Erix	Daisy
	<i>Eupatorium herbaceum</i>	Euhe	Thoroughwort
	<i>Gaillardia pulchella</i>	Gapu	Firewheel
	<i>Grindelia aphanactis</i>	Gaap	Gumweed
	<i>Gutierrezia microcephala</i>	Gumi	Snakeweed
	<i>Gutierrezia sarothrae</i>	Gusa	Snakeweed

	<i>Haplopappus spinulosus</i>	Hasp	Spiny goldenweed
	<i>Helianthus petiolaris</i>	Hepe	Sunflower
	<i>Helianthus sp.</i>	Helx	Sunflower
	<i>Hymenopappus filifolius</i>	Hyfi	White ragweed
	<i>Hymenoxys argentea</i>	Hyar	Perky Sue
	<i>Hymenoxys richardsonii</i>	Hyri	Bitterweed
	<i>Kuhnia chlorolepsis</i>	Kucl	Kuhnia
	<i>Lactuca sp.</i>	Lacx	Prickly lettuce
	<i>Machaeranthera biglovii</i>	Mabi	Bigelow aster
	<i>Pericome caudata</i>	Peca	Taperleaf
	<i>Psilotrope tagetina</i>	Psta	Paperflower
	<i>Senecio eremophilus</i>	Seer	Groundsel
	<i>Senecio longilobus</i>	Selo	Thread-leaf groundsel
	<i>Senecio multicapitatus</i>	Semu	Groundsel
	<i>Senecio sp.</i>	Senx	Groundsel
	<i>Stephanomeria tenuifolia</i>	Stte	Skeleton weed
	<i>Taraxicum officinale</i>	Taof	Dandelion
	<i>Thelesperma megapotamicum</i>	Thme	Indian tea
	<i>Thelesperma trifidum</i>	Thtr	Greenthread
	<i>Townsendia exscapa</i>	Toex	Easter daisy
	<i>Tragopogon dubius</i>	Trdu	Salisfy, Goatsbeard
	<i>Tragopogon pratensis</i>	Trpr	Salsify
	<i>Viguiera multiflora</i>	Vimu	Showy goldeneye
	<i>Xanthium italicum</i>	Xait	Cocklebur
CONVULVULACEAE	<i>Ipomoea coccinea</i>	Ipco	Star-glory
CRUCIFERAE	<i>Arabis hirsuta</i>	Arhi	Hairy rockcress
	<i>Capsella bursa-pastoris</i>	Cabu	Shepherd's purse
	<i>Descurania obtusa</i>	Deob	Tansy mustard
	<i>Descurania richardsonii</i>	Deri	Tansy mustard
	<i>Descurania sp.</i>	Desx	Tansy mustard
	<i>Erysium capitatum</i>	Erca	Western wallflower
	<i>Lepidium medium</i>	Leme	Peppergrass
	<i>Lesquerella fendleri</i>	Lefe	Bladderpod
	<i>Sisymbrium altissimum</i>	Sial	Tumble mustard
	<i>Thlaspi alpestre</i>	Thal	Mountain candytuft

CUPRESSACEAE	<i>Thlaspi alpestre</i>	Thal	Mountain candytuft
	<i>Juniperus monosperma</i>	Jumo	One-seeded juniper
	<i>Juniperus scopulorum</i>	Jusc	Rocky Mountain juniper
CYPERACEAE	<i>Carex esculentus</i>	Caes	Yellow nut sedge
	<i>Carex spp.</i>	Carx	Sedge
EUPHORBIACEAE	<i>Croton texensis</i>	Crte	Doveweed
	<i>Euphorbia dentata</i>	Eude	Wild poinsetta
	<i>Euphorbia fendleri</i>	Eufe	Spurge
	<i>Euphorbia serpyllifolia</i>	Euse	Thymeleaf spurge
	<i>Euphorbia sp.</i>	Eupx	Spurge
FAGACEAE	<i>Quercus gambelii</i>	Quga	Gambel oak
	<i>Quercus grisea</i>	Qugr	Gray oak
	<i>Quercus turbinella</i>	Qutu	Shrub live oak
	<i>Quercus undulata</i>	Quun	Wavyleaf oak
	<i>Quercus sp.</i>	Quex	Hybrid oak
FUMARIACEAE	<i>Cordyalis aurea</i>	Coau	Golden smoke
GERANIACEAE	<i>Erodium cicutarium</i>	Erci	Cranesbill
	<i>Geranium caespitosum</i>	Geca	James geranium
GRAMINEAE	<i>Agropyron smithii</i>	Agsm	Western wheatgrass
	<i>Andropogon barbinodis</i>	Anba	Cane bluestem
	<i>Andropogon scoparius</i>	Ansc	Little bluestem
	<i>Aristida adscensionis</i>	Arad	Six-weeks three-awn
	<i>Aristida sp.</i>	Arix	Three-awn
	<i>Blepharoneuron tricholepis</i>	Bltr	Pine dropseed
	<i>Bouteloua curtipendula</i>	Bocu	Side-oats grama
	<i>Bouteloua eriopoda</i>	Boer	Black grama
	<i>Bouteloua gracilis</i>	Bogr	Blue grama
	<i>Bromus anomalous</i>	Bran	Nodding brome
	<i>Bromus frondosus</i>	Brfr	Weeping brome
	<i>Bromus purgans</i>	Brpu	Canada brome
	<i>Bromus sp.</i>	Brox	Brome grass
	<i>Bromus tectorum</i>	Brte	Downy Chess
	<i>Elymus canadensis</i>	Elca	Canada wildrye
	<i>Festuca octiflora</i>	Feoc	Six-weeks fescue
	<i>Festuca sp.</i>	Fesx	Fescue

	<i>Hilaria jamesii</i>	Hija	Galleta
	<i>Koeleria cristata</i>	Kocr	Junegrass
	<i>Lycrus phleoides</i>	Lypb	Wolftail
	<i>Muhlenbergia montana</i>	Mumo	Mountain muhly
	<i>Muhlenbergia torreyi</i>	Muto	Ring muhly
	<i>Munroa squarosa</i>	Musq	False buffalo grass
	<i>Oryzopsis hymenoides</i>	Orhy	Indian rice grass
	<i>Poa fendleriana</i>	Pofe	Bluegrass
	<i>Poa interior</i>	Poin	Inland bluegrass
	<i>Poa sp.</i>	Poax	Blue grass
	<i>Setaria lutescens</i>	Selu	Bristle grass
	<i>Sitanion hystrix</i>	Sihy	Bottlebrush squirreltail
	<i>Sporobolus contractus</i>	Spcp	Spike dropseed
	<i>Sporobolus cryptandrus</i>	Spcr	Sand dropseed
	<i>Sporobolus sp.</i>	Spox	Dropseed
	<i>Stipa comata</i>	Stco	Needle and thread grass
HYDROPHYLLACEAE	<i>Phacelia corrugata</i>	Phco	Scorpionweed
	<i>Phacelia sp.</i>	Phax	Scorpionweed
LABIATAE	<i>Monarda menthaefolia</i>	Mome	Beebalm
	<i>Monarda pectinata</i>	Mope	Ponymint
	<i>Prunella vulgaris</i>	Prvu	Selfheal
LEGUMINOSAE	<i>Astragalus missouriensis</i>	Asmi	Milkvetch
	<i>Astragalus sp.</i>	Astx	Milkvetch
	<i>Lotus wrightii</i>	Lowr	Deervetch
	<i>Lupinus caudatus</i>	Luca	Lupine
	<i>Lupinus kingii</i>	Luki	Lupine
	<i>Lupinus sp.</i>	Lupx	Lupine
	<i>Melilotus alba</i>	Meal	Yellow sweet clover
	<i>Melilotus indicus</i>	Mein	White sweetclover
	<i>Melilotus officinalis</i>	Meof	Yellow wild clover
	<i>Petalostemum candidum</i>	Peca	White prairie clover
	<i>Petalostemum sp.</i>	Petx	Prairie clover
	<i>Robinia neomexicana</i>	Rone	New Mexico locust
	<i>Trifolium sp.</i>	Trix	Clover
	<i>Vicia americana</i>	Viam	American vetch

LILIACEAE	<i>Allium textile</i>	Alte	Onion
	<i>Yucca angustissima</i>	Yuan	Narrowleaf yucca
	<i>Yucca baccata</i>	Yuba	Datil yucca
LINACEAE	<i>Linum lewisii</i>	Lile	Blue flax
	<i>Linum neomexicana</i>	Line	New Mexico yellow flax
LOASACEAE	<i>Mentzelia albicaulis</i>	Meal	White-stemmed blazing star
	<i>Mentzelia pumila</i>	Mepu	Stickleaf
MALVACEAE	<i>Sphaeralcea coccinea</i>	Spco	Red globe mallow
	<i>Sphaeralcea sp.</i>	Sphx	Scarlet globe mallow
NYCTAGINACEAE	<i>Mirabilis linearis</i>	Mili	Four-o'clock
	<i>Mirabilis multiflora</i>	Mimu	Showy four-o'clock
	<i>Mirabilis oxybaphoides</i>	Miox	Vining four-o'clock
	<i>Oxybaphus linearis</i>	Oxli	Desert four-o'clock
OLEACEAE	<i>Forestiera neomexicana</i>	Fone	New Mexico olive
ONAGRACEAE	<i>Oenothera albicaulis</i>	Oeal	Evening-primrose
	<i>Oenothera coronopifolia</i>	Oeco	Cutleaf evening-primrose
	<i>Oenothera hartwegii</i>	Ooha	Evening-primrose
	<i>Oenothera hookeri</i>	Oeho	Hooker's evening-primrose
	<i>Oenothera procera</i>	Oepr	Yellow evening-primrose
	<i>Oenothera sp.</i>	Oenx	Evening-primrose
OROBANACEAE	<i>Orobanche fasciculata</i>	Orfa	Broomrape
	<i>Orobanche multiflora</i>	Ormu	Broomrape
PINACEAE	<i>Abies concolor</i>	Abco	White fir
	<i>Pinus edulis</i>	Pied	Pinyon pine
	<i>Pinus ponderosa</i>	Pipo	Ponderosa pine
PLANTAGINACEAE	<i>Plantago purshii</i>	Plpu	Woolly Indian wheat
POLEMONIACEAE	<i>Ipomopsis aggregata</i>	Ipag	Scarlet trumpet
	<i>Ipomopsis longiflora</i>	Iplo	Blue gilia
POLYGONACEAE	<i>Eriogonum cernuum</i>	Erce	Skeleton weed
	<i>Eriogonum flagellaris</i>	Erfl	Wild buckwheat
	<i>Eriogonum jamesii</i>	Erja	Antelope sage
	<i>Rumex sp.</i>	Rumx	Dock
POLYPODIACEAE	<i>Cheilanthes feei</i>	Chfe	Fee's lip fern
PORTULACACEAE	<i>Portulaca oleracea</i>	Pool	Common purslane
PRIMULACEAE	<i>Androsace septentrionalis</i>	Anse	Western rock-jasmine

RANUNCULACEAE	<i>Clematis pseudoalpina</i>	Clps	Rocky Mountain clematis
	<i>Delphinium virescens</i>	Devi	Larkspur
	<i>Thalictrum fendleri</i>	Thfe	Meadowrue
ROSACEAE	<i>Cercocarpus montanus</i>	Cemo	Mountain mahogany
	<i>Fallugia paradoxa</i>	Fapa	Apache plume
	<i>Potentilla pulcherrima</i>	Popu	Beauty cinquefoil
	<i>Prunus virginiana</i>	Prvi	Western black chokecherry
	<i>Rosa woodsii</i>	Rowo	Fendler's rose
RUTACEAE	<i>Ptelea trifoliata</i>	Pttr	Narrowleaf hoptree
SALICACEAE	<i>Populus angustifolia</i>	Poan	Narrowleaf cottonwood
	<i>Populus fremontii</i>	Pofr	River cottonwood
	<i>Salix exigua</i>	Saex	Sandbar willow
SANTALACEAE	<i>Comandra pallida</i>	Copa	Bastard toadflaw
SAXIFRAGACEAE	<i>Fendlera rupicola</i>	Feru	Fendler bush
	<i>Heuchera parvifolia</i>	Hepa	Alumroot
	<i>Philadelphus microphyllus</i>	Phmi	Mockorange
	<i>Ribes cerceum</i>	Rice	Wax Current
	<i>Ribes inebrians</i>	Riin	Squaw currant
	<i>Ribes lepthanthum</i>	Rile	Trumpet gooseberry
SCROPHULARIACEAE	<i>Castilleja integra</i>	Cain	Indian paintbrush
	<i>Penstemon barbatus</i>	Peba	Scarlet bugler
	<i>Penstemon secundiflorus</i>	Pese	Beard tongue
	<i>Penstemon sp.</i>	Penx	Penstemon, Beardtongue
	<i>Penstemon virgatus</i>	Pevi	Beard tongue
	<i>Verbascum thapsus</i>	Veth	Mullein
SOLANACEAE	<i>Lycium pallidum</i>	Lypa	Pale wolfberry
	<i>Physalis hederifolia</i>	Phhe	Ground cherry
	<i>Physalis neomexicana</i>	Phne	Ground cherry
	<i>Solanum sp.</i>	Solx	Wild potato, Nightshade
TAMARICACEAE	<i>Tamarix gallica</i>	Taga	Tamarisk
ULMACEAE	<i>Celtis reticulata</i>	Cere	Western hackberry
VALERIANACEAE	<i>Valeriana acutiloba</i>	Vaac	Valerian
VERBENACEAE	<i>Verbena wrightii</i>	Vewr	Wright's vervain
VIOLACEAE	<i>Viola adunca</i>	Viad	Western dog violet
VITACEAE	<i>Parthenocissus inserta</i>	Pain	Virginia creeper

\* This plant list was compiled from 1992 Level 2 surveys and the previous surveys listed below:

- (1). Water Canyon, firing range survey, Foxx and Tierney (April 1986),
- (2). Potrillo Canyon, large bore gun/sled track survey, Foxx and Tierney, (June 1986),
- (3). lower Ancho Canyon, pulsed power assembly building survey (August 1987),
- (4). middle and lower Water Canyon and lower canyon rim, *Status of the Flora of the Los Alamos National Environmental Research Park*, Foxx and Tierney (1980),
- (5). Minie Site and Lower Slobbovia, *Long-Term Ecological Effects of Exposure to Uranium*, Hanson and Miera (1976),
- (6). Water Canyon, endangered species study, Foxx and Tierney (1977-1978)

**APPENDIX B**

**Macrofauna of OU 1130**

	<i>Selasphorus platycercus</i>	Broad-tailed hummingbird	Confirmed
TROGLODYTIDAE	<i>Catherpes mexicanus</i>	Canyon wren	Confirmed
	<i>Salpinctes obsoletus</i>	Rock wren	Confirmed
	<i>Thryomanes bewickii</i>	Bewick's wren	Probable
	<i>Troglodytes aedon</i>	House wren	Confirmed
TYRANNIDAE	<i>Empidonax hammondi</i>	Hammond's flycatcher	Possible
	<i>Empidonax oberholseri</i>	Dusky flycatcher	Possible
	<i>Empidonax wrightii</i>	Gray flycatcher	Possible
	<i>Myiarchus cinerascens</i>	Ash-throated flycatcher	Confirmed
	<i>Sayornis saya</i>	Say's phoebe	Confirmed
	<i>Tyrannus vociferans</i>	Cassin's kingbird	Confirmed
VIREONIDAE	<i>Vireo gilvus</i>	Warbling vireo	Possible
	<i>Vireo solitarius</i>	Solitary vireo	Confirmed

APPENDIX B

MACROFAUNA OF LOWER SLOBOVIA (TA-36)  
AND THE EF SITE (TA-15)  
from Hanson and Miera, 1976

PHYLUM	CLASS	ORDER	FAMILY	NUMBER OF SPECIES
Annelida	Oligochaeta			1
Nematoda				1
Arthropoda	Arachnida	Acarina		25-50
	Arachnida	Araneida		3
	Chilopoda		Lithobiidae	Lithodius?
	Symphyla			1
	Insecta	Thysanura		1
		Diplura	Iapygidae	1
		Collembola	Sminthuridae	1
			Poduridae	1
			Entomobryiidae	1
		Psocoptera		1
		Thysanoptera		1-3
		Hemiptera		1-3
		Homoptera	Cicadellidae	1-2
		Homoptera		2-4
		Coleoptera	Elateridae	1
			Staphylinidae	2
			Carabidae	1
			Scarabaeidae	1
			Phynchophoran?	1
			Anthicidae	Notoxus
			Miscellaneous	1-3
		Lepidoptera		2-5
		Diptera	Cecidomyiidae	?
			Phoridae*	
			Tachinidae*	
			Mycetophilidae*	
			Muscidae*	
		Hymenoptera	Formicidae	2
			Tiphiidae	2

\*10-15 species for all 4 dipteran families

**APPENDIX C**

**Potential Ant Species within OU 1130**

## APPENDIX C

## POTENTIAL ANT SPECIES WITHIN OPERABLE UNIT 1130.

SUBFAMILY	SCIENTIFIC NAME AUTHORITY	HABITAT	TYPE	
DOLICHODERINAE	<i>Acanthomypos interjectus</i>	Ponderosa	Mayr	
	<i>Brachymyrmex depilis</i>	Ponderosa	Emery	
	<i>C. sansabeanus</i>	P-j and ponderosa	Buckley	
	<i>C. vicinus</i>	P-j and ponderosa	Mayr	
	<i>F. argentea</i>	Disturbed	Wheeler	
	<i>F. neogagates</i>	P-j and disturbed	Emery	
	<i>F. pergandei</i>	Disturbed	Emery	
	<i>F. podzolica</i>	P-j and disturbed	Francoeur	
	<i>F. subnuda</i>	Ponderosa	Emery	
	<i>L. pallitarsis</i>	Ponderosa	Provancher	
	<i>L. sitiens</i>	P-j and ponderosa	Wilson	
	<i>Polyergus breviceps</i>	Ponderosa	Emery	
	MYRMICINAE	<i>Crematogaster cerasi</i>	Ponderosa	Fitch
		<i>C. colei</i>	Disturbed	Buren
		<i>Leptothorax muscorum</i>	Ponderosa	Nylander
<i>L. nitens</i>		Disturbed	Emery	
<i>L. obliquicanthus</i>		Disturbed	Cole	
<i>Monomorium cyaneum</i>		Disturbed	Wheeler	
<i>Pheidole ceres</i>		Ponderosa, Disturbed, and burned ponderosa	Wheeler	
<i>P. wheelerorum</i>		P-j and disturbed	MacKay	
<i>Pogonomyrmex occidentalis</i>		P-j and ponderosa	Cresson	
<i>Solenopsis molesta</i>		P-j and disturbed	Say	

P-j = pinon pine and juniper. Stands of Ponderosa are found in the higher elevations and along the canyon bottoms of OU 1130. Disturbed areas occur along roadways and in testing areas.

<i>L. flavus</i>	P-R	Fabricius
<i>L. neoniger</i>	P-R	Emery
<i>L. niger</i>	P-R	Linnaeus
<i>L. pallitarsis</i>	P-R	Provancher
<i>L. subumbratus</i>	P-R	Viereck
<i>Liometopum apiculatum</i>	P-R	Mayr
<i>L. luctuosom</i>	P-R	Wheeler

Ant species found in Riparian (R) and Ponderosa-Riparian (P-R) habitats similar to those found in OU 1130 .

SUBFAMILY NAME	SCIENTIFIC NAME	HABITAT	AUTHORITY	
MYRMICINAE	<i>Leptothorax crassipilis</i>	R	Wheeler	
	<i>L. muscorum</i>	P-R	Nylander	
	<i>L. nitens</i>	P-R	Emery	
	<i>L. texanus texanus</i>	P-R	Wheeler	
	<i>L. tricarinatus</i>	P-R	Emery	
	<i>Monomorium cyaneum</i>	P-R	Buckley	
	<i>Myrmecina americana</i>	P-R	Emery	
	<i>Myrmica emeryana</i>	P-R	Forel	
	<i>Myrmica hamulata</i>	P-R	Weber	
	<i>Pheidole ceres</i>	P-R	Wheeler	
	<i>P. wheelerorum</i>	P-R	MacKay	
	<i>Pogonomyrmex occidentalis</i>	P-R	Cresson	
	<i>Solenopsis molesta</i>	P-R and R	Say	
	<i>Stenamma occidentale</i>	P-R	M R Smith	
	DOLICHODERINAE	<i>Tapinoma sessile</i>	P-R	Say
		<i>Acanthomyops latipes</i>	P-R	Walsh
<i>Camponotus laevigatus</i>		P-R	F Smith	
<i>C. vicinus</i>		P-R	Wheeler	
<i>F. densiventris</i>		P-R	Linnaeus	
<i>F. hewitti</i>		P-R	Wheeler	
<i>F. lasioides</i>		P-R	Emery	
<i>F. limata</i>		P-R	Wheeler	
<i>F. neorufibarbis</i>		R	Emery,	
<i>F. obscuripes obscuripes</i>		P-R	Forel	
<i>F. obscurivntris clivia</i>		P-R	Creighton	
<i>F. occulta</i>		P-R	Francoeur	
<i>F. planipilis</i>		P-R	Creighton	
<i>F. podzolica</i>		P-R	Francoeur	
<i>Lasius alienus</i>		P-R	Foerster	
<i>L. crypticus</i>		P-R	Wilson	

**APPENDIX D**

**Insects of Ancho Canyon**

**APPENDIX D**  
**INSECTS OF ANCHO CANYON (HAARMANN 1991)**

<b>ORDER</b>	<b>FAMILY</b>	<b>COMMON NAME</b>
<b>COLEOPTERA (beetles)</b>	Buprestidae	Metallic wood boring beetles
	Carabidae	Ground beetles
	Chrysomelidae	Leaf beetles
	Cicindelidae	Tiger beetles
	Elateridae	Click beetles
	Scarabaeidae	Scarab beetles
<b>COLLEMBOLA (springtails)</b>	Entomobryidae	Springtails
<b>DIPTERA (flies)</b>	Phoridae	Hump-backed flies
	Tachinidae	Tachinid flies
<b>HEMIPTERA (bugs)</b>	Anthocoridae	Minute pirate bugs
	Reduviidae	Assassin bug
<b>HYMENOPTERA (wasps, bees, ants)</b>	Apidae	Carpenter bees Honey bees
	Colletidae	Plasterer bees
	Formicidae	Ants
	Halictidae	Mining bees
	Sphecidae	Sphecid wasps
	Vespidae	Paper wasps
	<b>LEPIDOPTERA (butterflies, moths)</b>	Hesperiidae
Noctuidae		Noctuid moths
Pieridae		Sulfur butterflies
<b>NEUROPTERA (nerve-winged insects)</b>	Myrmeleontidae	Antlions
<b>ORTHOPERA (grasshoppers, crickets)</b>	Acrididae	Grasshoppers
	Gryllacrididae	Wingless grasshoppers
	Gryllidae	Crickets
	Mantidae	Mantids
<b>THYSANURA (bristletails)</b>	Machilidae	Jumping bristletails

**APPENDIX E**

**Reptiles and Amphibians of OU 1130**

## APPENDIX E

REPTILES AND AMPHIBIANS OF OU 1130 AND SURROUNDING CANYONS  
 FOUND BY CHARLES BOGART (1978-1979)

FAMILY	SCIENTIFIC NAME	COMMON NAME	LOCATION
AMBYSTOMATIDAE	<i>Ambystoma tigrinum</i>	Tiger salamander	Pajarito Canyon
BUFONIDAE	<i>Bufo punctatus</i>	Red-spotted toad	Pajarito Canyon
	<i>Bufo woodhousei</i>	Woodhouse toad	Pajarito Canyon
COLUBRIDAE	<i>Elphae guttata</i>	Corn snake	Pajarito Canyon
	<i>Thamnophis elegans</i>	Western terrestrial garter snake	Pajarito Canyon
HYLIDAE	<i>Hyla arenicolor</i>	Canyon treefrog	Pajarito Canyon
	<i>Pseudocris triseriata</i>	Striped chorus frog	Pajarito Canyon
IGUANIDAE	<i>Crotophytus collaris</i>	Collared lizard	Water Canyon
	<i>Phrynosoma douglassi</i>	Short-horned lizard	Ancho Canyon
	<i>Sceloporus undulatus</i>	Eastern fence lizard	Throughout LA county from 1640 m to 2500m
	<i>Urosaurus ornatus</i>	Tree lizard	Ancho Canyon
PELOBATIDAE	<i>Scaphiopus multiplicatus</i>	Southern spadefoot	Pajarito Canyon
SCINCIDAE	<i>Eumeces obsoletus</i>	Great Plains skink	Ancho Canyon
TEIIDAE	<i>Cnemidophorus exsanguis</i>	Chihuahuan spotted whiptail	Ancho Canyon
	<i>Cnemidophorus velox</i>	Plateau striped whiptail	Pajarito Canyon
VIPERIDAE	<i>Crotalus atrox</i>	Western diamondback rattlesnake	Ancho Canyon

**APPENDIX F**

**Breeding Birds of OU 1130**

## APPENDIX F

BREEDING BIRDS OF OU 1130  
 from Atlas of the Breeding Birds of Los Alamos County, New Mexico

FAMILY	SCIENTIFIC NAME	COMMON NAME	NESTING STATUS
ACCIPTRIDAE	<i>Accipiter cooperi</i>	Cooper's hawk	Confirmed
	<i>Buteo jamaicensis</i>	Red-tailed hawk	Confirmed
APODIDAE	<i>Aeronautes saxatalis</i>	White-throated swift	Confirmed
CAPRIMULGIDAE	<i>Chordeiles minor</i>	Common nighthawk	Probable
CATHARTIDAE	<i>Cathartes aura</i>	Turkey vulture	Possible
COLUMBIDAE	<i>Zenaida macroura</i>	Mourning dove	Probable
CORVIDAE	<i>Aphelocoma coerulescens</i>	Scrub jay	Confirmed
	<i>Corvus corax</i>	Common raven	Confirmed
	<i>Cyanocitta stelleri</i>	Steller's jay	Confirmed
	<i>Gymnorhinus cyanocephalus</i>	Pinon jay	Confirmed
EMBERIZIDAE	<i>Chondestes grammacus</i>	Lark sparrow	Confirmed
	<i>Coccothraustes verpertina</i>	Evening grosbeak	Probable
	<i>Guiraca caerulea</i>	Blue grosbeak	Probable
	<i>Melospiza Melodia</i>	Song sparrow	Probable
	<i>Pheucticus melancephalus</i>	Black-headed grosbeak	Confirmed
	<i>Pipilo chlorurus</i>	Green-tailed towhee	Possible
	<i>Pipilo erythrophthalmus</i>	Rufous-sided towhee	Confirmed
	<i>Pipilo fuscus</i>	Canyon towhee	Confirmed
	<i>Spizella passerina</i>	Chipping sparrow	Confirmed
FALCONIDAE	<i>Falco sparverius</i>	American kestrel	Confirmed
FRINGILLIDAE	<i>Carduelis psaltria</i>	Lesser goldfinch	Confirmed
	<i>Carpodacus casinii</i>	Cassin's finch	Probable
	<i>Carpodacus mexicanus</i>	House finch	Confirmed
	<i>Loxia curvirostra</i>	Red crossbill	Possible

	<i>Selasphorus platycercus</i>	Broad-tailed hummingbird	Confirmed
TROGLODYTIDAE	<i>Catherpes mexicanus</i>	Canyon wren	Confirmed
	<i>Salpinctes obsoletus</i>	Rock wren	Confirmed
	<i>Thryomanes bewickii</i>	Bewick's wren	Probable
	<i>Troglodytes aedon</i>	House wren	Confirmed
TYRANNIDAE	<i>Empidonax hammondii</i>	Hammond's flycatcher	Possible
	<i>Empidonax oberholseri</i>	Dusky flycatcher	Possible
	<i>Empidonax wrightii</i>	Gray flycatcher	Possible
	<i>Myiarchus cinerascens</i>	Ash-throated flycatcher	Confirmed
	<i>Sayornis saya</i>	Say's phoebe	Confirmed
	<i>Tyrannus vociferans</i>	Cassin's kingbird	Confirmed
VIREONIDAE	<i>Vireo gilvus</i>	Warbling vireo	Possible
	<i>Vireo solitarius</i>	Solitary vireo	Confirmed

HIRUNDINIDAE	<i>Hirundo pyrrhonota</i>	Cliff swallow	Probable
	<i>Tachycineta thalassina</i>	Violet-green swallow	Confirmed
ICTERIDAE	<i>Agelaius phoeniceus</i>	Red-winged blackbird	Probable
	<i>Euphagus cyanocephalus</i>	Brewer's blackbird	Confirmed
	<i>Icterus parisorum</i>	Scott's oriole	Confirmed
	<i>Molothrus ater</i>	Brown-headed cowbird	Confirmed
	<i>Sturnella neglecta</i>	Western meadowlark	Possible
MIMIDAE	<i>Mimus polyglottos</i>	Northern mockingbird	Possible
MUSCICAPIDAE	<i>Catharus guttatus</i>	Hermit thrush	Possible
	<i>Myadestes townsendi</i>	Townsend's solitaire	Possible
	<i>Sialia currucoides</i>	Mountain bluebird	Confirmed
	<i>Sialia mexicana</i>	Western bluebird	Confirmed
	<i>Turdus migratorius</i>	American robin	Confirmed
PARIDAE	<i>Parus gambeli</i>	Mountain chickadee	Confirmed
	<i>Parus inornatus</i>	Plain titmouse	Confirmed
	<i>Psaltriparus minimus</i>	Bushtit	Confirmed
PARULIDAE	<i>Dendroica coronata</i>	Yellow-rumped warbler	Possible
	<i>Dendroica graciae</i>	Grace's warbler	Confirmed
	<i>Dendroica nigrescens</i>	Black-throated warbler	Confirmed
PHASIANIDAE	<i>Callipepla gambelii</i>	Gambel's quail	Confirmed
PICIDAE	<i>Colaptes auratus</i>	Northern flicker	Confirmed
	<i>Picoides villosus</i>	Hairy woodpecker	Confirmed
	<i>Sphyrapicus thyroideus</i>	Williamson's sapsucker	Possible
PLOCEIDAE	<i>Passer domesticus</i>	House sparrow	Confirmed
SITTIDAE	<i>Sitta carolinensis</i>	White-breasted nuthatch	Confirmed
	<i>Sitta pygmaea</i>	Pygmy nuthatch	Confirmed
STRIGIDAE	<i>Bubo virginianus</i>	Great horned owl	Confirmed
	<i>Otus flammeolus</i>	Flammulated owl	Possible
STURNIDAE	<i>Sturnus vulgaris</i>	European starling	Confirmed
SYLVIDAE	<i>Polioptila melanura</i>	Blue-gray gnatcatcher	Probable
THRAUPIDAE	<i>Piranga flava</i>	Hepatic tanager	Confirmed
	<i>Piranga ludoviciana</i>	Western tanager	Confirmed
TROCHILIDAE	<i>Archilocus alexandri</i>	Black-chinned hummingbird	Confirmed

**APPENDIX H**

**Mammals of OU 1130**

## APPENDIX H

MAMMALS OF OU 1130  
(bats also listed in Appendix I)

FAMILY	SCIENTIFIC NAME	COMMON NAME	CANYON or SITE
CANIDAE	<i>Canis latrans</i>	Coyote	Potrillo, Water
	<i>Urocyon cinereoargenteus</i>	Gray fox	
CERVIDAE	<i>Cervus canadensis</i>	Elk	Potrillo, Water
	<i>Odocoileus hermionus</i>	Mule deer	Potrillo, Water
CRICETIDAE	<i>Neotoma</i> sp.	Woodrat	Water
	<i>Peromyscus maniculatus</i>	Deer mouse	Potrillo
	<i>Peromyscus truei</i>	Pinon mouse	Potrillo
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	Minie, Lower Slobbovia
ERETHIZONTIDAE	<i>Erethizon dorsatum</i>	Porcupine	Potrillo, Water
EQUIDAE	<i>Equus caballus</i>	Domestic horse	Potrillo
FELIDAE	<i>Felis concolor</i>	Mountain lion	
	<i>Lynx rufus</i>	Bobcat	
GEOMYIDAE	<i>Thomomys</i> sp.	Pocket gopher	Potrillo, Water
HETEROMYIDAE	<i>Perognathus flavus</i>	Silky pocket mouse	Potrillo
	<i>Perognathus intermedius</i>	Rock pocket mouse	Potrillo
LEPORIDAE	<i>Sylvilagus</i> sp.	Cottontail rabbit	Potrillo, Water, Lower Slobbovia
MUSTELIDAE	<i>Mephitis mephitis</i>	Striped skunk	

	<i>Taxidea taxus</i>	Badger	Potrillo
PROCYONIDAE	<i>Procyon lotor</i>	Raccoon	
SCIURIDAE	<i>Eutamias minimus</i>	Least chipmunk	Potrillo, Water
	<i>Eutamias quadrivittatus</i>	Colorado chipmunk	Potrillo
	<i>Citellus variegatus</i>	Rock squirrel	Water
	<i>Sciurus aberti</i>	Abert's squirrel	Water
URSIDAE	<i>Ursus americanus</i>	Black bear	

Appendix F was based on information from

- (1). Jim Kent, 1986, small mammal trapping in Potrillo Canyon
- (2). Wenzel and Kent, 1986, observations in Potrillo Canyon
- (3). Colleen Olinger, 1986, observations in lower Water Canyon
- (4). Rudy Archeleta, personal observations (no locations given)
- (5). Joan Morrison, 1986, small mammal trapping in Water Canyon
- (6). Hanson and Miera, 1976, small mammal trapping at Minie Site and Lower Slobbovia

**APPENDIX I**

**Plant Classification Outline**

# APPENDIX I

## Plant Classification Outline

### Hierarchy Order

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

### Definitions

**Vegetation Type:** The vegetation established under existing climate and includes upland or wetland.

**Formation Type:** 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:** 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:** 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:** Principal plant and animal communities within each of the Biotic Communities. These are based on distinctive climax plant dominants.

**Habitat Type:** The occurrence of particular dominant species that are local or regional in distribution.

**Phase:** 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. Refer to Appendix I for plant code abbreviations.

## 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

*Linnaea borealis* Phase

*Rubus parviflora* Phase

Abla/*Vaccinium*/*Linnaea 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

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

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 myrtilus 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

Sacaton/Saltbush Series  
     Sacaton/Shadscale/Fourwing HT  
 Mixed grama/western wheatgrass Series  
     Mixed grama/Jumo 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)

**Scrubland 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

**APPENDIX J**

**Bats of Los Alamos County**

## APPENDIX J

Bats of Los Alamos County  
(3/D ENVIRONMENTAL SERVICES, SUMMER 1992)

SCIENTIFIC NAME	COMMON NAME	FEMALE NR	FEMALE RF	MALE	JUV	UNK	TOTAL
<i>Antrozous pallidus</i>	Pallid bat	0	4	4	0	2	10
<i>Eptesicus fuscus</i>	Big brown bat	1	2	7	0	0	10
<i>Lasionycteris noctivagans</i>	Silver-haired bat	0	0	15	0	0	15
<i>Lasiurus cinereus</i>	Hoary bat	0	0	11	0	0	11
<i>Myotis californicus</i>	California myotis	0	2	2	0	0	4
<i>Myotis evotis</i>	Long-eared myotis	2	2	2	0	1	7
<i>Myotis leibii</i>	Small-footed myotis	0	0	5	0	0	5
<i>Myotis thysanodes</i>	Fringed myotis	1	6	4	2	0	13
<i>Myotis volans</i>	Long-legged myotis	1	1	4	1	0	7
<i>Myotis yumanensis</i>	Yuma myotis	0	4	1	0	0	5
<i>Pipistrellus hesperus</i>	Western pipistrelle	0	0	1	0	0	1
<i>Plecotus townsendii</i>	Townsend's big-eared bat	0	0	1	0	0	1
<i>Tadarida brasiliensis</i>	Brazilian free-tailed bat	0	1	3	0	1	5

**Abbreviations used in Appendix I: Bats of Los Alamos County**

NR = nonreproductive adult female

RF = reproductive adult female

MALE = adult male

JUV = juvenile (male or female)

UNK = age/sex unknown (escaped from net prior to handling)

**APPENDIX K**

**Plant Checklist Including Indicator Status for OU 1130**

APPENDIX K

Plant Checklist for OU 1130 including Indicator Status \*

FAMILY	SCIENTIFIC NAME	INDICATOR	COMMON NAME
ACERACEAE	<i>Acer glabrum</i>	NW, FAC	New Mexico maple
	<i>Acer negundo</i>	NW, FAC	Boxelder maple
AMARANTHACEAE	<i>Amaranthus retroflexus</i>	ECO	Pigweed
ANACARDIACEAE	<i>Rhus trilobata</i>	FAC	Skunk bush
APOCYNACEAE	<i>Apocynum androsaemifolium</i>	ECO	Spreading dogbane
ASCLEPIADACEAE	<i>Asclepias asperula</i>	NW	Immortal
	<i>Asclepias subverticillata</i>	ECO, FACU	Poison milkweed
	<i>Asclepias tuberosa</i>	NW	Butterflyweed
BERBERIDACEAE	<i>Berberis fendleri</i>	NW	Colorado barberry
BORAGINACEAE	<i>Cryptantha fendleri</i>	NW	Fendler cryptantha
	<i>Cryptantha jamesii</i>	NW	James hiddenflower
	<i>Hackelia hirsuta</i>		Beggarlice
	<i>Lappula echinata</i>	ECO	Stickseed
	<i>Lappula redowskii</i>	COL	Stickseed
	<i>Lappula texana</i>		Stickseed
	<i>Lappula sp.</i>		Stickseed
	<i>Lithospermum incisum</i>	NW	Fringed puccoon
	<i>Lithospermum multiflorum</i>	NW	Puccoon
	CACTACEAE	<i>Echinocereus triglochidiatus</i>	NW
<i>Echinocereus viridiflora</i>		NW	Strawberry cactus
<i>Opuntia imbricata</i>		ECO	Walkingstick cholla
<i>Opuntia polyacantha</i>		ECO	Starvation cactus
<i>Opuntia sp.</i>			Prickly pear cactus
CHENOPODIACEAE	<i>Atriplex canescens</i>	NW	Fourwing saltbush
	<i>Chenopodium alba</i>	ECO, FAC	Lamb's quarters
	<i>Chenopodium graveolans</i>	COL	Goosefoot
	<i>Chenopodium leptophyllum</i>	NW, FACU	Goosefoot
	<i>Chenopodium sp.</i>		Lamb's quarters
	<i>Kochia scoparia</i>	ECO, FAC	Summer cypress

## COMPOSITAE

<i>Kochia scoparia</i>	ECO, FAC	Summer cypress
<i>Salsola kali</i>		Russian thistle
<i>Achillea lanulosa</i>	ECO	Western yarrow
<i>Ambrosia artemisiifolia</i>	COL, FACU	Common ragweed
<i>Ambrosia confertifolia</i>		Ragweed
<i>Ambrosia coronopifolia</i>		Ragweed
<i>Antennaria parviflora</i>	NW	Pussytoes
<i>Artemisia bigelovii</i>	NW	Bigelow sagebrush
<i>Artemisia cana</i>	NW, FACW	Silver sagebrush
<i>Artemisia carruthii</i>	NW	Wormwood
<i>Artemisia dracunculus</i>	NW	False tarragon
<i>Artemisia filifolia</i>	ECO	Sand sagebrush
<i>Artemisia frigida</i>	COL	Estafiata
<i>Artemisia ludoviciana</i>	NW	Wormwood
<i>Artemisia tridentata</i>	ECO	Big sagebrush
<i>Aster bigelovii</i>		Bigelow aster
<i>Aster hirtifolius</i>		Sand aster
<i>Aster novae</i>	COL, FACW	Aster
<i>Bahia dissecta</i>	NW	Wild chrysanthemum
<i>Berlandiera lyrata</i>		Lyre leaf
<i>Bidens tenuisecta</i>		Sticktight
<i>Brickellia californica</i>	NW, FACU	California brickellia
<i>Brickellia sp.</i>		Bricklebush
<i>Chicorium intybus</i>		Chickory
<i>Chrysopsis foliosa</i>		Golden aster
<i>Chrysopsis villosa</i>		Golden aster
<i>Chrysothamnus nauseosus</i>	ECO	Chamisa, Rabbitbrush
<i>Conyza canadensis</i>	ECO, FACU	Horseweed
<i>Erigeron canus</i>	NW	Fleabane
<i>Erigeron divergens</i>	NW	Fleabane daisy
<i>Erigeron sp.</i>		Daisy
<i>Eupatorium herbaceum</i>	NW	Thoroughwort
<i>Gaillardia pulchella</i>		Firewheel
<i>Grindelia aphanactis</i>	NW	Gumweed
<i>Gutierrezia microcephala</i>	ECO	Snakeweed

	<i>Gutierrezia sarothrae</i>	ECO	Snakeweed
	<i>Haplopappus gracilis</i>	NW	Goldenweed
	<i>Haplopappus spinulosus</i>		Spiny goldenweed
	<i>Helianthus petiolaris</i>	ECO	Sunflower
	<i>Helianthus sp.</i>		Sunflower
	<i>Hymenopappus filifolius</i>	NW	White ragweed
	<i>Hymenoxys argentea</i>		Perky Sue
	<i>Hymenoxys richardsonii</i>	NW	Bitterweed
	<i>Kuhnia chlorolepsis</i>		Kuhnia
	<i>Lactuca sp.</i>		Prickly lettuce
	<i>Machaeranthera biglovii</i>	NW	Bigelow aster
	<i>Pericome caudata</i>	NW	Taperleaf
	<i>Psilotrope tagetina</i>	NW	Paperflower
	<i>Senecio eremophilus</i>		Groundsel
	<i>Senecio longilobus</i>		Thread-leaf groundsel
	<i>Senecio multicapitatus</i>	NW	Groundsel
	<i>Senecio sp.</i>		Groundsel
	<i>Stephanomeria tenuifolia</i>	NW	Skeleton weed
	<i>Taraxicum officinale</i>	ECO	Dandelion
	<i>Thelesperma megapotamicum</i>	NW	Indian tea
	<i>Thelesperma trifidum</i>		Greenthread
	<i>Townsendia exscapa</i>		Easter daisy
	<i>Tragopogon dubius</i>	ECO	Salisfy, Goatsbeard
	<i>Tragopogon pratensis</i>	ECO	Salsify
	<i>Viguiera multiflora</i>		Showy goldeneye
	<i>Xanthium italicum</i>		Cocklebur
CONVULVULACEAE	<i>Ipomoea coccinea</i>	FAC	Star-glory
CRUCIFERAE	<i>Arabis hirsuta</i>	NW, FACU	Hairy rockcress
	<i>Capsella bursa-pastoris</i>	ECO, FAC	Shepherd's purse
	<i>Descurania obtusa</i>	NW	Tansy mustard
	<i>Descurania richardsonii</i>	NW	Tansy mustard
	<i>Descurania sp.</i>		Tansy mustard
	<i>Erysium capitatum</i>		Western wallflower
	<i>Lepidium medium</i>		Peppergrass
	<i>Lesquerella fendleri</i>		Bladderpod

	<i>Sisymbrium altissimum</i>	ECO, FAC	Tumble mustard
	<i>Thlaspi alpestre</i>		Mountain candytuft
CUPRESSACEAE	<i>Juniperus monosperma</i>	NW	One-seeded juniper
	<i>Juniperus scopulorum</i>	NW	Rocky Mountain juniper
CYPERACEAE	<i>Carex esculentus</i>		Yellow nut sedge
	<i>Carex spp.</i>		Sedge
EUPHORBIACEAE	<i>Croton texensis</i>	NW	Doveweed
	<i>Euphorbia dentata</i>	ECO	Wild poinsetta
	<i>Euphorbia fendleri</i>	NW	Spurge
	<i>Euphorbia serpyllifolia</i>	ECO	Thymeleaf spurge
	<i>Euphorbia sp.</i>		Spurge
FAGACEAE	<i>Quercus gambelii</i>	NW	Gambel oak
	<i>Quercus grisea</i>	NW	Gray oak
	<i>Quercus turbinella</i>	NW	Shrub live oak
	<i>Quercus undulata</i>	NW	Wavyleaf oak
	<i>Quercus sp.</i>		Hybrid oak
FUMARIACEAE	<i>Cordyalis aurea</i>	COL	Golden smoke
GERANIACEAE	<i>Erodium cicutarium</i>	ECO	Cranesbill
	<i>Geranium caespitosum</i>		James geranium
GRAMINEAE	<i>Agropyron smithii</i>	NW, FAC	Western wheatgrass
	<i>Andropogon barbinodis</i>	NW	Cane bluestem
	<i>Andropogon scoparius</i>	NW	Little bluestem
	<i>Aristida adscensionis</i>	NW	Six-weeks three-awn
	<i>Aristida sp.</i>		Three-awn
	<i>Blepharoneuron tricholepis</i>	NW	Pine dropseed
	<i>Bouteloua curtipendula</i>	NW	Side-oats grama
	<i>Bouteloua eriopoda</i>	NW	Black grama
	<i>Bouteloua gracilis</i>	NW	Blue grama
	<i>Bromus anomalous</i>	NW	Nodding brome
	<i>Bromus frondosus</i>	NW	Weeping brome
	<i>Bromus purgans</i>	NW	Canada brome
	<i>Bromus sp.</i>		Bromegrass
	<i>Bromus tectorum</i>	ECO	Downy Chess
	<i>Elymus canadensis</i>	NW, FAC	Canada wildrye
	<i>Festuca octiflora</i>		Six-weeks fescue

	<i>Festuca sp.</i>		Fescue
	<i>Hilaria jamesii</i>	NW	Galleta
	<i>Koeleria cristata</i>	NW	Junegrass
	<i>Lycrus phleoides</i>	NW	Wolftail
	<i>Muhlenbergia montana</i>	NW	Mountain muhly
	<i>Muhlenbergia torreyi</i>	NW	Ring muhly
	<i>Munroa squarosa</i>	NW	False buffalo grass
	<i>Oryzopsis hymenoides</i>	NW, FACU	Indian rice grass
	<i>Poa fendleriana</i>	NW	Bluegrass
	<i>Poa interior</i>		Inland bluegrass
	<i>Poa sp.</i>		Blue grass
	<i>Setaria lutescens</i>		Bristle grass
	<i>Sitanion hystrix</i>	NW	Bottlebrush squirreltail
	<i>Sporobolus contractus</i>	NW	Spike dropseed
	<i>Sporobolus cryptandrus</i>	NW, FACU	Sand dropseed
	<i>Sporobolus sp.</i>		Dropseed
	<i>Stipa comata</i>	NW	Needle and thread grass
HYDROPHYLLACEAE	<i>Phacelia corrugata</i>	NW	Scorpionweed
	<i>Phacelia sp.</i>		Scorpionweed
LABIATAE	<i>Monarda menthaefolia</i>		Beebalm
	<i>Monarda pectinata</i>	NW	Ponymint
	<i>Prunella vulgaris</i>	NW, FACW	Selfheal
LEGUMINOSAE	<i>Astragalus missouriensis</i>	NW	Milkvetch
	<i>Astragalus sp.</i>		Milkvetch
	<i>Lotus wrightii</i>	NW	Deervetch
	<i>Lupinus caudatus</i>	NW	Lupine
	<i>Lupinus kingii</i>	NW, FAC	Lupine
	<i>Lupinus sp.</i>		Lupine
	<i>Melilotus alba</i>	COL, FACU	Yellow sweet clover
	<i>Melilotus indicus</i>	COL, FACU	White sweetclover
	<i>Melilotus officinalis</i>	COL, FACU	Yellow wild clover
	<i>Petalostemum candidum</i>		White prairie clover
	<i>Petalostemum sp.</i>		Prairie clover
	<i>Robinia neomexicana</i>	NW	New Mexico locust
	<i>Trifolium sp.</i>		Clover

LILIACEAE	<i>Vicia americana</i>	NW	American vetch
	<i>Allium textile</i>	ECO	Onion
	<i>Yucca angustissima</i>	NW	Narrowleaf yucca
	<i>Yucca baccata</i>	ECO	Datil yucca
LINACEAE	<i>Linum lewisii</i>	NW	Blue flax
	<i>Linum neomexicana</i>		New Mexico yellow flax
LOASACEAE	<i>Mentzelia albicaulis</i>	NW	White-stemmed blazing star
	<i>Mentzelia pumila</i>	NW	Stickleaf
MALVACEAE	<i>Sphaeralcea coccinea</i>	NW	Red globe mallow
	<i>Sphaeralcea sp.</i>		Scarlet globe mallow
NYCTAGINACEAE	<i>Mirabilis linearis</i>		Four-o'clock
	<i>Mirabilis multiflora</i>	NW	Showy four-o'clock
	<i>Mirabilis oxybaphoides</i>		Vining four-o'clock
	<i>Oxybaphus linearis</i>	NW, FACU	Desert four-o'clock
OLEACEAE	<i>Forestiera neomexicana</i>	NW, FACU	New Mexico olive
ONAGRACEAE	<i>Oenothera albicaulis</i>	NW	Evening-primrose
	<i>Oenothera coronopifolia</i>	NW	Cutleaf evening-primrose
	<i>Oenothera hartwegii</i>		Evening-primrose
	<i>Oenothera hookeri</i>	NW	Hooker's evening-primrose
	<i>Oenothera procera</i>		Yellow evening-primrose
	<i>Oenothera sp.</i>		Evening-primrose
OROBANACEAE	<i>Orobanche fasciculata</i>	NW	Broomrape
	<i>Orobanche multiflora</i>	NW	Broomrape
PINACEAE	<i>Abies concolor</i>	NW	White fir
	<i>Pinus edulis</i>	NW	Pinyon pine
	<i>Pinus ponderosa</i>	NW, FACU	Ponderosa pine
PLANTAGINACEAE	<i>Plantago purshii</i>	NW	Woolly Indian wheat
POLEMONIACEAE	<i>Ipomopsis aggregata</i>	NW	Scarlet trumpet
	<i>Ipomopsis longiflora</i>	NW	Blue gilia
POLYGONACEAE	<i>Eriogonum cernuum</i>	NW	Skeleton weed
	<i>Eriogonum flagellaris</i>		Wild buckwheat
	<i>Eriogonum jamesii</i>	NW	Antelope sage
	<i>Rumex sp.</i>		Dock
POLYPODIACEAE	<i>Cheilanthes feei</i>	NW	Fee's lip fern
PORTULACACEAE	<i>Portulaca oleracea</i>	ECO, FAC	Common purslane

PRIMULACEAE	<i>Androsace septentrionalis</i>	NW, FAC	Western rock-jasmine
RANUNCULACEAE	<i>Clematis pseudoalpina</i>		Rocky Mountain clematis
	<i>Delphinium virescens</i>	ECO	Larkspur
	<i>Thalictrum fendleri</i>	NW, FACU	Meadowrue
ROSACEAE	<i>Cercocarpus montanus</i>	NW	Mountain mahogany
	<i>Fallugia paradoxa</i>	NW	Apache plume
	<i>Potentilla pulcherrima</i>		Beauty cinquefoil
	<i>Prunus virginiana</i>	NW	Western black chokecherry
	<i>Rosa woodsii</i>	NW, FACU	Fendler's rose
RUTACEAE	<i>Ptelea trifoliata</i>	FACU	Narrowleaf hoptree
SALICACEAE	<i>Populus angustifolia</i>	NW, FACW	Narrowleaf cottonwood
	<i>Populus fremontii</i>	NW, FAC	River cottonwood
	<i>Salix exigua</i>	NW	Sandbar willow
SANTALACEAE	<i>Comandra pallida</i>		Bastard toadflaw
SAXIFRAGACEAE	<i>Fendlera rupicola</i>	NW	Fendler bush
	<i>Heuchera parvifolia</i>	NW	Alumroot
	<i>Philadelphus microphyllus</i>	NW	Mockorange
	<i>Ribes cerceum</i>	NW	Wax Current
	<i>Ribes inebrians</i>		Squaw currant
	<i>Ribes leptanthum</i>	NW	Trumpet gooseberry
SCROPHULARIACEAE	<i>Castilleja integra</i>	NW	Indian paintbrush
	<i>Penstemon barbatus</i>	NW	Scarlet bugler
	<i>Penstemon secundiflorus</i>	NW	Beard tongue
	<i>Penstemon sp.</i>		Penstemon, Beardtongue
	<i>Penstemon virgatus</i>	NW, FACU	Beard tongue
	<i>Verbascum thapsus</i>	ECO	Mullein
SOLANACEAE	<i>Lycium pallidum</i>	NW	Pale wolfberry
	<i>Physalis hederifolia</i>	NW	Ground cherry
	<i>Physalis neomexicana</i>		Ground cherry
	<i>Solanum sp.</i>		Wild potato, Nightshade
TAMARICACEAE	<i>Tamarix gallica</i>		Tamarisk
ULMACEAE	<i>Celtis reticulata</i>	NW, FACU	Western hackberry
VALERIANACEAE	<i>Valeriana acutiloba</i>		Valerian
VERBENACEAE	<i>Verbena wrightii</i>	NW	Wright's vervain
VIOLOCEAE	<i>Viola adunca</i>	NW, FAC	Western dog violet

VITACEAE	<i>Parthenocissus inserta</i>		Virginia creeper
	<i>Vitis arizonica</i>	NW, FAC	Canyon grape

**\* INDICATOR CODES**

NW = Non-weedy

Col = Colonizing

ECO = Economic

FAC = Facultative plants which are equally likely to occur in wetlands  
or nonwetlands

FACW = Facultative wetland plants which usually occur in wetlands

FACU = Facultative upland plants which usually occur in nonwetlands

OBL = Obligate wetland plants which almost always occur in wetlands

UPL = Obligate upland plants which almost always occur in nonwetlands

**TES Species Printout for OU 1130**

**APPENDIX I**

APPENDIX L

TES Species Printout for OU 1130

+-----+  
| ANIMALS |  
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BIRD  
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FAMILY ACCIPITRIDAE

SCIENTIFIC NAME: Accipiter gentilis

COMMON NAME: NORTHERN GOSHAWK

STATUS: CANDIDATE FOR FEDERAL REGISTER

FEDERAL/STATE REFERENCE: CURRENTLY, CANDIDATE FOR FEDERAL LISTING, FEDERAL REGISTER, 1991, VOL. 56, NO. 225, PP.58810.

DISTRIBUTION:

SPECIFIC REQUIREMENTS: DENSE, MATURE, OR OLD GROWTH CONIFEROUS FOREST.

HABITAT: PONDEROSA

BREEDING HABITAT: PONDEROSA

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON: LOGGING

BRIEF KEY DESCRIPTION: A LARGE ROBUST HAWK WITH A LONGISH TAIL, ROUNDED WINGS. CROWN AND CHECK BLACKISH; BROAD WHITE STRIPE OVER THE EYE. UNDER PARTS PALE GRAY, FINELY BARRED. SIZE = 20-26" .

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

LA REFERENCE OF OCCURRENCE: KENNEDY, P.L., 1987

GENERAL MAP LOCATION:

COMMENTS: STUDIES BY PAT KENNEDY INDICATE THE HIGHEST PERCENTAGE OF NEST WERE IN PONDEROSA PINE/GAMBEL'S OAK, PONDEROSA PINE/GRAY OAK, AND MIXED CONIFER (ABIES CONCOLOR-PSEUDOTSUGA MENZIESII-PINUS PONDEROSA/QUERCUS GAMBELII) HABITAT TYPES.

REFERENCE: KENNEDY, P.L., 1987, FED.REGISTER, 1991, VOL.56, NO.225

+-----+  
| ANIMALS |  
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BIRD  
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FAMILY EMBERIZINAE

SCIENTIFIC NAME: *Ammodramus bairdii*

COMMON NAME: BAIRD'S SPARROW

STATUS: FEDERALLY-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico Endangered (Group 2). First Listed  
01/24/75 (NMGF Reg. 563).

DISTRIBUTION: Occurs in migration in the eastern plains and  
southern lowlands, mainly in autumn with vagrants  
elsewhere.

SPECIFIC REQUIREMENTS: In New Mexico, can be found in desert  
grasslands-prairies-mountain meadows up to 3600 m.

HABITAT: JUNIPER-GRASSLAND BREEDING HABITAT: JUNIPER-GRASSLAND

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON: HABITAT LOSS AND ALTERATIONS

BRIEF KEY DESCRIPTION: Buffy-orange color on its streaked face and crown.  
The upper parts are light brown, variously spotted  
with blackish and edged with buffy, breast  
streaked black.

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 |  
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BIRD  
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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  
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FAMILY VIREONIDAE

SCIENTIFIC NAME: Vireo vicinior

COMMON NAME: GRAY VIREO

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico: Endangered (Group 2), 07/22/82 (NMGF Reg. 624).

DISTRIBUTION: Summers very locally west of the eastern plains, from the San Juan Valley, Santa Fe area and at least formerly near Montoya southward to the southern border.

SPECIFIC REQUIREMENTS: Open woodlands, dominated by juniper and oaks in the southern range.

HABITAT: JUNIPER-GRASSLAND BREEDING HABITAT: JUNIPER-GRASSLAND

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON: NEST-PARASITISM BY BROWN-HEADED COWBIRDS POSSIBLE THREAT

BRIEF KEY DESCRIPTION: Medium sized (length 140 mm), gray above and white-gray below, whitish eyering, two whitish wingbars. Wing and tail are darker than the body 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

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| ANIMALS |  
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MAMMAL  
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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: MULTIPLE

BREEDING HABITAT: MULTIPLE

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 and Pinon Juniper.

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

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| PLANTS |  
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CACTUS  
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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.

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| PLANTS |  
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CACTUS  
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FAMILY CACTACEAE

SCIENTIFIC NAME: *Opuntia clavata*, Engelm.

COMMON NAME: DAGGER-THORN CHOLLA

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Bernalillo, Cibola, Dona Ana, Guadalupe, Lincoln, Otero, Rio Arriba, Sandoval, San Miguel, Santa Fe, Socorro, Torrance, and Valencia Counties, New Mexico.

SPECIFIC REQUIREMENTS:

HABITAT: JUNIPER-GRASSLAND BREEDING HABITAT: N/A

MINIMUM ELEVATION: 6000 MAXIMUM ELEVATION: 8000

THREATS TO TAXON: NONE KNOWN

BRIEF KEY DESCRIPTION: Low mat-forming cholla, forming clumps up to 1 m in diameter; stems numerous club-shaped joints; tubercles large, each bearing cluster of white spines; flowers green.

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.

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| PLANTS |  
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CACTUS  
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FAMILY CACTACEAE

SCIENTIFIC NAME: *Opuntia 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.

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| PLANTS |  
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CACTUS  
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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, Torrance, 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.

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| PLANTS |  
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FORB  
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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  
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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 silkly-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  
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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 |  
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FORB  
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FAMILY FABACEAE

SCIENTIFIC NAME: Dalea scariosa Wats.

COMMON NAME: LA JOLLA PRAIRIE CLOVER

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE: federal register, 15 Dec. 1980, removed  
consideration from federal protection---3C.

DISTRIBUTION: Bernalillo, Sandoval, Socorro, and Valencia  
counties, New Mexico.

SPECIFIC REQUIREMENTS: Sandy clay banks and bluffs, open sandy areas and  
roadsides, desert grassland or junipers.

HABITAT: JUNIPER-GRASSLAND BREEDING HABITAT: N/A

MINIMUM ELEVATION: 4900 MAXIMUM ELEVATION: 5030

THREATS TO TAXON: HIGHWAY RIGHTS-OF-WAY GRADING AND HOUSING DEVELOPMENT.

BRIEF KEY DESCRIPTION: Stems spreading long; leaves bright green, long  
pinnately compound into thick-textured leaflets;  
flowers pea-like, petals pink, pink-purple; pod  
long.

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.

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| PLANTS |  
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FORB  
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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 |  
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FORB  
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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.

ENDANGERED SPECIES PRINTOUT FOR LOS ALAMOS COUNTY

PLANTS

FORB  
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FAMILY ORCHIDACEAE

SCIENTIFIC NAME: *Epipactis gigantea*

COMMON NAME: HELLEBORINE ORCHID

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Montana to British Columbia, southern to western Texas, New Mexico and California.

SPECIFIC REQUIREMENTS: Damp woods, seepage slopes, springs, streams and riparian areas.

HABITAT: RIPARIAN ZONES

BREEDING HABITAT: N/A

MINIMUM ELEVATION: 6000

MAXIMUM ELEVATION: 8500

THREATS TO TAXON:

BRIEF KEY DESCRIPTION: STEMS ALONG STEM. STEMS TO 2 1/2 FT. LEAVES TO 15 CM, OVAL. SEPALS GREENISH, PETALS PURPLE, LIP MARKED WITH PURPLE LINES.

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

LA REFERENCE OF OCCURRENCE: FOXX, T.S., 1984

GENERAL MAP LOCATION: SPRING IN WHITE ROCK CANYON

COMMENTS:

REFERENCE: FOXX, T.S. & HOARD, D, 1984, NM DEPART. OF NATURAL RES., 1993

**APPENDIX M**

**Tables of Calculated Parameters  
for Each Plant Species  
Found within the Transects**

	#Stems	#Stems Per Acre	Rel. Density	AVG DBH	%Cover	Rel. Cover	%Freq.	Rel. Freq.	Import Index
<b>Trees</b>									
JUMO	70.00	215.38	77.78	6.14	21.88	0.55	1.00	38.46	46.76
PIED	18.00	55.38	20.00	7.28	17.86	0.45	1.00	38.46	41.70
SNAG	2.00	6.15	2.22	0.28	0.00	0.00	0.60	23.08	11.54
<b>TOTAL:</b>	<b>90.00</b>	<b>276.92</b>	<b>100.00</b>	<b>13.70</b>	<b>39.74</b>	<b>100.00</b>	<b>2.60</b>	<b>100.00</b>	<b>100.00</b>
<b>Shrubs</b>									
QUUN	13.00	40.00	27.66	0.21	1.30	0.93	0.20	12.50	52.69
QUEX	10.00	30.77	21.28	0.02	0.00	0.00	0.40	25.00	12.50
RICE	5.00	15.38	10.64	0.02	0.00	0.00	0.20	12.50	6.25
CEMO	19.00	58.46	40.43	0.02	0.10	0.07	0.80	50.00	28.57
<b>Total =</b>	<b>47.00</b>	<b>144.62</b>	<b>100.00</b>	<b>0.27</b>	<b>1.40</b>	<b>ERR</b>	<b>1.60</b>	<b>100.00</b>	<b>100.00</b>

Transect 36-6c  
450 feet  
Circular plot

East of Ridge Road turn-off  
Mesa top

Minie Site                    700 feet  
 South-facing ridge        36-1u

Species	Cover	Plant Cover	Rel. Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	55.55					
ROCK	2.25					
LITTER	35.57					
BOGR		2.12	31.81	0.60	38.71	35.26
MUMO		0.58	8.77	0.10	6.45	7.61
ARLU		0.08	1.25	0.05	3.23	2.24
BADI		0.00	0.03	0.05	3.23	1.63
OPUX		0.50	7.52	0.10	6.45	6.98
HYRI		0.50	7.54	0.15	9.68	8.61
GUSA		0.18	2.76	0.10	6.45	4.60
CHFO		0.08	1.25	0.05	3.23	2.24
HYFL		0.02	0.25	0.05	3.23	1.74
CARX		0.33	5.01	0.05	3.23	4.12
ARCA		0.17	2.51	0.05	3.23	2.87
ANSE		0.42	6.26	0.05	3.23	4.74
QUEX		1.67	25.05	0.15	9.68	17.36
Total =	93.37	6.65	100	1.55	100	100

	#Stems	#Stems Per Acre	Rel Density	AVG DBH	%Cover	Rel. Cover	%Freq.	Rel. Freq.	Import Index
-----									
Trees									
JUMO	61	134.07	44.53	6.44	10.47	39.93	0.86	46.15	43.54
PIED	76	167.03	55.47	5.36	15.75	60.07	1.00	53.85	56.46
-----									
TOTAL:	137.00	301.10	100.00	11.81	26.22	100.00	1.86	100.00	100.00
-----									
Shrubs									
ARTR	42	92.31	100.00	0.10	5.77	100.00	0.71	100.00	100.00
-----									
Total =	42.00	92.31	100.00	0.10	5.77	100.00	0.71	100.00	100.00

Transect 36-13c  
650 feet  
Circular plot

South of Pajarito Wetlands  
Mesa top

	#Stems	#Stems Per Acre	Rel Density	AVG DBH	%Cover	Rel. Cover	%Freq.	Rel. Freq.	Import Index
<b>Trees</b>									
JUMO	100	219.78	46.08	6.15	13.52	26.68	1.00	41.18	37.98
JUSC	1	2.20	0.46	5.30	5.00	9.87	0.14	5.88	5.40
PIED	114	250.55	52.53	4.48	17.15	33.85	1.00	41.18	42.52
PIPO	2	4.40	0.92	22.15	15.00	29.60	0.29	11.76	14.10
<b>TOTAL:</b>	<b>217.00</b>	<b>476.92</b>	<b>100.00</b>	<b>38.08</b>	<b>50.67</b>	<b>100.00</b>	<b>2.43</b>	<b>100.00</b>	<b>100.00</b>
<b>Shrubs</b>									
FAPA	14	30.77	15.38	0.02	0.33	26.97	0.43	6.25	16.20
ARTR	26	57.14	28.57	0.98	0.78	62.92	0.71	10.42	33.97
RHTR	40	87.91	43.96	0.02	0.13	10.11	0.86	12.50	22.19
RICE	11	24.18	12.09	0.04	0.00	0.00	4.86	70.83	27.64
<b>Total =</b>	<b>91.00</b>	<b>200.00</b>	<b>100.00</b>	<b>1.06</b>	<b>1.24</b>	<b>100.00</b>	<b>6.86</b>	<b>100.00</b>	<b>100.00</b>

Transect 36-14c  
650 feet  
Circular plot

South of Pajarito Wetlands  
North-facing slope

	#Stems	#Stems Per Acre	Rel Density	AVG DBH	%Cover	Rel. Cover	%Freq.	Rel. Freq.	Import Index
-----									
Trees									
JUMO	17	37.36	89.47	6.38	23.59	82.51	0.43	60.00	71.25
PIED	2	4.40	10.53	3.50	5.00	17.49	0.29	40.00	28.75
-----									
TOTAL:	19	41.76	100.00	9.88	28.59	100.00	0.71	100.00	100.00
-----									
Shrubs									
QUUN	55	169.23	36.91	0.22	15.00	49.89	0.20	12.50	33.10
QUGA	29	89.23	19.46	0.38	8.33	27.72	0.60	37.50	28.23
RHTR	55	169.23	36.91	0.01	6.70	22.29	0.60	37.50	32.23
CEMO	10	30.77	6.71	0.01	0.03	0.10	0.20	12.50	6.44
-----									
Total =	149.00	458.46	100.00	0.62	30.06	100.00	1.60	100.00	100.00

Transect 36-2c  
450 feet  
Circular plot

Minie Site  
North-facing slope

	#Stems	#Stems Per Acre	Rel Density	AVG DBH	%Cover	Rel. Cover	%Freq.	Rel. Freq.	Import Index
<b>Trees</b>									
JUMO	97.00	298.46	65.99	4.87	23.44	57.02	1.00	41.67	54.89
PIED	44.00	135.38	29.93	6.68	17.67	42.98	1.00	41.67	38.19
SNAG	6.00	18.46	4.08	0.46	0.00	0.00	0.40	16.67	6.92
<b>TOTAL:</b>	<b>147.00</b>	<b>452.31</b>	<b>100.00</b>	<b>12.01</b>	<b>41.10</b>	<b>100.00</b>	<b>2.40</b>	<b>100.00</b>	<b>100.00</b>
<b>Shrubs</b>									
QUUN	4.00	12.31	25.00	0.03	0.03	100.00	0.40	50.00	58.33
CEMO	12.00	36.92	75.00	0.02	0.00	0.00	0.40	50.00	41.67
<b>Total =</b>	<b>16.00</b>	<b>49.23</b>	<b>100.00</b>	<b>0.04</b>	<b>0.03</b>	<b>100.00</b>	<b>0.80</b>	<b>100.00</b>	<b>100.00</b>

Transect 36-3c  
450 feet  
Circular plot

Minie Site  
Northwest mesa top

Lower Water Canyon  
North-facing slope

600 feet  
68-2u

Species	Cover	Plant Cover	Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	2.57					
LITTER	90.26					
ANSC		0.50	6.99	0.09	8.33	7.66
BOGR		3.64	50.94	0.34	33.33	42.14
POAX		0.57	7.99	0.10	9.72	8.86
CARX		0.57	7.99	0.09	8.33	8.16
KOCA		0.14	2.00	0.03	2.78	2.39
ARLU		0.14	2.00	0.03	2.78	2.39
ARDR		0.36	5.05	0.09	8.33	6.69
CHFO		0.64	8.99	0.11	11.11	10.05
STCO		0.36	4.99	0.07	6.94	5.97
AGSM		0.07	1.00	0.01	1.39	1.19
MOPE		0.00	0.02	0.01	1.39	0.70
SIHY		0.14	2.00	0.03	2.78	2.39
IPAG		0.00	0.02	0.01	1.39	0.70
LIMU		0.00	0.02	0.01	1.39	0.70
Total =	92.83	7.15	100.00	1.03	100.00	100

	#Stems	#Stems Per Acre	Rel Density	AVG DBH	%Cover	Rel. Cover	%Freq.	Rel. Freq.	Import Index
<b>Trees</b>									
JUMO	41.00	126.15	39.42	3.57	8.75	38.44	1.00	50.00	42.62
PIED	63.00	193.85	60.58	5.62	14.01	61.56	1.00	50.00	57.38
<b>TOTAL:</b>	<b>104.00</b>	<b>320.00</b>	<b>100.00</b>	<b>9.20</b>	<b>22.76</b>	<b>100.00</b>	<b>2.00</b>	<b>100.00</b>	<b>100.00</b>
<b>Shrubs</b>									
QUUN	250.00	769.23	64.94	0.10	8.64	75.85	0.80	40.00	60.26
RHTR	2.00	6.15	0.52	0.10	0.05	0.44	0.20	10.00	3.65
CEMO	133.00	409.23	34.55	0.10	2.70	23.71	1.00	50.00	36.09
<b>Total =</b>	<b>385.00</b>	<b>1184.62</b>	<b>100.00</b>	<b>0.30</b>	<b>11.39</b>	<b>100.00</b>	<b>2.00</b>	<b>100.00</b>	<b>100.00</b>

Transect 36-1c  
450 feet  
Circular plot

Minie Site  
North-facing slope

Pajarito Canyon            700 feet  
 North-facing slope        36-14u  
 9/10/92

Species	Cover	Plant Cover	Rel. Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	34.36					
ROCK	0.07					
LITTER	55.36					
MOSS/LICHENS	1.79					
SOIL CRUST	2.50					
BOGR		3.00	12.37	0.56	12.24	12.31
POAX		1.29	5.44	0.31	6.91	6.17
CARX		0.21	0.79	0.10	2.20	1.49
GUSA		0.07	0.31	0.10	2.20	1.25
ERDI		0.72	3.53	0.31	6.91	5.22
BADI		0.21	0.93	0.13	2.83	1.88
IPLO		0.00	0.07	0.10	2.20	1.14
ERJA		0.14	0.62	0.11	2.51	1.56
ARDR		0.07	0.31	0.10	2.20	1.25
FAPA		0.07	0.31	0.10	2.20	1.25
HYRI		0.14	0.62	0.11	2.51	1.56
ARTR		0.00	0.07	0.10	2.20	1.14
ARLU		0.00	0.07	0.10	2.20	1.14
Total =	94.07	5.95	100.00	4.55	100.00	100

Water Canyon near State Route  
Canyon bottom 68-1u

600 feet  
9/28/92

Species	REL					IMPORT INDEX
	COVER	PLANT COVER	PLANT COVER	FREQ	REL FREQ	
BARE SOIL	73.32					
ROCK	2.17					
LITTER	1.19					
MOSS/LICHEN	1.42					
SOIL CRUST	0.01					
BOGR		11.84	54.01	0.60	31.86	42.93
ARDR		0.19	0.84	0.07	3.54	2.19
TRIX		0.00	0.01	0.02	0.88	0.45
SPCO		0.83	3.80	0.13	7.08	5.44
FESX		0.25	1.15	0.07	3.54	2.34
PLPU		0.01	0.02	0.05	2.65	1.34
CHVI		2.17	9.90	0.10	5.31	7.60
ARDR		1.19	5.42	0.12	6.19	5.80
STCO		1.42	6.47	0.13	7.08	6.78
PENX		0.01	0.02	0.05	2.65	1.34
BRTE		1.00	4.57	0.05	2.65	3.61
HEPE		0.00	0.01	0.02	0.88	0.45
ERIX		0.50	2.30	0.08	4.42	3.36
POAX		0.17	0.76	0.03	1.77	1.27
FAPA		0.50	2.28	0.08	4.42	3.35
ERDI		0.08	0.38	0.02	0.88	0.63
TRDU		0.08	0.38	0.02	0.88	0.63
CHFE		0.08	0.38	0.02	0.88	0.63
SAKA		0.08	0.38	0.02	0.88	0.63
VETH		0.25	1.14	0.03	1.77	1.46
ARLO		0.50	2.28	0.07	3.54	2.91
GAPU		0.18	0.84	0.03	1.77	1.30
CHFO		0.50	2.28	0.07	3.54	2.91
LOWR		0.08	0.38	0.02	0.88	0.63
TOTAL:	78.11	21.91	100	1.88	100	100

Lower Potrillo Canyon  
South-facing slope  
9/9/92

700 feet  
36-12u

Species	Cover	Plant Cover	Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	45.86					
LITTER	34.82					
SOIL CRUST	4.14					
MOSS/LICHENS	0.43					
BOGR		9.97	67.81	0.73	51.00	59.41
POAX		0.21	1.46	0.03	2.00	1.73
MUTO		0.14	0.97	0.01	1.00	0.99
LOWR		2.00	13.64	0.29	20.00	16.82
ARTR		0.00	0.01	0.01	1.00	0.50
SENX		0.07	0.49	0.01	1.00	0.74
IPLO		0.36	2.47	0.13	9.00	5.73
GUSA		0.29	1.94	0.03	2.00	1.97
ERDI		0.14	0.97	0.03	2.00	1.49
OPUX		1.21	8.26	0.06	4.00	6.13
HYRI		0.07	0.50	0.03	2.00	1.25
BADI		0.00	0.02	0.03	2.00	1.01
ERJA		0.21	1.46	0.04	3.00	2.23
Total =	85.25	14.70	100.00	1.43	100.00	100.00

South of Pajarito Wetlands  
 Mesa top  
 9/19/92

700 feet  
 36-13u

Species	Cover	Plant Cover	Rel. Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	44.43					
ROCK	2.64					
LITTER	30.57					
SOIL CRUST	8.50					
MOSS/LICHENS	1.14					
BOGR		7.43	59.67	0.73	50.50	55.08
POAX		0.14	1.16	0.04	2.97	2.06
GUSA		0.65	5.21	0.17	11.88	8.54
LOWR		0.50	4.01	0.07	4.95	4.48
OPUX		2.14	17.22	0.20	13.86	15.54
ERDI		0.00	0.01	0.01	0.99	0.50
ARTR		0.07	0.57	0.01	0.99	0.78
IPLO		0.08	0.64	0.10	6.93	3.79
PIED		0.08	0.61	0.06	3.96	2.28
LARE		1.36	10.90	0.04	2.97	6.93
	87.29	12.45	100.00	1.44	100.00	100.00

Lower Potrillo Canyon  
 South-facing slope  
 9/27/92

700 feet  
 36-10u

Species	Cover	Plant Cover	Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	45.29					
ROCK	19.64					
LITTER	20.93					
STCO		0.43	3.28	0.06	5.33	4.31
BOGR		7.86	60.11	0.64	60.00	60.05
SIHY		0.07	0.55	0.01	1.33	0.94
IPLO		0.00	0.00	0.00	0.00	0.00
ARDR		0.07	0.55	0.01	1.33	0.94
CHNA		0.00	0.00	0.00	0.00	0.00
ARTR		2.71	20.77	0.07	6.67	13.72
SPCO		0.29	2.19	0.03	2.67	2.43
ASBI		0.07	0.55	0.01	1.33	0.94
GUSA		0.21	1.64	0.04	4.00	2.82
BOER		0.79	6.01	0.09	8.00	7.01
ORHY		0.14	1.09	0.03	2.67	1.88
THWR		0.00	0.00	0.00	0.00	0.00
ERJA		0.36	2.73	0.06	5.33	4.03
VETH		0.07	0.55	0.01	1.33	0.94
Total =	85.86	13.07	100.00	1.07	100	100

Lower Potrillo Canyon  
 North-facing slope  
 9/27/92

700 feet  
 36-11u

Species	Cover	Plant Cover	Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	64.56					
ROCK	0.71					
LITTER	23.00					
MOSS/LICHEN	0.07					
SOIL CRUST	4.00					
BOGR		3.46	45.15	0.49	36.56	40.85
ARLO		0.07	0.93	0.01	1.08	1.00
ANSC		1.00	13.06	0.14	10.75	11.91
LUCA		0.09	1.12	0.03	2.15	1.63
GUSA		0.07	0.93	0.01	1.08	1.00
EUSE		0.01	0.19	0.01	1.08	0.63
HYRI		0.44	5.78	0.10	7.53	6.66
CHFO		0.50	6.53	0.10	7.53	7.03
ARDR		0.33	4.29	0.10	7.53	5.91
OPUX		0.07	0.93	0.01	1.08	1.00
IPLO		0.01	0.19	0.01	1.08	0.63
SPCR		0.50	6.53	0.07	5.38	5.95
HYFL		0.21	2.80	0.04	3.23	3.01
PECA		0.30	3.92	0.07	5.38	4.65
ARTR		0.21	2.80	0.03	2.15	2.47
PENX		0.14	1.87	0.03	2.15	2.01
LOWR		0.01	0.19	0.01	1.08	0.63
ERJA		0.07	0.93	0.01	1.08	1.00
EUHE		0.07	0.93	0.01	1.08	1.00
MEAL		0.07	0.93	0.01	1.08	1.00
Total =	92.34	7.66	100	1.33	100	100

East of Ridge Road Turn-off 700 feet  
 Canyon bottom 36-7u

Species	Cover	Plant Cover	Rel. Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	2.51					
ROCK	22.86					
LITTER	72.50					
MOSS/LICHEN	0.07					
MUMO		1.22	58.37	0.19	51.35	49.84
CARX		0.51	24.40	0.10	27.03	23.39
CHFO		0.29	13.88	0.07	18.92	15.04
IPAG		0.07	3.35	0.01	2.70	3.32
Total =	97.87	2.09	100.00	0.37	100.00	100.00

North of Potrillo Canyon  
 South-facing slope

700 feet  
 36-8u

Species	Cover	Plant Cover	Rel. Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	41.84					
ROCK	18.57					
LITTER	36.93					
CARX		0.00	0.16	0.04	5.66	2.91
GRASSA		0.07	2.67	0.01	1.89	2.28
GRASSB		0.29	10.69	0.03	3.77	7.23
BOGR		2.08	77.98	0.44	58.49	68.24
ERJA		0.00	0.05	0.01	1.89	0.97
OPUX		0.07	2.67	0.01	1.89	2.28
QUEX		0.01	0.27	0.07	9.43	4.85
PENX		0.07	2.78	0.04	5.66	4.22
CRJA		0.00	0.05	0.01	1.89	0.97
PIED		0.04	1.60	0.04	5.66	3.63
ARLU		0.01	0.53	0.01	1.89	1.21
BRAN		0.01	0.53	0.01	1.89	1.21
Total =	97.34	2.67	100.00	0.76	100.00	100.00

Enie Site  
South-facing slope

600 feet  
36-5u

Species	Cover	Plant Cover	Rel. Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	21.21					
ROCK	19.83					
LITTER	53.31					
ANSE		2.10	30.51	0.18	22.92	26.71
MUMO		2.27	32.93	0.30	37.50	35.21
BLTR		0.83	12.11	0.10	12.50	12.30
CHFO		0.38	5.57	0.10	12.50	9.03
BADI		0.03	0.48	0.03	4.17	2.33
ERDI		0.02	0.24	0.02	2.08	1.16
OPUX		0.50	7.26	0.02	2.08	4.67
AGGE		0.42	6.05	0.02	2.08	4.07
FESX		0.17	2.42	0.02	2.08	2.25
ECTR		0.17	2.42	0.02	2.08	2.25
Total =	94.34	6.88	100.00	0.80	100.00	100.00

East of Ridge Road turn  
Mesa top  
6/4/92

500 feet  
36-6U

Species	Cover	Plant Cover	Rel. Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	60.43					
LITTER	19.81					
BOGR		14.82	74.98	0.68	40.00	57.49
HYRI		2.81	14.20	0.34	20.00	17.10
OPPO		0.00	0.01	0.02	1.18	0.59
ERDI		0.53	2.66	0.36	21.18	11.92
MUMO		0.90	4.57	0.12	7.06	5.82
VETH		0.00	0.01	0.02	1.18	0.59
PLPU		0.10	0.52	0.04	2.35	1.43
GUSA		0.40	2.02	0.06	3.53	2.78
PIED		0.10	0.51	0.02	1.18	0.84
SPCR		0.10	0.51	0.02	1.18	0.84
ARIX		0.00	0.01	0.02	1.18	0.59
Total =	80.24	19.76	100.00	1.70	100.00	100.00

South of Minie  
Northwest mesa top

600 feet  
36-3u

Species	Cover	Plant Cover	Rel. Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	54.22					
ROCK	2.25					
LITTER	35.57					
BOGR		2.12	31.81	0.22	29.55	30.68
MUMO		0.58	8.77	0.05	6.82	7.79
ARLU		0.08	1.25	0.03	4.55	2.90
BADI		0.00	0.03	0.03	4.55	2.29
OPUX		0.50	7.52	0.05	6.82	7.17
HYRI		0.50	7.54	0.07	9.09	8.32
GUSA		0.18	2.76	0.05	6.82	4.79
CHFO		0.08	1.25	0.03	4.55	2.90
HYFL		0.02	0.25	0.03	4.55	2.40
CARX		0.33	5.01	0.03	4.55	4.78
ARCA		0.17	2.51	0.03	4.55	3.53
ANSE		0.42	6.26	0.03	4.55	5.40
QUEX		1.67	25.05	0.07	9.09	17.07
Total =	92.03	6.65	100.00	0.73	100.00	100.00

Riparian, Eenie 36-4u  
 Number of feet in this transect = 1

500 l

Species	Cover	Plant Cover	Rel. Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	41.20					
ROCK	4.00					
LITTER	36.68					
ROSA		2.90	16.00	11.00	19.30	17.65
PAIN		1.10	6.07	3.00	5.26	5.67
BROX		0.12	0.66	3.00	5.26	2.96
AGAL		0.30	1.66	4.00	7.02	4.34
SAGE		8.90	49.12	17.00	29.82	39.47
BEFE		2.50	13.80	5.00	8.77	11.28
QUGA		1.00	5.52	3.00	5.26	5.39
PRME		0.70	3.86	3.00	5.26	4.56
RONE		0.10	0.55	2.00	3.51	2.03
MOME		0.40	2.21	4.00	7.02	4.61
RICE		0.10	0.55	2.00	3.51	2.03
Total =	81.88	18.12	100.00	57.00	100.00	100.00

Minie Site 700 feet  
 South-facing ridge 36-1u

Species	Cover	Plant Cover	Rel. Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	55.55					
ROCK	2.25					
LITTER	35.57					
BOGR		2.12	31.81	0.60	38.71	35.26
MUMO		0.58	8.77	0.10	6.45	7.61
ARLU		0.08	1.25	0.05	3.23	2.24
BADI		0.00	0.03	0.05	3.23	1.63
OPUX		0.50	7.52	0.10	6.45	6.98
HYRI		0.50	7.54	0.15	9.68	8.61
GUSA		0.18	2.76	0.10	6.45	4.60
CHFO		0.08	1.25	0.05	3.23	2.24
HYFL		0.02	0.25	0.05	3.23	1.74
CARX		0.33	5.01	0.05	3.23	4.12
ARCA		0.17	2.51	0.05	3.23	2.87
ANSE		0.42	6.26	0.05	3.23	4.74
QUEX		1.67	25.05	0.15	9.68	17.36
Total =	93.37	6.65	100	1.55	100	100

East of Minie Site  
North-facing slope

600 feet  
36-2u

Species	Cover	Plant Cover	Rel. Plant Cover	Freq.	Rel. Freq.	Importance Index
BARE SOIL	73.30					
VETH		0.00	0.01	0.02	0.93	0.55
ARLO		0.08	0.31	0.02	0.72	0.51
SPOX		1.25	4.69	0.10	4.31	4.50
BRTE		3.67	13.74	0.30	12.92	13.33
DESX		0.42	1.56	0.02	0.72	1.14
KOSC		0.00	0.01	0.02	0.72	0.36
ERDI		0.59	2.20	0.17	7.18	4.69
BADI		0.01	0.02	0.05	2.15	1.09
CHNA		0.17	0.62	0.02	0.72	0.67
TRDU		0.09	0.32	0.03	1.44	0.88
ARCA		5.67	21.23	0.47	20.10	20.67
ARDR		2.34	8.75	0.23	10.05	9.40
GUSA		0.00	0.01	0.02	0.72	0.36
STCO		0.75	2.81	0.07	2.87	2.84
PLPU		0.00	0.01	0.02	0.72	0.36
QUGX		0.83	3.12	0.02	0.72	1.92
HYAR		0.42	1.56	0.02	0.72	1.14
MUMO		0.83	3.12	0.02	0.72	1.92
ANSC		1.33	4.99	0.05	2.15	3.57
LUCA		0.92	3.43	0.03	1.44	2.43
GAPU		0.08	0.31	0.02	0.72	0.51
BOGR		5.92	22.17	0.40	17.23	19.70
LINE		0.01	0.02	0.05	2.15	1.09
CRJA		0.08	0.31	0.02	0.72	0.51
OPUX		0.25	0.94	0.02	0.72	0.83
AGSM		0.33	1.25	0.05	2.15	1.70
CHFO		0.25	0.94	0.05	2.15	1.55
TROF		0.17	0.62	0.02	0.72	0.67
HYRI		0.25	0.94	0.03	1.44	1.19
<b>Total =</b>	<b>73.30</b>	<b>26.71</b>	<b>100</b>	<b>2.32</b>	<b>100.00</b>	<b>100.08</b>

**APPENDIX G**

**Wintering Birds of Potrillo Canyon**

**APPENDIX G**  
**WINTERING BIRDS OF POTRILLO CANYON**  
**(WENZEL AND KENT, FEBRUARY AND MARCH, 1986)**

<b>FAMILY</b>	<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>
ACCIPITRIDAE	<i>Buteo jamaicensis</i>	Red-tailed hawk
COLUMBIDAE	<i>Zenaidura macroura</i>	Mourning dove
CORVIDAE	<i>Aphelocoma coerulescens</i>	Scrub jay
	<i>Corvus corax</i>	Common raven
FRINGILLIDAE	<i>Carpodacus mexicanus</i>	House finch
	<i>Junco hyemalis</i>	Dark-eyed junco
	<i>Pipilo erythrophthalmus</i>	Rufus-sided towhee
	<i>Pipilo fuscus</i>	Brown towhee
MELEAGRIDIDAE	<i>Meleagris gallopavo</i>	Wild turkey
PARIDAE	<i>Parus gambeli</i>	Mountain chickadee
	<i>Parus inornatus</i>	Plain titmouse
PICIDAE	<i>Colaptes auratus</i>	Yellow-shafted flicker
	<i>Dendrocopos pubescens</i>	Downy woodpecker
	<i>Dendrocopos villosus</i>	Hairy woodpecker
	<i>Sphyrapicus throideus</i>	Williamson's sapsucker
SITTIDAE	<i>Sitta corlinensis</i>	White-breasted nuthatch
	<i>Sitta pygmaea</i>	Pigmy nuthatch
TROGLODYTIDAE	<i>Catherpes mexicanus</i>	Canyon wren
	<i>Troglodytes aedon</i>	House wren
TURDIDAE	<i>Myadestes townsendi</i>	Townsend's solitaire
	<i>Sialia currucoides</i>	Mountain bluebird
	<i>Sialia mexicana</i>	Western bluebird
	<i>Turdus migratorius</i>	American robin

**Swamp-Scrub Formation**

**Arctic-Boreal Swamp-Scrub Climatic Zone**

**Rocky Mountain Alpine and Subalpine Swamp and Riparian-Scrub Community**

- Alnus tenuifolia Series
- 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 disclimax 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