

LATA RECEIVED NOV 15 1993

Rec'd # 885  
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Dunham 1992  
Accession # 04-0297  
04-0297  
ERFD # 31276

# DRAFT

## BIOLOGICAL AND FLOODPLAIN/WETLANDS ASSESSMENT

### FOR THE ENVIRONMENTAL RESTORATION PROGRAM OPERABLE UNIT 1129 TA-4,-5,-35,-42,-48,-52,-55,-63,-66 AND OPERABLE UNIT 1147 TA-50

Los Alamos National Laboratory  
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Environmental Protection Group, EM-8  
December 17, 1992



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The Biological Resource Evaluations Team performed these surveys in compliance with the following acts, orders and regulations:

- o The Federal Endangered Species Act of 1973,
- o New Mexico's Wildlife Conservation Act and Endangered Plant Species Act,
- o Executive Orders 11990 "Protection of Wetlands" and 11988, "Floodplain Management,"
- o Code of Federal Regulations 10 CFR 1022,
- o DOE Order 5400.1 and
- o The National Environmental Policy Act (NEPA).

The Environmental Protection Group maintains a habitat requirements data base. This database is for all state and federally listed TES plant and animal species known to occur within the Los Alamos National Laboratory and its environs.

The Biological Resource Evaluations Team (BRET) conducted habitat evaluation surveys (Level 2). The field crews used transects and Daubenmire plots to collect data for Level 2 surveys. These techniques collect percent cover, density and frequency data for an assessment of the understory and overstory components of the plant community.

The Biological Resource Evaluations Team compared the field survey results to the habitat requirements for the species of concern as identified in the data base search. If habitat types did not meet requirements, the team considered the site cleared for impact on state and federally listed species.

If habitat types met the requirements, a team conducted species-specific (Level 3) surveys for the species of concern. Level 3 surveys follow pre-established survey

## EXECUTIVE SUMMARY

During the months of August and October 1991, the Environmental Protection Group (EM-8) Biological Resource Evaluations Team (BRET) conducted reconnaissance and habitat evaluations surveys for:

- o Operable Unit 1129, TAs 4, 5, 35, 42, 48, 52, 55, 63 and 66, and
- o Operable Unit 1147, TA-50.

The survey had three purposes. The first was to determine the presence or absence of any critical habitat within the Operable Unit (OU) boundaries. A critical habitat is that required to sustain any state or federal threatened, endangered or sensitive (TES) plant or animal species.

Second, surveys identified the presence or absence of any sensitive areas (floodplains and wetlands) within locations to be sampled. Field teams noted their extent and general characteristics during the surveys.

The third purpose was to provide additional plant and wildlife data about the habitat types within the OUs. This information provides further base line information about the sites' biological components for site characterization and determination of presampling conditions. National Environmental Policy Act (NEPA) documentation and determination of a categorical exclusion for the sampling plan for site characterization also require base line data.

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varied comprised of mesa tops and steep canyon slopes in Sandia, Mortandad-Ten Site and Pajarito Canyons.

The Biological Resource Evaluations Team performed Level 2 surveys within OU 1129 on the mesa top in three different locations within the piñon-juniper woodland. Within Mortandad-Ten Site Canyon, the team performed habitat evaluations of the north canyon rim, north canyon wall and the canyon bottom.

The mesa top portions of the OUs were within a piñon-juniper woodland with an understory of blue grama. A mixed-conifer forest characterizes the north-facing slopes with an open Ponderosa pine forest in the canyon bottom. Database searches indicated that the species of concern for this OU were as follows.

*Birds:*

- o Bald eagle
- o Broad-billed hummingbird
- o Common black hawk
- o Mississippi kite
- o Peregrine falcon
- o Willow flycatcher

*Mammals:*

- o Meadow jumping mouse
- o Spotted bat

*Plants:*

- |                              |                                 |
|------------------------------|---------------------------------|
| o Cyanic milk vetch          | o Santa Fe milk vetch           |
| o Grama grass cactus         | o Sessile-flowered false carrot |
| o Mathew's woolly milk vetch | o Threadleaf horsebrush         |
| o Pagosa phlox               | o Tufted sand verbena           |
| o Plank's catchfly           | o Wright's fishhook cactus      |
| o Santa Fe cholla            |                                 |

The results of the field habitat evaluation suggest that the habitat components needed for TES species are not

present. Additionally, field surveys suggest that there are no floodplain or wetland concerns within the OUs that must be addressed during sampling. Therefore, surface sampling of the OUs will not cause any adverse impacts to any known critical habitat or sensitive areas.

protocols. These protocols often require certain meteorological or seasonal conditions.

In each location, BRET verified all wetlands and floodplains within the survey area. The team field-checked National Wetland Inventory Maps. They recorded wetlands, floodplains and riparian area characteristics using criteria outlined in the "Army Corps of Engineers Wetland Delineation Manual" (Environmental Laboratory 1987).

The Biological Resource Evaluations Team did not delineate wetland boundaries during these surveys. Wetland boundaries are valid for only two years and are best determined at sampling time. The field team will delineate the wetland boundaries just before sampling. This ensures that the sampling is not conducted within areas meeting wetland criteria.

This report provides comprehensive background information about the site. It summarizes the historical and biological information from previous surveys. These summaries provide inventory information that may be used in future ecological risk assessments and pathways analysis.

Operable Unit 1147 and the western portion of OU 1129 contain most disturbances. These include buildings, roads and surface and sub-surface utilities. Mortandad Canyon receives Laboratory effluent discharges.

The undisturbed areas contain historic and prehistoric fields and archaeological sites. The terrain is rugged and

## 1 INTRODUCTION

The Biological Resource Evaluations Team performed reconnaissance and habitat evaluation surveys within OU 1129 and 1147 from August through October, 1991. This report documents the threatened and endangered (TES) species and floodplain and wetlands biological assessment done for the Environmental Restoration Program site-characterization or sampling phase.

The surveys were performed in compliance with the following acts orders and regulations.

- o 1973 Federal Endangered Species Act
- o New Mexico's Wildlife Conservation Act and Endangered Plant Species Act
- o Floodplain/Wetland Executive Orders (EOs) 11990 and 11988
- o DOE Order 5400.1 (Environmental Compliance)
- o Code of Federal 10 CFR 1022
- o The National Environmental Policy Act

The Biological Resource Evaluations Team evaluated the proposed activity for its impact on TES species and floodplains and wetlands.

Section 7 of the Federal Endangered Species Act requires every federal agency to ensure that its activities and programs will not jeopardize the continued existence of a federally listed TES species or its designated critical habitat. New Mexico's Wildlife Conservation Act (WCA) and Endangered Plant Species Act (EPSA) also require federal agencies to ensure that their activities and programs will not jeopardize state protected species. The National

Environmental Policy Act (NEPA) provides implementation framework for Section 7 and NM WCA and EPSA.

There are three possible outcomes of a TES species assessment:

- o No TES species use the proposed project area;
- o TES species use the proposed project but the proposed project will have no adverse impact for the species;
- o TES species use the proposed project area and the proposed project will have adverse impact for the species.

If the proposed project jeopardizes a protected species, BRET and the project managers initiate consultation with the appropriate state or federal agency. Formal consultation efforts could result in modifications, alternatives or abandonment of the proposed project to avoid impacts to the protected species.

Two executive orders (EOs) provide protection for floodplains and wetlands. Executive Order 11988, "Floodplain Management," calls for floodplain protection and mandates evaluation of any federally funded action's potential floodplain impacts. Executive Order 11990, "Protection of Wetlands," requires all federally funded agencies to issue or amend procedures securing the protection of wetlands from loss or degradation.

Code of Federal Regulations 10 CFR 1022 outlines the DOE compliance procedures for these EOs and the means to provide public review of floodplain and wetland impacts. The CFR requires that DOE assess the floodplains or wetlands impacts for all its projects with no minimum defined.

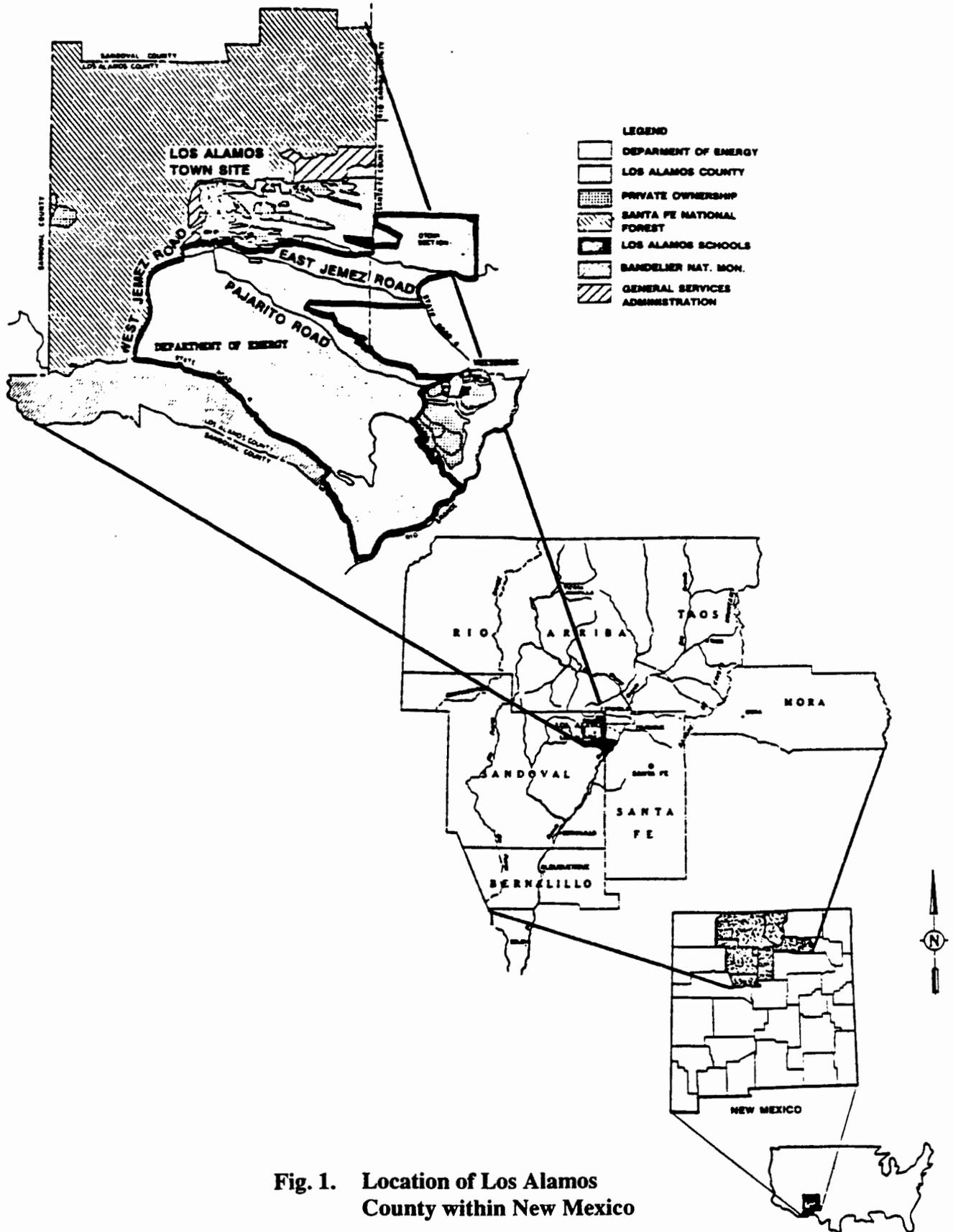
Federal Register notification or NEPA documentation provide public review opportunity. If a floodplain or wetland potentially may be affected, DOE must conduct a floodplain or wetland assessment to determine if the impacts are damaging.

Additionally, Section 404 of the Clean Water Act (CWA) controls wetlands and floodplains degradation by limiting the discharge of fill into these sensitive areas. Based on the size of the affected floodplain or wetland, the Corps of Engineers (COE) issues one of two types of permits. A nationwide permit is most often issued if the impact is less than 10 acres. If the impact is greater than 10 acres, an individual permit must be issued before activities can begin.

In addition to the compliances mentioned, DOE Order 5400.1 requires an environmental pre-operational survey before the start up of a new site, facility or process that has the potential for significant adverse environmental impact. The survey should begin no less than one year, and preferably two years, before start up to evaluate seasonal changes.

This base line data supports

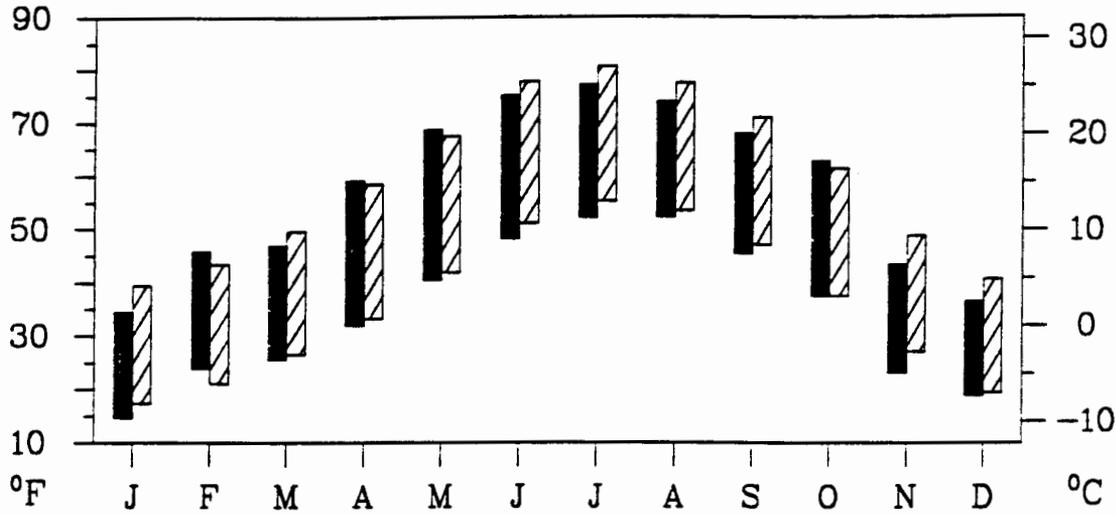
- o the environmental setting portion of site investigation work plans and
- o environmental impact evaluation of the corrective measures.



# 1991 WEATHER SUMMARY, LOS ALAMOS, NM (EL. 7425 ft)

Normal = ( )

## TEMPERATURE



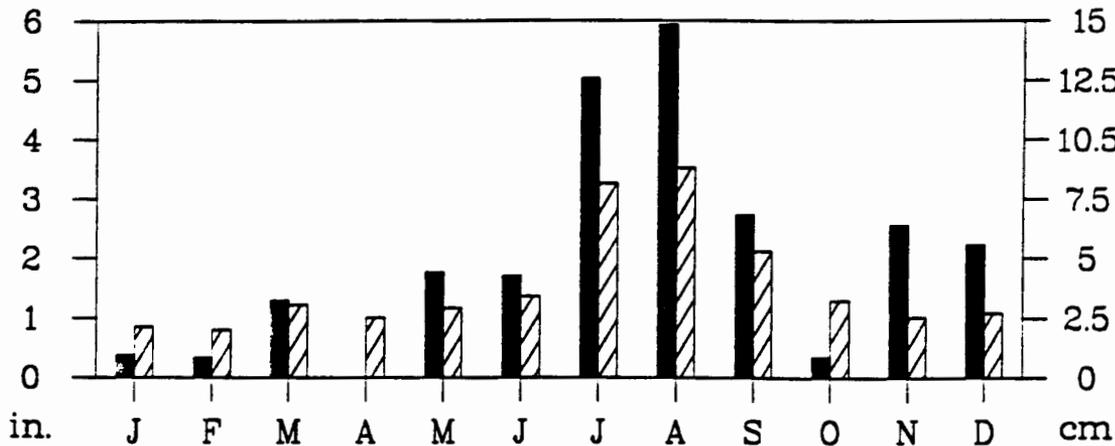
ANNUAL , °F

Maximum  
57.8 (59.7)

Minimum  
34.6 (36.0)

Average  
46.2 (47.8)

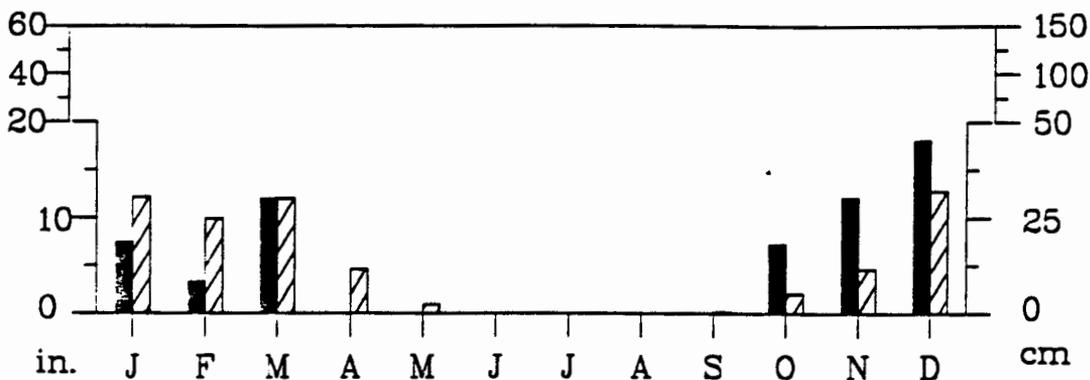
## PRECIPITATION



ANNUAL , in.

24.34 (18.72)

## SNOWFALL

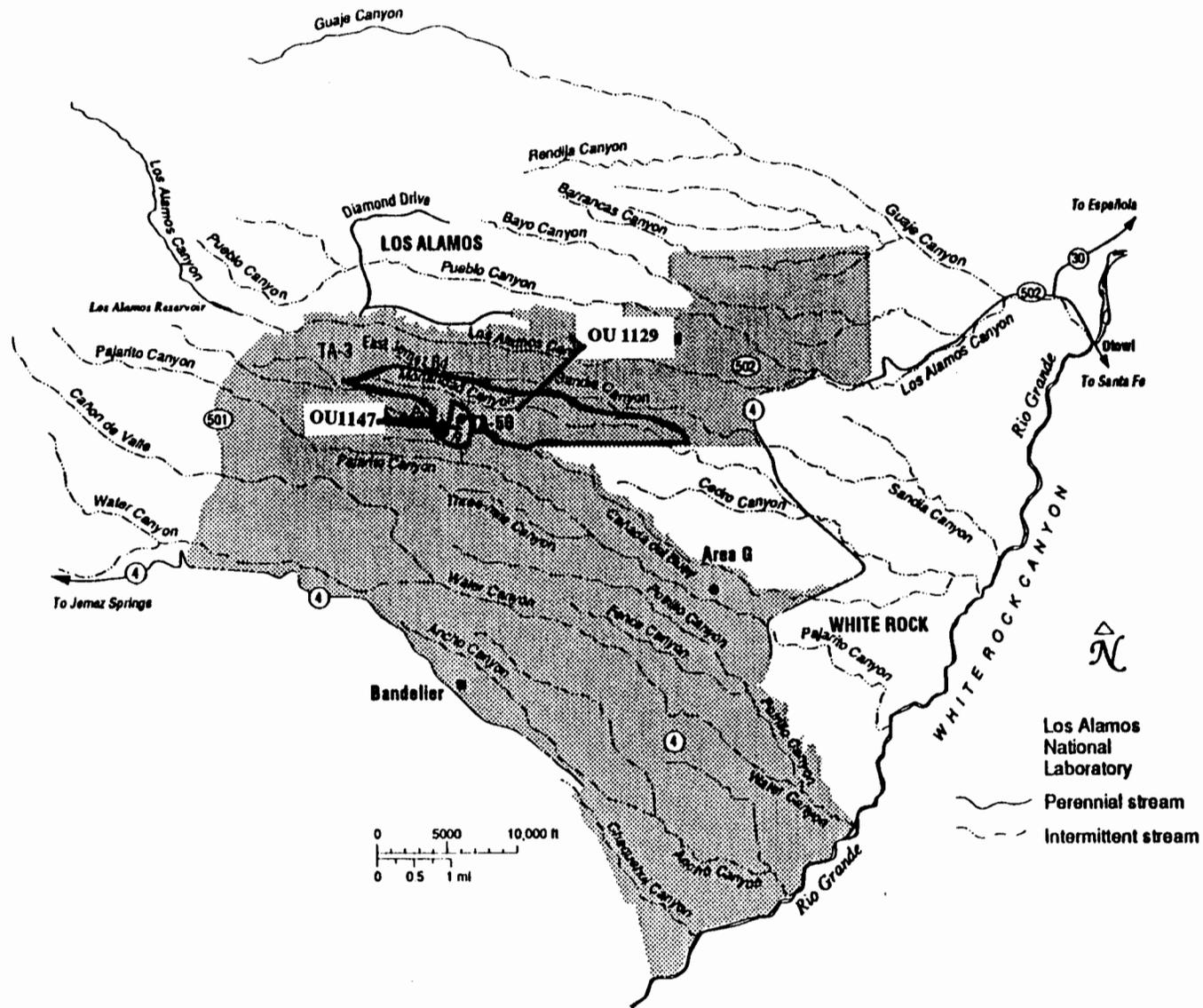


ANNUAL , in.

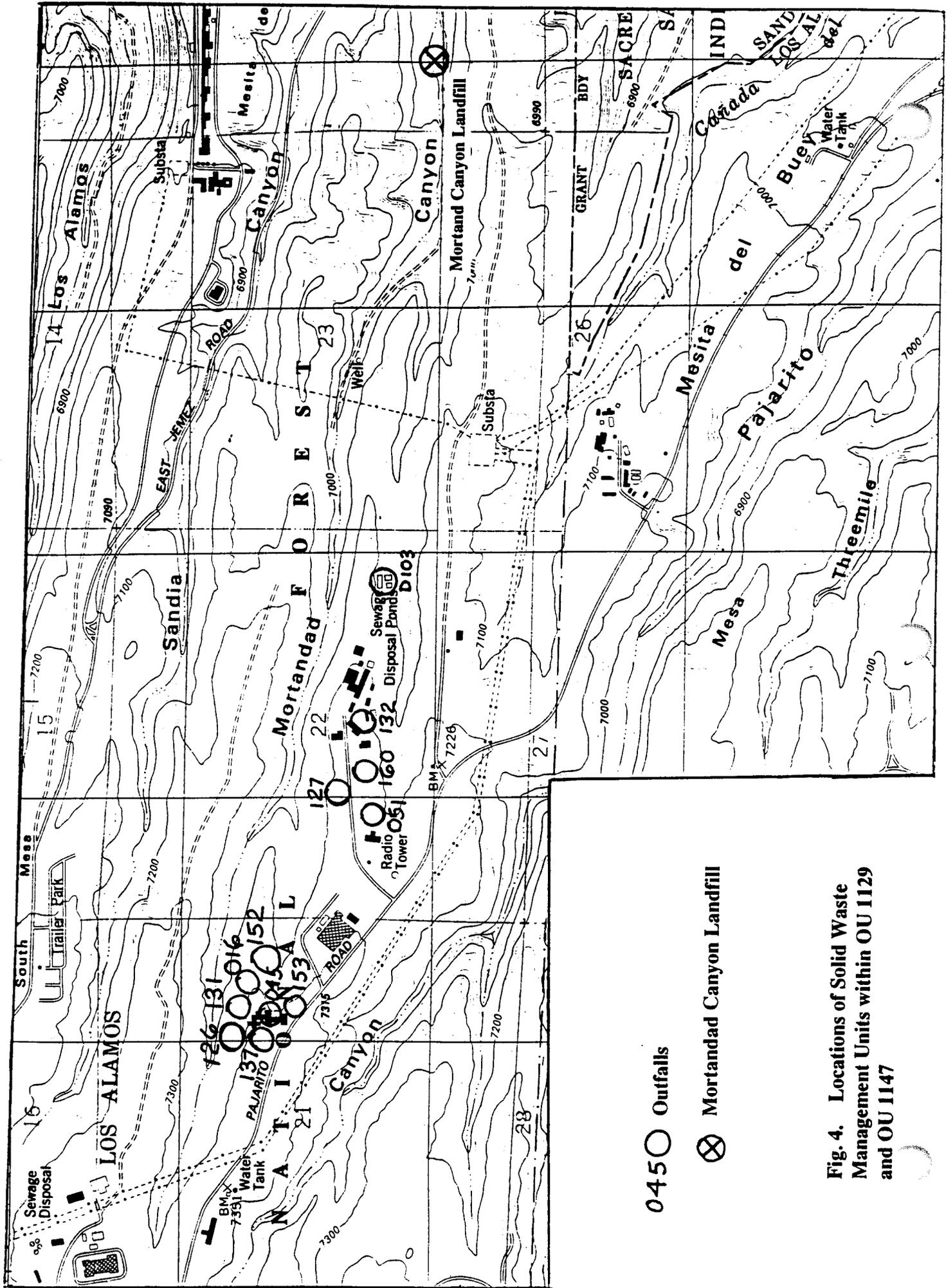
60.3 (59.0)

1991 Normal

Fig. 2. Meteorological Conditions for 1991.



**Fig. 3. Locations of Operable Units 1129 and 1147 within Los Alamos National Laboratory**



0450 Outfalls

⊗ Mortandad Canyon Landfill

Fig. 4. Locations of Solid Waste Management Units within OU 1129 and OU 1147

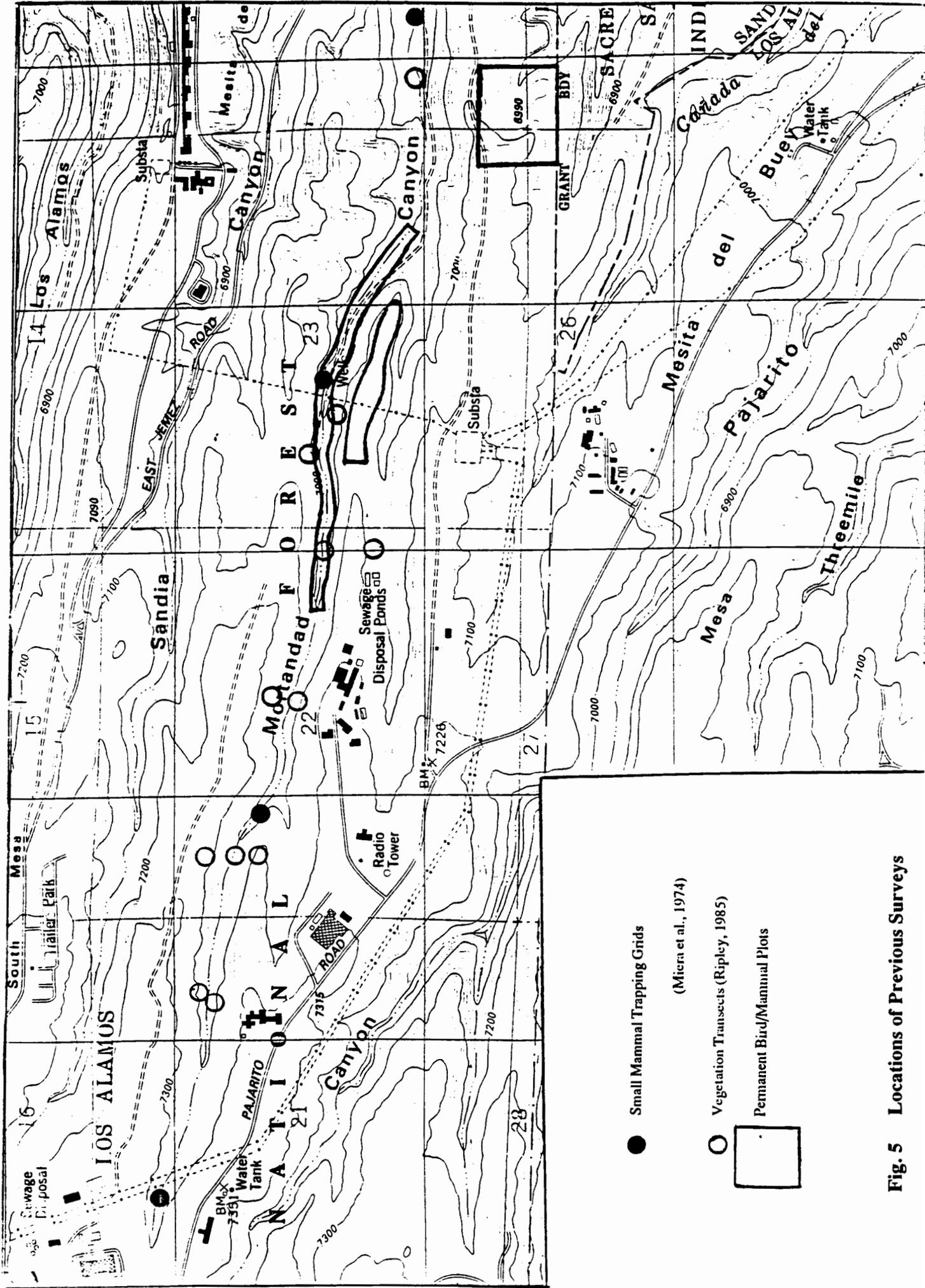


Fig. 5 Locations of Previous Surveys

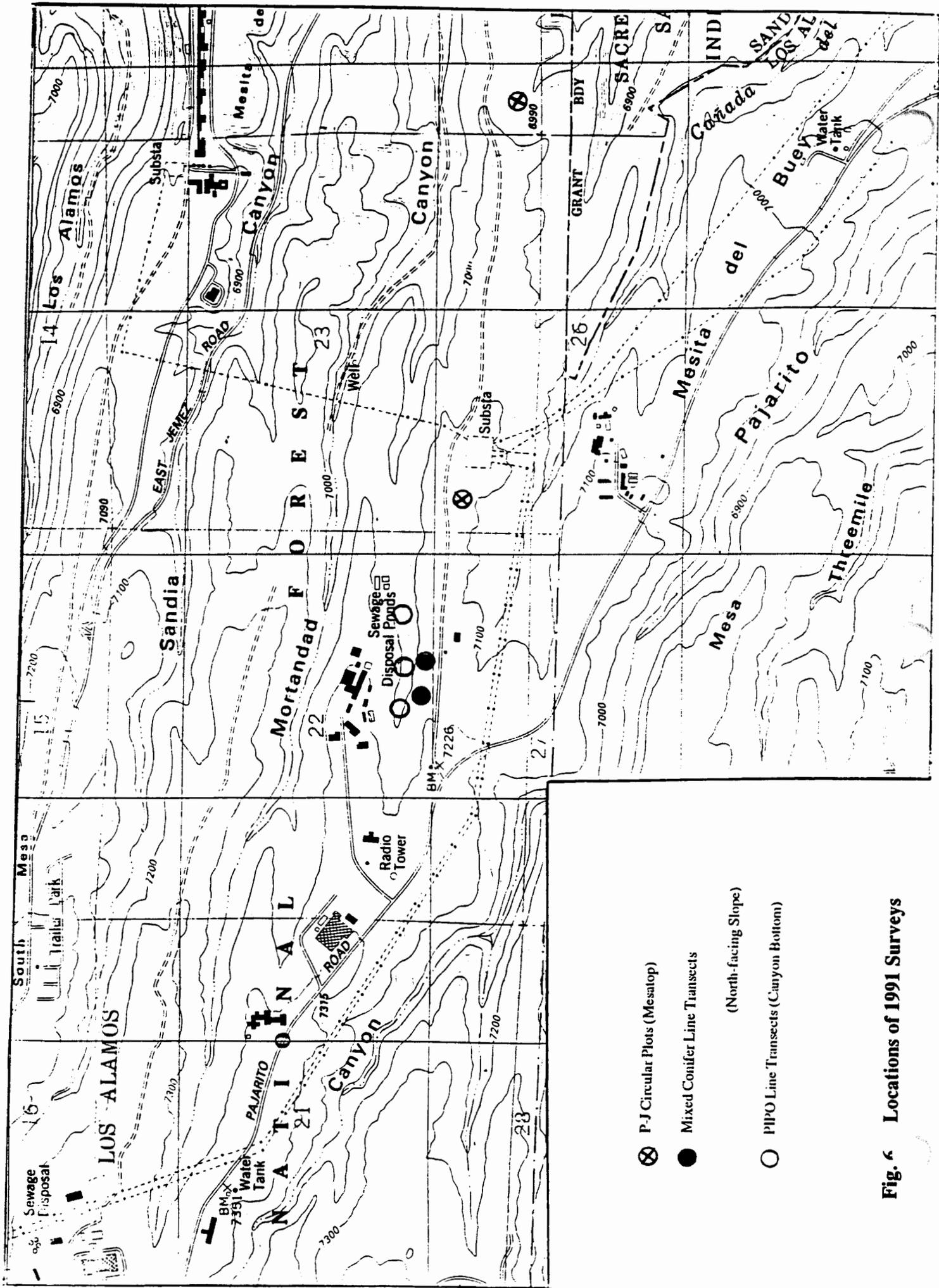
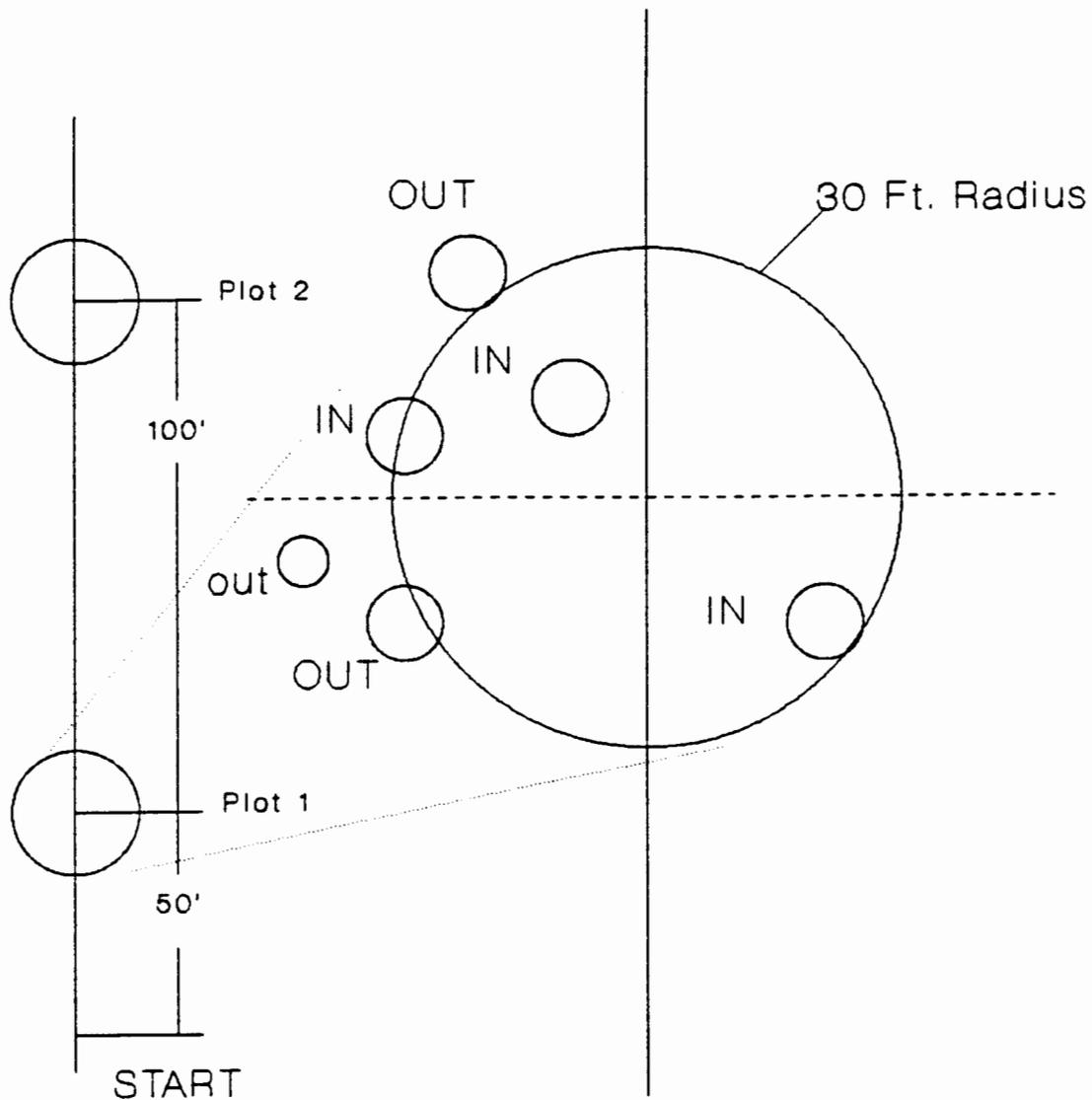
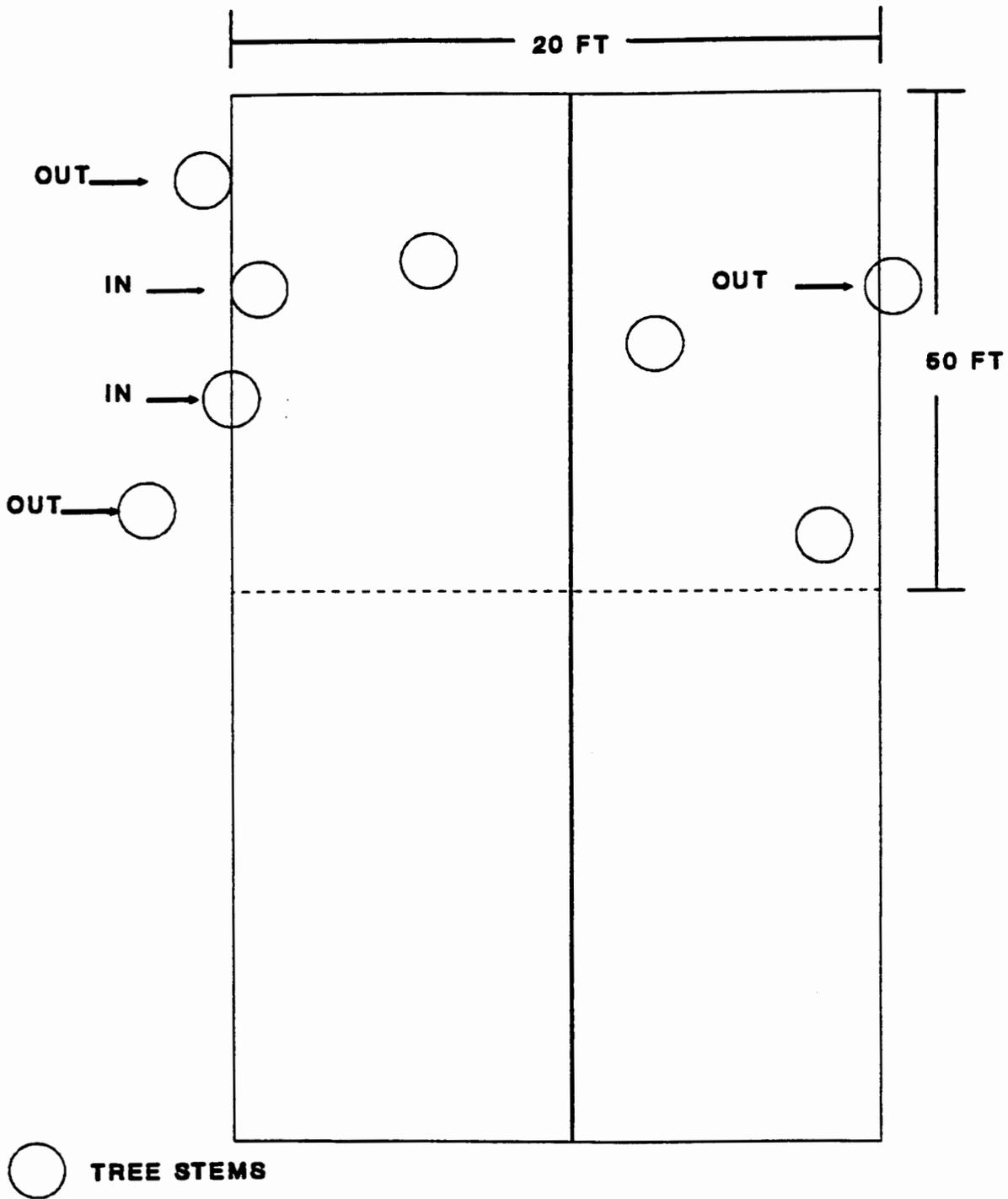


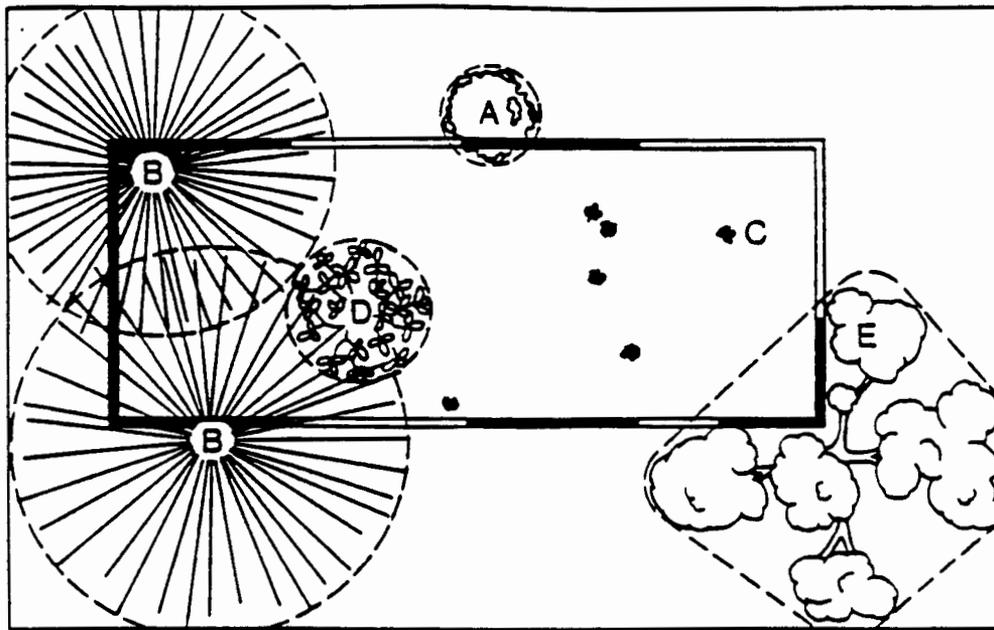
Fig. 6 Locations of 1991 Surveys



**Fig. 7 Circular plot method of overstory evaluation. When 50% or greater of the bole or group of stems is in the plot, the bole or shrub stems should be counted.**

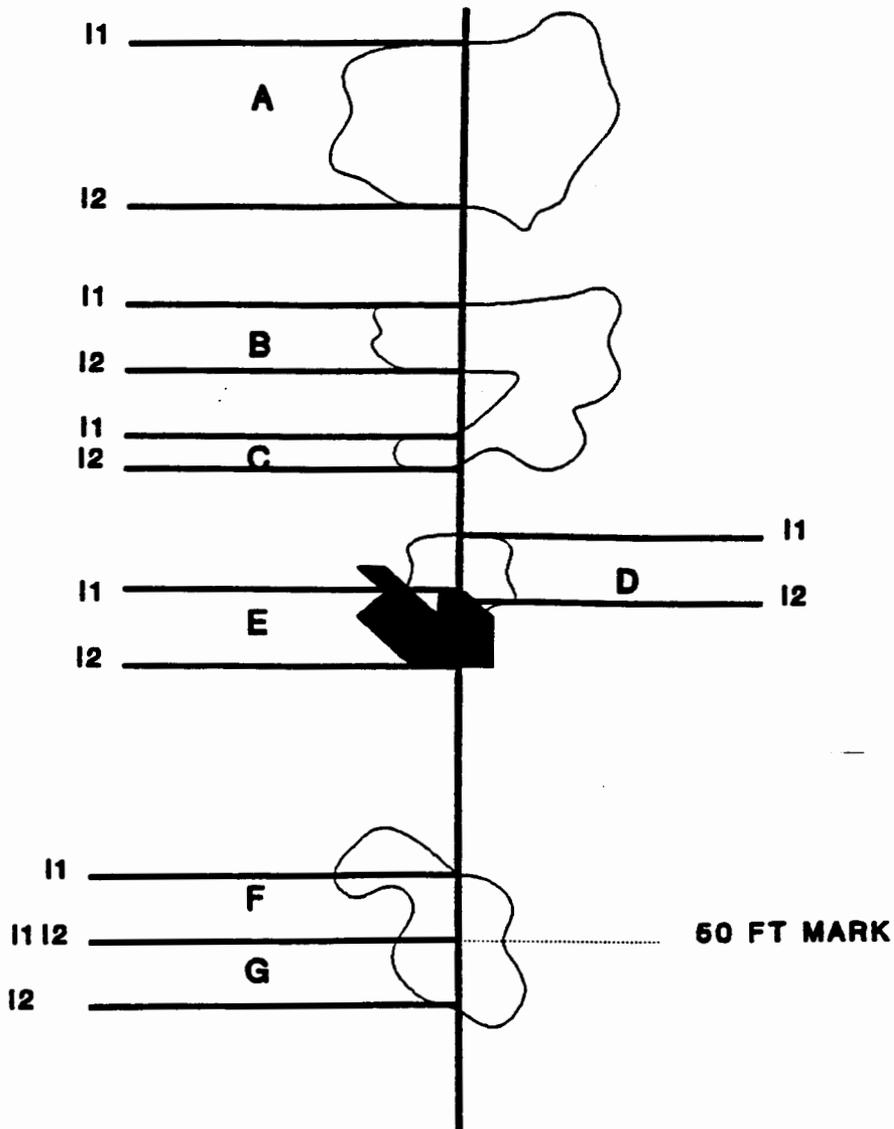


**Fig 8. The grid technique of ocular estimation of cover (redrawn from Daubenmire 1973). Note the marks along the sides of the frame lay out areas of 5%, 25%, 50%, 75% and 95%. Cover classes of species shown are: A, <5% ; B, 25-50% ; C, <5% ; D, 5-25% and E, <5%.**



**Fig. 9. Line intercept method for overstory components. When 50% or greater of the bole or group of stems is in the plot, the bole or stems should be counted**

# READING FOLIAR INTERCEPTS

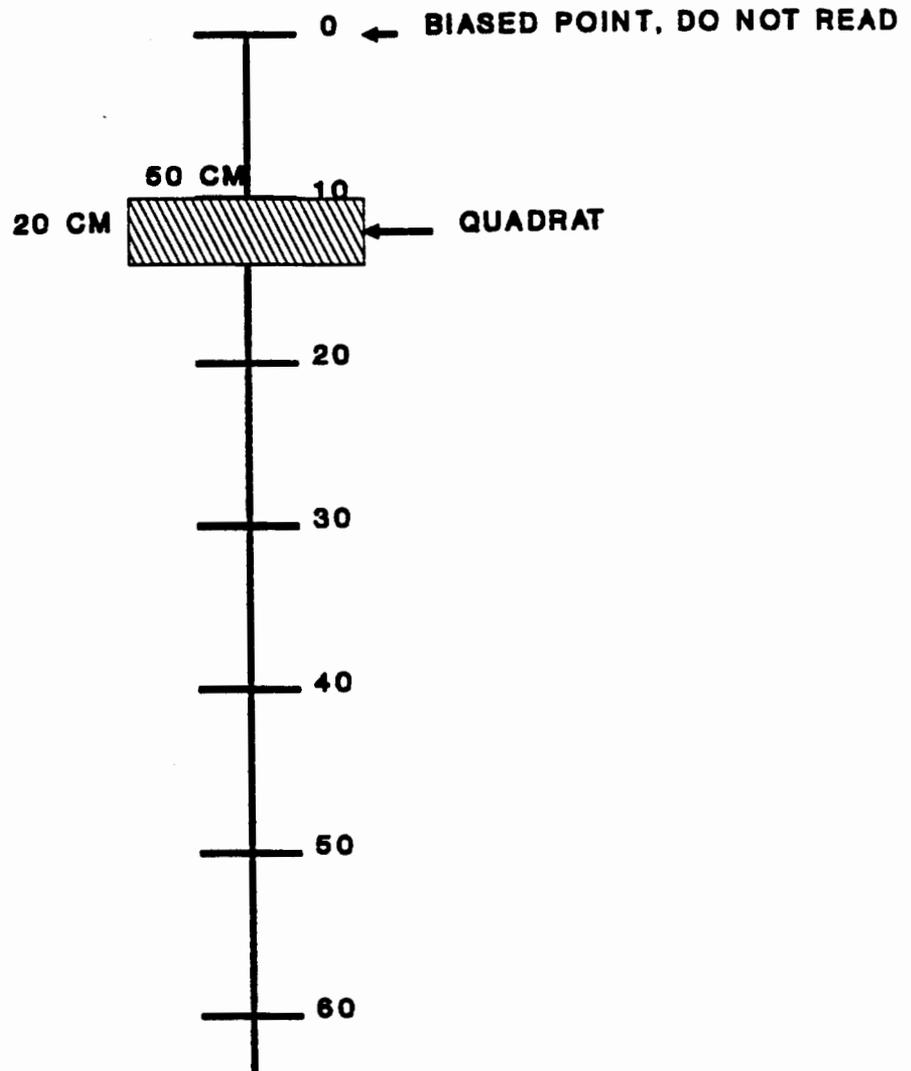


**Fig. 10. Placement and number of quadrats for understory herbaceous foliar cover. Quadrats are placed every 10 ft along the tape. A total of 100 quadrats should be read along the total 1000 ft. To determine if further quadrats are required, a species curve should be done until no new species are picked up within the quadrats or until 90% of the species noted on the initial inventory list have been measured in the quadrats.**

$$\frac{\text{\# Species in Quadrats}}{\text{\# Species in Inventory}} = A \times 100 = \underline{\hspace{2cm}} \%$$

# QUADRATS FOR HERBACEOUS FOLIAR COVER

## PLACEMENT OF QUADRAT



**Fig. 11. Foliar intercept for the line intercept method of overstory evaluation. View from above the line showing a transect with tree and shrub intercepts indicated; L1 = beginning intercept, L2 = ending. When the intercept crosses the 50-ft mark, intercepts should be read separately, with a new intercept beginning at the 50-ft mark.**

## 2 DESCRIPTION OF PROPOSED PROJECT

### 2.1 Background

Research activities pursued at Los Alamos National Laboratory (LANL) since its creation have produced many solid waste management units (SWMUs). These SWMUs exist at various technical areas (TAs) throughout the 43 square-mile of the Laboratory.

The US Environmental Protection Agency (EPA) is the regulatory authority over SWMUs and derives its authority from the Resource Conservation and Recovery Act (RCRA). Agreements with EPA define SWMUs at LANL 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). By requirements of RCRA, LANL must develop corrective actions for all hazardous waste releases (SWMUs) into the environment.

The Environmental Restoration (ER) Group (EM-13) is the responsible party for development and implementation of corrective actions for SWMUs at LANL. The corrective action process (IT 1990) consists of

- o site assessment,
- o site characterization,
- o development of proposed corrective actions and
- o selecting and rendering corrective actions.

This biological assessment is for the site-characterization phase. Biological Assessments for other phases may be required.

## 2.2 Description of Operable Units 1129 and 1147

### 2.2.1 General Setting

Operable Unit 1129 and 1147 are within the boundaries of Los Alamos National Laboratory, Los Alamos, New Mexico. The Laboratory is located in north-central New Mexico, roughly 100 air miles from Albuquerque and 35 miles from Santa Fe (Fig. 1).

Los Alamos National Laboratory is on the Pajarito Plateau at the east-central edge of the Jemez mountains. These mountains are a complex pile of volcanic rocks along the northwest margin of the Rio Grande rift in north-central New Mexico. The plateau, which forms an apron of volcanic sedimentary rocks along the eastern flank of the mountains, runs north-south. The length of the plateau is 20 to 25 mi; the width 10 mi. Southeast-trending intermittent streams dissect the plateau into several narrow mesas.

This plateau slopes gently eastward from an elevation of about 7500 ft near the mountains toward the Rio Grande. It ends there at an elevation of about 6200 ft in steep slopes formed by the down-cutting river. The Rio Grande floodplain is at 5400 ft.

The apron-like plateau at the base of the mountains extends east in finger-like mesas separated by deep canyons. Volcanic eruptions in the Jemez Mountains deposited the geological substrate, Bandelier Tuff (Environmental Surveillance Group 1988), about 1.1 to 1.4 million years ago. The tuffs overlap other volcanics that the

conglomerate of the Puye formation underlay (LANL 1988). This conglomerate intermixes with Chino Mesa basalts along the Rio Grande.

The area has a semiarid, temperate mountain climate. Summer temperatures range from the 50°F to the 70°F and 80°F during a 24 hr period (Bowen 1990). Winter temperatures generally range from 12-19°F to about 50°F during a 24-hr period. The annual precipitation in Los Alamos ranges from 13 in. to 18 in. with much of it occurring during summer rain showers in July and August. Figure 2 summarizes meteorological conditions during the 1991 field season.

#### 2.2.2 Setting of Operable Unit 1129

Operable Unit 1129 is located in the north central sector of the Laboratory (Fig. 3). The Operable Unit extends thus:

North - Sigma mesa and Sandia Canyon,  
South - Two-mile Canyon,  
West - South Mesa and  
East - The mesa between Mortandad and Sandia  
Canyons in Santa Fe County.

The unit is located within Township 19 North, Range 7 East, Section 19 and Township 19 North, Range 6 East, Sections 21, 22, 23, 24 and 27. The Unified Topographic Mercator Coordinates for the area are:

Zone 13	381250mE;	3970100mN
	383450mE;	3968500mN
	384750mE;	3969850mN
	388450mE;	3968450mN

Operable Unit 1129 encompasses portions of the following Canyon complexes:

- o Sandia Canyon,
- o Mortandad-Ten Site Canyon,
- o Cañada del Buey,
- o Sigma Mesa,
- o Mesita del Buey,
- o Pajarito Mesa and
- o Two-mile Canyon.

The elevation ranges from 6600 ft in the Mortandad Canyon bottom in TA 5 to 7300 ft on the mesa top in TA-55. The topography ranges from steep precipitous canyon walls to gently sloping mesa tops.

The OU 1129 encompasses nine TAs: 4, 5, 35, 42, 48, 52, 55, 63 and 66. All structures within OU 1129 are on the mesas between Mortandad Canyon, Ten Site Canyon and Cañada del Buey, or are on Mesita del Buey. The Biological Resource Environmental Team concentrated all 1991 field surveys within Ten Site Canyon and on the mesa top extending

south to Pajarito Canyon and Cañada del Buey. Other sampling areas were previously surveyed.

Operable Unit 1129 sits on welded Bandelier Tuff. The soil composition (Nyhan et al. 1978) of the study area is as follows.

*Canyon rims and side slopes:*

- o Rock outcrop (TA-35, -48, -52, -55, -63)
- o Typic Ustorthents-Rock outcrop complex (TA-50)

*Canyon bottoms:*

- o Totavi gravelly loamy sand (TA-35, -52)

*Mesa tops:*

- o Carjo loam (TA-35, -48, -55)
- o Hackroy sandy loam (TA-5, -35)
- o Hackroy-Rock outcrop complex (TA-4, -5, -35, 52, -63)
- o Nyjack loam (TA-4, -5, -35, -52)
- o Pogna fine sandy loam (TA-55)
- o Tocal very fine sandy loam (TA-48, -55)

### 2.2.3 Description of SWMUs and Proposed Sampling at Operable Unit 1129

The following activities may have resulted in routine and systematic hazard waste releases from SMWUs and areas contaminated by such releases located throughout OU 1129 (Fig 4).

- o Material disposal sites;
- o Septic systems, drains and outfalls;
- o Firing areas;
- o Canyon-side disposal sites;
- o Incinerators;
- o Container storage areas;
- o Waste lines;
- o Solvent spills and leakage from PCB transformers;
- o Surface impoundment;
- o A treatment facility and
- o Sumps and tanks.

The Environmental Restoration group (EM-13) will sample SWMUs and areas downgradient from SWMUs to determine the type, quantity and extent of any environmental contamination. Sampling will be primarily in drainages leading to Mortandad Canyon and Cañada del Buey. Surface and subsurface soils will be sampled. Sampling will vary from surface samples of no greater than 10 in. to core drilling to exceed 200 feet depths

#### 2.2.4 Setting of Operable Unit 1147

Operable Unit 1147 is located in the north-central sector of the Laboratory (Fig. 3). The Operable Unit extends thus:

North - Mortandad Ten Site Canyon (north)  
South - Two Mile-Pajarito Canyon (south)  
East - The west end of Mesita del Buey (east)  
West - Near Diamond Dr. and Pajarito Rd at the head on Mortandad Canyon

The unit is located within Township 19 North, Range 6 East, Section 27. The Unified Topographic Mercator Coordinates for the area are:

Zone 13	382650mE	3969100mN
	382800mE	3968650mN
	382800mE	3969300mN
	383000mE	3969000mN

Operable Unit 1147 encompasses portions of the following Canyon complexes:

- o Mortandad-Ten Site Canyon,
- o Cañada del Buey and
- o Two Mile-Pajarito Canyon.

The elevation ranges from 7000 ft to 7280 ft. The topography is a gently sloping mesa top.

All structures within OU 1147 are on the mesa between Mortandad-Ten Site Canyon and Cañada del Buey. The Biological Resource Evaluations Team concentrated all 1991 field surveys within Ten Site Canyon and on the mesa top extending south to Pajarito Canyon and Cañada del Buey. Other sampling areas were previously surveyed.

Technical Area 50 sits on welded Bandelier Tuff. The soil composition (Nyhan et al., 1978) of the study area is:

- o Carjo loam,
- o Hackroy loam,
- o Hackroy-Rock outcrop complex,
- o Seaby loam and
- o Tocal very fine sandy loam.

#### 2.2.5 Description of SWMUs and Proposed at Sampling OU 1147s

Technical Area 50 houses treatment facilities for radioactive and chemical wastes. An industrial waste line and trucks collect the waste material. Technical Area 50 contains the following SMWUs (Fig. 4):

- o Radioactive waste treatment facility,
- o Tanks and drain lines,
- o Waste storage areas,
- o Decommissioned tanks and waste lines,
- o Nonradioactive waste treatment plant,
- o Operational releases and outfalls,
- o Incinerator complex,
- o Size reduction facility,
- o Material disposal Area C,
- o Radioactive decontamination facility and
- o Septic systems.

The Environmental Restoration Group will sample SWMUs and areas downgradient from SWMUs to determine the type,

quantity and extent of any environmental contamination. Sampling will be primarily in drainages leading to Mortandad-Ten Site Canyon, Cañada del Buey, and Two Mile-Pajarito Canyon. Surface and subsurface soils will be sampled. Sampling will vary from surface samples of no greater than 10 in. to core drilling to exceed 200 feet depths

### 3.0 PREVIOUS STUDIES

Before the 1991 surveys, several site-specific studies had been completed within or immediately adjacent to OUs 1129 and 1147 (Fig. 5). These studies include biological resources and TES species information for sites of past proposed activities and base line and inventory data. Much of this section's species information can be projected beyond the known range to estimate the area's biological composition. Present biological community surveys complement existing plant and wildlife species information for the area.

#### 3.1 Previous Vegetation Studies

Previous investigators in EM-8 studied the OUs 1129, 1147 and surrounding areas. The studies, since 1980, either cleared various proposed waste site areas for construction or typed the permanent bird and mammal transect habitats in the area. Figure 5 notes these survey locations. A plant species check list compiled from these surveys appears in Table 1 (Appendix 1).

Foxx (1981), Foxx (1986) and Ripley (1985) studied the vegetation in Mortandad Canyon, Cañada del Buey and the surrounding mesa tops. Foxx and Tierney (1984) studied Mortandad Canyon specifically because of these past non-natural disturbances:

- o laboratory effluent,
- o historic and prehistoric agriculture and
- o prehistoric ruins.

The OUs mesa tops accommodate several permanent bird and mammal transects. Foxx (1986) surveyed the vegetation within these plots. Ripley (1985) evaluated the Mortandad Canyon riparian area adjacent to one of these bird plots. However, his work principally supplemented EM-8's general habitat typing efforts.

### 3.2 Previous Wildlife Studies

A limited number of studies that characterize the fauna of the area have been done since 1977. The following discussion addresses these surveys.

#### 3.2.1 Insects

Hanson and Miera (1978) reported the results of an insect study conducted by D. C. Lowrie in the operable unit. Lowrie collected spiders in the Mortandad Canyon stream bank habitat. McKay et al. (1986) continued the work of Lowrie countywide with special reference to ants. Table 1 (Appendix 2) lists the ant species found (McKay et al. 1986) in OUs 1129 and 1147.

### 3.2.2 Snails and bivalves

No extensive field surveys have been conducted for mollusks within the OUs.

### 3.2.3 Reptiles and Amphibians

In 1978 Charles Bogert, consultant to Los Alamos National Laboratory, surveyed reptile and amphibian distribution within the Laboratory boundaries (Bogert 1978). Table 2 (Appendix 2) is a check list of species found in the northern portions of the Laboratory.

### 3.2.4 Birds

The Pajarito Ornithological Society performed a five-year breeding bird study (Travis 1991). Table 3 (Appendix 2) lists the bird species that this study revealed to be nesting or believed to nest within Mortandad-Ten Site Canyon and the mesas in the immediate vicinity.

### 3.2.5 Fish

No previous fish collections have been made in OU 1129 and OU 1147 because no perennial streams or water bodies exist.

### 3.2.6 Mammals

Miera et al. (1974) and Kent (1986) live-trapped small mammals within the OUs 1129 and 1147. Miera trapped in Mortandad Canyon. Kent trapped in Mortandad and Ten Site Canyon and the mesa top between these canyons. Table 4 (Appendix 2) lists the results of these studies.

## 3.3 Previous Threatened, Endangered and Sensitive (TES) Species

Plants: Foxx and Tierney (1980) documented the status of the flora at LANL. Only the federal candidate species, grama grass cactus (*Toumeyia paparacanthus*), is likely to occur in the Operable Unit 1129 and 1147. None of the previous studies disclosed this cactus' presence.

Wildlife: No previous TES wildlife surveys were conducted in the OUs.

#### 4.0 METHODS

The Biological Resource Evaluations Team performed three levels of surveys within Operable Units 1129 and 1147. The purpose of these surveys was to determine the presence or absence of sensitive species or habitats that may be affected by the site characterization sampling.

The Level 1 (reconnaissance) survey was the initial survey. This survey type determines

- o the placement transects,
- o extent of potential impact,
- o presence or absence of water or floodplains and
- o presence or absence of disturbance.

The Level 2 surveys follow these initial examinations when undisturbed areas and potential critical habitat exist.

The Biological Resource Evaluations Team conducted no Level 3 surveys . These are species-specific surveys done by pre-established survey protocols, which often require certain meteorological or seasonal conditions. If habitat types had met the requirements, then the team would have conducted Level 3 surveys for the species of concern.

#### 4.1 Level 1 (Reconnaissance) Surveys

The Biological Resource Evaluations Team conducted one reconnaissance survey in August and another in September 1991.

#### 4.2 Threatened, Endangered and Sensitive (TES) Species Data base

After the initial field reconnaissance, team members searched the TES data base. This database contains a list of state and federal TES animal and plant species. The data base contains the latest information about individual TES species occurring in Los Alamos and surrounding counties from these sources:

- o New Mexico Department of Game and Fish,
- o New Mexico Energy and Minerals and Natural Resources Department,
- o New Mexico Plants Protection Advisory Committee (1984) and
- o US Fish and Wildlife Service (50 CFR 17.11 and 17.12)

The user searches the data base by referencing potential habitat criteria noted during the reconnaissance survey. The user can then obtain a listing of the potential species occurrences in an area. The habitat match generates a listing of threatened, endangered, candidate and sensitive species that may occur within an OU (Appendix 3).

#### 4.3 Level 2 (Habitat Evaluation) Surveys

After obtaining a list of potential sensitive species, BRET conducted Level 2 surveys (Fig. 6). These surveys, which measure quantitatively the habitat, document the habitat characteristics and ensure that no habitat types for

any known sensitive species are present, have various uses.

These uses include

- o descriptions for environmental settings,
- o data for Habitat Evaluation Procedures (HEP)  
and
- o data for base line information.

The field teams evaluate both the overstory and understory components of the habitat. Techniques used in the habitat evaluation are standard ecological techniques for measuring foliar cover, density and frequency of the vegetative component.

#### 4.3.1 Overstory Evaluation:

The team used a circular plot technique and a line intercept technique to measure the overstory components of the forest, woodland and riparian communities.

##### 4.3.1.1 Circular Plots

The team used a circular plot technique to measure the overstory components within riparian zones or woodlands. Field technicians placed a transect line within the habitat to be evaluated. Circular plots were established every 100 ft along the transect (Fig. 7). All trees within a 30-ft radius of the center point (the transect line) were measured for basal diameter (e.g. piñons and junipers) or diameter breast high (tall stemmed tree). A field technician then estimated the shrub cover within each of four equal subplots inside the circle.

#### 4.3.1.2 Line Intercept

Field teams measured the overstory component within conifer forests using a line intercept technique. These data were collected within a 20-ft-wide strip centered on a transect line through the habitat (Fig. 8). Field technicians measured all tree basal diameters and counted all shrub stems within the strip (Fig 9).

The total length of the transect line and the total length intercepted by vegetation were measured for foliar cover estimation. Intercept was recorded by observing the vegetation canopy's vertical projection onto a tape measure placed at ground level along the transect center line. Each 50-ft strip segment measured from the start of the transect constituted a plot for frequency estimation.

#### 4.32 Understory

Understory measurement employed a quadrat method or the following elements:

- o the cryptogamic and herbaceous layers,
- o percent bare soil, rock or litter and
- o shrubs less than 3 feet tall.

A Daubenmire plot of 20 x 50 cm was used (Daubenmire 1959).

Field workers used ocular estimates (Fig. 10) of foliar cover to determine percent cover and species composition. Cover estimates were recorded until one of two conditions were met:

- o The cumulative species total (graphically, the species area curve) stopped increasing

or

- o The number of quadrats totaled 100 for each transect (Fig. 11)

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

Species information can be summarized from vegetative transect data for mapping using a hierarchical classification system. This provides base information to map vegetation on Geographic Information Systems such as ARC INFO. All study areas were classified following the classification of Brown (1982) and USFS Habitat Typing (Moir and Ludwig 1979).

The following classification was used:

Vegetation type  
Formation type  
Climatic (Thermal) Zone  
Biotic community  
Series  
Habitat type  
Phase

Table 1 (Appendix 4) provides a definition for each of the classification elements. The classification for both upland and wetland vegetation types for the Pajarito plateau is in Appendix 4. This listing, based on Brown (1982), Moir and Ludwig (1979) and USFS (undated), includes known and potential habitat types and phases. No attempt was made to develop new habitat types for the area. Some study areas did not fit within one of the designated habitat types

previously defined for Northern New Mexico. Such habitat types should be considered potential classification and further studies should be conducted to determine the final classification.

#### 4.4 Level 3 (Species Specific) Surveys

The Biological Resource Evaluations Team did not conduct any species specific surveys in the Operable Unit.

##### 4.4.1 Small Mammal Trapping

The Biological Resource Evaluations Team conducted the nearest small mammal live trapping sessions in Cañada del Buey. The small mammals trapped during these sessions did corresponded to the previous years' lists. Table 4 (Appendix 2) lists the results for 1991.

Small nocturnal mammals were captured using Sherman live traps. Shaded traps spaced at 10-20 m were stationed on a level surface. Afternoon baiting with peanut butter and oats permitted inspection the following morning. Trapping continued for at least four consecutive nights.

Team members weighed, sexed and measured captured animals. Animals were identified to species using Whitaker (1980) and Burt and Grossenheider 1976, and released at the capture site.

##### **Spotted bat:**

There were no spotted bat surveys conducted in Operable Units 1129 and 1147. However, this report incorporates information from bat surveys conducted elsewhere on LANL property.

Previous bat surveys were conducted using mist nets. Mist netting was conducted by rabies-immunized researchers from the University of New Mexico. Bats were not weighed, measured or marked to prevent unnecessary handling and injury. Identifications were made using Whitaker (1980) and Burt and Grossenheider (1976).

Mist netting is not specific to Spotted Bats (*Euderma maculatum*) and general inventory data were also collected. Nets were set up at dusk and run several hours into the night. Nets were closely monitored and checked every few minutes for bat captures.

When a bat was caught in the net, it was carefully removed by holding it gently and pulling the net strands away from its body and wings. Species were identified, sexed, photographed, and released immediately.

#### 4.4.2 Bird Surveys

Birds were identified and counted along transects. Counts were begun 200 m from the transect beginning to avoid bias at the first point. There were at least 30 points on each transect and each point was 200 m apart. At each point the observer remained stationary for 6 minutes and counted all birds seen and heard. Additional data on age and sex of birds was recorded if time permitted. Birds were recorded as being <25 ft from the observer or >25 ft from the observer. Identifications were made using Robbins, Bruun, Zim, and Singer (1983) and R. T. Peterson (1990).

#### 4.4.3 Large Mammals Surveys

Formal large mammal surveys were conducted in Cañada del Buey. These areas were outside but bordering the Operable Units 1129 and 1147. They probably reflect usage of the area.

Large mammal activity surveys relied on fecal pellet counts (Raskevitz, Kocan, and Shaw 1991) along transects and in circular plots. Initially, transects and plots were surveyed for scat, which is categorized by apparent age. Plots were cleared of fecal matter as they were surveyed. These initial data can only be compared to other initial data sets.

Plots were marked with angle irons and transects were marked with flagging and spray paint. Each of 50 plots in a study area was 0.1 Ha. The 2m wide transects ran between plots.

The transects and plots were later examined approximately every 30 days. Fecal matter was considered in a plot or transect if the boundaries intersected the center line or more of the scat. Pellet groups (5 or more pellets) and scat were recorded by species, number, location, and age. All recorded fecal matter was removed after recording.

#### 4.5 Wildlife Observation Surveys

##### 4.5.1 Insects

The Biological Resource Evaluations Team performed no formal insect surveys in the Operable Units 1129 and 1147.

#### 4.5.2 Snails and Bivalves

The Biological Resource Evaluations Team performed no formal snail or bivalve surveys in the Operable Units 1129 and 1147.

#### 4.5.3 Reptiles and Amphibians

Wildlife observations were made on reptiles and amphibians inhabiting the Operable Unit 1129 and 1147. No systematic study was done but species observations were noted. identifications were made using Stebbins (1985).

#### 4.5.4 Fish

Effluent discharges are made into Mortandad Canyon; however, no other perennial streams or water bodies exist within Operable Units 1129 and 1147.

#### 4.5.5 Birds

Wildlife observations were made on birds inhabiting the Operable Unit 1129 and 1147. No systematic study was done but species observations were noted. Identifications were made using Peterson (1990).

#### 4.5.6 Mammals

Wildlife observations were made on mammals inhabiting Operable Units 1129 and 1147. No systematic study was done but species observations were noted.

There were two federal endangered and three candidate species for federal threatened status that met the search criteria (U. S. Fish and Wildlife Service, 1989).

*Endangered*

- o Bald Eagle (*Haliaeetus leucocephalus*)
- o Peregrine Falcon (*Falco peregrinus*)

*Threatened (Candidate)*

- o Northern Goshawk (*Accipiter gentilis*)
- o Mexican Spotted Owl (*Strix lucida*)
- o Willow Flycatcher (*Empidonax trailii*)

**State Listed Species:**

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

*Endangered*

- o Broad-Billed Hummingbird (*Cyanthus latirostris*)
- o Common Black Hawk (*Buteogallus anthracinus*)
- o Mississippi Kite (*Ictinia mississippiensis*)
- o Spotted Bat (*Euderma maculatum*)

5.2.2 Threatened, Endangered and Sensitive (TES) Plant Species with Potential Habitat in Operable Unit

**Federally Listed Species:** There were no federally listed plants that met the search criteria.

**State Listed Species** (New Mexico's Natural heritage Program 1991):

*Endangered:*

- o Wood Lily (*Lilium philadelphicum*)
- o Wright Fishhook Cactus (*Mammillaria wrightii*)
- o Santa Fe Cholla (*Opuntia viridiflora*)
- o Grama grass cactus (*Toumeyia papyracantha*)

## 5.0 RESULTS

### 5.1 Level 1 (Reconnaissance) Surveys

The Biological Resource Evaluations Team conducted two reconnaissance surveys within the OUs to record seasonal observations and to determine and identify:

- o potential habitats,
- o sampling locations and
- o access points.

From the reconnaissance results, BRET decided to conduct five vegetation surveys. The field team conducted these surveys at various times from August 29 through October 17, 1991.

### 5.2 Threatened, Endangered and Sensitive (TES) Species

Team members reviewed the data base containing information on TES species. This review determined the potential existence of any TES or sensitive plant or animal species within the OUs 1129 and 1147 (Appendix 3, Table 1) based on previously documented occurrences or existing habitat.

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

<i>Plant Community:</i>	Mixed Conifer forest
	Ponderosa Pine forest
	Piñon-Juniper woodland
	Riparian
<i>Elevation:</i>	6600 to 7300 ft

5.2.1 Threatened, Endangered and Sensitive (TES) Animal Species with Potential Habitat in Operable Units 1129 and 1147

**Federally Listed Species:**

Smooth brome was the dominant grass species understory component in the canyon bottom with a relative cover of 41.6%. The other grasses present were sand dropseed (relative cover 31.0%), western wheatgrass (6.0%) and Cañada wild rye (4.4%). The forbs present were green amaranth (relative cover 10.4%), white sweet clover and rippleseed plantain.

The riparian area borders the flowline of an intermittent stream. The tree canopy includes both the open ponderosa pine forest, discussed above, and Russian olive along the streambed. The relative Russian olive cover was 18.1%. The relative Russian olive density was 29.2% with 18.8% relative frequency.

## 6.0 DISCUSSION

### 6.1 Level 2 Survey (Habitat Evaluation)

Surveys suggest the presence of the following habitats within OU 1129 and 1147:

<i>Piñon-Juniper:</i>	Great Basin Conifer Woodland Community, Piñon-Juniper series, Colorado Piñon/Wavyleaf Oak Habitat Type.
<i>Mixed conifer forest:</i>	Rocky Mountain Montane Conifer Forest Community, Douglas Fir Series, Douglas Fir/Gambel Oak Habitat Type, Gambel Oak Phase.
<i>Ponderosa pine forest:</i>	Rocky Mountain Conifer Forest Community, Ponderosa Pine Series, Ponderosa Pine/Gambel Oak Habitat Type, Gambel Oak Phase.

mountain mahogany shrub component. The relative Douglas fir cover was 64.5%. The relative Douglas fir density was 88.0% with a 53.0% relative frequency. The relative Ponderosa pine cover was 35.5%. The relative Ponderosa pine density was 12.0% with a 47.0% relative frequency. The shrub canopy was Gambel oak with Colorado barberry present in small drainages.

The understory component on the north-facing slope was mountain muhly, the dominant grass species, with a relative cover of 50.0%. The only other grasses present were *Bromus* spp. with 5.0% relative cover. Pussytoes, mountain lover and wormwood were the forbs present.

The Biological Resource Evaluations Team ran three transects in the canyon bottom. The overstory component canyon bottom is a ponderosa pine dominated conifer forest with oak and mountain mahogany shrub components. The relative ponderosa pine cover was 79.8%. The relative Ponderosa pine density was 68.8% with a 78.2% relative frequency. Douglas fir grows in the west end of the canyon bottom with 6.3% relative cover, 6.1% relative density and 9.1% relative frequency.

A more varied shrub canopy existed here than on the mesa top, canyon rim or north slope. Willow species present had relative densities of 65.9%. Gambel oak, wavyleaf oak and mountain mahogany occurred along with lesser amounts of apache plume and skunkbush sumac.

Wavyleaf oak and mountain mahogany comprised the shrub canopy. The relative wavyleaf oak and mountain mahogany cover were 76.9% and 23.1% respectively.

The understory components on the mesa top were blue grama, the dominant grass (42.1% relative cover), with wild chrysanthemum the most common forb (8.2%). Mountain muhly, sand dropseed and wormwood were also present.

The Biological Resource Evaluations Team ran one transect on the north Ten Site Canyon rim and two on the north-facing slope. The overstory component on the canyon rim was a Douglas fir dominated conifer forest with an oak and mountain mahogany shrub component.

The relative Douglas fir cover was 45.6%. The relative Douglas fir density was 53.3% with a 50% relative frequency. The relative ponderosa pine cover was 47.7%. The relative ponderosa pine density was 33.3% with a 35.3% relative frequency.

Gambel oak was the dominant shrub (relative cover 74.5%). Wavyleaf oak and mountain mahogany were present with relative cover of 15.0% and 10.5% respectively.

The understory component on the canyon rim was a dominant grass, mountain muhly, with a relative cover of 72.4%. Little bluestem and wormwood were the only other understory species present with relative covers of 20.8% and 6.2% respectively.

The north-facing slope overstory component was also a Douglas fir dominated conifer forest with a Gambel oak and

### 5.2.3 Level 2 (Habitat Evaluation) Surveys

Field teams established vegetation transects in TA-52, OU 1129, to evaluate the understory and overstory components of the following habitats:

*Ten Site Canyon mesa top:* Piñon-Juniper woodland  
*Ten Site Canyon rim:* Mixed Conifer forest  
*Ten Site Canyon north-facing slopes:* Mixed Conifer forest  
*Ten Site Canyon bottom:* Ponderosa Pine Forest/Mixed Broadleaf woodland.

The Biological Resource Evaluations Team ran two transects on the mesa top. The overstory components are trees and shrubs. Relative species traits of these two canopies were determined separately. These comparative values express the following species attributes:

<i>Relative cover:</i>	an individual species' contribution to the total vegetative cover;
<i>Relative density:</i>	an individual species' share of the total number of plants (trees) or stems (shrubs) per acre; and
<i>Relative frequency:</i>	the occurrence rate of a species within study plots.

The above values when averaged yield a relative importance index.

The mesa top is a Colorado piñon dominated Piñon-Juniper woodland with an oak and mountain mahogany shrub component. The relative Colorado piñon cover was 59.7%. The relative piñon density was 63.6% with a relative frequency of 52.1%. One-seed juniper relative density was 36.4% with a 47.9% relative frequency. Relative one-seed juniper cover was 40.2%.

The Federal Endangered Species Act and state statutes protect only species that are listed species or are candidates for listing. New Mexico has listed species occurring within the state that are considered rare because of restricted distribution or low numerical density. These species are sensitive to long-term or cumulative land use impacts and are vulnerable to biological or climatic events that could eventually threaten them. The state monitors these species to determine if they should be elevated to endangered status.

*Sensitive*

- o Checker Lily (*Fritillaria atropurpurea*)
- o Cyanic milk vetch (*Astragalus cyaneus*)
- o Mathew's woolly milk-vetch (*Astragalus mollissimus* var. *mathewsii*)
- o Pagosa phlox (*Phlox caryophylla*)
- o Plank's catchfly (*Silene plankii*)
- o Sandia Alumroot (*Heuchera pulchella*)
- o Santa Fe milk vetch (*Astragalus kentrophyta* var. *neomexicanus*)
- o Sessile-flowered false carrot (*Aletes sessiliflorus*)
- o Taos milk vetch (*Astragalus puniceus*)
- o Threadleaf horsebrush (*Tetradymia filifolia*)
- o Tufted sand verbena (*Abronia bigelovii*)

The Migratory Bird Treaty and Bald Eagle Protection Act protects certain species from being collected or maimed and from having their nests disturbed. This act (US Code 16 USC 703-711) provides federal protection for all wild birds except resident game birds, English sparrows, starlings and feral pigeons.

*Riparian willow scrub:* Willows, Russian olive and Ponderosa pine are the canyon bottom's dominant vegetation.

Table 1 (Appendix 5) lists the dominant species and corresponding importance index for each habitat type.

## 6.2 Threatened and Endangered Species Presence or Absence

Habitat information collected from the Level 1 and Level 2 field surveys and previous data were compared to habitat information and the threats to the taxon for each sensitive species in the TES data base. Based on those comparisons, species were either dismissed from further consideration or additional surveys were conducted to confirm the presence or absence of the species within that habitat.

### 6.2.1 Species Dismissed From Further Consideration

Based on the information gained from the Level 1 and Level 2 field surveys and previous data, we concluded that the following species not present in Operable Units 1129 and 1147:

Northern goshawk (*Accipiter gentilis*) is found in dense, mature and old growth coniferous forest. Logging in ponderosa pine habitat limits the range of this large accipiter. Its confirmed breeding territory is in the northwestern part of the county. It has occurred in southeast to south central part of the county. Ponderosa Pine/Gambel Oak and mixed conifer (White Fir-Douglas Fir-Ponderosa Pine/Gambel Oak) is the preferred habitat, but no

occurrences have been recorded in the OUs. No northern goshawks were observed during the surveys.

Common black hawk (*Buteogallus anthracinus*) is found in cottonwoods and other woodlands along permanent streams. Primarily riparian habitat destruction limits this medium-sized raptors distribution. It has occurred in small numbers in the Rio Grande Valley. Riparian areas in Mortandad-Ten Site Canyon are willow riparian scrub. Therefore, the habitat is marginal at best. Additionally there have been no sightings of this raptor within Los Alamos County.

Bald eagle (*Haliaeetus leucocephalus*) winters along the Rio Grande. Winter roosts have been observed at Cochiti Lake. Mortandad Canyon upstream has some suitable roosting areas but no confirmed roosting sites. Suitable roosting sites consist of large trees and protection from wind. However, no bald eagles were observed during the surveys.

Mississippi kite (*Ictinia mississippiensis*) generally inhabits the lower Rio Grande and Pecos Valleys in riparian zones and shelterbelts. The riparian area in Mortandad-Ten Site Canyon is willow scrub. This species has not been reported for the Los Alamos area.

Peregrine falcon (*Falco peregrinus*) breeds where breeding territories containing both suitable nesting and foraging can be established. Nesting peregrine falcons have been observed in Pueblo Canyon north of LANL boundaries. No

sightings of this species nesting in the OUs have been recorded. None were observed during the surveys.

Broad-billed hummingbird (*Cynanthus latirostris*) has been identified in the riparian woodlands in Bandelier National Monument. They usually occur as vagrants near Los Alamos primarily breeding in the southern part of the state.

Willow flycatcher (*Empidonax trailii*) breeds through central New Mexico and occurs statewide in spring and autumn migrations. They usually require riparian areas dominated by cottonwoods. No cottonwoods are found in Mortandad-Ten Site Canyon.

Spotted Bat (*Euderma maculatum*) inhabits a wide range of habitats that include ponderosa pine and mixed conifer plant communities. The bat roosts in cliffs or rock crevices and comes to open water (ponds or pools in streams) to drink (NM Department of Game and Fish). The survey results show that cliffs and rock crevices are available in this area, but water sources are not. This species has been collected in the Jemez Mountains but limited mist netting of bats during 1991 did not reveal any spotted bats on Laboratory lands.

Meadow jumping mouse (*Zapus hudsonius*) prefers wetlands and other mesic habitats such as permanent streams and wet meadows.

Grama grass cactus (*Toumeyia papyracantha*) is found in Piñon-Juniper Woodlands. In Los Alamos County, all cacti have been found in association with basalt outcrops. No

specimens of this cacti were found within the OUs during Level 1 (reconnaissance) surveys and Level 2 (habitat evaluation) surveys.

Wright fishhook cactus (*Mammillaria wrightii*\_var. *wrightii*) is associated with gravelly and sandy hills or plains, desert grassland to piñon-juniper (3000-7000 ft.) (New Mexico Native Plants Protection Advisory Committee, 1984). Habitat evaluations show that mesa tops, canyon walls, and canyon bottoms have stands of Piñon-Juniper. Sandy alluvial areas are found along the canyon bottoms in Mortandad-Ten Site Canyon. No specimens of this cactus were found within the OUs during Level 1 (reconnaissance) surveys and Level 2 (habitat evaluation) surveys.

Plank's catchfly (*Silene plankii*) is found in piñon-juniper in igneous rock crevices along the Rio Grande. It has not been found in Los Alamos County and was not encountered during the surveys.

Tufted sand verbena (*Abronia bigelovii*) is found in soils developed from Todlito gypsum in piñon-juniper. It has not been found in Los Alamos County and was not encountered during the surveys.

Santa Fe cholla (*Opuntia viridiflora*) has only been found in Santa Fe County in an urban area. They appear to be strongly associated with south- and west-facing slopes in piñon-juniper woodlands at about 7200 ft. (New Mexico Native Plants Protection Advisory Committee 1984). No specimens of this cacti were found within the Operable Unit during Level

1 (reconnaissance) surveys and Level 2 (habitat evaluation) surveys.

The sessile-flowered false carrot (*Aletes sessiliflorus*) occurs in rocky canyons in basalt or sandstone. This has not been recorded for Los Alamos County and was not found during the surveys.

Threadleaf horsebrush (*Tetradymia filifolia*) occurs on limestone or gypsiferous soils. This species has not been recorded for Los Alamos County and was not encountered during the surveys.

The Santa Fe milk vetch (*Astragalus feensis*) occurs in piñon-juniper woodlands on dry slopes. It has not been recorded for Los Alamos County and was not found during the surveys.

Mathew's woolly milk vetch (*Astragalus mollissimus*) occurs on slopes, ridges and canyons in open country. It has not been recorded for Los Alamos County and was not found during the surveys.

Taos milk vetch (*Astragalus puniceus*) occurs in loose soil in open areas of piñon-juniper. It not been recorded for Los Alamos County and was not found during the surveys.

Cyanic milk vetch (*Astragalus cyaneus*) occurs on sandy or gravelly slopes in piñon-juniper. It has not been found in Los Alamos County and was not found during the surveys.

Pagosa phlox (*Phlox caryophylla*) occurs on open slopes in mountain woodlands and forests. It was not recorded

during the Level 1 or Level 2 surveys and has not been previously recorded for Los Alamos County.

Sandia Alumroot (*Heuchera pulchella*) is a cliff-loving plant endemic to the central New Mexico mountains. It was not found during the Level 1 or Level 2 surveys and has not been previously recorded for Los Alamos County.

Checker Lily (*Fritillaria atropurpurea*) occurs in mixed-conifer habitat. It was not found during the surveys.

#### 6.2.2 Species surveyed at Level 3

Based on the Level 1 (reconnaissance) surveys, Level 2 (habitat evaluation) surveys and previous studies, no Level 3 surveys were conducted in the OUs.

## 7.0 IMPACTS

### 7.1 Wetlands and Floodplains in Operable Units 1129 and 1147

Sewage disposal ponds in Mortandad-Ten Site Canyon appear on the National Wetlands Inventory Maps as artificially and permanently flooded wetlands. Delineation of these wetlands boundaries must be done at the time of sampling. These delineations should be done within two years of the sampling. After two years the delineation is no longer valid and must be repeated.

The canyon bottom conveys both perennial and intermittent flows in Mortandad-Ten Site Canyon. Upper Mortandad Canyon is subject to perennial sewage effluent discharge. Delineation and characterization of the upper

canyon floodplain, using federal criteria, must be done at sampling time.

Surface sampling to not greater than 10-in. depths and core drilling from 10 to 200 ft may occur in the dry canyon bottoms. Sampling for site characterization may range from surface sampling to core drilling. Sampling should remain outside designated wetlands. This will allow for sampling outside of areas that meet wetland criteria.

## 7.2 Sensitive Species

No sensitive species should be affected by site characterization activities which involve surface sampling and core drilling.

## 7.3 Non sensitive Species

Species in this category do not have threatened or endangered status to protect them from harassment and collection. Impacts to these species would be excessive activity or noise during the mating and nesting periods.

*Cooper's Hawk:* Travis (1991) reported confirmed nesting sites for Cooper's hawk (Travis 1991) in OU 1129. These hawk nest in riparian areas and adjacent forest edges and woodlands. They are still hunters that perch to ambush birds, small mammals and lizards (Clark and Wheeler 1987).

All nesting trees identified by Travis were ponderosa pines. Probable breeding areas would be in the east half of TA-5. Sampling these locations should be confined to September through April.

*Red-tailed Hawk:* Travis (1991) reported confirmed nesting sites. Although they breed from lowland shrublands to mountain forests, in Los Alamos County all recorded nests have been on tuff ledges, in caves or on lofty stations in ponderosa pine crowns. Nest sites require seclusion, a prominent view and an adequate foraging area.

#### 7.4 Erosion

Sampling should not cause increased erosion in the area. Large equipment driven throughout the area indiscriminately could affect the area.

### 8.0 MITIGATION

#### 8.1 Wetlands and Floodplains

Sampling for site characterization may range from surface sampling to core drilling. heavy equipment may be required for core drilling in the canyon bottoms or near cliff faces. The sites of such sampling should be surveyed for wetlands, floodplains and possible raptor roosts.

#### 8.2 Revegetation and Erosion

Sampling and corrective actions may require revegetation. A useful species listing for revegetation is found in Appendix 5 (Table 1). This list is compiled from inventory data and the indicator species catalog in Pierce and Foxx (1991).

#### 8.3 Sensitive Species

No mitigation measures for sensitive species are expected to be required.

#### 8.4 Nonsensitive Species

Cooper's and Red-tailed Hawk: Sampling within raptor nesting areas should be done outside of the mating, nesting, and fledging times. Within the nesting areas, sampling should occur during the months of September through April.

#### 9.0 CONCLUSION

The TES data base yielded a listing of potential species that could occur within the habitat types (OU 1129 and 1147). Nine species on the state or federal protection list potentially occur in mixed conifer, ponderosa pine, piñon-juniper and riparian areas of Los Alamos or surrounding counties. The Biological Resource Evaluations Team conducted a habitat evaluation survey to determine if the specific requirements of the species are fulfilled in the project locations.

The area was searched for the presence of floodplains and wetlands. Floodplain and wetland issues were identified for this site. These are upper Mortandad Canyon and the Mortandad-Ten Site confluence. These areas should re-evaluated at the time of sampling if testing requires more than minor surface disturbance.

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

Best management practices to maintain nesting of a sensitive raptor species suggest that sampling in portions of Mortandad Canyon should be confined to September through April.

#### **10 ACKNOWLEDGMENTS**

The Biological Resource Evaluations Team performed this survey in cooperation with and funding from the Environmental Restoration Program, Los Alamos National Laboratory. Teralene Foxx, Project Ecologist, Biological Resource Evaluations Team, Environmental Assessments and Resource Evaluations Section, Environmental Protection Group, EM-8, directed this study. Field personnel included Kathryn Bennett, Environmental Scientist; James Biggs Wildlife Biologist; Daniel Dunham, Botanist; Delia Raymer, Wildlife Biologist, Graduate Research Assistant; Robert Visel, Undergraduate Student.

#### **11 DEFINITIONS**

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

*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.

*Federal Candidate Species:* Species proposed for federal endangered or threatened listing.

*Federal Endangered Species:* Species that is in danger of extinction through all or a significant portion of its range.

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

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

**Group 1 Species:** Species whose prospects of survival or recruitment within the state are in jeopardy. These species are protected by state law.

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

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

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

**Level 1 Survey:** Reconnaissance survey to determine if a proposed project is in a developed technical area or otherwise disturbed areas. This survey produces nonquantitative data about the area.

**Level 2 Survey:** Detailed quantitative vegetation survey that is used to evaluate whatever critical habitat requirements for a threatened and endangered species are present at the proposed project area.

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

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

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

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

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

*Species Area Curve:*\_\_Test to determine relative sample adequacy from the relationship between the number of species encountered as plot area increases; the graph produced by plotting the cumulative total of species recorded along a transect against the total number of plots.

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

*State Group 1 Species:* Animal species considered to be endangered in the state of New Mexico.

*State Group 2 Species:* Animal species considered to be threatened in the state of New Mexico. Group 2 species are those species whose prospects of survival or recruitment within the state are likely to become jeopardized in the near future. State laws protect these species.

*State Sensitive Plant:* Plant species whose numbers or occurrences are low in the state. The state monitors these species to see if their status needs to be upgraded to endangered. At present, state law does not protect state sensitive plants.

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

*Wetlands:* Areas 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, mudflats, and natural ponds.

## **12 SUMMARY OF PERTINENT REGULATIONS**

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

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

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

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

*The 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.

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**APPENDICES**

APPENDIX 1--Annotated Plant Checklist

TABLE 1: Plant Checklist for OU 1129 and OU 1147

FAMILY	SCIENTIFIC NAME	COMMON NAME	INDICATOR STATUS
ACERACEAE	<i>Acer glabrum neomexicanum</i>	New Mexico maple	Nonweedy FACU
	<i>Acer negundo</i>	Boxelder	Non-weedy FACW
AMARNTHACEAE	<i>Amaranthus retroflexus</i>	Green or rough pigweed	Economic FACU
ANACARDIACEAE	<i>Rhus radicans</i>	Poison ivy	Nonweedy FAC
	<i>R. trilobata</i>	Skunkbush sumac	
BERBERIDACEAE	<i>Berberis fendleri</i>	Colorado barberry	Nonweedy
BORAGINACEAE	<i>Cryptantha fendleri</i>	Fendler cryptantha	Nonweedy
	<i>Cryptantha jamesii</i>	James hiddenflower	Nonweedy
	<i>Lappula</i> sp.	Stickseed	
	<i>Lithospermum multiflorum</i>	Many-flowered stoneseed	Nonweedy
	<i>Mertensia lanceolata</i> var <i>fendleri</i>	Bluebells	Non-Weedy
CACTACEAE	<i>Opuntia Polyacantha</i>	Prickly Pear Cactus	Economic
CAMPANULACEAE	<i>Campanula rotundifolia</i>	Harebell	UPL, FAC
CAPRIFOLACEAE	<i>Symphoricarpos oreophilus</i>	Mountain snowberry	Nonweedy
CAPPARIDACEAE	<i>Cleome serrulata</i>	Rocky Mountain beeplant	FAC
CELESTRACEAE	<i>Pachystima myrsinites</i>	Myrtle boxleaf	Nonweedy
CHENOPODIACEAE	<i>Atriplex canescens</i>	Fourwing saltbush	Nonweedy
	<i>Chenopodium album</i>	Lamb's quarters	Economic
	<i>C. fremontii</i>	Fremont goosefoot	Nonweedy
	<i>Kochia scoparia</i>	Summer cypress	Economic
	<i>Salsola kali</i>	FAC Russian thistle	

<b>FAMILY</b>	<b>SCIENTIFIC NAME</b>	<b>COMMON NAME</b>	<b>INDICATOR STATUS</b>
COMPOSITAE	<i>Achillea lanulosa</i>	Western yarrow	Economic
	<i>Antennaria parvifolia</i>	Pussytoes	Nonweedy
	<i>Artemisia carruthii</i>	Wormwood	Nonweedy
	<i>A. frigida</i>	Estafiata	Colonizing
	<i>A. ludoviciana</i> var <i>albula</i>	Wormwood	
	<i>Bahia dissecta</i>	Wild Chrysanthemum	Nonweedy
	<i>Brickellia</i> spp.	Bricklebush	Non-weedy FACU
	<i>Chicorium intybus</i>	Chicory	
	<i>Chrysopsis viliosa</i>	Golden Aster	
	<i>Chrysothamnus nauseosus</i>	Chamisa, rabbitbrush	Nonweedy
	<i>Cirsium</i> spp.	Thistle	Economic Nonweedy FAC, FACU & FACW
	<i>Conyza canadensis</i>	Horseweed fleabane	Economic FACU
	<i>Cosmos parviflorus</i>	Cosmos	Nonweedy FAC
	<i>Erigeron divergens</i>	Fleabane Daisy	Nonweedy
	<i>E. flagellaris</i>	Trailing Fleebane	Nonwoody FAC
	<i>E. philadelphicus</i>	Common fleabane	Nonweedy
	<i>Franseria confertifolia</i>	Common ragweed	
	<i>Gaillardia pulchella</i>	Firewheel	
	<i>Grindelia aphanactis</i>	Gumweed	Nonweedy
	<i>Gutierrezia microcephala</i>	Snakeseed	Economic
	<i>G. sarothrae</i>	Snakeweed	Economic
	<i>Haplopappus spinulosus</i>	Spiny goldenaster	
	<i>Helianthus petiolaris</i>	Prairie sunflower	Economic
<i>Hymenopappus filifolius</i>	White ragweed	Nonweedy	
<i>Hymenoxys argentea</i>	Perky sue		

FAMILY	SCIENTIFIC NAME	COMMON NAME	INDICATOR STATUS	
COMPOSITAE	<i>Hymenoxys richardsonii</i>	Bitterweed	Nonweedy	
	<i>Iva xanthifolia</i>	Marsh-elder, clotbur	FACU	
	<i>Lactuca pulchella</i>	Chicory	FACU	
	<i>Lactuca spp.</i>	Prickly	Nonweedy	
			FAC	
		<i>Liatrix punctata</i>	Dotted gayfeather	Nonweedy
		<i>Machaeranthera bigelovii</i>	Bigelow aster	
		<i>Pericome caudata</i>	Taperleaf	Nonweedy
		<i>Senecio douglasii</i>	Thread-leaf groundsel	Nonweedy
		var <i>longilobus</i>		
		<i>S. fendleri</i>	Notchleaf butterweed	Nonweedy
		<i>Solidago spp.</i>	Goldenrod	Nonweedy
				FACU
		<i>Taraxacum officinale</i>	Dandelion	Economic
				FACU
		<i>Thelesperma megapotanicum</i>	Navajo tea	Nonweedy
		<i>Thelesperma trifidum</i>	Greenthread	
		<i>Townsendia eximia</i>	Townsend's aster	Nonweedy
	<i>Tragopogon dubius</i>	Salisfy, Goatsbeard	Economic	
	<i>Viguiera multiflora</i>	Showy goldeneye		
CRUCIFERAE	<i>Arabis. hirsuta</i>	Hairy rockcress	Nonweedy	
			FACU	
		<i>Capsella bursa-pastoris</i>	Shepherd's purse	Economic
				FACU
		<i>Descurainia richardsonii</i>	Tansy mustard	
		subsp. <i>incisa</i>		
		<i>D. spp.</i>	Tansy mustard	Economic
				Nonweedy
		<i>Draba aurea</i>		Nonweedy
				FACW
	<i>Erysium capitatum</i>	Western wallflower		
	<i>Sisymbrium altissimum</i>	Tumble mustard	Economic	
			FAC	

FAMILY	SCIENTIFIC NAME	COMMON NAME	INDICATOR STATUS
CRUCIFERAE	<i>Thelypodium wrightii</i>	Wright's thelypody	Nonweedy
CUPRESSACEAE	<i>Juniperus monosperma</i>	One-Seeded Juniper	Nonweedy
CYPERACEAE	<i>Cyperus esculentus</i>	Yellow nut sedge	Noxious FACW
EUPHORBIACEAE	<i>Croton texensis</i>	Doveweed	Nonweedy
	<i>Euphorbia dentata</i>	Wild poinsetia	Economic
	<i>Euphorbia spp.</i>	spurge	Economic Nonweedy
FABACEAE	<i>Lupinus caudatus</i>	Lupine	Nonweedy
FABACEAE	<i>Melilotus albus</i>	White sweet clover	Colonizing FACU
	<i>M. spp.</i>	Sweet clover	Colonizing FACU
	<i>Petalostemum candidum</i>	White prairie clover	
	<i>Robinia neomexicana</i>	New Mexico locust	Nonweedy
	<i>Thermopsis pinetorum</i>	Pine goldenpea	Nonweedy
	<i>Trifolium repens</i>	White clover	Colonizing FACU
	<i>Vicia americana</i>	American vetch	Nonweedy
FAGACEAE	<i>Quercus gambelii</i>	Gambel oak	Nonweedy
	<i>Q. undulata</i>	Wavyleaf oak	Nonweedy
FUMARIACEAE	<i>Corydalis aurea</i>	Golden smoke	Colonizing
GERANIACEAE	<i>Geranium caespitosum</i>	James geranium	
GRAMINEAE	<i>Agropyron smithii</i>	Western wheatgrass	Nonweedy FACU
	<i>Andropogon scoparius</i>	Little bluestem	Nonweedy
	<i>Aristida fendleriana</i>	Fendlers three-awn	Nonweedy
	<i>Bouteloua curtipendula</i>	Side-oats grama	Nonweedy
	<i>B. gracilis</i>	Blue grama	Nonweedy
	<i>Bromus anomalus</i>	Nodding brome	Nonweedy
	<i>Bromus inermis</i>	Smooth brome	Nonweedy
	<i>B. tectorum</i>	Cheatgrass, downy chess	Economic

FAMILY	SCIENTIFIC NAME	COMMON NAME	INDICATOR STATUS
GRAMINAE	<i>Elymus canadensis</i>	Canada wildrye	Nonweedy FAC
	<i>Festuca octoflora</i>	Six-weeks fescue	Economic Nonweedy FAC, FACW
	<i>Hordeum spp.</i>	Barley	
	<i>Koeleria cristata</i>	Junegrass	Nonweedy
	<i>Melica porteri</i>	Melic grass	Nonweedy
	<i>Muhlenbergia mexicana</i>	Mexican	Nonweedy FACW
	<i>Muhlenbergia montana</i>	Mountain muhly	Nonweedy
	<i>Munroa squarosa</i>	False buffalo grass	Nonweedy
	<i>Oryzopsis hymenoides</i>	Indian ricegrass	Nonweedy FACU
	<i>Panicum capillare</i>	Witchgrass	Economic FAC
	<i>Poa fendleriana</i>	Muttongrass	Nonweedy
	<i>Setaria lutescens</i>	bristle grass	Nonweedy
	<i>Sitanion hystrix</i>	Bottlebrush squirreltail	
	<i>Sporobolus cryptandrus</i>	Sand dropseed FACU	
	<i>Stipa comata</i>	Needle-and-thread grass	Nonweedy
	LABIATAE	<i>Monarda menthaefolia</i>	Beebalm, Horsemint
<i>M. pectinata</i>		Ponymint	
<i>Salvia reflexa</i>		Rocky Mountain sage	Economic
LILIACEAE	<i>Allium cernuum</i>	Nodding onion	Economic
	<i>Smilacina racemosa</i>	False Solomon's seal	Nonweedy FACU
	<i>Yucca angustissima</i>	Narrowleaf yucca	Nonweedy
	<i>Yucca baccata</i>	Banana yucca, datil	Economic

FAMILY	SCIENTIFIC NAME	COMMON NAME	INDICATOR STATUS
LINACEAE	<i>Linum neomexicana</i>	New Mexico yellow flax	
LOASACEAE	<i>Mentzelia pumila</i>	Blazing star	Nonweedy
	<i>Mentzelia sp.</i>	Blazing star	Nonweedy
MALVACEAE	<i>Sphaeralcea coccinea</i>	Red globe mallow	Nonweedy
NYCTAGINACEAE	<i>Mirabilis multiflora</i>	Showy four-o'clock	Nonweedy
	<i>Oxybaphus linearis</i>	Desert four-o'clock	Nonweedy
OLEACEAE	<i>Forestiera neomexicana</i>	New Mexico olive	Nonweedy FACU
ONAGRACEAE	<i>Epilobium spp.</i>	Willow weed	Nonweedy FAC, FACW
	<i>Oenothera albicaulis</i>	Evening primrose	Nonweedy
	<i>O. coronopifolia</i>	Evening primrose	Nonweedy
	<i>O. hookeri</i>	Hooker's primrose	Nonweedy
OXALIDACEAE	<i>Oxalis violacea</i>	Violet wood-sorrel	Nonweedy
PINACEAE	<i>Abies concolor</i>	White fir	Nonweedy
PINACEAE	<i>Pinus edulis</i>	Pinon pine	Nonweedy
	<i>P. ponderosa</i>	Ponderosa pine	Nonweedy FACU
	<i>Pseudotsuga menziesii</i>	Douglas fir	Nonweedy
PLANTAGANACEAE	<i>Plantago major</i>	Rippleseed plantain	Economic FACW
	<i>Plantago purshii</i>	Wooley Indian wheat	Nonweedy FACU
POLEMONIACEAE	<i>I. aggregata</i>	Blue gilia	Nonweedy
	<i>Ipomopsis longiflora</i>	Skyrocket	Nonweedy
	<i>Ipomopsis pumila</i>	Ipomopsis	Nonweedy
POLYGONACEAE	<i>Eriogonum cernuum</i>	Skeleton weed	Nonweedy
	<i>E. jamesii</i>	Antelope sage	Nonweedy
	<i>Polygonum aviculare</i>	Knotweed	Nonweedy FACW
	<i>P. convolvulus</i>	Black bindweed	Economic FACU

FAMILY	SCIENTIFIC NAME	COMMON NAME	INDICATOR STATUS
POLYGONACEAE	<i>Rumex sp.</i>	Dock	Colonizing Economic Nonweedy Noxious FACW, OBL
PORTULACAEAE	<i>Portulaca oleracea</i>	Purslane	Economic FAC
PRIMULACEAE	<i>Androsace septentrionalis</i> var. <i>subulifera</i>	Rock-jasmine	Nonweedy FAC
RANUNCULACEAE	<i>Clematis ligusticifolia</i>	Western virgin's	Nonweedy bower
	<i>Clematis pseudoalpina</i>	FAC Rocky Mountain clematis	
	<i>Pulsatilla ludoviciana</i>	Pasque flower	
	<i>Thalictrum fendleri</i> var. <i>fendleri</i>	Fendler meadowrue	Nonweedy FACU
ROSACEAE	<i>Cercocarpus montanus</i>	Mountain mahogany	Nonweedy
	<i>Fallugia paradoxa</i>	Apache plume	Nonweedy
	<i>Fragaria americana</i>	Wild strawberry	
	<i>F. bracteata</i>	Wood strawberry	
	<i>Holodiscus dumosa</i>	Mountain rock spirea	
	<i>Physocarpus monogynus</i>	Ninebaark	Nonweedy FACU
	<i>Prunus virginiana</i> var. <i>melanocarpa</i>	Western black chokechery	Nonweedy FACU
	<i>Rosa woodsii</i> var. <i>fendleri</i>	Fendler's rose	Nonweedy FACU
	<i>R. spp.</i>	Wild rose	Nonweedy
	<i>Rubus strigosus</i> var. <i>arizonicus</i>	Wild raspberry	FAC

FAMILY	SCIENTIFIC NAME	COMMON NAME	INDICATOR STATUS
RUBIACEAE	<i>Galium aparine</i>	Goosegrass	Nonweedy FACU
	<i>G. asperrimum</i>	Rough-stemmed bedstraw	
RUTACEAE	<i>Ptelea trifoliata</i>	Narrowleaf hoptree	FACU
SALICACEAE	<i>Salix</i> spp.	Willow	Nonweedy FACU, FACW
SAXIFRAGACEAE	<i>Jamesia americana</i>	Cliff bush	Nonweedy FACU
	<i>Ribes cereum</i>	Wax current	Nonweedy
SCROPHULARIACEAE	<i>Castilleja integra</i>	Foothills paintbrush	Nonweedy
	<i>Orthocarpus</i>	Purple-white <i>purpurea-albus</i>	Nonweedy owl-clover
	FACU		
	<i>Penstemon secundiflorus</i>	Beardtongue	Nonweedy
	<i>Penstemon virgatus</i>	Varigated penstemon	Nonweedy FACU
	<i>Verbascum thapsus</i>	Mullein, miner's candle	Economic
SOLANACEAE	<i>Physalis foetans</i> var. <i>neomexicana</i>	Ground cherry	Nonweedy
UMBELLIFERAE	<i>Ozmorhiza obtusa</i>	Bluntseed sweet cicely	
VERBENACEAE	<i>Verbena</i> spp.	Verbena	Nonweedy Economic FAC, FACU
VIOLACEAE	<i>V. pedatifida</i>	Larkspur violet	Nonweedy
VITACIAE	<i>Parthenocissus inserta</i>	Virginia creeper	

Indicator Status Definitions:

FAC = Facultative: Equally likely to occur in wetlands or upland.

FACU: = Faculative upland: Usually occurs in uplands, but occasionally found in uplands.

FACW: = Faculative wetland: Usually occurs in wetlands, but occasionally found in

wetlands.

- OBL: Obligate wetland: Occurs almost always under natural conditions in wetlands.
- UPL: Obligate upland: Occurs in wetlands in another region, but occurs almost always under natural conditions in uplands in the region specified. If a species does not occur in wetlands in any region, it is not on the National List.

**Code list 1991 surveyed plants Operable Units 1129 and 1147**

<b>SCIENTIFIC NAME</b>	<b>CODE</b>	<b>COMMON NAME</b>
<i>Abies concolor</i>	Abco	White Fir
<i>Acer glabrum neomexicanum</i>	Acgl	New Mexico Maple
<i>Acer negundo</i>	Acne	Boxelder
<i>Achillea lanulosa</i>	Acla	Western yarrow
<i>Agropyron smithii</i>	Agsm	Western wheatgrass
<i>Allium cernuum</i>	Alce	Nodding onion
<i>Amaranthus retroflexus</i>	Amre	Green or rough pigweed
<i>Ambrosia confertifolia</i>	Amco	Common ragweed
<i>Andropogon scoparius</i>	Ansc	Little bluestem
<i>Androsace septentrionalis</i> var. <i>subulifera</i>	Anse	Rock jasmine
<i>Antennaria parvifolia</i>	Anpa	Pussytoes
<i>Arabis hirsuta</i>	Arhi	Hairy rockcress
<i>Aristida fendleriana</i>	Arfe	Fendler three-awn
<i>Artemisia carruthii</i>	Arca	Wormwood
<i>Artemisia dracunculoides</i>	Ardr	False tarragon
<i>Artemisia frigida</i>	Arfr	Estafiata, fringed sagebrush
<i>Artemisia ludoviciana</i> var. <i>albula</i>	Arlu	Wormwood
<i>Atriplex canescens</i>	Atca	Four-winged saltbush
<i>Bahia dissecta</i>	Badi	Wild chrysanthemum
<i>Berberis fendleri</i>	Befe	Colorado barberry
<i>Bouteloua gracilis</i>	Bogr	Blue grama
<i>Brickellia</i> spp.	Brix	Brickell bush
<i>Bromus anomalus</i>	Bran	Nodding brome
<i>Bromus inermis</i>	Brin	Smooth brome
<i>Bromus tectorum</i>	Brte	Downy chess
<i>Campanula rotundifolia</i>	Caro	Harebell
<i>Capsella bursa-pastoris</i>	Cabu	Shepherd's purse
<i>Carex esculentus</i>	Caes	Yellow nut sedge
<i>Castilleja integra</i>	Cain	Foothills paintbrush
<i>Cercocarpus montanus</i>	Cemo	Mountain mahogany
<i>Chenopodium album</i>	Chal	Lamb's quarters
<i>Chenopodium fremontii</i>	Chfr	Fremont goosefoot
<i>Chenopodium graveolens</i>	Chgr	Goosefoot
<i>Chrysopsis foliosa</i>	Chfo	Golden aster
<i>Chrysothamnus nauseosus</i>	Chna	Rubber rabbitbrush, chamisa
<i>Cichorium intybus</i>	Chin	Chicory
<i>Cirsium</i> sp.	Cirx	Thistle
<i>Clematis ligusticifolia</i>	Cli	Western virgin's bower
<i>Clematis pseudoalpina</i>	Clps	Rocky Mountain clematis
<i>Cleome serrulata</i>	Clse	Rocky Mountain bee-plant
<i>Conyza canadensis</i>	Coca	Horseweed fleabane
<i>Corydalis aurea</i>	Coau	Golden smoke
<i>Cosmos parviflorus</i>	Copa	Cosmos
<i>Croton texensis</i>	Crte	Doveweed croton
<i>Cryptantha fendleri</i>	Crfe	Fendler hiddenflower
<i>Cryptantha jamesii</i>	Crja	James hiddenflower
<i>Descurainia richardsonii</i> subsp. <i>incisa</i>	Deri	Tansy mustard

SCIENTIFIC NAME	CODE	COMMON NAME
<i>Elymus canadensis</i>	Elca	Canada wildrye
<i>Epilobium spp.</i>	Epix	Willow weed
<i>Erigeron divergens</i>	Erdi	Fleabane daisy
<i>Erigeron flagellaris</i>	Erfl	Trailing fleabane
<i>Erigeron philadelphicus</i>	Erph	Common fleabane
<i>Erigeron spp.</i>	Erix	Daisy
<i>Eriogonum cernuum</i>	Erce	Skeleton weed
<i>Eriogonum jamesii</i>	Erja	Antelope-sage
<i>Eriogonum racemosum</i>	Erra	Wild buckwheat
<i>Erysimum capitatum</i>	Erca	Western wallflower
<i>Euphorbia dentata</i>	Eude	Wild poinsettia
<i>Fallugia paradoxa</i>	Fapa	Apache plume
<i>Festuca octiflora</i>	Feoc	Six-weeks fescue
<i>Forestiera neomexicana</i>	Fone	New Mexico olive
<i>Fragaria americana</i>	Fram	Wild strawberry
<i>Fragaria bracteata</i>	Frbr	Wood strawberry
<i>Gaillardia pulchella</i>	Gapu	Firewheel
<i>Galium aparine</i>	Gaap	Goosegrass
<i>Galium aparimum</i>	Gala	Rough-stemmed goosegrass
<i>Geranium caespitosum</i>	Geca	James geranium
<i>Grendelia aphanactis</i>	Grap	Gumweed
<i>Gutierrezia microcephala</i>	Gumi	Snakeweed
<i>Gutierrezia sarothrae</i>	Gusa	Snakeweed
<i>Haplopappus spinulosus</i>	Hasp	Spiny goldenaster
<i>Helianthus petiolaris</i>	Hepe	Prairie sunflower
<i>Holodiscus dumosa</i>	Hodu	Mountain rock spirea
<i>Hordeum spp.</i>	Horx	Barley
<i>Hymenopappus filifolius</i>	Hyfi	White ragweed
<i>Hymenoxys argentea</i>	Hyar	Perky sue
<i>Hymenoxys richardsonii</i>	Hyri	Bitterweed
<i>Ipomopsis aggregata</i>	Ipag	Skyrocket
<i>Ipomopsis longiflora</i>	Iplo	Blue gilia
<i>Ipomopsis pumila</i>	Ippu	Ipomopsis
<i>Iva xanthifolia</i>	Ivxa	Marsh-elder, clotbur
<i>Jamesia americana</i>	Jaam	Cliff bush
<i>Juniperus monosperma</i>	Jumo	One-seeded juniper
<i>Kochia scoparia</i>	Kosc	Summer cypress
<i>Koeleria cristata</i>	Kocr	Junegrass
<i>Lactuca pulchella</i>	Lapu	Chicory-lettuce
<i>Lappula spp.</i>	Lapx	Stickseed
<i>Liatris punctata</i>	Lipu	Dotted gayfeather
<i>Linum neomexicana</i>	Line	New Mexico yellow flax
<i>Lithospermum multiflorum</i>	Limu	Many-flowered stoneseed, puccoon
<i>Lupinus caudatus</i>	Luca	Lupine
<i>Machaeranthera bigelovii</i>	Mabi	Bigelow aster
<i>Melica porteri</i>	Mepo	Melica grass
<i>Melilotus albus</i>	Meal	White sweet clover
<i>Mentzelia pumila</i>	Mepu	Golden blazing star
<i>Mertensia lanceolata fendleri</i>	Mela	Bluebells

SCIENTIFIC NAME	CODE	COMMON NAME
<i>Mirabilis multifolia</i>	Mimu	Showy four-o'clock
<i>Monarda menthaefolia</i>	Mome	Beebalm horsemint
<i>Muhlenbergia montana</i>	Mumo	Mountain muhly
<i>Muhlenbergia wrightii</i>	Muwr	Spike muhly
<i>Munroa squarosa</i>	Musq	False buffalograss
<i>Oenothera albicaulis</i>	Oeal	Evening primrose
<i>Oenothera coronopifolia</i>	Oeco	Evening primrose
<i>Oenothera hookeri</i>	Oeho	Hooker's primrose
<i>Opuntia polyacantha</i>	Oppo	Prickly pear cactus
<i>Opuntia sp.</i>	Opux	Prickly pear cactus
<i>Orthocarpus purpurea-albus</i>	Orpu	Purple-white owl-clover
<i>Oryzopsis hymenoides</i>	Orhy	Indian ricegrass
<i>Oxybaphus linearis</i>	Oxli	Desert four-o'clock
<i>Osmorhiza obtusa</i>	Ozob	Bluntseed sweet cicely
<i>Pachystima myrsinites</i>	Pamy	Mountain lover
<i>Panicum capillare</i>	Paca	Witchgrass
<i>Parthenocissus inserta</i>	Pain	Virginia creeper
<i>Penstemon secundiflorus</i>	Pese	Beardtongue
<i>Penstemon virgatus</i>	Pevi	Varigated penstemon
<i>Pericome caudata</i>	Peca	Taperleaf
<i>Petalostemum candidum</i>	Petc	White prairie clover
<i>Physalis neomexicana</i>	Phne	Ground cherry
<i>Physocarpus monogynus</i>	Phmo	Ninebark
<i>Prunus virginiana</i>	Prvi	Virginia creeper
var. <i>melanocarpa</i>		
<i>Pinus edulis</i>	Pied	Pinyon pine
<i>Pinus ponderosa</i>	Pipo	Ponderosa pine
<i>Plantago major</i>	Plma	Ripple seed plantain
<i>Plantago purshii</i>	Plpu	Woolly indian wheat
<i>Poa fendleriana</i>	Pofe	Muttongrass
<i>Polygonum aviculare</i>	Poav	Knotweed
<i>Polygonum convolvulus</i>	Poco	Black bindweed
<i>Portulaca oleracea</i>	Pool	Purslane
<i>Ptelea trifoliata</i>	Pptr	Narrowleaf hoptree
var. <i>angustifolia</i>		
<i>Pseudotsuga menziesii</i>	Psme	Douglas fir
<i>Pulsatilla ludoviciana</i>	Pulu	Pasque flower
<i>Quercus gambelii</i>	Quga	Gambel oak
<i>Quercus undulata</i>	Quun	Wavyleaf oak
<i>Rhus radicans</i>	Rhra	Poison ivy
<i>Rhus trilobata</i>	Rhtr	Skukbush sumac
<i>Ribes cereum</i>	Rice	Wax current
<i>Robinia neomexicana</i>	Rone	New Mexico locust
<i>Rosa woodsii</i> var. <i>fendleri</i>	Rowo	Fendler's rose
<i>Rubus strigosus</i>	Rust	Wild red raspberry
var. <i>arizonicua</i>		
<i>Rumex spp.</i>	Rumx	Dock
<i>Salix spp.</i>	Salx	Willow
<i>Salvia reflexa</i>	Sare	Rocky Mountain sage
var. <i>longilobus</i>		
<i>Senecio fendleri</i>	Sefe	Notchleaf groundsel
<i>Setaria lutescens</i>	Selu	Yellow bristle grass

SCIENTIFIC NAME	CODE	COMMON NAME
<i>Solidago spp.</i>	Solx	Goldenrod
<i>Sphaeralcea coccinea</i>	Spco	Red globemallow
<i>Smilacina racemosa</i>	Smra	False Solomon's seal
<i>Sporobolus cryptandrus</i>	Spcr	Sand dropseed
<i>Stipa comata</i>	Stco	Needle-and-thread grass
<i>Symphoricarpos oreophilus</i>	Syor	Mountain snowberry
<i>Taraxacum officinale</i>	Taof	Dandelion
<i>Thalictrum fendleri</i>	Thfe	Fendler meadowrue
<i>var. fendleri</i>		
<i>Thelesperma megapotanicum</i>	Thme	Navajo tea
<i>Thelesperma trifidum</i>	Thtr	Greenthread
<i>Thelypodium wrightii</i>	Thwr	Wright's thelypody
<i>Thermopsis pinetorum</i>	Thpi	Big golden-pea
<i>Trifolium repens</i>	Trpr	White clover
<i>Townsendia eximia</i>	Toex	Townsend's aster
<i>Tragopogon dubius</i>	Trdu	Salisfy, Goatsbeard
<i>Verbascum thapsus</i>	Veth	Mullein
<i>Verbena spp.</i>	Verx	Vervain
<i>Vicia americana</i>	Viam	American vetch
<i>Viguiera multiflora</i>	Vimu	Showy goldeneye
<i>Viola pedatifida</i>	Vipe	Larkspur violet
<i>Yucca anustissima</i>	Yuan	Narrowleaf yucca
<i>Yucca baccata</i>	Yuba	Banana yucca, datil

APPENDIX 2--Animal Species Checklists

**TABLE 1: Probable species of the ants found in Operable Units 1129 and 1147**

<b>SUBFAMILY</b>	<b>SCIENTIFIC NAME</b>	<b>HABITAT TYPE</b>	<b>AUTHORITY</b>
DOLICHODERINAE	<i>Acanthomyops interjectus</i>	PIPO	Mayr
	<i>A. latipes</i>	PIPO Riparian	Walsh
	<i>Brachymyrmex depilis</i>	PIPO Riparian	Emery
	<i>Camponotus laevigatus</i>	PIPO Riparian	F Smith
	<i>C. sansabeanus</i>	P-J, PIPO	Buckley
	<i>C. vicinus</i>	P-J, PIPO	Mayr
	<i>Conomyrma insana</i>	Disturbed	Buckley
	<i>Formica altipetens</i>	Disturbed	Wheeler
	<i>F. argentea</i>	P-J, PIPO, Disturbed	Wheeler
	<i>F. ciliata</i>	P-J, Disturbed	Mayr
	<i>F. densiventris</i>	Piñon-juniper	Viereck
	<i>F. fusca</i>	Piñon-juniper	Linnaeus
	<i>F. hewitti</i>	Ponderosa-grass	Wheeler
	<i>F. lasioides</i>	P-R	Emery
	<i>F. limata</i>	Piñon-juniper	Wheeler
	<i>F. neogagates</i>	Piñon-juniper and disturbed	Emery
	<i>F. obscuripes obscuripes</i>	Piñon-juniper	Forel
	<i>F. obscurivntris clivia</i>	P-R	Creighton
	<i>F. obtusopilosa</i>	Piñon-juniper	Emery
	<i>F. occulta</i>	P-R	Francoeur
	<i>F. planipilis</i>	P-R	Creighton
	<i>F. podzolica</i>	P-R	Francoeur
	<i>F. subnuda</i>	Ponderosa	Emery
	<i>Lasius alienus</i>	Piñon	Foerster
	<i>L. crypticus</i>	P-R	Wilson
	<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. sitiens</i>	Piñon-juniper and ponderosa	Wilson
	<i>L. subumbratus</i>	P-R	Viereck
	<i>Liometopum apiculatum</i>	P-R	Mayr
<i>L. luctuosom</i>	P-R	Wheeler	
<i>Myrmecocystus mexicanus</i>	Piñon-juniper	Wesmael	

<b>SUBFAMILY</b>	<b>SCIENTIFIC NAME</b>	<b>HABITAT TYPE</b>	<b>AUTHORITY</b>
DOLICHODERINAE	<i>Polyergus breviceps</i>	Ponderosa	Emery
	<i>Tapinoma sessile</i>	Pinon-juniper	Mayr
DORYLINAE	<i>Neivamyrmex carolinensis</i>	Bandelier	Emery
	<i>N. nigrescens</i>	Pinon-juniper	Cresson
MYRMICINAE	<i>Crematogaster cerasi</i>	Ponderosa	Fitch
	<i>C. colei</i>	PIPO	
	<i>Leptothorax crassipilis</i>	Disturbed	Cole
	<i>L. muscorum</i>	Disturbed	Wheeler
	<i>L. nitens</i>	Disturbed	Buren
	<i>L. obliquicanthus</i>	Ponderosa	Nylander
	<i>L. texanus texanus</i>	P-R	Wheeler
	<i>L. tricarinatus</i>	P-R	Emery
	<i>Monomorium cyaneum</i>	Piñon-juniper	Wheeler
	<i>M. minimum</i>	Piñon-juniper	Buckley
	<i>Myrmecina americana</i>	P-R	Emery
	<i>Myrmica brevispinosa</i>	Ponderosa	Wheeler
		disturbed, and burned ponderosa	
	<i>Myrmica emeryana</i>	P-R	Forel
	<i>Myrmica hamulata</i>	P-R	Weber
	<i>Pheidole ceres</i>	P-R	Wheeler
	<i>P. sitarches</i>	Disturbed	
	<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	

TABLE 2: Reptiles OU 1129 and OU 1147

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
COLUBRIDAE	<i>Elphae guttata</i>	Corn snake	1
	<i>Masticophis flagellum</i>	Coachwhip	1
	<i>Pituophis melanoleucus</i>	Gopher snake	1
	<i>Thamnophis elegans</i> snake	Western terrestrial garter	1
IGUANIDAE	<i>Crotaphytus collaris</i>	Collared lizard	1
	<i>Phrynosoma douglassi</i>	Short-horned lizard	1
	<i>Sceloporus undulatus</i>	Eastern fence lizard	1
SCINICIDAE	<i>Eumeces multivirartus</i>	Many-lined skink	1
TEIIDAE	<i>Cnemidophorus velox</i>	Plateau stripped whiptail	1
VIPERIDAE	<i>C. viridis viridis</i>	Prairie rattlesnake	1

TABLE 2: Amphibians OU 1129 and OU 1147

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
AMBYSTOMATIDAE	<i>Ambystoma tigrinum</i>	Tiger salamander	1
BUFONIDAE	<i>Bufo punctatus</i>	Red-spotted toad	1
	<i>B. woodhousei</i>	Woodhouse toad	1
PELOBATIDAE	<i>Scaphiopus multiplicatus</i>	Southern spadefoot	1

1=Bogert 78-79

TABLE 3: Birds OU 1129 and OU 1147

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
ACCIPITRIDAE	<i>Accipiter cooperii</i>	Cooper's hawk	Travis
AEGITHALIDAE	<i>Psaltriparus minimus</i>	Bushtit	-
APODIDAE	<i>Aeronautes saxatalis</i>	White-throated swift	Travis
CAPRIMULGIDAE	<i>Chordeiles minor</i>	Common nighthawk	Travis
	<i>Phalaenoptilus nuttallii</i>	Common poorwill	Travis
CARTHARTIDAE	<i>Cathartes aura</i>	Turkey vulture	Travis
CERTHIIDAE	<i>Certhia americana</i>	Brown creeper	-
COLUMBIDAE	<i>Zenaida macroura</i>	Morning dove	Travis
CORVIDAE	<i>Amphelocoma coerulescens</i>	Scrub jay	Travis
	<i>Corvus corax</i>	Common raven	-
	<i>Cyanocitta stelleri</i>	Steller's jay	Travis
EMBERIZIDAE	<i>Agelaius phoeniceus</i>	Red-winged blackbird	-
	<i>Chodestes grammacus</i>	Lark sparrow	-
	<i>Dendroica coronata</i>	Yellow-rumped warbler	-
	<i>D. gracial</i>	Grace's warbler	Travis
	<i>D. nigrescens</i>	Black-throated gray warbler	-
	<i>Euphagus cyanocephalus</i>	Brewer's blackbird	-
	<i>Icterus galbula bullockii</i>	Northern oriole	-
	<i>Junco hyemalis</i>	Dark-eyed junco	-
	<i>Melospiza melodia</i>	Song sparrow	-
	<i>Molothrus aster</i>	Brown-headed cowbird	Travis
	<i>Oporonis tolmei</i>	Macgillivray's warbler	-
	<i>Passerina amoena</i>	Lazuli bunting	-
	<i>Pheucticus melanocephalus</i>	Black-headed grosbeak	Travis
	<i>Pipilo chlorurus</i>	Green-tailed towhee	Travis
	<i>P. erythrophthalmus</i>	Rufous-sided towhee	Travis
	<i>P. fuscus</i>	Canyon towhee	-
	<i>P. ludoviciana</i>	Western tanager	-
EMBERIZIDAE	<i>Spizella passerina</i>	Chipping sparrow	Travis
	<i>Vermivora celata</i>	Orange-crowned warbler	-
	<i>Vermivora virginiae</i>	Virginia's warbler	Travis
FALCONIDAE	<i>Falco sparverius</i>	American kestrel	Travis

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
FRINGILLIDAE	<i>Carduelis pinus</i>	Pine siskin	-
	<i>Carpodacus cassinii</i>	Cassin's finch	-
	<i>C. mexicanus</i>	House finch	-
	<i>C. psaltria</i>	Lesser goldfinch	Travis
	<i>Coccythraustes vespertinus</i>	Evening grosbeak	-
	<i>Loxia curvirostra</i>	Red crossbill	Travis
	HIRUNDINIDAE	<i>Tachycineta thalassina</i>	Violet-green swallow
MUSCICAPIDAE	<i>Catharus guttatus</i>	Hermit thrush	Travis
	<i>Myadestes townsendii</i>	Townsend's solitaire	-
	<i>Polioptila caerulea</i>	Blue-grey gnatcatcher	Travis
	<i>S. mexicana</i>	Western bluebird	Travis
PARIDAE	<i>Turdus migratorius</i>	American robin	Travis
	<i>Parus gambeli</i>	Mountain chickadee	Travis
	<i>P. inornatus</i>	Plain titmouse	Travis
PASSERIDAE	<i>Passer domesticus</i>	House sparrow	-
PICIDAE	<i>Colaptes auratus</i>	Northern flicker	Travis
	<i>Melanerpes formicivorus</i>	Acorn woodpecker	Travis
	<i>Picoides villosus</i>	Hairy woodpecker	Travis
SITTIDAE	<i>Sitta carolinensis</i>	White-breasted nuthatch	Travis
	<i>S. pygmaea</i>	Pygmy nuthatch	Travis
TROCHILIDAE	<i>Selasphorus platycercus</i>	Broad-tailed hummingbird	Travis
TROGLODYTIDAE	<i>Catherpes mexicanus</i>	Canyon wren	Travis
	<i>Salpinctes obsoletus</i>	Rock wren	Travis
	<i>Throamanes bewickii</i>	Bewick's wren	Travis
	<i>E. wrightii</i>	Gray flycatcher	-
TYRANNIDAE	<i>Myiarchus cinerascens</i>	Ash-throated flycatcher	Travis
	<i>Sayornis nigricans</i>	Black phoebe	-
	<i>S. saya</i>	Say's Phoebe	Travis
	<i>Tyrannus vociferans</i>	Cassin's kingbird	Travis
TYTONIDAE	<i>Buteo virginianus</i>	Great horned owl	Travis
VIREONIDAE	<i>Vireo gilvus</i>	Warbling vireo	Travis
	<i>V. solitarius</i>	Solitary vireo	Travis

Travis=Travis 1992

TABLE 4: Mammals OU 1129 and OU 1147

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
CANIDAE	<i>Canis latrans</i>	Coyote	3
	<i>Vulpus vulpus</i>	Red fox	3
CERVIDAE	<i>Cervus elaphus</i>	Elk	3
	<i>Odocoileus hemionus</i>	Mule deer	3
CRICETIDAE	<i>Neotoma mexicana</i>	Mexican woodrat	2,3
	<i>Peromyscus boylii</i>	Brush mouse	1,2
	<i>P. maniculatus</i>	Deer mouse	1,2
	<i>P. trueii</i>	Pinon mouse	2,3
	<i>Reithrodontomys megalotis</i>	Western harvest mouse	2,1
ERETHIZONTIDAE	<i>Erethizon dorsatum</i>	Porcupine	3
FELIDAE	<i>Felis concolor</i>	Mountain Lion	3
	<i>Lynx rufus</i>	Bobcat	3
LEPORIDAE	<i>Sylvilagus audubonii</i>	Desert cottontail	3
MUSTELIDAE	<i>Mustela frenata</i>	Long-tailed weasel	3
	<i>Taxidea taxus</i>	Badger	3
SCIURIDAE	<i>Eutamias minimus</i>	Least chipmunk	2,3
	<i>E. quadrivittatus</i>	Colorado chipmunk	2
	<i>Sciurus aberti</i>	Abert's squirrel	2,1
URSIDAE	<i>Ursus americanus</i>	Black bear	3

1=Kent 1981

2=Miera and Hakonson 1974

3=Probable, or observed

APPENDIX 3--Listing of TES Species from Database

T & E Species for Operable Units 1129 and 1147

SCIENTIFIC NAME	COMMON NAME	STATUS	HABITAT	POTENTIAL FOR OCCURRENCE
<b>ANIMALS</b>				
<i>Accipiter gentilis</i>	Northern goshawk	FC	Ponderosa; dense, mature or old growth coniferous forest	None
<i>Buteogallus anthracinus</i>	Common black hawk	SE	Riparian with cottonwood	None
<i>Cynanthus latirostris</i>	Broad-billed hummingbird	SE	Riparian woodlands	Low
<i>Empidonax trailii</i>	Willow flycatcher	FC	Riparian with cottonwood	None
<i>Euderma maculatum</i>	Spotted bat	SE FC	Ponderosa, pinon-juniper, cliffs and rock crevices	Low
<i>Falco peregrinus</i>	Peregrine falcon	FE SE	Ponderosa-pinon, streams and lakes	Low
<i>Haliaeetus leucocephalus</i>	Bald eagle	FE	Riparian near streams and lakes	Low
<i>Ictinia mississippiensis</i>	Mississippi kite	SE	Riparian and shelterbelts	None
<i>Strix occidentalis lucida</i>	Mexican spotted owl	FC SE	Mixed conifer; mountains and canyons; uneven-aged, multi-storied forest w/closed canopy	None
<b>PLANTS</b>				
<i>Abronia bigelovii</i>	Tufted sand verbena	FC SS	Pinon-juniper, restricted to Todilto gypsum	None
<i>Aletes sessiliflorus</i>	Sessile-flowered false carrot	SS	Pinon-juniper, 6500-8100 ft, rocky canyons and slopes, in basaltic and sandstone areas	None
<i>Astragalus cyaneus</i>	Cyanic milk vetch	SS	Pinon-juniper, 5500-6500 ft, sandy, gravelly hillsides adjacent to the Rio Grande	Low

<i>Astragalus feensis</i>	Santa Fe milk vetch	SS	Pinon-juniper, 5000-6500 ft, dry slopes	Low
<i>Astragalus mollissimus</i>	Mathew's wooly milk vetch	SS	Pinon-juniper, 5000-6000 ft, open slopes and ridges, sometimes in canyons	Low
<i>Astragalus puniceus</i>	Taos milk vetch	SS	Pinon-juniper, open loose soil	Low
<i>Fritillaria atropurpurea</i>	Checker lily	SS	Mixed conifer	Moderate
<i>Heuchera pulchella</i>	Sandia alumroot	SS	Mixed conifer, 8000-12000 ft, cliffs	None
<i>Lilium philadelphicum</i> var. <i>andium</i>	Wood lily	SE	Ponderosa to mixed conifer, 6000-10000 ft	Moderate
<i>Mammillaria wrightii</i>	Wright fishhook cactus	FC SE	Desert grassland to pinon- juniper, 3000-7000 ft, gravel- ly, sandy hills or plains	Low
<i>Opuntia viridiflora</i>	Santa Fe cholla	FC SE	Pinon-juniper, 7200- 8000 ft	Low
<i>Phlox caryophylla</i>	Pagosa phlox	SS	Ponderosa-pinon, 6500-7500 ft crevices and pockets in protected cliff faces of igneous rock	None
<i>Tetradymia filifolia</i>	Threadleaf horsebrush	SS	Pinon-juniper, 6000-7000 ft, limestone or highly gypseous soils	None
<i>Toumeyia papyracantha</i>	Gramma grass cactus	FC SE	Pinon-juniper, 5000-7300 ft, sandy, basalt outcrops	Moderate

**STATUS:**

- SS: **State Sensitive:** New Mexico listed species which are considered rare because of restricted distribution or low numerical density; they are sensitive to long-term or cumulative land use impacts and are vulnerable to biological or climatic events.
- SE: **State Endangered:** ". . . any species or subspecies whose prospects of survival or recruitment in New Mexico are (or) . . . are likely to be [within the foreseeable future] in jeopardy (NMDGF, State Game Commission, Reg. No. 682, 1990)."
- FC: **Federal Candidate -** ". . . (Any species) for which the USFWS has on file enough substantial information on biological vulnerability and threat, (or) for which other information now in the possession of the

USFWS indicates that proposing to list them as threatened or endangered is possibly appropriate . . . " (Federal Register Vol. 56, No. 255).  
FE: Federal Endangered - " . . . Any species that is in danger of extinction throughout all or a significant portion of its range (Federal Register/Vol. 56, No. 255)."

**POTENTIAL FOR OCCURRENCE:**

Not Determined: Potential for occurrence based on habitat requirements but unable to determine presence or absence due to seasonal occurrence or flowering period.

None: Suitable habitat for species does not exist within or near operable unit.

Low: Potential for occurrence due to habitat requirements but not found during field survey or not known to occur in general project area.

Moderate: Known to occur in similar habitat to project area or general area of operable unit.

High: Species observed during field survey or known populations exist near operable unit.

**APPENDIX 4--Biotic Community Classification**

## **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. The types are as follows:

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

**Climatic Zone:** Refers to one of the four world climatic zones; minimum temperature is the primary determining factor. The zones include Arctic-Boreal, Cold Temperate, Warm Temperate and Tropical-Subtropical.

**Biotic Community:** Refers to a unit characterized by a distinct evolutionary history within a formation and is 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. The series is based on distinct climax plant dominants.

**Habitat Type:** Determination of types is based on the occurrence of a particular dominant species that is local or regional in distribution.

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

APPENDIX 5--Summary of Vegetation Transect by Species

**Percent Cover, Average Basal Diameter, Density, Frequency and Importance Index of Tree Canopy, Mesatop, TA-5**

Species	Transect			Avg
	1	2	3	
<b>Colorado Pinon</b>				
% Cover	20.7	25.0	22.0	22.6
Basal Diameter	7.5	4.3	5.9	5.9
Trees/Acre	150.0	147.6	81.0	126.2
Frequency	88.0	92.0	75.0	85.0
Importance Index	58.2	51.5	58.6	56.1
<b>One-seed Juniper</b>				
% Cover	14.3	18.0	14.4	15.6
Basal Diameter	8.5	5.9	19.7	11.4
Trees/Acre	92.9	171.4	42.9	102.4
% Frequency	75.0	92.1	75.0	80.7
Importance Index	41.8	48.5	41.4	43.9

**Percent Cover, Density, Frquency and Importance Index of Shrub Canopy, Mesatop, TA-52**

Species	Transect			Avg
	1	2	3	
<b>Mountain Mahogany</b>				
% Cover	3.3	4.3	4.6	4.1
Stems/Acre	714.3	371.4	728.6	604.8
% Frequency	50.0	50.0	67.0	55.7
Importance Index	35.1	41.8	37.4	38.1
<b>Wavyleaf oak</b>				
% Cover	8.3	0.0	13.1	7.1
Stems/Acre	632.1	0.0	1142.9	591.7
Frequency	63.0	0.0	75.0	46.0
Importance Index	45.7	0.0	62.6	36.1
<b>Gambel's Oak</b>				
% Cover	0.0	3.8	0.0	1.3
Stems/Acre	0.0	285.7	0.0	95.2
% Frequency	0.0	75.0	0.0	75.0
Importance Index	0.0	40.7	0.0	13.6

**Percent Cover, Average Basal Diameter, Density, Frequency and Importance Index of Tree Canopy, Canyon Rim and North-facing Slope, TA-52**

Species	Canyon Rim	North-facing Slope		Avg
	1	1	2	
<b>Douglas Fir</b>				
% Cover	7.6	39.8	41.2	29.5
Basal Diameter	3.8	3.7	4.6	4.0
Trees/Acre	87.1	359.4	468.3	304.9
Frequency	71.0	100.0	25.0	65.3
Importance Index	55.0	73.6	63.3	64.0
<b>Ponderosa Pine</b>				
% Cover	7.9	20.4	24.4	17.6
Basal Diameter	6.4	3.0	6.1	5.2
Trees/Acre	38.1	32.7	87.1	52.6
Frequency	50.0	58.0	33.0	47.0
Importance Index	37.8	26.4	36.7	33.6

**Percent Cover, Density, Frequency and Importance Index of Shrub Canopy, Canyon Rim and North-facing Slope, TA-52**

Species	Canyon Rim	North-facing Slope		Avg
	1	1	2	
<b>Gambel's Oak</b>				
% Cover	8.6	28.5	9.3	15.5
Stems/Acre	1442.9	4682.7	1372.1	2499.2
Frequency	58.0	100.0	100.0	86.0
Importance Index	48.5	83.5	69.4	67.1
<b>Mountain Mahogany</b>				
% Cover	1.2	0.0	0.0	0.4
Stems/Acre	2695.3	54.4	119.8	956.5
Frequency	37.8	8.0	25.0	23.6
Importance Index	36.8	2.3	5.4	14.8
<b>Colorado Barberry</b>				
% Cover	0.0	0.0	0.4	0.1
Stems/Acre	0.0	686.1	740.5	475.5
Frequency	0.0	8.0	100.0	16.7
Importance Index	0.0	5.9	19.1	8.3
<b>Wavyleaf Oak</b>				
% Cover	1.7	0.0	0.0	0.6
Stems/Acre	201.5	0.0	0.0	67.4
Frequency	25.0	0.0	0.0	8.3
Importance Index	12.0	0.0	0.0	4.0

**Percent Cover, Average Basal Diameter, Density, Frequency and Importance Index of Tree Canopy, Canyon Bottom, TA-52**

Species	Transect			Avg
	1	2	3	
<b>Ponderosa Pine</b>				
% Cover	32.1	26.3	24.4	27.6
Basal Diameter	5.8	4.3	3.0	4.6
Trees/Acre	87.1	76.2	76.2	79.8
Frequency	33.3	100.0	33.3	55.5
Importance Index	81.2	100.0	100.0	93.7
<b>Russian Olive</b>				
% Cover	34.8	5.2	0.0	13.3
Stems/Acre	283.1	32.6	0.0	105.2
Frequency	100.0	8.0	0.0	36.0
Importance Index	37.0	36.4	0.0	24.5
<b>Douglas Fir</b>				
% Cover	6.2	0.0	0.0	2.1
Basal Diameter	19.2	0.0	0.0	6.4
Trees/Acre	21.8	0.0	0.0	7.3
Frequency	8.0	0.0	0.0	2.7
Importance Index	12.2	0.0	0.0	4.1

**Percent Cover, Density, Frquency and Importance Index of Shrub Canopy, Canyon Bottom, TA-52**

Species	Transect			Avg
	1	2	3	
<b>Salix (willow) sp.</b>				
% Cover	7.2	0.0	20.7	9.3
Stems/Acre	740.5	0.0	1589.9	776.8
Frequency	50.0	0.0	25.0	25.0
Importance Index	23.8	0.0	64.5	29.4
<b>Gambel's Oak</b>				
% Cover	11.6	1.2	0.0	4.3
Stems/Acre	163.4	108.9	359.4	119.8
Frequency	50.0	17.0	25.0	30.7
Importance Index	15.4	29.3	14.1	19.6
<b>Mountain Mahogany</b>				
% Cover	0.9	0.0	0.2	0.4
Stems/Acre	479.2	0.0	381.2	286.8
Frequency	75.0	0.0	25.0	33.3
Importance Index	17.4	0.0	14.7	10.7
<b>Wavyleaf Oak</b>				
% Cover	0.0	0.0	0.0	0.0
Stems/Acre	32.7	0.0	0.0	10.9
Frequency	25.0	0.0	0.0	8.3
Importance Index	3.2	0.0	0.0	1.1