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RADIOACTIVE LIQUID WASTE TREATMENT FACILITY

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ROUGH DRAFT

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ABSTRACT

This document is intended to act as a baseline source material for risk assessments which can be used in Environmental Assessments and Environmental Impact Statements. The current Radioactive Liquid Waste Treatment Facility (RLWTF) does not meet current General Design Criteria for Non-reactor Nuclear Facilities and could be shut down affecting several DOE programs. This Biological Information Document summarizes various biological studies that have been conducted in the vicinity of new Proposed RLWTF site and an Alternative site. The Proposed site is located on Mesita del Buey, a mesa top, and the Alternative site is located in Mortandad Canyon. The Proposed Site is devoid of overstory species due to previous disturbance and is dominated by a mixture of grasses, forbs, and scattered low-growing shrubs. Vegetation immediately adjacent to the site is a pinyon-juniper woodland. The Mortandad canyon bottom overstory is dominated by ponderosa pine, willow, and rush. The south-facing slope was dominated by ponderosa pine. mountain mohagany, oak, and muhly. The north-facing slope is dominated by Douglas fir, ponderosa pine, and oak. Studies on wildlife species are limited in the vicinity of the proposed project and further studies will be necessary to accurately identify wildlife populations and to what extent they utilize the project area. Some information is provided on invertebrates, amphibians and reptiles, and small mammals. Additional species information from other nearby locations is discussed in detail. Habitat requirements exist in the project area for one federally threatened wildlife species, the peregrine falcon, and one federal candidate species, the spotted bat. However, based on surveys outside of the project area but in similar habitats, these species are not expected to occur in either the Proposed or Alternative RLWTF sites. Habitat Evaluation Procedures were used to evaluate habitat rarity in the project area and information on plant species value to wildlife was used to evaluate ecological functioning in the project area. Addional information is provided on species diversity and biotic productivity at each of the sites. Currently, vegetative data collected is sufficient to adequately characterize the Proposed and Alternative sites but additional studies will be necessary to characterize the mesa top adjacent to the south-facing slope of the Alternative site. Due to an existing water source within Mortandad Canyon and within the Alternative site boundaries, various wildlife species may be utilizing this area extensively as a water source which will need to be determined. It may also be necessary to conduct studies as part of developing predictive models identifying future potential impacts (including cumulative) the proposed project will have on the general biotic community as well as certain target species of wildlife and plants. It will also be necessary to set up control sites and conduct similar studies comparing the control site to the project area to determine if differences in the biotic communties exist.

1.0 INTRODUCTION

The following document has been prepared as per U.S. Department of Energy (DOE) regulations concerning the National Environmental Policy Act (NEPA). Los Alamos National Laboratory (LANL) has been instructed to develop NEPA documents, including baseline sources, prior to undertaking Environmental Impact Statements (EIS). To help meet these regulations, this document (to be referred to as a Biological Information Document -BID) is intended to act as a baseline source material for risk assessments which can be used in Environmental Assessments and EIS's. This BID will be included within an Environmental Information Document (EID) which will contain information on the sites history and physical setting, environmental resources that could be affected, environmental impacts, health risks, ecological assessments, and evaluation methodologies.

The current Radioactive Liquid Waste Treatment Facility (RLWTF) began operation in 1963. It receives liquid waste containing radioactive constituents and removes contaminants such as americium (Am), strontium (Sr), cesium (Cs), and uranium (U). It also pretreats some liquid wastes that contain high amounts of radionuclides. The plant does not meet current General Design Criteria for Non-reactor Nuclear Facilities and does not meet proposed effluent standards for chemical and radioactive constituents that are regulated by the National Pollutant Discharge Elimination System (NPDES) permit requirements (Gonzales and Selvage 1994). The facility could be shut down and may not be reopened. If the palnt is shut down, several DOE programs at LANL may cease operations. To avoid an interruption in operations, construction of a new facility is planned. The proposed project includes construction and operation of a new RLWTF at TA-63 and a pretreatment facility (approximately 13,000 sq ft) at TA-50, both are located on Mesita del Buey. Currently, there are five alternatives to the proposed action:

1. No action.
2. Upgrade/refurbish existing plant.

3. Privatization.
4. Transport waste off-site.
5. Alternative site.

The Proposed site is located on the mesa top and the Alternative site is located within Mortandad Canyon. This BID summarizes, in detail, various biological studies that have been conducted in the vicinity of the Proposed and Alternative RLWTF sites. Many of these studies have been conducted outside of the project area but in similar habitats therefore allowing for some comparisons. In cases where information has not been gathered in the project site or in similar habitats, it is indicated by stating that no information is available. Both a regional and site description of the biota are given under Section 2, Environmental Setting. The site description is a summary of the information provided in Section 3, Habitat Characterization. The Habitat Characterization section is a compilation of detailed studies and surveys in or near the project area. The fourth section of this document identifies threatened, endangered, and sensitive plant and animal species potentially occurring in the project area. The Biological Importance/Values Section (5.0) attempts to evaluate the rarity, diversity, function, etc. of the biotic components of the project area based on existing data.

2 ENVIRONMENTAL SETTING

2.1 Regional Description

2.1.1 Plants

New Mexico, located in a semiarid environment, is characterized by plant communities ranging from Chihuahuan desertscrub to alpine tundra (Brown 1982). Los Alamos National Laboratory is located in north-central New Mexico. This region of the state consists of a variety of vegetative complexes that are dictated by wide range of elevational zones. Two climatic zones consisting of three plant communities are found in the upland (nonriparian) mountainous areas and include the Rocky Mountain Subalpine Conifer Forest and Woodland, the Rocky Mountain

Montane Conifer Forest, and the Great Basin Conifer Woodland (Brown 1982). There are also two grassland climatic zones that contain at least three different upland communities found at the lower elevations of the region. These include the Plains Grassland, the Great Basin Shrub Grassland, and the Rocky Mountain Montane Grassland.

In addition to the upland communities, there are numerous wetland (riparian) plant communities that occur in association with most of the previously mentioned uplands. Due to the large number of wetland communties, a more general description of the climatic zones in which these communities are located, is given. These wetland communities are located within five different climatic zones and include the Cold Temperate Swamp and Riparian Forest, the Arctic-Boreal Swamp-Scrub, the Arctic-Boreal Marshland, the Arctic-Boreal Strand (streams, lakes), and the Cold Temperate Strand (streams, lakes).

Table 1 lists climatic zones and communities found in north-central New Mexico with typical plant species of each.

Many of the plant communities listed in Table 1 for north-central New Mexico are found in Los Alamos County or relatively close to the County borders (more generally, the east slope of the Jemez Mountains and the Pajarito Plateau, which extends eastward off the Jemez Mountains). The Rio Grande floodplain contains the lowest elevations in or near Los Alamos County and is characterized by a Plains and Great Basin Riparian-Deciduous Forest with cottonwood and willow within its boundaries. Nonnative species, salt cedar and Russian olive, are also present. Once out of the floodplain, juniper becomes a typical upland overstory species at elevations ranging from about 5600-6200 ft, intermixed with lesser amounts of pinyon pine, both species typical of the Great Basin Conifer Woodland. Pinyon pine and juniper are common at higher elevations (6200-6900 ft) and occur on much of the mesa tops. This woodland community eventually intergrades into the more common plant communities of the western portion of Los Alamos County where overstory species of the Rocky Mountain Montane Conifer Forest are found. Ponderosa pine is a common species at about 6900-7500 ft on the higher mesa tops and along many of the north-facing canyon slopes. Species of fir can be found along the higher north-facing slopes intermixing with

Table 1. Climatic Zones and Communities of North-Central New Mexico.

Climatic Zone	Community	Typical Plant Species[1]
UPLAND		
Boreal Forests and Woodlands	Rocky Mountain Subalpine Conifer Forest and Woodland	Englemann spruce Corkbark fir
Cold Temperate Forests and Woodlands	Rocky Mountain Montane Conifer-Forest	Colorado spruce White fir Douglas fir Gambel oak Ponderosa pine
	Great Basin Conifer-Woodland	Pinyon pine One-seed juniper Gambel oak
Arctic-Boreal Grassland	Rocky Mountain Alpine and Subalpine Grassland	Sedge-Forb mixture
Cold Temperate Grassland	Plains Grassland Community	Blue grama Western wheatgrass Galleta
	Great Basin Shrub Grassland	Wheatgrass Galleta Sagebrush Saltbush
	Rocky Mountain Montane Grassland	Thurber fescue Arizona fescue Mountain muhly Sedge
WETLAND		
Cold Temperate Swamp and Riparian Forest	Plains and Great Basin Riparian-Deciduous Forest	Fremont cottonwood Willow
	Rocky Mountain Riparian-Deciduous Forest	Narrowleaf cottonwood Willow Box elder
Arctic-Boreal Swamp-Scrub	Rocky Mountain Alpine and Subalpine Swamp and Riparian-Scrub	Narrowleaf alder Sand bar willow Scouler willow
	Plains and Great Basin Riparian-Scrub	Willow Salt cedar
Arctic-Boreal Marshland	Rocky Mountain Alpine and Subalpine Marshland	Rush

	Plains Interior Marshland	Cattail Bulrush
	Rocky Mountain Montane Marshland	Rush
Arctic-Boreal Strand	Rocky Mountain Alpine and Subalpine Stream and Lake Strand	
Cold Temperate Strand	Rocky Mountain Montane Stream and Lake Strand	

1 Plant species listed are intended for general interpretation only and may not be present in all locations where these communities occur.

ponderosa pine and is often referred to a mixed-conifer community. Species of the Rocky Mountain Subalpine Conifer Forest and Woodland occur along the extreme western edge of the county and are more prevalent at the higher elevations of the nearby Jemez Mountains.

Most of the canyons in and adjacent to Los Alamos County are ephermeral (flowing during periods of precipitation) and are therefore not considered wetlands. However, permanent flow from springs and Laboratory facilities result in a small number of permanent or near-permanent stream flows along or within short stretches of certain canyons. Many of these streams and other wetands are characterized by vegetation of the Rocky Mountain Riparian Deciduous Forest and the Plains Interior Marshland.

A general vegetation map of north-central New Mexico is shown in Figure 1 and a more complete checklist of plant species found within the plant communities of Los Alamos County and its borders are given in Foxx 1985.

2.1.2 Wildlife

The wide range of plant communities contain an equally wide range of micro and macro-habitats in the Los Alamos County area. This diversity of habitats results in a relatively large diversity of wildlife species, including both invertebrates and vertebrates with a variety of species interactions. Table 2 gives an example of a possible food web that includes several layers of plant

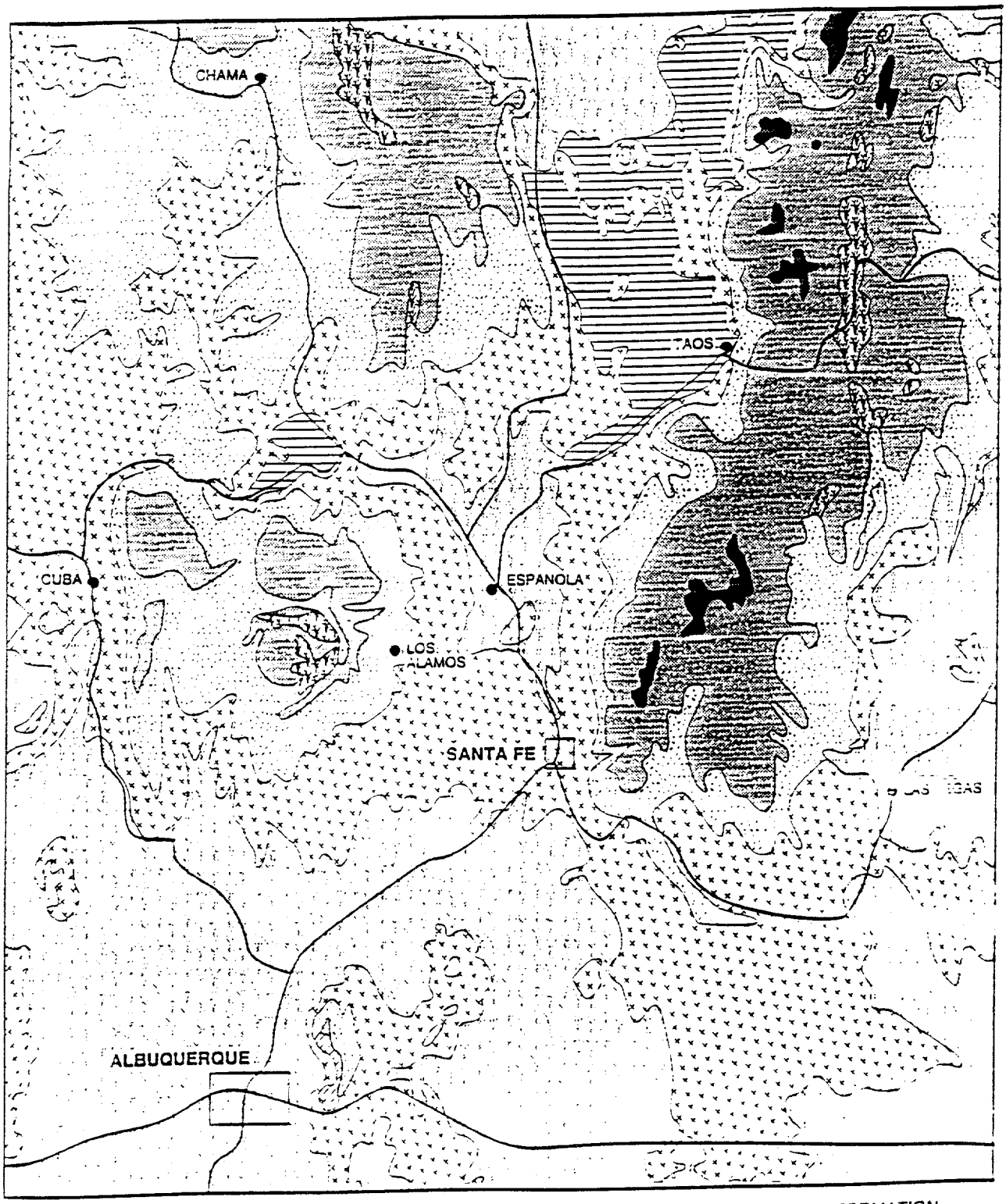

CHAMA
TAOS
CUBA
ESPANOLA
LOS ALAMOS
SANTA FE
ALBUQUERQUE
TUNDRA FORMATION
Alpine tundra
FOREST FORMATION
Petran Subalpine Conifer Forest
Petran Montane Conifer Forest
WOODLAND FORMATION
Great Basin Conifer Woodland
SCRUB FORMATION
Great Basin Montane Scrub
GRASSLAND FORMATION
Subalpine Grassland
Plains and Great Basin Grassland
DESERTSCRUB FORMATION
Great Basin Desertscrub

Figure 1

and animal species in the area. This is intended as a general interpretation only and is not intended as a complete and accurate representation.

Table 2. A Possible General Food Web of the Common Biological Resources of the Los Alamos County Region (Taken from DOE, 1979).

Group	Juniper-Grassland	Pinyon-Juniper	Riparian Canyons	Ponderosa Pine	Mixed Conifer
Producers	Juniper	Pinyon pine	Cottonwood	Ponderosa pine	Douglas fir
	Saltbush	Juniper	Currant	Gambel oak	Ponderosa pine
	Ponderosa pine	Rabbitbrush	Hoptree	Skunkbush	Aspen
	Prickly pear	Apache plume	Box elder	Mountain muhly	White fir
	Feathergrass	Mountain mohagany	Sedge		
	Dropseed	Blue grama	Bluegrass		
	Three-awn		Little bluestem		
Consumers	Deer mouse	Deer mouse	Harvest mouse	Deer mouse	Pocket gopher
	Pinyon mouse	Pinyon mouse	Meadow vole	Chipmunk	Montane vole
	Cottontail	Cottontail	Cottontail	Squirrel	Chipmunk
	Woodrat	Woodrat	Chipmunk	Woodrat	Woodrat
		Mule deer	Mule deer	Mule deer	Mule deer
			Elk	Elk	Elk
					Bluebird
					Junco
Secondary Consumers	Coyote	Coyote	Coyote	Mountain lion	Mountain lion
	Gray fox	Gray fox	Racoon	Black bear	Black bear
	Bobcat	Bobcat	Bobcat	Bobcat	Green-tailed towhee
	Scrub jay	Steller's jay	Steller's jay	Pygmy nuthatch	Clark's nutcracker
	Pinyon jay	Pinyon jay	Common raven	Common flicker	Hairy woodpecker
	Rattlesnake	Spiny lizard	Kestrel	Pygmy nuthatch	
			Golden eagle	Common raven	
			Gopher snake		

2.1.2.1 Invertebrates

Surveys for terrestrial and aquatic invertebrates have been conducted on Laboratory property and Bandelier National Monument. However, the results from these surveys are restricted to localized areas and are limited in regional application. Information discussed below includes the most recent studies/surveys conducted at the Laboratory. In addition, an extensive study has been conducted at Bandelier National Monument with some of the results discussed here. Genera and

species are not presented due to many of the recent collection identifications not yet being confirmed.

Terrestrial

Four species of terrestrial mollusks have been identified in the Laboratory within canyons near the Rio Grande. To date, there have been at least 57 different families of terrestrial insects identified on the Laboratory and it is expected that additional families will be identified for the Laboratory. Genera and species identifications have not yet been confirmed for these families.

Aquatic

Based on a limited number of surveys, there have been three species of aquatic mollusks identified at the Laboratory. Further surveys are expected to yield additional species.

Few studies on aquatic invertebrates have been conducted in Los Alamos County. Currently, a study is underway to collect and identify aquatic insects within and adjacent to the Laboratory. To date there have been 33 families collected in the county.

2.1.2.2 Vertebrates

Fish

There have been no fish found on Laboratory property. However, there have been fish observed in Guaje Reservoir and below Guaje Reservoir, Los Alamos Canyon Reservoir, and at the confluence of White Rock Canyon and the Rio Grande below Ancho Springs.

Reptiles and Amphibians

A variety of reptiles are common throughout much of the county and include at least 14 species of skinks, lizards, and snakes. The presence of wetlands adds additional habitat for water-associated species. At least seven species of amphibians are found in the county.

Mammals

At least 29 species of small mammals (i.e., mice, woodrats, voles, squirrels, chipmunks) occur in the area, some of which are specific to certain elevational gradients. Deer mice, woodrats, and least chipmunks inhabitat most areas of the region. Pinyon mice are found primarily in pinyon-juniper woodlands, the red-backed vole in the higher elevations, and the western harvest mouse and long-tailed voles are found in the more moist canyon bottoms. Shrews are found associated with flowing water. Another group of small mammals, bats, are present within the laboratory boundaries as well, and consist of at least 13 different species.

Mule deer and elk are the most well-known of the larger mammals of the region, although their populations and distributions are constantly changing. These species generally winter in the lower elevations of the Pajarito Plateau, including many of the mesas and canyons along the central and eastern portions of the county and surrounding areas, and spend their summers at the higher elevations of the Jemez Mountains. However, recent surveys in the Los Alamos County area indicate growing population numbers of these species residing year-round at lower elevations. Figure 2 shows general distribution patterns of elk.

Little is known on other large and medium size mammals of the area, but based on observations and current studies, at least 12 species of carnivores are present. These include bear, mountain lion, bobcat, fox, and coyote, in addition to a number of other species.

Birds

Birds are the most diverse group of wildlife found in the area, which is in part, due to the wide range of habitats. These include a variety of nesting and migrating raptors that occupy some of the less disturbed areas and the steeper canyon walls. There are over 200 bird species reported in the county which includes at least 112 species of breeding birds (Travis 1992). Of the breeding birds, at least 39 are resident species and 59 migratory summer residents.

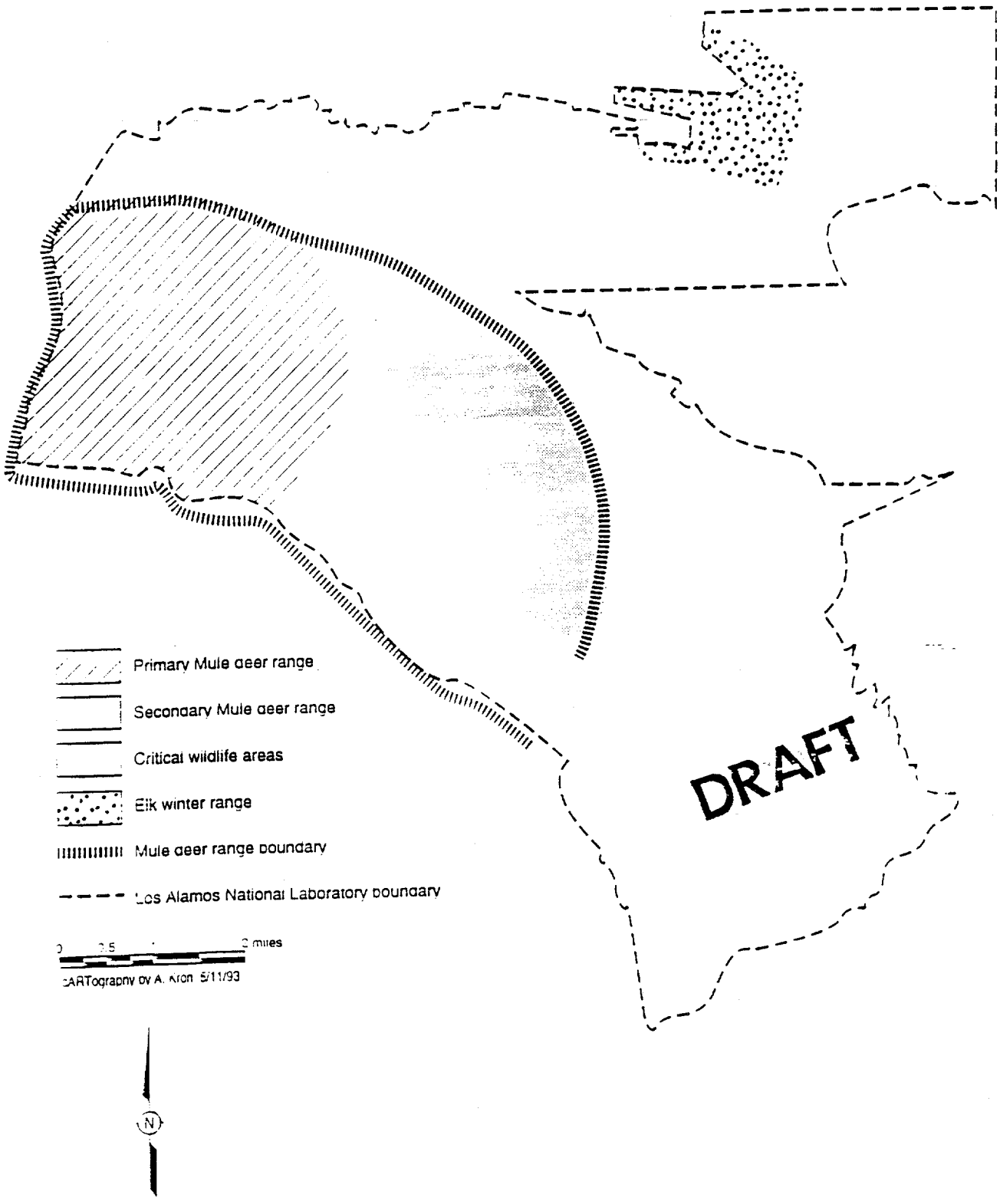


Fig. 2. Wintering deer and elk patterns on Los Alamos National Laboratory land.

2.1.3 Threatened, Endangered, and Sensitive Species

There are a total of 44 species of plants and animals listed by the state and/or federal government as threatened, endangered, or sensitive that are known to occur in Los Alamos County or could potentially occur in Los Alamos County. The potential occurrences are based on preferred habitats of the species and whether those habitats are found within or near Los Alamos County. They are also based on whether the species has been observed at locations adjacent to the County (i.e., Bandelier National Monument, Jemez Mountains). Table 3 lists all plant and wildlife species known to occur or potentially occur in the County along with their listing status and preferred habitat.

Table 3. Threatened, Endangered, and Sensitive Plant and Wildlife Species Known To Occur or Potentially Occur Within Los Alamos County.

SPECIES	STATUS1	GENERAL HABITAT	CONFIRMED IN LOS ALAMOS COUNTY
PLANTS			
Wright fishhook cactus (*Mammillaria wrightii*)	SE	Pinyon-Juniper 3000-7000	No
Dagger-thorn cholla (*Opuntia clavata*)	SS	Juniper-Grassland 6000-8000 ft	No
Santa Fe cholla (*Opuntia viridiflora*)	SE Federal C2	Pinyon-Juniper 7200-8000 ft	No
Grama grass cactus (*Toumeva papyracantha*)	SE Federal C2	Pinyon-Juniper 5000-7300 ft	Yes
Sessile-flowered false carrot (*Aletes sessiliflorus*)	SS	Pinyon-Juniper 6500-8100 ft	No
Plain thistle (*Cirsium inornatum*)	SS	Mountain slopes 7500-9000 ft	No
Threadleaf horsebrush (*Tetradymia filifolia*)	SS	Pinyon-Juniper 6000-7000 ft	No
Alpine bluebell (*Mertensia viridis*)	SS	Mountain slopes 12000-13000 ft	No
Plank's catchfly (*Silene plankii*)	SS	Pinyon-Juniper 5000-6000 ft	No
Cyanic milk-vetch (*Astragalus cyaneus*)	SS	Pinyon-Juniper 5500-6500 ft	No
Santa Fe milk-vetch (*Astragalus feensis*)	SS	Pinyon-Juniper 5000-6500 ft	No
Spiny-leaf milk-vetch (*Astragalus kentrophyta*)	SS	Juniper-Grassland 5300-6900 ft	No
Mathew's woolly milk-vetch (*Astragalus mollissimus*)	SS	Pinyon-Juniper 5000-6000 ft	No
Taos milk-vetch (*Astragalus puniceus*)	SS	Pinyon-Juniper 7000-? ft	No

La Jolla prairie clover (*Dalea scariosa*)	SS	Juniper-Grassland 4900-5300 ft	No
Checker lily (*Fritillaria atropurpurea*)	SS	Mixed-conifer	Yes
Wood lily (*Lilium philadelphicum* var. *andium*)	SE	Mixed-conifer 6000-10000 ft	Yes
Wild hollyhock (*Iliamna grandiflora*)	SE	Mountain slopes 7000-11000 ft	No
Tufted sand verbena (*Abronia bigelovii*)	SS	Pinyon-Juniper 6000-? ft	No
Helleborine orchid (*Epipactis gigantea*)	SE	Riparian zones	Yes
Pagosa phlox (*Phlox caryophylla*)	SS	Ponderosa-Pinyon 6500-7500 ft	No
Sandia alumroot (*Heuchera pulchella*)	SS	Mixed-conifer 8000-12000 ft	No
WILDLIFE			
Western toad (*Bufo boreas*)	SE Group 2	Lakes-ponds	No
Jemez Mountains salamander (*Plethodon neomexicanus*)	SE Group 2	Spruce-fir 7225-9250 ft	Yes
Northern goshawk (*Accipiter gentilis*)	Candidate	Ponderosa pine	Yes
Common black hawk (*Buteogallus anthracinus*)	SE Group 2	Riparian zones-lower elevations	No
Bald eagle (*Haliaeetus leucocephalus*)	SE Group 2 Federal Endangered	Riparian zones	Yes
Baird's sparrow (*Ammodramus bairdii*)	SE Group 2 Federal Endangered	Juniper-Grassland	No
Mississippi kite (*Ictinia mississippiensis*)	SE Group 2	Riparian zones. shelter belts. manicured areas	No
Peregrine falcon (*Falco peregrinus* var. *anatum*)	SE Group 1 Federal Endangered	Ponderosa-Pinyon	Yes
Whooping crane (*Grus americana*)	SE Group 2 Federal Endangered	Rivers-streams	Yes
Least tern (*Sterna antillarum*)	SE Group 1 Federal Endangered	Rivers-streams	No
White-tailed ptarmigan (*Lagopus leucurus*)	SE Group 1	Tundra	No
Occult little brown myotis (*Myotis lucifugus occultus*)	Federal C2	Permanent water	No
Goat Peak pika (*Ochotona princeps nigrescens*)	Federal C2	Alpine-tundra	No
White-faced ibis (*Plegadis chihi*)	Candidate	Wetlands (Rio Grande)	No
Mexican spotted owl (*Strix occidentalis lucida*)	Federal Threatened	Mixed-conifer	Yes
Broad-billed hummingbird (*Cynanthus latirostris*)	SE Group 2	Riparian zones	Yes
Willow flycatcher (*Empidonax traillii*)	SE Group 2 Proposed End.	Riparian zones 3700-8900 ft	No

Gray vireo (*Vireo vicinior*)	SE Group 2	Juniper-Grassland	No
Rio Grande silvery minnow (*Hybognathus amarus*)	SE Group 2	Rivers-streams	No
Bluntnose shiner (*Notropis simus*)	SE Group 1	Rivers-streams	No
Pine marten (*Martes americana*)	SE Group 2	Spruce-fir	No
Spotted bat (*Euderma maculatum*)	SE Group 2 Federal Notice of Review	Varies-usually near water	No
Meadow jumping mouse (*Zapus hudsonius*)	SE Group 2 Federal Notice of Review	Wetland	Yes
Say's pond snail (*Lymnaea caperata*)	SE Group 1	Wetland 3700-8600 ft	No
Lilljeborg's pea-clam (*Pisidium lilljeborgi*)	SE Group 2	Lakes-ponds	No

1 SE State Endangered
SS State Sensitive
Reference: Biological Resource Evaluation Team database for threatened, endangered, and sensitive species, LANL, Los Alamos, N.M.

2.1.3.1 Plants

State

There are 22 plant species, 6 endangered and 16 sensitive, listed by the state of New Mexico as occurring or potentially occurring in Los Alamos County. Those known to occur in the county include grama grass cactus, checker lily, wood lily, and helleborine orchid.

Federal

Two state endangered species, the Santa Fe cholla and grama grass cactus, are also listed by the federal government as Candidate 2 (C2) species and may be considered for federal protection in the future.

2.1.3.2 Wildlife

State

There are 22 species of animals, including five Group 1 and 15 Group 2, listed by the state as occurring or potentially occurring in the county. Seven species are known to occur within the County and

include the Jemez Mountains salamander, bald eagle (along the Rio Grande), peregrine falcon, whooping crane (along the Rio Grande), the broad-billed hummingbird, and the meadow jumping mouse.

Federal

The bald eagle, peregrine falcon, and whooping crane are also listed as endangered by the federal government. In addition, there are seven species on the Notice of Review for listing or are candidates for listing (Table 3). The northern goshawk has not been listed by the state yet but is being considered for listing by the federal government.

2.1.4 Unique/Sensitive Habitats

Travel Corridors

The Laboratory is located within a transitional area for wintering elk and deer. Herds of these animals move down onto Laboratory property during the winter months as snow becomes too deep at higher elevations in the Jemez Mountains. Figure 2 shows a general distribution map for migrating elk and deer. This map incorporates some information from studies conducted in the 1970's and 1980's (White 1981; Eberhardt and White 1979). A wider distribution and additional travel corridors within Laboratory property are suspected. In addition, small herds of these species are now residing year-round on Laboratory property. More widely distributed fawning and calving grounds of deer and elk are also expected. Additional intensive studies will be necessary to identify these areas.

Breeding/Nesting Areas

A survey of breeding birds of Los Alamos County indicates locations of birds breeding in the area (Travis 1992). Many of the less disturbed mesas and canyons support breeding birds as do some of the more heavily disturbed areas. The combination of steep canyons and coniferous forests provides suitable nesting sites for a variety of bird species.

Foraging/Hunting Areas

Those habitats supporting relatively higher diversities and densities of prey species can be expected to support greater densities and diversities of predator species. Higher use areas for elk and deer, shown in Figure 2, may also support greater densities of predators that feed on these animals. However, in the time elapsed since the studies on elk and deer were completed, animal distribution and habitat use has likely changed, mostly increasing throughout the County. Higher use areas, such as wetlands, can be expected to support greater densities and diversities of wildlife species. Additional intensive studies will be necessary to more accurately identify sensitive foraging and hunting areas for all groups of wildlife species in the area.

Water Sources

The Pajarito Plateau is dissected by a number of canyons that have ephermeral streams. The only perennial flowing stream in the area is in Bandelier National Monument in Frijoles Canyon. All of the major canyon systems on Los Alamos National Laboratory lands have ephermeral flowing streams. Portions of some of the canyons on Laboratory property are fed by Laboratory facility outfalls or other artificial sources, and receive relatively high amounts of use by a variety of wildlife species. Areas receiving intermittent flow also provide important sources of water during certain times of the year for species such as amphibians and migratory animals.

2.1.5 Floodplains and Wetlands

There are few perennially flowing streams or other wetlands in Los Alamos County or the immediate surrounding area. Frijoles Canyon, in Bandelier National Monument, has a perennial flowing stream and Pajarito Canyon, Guaje Canyon, Los Alamos Canyon, and Water Canyon all have perennial stretches, either natural or artificially fed. Other canyons that include Bayo, Pueblo, Sandia, Mortandad, Canada del Buey, Potrillo, Fence, Indio, Ancho, and Chaquehui all have ephermerally flowing water as a result of snowmelt and periods of heavy precipitation. There are also several springs that are found in Guaje Canyon, upper Los Alamos Canyon, Pajarito Canyon, Water Canyon, and Canyon del Valle.

The National Wetlands Inventory Maps identify two types of wetlands within the county; riverine and palustrine. Riverine systems are contained within a channel. Palustrine systems include nontidal wetlands dominated by trees, shrubs, emergents, etc. and/or are less than 20 acres, less than 2 meters deep, and no active wave-forming shoreline features (i.e., ponds, marshes, bog, etc.). The lower portion of Pajarito Canyon, near the intersection of Pajarito Canyon and State Road 4, is classified as palustrine . Frijoles Canyon, outside of the county, is considered to contain a riverine system. The major canyons previously mentioned all contain floodplains within the canyon bottoms.

2.2 Site Description

A regional description of the plant and wildlife communities occurring in or near Los Alamos County has been previously discussed. This section attempts to provide more specific information on the biological communities of the RWLTF project area, including the Alternative site in Mortandad Canyon and the Proposed site on the adjacent mesa top, Mesita del Buey. Information is provided for the immediate project area as well as locations outside of the area that contain similar habitats or that could possibly be impacted by the proposed project.

2.2.1 Plants

The proposed RLTWF project area is characterized by two types of terrain, mesa top and canyon, each containing unique vegetative components. The Proposed site is located on Mesita del Buey which has a vegetation component different from the canyon. The Alternative site is located in Mortandad Canyon where the habitats are classified according to slope and canyon bottom.

There are primarily two vegetation communities associated with the terrain features present in the project area, the Rocky Mountain Montane Conifer Forest and the Great Basin Conifer Woodland, with influences of two riparian communities, the Rocky Mountain Riparian-Deciduous Forest and Rocky Mountain Montane Marshland. A breakdown of the general habitats is given below:

> Great Basin Conifer Woodland Community: This community consists mostly of pinyon pine and juniper trees and can be further broken into a Piñon-Juniper series and Piñon/Wavyleaf Oak Habitat Type.

Rocky Mountain Montane Conifer Forest Community: This community consists of species of a mixed conifer forest and can be broken down into a Douglas Fir Series, Ponderosa Pine Series, Douglas Fir/Gambel Oak Habitat Type, and a Ponderosa Pine/Gambel Oak Habitat Type.

Rocky Mountain Riparian-Deciduous Forest Community with patches of a Rocky Mountain Montane Marshland Community.

A series refers to the principal plant and animal communities within each of the biotic communities and is based on distinctive climax dominant plants. A habitat type is based on the occurrence of particular dominant species that are local or regional in distribution.

Two series of the Rocky Mountain Montane Conifer Forest were prevalent on north-facing slopes and canyon rims, Ponderosa pine and Douglas fir. Two habitat types were present within these series, the Ponderosa pine-Gambel oak and the Douglas fir-Gambel oak. Series and habitat types for the riparian vegetation are not well-defined therefore no attempt is made here to classify these. These wetlands are present as a result of Laboratory outfalls.

The Great Basin Conifer Woodland community is found on the mesa tops in the project area. It is represented by the Piñon-Juniper series which is further broken down into the Colorado piñon-wavy leaf oak habitat type on the mesa tops and south-facing slopes.

Appendix A lists the more common species in each of the major plant communities in the project area and are discussed in further detail in Section 3, Habitat Characterization. Appendix B gives detailed tables providing vegetation data for much of the general discussion below.

2.2.1.1 Proposed Site

Although the Proposed Site is located on a mesa top, the site is devoid of overstory species due to previous disturbance and is dominated by a mixture of grasses, forbs, and scattered low-growing shrubs. Vegetation immediately adjacent to the site is a pinyon-juniper woodland and nearby mesa tops contain a combination of pinyon pine, juniper, and ponderosa pine.

Vegetation characteristics of the Proposed Site and of a disturbed field similar and adjacent to the Proposed Site, were measured. The vegetation consisted primarily of understory species with lesser

amounts of shrubs. The dominant species included bromegrass, bluegrass, false terragon, wormwood, and a large amount of bare dirt and organic litter.

Foxx (1986) measured vegetation characteristics of a ponderosa pine plant community on the narrow mesa top situated between Mortandad and Ten-Site Canyon and a pinyon-juniper woodland on the narrow mesa top between Mortandad Canyon and Canada del Buey, neither of which is the actual Proposed site. The ponderosa pine community was dominated by ponderosa pine trees that ranged in size from 4-14 inches diameter at breast height (dbh) with an average density of 137 trees per acre. Canopy cover varied from less than 5% to near 50% for trees, shrubs, and grasses. The Pinyon-Juniper Woodland community is dominated by pinyon pine and juniper trees with pockets of ponderosa pine. The ponderosa pine are generally large ranging from 9-14 inches dbh. Pinyon pine and juniper trees ranged from less than 4 inches dbh to greater than 20 inches dbh. The average number of trees per acre was 157, but the range in density varied considerably. The canopy cover ranged from less than 5% to less than 50%. Grasses around ponderosa pine consisted mostly of blue grama, little bluestem, and needle-and-thread. Grasses within the pinyon pine and juniper trees were blue grama, galleta, and mountain muhly.

Transects were established on the mesa top of TA-52 to evaluate vegetation characteristics of the plant communities in that area (Dunham 1993). The dominant tree species were Colorado pinyon and one-seed juniper, and the most common shrubs were mountain mohagany and wavyleaf oak.

2.2.1.2 Alternative Site

The Alternative Site is located within Mortandad Canyon and will occur primarily in the canyon bottom and south-facing slope. However, road improvements and other necessary improvements and construction will occur on the north-facing slope. Vegetation characteristics are discussed for portions of Mortandad Canyon, Ten Site Canyon, and upper Canada del Buey, all of which have habitat characteristics similar to the Alternative Site and surrounding area.

The Mortandad canyon bottom overstory is dominated by ponderosa pine (90% relative cover) with a midstory dominated by willow. The understory is dominated by rush which has a relative cover value of 53%.

The only overstory species recorded along the south-facing slope was ponderosa pine. However, the south-facing slope is more "shelf-like" in appearence as opposed to a steep incline. Because it is a very gradual incline, the climatological and topographical features favor moist conditions. In comparison, a typical dry south-facing slope that would consist of species such as juniper and pinyon pine is, for the most part, absent. The midstory is dominated by mountain mohagany and oak and the understory is dominated by muhly.

The north-facing slope is dominated by Douglas fir and ponderosa pine with a midstory dominated by oak. With the exception of oak seedlings, the understory is predominantly mountain muhly and pussytoes.

2.2.1.3 Additional Studies

Canyon Bottom: Vegetative species were recorded at small mammal study areas located above and below the tritium outfall (051-051) in the Mortandad Canyon bottom. This area is immediately adjacent to the Alternative Site. Below the outfall, ponderosa pine, limber pine, and Douglas fir are common overstory species along the canyon bottom. Shrubs include barberry, cliffbush, and oak, and common understory species are sedge, mountain muhly, and Virgiania creeper. Above the outfall, ponderosa pine and Douglas fir are common overstory species and mountain mohagany, gambel oak, and cattail are common midstory species. Understory species include redtop, little bluestem, and mountain muhly.

Although outside of the project area, vegetation characteristics of the riparian area were collected in several locations within Mortandad Canyon by Foxx (1986). Ponderosa pine dominate the lower portions of the canyon section surveyed. Many of the ponderosa pine were large, ranging from 14 inches dbh and higher. Box maple was the dominant overstory species along the stream banks with scattered oak. Foxx measured a range in canopy cover within the canyon bottom of less than 5% to 95% with a greater density in the upper portions of the canyon. Ripley (1985) also recorded vegetation characteristics in Mortandad Canyon. In the lower portions of Ripleys study area (down canyon from the section studied by Foxx), pinyon pine, one-seed juniper, and oak are the dominant species. Up canyon from this area

(this is likely to be in a similar section as the lower portions of the area studied by Foxx, 1986), the ponderosa pine plant community becomes dominant as the canyon narrows. The upper reaches of the canyon are dominated by Douglas-fir, white fir, and various riparian species such as boxelder.

South-Facing Slope: Ponderosa pine and Douglas fir are common overstory species on the south-facing slope of Mortandad Canyon north of TA 42. Low amounts of gambel oak, rose, and mountain mohagany are also present. The understory species are also scarce and include fleabane, gilia, and bluegrass.

North-facing Slope: The north-facing slope of Ten Site Canyon is dominated by Douglas fir and ponderosa pine and has an average number of trees per acre of 305 and 53 respectively. Common shrubs include gambel oak and mountain mohagany.

Canyon Bottom: The canyon bottom of Ten Site Canyon is dominated by ponderosa pine with Russian olive occurring along the stream channel (Dunham 1993). Willow and gambel oak are the most common shrubs with infrequent occurrences of mountain mohagany.

Canada del Buey is located east of the Proposed site and essentially out of the project area. However, the location and nature of the proposed project could impact plant and animal species similar to those found in Canada del buey due to the similarity in habitats. Vegetation characteristics are discussed below based on information primarily for the upper portion of Canada del Buey (Biggs 1993).

North-facing Slope: Ponderosa pine is the dominant overstory species along the north-facing slope of upper Canada del Buey above the Sanitary Wastewater Consolidation System (SWCS) facility. One-seed juniper is relatively frequent and pinyon pine was the only other species recorded. Mountain mohagany is the dominant shrub species along the north-facing slope with common occurrences of gambel oak.

Mountain muhly is the dominant understory species along the north-facing slopes of Canada del Buey and is particularly common below the SWCS plant. Sedge was relatively common along with mountain muhly in upper Canada del Buey.

Canyon Bottom: Ponderosa pine is the most dominant species along the canyon bottom of Canada del Buey below the SWSC with less occurrences of juniper. Douglas fir is also found along the canyon bottom but in relatively low amounts. The dominant shrub in the area is chokecherry with fewer occurrences of oak, skunkbush sumac, currant, and barberry.

Mutton grass is the dominant species in most areas of upper Canada del Buey. Other common species include mountain muhly, western virgin's bower, horseweed, and redtop. Meadowrue and sedge were common in some locations.

South-Facing Slope: One-seed juniper and pinyon pine are co-dominants along the base of the south-facing cliff face with lesser occurrences of ponderosa pine. The relative cover of ponderosa pine is greater than juniper (36% compared to 25%, respectively) but its relative density is only 25% of juniper. Oak and mountain mohagany are the dominant shrub species along the south-facing slope. Ponderosa pine was the most common overstory species at the base of the south-facing slope near the canyon bottom. Mountain mohagany is the dominant shrub species with lesser occurrences of oak and skunkbush sumac. Blue grama occurs in small amounts on north-facing slopes but is the dominant understory species on the south-facing slope of Canada del Buey.

2.2.2 Wildlife

Information on wildlife communities was collected at several locations within the previously discussed canyons and mesatops. Studies on wildlife species are limited in the vicinity of the proposed project and further studies will be necessary to accurately identify wildlife populations and to what extent they utilize the project area. Studies on birds, small mammals, and some large mammals, has been conducted in other portions of Mortandad Canyon and Canada del Buey. Due to the mobility of many

wildlife species and overlapping habitat use, especially by medium and large mammals and birds, information is not separated by canyon and mesatop. In many instances, however, the locations of data collection are discussed (i.e., canyon bottom).

2.2.2.1 Invertebrates

Aquatic. No information is available.

Terrestrial

Several studies have been conducted on terrestrial invertebrates in the general project area (McKay *et al.* 1986), and in locations adjacent to the area (Hanson and Miera 1978). Table 4 lists the ant species that have been identified by Mckay *et al.*

The Biological Resource Evaluations Team (BRET) conducted intensive ant mound inventorying and insect trapping in Canada del Buey during the summer of 1992. Identification and classification, as well as data compilation, of ants and other insects collected has not been completed. However, some information has been provided on groups of insects (Table 5).

Table 4. Ant species potentially occurring in project area (Mckay et.al 1986).

SUBFAMILY	SCIENTIFIC NAME	HABITAT TYPE
DOLICHODERINAE	*Acanthomyops latipes*	P-R
	A. interjectus	PP
	Camponotus laevigatus	P-R and PP
	C. sansabeanus	P-J and PP
	C. vicinus	P-J and PP
	Formica argentea	Disturbed
	F. ciliata	P-J
	F. densiventris	P-J
	F. fusca	P-J
	F. hewitti	PP-grass
	F. lasioides	P-R
	F. limata	P-J
	F. neogagates	P-J and disturbed
	F. neorufibarbis	P-R
	F. obscuripes obscuripes	P-J
	F. obtusopilosa	P-J
	F. planipilis	P-R and PP
	F. podzolica	P-J and disturbed
	Lasius alienus	Pinon
	L. neoniger	P-R
	L. pallitarsis	PP

	L. provancheri	P-R
	L. sitiens	P-J and PP
	L. subumbratus	P-R
	Liometopum apiculodum	PP and P-R
	L. luctuosum	PP and P-R
	Myrmecocystus mexicanus	P-J
	Polyergus breviceps	PP
	Tapinoma sessile	P-J
DORYLINAE	*Neivamyrmex nigrescens*	P-J
MYRMICINAE	*Crematogaster cerasi*	PP
	C. colei	Disturbed
	Leptothorax crassipilis	P-R
	L. muscorum	PP
	L. nitens	Disturbed
	L. texanus texanus	P-R
	L. tricarinatus	P-R
	Monomorium minimum	P-J
	Myrmecina americana	P-R
	Myrmica brevispinosa	P-J
	M. emeryana	R-P
	M. hamulata	P-R
	Pheidole ceres	PP and disturbed,
	P. wheelerorum	P-J and disturbed
	Pisitarches soritis	PP
	Pogonomyrmex occidentalis	P-J and PP
	Solenopsis molesta	P-J and Disturbed
	Stenamma occidentale	P-R

HABITATS: Ponderosa pine (PP); Ponderosa-riparian (P-R); Riparian-ponderosa pine (R-P); Pinon-juniper (P-J).

Table 5. Terrestrial insects potentially occurring in project area.

ORDER	FAMILY	COMMON NAME
Odonata	Aeshnidae	Darners
	Libellulidae	Common skimmers
	Coenagrionidae	Narrow-winged damselflies
Orthoptera	Acrididae	Short-horned grasshoppes
	Gryllacrididae	Camel crickets
	Gryllidae	True crickets
Plecoptera	Perlidae	Common stoneflies
Dermoptera	Forficulidae	Common earwigs
Hemiptera	Belostomatidae	Giant water bugs
	Miridae	Plant bugs
	Reduviidae	Assasin bugs
	Phymatidae	Ambush bugs
	[illegible]vgaeidae	Seed bugs
	[illegible]ydnidae	Burrower bugs
	Scutelleridae	Shield-backed bugs
	Pentatomidae	Stink bugs
Homoptera	Cicadidae	Cicadas
Neuroptera	Myrmeleontidae	Ant lions
Coleoptera	Cicindelidae	Tiger beetles

	Carabidae	Ground beetles
	Silphidae	Carrion beetles
	Elateridae	Click beetles
	Staphylinidae	Rove beetles
	Anthicidae	Antlike flower beetles
	Lampyridae	Fireflies
	Cantharidae	Soldier beetles
	Lycidae	Net-winged beetles
	Buprestidae	Metallic wood-boring beetles
	Erotylidae	Pleasing fungus beetles
	Coccinellidae	Ladybird beetle
	Tenebrionidae	Darkling beetle
	Meloidae	Blister beetle
	Cerambycidae	Long-horned beetle
	Lucanidae	Stag beetle
	Scarabaeidae	Scarab beetles
	Chrysomelidae	Leaf beetle
	Curculiouidae	Weevils
Lepidoptera	Papilionidae	Swallowtails
	Pieridae	Whites, sulphurs, and oranges
	Nymphalidae	Brush-footed butterflies
	Satyridae	Satyrs, nymphs, and arctics
	Saturniidae	Giant silkworm moth
	Pterophoridae	Plume moths
Diptera	Tabanidae	Horse and deer flies
	Therevidae	Stiletto flies
	Asilidae	Robber flies
	Bombyliidae	Bee flies
	Syrphidae	Hover flies
	Tachinidae	Tachinid flies
Hymenoptera	Ichneumonidae	Ichneumonid wasp
	Cynipidae	Gall wasps
	Mutillidae	Velvet ants
	Scoliidae	Scoliid wasps
	Formicidae	Ants
	Pompilidae	Spider wasps
	Vespidae	Vespid wasps
	Apidae	Honey bees
	Sphecidae	Sphecid wasps
	Halictidae	Metallic bees
	Tiphiidae	Tiphiid wasps
	Megachilidae	Leaf-cutting bee

2.2.2.2 Vertebrates

Fish

Fish are not expected to inhabit the water sources in the project area. However, no formal surveys for fish species have been conducted.

Amphibians and Reptiles

Due to the presence of a stream channel and pools, amphibians are expected to occur in Mortandad Canyon. However, during a recent survey (Pierce and Cross 1993), no amphibians were found. During this same survey, eastern fence lizards and many-lined skinks were recorded. Few reptiles and no amphibians were trapped in Canada del Buey during a 1990 trapping session by Haarman and Bennett. Additional surveys will be necessary for a more accurate presentation of data on amphibians and reptiles and to determine impacts and mitigation measures.

Bogart (1986) found three species of reptiles and two of amphibians in Mortandad Canyon during his surveys in 1978 and 1979: the coachwhip snake, gopher snake, eastern fence lizard, Woodhouse toad, and southern spadefoot. He found the short-horned lizard, plateau striped whiptail, prairie rattlesnake, eastern fence lizard, and the Woodhouse toad in Canada del Buey.

Mammals

Mammal surveys have been previously conducted in Mortandad Canyon and Canada del Buey. Studies to determine use by large and medium size mammals have also been conducted in Canada del Buey. However, the information discussed below is insufficient to adequately characterize the project area and its use by mammals. Future studies will be necessary to accurately evaluate mammal populations, their use of the project area and surrounding terrain, and to evaluate impacts from the proposed project to those species.

Small Mammals

Canada del Buey/Mesita del Buey

Brush mice and deer mice were the most commonly captured species during trapping sessions in Canada del Buey. A density for brush mice was estimated between 13-36 animals per hectare. An estimated population size for all nocturnal rodents in the trapping session was 54 to 65 animals.

Seven small mammal species were captured during a July 1991 trapping session along a stretch of approximately 1.5 miles in Canada del Buey below the proposed SWSC facility: least chipmunk

(*Eutamias minimus*); Colorado chipmunk (*Eutamias quadrivittatus*); white-throated woodrat (*Neotoma albigula)*; Mexican woodrat (*Neotoma mexicana*); brush mouse (*Peromyscus boylii*); deer mouse (*Peromyscus maniculatus*); and rock squirrel (*Citellus variegatus*). The same area was trapped in June 1992 at which time there were also seven species of small mammals captured: least chipmunk; Colorado chipmunk; white-throated woodrat; harvest mouse (*Reithrodontomys megalotis*); long-tail vole (*Microtus longicaudus*); brush mouse and deer mouse.

We calculated a population estimate for brush mouse of 87 (s.e.=10.54). A range of 72 to 113 animals was estimated using a 95% confidence interval. Table 6 shows results of survey trapping conducted in Canada del Buey and on Mesita del Buey by Kent (1986). A greater number of mammals were captured in the canyon itself, with deer mice and chipmunks being most common. Although no specific habitat descriptions are available, it is likely that chipmunks, brush, pinyon, and deer mice were trapped primarily in the rocky habitat on the canyon walls, while the voles and harvest mice were trapped in the more mesic habitat in the canyon bottom. More pinyon mice were also caught on the mesa top in the pinyon-juniper woodland habitat, which is more characteristic of this species. The northern pocket gopher was also present in Canada del Buey in the canyon bottom.

TABLE 6. Numbers of nocturnal small mammals captured in Canada del Buey and Mesita del Buey by Kent, 1986.

	Habitat	
Species	Canada del Buey	Mesita del Buey
Deer mouse	23	8
Pinyon mouse	3	4
Brush mouse	1	0
Peromyscus spp.	1	0
Chipmunk	9	2
Long-tailed vole	2	0
Western harvest mouse	2	1

Morrison (1990) conducted a study on Mesita del Buey in habitat similar to what is found at the Alternative site. Chipmunks were the only diurnal small mammals which were captured frequently

enough to evaluate population size or density; however, the numbers were, in most cases, too small to use the models appropriately.

Other mammals captured (in the canyon bottom only) were rock squirrels and long-tailed vole, although not enough individuals of either species were captured to utilize population and density estimate programs. Chipmunks were the only mammals captured on the mesatops. Rock squirrels were observed high up on the canyon walls in the rocky habitat and the long-tailed vole was captured in the grassy habitat in the bottom of the canyon.

Mortandad Canyon/Ten Site Canyon

To obtain species diversity information, small mammal surveys were conducted in 1992, above and below the tritium outfall (051-051). Table 7 lists the species captured during the trapping sessions in those areas.

Table 7. Small mammal species captured in Mortandad Canyon along tritium outfall, 1992.

Common Name	Scientific Name
Least chipmunk	*Eutamias minimus*
Colorado chipmunk	*Eutamias quadrivatattus*
Long-tail vole	*Microtus longicaudus*
White-throated woodrat	*Neotoma albigula*
Mexican woodrat	*Neotoma mexicana*
Brush mouse	*Peromyscus boylii*
Deer mouse	*Peromyscus maniculatus*

Miera and Hakonson (1974) and Kent (1986) also live-trapped small mammals in the project area. Miera and Hakonson trapped in Mortandad Canyon, and Kent trapped in Mortandad and Ten Site Canyons and the mesa top between these canyons. In addition to most of the species listed above, Miera also captured a pinyon mouse (*Peromyscus trueii*) and a harvest mouse and Kent reported captures of plains pocket mouse (*Perognathus flavescens*), rock pocket mouse (*Perognathus intermedius*), and a shrew (*Sorex* sp.).

Large Mammals

Most information collected for large mammals includes deer and elk with a very limited amount of information on other species (i.e., bear, mountain lion, coyote, etc.).

Large mammal pellet/scat transects and circular plots are set up in Canada del Buey to collect data on the large mammals utilizing that canyon. Because of similarity in habitats, species information from Canada del Buey can, most likely, be applied to Mortandad Canyon.

Data analysis revealed 141 deer pellet groups/ha were found on circular plots (141/ha) and 90/ha were found on transects. For elk pellet groups, 605/ha were found on circular plots and 590/ha were found on transects. Additional species recorded for Canada del Buey based on scat counts, include bear, coyote, and fox.

Birds

Several studies on birds have also been conducted in and around Canada del Buey for purposes of the SWSC facility. Most of these species can be expected to occur in Mortandad and Ten Site Canyons as well as the adjacent mesas. Additional species may occur in Mortandad Canyon due to an existing water source.

Table 8 shows a listing of birds recorded in Canada del Buey by Morrison (1990). Nineteen were found in the mixed conifer habitat along the upper part of the transect, 29 in the pinyon/juniper habitat within the lower canyon, and 31 in the Ponderosa pine habitat in mid-canyon.

Table 9 lists species that were recorded in pinyon-juniper habitat similar to that on the mesa tops surrounding Canada del Buey. These data were collected during 1988 throughout the Laboratory, and it is assumed that these species would currently be present in mesa top habitat near Mortandad Canyon.

Table 5. Bird species present in each of the habitats surveyed in Canada del Buey, 1990.

	HABITAT		
SPECIES	MIXED CONIFER	PINYON/JUNIPER	PONDEROSA PINE
Northern flicker	X	X	
American Robin	X		X
Brown-headed cowbird	X	X	X
Black-headed grosbeak	X	X	X
Broad-tailed hummingbird	X	X	X
Common nighthawk	X		
Hermit thrush	X		
Red crossbill	X	X	X
Western tanager	X		X
Grace's warbler	X		
Hammond's flycatcher	X		X
House wren	X		X
Mountain chickadee	X		X
Rufous-sided towhee	X	X	X
Violet-green swallow	X	X	X
Virginia warbler	X	X	X
Warbling vireo	X		
White-breasted nuthatch	X	X	X
Western wood peewee	X	X	X
Mourning dove		X	
Red-tailed hawk		X	
Turkey vulture		X	
Ash-throated flycatcher		X	X
Hairy woodpecker		X	X
Scrub Jay		X	X
Solitary vireo		X	X
Stellar's Jay		X	
Western bluebird		X	X
Bewick's wren		X	X
Blue-gray gnatcatcher		X	X
Canyon wren		X	X
Chipping sparrow		X	X
Gray flycatcher		X	
House finch		X	
Lesser goldfinch		X	X
Plain titmouse		X	X
Pygmy nuthatch		X	X
Say's phoebe		X	
Common raven			X
Yellow-bellied sapsucker			X
Rock wren			X

Table 6. Bird species recorded in pinyon-juniper mesatop habitat, 1988.

Species
Rufous-sided towhee
Clark's nutcracker
Chipping sparrow
Violet-green swallow
Scrub jay
Plain titmouse
Virginia warbler
Broad-tailed hummingbird
Western bluebird
Lesser goldfinch
Ash-throated flycatcher
White-tailed swallow
Gray flycatcher
Common bushtit
House finch
White-breasted nuthatch
Northern flicker
Pygmy nuthatch
Western wood peewee
Brown-headed cowbird
Mountain chickadee
American robin
Yellow-rumped warbler

In 1991 and 1992, L. Willis and D. Novoroske used similar methodology to conduct bird surveys in the same area as Morrison. Table 10 lists all bird species recorded during the surveys. The most frequently observed species were canyon wren, common raven, mountain chicadee, pygmy nuthatch, rufous-sided towhee (the most common species), scrub jay, Townsend's solitaire, white-breasted nuthatch, and western wood-peewee.

Table 10. List of bird species observed during all seasons surveyed, Canada del buey, 1991-92.

Species
Acorn woodpecker
American kestrel
American robin
Ash-throated flycatcher
Bewick's wren
Blue-gray gnatcatcher
Black-headed grosbeak
Brown-headed cowbird
Black-headed grosbeak
Brown creeper
Broad-tailed hummingbird

Bushtit
Canyon towhee
Canyon wren
Chipping sparrow
Clark's nutcracker
Cooper's hawk
Common raven
Dark-eyed junco
Dusky flycatcher
Flycatcher
Gray flycatcher
Grace's warbler
Green-tailed towhee
Hammond's flycatcher
Hairy woodpecker
Hepatic tanager
Hermit thrush
House finch
House wren
Hummingbird
Lark sparrow
Lesser goldfinch
Mountain chickadee
Mourning dove
Northern flicker
Pinyon jay
Pine siskin
Plain titmouse
Pygmy nuthatch
Ruby-crowned kinglet
Red crossbill
Rock wren
Rufous-sided towhee
Red-tailed hawk
Say's phoebe
Scrub jay
Solitary vireo
Steller's jay
Townsend's solitaire
Turkey vulture
Violet-green swallow
Virginia's warbler
Warbling vireo
White-breasted nuthatch
Western bluebird
Western tanager
Williamson's sapsucker
Wilson's warbler
Western wood-pewee
Yellow-rumped warbler

Plots located in the upper portion of the study area in Canada del Buey tended to have a greater number of observations than the lower portions indicating greater use by birds closer to the SWCS facility. The upper portion of the study area is characterized by ponderosa pine and mixed conifer (north-facing slope) which is typical of the slopes of Mortandad and Ten Site Canyons.

Specific results of the information collected for the Breeding Bird Atlas (Travis 1992) are not provided in this document. The atlas indicates that up to 70 species of birds could be breeding in the general project area.

2.2.3 Threatened, Endangered, and Sensitive Species

A database developed by the Biological Resource Evaluations Team was used to determine potentially occurring threatened, endangered, and sensitive species based on habitats present in the project area.

2.2.3.1 Plants

2.2.3.1.1 Federally Listed Species

No federal endangered or threatened plant species were listed as potentially occurring in the project area. However, the following five federal candidate plant species (including 3C) meet the search criteria:

Candidate	
Wright fishhook cactus	*Mammillaria wrightii*
Santa Fe cholla	*Opuntia viridiflora*
Grama grass cactus	*Toumeya papyracantha*
Tufted sand verbena	*Abronia bigelovii*
Plank's catchfly	*Silene plankii*

2.2.3.1.2 State Listed Species

Three of the previously mentioned federal candidate species are also listed as state threatened or endangered.

Endangered	
Wright fishhook cactus	*Mammillaria wrightii*
Santa Fe cholla	*Opuntia viridiflora*
Grama grass cactus	*Toumeya papyracantha*
Wood lily	*Lilium philadelphicum var. andium*
Helleborine orchid	*Epipactis gigantea*

The following sensitive species could occur in habitats similar to what is found in the project area.

Sensitive Species	
Sessile-flowered false carrot	*Aletes sessiliflorus*
Threadleaf horsebrush	*Tetradymia filifolia*
Plank's catchfly	*Silene plankii*
Santa Fe Milkvetch	*Astragalus feensis*
Mathew's wooly milkvetch	*Astragalus mollissimus*
Taos milkvetch	*Astragalus puniceus*
Cyanic milk-vetch	*Astragalus cyaneus*
Tufted Sand Verbena	*Abronia bigelovii*
Pagosa phlox	*Phlox caryophylla*
Checker lily	*Fritillaria atropurpurea*
Sandia alumroot	*Heuchera pulchella*

2.2.3.2 Wildlife

2.2.3.2.1 Federal

Two federal endangered, one threatened, and six federal candidate species meet the search criteria:

Endangered/Threatened	
Bald Eagle	*Haliaeetus leucocephalus*
Peregrine falcon	*Falco peregrinus*
Mexican spotted owl	*Strix occidentalis lucida*
Candidate	
Willow flycatcher	*Empidonax trailii*
Spotted bat	*Euderma maculatum*
Meadow Jumping Mouse	*Zapus hudsonius*
Northern goshawk	*Accipiter gentilis*
White-faced ibis	*Plegadis chihi*
Goat Peak pika	*Ochotona princeps nigrescens*
Occult little brown myotis	*Myotis lucifugus occultus*

2.2.3.2.2 State

Species listed as endangered or threatened in the state of New Mexico that met the search criteria are as follows:

Endangered	
Broad-Billed Hummingbird	*Cyanthus latirostris*
Common Black Hawk	*Buteogallus anthracinus*
Mississippi Kite	*Ictinia mississippiensis*
Spotted Bat	*Euderma maculatum*
Bald eagle	*Haliaeetus leucocephalus*
Peregrine falcon	*Falco peregrinus*
Willow flycatcher	*Empidonax trailii*
Say's Pond Snail	*Lymnaea captera*
Meadow Jumping Mouse	*Zapus hudsonius*

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

2.2.3.3 Species Dismissed from Further Consideration

Based on the information gained from field surveys and previous data, we concluded that the following species are not expected to occur in the proposed or alternative site:

Plants

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

Wright fishhook cactus
Santa Fe Cholla
Plank's catchfly
Tufted sand verbena
The sessile-flowered false carrot
Threadleaf horsebrush
The Santa Fe milkvetch
Mathew's woolly milkvetch
Taos milkvetch
The cyanic milkvetch
Pagosa phlox
Grama grass cactus

Wildlife

Bald Eagle
Willow flycatcher
Common Black Hawk
Mississippi Kite
Meadow jumping mouse
Broad-billed Hummingbird
Say's pond snail
Mexican spotted owl
Northern goshawk
White-faced ibis
Goat Peak pika
Occult little brown myotis

Habitat requirements for the spotted bat and peregrine falcon were found to exist in the project area and a further evaluation to their possible presence was made.

The peregrine falcon (*Falco peregrinus*) has little probability of occurring in the project area, except for possibly feeding. They do, however, migrate through New Mexico and winter statewide. Peregrines occupy steep cliffs in wooded or forested habitats; breeding territories center on cliffs. Peregrine falcons have been observed in and near Pueblo Canyon, and have been recorded as nesting along the cliffs of this canyon. Johnson (1992) examined locations in Los Alamos County and does not believe the peregrine will use Mortandad or Ten Site Canyons for nesting. There is a moderate to high potential for its re-occurrence in Pueblo Canyon, and from there, it could utilize the project area as feeding grounds. A habitat management plan developed by Johnson (1992) discusses the past and present status of the peregrine falcon within and near the area.

Spotted bat (*Euderma maculatum*) is a state endangered species found in pinon-juniper, ponderosa, mixed conifer and riparian habitats. This species requires a source of water with standing pools and roost sites such as caves in cliffs or rock crevices. Suitable roosts sites are present along the cliff faces of the canyons. However, open water sources are somewhat limited and include a marrow flowing stream. Mist net surveys on Laboratory land were conducted for this species. No spotted bats were captured. In addition, surveys conducted in lower Pajarito Canyon in 1992 which has more suitable habitat, resulted in no captures.

2.2.4 Unique/Sensitive Habitats

Travel Corridors

The Laboratory is located within a transitional area for wintering elk and deer. Herds of these animals move down on to Laboratory property during the winter months as snow becomes too deep at the higher elevations of the Jemez Mountains. Due to the presence of water, large mammals are expected to utilize the area for watering. There are also relatively large amounts of sign (tracks, scat) occurring on

the open Alternative site. Large mammals are frequently observed traveling from canyon to canyon over the mesa tops. In October 1993, five deer (3 male and 2 female) were observed at the Alternative Site.

Breeding/Nesting Areas

Many of the less disturbed mesas and canyons on the Laboratory support breeding birds as do some of the heavily disturbed areas. The combination of steep canyons and coniferous forests provides suitable nesting sites for a variety of bird species in the project area. Mortandad Canyon is expected to receive greater use than adjacent dry canyons due to the presence of a water source.

Foraging/Hunting Areas

Higher use areas, such as wetlands, can be expected to support greater densities and diversities of wildlife species. Additional intensive studies will be necessary to more accurately identify sensitive foraging and hunting areas for all groups of wildlife species in the project area, especially at the Proposed site.

Water Sources

All of the major canyon systems at Los Alamos National Laboratory have ephermerally flowing streams. Portions of some of the canyons on Laboratory property, such as Mortandad Canyon, are fed by Laboratory facility outfalls or other artificial sources and receive relatively high amounts of use by a variety of wildlife species. Areas receiving intermittent flow also provide important sources of water during certain times of the year for species such as amphibians and migratory animals.

2.2.5 Floodplains and Wetlands

Both wetlands and floodplains exist in the project area. Sewage disposal ponds in Mortandad-Ten Site Canyon appear on the National Wetlands Inventory Maps as artificially and permanently flooded wetlands. The canyon bottom conveys both perennial and intermittent flows in Mortandad-Ten Site Canyon. Upper Mortandad Canyon is subject to perennial sewage effluent discharge.

3.0 HABITAT CHARACTERIZATION

This section is a compilation and detailed discussion of various surveys and studies conducted in the vicinity of the Proposed and Alternative RLWTF sites and in habitats similar to what is found in the vicinity of those sites. Much of the information was summarized in the Site Description Section of this document. This section contains information on wildlife species that occur in the project area or are expected to occur in the area due to existing suitable habitat. Because this is a compilation of different studies, the results and data are presented in different forms. This section is intended to be used as a biological reference section for the project area, to provide baseline source information for possible long-term monitoring, and to help identify biological components that will be necessary to evaluate possible impacts and develop appropriate mitigation measures. However, this section does not contain detailed enough information on all biological components in the project area to make conclusive statements. Where noted in the text, additional information will be required to appropriately assess the biological component.

3.1 Vegetation Studies

Studies to characterize the habitats based on vegetation characteristics were carried out at each of the project sites (Proposed and Alternative) and in the vicinity of the project area. These studies were conducted in canyons and mesas adjacent to the proposed facility. In addition to data collected at the actual Proposed and Alternative sites, the following references were used in describing the vegetation in this section:

Biggs 1993 (Canada del Buey)	A Biological Assesment for Operable Unit 1140 (in process)
Dunham 1993 (Ten Site Canyon, Mesa top)	A Biological and Wetland/Floodplain Assesment for Operable Units 1129and 1147
Foxx 1986 (Mesa top, Mortandad Canyon)	Vegetation Survey of Permanent Bird/Mammal Plots at Los Alamos National Laboratory
Biggs and Foxx 1993 (Canada del Buey)	A Biological Assesment for the Proposed Solid Waste Systems Consolidation (SWSC) Plant (in process)
Ripley, Douglas 1985 (Mortandad Canyon)	A Reconnaissance Vegetation Survey of Mortandad Canyon, Los Alamos National Laboratory, Los Alamos, New Mexico

3.1.1 Mesatop

3.1.1.1 Proposed Site

The proposed site, located on a mesatop, contains primarily understory species with few trees or shrubs. The area has been previously disturbed and many of the species present are typically associated with disturbed sites. Vegetation data were collected at two sites near the proposed RLWTF, one across from TA-52 and the other across from TA-50 (Table 11). The most common species at both sites were wormwood (*Artemisia carruthii*), false tarragon (*Artemisia dracunculus*), brome grass (*Bromus spp.*), and blue grama (*Bouteloua gracilis*).

Table 11. Vegetative Characteristics of Understory Species near the Proposed RLWTF, Mesatop.

SPECIES	RELATIVE PLANT COVER		RELATIVE FREQUENCY		IMPORTANCE INDEX	
	TA-52	TA-50	TA-52	TA-50	TA-52	TA-50
Wormwood	23.5	16.7	16.5	21.0	20.0	18.8
False tarragon	19.1	19.2	15.2	19.1	17.1	19.1
Brome grass	14.0	20.0	13.9	15.2	14.0	17.6
Blue grama	14.7	17.6	11.4	16.2	13.1	16.9
Wheatgrass	----	6.7	----	4.3	----	5.5
Bitterweed	8.2	----	10.1	----	9.1	----

All plant species recorded in these transects and in other studies conducted in habitats in the vicinity of the Proposed Site, are given in Appendix A.

3.1.1.2 Additional Studies

Foxx 1986 measured vegetation characteristics of two plant communities located in areas within or adjacent to the Proposed Site: A ponderosa pine plant community on a narrow mesa top situated between Mortandad and Ten-Site Canyon; and a pinyon-juniper woodland on a narrow mesa top between Mortandad Canyon and Canada del Buey.

Ponderosa Pine Community: Ponderosa pine trees dominate the ponderosa pine community and range in size from 4 to 14 inches dbh with an average density of 137 trees per acre. Of the trees, 54% were 7 to 10" dbh, 36% were 4 to 6" dbh, and 10% were 11 to 14" dbh. There were approximately 4

standing snags/acre and there was evidence of previous fires in the area. Approximately 28 ponderosa pine seedlings/acre and 12 one-seed juniper seedlings/acre were recorded. Canopy cover varied from less than 5% to nearly 50% for trees, shrubs, and grasses. Except where presented in text, detailed information on vegetation characteristics for each of the studies conducted in this and other areas discussed in this document are given in Appendix B.

Pinyon-Juniper Woodland: This community is dominated by pinyon pine and juniper trees with pockets of ponderosa pine. The ponderosa pine are generally large ranging from 9 to 14 inches dbh 50% of the trees 9 to 10 inches dbh. Pinyon pine trees ranged from less than 4 inches dbh (46%) to greater than 20 inches dbh. The average number of trees per acre was 157 but the density ranged from 20 to over 400 trees/acre. The dbh of juniper ranged from 4 to greater than 20 inches at the base with most of the trees ranging from 4 to 10 inches dbh. The average number of trees per acre was 58. The canopy cover ranged from primarily 5-25%. Grasses had the greatest cover around ponderosa pine and consisted mostly of blue grama, little bluestem, and needle-and-thread. Grasses within the pinyon pine and juniper trees were blue grama, galleta, and mountain muhly. Forb and shrub cover was generally less than 5% but ranged to 25%.

Transects were established on the mesatop of TA-52 to evaluate vegetation characteristics of the plant communities in that area (Dunham 1993). The dominant tree species were Colorado pinyon and one-seed juniper (Tables 12 and 13) and the most common shrubs were mountain mohagany and wavyleaf oak.

Table 12. Percent Cover, Average Basal Diameter, Density, Frequency and Importance Index of Tree Canopy, Mesatop, TA-52

			TRANSECT		
SPECIES		1	2	3	Avg
Colorado Pinyon					
	% 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
One-seed Juniper					
	% 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

Table 13. Percent Cover, Density, Frquency and Importance Index of Shrub Canopy, Mesatop, TA-52

		TRANSECT			
SPECIES		1	2	3	Avg
Mountain Mahogany					
	% 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
Wavyleaf oak					
	% 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
Gambel's Oak					
	% 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

3.1.2 Canyon

3.1.2.1 Alternative Site

The Alternative RLWTF Site is located in Mortandad Canyon and will occupy approximately seven acres and will consist of structures and/or road improvements on the south-facing slope, north-facing slope, and within the canyon bottom. The majority of the complex would be located on the south-facing slope. Vegetation data was collected at locations within the canyon bottom and along both slopes.

The canyon bottom overstory is dominated by ponderosa pine (90% relative cover, Table 14) with a midstory dominated by willow (99% relative cover, Table 15). The understory is dominated by rush which has a relative cover value of 53.1% (Table 16).

Table 14. Characteristics of Overstory Plant Species Recorded at the Alternative Site, Canyon Bottom.

SPECIES	TREES/ACRE	RELATIVE DENSITY	AVERAGE DBH	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE INDEX
One-seed juniper	6.2	4.7	1.1	0.0	11.5	5.4
Rocky Mountain juniper	3.1	2.3	1.0	0.0	15.4	5.9
Ponderosa pine	108.9	81.4	7.6	90.0	42.3	71.1
Douglas fir	3.1	2.3	12.7	10.3	11.5	8.1
Snag (standing dead tree)	12.5	9.3	10.9	0.0	19.2	9.5

Table 15. Characteristics of Midstory (shrubs) Plant Species Recorded at the Alternative Site, Canyon Bottom.

SPECIES	RELATIVE DENSITY	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE INDEX
Wavy-leaf oak	4.4	0.0	9.8	4.7
Gambel oak	20.0	0.0	17.1	12.4
Skunkbush sumac	2.2	0.0	9.8	4.0
Willow	44.4	98.5	31.7	58.2
Rose	8.9	1.1	9.8	6.6
Chokecherry	11.1	0.1	7.3	6.2
Mountian mohagany	4.4	0.0	7.3	3.9
Barberry	4.4	0.4	7.3	4.0

Table 16. Characteristics of Understory Plant Species Recorded at the Alternative Site, Canyon Bottom.

SPECIES	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE INDEX
Rush	53.1	25.8	39.4
Cattail	12.2	17.4	14.8
Willow	4.7	9.9	7.3
Redtop	7.2	8.3	7.8
Rose	7.7	9.1	8.4

The only overstory species recorded along the south-facing slope was ponderosa pine (Table 17). However, the south-facing slope is more "shelf-like" in appearence as opposed to a steep incline. Because it is a very gradual incline, the climatological and topographical features favor moist conditions. In comparison, a typical dry south-facing slope that would consist of species such as juniper and pinyon pine is, for the most part absent. The midstory is dominated by mountain mohagany and oak (Table 18) and the understory is dominated by muhly (50% relative cover, Table 19).

Table 17. Characteristics of Overstory Plant Species Recorded at the Alternative Site, South-facing Slope.

SPECIES	TREES/ ACRE	RELATIVE DENSITY	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE INDEX
Ponderosa pine	225.1	100	100	100	100

Table 18. Characteristics of Midstory (shrub) Plant Species Recorded at the Alternative Site, South-facing Slope.

SPECIES	RELATIVE DENSITY	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE INDEX
Gambel oak	4.8	0.0	10.0	4.9
Wavy-leaf oak	19.1	0.0	30.0	16.4
Currant	4.8	0.0	10.0	4.9
Mountain mohagany	71.4	100.0	50.0	73.8

* Importance index is average of density, cover, and frequency.

Table 19. Characteristics of Understory Plant Species Recorded at the Alternative Site, South-facing slope.

SPECIES	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE INDEX
Blue grama	6.4	11.1	8.7
Little bluestem	37.6	24.4	31.0
Golden aster	4.9	8.9	6.9
Muhly	49.4	48.9	49.1

* Importance index is average of density, cover, and frequency.

The north-facing slope is dominated by Douglas fir and ponderosa pine (relative cover values of 63 and 37%, respectively) with a midstory of primarily oak (85% relative cover). With the exception of oak seedlings, the understory is predominantly mountain muhly and pussytoes. Tables 20 through 22 give characteristics on plant species recorded on the north-facing slope of the Alternative Site.

Table 20. Characteristics of Overstory Plant Species Recorded at the Alternative Site, North-facing Slope.

SPECIES	TREES/ ACRE	RELATIVE DENSITY	AVERAGE DBH	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE INDEX
Ponderosa pine	65.3	19.8	7.4	36.6	44.0	33.5
Douglas fir	261.4	79.3	4.4	63.4	52.0	64.9
Snag	3.1	0.9	9.3	0.0	4.0	1.7

* Importance index is average of density, cover, and frequency.

Table 21. Characteristics of Midstory (shrub) Plant Species Recorded at the Alternative Site, North-facing Slope.

SPECIES	RELATIVE DENSITY	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE INDEX
Gambel oak	60.0	85.2	48.3	64.5
Wavy-leaf oak	2.5	0.0	6.9	3.1
Currant	1.3	0.0	3.5	1.6
Cliffbush	3.1	0.0	3.5	1.6
Mountain mohaganv	35.0	14.8	37.9	29.3

Table 22. Characteristics of Understory Plant Species Recorded at the Alternative Site, North-facing slope.

SPECIES	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE INDEX
Mountain muhly	9.9	20.0	15.0
Sedge	2.9	8.6	5.7
Pussytoes	12.4	8.6	10.5
Clematis	6.2	8.6	7.4
Oak	43.4	17.1	30.3
Strawberry	6.6	8.6	7.6

* Importance index is average of cover and frequency.

3.1.2.2 Additional Studies

3.1.2.2.1 Mortandad Canyon

3.1.2.2.1.1 North-Facing Slope. No additional information is available.

3.1.2.1.1.2 Canyon Bottom

Vegetation characteristics of a riparian area were collected in several locations within Mortandad Canyon. Ponderosa pine, many of which are large ranging from 14 inches dbh and higher, dominates the lower portions of the canyon. Box maple, with scattered oak, is the dominant overstory species along the stream banks with scattered oak (see Appendix B for detailed tables of data for this section). Canopy cover within the canyon bottom ranges from less than 5% to 95% with a greater density in the upper portions of the canyon. The highest grass cover was recorded in the lower areas.

Transects were set up in 1985 (Ripley) to obtain information on the riparian area of Mortandad Canyon. The lower portion of the canyon is dominated by pinyon pine, one-seed juniper, and oak. Up canyon from this area, the ponderosa pine plant community dominates as the canyon narrows. The upper

reaches of the canyon are dominated by Douglas-fir, white fir, and various riparian species such as boxelder. Appendix C gives vegetation characteristics of various locations along Mortandad Canyon.

3.1.2.2.1.3 South-Facing Slope

One of the transects set up in 1985 (Ripley) was placed on the south-facing slope of Mortandad Canyon. Ponderosa pine was the dominant overstory species, rose the most common midstory species, and bluegrass the most common understory species (Appendix B).

3.1.2.2.2 Ten Site Canyon

3.1.2.2.2.1 North-facing Slope

Vegetation studies in canyons of TA 52 were conducted in 1991 (Dunham 1993). Tables 23 and 24 provide characteristics of plants on the north-facing slopes of Ten Site Canyon.

Table 23. Percent Cover, Average Basal Diameter, Density, Frequency and Importance Index of Tree Canopy, Canyon Rim and North-facing Slope, TA-52

	Canyon Rim	North-facing Slope		
Species	1	1	2	Avg
Douglas Fir				
% 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
Ponderosa Pine				
% 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

Table 24. Percent Cover, Density, Frquency and Importance Index of Shrub Canopy, Canyon Rim and North-facing Slope, TA-52

	Canyon Rim	North-facing Slope		
Species	1	1	2	Avg
Gambel's Oak				
% 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
Mountain Mahogany				
% 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
Colorado Barberry				
% 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
Wavyleaf Oak				
% 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

As shown in Tables 23 and 24, the slope is dominated by Douglas fir and oak. The presence of fir characterizes this habitat as a mixed conifer forest.

3.1.2.2.2.2 Canyon Bottom

The canyon bottom of Ten Site Canyon is dominated by ponderosa pine with Russian olive (Table 25) and willow is the most common shrub (Table 26). Based on these dominants. the area can be classified as a Ponderosa Pine Community with established riparian areas.

Table 25. Percent Cover, Average Basal Diameter,Density, Frequency and Importance Index of Tree Canopy, Canyon Bottom, TA-52

Species	Transect 1	2	3	Avg
Ponderosa Pine				
% 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
Russian Olive				
% 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
Douglas Fir				
% 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

Table 26. Percent Cover, Density, Frquency and Importance Index of Shrub Canopy, Canyon Bottom, TA-52

Species	Transect 1	2	3	Avg
Salix (willow) sp.				
% 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
Gambel's Oak				
% 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
Mountain Mahogany				
% 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
Wavyleaf Oak				
% 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

Tables 23-26 indicate Ten Site Canyon is characterized by a mixed-conifer community on the north-facing slope and a ponderosa pine/riparian community along portions of the canyon bottom.

3.1.2.2.2.3 South-Facing Slope. No additional information available.

3.1.2.2.3 Canada del Buey

3.1.2.2.3.1 North-facing Slope

Ponderosa pine is the dominant overstory species along the north-facing slope of upper Canada del Buey above the SWSC facility (Table 27). One-seed juniper had a high relative frequency value (41%), but its overall importance index (II of 25%) was much lower than ponderosa pine. Pinyon pine was the only other species recorded. Mountain mohagany, with common occurrences of gambel oak, is the dominant shrub species (II of 66%) along the north-facing slope (Table 27).

Table 27. Overstory Vegetation Characteristics of North-facing Slopes in Upper Canada del Buey.

SPECIES	REL. DENSITY	AVG DBH	REL. COVER	REL. FREQ.	IMPORT. INDEX
TREES					
One-seed juniper	30.88	1.80	4.10	40.91	25.30
Pinyon pine	2.94	2.95	0.00	4.55	2.50
Ponderosa pine	66.18	10.69	95.90	54.55	72.21
TOTAL	100		100	100	100
SHRUBS					
Gambel oak	14.44	****	24.48	30.00	22.97
Skunkbush sumac	5.35	****	1.52	16.70	7.84
Currant	1.60	****	0.00	6.70	2.76
Mountain mohagany	78.61	****	74.00	46.70	66.43
TOTAL	100		100	100	100

**** Indicates attribute not recorded for this species.

Mountain muhly is the dominant understory species along the north-facing slopes of Canada del Buey (Table 28), and was particularly common below the SWCS plant (II=71%). Sedge was relatively common (II=12%) along with mountain muhly in upper Canada del Buey.

Table 28. Understory Vegetation Characteristics of the North-facing Slope, Canada del Buey.

SPECIES	RELATIVE COVER		RELATIVE FREQUENCY		IMPORTANCE INDEX	
	SWCS[1]	Upper	SWCS	Upper	SWCS	Upper
Mountain muhly	72.36	39.36	70.00	23.61	71.18	31.48
Blue grama	4.73	8.85	6.67	5.56	5.70	7.20
Wheatgrass	****	4.34	****	6.94	****	5.64
Sedge	****	9.87	****	13.89	****	11.84
TOTAL[2]	77.09	62.42	76.67	51.00	76.88	56.16

**** Indicates species not recorded for this site or importance value less than 5.0%.

[1] SWCS=Transect below SWCS

[2] Upper=Transect in upper Canada del Buey

3.1.2.2.3.2 Canyon Bottom

Ponderosa pine is the most dominant species along the canyon bottom of Canada del Buey below the SWCS plant (Table 29) where there is a mixture of single and multi-stemmed overstory species. Juniper is also common (II of 24%); pinyon pine was not recorded in the transect and Douglas fir is also found along the canyon bottom but in relatively low amounts. The dominant shrub in the area is chokecherry (II of 26%) with fewer occurrences of oak, skunkbush sumac, currant, and barberry (Table 29).

Table 29. Overstory Vegetation Characteristics for Canyon Bottom Below SWCS, Canada del Buey (circular plot).

SPECIES	REL. DEN.	AVG. DBH	REL. COVER	REL.FREQ.	IMPORT. INDEX
TREES					
One-seed juniper	1.36	7.52	42.55	27.27	23.73
Ponderosa pine	98.64	1.45	42.55	63.64	68.18
Douglas fir	0.00	0.00	15.20	9.09	8.10
SHRUBS					
Gambels oak	1.57	****	23.68	14.89	13.38
Skunkbush sumac	22.53	****	6.55	17.02	15.37
Currant	25.80	****	9.74	19.15	18.23
Wild rose	0.39	****	6.99	6.38	4.59
Chokecherry	34.85	****	23.91	19.15	25.97
Barberry	11.14	****	17.87	8.51	12.51
New Mexico olive	3.07	****	5.04	6.38	4.83

**** Indicates attribute not measured for this species.

Similarly, ponderosa pine is the dominant overstory species within the canyon bottom within a second transect below the SWCS plant (Table 30) where there is primarily single-stemmed overstory species. Skunkbush sumac is the dominant shrub species with common occurrences of gambel oak and mountain mohagany. Currant is also found along the canyon bottom but in low quantities (relative frequency of 9%).

Table 30. Overstory Vegetation Characteristics of the Canyon Bottom Below SWCS, Canada del Buey.

SPECIES	RELATIVE DENSITY	AVG DBH	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE INDEX
TREES					
One-seed juniper	10.71	1.85	2.48	22.22	11.80
Ponderosa pine	89.29	9.00	97.52	77.78	88.20
TOTAL	100		100	100	100
SHRUBS					
Gambel oak	10.79	****	33.95	18.18	20.98
Skunkbush sumac	61.15	****	43.72	45.45	50.11
Currant	19.42	****	0.00	9.09	9.51
Mountain mohagany	8.63	****	22.33	27.27	19.41
TOTAL	100		100	100	100

**** Indicates attribute not recorded for this species.

Four transects were established in upper Canada del Buey and one below the SWCS facility, to measure understory characteristics. In most transects in upper Canada del Buey, mutton grass was the dominant species (Table 31). Additional common species include mountain muhly, western virgin's bower, horseweed, and redtop. Meadowrue and sedge were the dominant understory species in one transect.

Little bluestem, wolftail, and nodding brome were the most common understory species within the transect below the SWCS plant with lesser amounts of lupine, mutton grass, and wormwood (Table 32). However, the amount of data collected for this area was limited. A more complete presentation of vegetation information for the lower portion of Canada del Buey is given in Banar (1993).

Table 31. Understory Vegetation Characteristics within the Canyon Bottom, Upper Canada del Buey.

SPECIES	RELATIVE COVER				RELATIVE FREQUENCY				IMPORTANCE INDEX			
	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4
Western virgin's bower	***	***	***	6.82	***	***	***	12.12	***	***	***	13.81
Sweet clover	***	***	***	13.43	***	***	***	9.09	***	***	***	11.26
Mutton grass	***	41.11	20.50	38.43	***	21.21	14.28	24.24	***	31.16	17.40	31.34
Redtop	***	15.30	37.25	6.20	***	6.06	17.86	6.06	***	10.68	27.56	6.13
Poison ivy	***	***	***	8.26	***	***	***	3.03	***	***	***	5.65
Muhly (*M. racemosa*	***	***	2.67	***	***	***	7.14	***	***	***	4.91	***
Rush	***	***	15.15	***	***	***	3.57	***	***	***	9.36	***
Quackgrass	6.10	***	1.78	***	6.67	***	7.14	***	6.39	***	4.46	***
Horseweed	***	4.97	1.25	***	***	15.15	10.71	***	***	10.06	5.98	***
Virginia creeper	***	6.69	5.35	***	***	6.06	3.57	***	***	6.38	4.46	***
Pussytoes	***	***	10.70	***	***	***	3.57	***	***	***	7.13	***
Mountain muhly	***	15.30	***	***	***	18.18	***	***	***	16.74	***	***
Downy chess	***	5.74	***	***	***	6.06	***	***	***	5.90	***	***
Wormwood	***	3.82	***	***	***	6.06	***	***	***	4.94	***	***
Horsemint	***	6.10	***	***	***	6.67	***	***	***	6.38	***	***
Meadowrue	42.68	***	***	***	13.33	***	***	***	28.01	***	***	***
Bottlebrush squirreltail	6.10	***	***	***	6.67	***	***	***	6.38	***	***	***

Sedge	18.29	***	***	***	13.33	***	***	***	15.81	***	***	***
TOTAL	73.17	99.03	94.65	73.14	40.00	85.45	67.84	54.54	56.68	92.24	81.26	67.80

**** Indicates species not recorded for this site or overall importance index is < 5%.

Table 32. Understory Vegetation Characteristics of the Canyon Bottom Below SWCS, Canada del Buey.

SPECIES	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE INDEX
Little bluestem	29.82	22.73	26.28
Lupine	10.18	5.45	7.82
Wolftail	19.48	12.73	16.10
Nodding brome	14.80	4.55	9.67
Bluegrass	8.40	8.18	6.00
TOTAL	82.68	53.64	65.87

3.1.2.2.3.3 South-Facing Slope

Circular plots were established along the base of a south-facing cliff face (above the canyon bottom) of Canada del Buey above the SWCS facility and along the canyon bottom below the SWCS facility. One-seed juniper and pinyon pine are co-dominants along the base of the south-facing cliff face with lesser occurrences of ponderosa pine. The relative cover of ponderosa pine is greater than juniper (36% compared to 25%, respectively) but ponderosa pine occured in only half as many plots as juniper (Table 33) and its relative density is only 25% of juniper. Oak and mountain mohagany are the dominant shrub species (II of 37% and 32%, respectively) along the south-facing slope (Table 33). Line intercept transects were set up at the base of the south-facing slope near the canyon bottom (Table 34) and ponderosa pine was the most common overstory species (II of 61%). Pinyon pine and juniper are also found along the base of the slope

with moderate relative frequency values (22% and 30%, respectively) but lower overall importance indexes (Table 34). Mountain mohagany is the dominant shrub species with lesser occurrences of oak and skunkbush sumac (Table 34).

Table 33. Overstory Vegetation Characteristics for South-facing Slope, Canada del Buey (circular plot).

SPECIES	RELATIVE DENSITY	AVERAGE DBH	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE INDEX
TREES					
Pinyon pine	52.63	7.9	39.62	40.00	44.08
One-seed juniper	43.08	5.2	24.60	40.00	33.81
Ponderosa pine	10.53	9.5	35.78	20.00	22.10
SHRUBS					
Oak	40.45	****	40.62	28.57	36.55
Skunkbush sumac	11.24	****	15.07	28.57	18.29
Currant	2.25	****	22.16	14.29	12.90
Mountain mohagany	46.07	****	22.16	28.57	32.27

**** Indicates attribute not measured for this species.

Table 34. Overstory Vegetation Characteristics of the South-facing Slope (base), Upper Canada del Buey.

SPECIES	REL. DEN.	AVG DBH	REL. COV.	REL. FREQ.	IMPORT. INDEX
TREES					
One-seed juniper	24.44	5.8	17.16	29.63	23.74
Pinyon pine	15.56	3.2	0.71	22.22	12.83
Ponderosa pine	57.78	11.1	82.13	44.44	61.45
Snag	2.22	8.9	0.00	3.70	1.98
TOTAL	100		100	100	100
SHRUBS					
Oak	15.38	****	20.49	26.09	20.65
Skunkbush sumac	23.08	****	9.84	21.74	18.22
Currant	5.13	****	0.00	8.70	4.61
Mountain mohagany	53.85	****	53.28	39.13	48.75
New Mexico olive	2.56	****	16.39	4.35	7.77
TOTAL	100		100	100	100

**** Indicates attribute not recorded for this species.

Blue grama occurs in small amounts on north-facing slopes but is the dominant understory species on the south-facing slope of Canada del Buey (Table 35).

Table 35. Understory Vegetation Characteristics of the South-facing Slope, Canada del Buey.

SPECIES	RELATIVE COVER	RELATIVE FREQUENCY	IMPORTANCE INDEX
Mountain muhly	3.31	6.25	4.78
Blue grama	82.78	62.50	72.64
James hidden flower	3.31	6.25	4.78
Snakeweed	3.31	6.25	4.78
Antelope sage	6.62	12.50	9.56
TOTAL	99.33	93.75	96.54

3.2 Wildlife Studies

Species information from studies described in this section have been gathered from locations in the vicinity of the proposed project within habitats similar to those found in the project area. These studies differ in their objectives and analysis and therefore the data provided in this section is presented in different forms.

3.2.1 Mammals

Small and large mammal studies have been and are currently being conducted in the general area of the RLTWF. Several studies have been conducted in Mortandad Canyon and Ten Site Canyon and the adjacent mesa tops. Additionally, more detailed studies have been conducted in Canada del Buey east of the project area. The studies in Canada del Buey have been conducted to provide baseline data on the biological components of the canyon prior to effluent release from the proposed SWSC facility. Due to some similarities in habitat between Mortandad and Ten Site Canyons and Canada del Buey, this data can, to a degree, be applied to Mortandad and Ten Site Canyons . However, it should be noted that Canada del Buey is currently a dry canyon whereas Mortandad Canyon contains a flowing stream channel in certain stretches and pools of standing water. The occurrence of water provides habitat features that likely attract

certain species and varying degrees of use by other species than what may be found in Canada del Buey.

3.2.1.1 Small Mammals

To obtain species diversity information, small mammal surveys were conducted in 1992, above and below the tritium outfall (051-051) in Mortandad Canyon. This area is immediately adjacent to the Alternative site. Information on diversity indices for small mammals captured during these trapping sessions is given in Section 5 of this document. Table 36 lists the species captured during the trapping sessions in those locations.

Table 36. Small mammal species captured in Mortandad Canyon along tritium outfall, 1992.

Common Name	Scientific Name
Least chipmunk	*Eutamias minimus*
Colorado chipmunk	*Eutamias quadrivatattus*
Long-tail vole	*Microtus longicaudus*
White-throated woodrat	*Neotoma albigula*
Mexican woodrat	*Neotoma mexicana*
Brush mouse	*Peromyscus boylii*
Deer mouse	*Peromyscus maniculatus*

Miera *et al.* (1974) and Kent (1986) live-trapped small mammals within 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 37 lists the results of these studies and visual observations.

TABLE 37: Mammals OU 1129 and OU 1147

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
CANIDAE	*Canis latrans*	Coyote	3
	Vulpus vulpus	Red fox	3
CERVIDAE	*Cervus elaphus*	Elk	3
	Odocoileus hemionus	Mule deer	3

CRICETIDAE	*Neotoma mexicana*	Mexican woodrat	2,3
	Peromyscus boylii	Brush mouse	1,2
	P. maniculatus	Deer mouse	1,2
	P. trueii	Pinon mouse	2,3
	Reithrodontomys megalotis	Western harvest mouse	2,1
ERETHIZONTIDAE	*Erethizon dorsatum*	Porcupine	3
FELIDAE	*Felis concolor*	Mountain Lion	3
	Lynx rufus	Bobcat	3
LEPORIDAE	*Sylvilagus audubonii*	Desert cottontail	3
MUSTELIDAE	Mustela frenata	Long-tailed weasel	3
	Taxidae taxus	Badger	3
SCIURIDAE	*Eutamius minimus*	Least chipmunk	2,3
	E. quadrivittatus	Colorado chipmunk	2
	Sciurus aberti	Abert's squirrel	2,1
URSIDAE	*Ursus americanus*	Black bear	3

1=Kent 1981
2=Miera and Hakonson 1974
3=Probable, or observed

Seven small mammal species were captured during a July 1991 trapping session along a stretch of approximately 1.5 miles in Canada del Buey below the proposed SWCS facility: least chipmunk, Colorado chipmunk, white-throated woodrat, Mexican woodrat, brush mouse, deer mouse, and rock squirrel. The same area was trapped in June 1992. During this study, there were also seven species of small mammals captured: least chipmunk; Colorado chipmunk; white-throated woodrat; harvest mouse, long-tail vole (*Microtus longicaudus*); brush mouse and deer mouse.

Habitats were defined in the trapping area to determine species and habitat use patterns. Different vegetative components were recorded for the north-facing slope, south-facing slope, and canyon bottom, particularly with respect to the overstory species. The north-facing slope consisted of mixed conifer overstory species such as ponderosa pine (the dominant species), and fir, with oak the dominant shrub species in many locations. The canyon bottom has a mixture of ponderosa pine with various shrubs and grasses, and the south-facing slope consists of scattered pinyon pine and juniper on rocky slopes mixed with shrubs and grasses. Data collected for the trapping sessions were also divided by area that included upper, middle, and lower. Although vegetation transects

were not set up specifically to identify vegetative features of the upper, middle, and lower areas (or for the habitats), certain features were obvious. These primarily pertained to dominant species and cover (openess). The upper portion of the trapping area within Canada del Buey appeared to have the greatest amount of cover with dominant species including ponderosa pine, oak, currant, sumac, and chokecherry. The middle area was, for the most part, void of tree species (with the exception of the base of the north-facing slope). The common species were sumac, currant, and chokecherry with a mixture of grasses. The lower area appeared to have the least amount of ground cover, particularly within the canyon bottom. Similar species occurred here as in the middle and upper areas but in lower densities.

Based on information in Table 38, the greatest number of captures in 1991, occurred in the canyon bottom and in the upper area. However, both these locations had the highest number of trap nights. When comparing the number of captures to the total number of trap nights for a specific habitat or area, more accurate values are presented. The south-facing slope and middle area recorded the highest percentage of captures per trap night (57.5% and 39.6%, respectively). The lowest values were recorded in the canyon bottom and lower area.

The north-facing slope and middle and lower areas had the highest percentage of captures in 1992.

Table 38. Capture Rates by Habitat and Area for Canada del Buey.

HABITAT	TRAP NIGHTS		NUM. OF CAPTURES		CAPTURE RATE		OVERALL CAPT. RATE (%)	
	1991	1992	1991	1992	1991	1992	1991	1992
North-facing slope	92	92	41	46	44.6 (41/92)	50	10.1 (41/408)	11.1
South-facing slope	40	48	23	14	57.5	29.2	5.6	3.4
Canyon bottom	276	276	81	112	29.4	40.6	19.9	26.9
TOTALS	408	416	145	172				
AREA								
Upper	168	176	63	60	37.5	34.1	15.4	14.4
Middle	96	96	38	45	39.6	46.9	9.3	10.8
Lower	144	144	44	67	30.6	46.5	10.8	16.1
TOTALS	408	416	145	172				

During both trapping sessions, brush mouse was the most frequently captured species in all habitats and areas. Chipmunks were the second most frequently captured species in 1991, while deer mice were the second most frequently captured species in 1992.

As shown in Figures 3 and 4, brush mouse was the most common species captured in all habitats sampled during both sessions. More specifically, it recorded its highest number of captures per trap night on the north and south-facing slopes during both years. In comparison, deer mice had its greatest number of captures per trap night on north-facing slopes in 1991, and within the canyon bottom during 1992.

Figure 1: Percent Species Compostion by Habitat (based on total number of trap nights per habitat) for 1991.

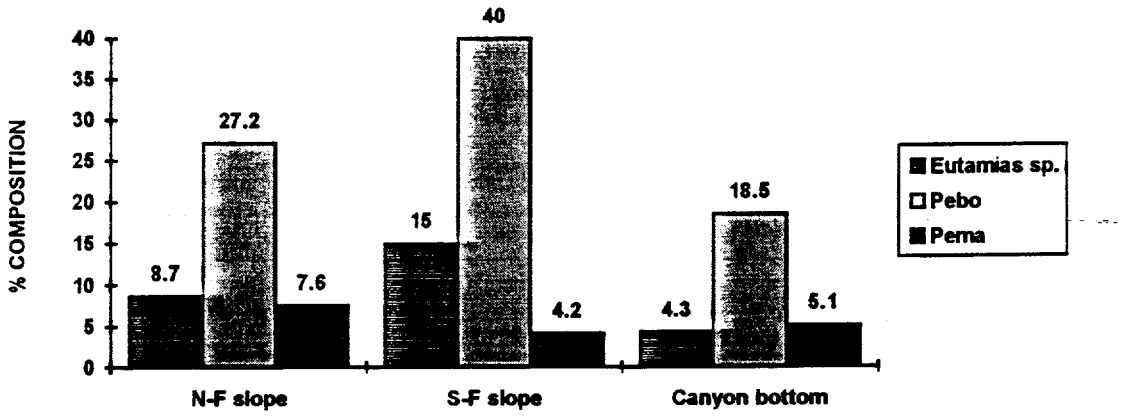


Figure 2: Percent Species Compostion by Habitat (based on number of captures to total number of trap nights) for 1992.

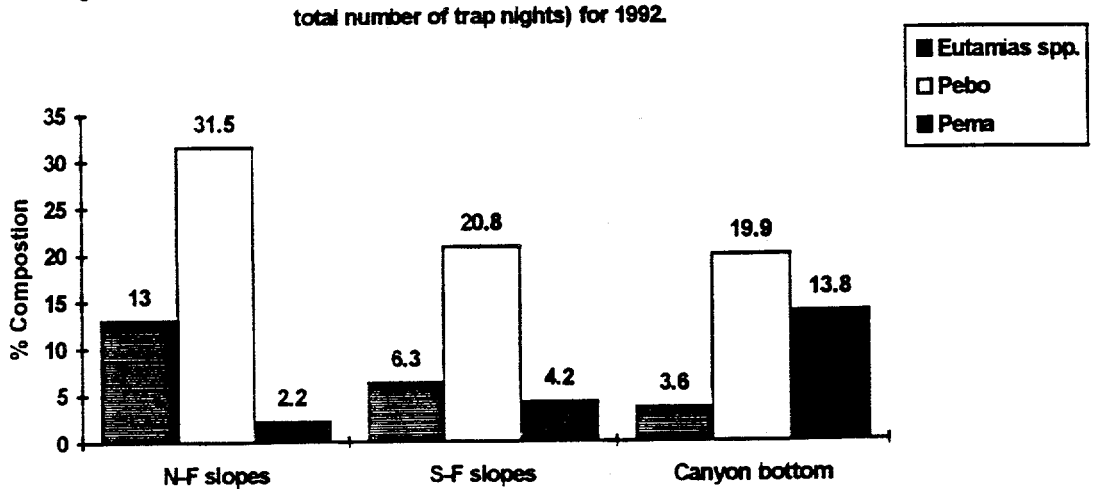
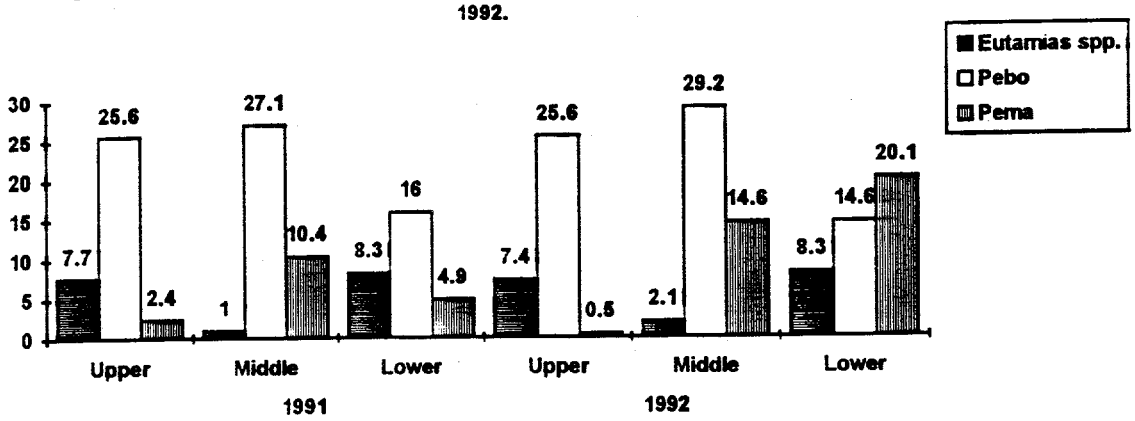


Figure 5 shows the overall species composition based on captures and Figures 6 through 11 show a breakdown of each area by habitat for the most frequently captured species during the 1991 and 1992 sessions.

Figure 3: Percent Compostion of Small Mammals in Areas of Canada del Buey, 1991-1992.

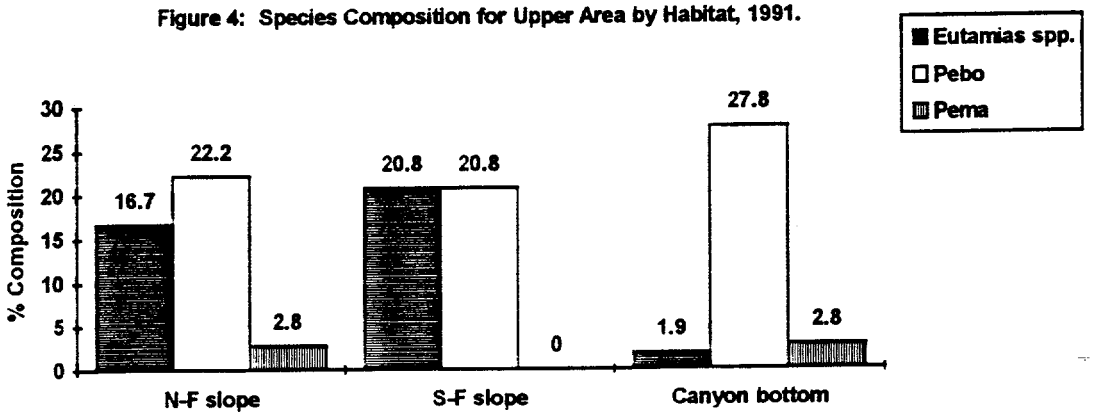


As shown in Figure 5, brush mouse was the most common species captured in all areas during the 1991 session. It was particularly more common in the upper and middle areas. Deer mice was least common in the upper area and most common in the middle area. In

comparison, brush mice were the most frequently captured species in the upper and middle areas but deer mice were the most common species in the lower area. To show a more accurate distribution of species within these areas, each area has been separated by habitat with percent species composition of each (Figures 6-11).

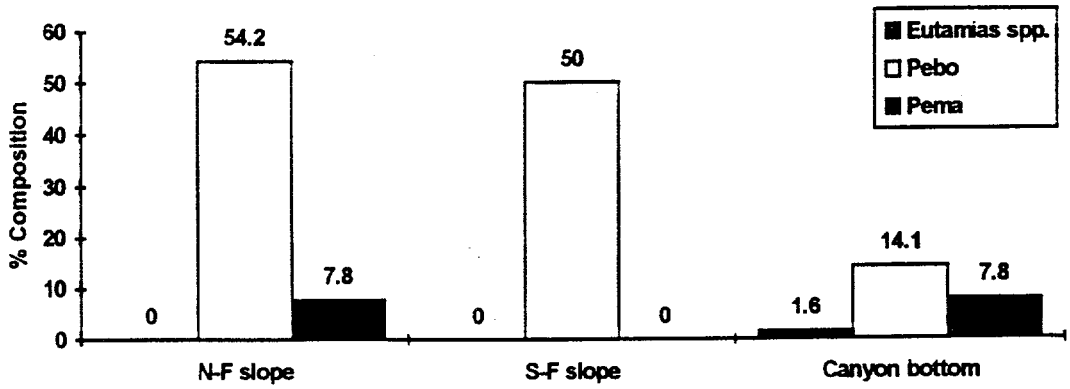
Brush mouse had the highest composition of all species in the north-facing slopes and canyon bottom of the upper area; brush mice and chipmunks were most common on south-facing slopes (Figure 6). Brush mice were most frequently found in the canyon bottom than elsewhere. Deer mouse composition was less than 5% in all habitats of the upper area.

Figure 4: Species Composition for Upper Area by Habitat, 1991.



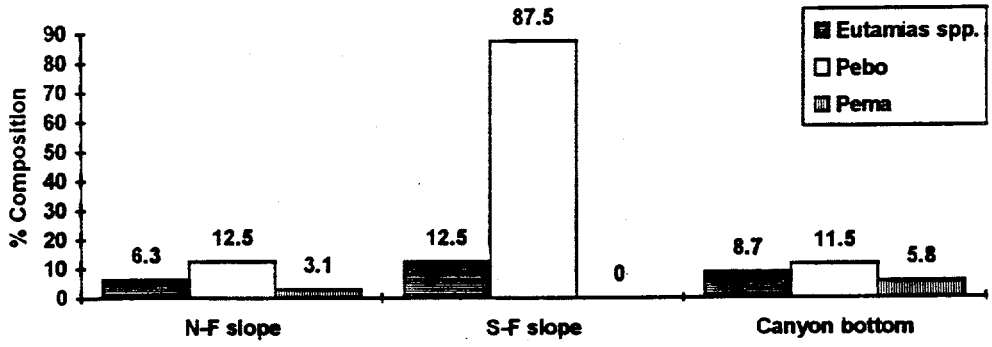
Brush mouse was also the most frequently captured species in all habitats of the middle area with deer mice the second most commonly captured species on north-facing slopes and in the canyon bottom (Figure 7). The percent composition of brush mouse was much less in the middle canyon bottom compared to the upper canyon bottom (28% and 14%, respectively). Deer mice had a slightly higher percent composition in the middle area compared to the upper area.

Figure 5: Species Composition for Middle Area by Habitat, 1991.



Brush mouse had the highest composition in all habitats in the lower area (Figure 8) but particularly so on the south-facing slope (88%). Deer mouse recorded the lowest composition in all habitats.

Figure 6: Species Composition for Lower Area by Habitat, 1991.

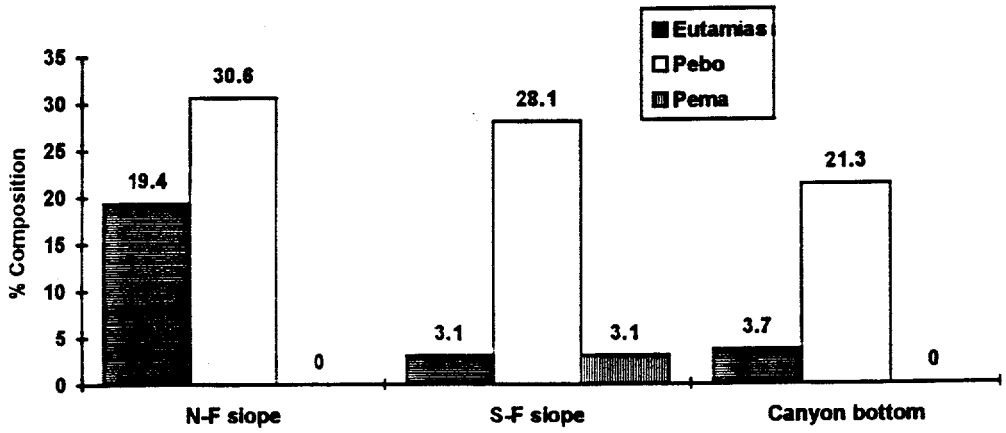


A different combination of percent composition were observed during the 1992 trapping session as compared to the 1991 session. The 1992 data may be more accurate in its percent compositions due to a greater sample size collected (145 captures in 1991 compared to 172 in 1992).

Brush mouse had the highest composition in all habitats in the upper area during the 1992 session which is consistent with the 1991 data (Figure 9). Also consistent with the

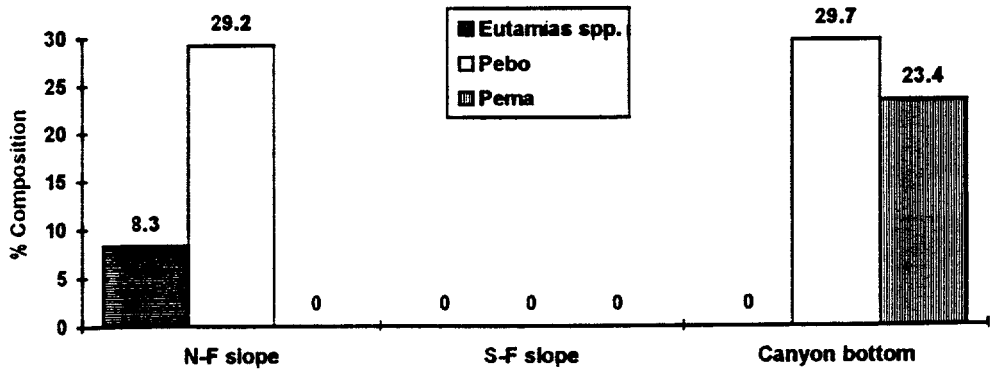
1991 data, deer mice had a composition less than 5% in any one habitat in the upper area during the 1992 session.

Figure 7: Species Composition for Upper Area, 1992.



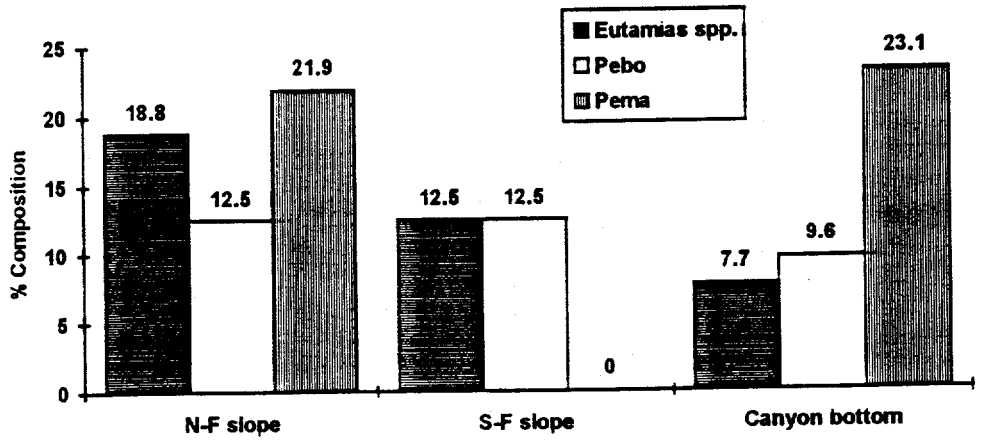
Brush mouse had a similar percent composition on the north-facing slope and canyon bottom of the lower area (Figure 10). Deer mouse was found in much greater frequency than in 1991; however, although it occurred only in the canyon bottom, it had one of its highest percent compositions of any habitat of any area in 1991 or 1992. Also of note is the absence of any deer mice captures within the south-facing slope in 1992, whereas brush mouse had a high percent compostion at this location in 1991.

Figure 8: Species Composition for Middle Area by Habitat, 1992.



Data collected in the lower area during 1992 also differed substantially from the data collected in 1991. Deer mouse had the highest percent composition in the north-facing slope and canyon bottom, whereas brush mouse had the lowest percent in the north-facing slope and was less than half the deer mouse composition in the canyon bottom (Figure 11).

Figure 9: Species Composition for Lower Area by Habitat, 1992.



The Lincon-Peterson Index was also used to estimate abundance of overall rodent populations in each area sampled in Canada del Buey. These values are provided for relative comparisons only and do not represent specific size areas (i.e., density estimates). Based on these calculations, the upper area had the highest estimate, with 46.5 animals, and the middle area had the lowest abundance, with 21.5 animals (Table 39).

Table 39: Population Estimates of Rodents in Canada Del Buey Using The Lincoln-Peterson Index.

AREA	ESTIMATE	VARIANCE	95% CONFIDENCE INTERVAL
UPPER	46.50	58.2955	32-62
MIDDLE	21.50	2.5962	18-25
LOWER	36.00	1.2803	34-38

The model selection procedure of program CAPTURE chose the Model Mh as the appropriate model to be used for the brush mouse data (pooled for all areas) and the Jacknife estimator as the most appropriate estimate for population size. A population estimate (N) for brush mouse of 87 (s.e.=10.54) was calculated by CAPTURE. A range of 72 to 113 animals was estimated using a 95% confidence interval. The Lincoln-Peterson Index calculated a population estimate of 79 with a range of 63-95 at a 95% confidence interval.

When estimating population abundance of brush mouse using the Lincoln-Peterson index, the upper area had the highest abundance and the lower area had lowest estimate (Table 40).

Table 40: Population Estimates of the Brush Mouse in Areas of Canada Del Buey Using The Lincoln-Peterson Index.

AREA	ESTIMATE	VARIANCE	95% CONFIDENCE INTERVAL
UPPER	29.0	18.00	21-37
MIDDLE	26.5	57.75	12-41
LOWER	13.4	5.76	9-18

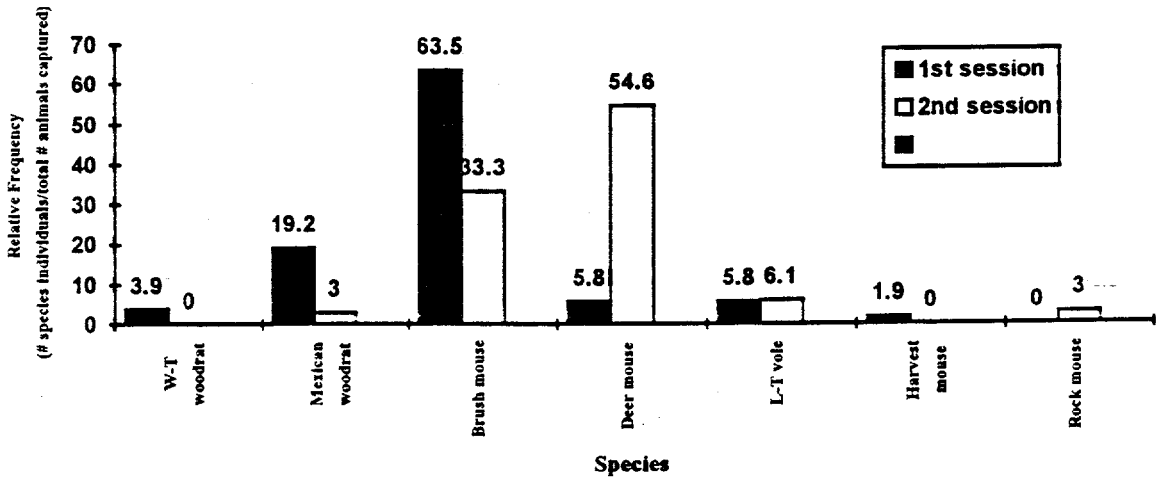
Information from the previously discussed study was also used to aid in evaluating possible future studies prior to effluent release from the SWSC facility. Based on information gathered from that study, a permanent small mammal live-trapping grid was set up in late June, 1992 and September 1992. The grid is located approximately 0.75 miles down canyon of the SWSC facility.

Six species of nocturnal small mammals were captured during the first session and five were caught during the second session. In the first session, deer mice, brush mouse, Mexican woodrat, white-throated woodrat, long-tailed vole, and harvest mouse

(*Reithrodontomys megalotis*) were captured. During the second session, deer mice, brush mice, rock mouse (*Peromyscus difficilis*), long-tailed vole, and Mexican woodrat were captured. In addition, two diurnal species were captured in the first session, Colorado chipmunk and least chipmunk, and one, Colorado chipmunk, during the second session,.

Brush mouse was the most frequently captured species during the first session with a relative frequency of 63.5% (33 individuals/52 total captures). Mexican woodrat was also common during the first session (Fig. 12). In contrast, deer mice were the most commonly captured species during the second session with a relative frequency of 54.5%. Brush mice were the second most frequently captured species (Fig. 12).

Figure 3. Relative Species Composition For Each Session.



Population and density estimates were calculated using program CAPTURE (White 1982). The M_0 model of CAPTURE estimated a probability of capture of 0.59 and a population estimate of 35 brush mouse (se=1.924) for the general grid area. The approximate 95% confidence interval is 34 to 42 brush mouse.

Table 41 lists brush mice population estimates and their accompanying standard error for each of the sub grids.

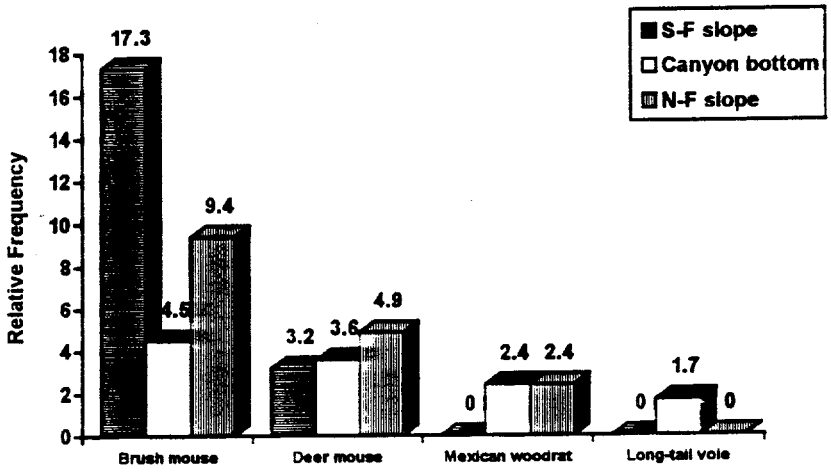
Table 41. Subgrid Population and Density Estimates Utilizing Model M_0 for Brush Mouse Data, June-July 1992.

GRID NUMBER	NO. OF ANIMALS CAPTURED	TOTAL NUMBER OF CAPTURES	ESTIMATED PROBABILITY OF CAPTURE	POPULATION ESTIMATE	STANDARD ERROR
1 (x=4-9, y=4-9)	9	13	0.39	11	2.75
2 (x=3-10, y=3-10)	13	21	0.48	15	2.10
3 (entire grid)	33	62	0.59	35	1.92

The M_0 model calculated a population estimate in the first session of 56 nocturnal small mammals in the grid (se=2.806) with a 95% confidence interval of 54 to 65 animals.

The total number of individuals captured for each species, based on the total number of trap nights for each location, was used to identify, if present, species/habitat relationships. Relative frequencies of the four most commonly captured species are shown in Figure 13. These frequencies are based on the total number of each species captured (including recaptures) divided by the total number of trap nights given in Table 38.

Figure 7. Relative Capture Frequencies For Most Commonly Captured Species.



Brush mice were the most frequently captured species in the grid and were the most frequently captured species on the south-facing slope (relative frequency=17.3%) and least common in the canyon bottom (4.5%). Deer mice were the second most

frequently captured species and were relatively evenly distributed throughout the study plot. Mexican woodrats were found primarily on the canyon bottom and north-facing slope. However, as shown on Figure 12, the captures were generally concentrated along the canyon bottom edge of the south-facing slope and along the rocky ledge on the north-facing slope. A total of seven captures were recorded for the long-tail vole, all of which were in the canyon bottom. One white-throated woodrat was captured in the study area and was on the south-facing slope. There was also one harvest mouse captured which was in the canyon bottom. One rock mouse was captured and recaptured on the south-facing slope.

The highest number of captures occurred on the south-facing slope (capture rate=23%) and on the north-facing slope (16%). The lowest number of captures per trap night occurred in the canyon bottom but the canyon bottom recorded the highest number of individual species. The lowest number of different species was found on the north-facing slope.

Morrison (1990) conducted a study on Mesita del Buey. Chipmunks were the only diurnal small mammals which were captured frequently enough to evaluate population size or density, yet they still were not captured in enough numbers to use the models appropriately in most cases. Trapping success on all grids was poor, and for the last two sampling periods, data were not adequate to estimate population parameters or density. Table 42 shows comparisons of population size and density, when they could be estimated, for each sampling period between canyon bottom and mesatop habitats.

TABLE 42

Population parameters estimated using program CAPTURE for chipmunk populations in canyon bottom and mesa top habitats at Canada del Buey, 1990. N = estimated population size; D = estimated population density, animals/ha. -- = this model not used for estimates in this habitat. ID = insufficient data to run the tests.

	HABITAT			
SAMPLING PERIOD	Canyon Bottom		Mesatop	
	N (SE)	D (SE)	N (SE)	D (SE)
1				
(general removal estimator)	27 (5.3)	12.35 (5.77)	11 (2.00)	3.69 (1.96)
(jackknife estimator)	34 (4.60)	13.68 (4.49)		
(Zippin estimator)		-- --	11 (2.00)	3.69 (1.96)
(null)	38 (6.09)	14.91 (9.58)	12 (2.47)	--
2	ID	ID	ID	ID
3	ID	ID	ID	ID
Average density		13.02 (0.67)		3.69 (0.00)

Although no chipmunk specimens were taken, it is likely that chipmunks found in the Canada del Buey system are Colorado chipmunks. All specimens taken by Jim Kent in 1986 were of this species.

Using these density estimates provided by CAPTURE for sampling period 1 (the only sampling period where enough captures were made to estimate population parameters), significantly greater densities of chipmunks were found in the canyon bottom habitat than in mesa top habitat (t=19.57, $P<0.05$)

Other mammals captured (in the canyon bottom only) were rock squirrels and a long-tailed vole, although not enough individuals of either species were captured to utilize these programs to evaluate population size or density (Table 43). Chipmunks were the only mammals captured on the mesa tops. Rock squirrels were observed high up on the canyon walls in the rocky habitat. Those captured were caught along the outer traps of the grid, in this habitat. It is possible that the grids did not extend far enough up the canyon walls to capture many rock squirrels. The long tailed vole was captured in the

grassy habitat in the bottom of the canyon. This species is closely associated with grass and meadow habitat, particularly in riparian areas. Although there is no true riparian habitat in the canyon bottom, the area near the upper fork is often wet due to runoff accumulating in this area, and vegetation there reflects the higher water table and increased exposure to moisture from runoff. The grassy habitat found here is typical of that occupied by voles, but considering that there is only a small area of this habitat, voles are likely not numerous and probably do not occur in many places throughout the length of the canyon. Jim Kent, in 1986, also captured long-tailed voles in the canyon (Table 43).

TABLE 43

Total numbers of small mammals captured in canyon bottom and mesatop habitats at Canada del Buey. (SP = sampling period)

	Canyon bottom			Mesa top		
SPECIES	SP1	SP2	SP3	SP1	SP2	SP3
Chipmunks	28	10	4	10	2	6
Rock squirrels	0	2	3	0	0	0
Long-tailed vole	0	1	0	0	0	0

Average adult and juvenile chipmunk weights were determined from captured animals, and total biomass was calculated for each habitat. When habitats were evaluated separately, both adult and juvenile average weights differed significantly between canyon bottom and mesa top habitats (adults, $t = 29.53$, $\mathbf{P} < 0.01$; juveniles, $t = 18.58$, $\mathbf{P} < 0.01$). Table 44 shows average weights and total biomass for adult and juvenile chipmunks in these two habitats in Canada del Buey. Greater chipmunk biomass occurred in the canyon bottom habitat.

Table 44. Mean weights (X) and total biomass (TB), in grams, of adult and juvenile chipmunks across all sampling periods in canyon bottom and mesa top habitats, Canada del Buey, 1990.

	Habitat					
	Canyon bottom			Mesa Top		
	N	X wt (SE)	TB	N	X wt (SE)	TB
Adult	44	67.5 (1.32)	2970	14	58.3 (1.97)	816.2
Juvenile	6	33.7 (2.49)	202	8	30.0 (1.61)	240.0
TOTAL BIOMASS			3172			1056.2

During the second sampling period, all chipmunks captured in the mesatop habitat were juveniles. This and the fact that few chipmunks were captured in this habitat at all, suggests that these individuals were probably dispersing juveniles, moving away from the canyon across the mesa top. All were captured in open pinyon-juniper woodland habitat, where there was little cover or food.

Transects

Table 45 shows estimates of chipmunk density within each habitat calculated using the line transect method and program TRANSECT. Significantly more chipmunks were counted in the canyon bottom habitat than in the mesatop habitat ($t = 16.53$, $P < 0.05$).

Table 45. Estimates of chipmunk densities using program TRANSECT in mesa top and canyon bottom habitats at Canada del Buey, 1990.

	Habitat			
	Canyon bottom		Mesa top	
Sampling Period	Transect Length (km)	Density (#/ha) (SE)	Transect Length (km)	Density (#/ha) (SE)
1	9.66	0.54 (.28)	12.87	0.58 (.29)
2	9.66	0.66 (.31)	12.87	0.56 (.25)
3	9.66	0.64 (.38)	12.87	0.57 (.26)
Average density (SE)		0.61 (.38)		0.57 (.75)

Table 46 shows results of survey trapping conducted in Canada del Buey and on Mesita del Buey by Kent (1986). A greater number of mammals were captured in the canyon itself, with deer mice and chipmunks being the most common. Although no

specific habitat descriptions are available, it is likely that the deer, brush, and pinyon mice and chipmunks were trapped in the rocky habitat on the canyon walls and the voles and harvest mice were trapped in the more mesic habitat in the canyon bottom. More pinyon mice were also caught on the mesa top in the pinyon-juniper woodland habitat, which is more characteristic of this species.

Table 46. Numbers of nocturnal small mammals captured during survey trapping in Canada del Buey by Jim Kent, 1986.

	Habitat	
Species	Canada del Buey	Mesita del Buey
Deer mouse	23	8
Pinyon mouse	3	4
Brush mouse	1	0
Peromyscus spp.	1	0
Chipmunk	9	2
Long-tailed vole	2	0
Western harvest mouse	2	1

The northern pocket gopher is also present in Canada del Buey. Although none were trapped either during the current or the 1986 study, one was found in a pitfall trap during reptile sampling during 1990. The trap was located in the canyon bottom at the base of the canyon walls in sandy soils near a gully which often flooded during rains.

Bats: Mist-netting for bats took place over open water between June 30 and July 5, 1992. These surveys did not take place in Mortandad Canyon. However, due to potentially suitable habitat (i.e., cliffs, open water) present in the project area, many of the bat species captured during the study could occur in the vicinity of Mortandad Canyon. General information is provided for those species captured. A more detailed account of the study and results can be found in Tyrell and Brack (1992).

A total of 94 bats representing 13 species were captured in 16 net nights. Table 47 lists the species captured with their percent of the total catch.

Table 47: Bats Captured During 1992 Mist-Netting Session At Los Alamos National Laboratory.

Common Name	Scientific Name	% of Total Catch
Big brown bat	*Eptesicus fuscus*	10.6
Pallid bat	*Antrozous pallidus*	10.6
Silver-haired bat	*Lasionycteris noctivigans*	16
Hoary bat	*Lasiurus cinereus*	11.7
California myotis	*Myotis californicus*	4.3
Long-eared myotis	*Myotis evotis*	7.4
Small-footed myotis	*Myotis leibii*	5.3
Fringed myotis	*Myotis thysanodes*	13.8
Yuma myotis	*Myotis yumanensis*	5.3
Long-legged myotis	*Myotis volans*	7.4
Western pipistrelle	*Pipistrellus hesperus*	1.1
Townsend's big-eared bat	*Plecotus townsendii*	1.1
Brazilian free-tailed bat	*Tadarida brasiliensis*	5.3

3.2.1.2 Large Mammals

Pellet group and scat counts have been conducted in Canada del Buey. Data collected in 1991 and part of 1992 has been analyzed. The study was designed to compare data between Canada del Buey and Pajarito Canyon (a wetland). However, only pellet count data is discussed for Canada del Buey due to the extension of Canada del Buey into the RLWTF project area. Data analysis revealed 28 deer pellet groups were found on circular plots (141/ha) and 14 were found on transects (90/ha). Elk pellet groups numbering 120 were found on circular plots (605/ha) and 92 were found on transects (590/ha). Table 48 provides information on pellet counts based on chi-square analysis and Table 49 summarizes the data for each season. The tables combine data from Pajarito Canyon and Canada del Buey from which relative comparisons can be extracted. Additional analysis of data are currently being conducted.

Table 48: Comparison of Deer and Elk Pellet Groups in Canada del Buey and Pajarito Canyon Using Circular Plots and Rectangular Transects.

	DEER		ELK	
AREA	PELLET[1] GROUPS	CANYON SELECTIVITY	PELLET GROUPS	CANYON SELECTIVITY
Circular Plots				
Canada del Buey	28	+	120	-
Pajarito Canyon	9	-	245	+
Transects				
Canada del Buey	14	0	92	-
Pajarito Canyon	21	0	229	+

1 Chi-square analysis followed by Bonferroni confidence intervals; +=more than expected, o=equal with expected, -=less than expected ($P<0.05$).

Table 49: Comparison of Deer and Elk Pellet Groups Between Seasons Using Circular Plots and Rectangular Transects.

	DEER		ELK	
AREA	PELLET[1] GROUPS	CANYON SELECTIVITY	PELLET GROUPS	CANYON SELECTIVITY
Circular Plots				
Summer				
Canada del Buey	9	0	32	0
Pajarito Canyon	6	0	52	0
Fall				
Canada del Buey	6	b	50	0
Pajarito Canyon	2		47	0
Winter				
Canada del Buey	2	b	18	-
Pajarito Canyon	1		48	+
Spring				
Canada del Buey	11	+	20	-
Pajarito Canyon	0	-	106	+
Transects				
Summer				
Canada del Buey	2	0	22	-
Pajarito Canyon	7	0	53	+
Fall				
Canada del Buey	5	b	33	0
Pajarito Canyon	5		45	0
Winter				
Canada del Buey	1	b	20	-
Pajarito Canyon	2		42	+

Spring				
Canada del Buey	6	0	17	-
Pajarito Canyon	7	0	89	+

1 Chi-square analysis followed by Bonferroni confidence intervals; +=more than expected, o=equal with expected, -=less than expected ($P<0.05$).

b Does not meet the assumptions of the chi-square statistic.

Additional species recorded for Canada del Buey based on scat counts, include bear (September and February), coyote (September), and fox (December and Febuary).

3.2.2 Birds

Several studies on birds have also been conducted in and around Canada del Buey for purposes of the SWSC facility. Most of these species can be expected to occur in Mortandad and Ten Site Canyons as well as the adjacent mesas. The analysis included only frequency information. Additional data analysis will be necessary to obtain statistical inferences.

Table 50 shows a listing of all bird species and their frequencies of observation noted in Canada del Buey by Morrison. Forty-three species were noted. Nineteen were found in the mixed conifer habitat along the upper part of the transect, 29 in the pinyon/juniper habitat within the lower canyon, and 31 in the Ponderosa pine habitat in mid-canyon (Table 51). Nine species were observed in all 3 habitats (Table 52). Table 53 lists the most frequently observed (>10%) species in each habitat. The rufous-sided towhee appeared commonly in both the pinyon/juniper and ponderosa pine habitat, while the western wood peewee was common in both the mixed conifer and ponderosa pine habitat.

No point-count transects were conducted in mesa top pinyon-juniper habitat in 1990. However, Table 54 lists common species in order of decreasing frequency, which were detected in pinyon-juniper habitat similar to that on the mesa tops surrounding

Canada del Buey. These data were collected during 1988 throughout the Laboratory, and it is assumed that these species would currently be present in the mesa top habitat near Canada del Buey.

Additional observations of species were made at times other than during the walking of the transect. A brown creeper was seen in the upper canyon, in mixed conifer habitat just below TA-46,. This species is known to be strongly associated with old growth mixed conifer habitat. A red-tailed hawk was observed several times in the lower part of the canyon. The fact that vocalizations were heard on almost every observation occasion suggests the presence of nesting activity by these hawks. A Cooper's hawk was also seen, flying across the canyon (south to north) in the upper canyon, in Ponderosa pine habitat. No nest structures were observed during the 1990 field season, but habitat looked suitable for nesting by Cooper's hawks, and further searching is necessary to confirm breeding activity by the species, if indeed present.

Table 50: Bird species present and frequencies (%) in all 3 habitats in Canada del Buey, 1990.

		HABITAT	
SPECIES	MIXED CONIFER	PINYON/JUNIPER	PONDEROSA PINE
Northern flicker	5.4	1.3	
American Robin	11.0		0.5
Brown-headed cowbird	1.8	1.3	2.7
Black-headed grosbeak	1.8	1.3	0.5
Broad-tailed hummingbird	1.8	2.7	6.0
Common nighthawk	1.8		
Hermit thrush	1.8		
Red crossbill	14.3	2.7	6.6
Western tanager	3.6		2.2
Grace's warbler	1.8		
Hammond's flycatcher	3.6		0.5
House wren	5.4		1.1
Mountain chickadee	5.4		1.1

Rufous-sided towhee	7.1	12.8	15.4
Violet-green swallow	3.6	7.3	6.0
Virginia warbler	3.6	3.4	6.0
Warbling vireo	1.8		
White-breasted nuthatch	8.9	1.3	2.2
Western wood peewee	16.1	3.4	11.5
Mourning dove		2.0	
Red-tailed hawk		0.7	
Turkey vulture		0.7	
Ash-throated flycatcher		7.3	4.9
Hairy woodpecker		0.7	1.1
Scrub Jay		6.7	1.6
Solitary vireo		1.3	2.2
Stellar's Jay		0.7	
Western bluebird		2.0	3.3
Bewick's wren		1.3	0.5
Blue-gray gnatcatcher		0.7	0.5
Canyon wren		2.0	1.6
Chipping sparrow		10.1	8.2
Gray flycatcher		4.0	
House finch		6.7	
Lesser goldfinch		4.7	2.7
Plain titmouse		2.7	2.2
Pygmy nuthatch		6.0	3.8
Say's phoebe		1.3	
Common raven			0.5
Yellow-bellied sapsucker			1.1
Rock wren			1.1
Unidentified flycatcher			1.1
Unidentified finch			0.5

TABLE 51. Total number of species observed in all 3 habitats, Canada del Buey, 1990.

		HABITAT	
	Mixed Conifer	Pinyon/Juniper	Ponderosa Pine
Total Species	19	29	31
Number of points in this habitat	4	13	13
Frequency of points in this habitat (%)	13	43	43

Table 52: Bird species and frequencies (%) observed in all 3 habitats in Canada del Buey, 1990

		HABITAT	
SPECIES	Mixed Conifer	Pinyon/ Juniper	Ponderosa Pine
Brown headed cowbird	1.8	1.3	2.7
Black-headed grosbeak	1.8	1.3	0.5
Broad-tailed hummingbird	1.8	2.7	6.0
Red crossbill	14.3	2.7	6.6
Rufous-sided towhee	7.1	12.8	15.4
Violet-green swallow	3.6	7.3	6.0
Virginia warbler	3.6	3.4	6.0
White breasted nuthatch	8.9	1.3	2.2
Western wood peewee	16.1	3.4	11.5

Table 53: Most frequently observed (>10%) species in all 3 habitats, Canada del Buey, 1990.

Habitat		
Mixed Conifer	Pinyon/ Juniper	Ponderosa Pine
Red crossbill	Rufous-sided towhee	Rufous-sided towhee
Western wood peewee	Chipping sparrow	Western wood peewee
American Robin		

Table 54: Bird species commonly found in pinyon-juniper mesatop habitat, in order of decreasing frequency (%) by sampling period, 1988.

	Sampling period		
Species	1	2	3
Rufous-sided towhee	17	10	3
Clark's nutcracker	14	0	5
Chipping sparrow	7	13	23
Violet-green swallow	7	6	4
Scrub jay	6	8	8
Plain titmouse	5	4	4
Virginia warbler	5	2	1
Broad-tailed hummingbird	4	2	2
Western bluebird	3	9	11
Lesser goldfinch	3	5	7
Ash-throated flycatcher	3	2	0
White-tailed swallow	3	2	1
Gray flycatcher	3	3	0
Common bushtit	2	9	2
House finch	2	4	4

White-breasted nuthatch	2	4	2
Northern flicker	2	2	2
Pygmy nuthatch	2	2	5
Western wood peewee	2	3	1
Brown-headed cowbird	2	0	0
Mountain chickadee	1	4	2
American robin	0	2	2
Yellow-rumped warbler	0	0	8

In 1991 and 1992, L. Willis and D. Novoroske also conducted bird surveys in the same area as Morrison utilizing similar methodology. However, Willis and Novoroske conducted surveys during spring, summer, fall, and winter to determine species composition and habitat use for each of the four seasons. Data analysis will provide baseline information on the bird species of Canada del Buey below the SWCS plant. General trends from this data can be applied toward Mortandad and Ten Site Canyons.

Table 55 gives the total number of bird observations recorded for each season, their relative percent, and the total number of individual species recorded for each season. As shown in the table, over half of all observations took place during the spring due to a larger number of surveys being conducted at that time. The average number of observations per survey was similar for all seasons except fall which was considerably less. The greatest number of individual species were also found during the spring and the fewest number occurred during the winter which may have been due to the greater number of surveys conducted during the spring.

Table 55. Total number and percent of bird observations for spring, summer, fall, and winter in Canada del Buey, 1991-92.

SEASON	FREQUENCY (OBSERVATIONS)	AVERAGE NO. OBSERVATIONS PER SURVEY	NUMBER OF INDIVIDUAL SPECIES
Spring (5)[1]	1191	238	59
Summer (1)	241	241	35
Fall (2)	358	179	42
Winter (1)	235	235	14

1 Indicates total number of surveys conducted for that season.

The number of observations has also been broken down by plot (Table 56) with total number of observations and their relative percents. In addition, this has been further separated into seasons (Table 57). The highest number of observations were recorded at plots 5 and 7 (frequencies of 98 and 105, respectively). The lowest frequency was recorded in plot 22.

Table 56. Total number and relative percents of bird observations for each plot in Canada del Buey, 1991-92.

PLOT	FREQUENCY (OBSERVATIONS)	RELATIVE PERCENTS
1	68	3.4
2	65	3.2
3	65	3.2
4	76	3.8
5	98	4.8
6	84	4.1
7	105	5.2
8	88	4.3
9	67	3.3
10	67	3.3
11	82	4.0
12	62	3.1
13	75	3.7
14	66	3.3
15	51	2.5
16	73	3.6
17	70	3.5
18	73	3.6
19	47	2.3
20	52	2.6
21	60	3.0
22	37	1.8
23	58	2.9
24	47	2.3
25	86	4.2
26	65	3.2
27	68	3.4
28	69	3.4
29	47	2.3
30	54	2.7

Table 57. Total number and relative percents of bird observations for each plot by season in Canada del Buey, 1991-92.

PLOT	SEASON							
	Spring		Summer		Fall		Winter	
	No.	%	No.	%	No.	%	No.	%
1	41	2.02	10	0.49	7	0.35	10	0.49
2	42	2.07	8	0.40	6	0.30	9	0.44
3	40	1.98	9	0.44	9	0.44	7	0.35
4	41	2.02	9	0.44	9	0.44	17	0.84
5	71	3.51	13	0.64	9	0.44	5	0.25
6	55	2.72	12	0.59	8	0.40	9	0.44
7	55	2.72	9	0.44	14	0.69	27	1.33
8	41	2.02	13	0.64	14	0.69	20	0.99
9	37	1.83	10	0.49	9	0.44	11	0.54
10	46	2.27	7	0.35	14	0.69	0	0.00
11	45	2.22	6	0.30	20	0.99	11	0.54
12	45	2.22	8	0.40	9	0.44	0	0.00
13	53	2.62	7	0.35	15	0.74	0	0.00
14	47	2.32	13	0.64	6	0.30	0	0.00
15	32	1.58	6	0.30	12	0.59	1	0.05
16	54	2.67	7	0.35	10	0.49	2	0.10
17	36	1.78	10	0.49	15	0.74	9	0.44
18	26	1.28	11	0.54	14	0.69	22	1.09
19	25	1.23	10	0.49	12	0.59	0	0.00
20	32	1.58	5	0.25	12	0.59	3	0.15
21	29	1.43	8	0.40	15	0.74	8	0.40
22	15	0.74	2	0.10	14	0.69	6	0.30
23	45	2.22	3	0.15	4	0.20	6	0.30
24	27	1.33	6	0.30	10	0.49	4	0.20
25	38	1.88	13	0.64	16	0.79	19	0.94
26	33	1.63	6	0.30	17	0.84	9	0.44
27	45	2.22	5	0.25	15	0.74	3	0.15
28	45	2.22	5	0.25	11	0.54	8	0.40
29	28	1.38	4	0.20	9	0.44	6	0.30
30	22	1.09	6	0.30	23	1.14	3	0.15

As shown in Table 56, plot 5 has the highest frequency during the spring surveys (relative frequency of 3.51%) and the lowest frequency in plot 22 (0.74%). In addition to plot 5, plots 8, 14, and 25 also recorded the highest relative frequencies in the summer (0.64%) and plot 22 had the lowest at 0.10%. During the fall surveys, plot 30 had the highest relative percent frequency (1.14) and plot 23 had the lowest (0.20). Plots 10, 12-14, and 19 had no recorded observations during the winter and plot 4 had the highest relative frequency at 1.33%. The plots located in the upper portions of the canyon recorded higher numbers of observations (although a larger number is

shown for the fall in the lower portion, data for plots 2-15 was missing from the data set, therefore a higher number of observations can be expected for the lower reaches of the study area.

Table 58 lists all bird species recorded during the surveys and their overall frequencies (observations). The most frequently observed species were canyon wren,common raven, mountain chicadee, pygmy nuthatch, rufous-sided towhee (the most common species), scrub jay, townsend's solitaire, white-breasted nuthatch, and western wood-peewee (all had frequencies >60). There were numerous species observed only once during the surveys; all are listed in Table 58.

Table 59 lists each species and the total number observed by season. Figure 1 shows the relative percent frequencies for the most commonly observed species during each season. Pygmy nuthatch, rufous-sided towhee, dark-eyed junco, and western wood-peewee were the most frequently observed species during the spring surveys. Rufous-sided towhee, violet-green swallow, and western wood-peewee were the most common species in the summer surveys. Pygmy nuthatch, rufous-sided towhee, Townsend's solitaire, and scrub jay were the most common in the fall surveys and dark-eyed junco, mountain chicadee, pygmy nuthatch, and Townsend's solitaire were the most common in the winter surveys.

Table 58. List of bird species observed during all seasons surveyed and their frequencies and relative percent frequencies, Canada del buey, 1991-92.

SPECIES	FREQUENCY (OBSERVATION)	RELATIVE PERCENT
Acorn woodpecker	9	0.4
American kestrel	2	0.1
American robin	24	1.2
Ash-throated flycatcher	32	1.6
Bewick's wren	14	0.7
Blue-gray gnatcatcher	6	0.3
Black-headed grosbeak	1	0.0
Brown-headed cowbird	25	1.2
Black-headed grosbeak	22	1.0
Brown creeper	2	0.1
Broad-tailed hummingbird	35	1.7
Bushtit	9	0.4
Canyon townee	1	0.0
Canyon wren	79	3.9
Chipping sparrow	61	3.0
Clark's nutcracker	6	0.3

Cooper's hawk	1	0.0
Common raven	87	4.3
Dark-eyed junco	159	7.9
Dusky flycatcher	3	0.1
Flycatcher	29	1.4
Gray flycatcher	9	0.4
Grace's warbler	15	0.7
Green-tailed towhee	3	0.1
Hammond's flycatcher	3	0.1
Hairy woodpecker	10	0.5
Hepatic tanager	4	0.2
Hermit thrush	4	0.2
House finch	10	0.5
House wren	15	0.7
Hummingbird	1	0.0
Lark sparrow	1	0.0
Lesser goldfinch	4	0.2
Mountain chickadee	93	4.6
Mourning dove	26	1.3
Northern flicker	61	3.0
Pinyon jay	6	0.3
Pine siskin	15	0.7
Plain titmouse	7	0.3
Pygmy nuthatch	201	9.9
Ruby-crowned kinglet	1	0.0
Red crossbill	5	0.2
Rock wren	7	0.3
Rufous-sided towhee	258	12.7
Red-tailed hawk	5	0.2
Say's phoebe	5	0.2
Scrub jay	82	4.0
Solitary vireo	45	2.2
Steller's jay	45	2.2
Townsend's solitaire	83	4.1
Turkey vulture	5	0.2
Violet-green swallow	64	3.2
Virginia's warbler	35	1.7
Warbling vireo	16	0.8
White-breasted nuthatch	82	4.0
Western bluebird	39	1.9
Western tanager	27	1.3
Williamson's sapsucker	2	0.1
Wilson's warbler	3	0.1
Western wood-pewee	87	4.3
Yellow-rumped warbler	27	1.3

Table 59. Total number of species observations by season. Canada del Buey, 1991-92.

	SEASON			
SPECIES	Spring	Summer	Fall	Winter
Acorn woodpecker	7		2	
American kestrel		3	2	
American robin	18	5	1	2
Ash-throated flycatcher	27			
Bewick's wren	11		3	
Blue-gray gnatcatcher	3	2	1	
Brown-headed cowbird	25			
Black-headed grosbeak	19	3		
Brown creeper	1		1	
Broad-tailed hummingbird	26	6	3	
Bushtit			9	
Canyon tohee			1	
Canyon wren	44	17	7	
Chipping sparrow	34	14	13	
Clark's nutcracker			6	
Cooper's hawk	1			
Common raven	37	8	23	19
Dark-eyed junco	102		4	53
Dusky flycatcher	2	1		
Flycatcher	27	2		
Gray flycatcher	9			
Grace's warbler	14	1		
Green-tailed towhee	1		2	
Hammond's flycatcher	3			
Hairy woodpecker	5		4	1
Hepatic tanager	3	1		
Hermit thrush	2	1	1	
House finch	5		5	
House wren	1	3	11	
Hummingbird	1			
Lark sparrow		1		
Lesser goldfinch	1		3	
Mountain chickadee	43	7	21	22
Mourning dove	13	2	11	
Northern flicker	44	5	9	3
Pinyon jay	1		5	
Pine siskin	15			
Plain titmouse	5	1		1
Pygmy nuthatch	74	12	51	64
Ruby-crowned kinglet			1	
Red crossbill	4	1		
Rock wren	3	1	3	
Rufous-sided towhee	158	48	34	18
Red-tailed hawk		1	4	
Say's phoebe	5			
Scrub jay	33	16	26	7
Solitary vireo	31	6	8	
Steller's jay	20	5	19	1

Townsend's solitaire	28	1	30	24
Turkey vulture	3		2	
Violet-green swallow	44	20		
Virginia's warbler	33		2	
Warbling vireo	13	3		
White-breasted nuthatch	38	19	17	9
Western bluebird	36	1	2	
Western tanager	25	2		
Williamson's sapsucker		1	1	
Wilson's warbler			3	
Western wood-pewee	67	20		
Yellow-rumped warbler	23	1	3	

The spring and fall surveys recorded the greatest number of observations from 1991-1992. However, a total of five surveys were conducted during that season whereas only two were conducted during the fall and one in the summer and winter. The actual number of individual species observed was also highest during the spring which may have been a result of the greater number of surveys conducted at that time.

Plots located in the upper portion of the study area in Canada del Buey tended to have a greater number of observations than the lower portions which indicates greater use by birds closer to the SWSC facility. The upper portion of the study area is characterized by ponderosa pine and mixed conifer (north-facing slope) which is typical of the slopes of Mortandad and Ten Site Canyons.

Of special note is the observation of a Cooper's hawk during Morrisons survey in the summer of 1990 and an observation made by Willis and Novoroske during the spring. Further studies would be necessary to confirm if this species is nesting in the area.

Specific results of the information collected for the Breeding Bird Atlas (Travis 1992) are not provided in this document. The atlas indicates that up to 70 species of birds could be breeding in the general project area.

3.2.3 Amphibians and Reptiles

Due to the presence of a stream channel and pools, amphibians are expected to occur in Mortandad Canyon. However, only one preliminary survey was conducted in the

project area. Pierce and Cross (1993) conducted an amphibian/reptile survey in Mortandad Canyon at the Alternative site. Several reptiles were observed but no amphibians. Only three reptiles were trapped in Canada del Buey during a 1990 trapping session by Haarman and Bennett. There were no amphibians trapped.

Bogart (1986) found three reptiles and two amphibians in Mortandad Canyon during his surveys in 1978 and 1979 (Table 60). The coachwhip, gopher snake, eastern fence lizard, Woodhouse toad, and southern spadefoot. He found the short-horned lizard, plateau striped whiptail, prairie rattlesnake, eastern fence lizard, and the Woodhouse toad in Canada del Buey.

TABLE 60: Reptiles and Amphibians

FAMILY	SCIENTIFIC NAME	COMMON NAME
AMBYSTOMATIDAE	*Ambystoma tigrinm*	Tiger salamander
BUFONIDAE	*Bufo punctatus*	Red-spotted toad
	B. woodhousei	Woodhouse toad
COLUBRIDAE	*Elphae guttata*	Corn snake
	Masticophis flagellum	Coachwhip
	Pituophis melanoleucus	Gopher snake
	Thamnophis elegans	Western terestrial garter snake
IGUANIDAE	*Crotaphytus collaris*	Collared lizard
	Phrynosoma douglassi	Short-horned lizard
	Sceloporus undulatus	Eastern fence lizard
PELOBATIDAE	*Scaphiopus multiplicatus*	Southern spadefoot
SCINICIDAE	*Eumeces multivirartus*	Many-lined skink
TEIIDAE	*Cnemidophorus velox*	Plateau stripped whiptail
VIPERIDAE	*Crotalus viridis viridis*	Prairie rattlesnake

Reference: Bogert 1985.

3.2.4 Mollusks

No information available.

3.2.5 Insects

3.2.5.1 Terrestrial

Hanson and Miera (1978) reported the results of an insect study conducted in the project area by D. C. Lowrie.. Lowrie collected spiders in the Mortandad Canyon stream-

bank habitat. A study by McKay *et al.* (1986) continued the work of Lowrie countywide with special reference to ants. Table 61 lists the ant species found in the project area (Mckay *et al.* 1986).

Intensive ant mound inventorying and insect trapping took place in Canada del Buey during the summer of 1992 by BRET personnel. Identification and classification, as well as data compilation, of ants and other insects collected has not been completed. However, some information has been provided on groups of insects. The most common group of beetles captured in the pitfall traps were ground beetles (Family *Carabidae*). Darkling beetles (Family *Tenebrionidae*) were relatively common and scarab beetles (Family *Scrabaeidae*) were trapped infrequently.

TABLE 61: Potenial ant species found in Operable Unit 1144 (TA-49)

SUBFAMILY	**SCIENTIFIC NAME**	**HABITAT TYPE**
DOLICHODERINAE	*Acanthomypos coloradensis*	Bandelier
	A. interjectus	Ponderosa
	Brachymyrmex depilis	Ponderosa
	Camponotus modoc	Bandelierr
	C. sansabeanus	Pinon-juniper and ponderosa
	C. semitestaceus	Bandelier
	C. vicinus	Pinon-juniper and ponderosa
	Formica altipetens	Pinon-juniper
	F. argentea	Disturbed
	F. ciliata	Pinon-juniper
	F. densiventris	Pinon-juniper
	F. fusca	Pinon-juniper
	F. hewitti	Ponderosa-grass
	F. limata	Pinon-juniper
	F. neogagates	Pinon-juniper and disturbed
	F. obscuripes obscuripes	Pinon-juniper
	F. obtusopilosa	Pinon-juniper
	F. pergandei	Disturbed
	F. podzolica	Pinon-juniper and disturbed
	F. subnuda	Ponderosa
	Lasius alienus	Pinon
	L. niger	Bandelier
	L. pallitarsis	Ponderosa

	L. sitiens	Pinon-juniper and ponderosa
	Myrmecocystus mexicanus	Pinon-juniper
	Polyergus breviceps	Ponderosa
	Tapinoma sessile	Pinon-juniper
DORYLINAE	*Neivamyrmex carolinensis*	Bandelier
	N. nigrescens	Pinon-juniper
MYRMICINAE	*Aphaenogaster huachucana crimera*	Bandelier
	Crematogaster cerasi	Ponderosa
	C. colei	Disturbed
	Leptothorax muscorum	Ponderosa
	L. nitens	Disturbed
	L. obliquicanthus	Disturbed
	L. rugatulus	Bandelier
	Monomorium cyaneum	Disturbed
	M. minimum	Pinon-juniper
	Myrmica brevispinosa	Pinon-juniper
	Pheidole ceres	Ponderosa,
		disturbed, and burned ponderosa
	P. wheelerorum	Pinon-juniper and disturbed
	Pogonomyrmex occidentalis	Pinon-juniper and ponderosa
	Solenopsis molesta	Pinon-juniper and Disturbed
MYRMICINAE	*Leptothorax crassipilis*	R
	L. muscorum	P-R
	L. nitens	P-R
	L. texanus texanus	P-R
	L. tricarinatus	P-R
	Monomorium cyaneum	P-R
	Myrmecina americana	P-R
	Myrmica emeryana	P-R
	Myrmica hamulata	P-R
	Pheidole ceres	P-R
	P. wheelerorum	P-R
	Pogonomyrmex occidentalis	P-R
	Solenopsis molesta	P-R and R
	Stenamma occidentale	P-R
DOLICHODERINAE	*Tapinoma sessile*	P-R
	Acanthomyops latipes	P-R
	Camponotus laevigatus	P-R
	C. vicinus	P-R
	Formica argentea	P-R
	F. densiventris	P-R
	F. fusca	P-R
	F. hewitti	P-R
	F. lasioides	P-R

	F. limata	P-R
	F. neorufibarbis	R
	F. obscuripes obscuripes	P-R
	F. obscurivrntris clivia	P-R
	F. occulta	P-R
	F. planipilis	P-R
	F. podzolica	P-R
	Lasius alienus	P-R
	L. crypticus	P-R
	L. flavus	P-R
	L. neoniger	P-R
	L. niger	P-R
	L. pallitarsis	P-R
	L. subumbratus	P-R
	Liometopum apiculatum	P-R
	L. luctuosom	P-R

3.2.5.2 Aquatic: No information available.

3.2.6 Fish

There are no fish species expected to occur in Mortandad Canyon, however no surveys have been conducted.

4.0 Threatened, Endangered, and Sensitive Species

We searched the threatened, endangered, and sensitive (TES) species database developed by BRET. The data base contains the latest information concerning individual threatened, endangered, and sensitive species occurring in Los Alamos and surrounding counties as supplied through the New Mexico Department of Game and Fish (1988, 1991), New Mexico Energy, Minerals, and Natural Resources Department, New Mexico Native Plants Protection Advisory Committee (1984), and the U.S. Fish and Wildlife Service (1989, 1991a, 1991b). The habitat match generated a list of potential state and federally threatened, endangered, candidate and sensitive species which could occur within the OU (Appendix C) based on habitats of the area.

4.1 Plants

4.1.1 Federally Listed Species

No federal endangered or threatened plant species were listed as potentially occurring in the project area. However, the following five federal candidate plant species (including 3C) meet the search criteria:

Candidate	
Wright fishhook cactus	*Mammillaria wrightii*
Santa Fe cholla	*Opuntia viridiflora*
Grama grass cactus	*Toumeya papyracantha*
Tufted sand verbena	*Abronia bigelovii*
Plank's catchfly	*Silene plankii*

4.1.2 State Listed Species

Three of the previously mentioned federal candidate species are also listed as state threatened or endangered (New Mexico Natural Heritage Program 1991).

Endangered	
Wright fishhook cactus	*Mammillaria wrightii*
Santa Fe cholla	*Opuntia viridiflora*
Grama grass cactus	*Toumeya papyracantha*

4.1.3 Sensitive Species

Under the Federal Endangered Species Act and state statutes, only those species that are listed, or are candidates for listing, are protected. New Mexico has listed those species occurring within the state that are considered rare because of restricted distribution or low numerical density. Below is a list of sensitive species potentially occurring in the project area.

Sessile-flowered false carrot	*Aletes sessiliflorus*
Threadleaf horsebrush	*Tetradymia filifolia*
Plank's catchfly	*Silene plankii*
Santa Fe Milkvetch	*Astragalus feensis*
Mathew's wooly milkvetch	*Astragalus mollissimus*
Taos milkvetch	*Astragalus puniceus*
Cyanic milk-vetch	*Astragalus cyaneus*
Tufted Sand Verbena	*Abronia bigelovii*
Pagosa phlox	*Phlox caryophylla*
Bald eagle	*Haliaeetus leucocephalus*

Mississippi kite	*Ictinia mississippiensis*
Peregrine falcon	*Falco peregrinus*
Broad-billed hummingbird	*Cynanthus latirostris*
Willow flycatcher	*Empidonax trailii*
Spotted Bat	*Euderma maculatum*
Say's Pond Snail	*Lymnaea captera*
Meadow Jumping Mouse	*Zapus hudsonius*

4.2 Wildlife

4.2.1 Federal

Two federal endangered and three federal candidate species met the search criteria:

Endangered	
Bald Eagle	*Haliaeetus leucocephalus*
Peregrine falcon	*Falco peregrinus*
Candidate	
Willow flycatcher	*Empidonax trailii*
Spotted bat	*Euderma maculatum*
Meadow Jumping Mouse	*Zapus hudsonius*

4.2.2 State

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

Endangered	
Common black hawk	*Buteogallus anthracinus*

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

4.3 Species Dismissed from Further Consideration

Based on the information gained from previous field surveys and more recent surveys, we concluded that the following species are not present in this OU, or are not expected to be impacted by the proposed project:

4.3.1 Plants

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

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

Santa Fe Cholla (*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 pinon-juniper woodlands at about 7,200 ft (New Mexico Native Plats Protection Advisory Committee, 1984). No specimens of this cacti were found within the OU during Level 1 (reconnaissance) surveys and Level 2 (habitat evaluations) surveys.

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

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

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

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

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

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

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

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

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

Grama grass cactus (*Toumeya papyracantha*) is found in pinon-juniper dominated habitats in sandy soil and basalt outcrops. This species has not been found on Laboratory property in recent years but has been recorded in the past as occuring on Laboratory lands. The grama grass cactus only occurs in Los Alamos County on basalt outcrops (personal communications). Extensive surveys, past and present, and walkthroughs of OU1148 have not encountered this species and it is not believed to occure in this OU.

4.3.2 WILDLIFE

Bald Eagles (*Haliaeetus leucocephalus*) winter along the Rio Grande. Winter roosts have been observed at Cochiti Lake. Mortandad Canyon, northeast of OU 1148, has some suitable roosting areas but no confirmed roosting sites. Suitable rooting sites consist of large trees and protection from wind near permanent water sources. Within the survey area there are a few stands of large ponderosa pines associated with the canyon bottoms or intermixed with Douglas fir, however the riparian areas and streams are limited in size. No bald eagles were seen within Canada del Buey, Pajarito Canyon or Mesita del Buey during the surveys. Bald eagles are more likely to occur southeast of the survey area nearer to the Rio Grande.

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

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

Mississippi Kites (*Ictinia mississippiensis*) generally inhabit the lower Rio Grande and Pecos Valleys in riparian zones and shelter belts with permanent streams.

They are also common around manicured environments such as parks and golf courses. Riparian areas in the OU consist of a few large trees, willows and other riparian vegetation but are limited in size and extent. This species has not been reported for the Los Alamos area.

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

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

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

Habitat requirements for the spotted bat and peregrine falcon were found to exist in the project area.

The peregrine falcon (*Falco peregrinus*) has little probability of occurring in the project area, except for possibly feeding. They do, however, migrate through New Mexico and winter statewide. Peregrines occupy steep cliffs in wooded or forested habitats; breeding territories center on cliffs. Peregrine falcons have been observed in and near Pueblo Canyon, and have been recorded as nesting along the cliffs of this canyon. Johnson (1992) examined locations in Los Alamos County and does not believe the peregrine will use Mortandad or Ten Site Canyons for nesting. There is a moderate to high potential for its re-occurrence in Pueblo Canyon, and from there, it could utilize the project area as feeding grounds. A habitat management plan developed by Johnson (1992) discusses the past and present status of the peregrine falcon within and near the area.

Spotted bat (*Euderma maculatum*) is a state endangered species found in pinon-juniper, ponderosa, mixed conifer and riparian habitats. This species requires a source of water with standing pools and roost sites such as caves in cliffs or rock crevices. Suitable roosts sites are present along the cliff faces of the canyons. However, open water sources are somewhat limited and include a marrow flowing

stream. Mist net surveys on Laboratory land were conducted for this species. No spotted bats were captured. In addition, surveys conducted in lower Pajarito Canyon in 1992 (more suitable habitat) resulted in no captures.

5.0 BIOLOGICAL IMPORTANCE VALUES

5.1 Habitat Rarity

Detailed information on habitats in the project area will be necessary to evaluate their uniqueness or rarity in relation to other portions of the Laboratory and surrounding properties. Information and data collected for other sites at the Laboratory can be used to estimate relative occurrence of habitats found in the project area.

for purposes of this document, habitat evaluation procedures (HEP) were used to determine suitability of existing habitats in the project to support certain wildlife species. HEP helps to document the quality and quantity of available habitat for selected wildlife species through time and between sites (USFWS 1980) through the use of habitat suitability indices (HSI) based on quantitative data.

Three species were selected to calculate suitability indices for each site; raccoon (*Procyon lotor*), bobcat (*Felis rufus*), and hairy woodpecker (*Picoides villosus*). Table 62 lists each of the species and provides habitat suitability indices for each site.

Table 62. Habitat Suitability Indices for Selected Wildlife Species Known to occur or Potentially Occur in the Project Area.

	HABITAT SUITABILITY INDEX	
SPECIES	Proposed Site	Alternative Site
Raccoon	0.15	0.85
Bobcat	0.46	0.77
Hairy woodpecker	0.00	0.56

As shown in Table 62, in all cases the HSI's are higher for the Proposed site. Additional HSI's could be calculated through the use of other HEP models.

5.2 Ecological Functioning

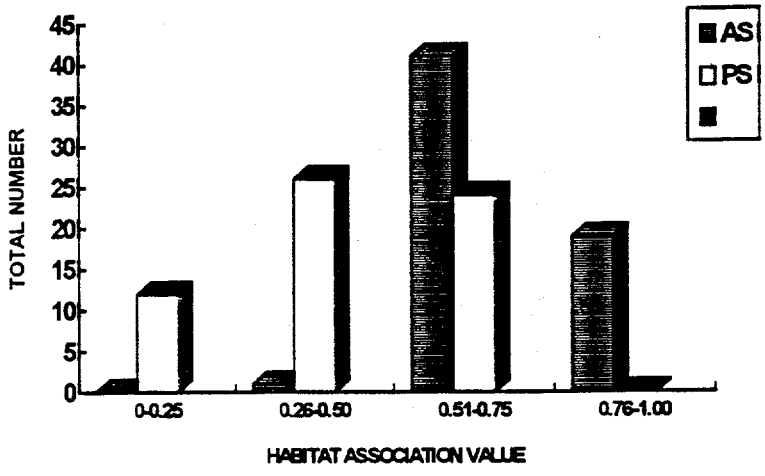
Tables 63 and 64 have been compiled to present information on plant and wildlife species occurring in the project area. Information provided in these tables are intended to be used to show relative comparisons between the Proposed site and the Alternative site only. The values given in the wildlife table are not intended to be compared to other studies or to be used as an index to the species composition of the project area or other areas of the Laboratory. The values are based on a combination of quantitive and qualitative measurements and can be used for comparisons among species, groups of species, habitats, and between the Proposed site and the Alternative site.

Table 63 lists plant species identified in Mortandad Canyon at the Alternative Site and on the mesa top within and near the Proposed Site. Information on forage and cover utilization by wildlife were obtained from plant and wildlife databases. Use of a particular plant species for cover or forage is indicated by an X in Table 63 which is converted to numerical values (see Table 64 footnotes) for each of the wildlife species at each of the project sites. This information has been used to calculate the habitat association values (HAV) in Table 64. In order to calculate the HAV's in Table 64, it is assumed that all plant species listed in Table 63 occur in equal density, frequency, and cover. Since this assumption would not hold true in reality, the resulting HAV is intended to reflect optimum values for comparative purposes. Additional detailed analysis and more extensive calculations would be necessary to incorporate actual plant species presence based on cover, density, and frequency. Although pinyon pine and juniper occur within Mortandad Canyon, the pinyon-juniper woodland is used to characterize the Alternative site. However, this woodland is found only at the extreme east end of the Alternative site. This has been taken into consideration when determining availability of breeding habitat (or other habitat necessary for occurrence in the area) to calculate the HAV. In some cases, the availability of pinyon-juniper for breeding (or other important period) is given, whereas in other instances it is not. The mobility of a species, in addition to other factors,

are used when determing this value. The Habitat Presence column of Table 64 shows almost 50% of all wildlife species identified within or near the project area are usually typical of habitats within the Alternative Site and an additional 10% are indicator species of those habitats. In addition, 20% of all species are typical of the Proposed Site with an additional 13% indicator species.

Additional information in the tables can be used to help characterize the Proposed and Alternative sites with respect to wildlife use and habitat availability. Figure 14 illustrates a comparison of the HAV's for the Proposed and Alternative sites.

Figure A. Total Number of HAV's For Each Site.



As shown in Figure 14, a larger number of HAV's with more than a 0.50 value, were calculated for the Alternative site. This suggests habitat present in the Alternative site is more suitable for a larger number and, likely, diversity of wildlife species.

Table 63. Characteristics and Use of Plant Species Identified in the Radioactive Waste Liquid Treatment Facility Project Area.

SPECIES	DISTURBANCE INDICATOR	WILDLIFE USE								WETLAND/UPLAND INDICATOR	SITE PRESENCE 1	
		Cover				Forage						
		LM	SM	GB	NB	LM	SM	GB	NB		PS	AS
Agropyron smithii			X	X	X	X		X			X	
Agrostis alba								X		Facultative wetland	X	
Andropogon scoparius	X		X	X	X		X				X	
Antennaria parviflora											X	
Artemisia carruthii	X					X						X
Artemisia dranculus	X		X				X	X	X			X
Artemisia frigida	X					X	X	X	X			X
Artemisia ludoviciana	X		X									X
Berberis fendleri						X					X	
Bouteloua gracilis	X						X				X	X
Bromus anomalus								X			X	
Bromus tectorum	X						X					X
Carex sp.						X		X			X	
Cercocarpus montanus		X	X	X	X	X	X	X	X		X	
Chrysopsis foliosa	X										X	
Cirsium sp.						X	X				X	
Clematis sp.			X		X						X	
Equisetum sp.						X					X	
Frageria americana											X	
Geranium sp.	X					X	X				X	
Jamesia americana											X	
Juncus sp.							X				X	
Juniperus monosperma	X	X	X	X	X	X	X	X	X		X	X
Juniperus scopulorum		X	X	X	X	X	X	X	X		X	

SPECIES	DISTURBANCE INDICATOR	WILDLIFE USE								WETLAND/UPLAND INDICATOR	SITE PRESENCE	
		Cover				Forage						
		LM	SM	GB	NB	LM	SM	GB	NB		PS	AS
Lappula radowskii								X			X	
Muhlenbergia montana								X			X	
Parthenocissus inserta											X	
Penstemon sp.						X	X				X	
Pinus edulis		X	X	X	X	X	X	X	X		X	X
Pinus ponderosa		X	X	X	X	X	X	X	X	Facultative upland	X	
Poa pratensis	X		X	X	X	X	X	X	X	Facultative upland	X	
Psuedostuga menziesii	X	X	X	X	X	X	X	X	X		X	
Quercus gambelii		X	X	X	X	X	X	X			X	X
Quercus undulata						X					X	
Rhus radicans											X	
Rhus trilobata	X	X	X	X	X	X	X	X	X		X	
Ribes cereum	X		X	X	X	X	X	X	X		X	
Rosa woodsii		X	X	X	X	X	X	X	X	Facultative upland	X	
Salix sp.			X	X	X	X					X	
Sitanion hystrix	X		X	X	X						X	X
Taraxacum officinale						X	X	X	X		X	
Thalictrum fendleri											X	
Thelesperma trifidum	X										X	
Thermopsis pinetorum											X	
Typha latifolia			X	X	X						X	
Vicia americana				X		X		X			X	
Yucca baccata						X					X	

1 PS - Proposed Site
AS - Alternative Site

LM Large mammal
SM Small mammal
GB Game Bird
NB Non-gamebird

References: BISON; Foxx and Pierce 1993.

Table 64. Habitat and Socioeconomic Characteristics of Wildlife Species in the Project Area.

SCIENTIFIC NAME	ECONOMIC VALUE	TROPHIC LEVEL	HABITAT PRESENCE[1]		INDICATOR SPECIES[2]		HABITAT ASSOC. VALUES (HAV)[3]		CULTURAL VALUE[4]	SOCIO-ECONOMIC VALUE[5]	IMPORTANCE INDEX[6]	
			AS	PS	AS	PS	AS	PS			AS	PS
Aphelocoma coerulescens		Omnivore		X			0.67	0.55			0.50	0.41
Bufo woodhousii		Carnivore	X				0.88	0.17			0.66	0.13
Buteo jamaicensis		Carnivore		X			0.57	0.31	X	0.50	0.55	0.36
Canis latrans		Omnivore	X	X			0.67	0.22	X	0.50	0.63	0.30
Catharus guttatus		Omnivore	X				0.67	0.55			0.50	0.41
Catherpes mexicanus		Carnivore		X			0.79	0.34			0.59	0.26
Cervus elaphus	Consumptive	Herbivore	X				0.58	0.30	X	1.00	0.69	0.48
Chordeiles minor		Carnivore	X	X			0.79	0.60	X		0.72	0.58
Cnemidophorus velox		Carnivore					0.79	0.60			0.59	0.45
Colaptes auratus		Omnivore	X				0.67	0.22	X		0.50	0.17
Contopus sordidulus		Carnivore	X				0.79	0.27			0.59	0.20
Crotalus viridis		Carnivore	X	X			0.69	0.64			0.52	0.48
Cyanocitta stelleri		Omnivore			X		0.67	0.32	X	0.50	0.63	0.37
Dendroica coronata		Carnivore	X				0.79	0.27			0.59	0.20
Dendroica graciae		Carnivore					0.79	0.27			0.59	0.20
Empidonax hammondii		Carnivore					0.79	0.27			0.59	0.20
Empidonax wrightii		Carnivore		X			0.79	0.60			0.59	0.45
Eutamias minimus		Omnivore	X	X			0.61	0.73	X	0.50	0.58	0.67
Eutamias quadrivattatus		Omnivore	X			X	0.70	0.64	X	0.50	0.65	0.61
Felis concolor	Furbearer	Carnivore		X			0.64	0.23	X	1.00	0.73	0.42
Felis rufus	Furbearer	Carnivore	X		X		0.60	0.40	X	1.00	0.70	0.55

SCIENTIFIC NAME	ECONOMIC VALUE	TROPHIC LEVEL	HABITAT PRESENCE[1]		INDICATOR SPECIES[2]		HABITAT ASSOC. VALUES (HAV)[3]		CULTURAL VALUE[4]	SOCIO-ECONOMIC VALUE[5]	IMPORTANCE INDEX[6]	
			AS	PS	AS	PS	AS	PS			AS	PS
Lasiurus cinerea		Carnivore					0.64	0.23			0.48	0.17
Loxia curvirostra		Herbivore	X				0.67	0.55			0.50	0.41
Masticophis flagellum		Carnivore					0.60	0.73			0.45	0.55
Microtus longicaudus		Herbivore	X				0.60	0.40			0.45	0.30
Microtus montanus		Herbivore	X				0.62	0.40			0.47	0.30
Myiarchus cinerascens		Carnivore		X			0.79	0.60			0.59	0.45
Neotoma albigula		Herbivore					0.60	0.40			0.45	0.30
Neotoma mexicana		Herbivore					0.60	0.40			0.45	0.30
Nucifraga columbiana		Omnivore		X			0.67	0.22			0.50	0.17
Odocoileus hemionus	Consumptive	Herbivore	X	X			0.58	0.30	X	1.00	0.69	0.48
Parus gambeli		Omnivore	X	X			0.67	0.55			0.50	0.41
Parus inornatus		Omnivore				X	0.67	0.55			0.50	0.41
Perognathus flavescens		Omnivore					0.69	0.31			0.52	0.23
Perognathus intermedius		Omnivore					0.69	0.31			0.52	0.23
Peromyscus boylii		Omnivore					0.70	0.64			0.53	0.48
Peromyscus maniculatus		Omnivore	X				0.69	0.64			0.52	0.48
Peromyscus trueii		Omnivore		X			0.28	0.73			0.21	0.55
Pheucticus melanocephalus		Not listed	X				*	*			*	*
Phrynosoma douglasii		Carnivore	X				0.79	0.60			0.59	0.45

SCIENTIFIC NAME	ECONOMIC VALUE	TROPHIC LEVEL	HABITAT PRESENCE[1]		INDICATOR SPECIES[2]		HABITAT ASSOC. VALUES (HAV)[3]		CULTURAL VALUE[4]	SOCIO-ECONOMIC VALUE[5]	IMPORTANCE INDEX[6]	
			AS	PS	AS	PS	AS	PS			AS	PS
Pipilo fuscus		Omnivore				X	0.67	0.22			0.50	0.17
Piranga ludoviciana		Omnivore	X				0.67	0.22			0.50	0.17
Pituophis catenifer		*	X	X			*	*			*	*
Polioptila caerulea		Carnivore				X	0.79	0.60			0.59	0.45
Procyon lotor	Furbearer	Omnivore	X				0.61	0.40	X	1.00	0.71	0.55
Psaltriparus minimus		Omnivore				X	0.67	0.55			0.50	0.41
Reithrodontomys megalotis		Omnivore					0.69	0.31			0.52	0.23
Salpinctes obsoletus		Carnivore	X			X	0.79	0.27			0.59	0.20
Sayornis saya		Carnivore					0.79	0.27			0.59	0.20
Sceloporus undulatus		Carnivore	X	X			0.79	0.60			0.59	0.45
Selasphorus platycercus		Omnivore	X				0.67	0.22	X	0.50	0.63	0.30
Sialia mexicana		Omnivore		X	X		0.67	0.55	X	0.50	0.63	0.54
Sitta carolinensis		Omnivore	X				0.67	0.22	X	0.50	0.63	0.30
Sitta pygmaea		Omnivore			X		0.67	0.22	X	0.50	0.63	0.30
Spermophilus variegatus		Omnivore				X	0.61	0.40	X	0.50	0.58	0.43
Sphyropicus varius		Omnivore					0.67	0.22			0.50	0.17
Spizella passerina		Carnivore	X	X			0.79	0.60			0.59	0.45
Tachycineta thalassina		Carnivore	X				0.79	0.27	X	0.50	0.72	0.33
Troglodytidae thryomanes		Omnivore	X	X			0.67	0.55			0.50	0.41

SCIENTIFIC NAME	ECONOMIC VALUE	TROPHIC LEVEL	HABITAT PRESENCE[1]		INDICATOR SPECIES[2]		HABITAT ASSOC. VALUES (HAV)[3]		CULTURAL VALUE[4]	SOCIO-ECONOMIC VALUE[5]	IMPORTANCE INDEX[6]	
			AS	PS	AS	PS	AS	PS			AS	PS
Urocyon cinereoargenteus	Furbearer	Carnivore		X			0.60	0.73	X	1.00	0.70	0.80
Ursus americanus	Consumptive	Omnivore	X				0.67	0.26		0.50	0.63	0.32
Vermivora virginiae		Carnivore		X			0.79	0.27			0.59	0.20
Vireo gilvus		Carnivore	X				0.79	0.27			0.59	0.20
Vireo solitarius		Carnivore	X				0.79	0.27			0.59	0.20

1 An X indicates species is usually common in the habitat(s) found in each of the sites but are less important in defining that habitat (Kricher and Morrison 1993).
2 An X indicates species that are most characteristic of the habitat(s) found in each of the sites, including those that occur exclusively in that habitat (Kricher and Morrison 1993).
3 The HAV is calculated using information from Table 63 (forage and cover use) and BISON (breeding/denning) which is inserted into the following formula:

HAV = Forage value + Cover value + Breeding/Denning habitat availability

Each value has a potential maximum of 0.33 for most wildlife species, giving a total maximum of 1.00. The exception are those species whose diet consists partially (ominivores) or wholly (carnivores) of insects. Those species likely feed on a diversity of insects and due to a greater diversity of insects occurring in wet areas a full forage value of 0.33 is assigned to the AS for carniverous species and 0.165 to the PS for omniverous species. Only half of the full value of 0.33 is given to the PS due to less than half the diversity of insect species likely occurring in dry areas compared to wet areas. Omniverous species in the AS are assigned a total value of 0.165 for insects (the remaining 0.165 based on plant values) and a total of 0.0825 for the PS, reflecting less than half the diversity of available insect species.

4 The cultural value is based on traditional uses by area indian tribes.
5 A value of 0.50 is assigned to a species if it has cultural value or economic value. A value of 1.0 is given if it posseses both.
6 The importance index is calculated using the following formula:

II = HAV (0.75) + Socioeconomic value (0.25)

* Indicates insufficient information to provide attribute.

5.3 Species Diversity

Surveys for small nocturnal mammals were conducted within Mortandad Canyon at or near the Alternative Site of the RLWTF. Two surveys were conducted along the stream channel just above and below the tritium outfall (# 051-051) as part of a Laboratory-wide study that included surveys at various canyons (Raymer and Biggs 1992). Certain information from this study has been extracted for use in this section.

Species diversity indexes were calculated for each of the survey sites. These indexes are presented here for comparison to other similar habitats (i.e., Los Alamos Canyon) and to dry canyons (Table 65). Total number of captures and relative compositions are also provided in Table 65.

Table 65. Small mammal species diversity indexes and relative compositions for Mortandad Canyon and similar habitats.

LOCATION	SPECIES	TOTAL NUMBER OF CAPTURES	RELATIVE COMPOSTION	DIVERSITY INDEX
Mortandad Canyon outfall #051-051	Long-tailed vole	3	18.75	2.18
	White-throated woodrat	1	6.25	
	Mexican woodrat	3	18.75	
	Woodrat (unidentified)	1	6.25	
	Brush mouse	3	18.75	
	Deer mouse	5	31.25	
Mortandad Canyon 03A-081	Long-tailed vole	11	50.00	1.43
	Mexican woodrat	1	4.55	
	Brush mouse	1	4.55	
	Deer mouse	9	40.91	
Sandia Canyon	Long-tailed vole	19	24.68	2.10
	Montane vole	14	18.18	
	Deer mouse	24	31.17	
	Harvest mouse	2	2.60	
	Vagrant shrew	18	23.38	
Los Alamos Canyon 03A-020	Long-tailed vole	2	5.71	1.65
	Mexican woodrat	1	2.86	
	Brush mouse	13	51.43	
	Deer mouse	5	37.14	
	Vagrant shrew	1	2.86	
de Valle Canyon 05A-054	Long-tailed vole	8	28.57	1.62
	Mexican woodrat	3	10.71	
	Brush mouse	2	7.14	
	Deer mouse	15	53.57	

Los Alamos Canyon TA-43	Long-tailed vole	14	21.88	2.24
	Montane vole	15	23.44	
	Brush mouse	5	7.81	
	Deer mouse	23	35.94	
	Peromyscus sp.	1	1.56	
	Harvest mouse	1	1.56	
	Water shrew	1	1.56	
	Vagrant shrew	4	6.25	
Los Alamos Canyon TA-3	*Microtus* sp.	2	5.41	1.97
	Long-tailed vole	9	24.32	
	Montane vole	5	13.51	
	Brush mouse	2	5.41	
	Deer mouse	16	43.24	
	Peromyscus sp.	1	2.70	
	Harvest mouse	1	2.70	
	Vagrant shrew	1	2.70	

As shown in Table 65, of the two surveys conducted in the vicinity of the RLWTF Alternative Site in Mortandad Canyon, the survey conducted below the tritium outfall had one of the highest species diversity indexes (2.18) among the Laboratory sites studied. Lower Los Alamos Canyon, dominated by pinyon pine and juniper, is similar in habitat characteristics to the undisturbed habitat in the vicinity of the Proposed Site.

5.4 Species Abundance

The small mammal surveys conducted in Mortandad Canyon did not produce sample sizes large enough to calculate abundance estimates. Studies outside of the Proposed site and Alternative site included density and population estimates but since this section attempts to provide information and data specific to the Proposed and Alternative sites, information from other locations is not given here. Larger studies would need to be conducted at both sites to estimate species abundance.

5.5 Biotic Productivity

Morrison (1990) calculated total biomass for chipmunks on Mesita del Buey and within Canada del Buey. These estimates are shown in Table 66 and discussed in further detail in the Habitat Characterization section of this document.

Weight measurements collected for small mammals captured in Mortandad Canyon at the Alternative Site and lower Los Alamos Canyon were used to estimate total biomass for each of the trapping grids. Studies in other locations of the Laboratory to collect information for plant biomass estimates are currently being designed and will be initiated during the summer of 1993. Methodology and results from these studies could potentially be used for the RLWTF project area. However, preliminary results are not yet available. Table 66 shows that the Alternative Site or habitats similar to it, had biomass estimates over three times greater than the Proposed Site or habitats similar to it. Table 66 gives total biomass estimates by Morrison for chipmunks within a canyon and on a mesa top. This table also gives biomass estimates from data collected on nocturnal species in Mortandad Canyon (Alternative site) and in lower Los Alamos Canyon (habitat similar to the Alternative site).

Table 66. Total biomass (TB) estimates, in grams, for nocturnal and diurnal (chipmunks) small mammal species captured in the project area or in habitats similar to the project area.

LOCATION	NUMBER	MEAN WEIGHT	STANDARD ERROR	TB
Nocturnal Species				
[1]Mortandad Canyon	34	42.9	5.76	1459
[2]Lower Los Alamos Canyon	20	22.3	1.35	446
Diurnal Species				
[1]Canada del Buey	44	67.5	1.32	2970
[2]Mesita del Buey	14	58.3	1.97	816

[1]Represents Proposed site.
[2]Represents Alternative site.

5.6 Food Chain Support

Information is not availble for all trophic levels in the vicinity of the project area. Additional studies on species inhabiting the project area and their food habits will be necessary. However, certain species are assumed to be present based on available habitat.

Figure 15 illustrates simplified possible food chain that include representative wildlife and plant species that have been identified in the project area or are expected to occur there.

Figure 15. Simplified potential food chains for the proposed and alternative RLWTF sites.

CANID ------>	RODENT------>	INVERTEBRATE/PLANT
Gray fox	>Deer mouse	>Worms
		>Spiders
		>Butterflies/moths
		>White fir
		>Ponderosa pine
		>Grass
		>Aster
		>Mountain mohagany

6.0 Research Needs

Currently, vegetative data collected in 1993 is sufficient to adequately characterize the proposed and alternative sites. However, additional studies will be necessary to characterize the mesa top adjacent to the south-facing slope of the alternative site.

Additional studies will be necessary to more accurately identify the wildlife communities in the project area and to what extent they are utilizing the proposed and alternative sites. It is possible, based on general observations of sign, elk are foraging at certain times of the year on the proposed site. Due to an existing water source within Mortandad Canyon and within the alternative site boundaries, various wildlife species may be utilizing this area extensively as a water source. It may also be necessary to conduct studies as part of developing predictive models identifying future potential impacts (including cumulative) the proposed project will have on the general biotic community as well as certain target species of wildlife and plants. It will also be necessary to set up control sites and conduct

similar studies comparing the control site to the project area to determine if differences in the biotic communties exist.

Additional data on the following groups of fauna will be needed to provide a more accurate assessment of project site use and potential impacts:

Invertebrates - terrestrial
aquatic

Vertebrates - small, large, medium mammals
population/density estimates
travel corridors
foraging areas
amphibians
reptiles
birds
foraging areas
breeding areas

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APPENDIX A. Plant Species List.

FAMILY	SCIENTIFIC NAME	COMMON NAME
ACERACEAE	*Acer glabrum neomexicanum*	New Mexico maple
AMARANTHACEAE	*Amaranthus retroflexus*	Pigweed
ANACARDIACEAE	*Rhus radicans*	Poison ivy
	R. trilobata	Shunkbush sumac
BERBERIDACEAE	*Berberis fendleri*	Colorado barberry
BETULACEAE	*Betula occidentalis*	Birch
BORAGINACEAE	*Cryptantha jamesii*	James hiddenflower
	Lithospermum multiflorum	Puccoon
CACTACEAE	*Coryphantha vivipara*	Pincushion cactus
	Opuntia spp.	Prickly Pear Cactus
CAPPARIDACIEAE	*Polanisia trachysperma*	Clammyweed
CARYOPHYLLACEAE	*Arenaria fendleri*	Fendler's sandwort
CELESTRACEAE	*Pachystima myrsinites*	Myrtle boxleaf
CERATOPHYLLACEAE	*Clematis pseudoalpina*	Rocky Mountain clematis
CHENOPODIACEAE	*Atriplex canescens*	Four-wing saltbush
	Chenopodium album	Lamb's quarters
	C. fremontii	Fremont goosefoot
	C. graveolens	Chenopodium
	Kochia scoparia	Summer cypress
	Salsola iberica	Russian thistle
COMPOSITAE	*Achillea lanulosa*	Yarrow
	Ambrosia coronopifolia	Ragweed
	Antennaria parvifolia	Pussytoes
	Artemisia carruthii	Wormwood
	A. dracunculus	False Tarragon
	A. franserioides	Ragweed sagebrush
	A. frigida	Estafiata
	A. ludoviciana	Wormwood
	A. tridentata	Big sagebrush
	Bahia dissecta	Wild chrysanthemum
	Brickellia spp.	Bricklebush
	Chrysopsis foliosa	Golden Aster
	Chrysothamnus nauseosus	Rubber rabbitbrush
	Cirsium sp.	Thistle
	Conyza canadensis	Horseweed
	Erigeron flagellaris	Fleabane
	E. divergens	Fleabane daisy
	Eupatorium herbaceum	Throughwort
	Franseria confertifolia	Bursage
	Gaillardia pulchella	Firewheel
	Grindelia aphanactis	Gumweed
	Gutierrezia sarothrae	Snakeweed
	Haplopappus spinulosus	Spiny goldenweed
	Helianthus annuus	Sunflower
	Hymenopappus filifolius	Yellow cut-leaf
	H. argentea	Perky sue
	H. richardsonii	Bitterweed
	Iva spp.	Marsh-elder
	Senecio sp.	Groundsel
	Solidago spp.	Goldenrod
	Taraxacum officinale	Dandelion
	T. trifidum	Greenthread

	Townsendia exscapa	Easter daisy
	Tragopogon dubius	Salisfy, Goatsbeard
	Verbesina encelioides	Crownbeard
	Viguiera multiflora	Showy goldeneye
	Xanthium strumarium	Cocklebur
CONVOLVULACEAE	*Ipomoea coccinea*	Star glory
CORNACEAE	*Cornus stolonifera*	Dogwood
CRUCIFERAE	*Descurainia* sp.	Mustard
	Erysimum capitatum	Western wallflower
	Lesquerella intermedia	Bladderpod
CUPRESSACEAE	*Juniperus monosperma*	One-Seeded Juniper
	J. scopulorum	Rocky Mountain juniper
CYPERACEAE	*Carex spp.*	Sedge
ELEAGNACEAE	*Eleagnus angustifolia*	Russian olive
ERICACEAE	*Arctostaphylus uva-ursi*	Bearberry
EUPHORBIACEAE	*Croton texensis*	Doveweed
	Euphorbia dentata	Spurge
FAGACEAE	*Quercus gambelii*	Gambel oak
GERANIACEAE	*Erodium cicutarium*	Filaree
	Geranium caespitosum	James geranium
GRAMINEAE	*Agropyron smithii*	Western wheatgrass
	Andropogon scoparius	Little bluestem
	Aristida spp.	Three-awn
	Blepharoneuron tricholepsis	Pine dropseed
	Bouteloua eriopoda	Black grama
	Bouteloua gracilis	Blue grama
	Bromus anomalus	Nodding brome
	B. inermis	Smooth brome
	B. marginatus	Mountian brome
	B. tectorum	Downy chess
	Dactylis glomerata	Orchard grass
	Elymus canadensis	Wild rye
	Festuca octoflora	Six-weeks fescue
	Hilaria jamesii	Galleta
	Hordeum sp.	Barley
	Muhlenbergia montana	Mountain muhly
	M. torreyi	Ring muhly
	Oryzopsis asperifolia	
	Oryzopsis hymenoides	Indian ricegrass
	Phleum pratense	Common timothy
	Poa fendleriana	Mutton grass
	Poa spp.	Bluegrass
	Sitanion hystrix	Bottlebrush squirreltail
	Sporobolus cryptandrus	Sand dropseed
	Stipa spp.	Needle and thread
LABIATEAE	*Monarda pectinata*	Ponymint
LEGUMINOSAE	*Lupinus caudatus*	Lupine
	Melilotus albus	White sweet clover
	Melilotus officinalis	Yellow sweet clover
	Petalostemum spp.	Clover
	Robinia neomexicana	New Mexico locust
	Thermopsis pinetorum	Big golden-pea
	Vicia americana	American vetch
LILIACEAE	*Allium cernuum*	Nodding onion

	Yucca baccata	Banana yucca
LINACEAE	*Linum neomexicana*	New Mexico yellow flax
LOASACEAE	*Mentzelia pumila*	Stickleaf
NYCTAGINACEAE	*Mirabalis multiflora*	Wild four o'clock
	M. oxybaphoides	Vining four-o'clock
OLEACEAE	*Forestiera neomexicana*	New Mexico olive
ONAGRACEAE	*Oenothera* spp.	Evening primrose
PINACEAE	*Abies concolor*	White fir
	Picea pungens	Blue spruce
	Pinus edulis	Pinon pine
	P. flexilis	Limber pine
	P. ponderosa	Ponderosa pine
	Pseudotsuga menziesii	Douglas fir
PLANTAGINACEAE	*Plantago* sp.	Plantain
POLEMONIACEAE	*Ipomopsis aggregata*	Skyrocket
	Ipomopsis longiflora	Blue skyrocket
POLYGONACEAE	*Eriogonum jamesii*	Antelope sage
	E. leptophyllum	Wild buckwheat
	Rumex spp.	Dock
POLYPODIACEAE		Fern
PORTULACACEAE	*Portulaca* sp.	Purslane
RANUNCULACEAE	*Clematis ligusticifolia*	Western's virgin bower
	Clematis pseudoalpina	Rocky Mountain clematis
	Delphinium sp.	Larkspur
	Thalictrum fendleri	Fendler meadowrue
ROSACEAE	*Cercocarpus montanus*	Mountain mahogany
	Fallugia paradoxa	Apache plume
	Fragaria americana	Wild strawberry
	Potentilla pulcherrima	Cinquefoil
	Rosa woodsii	Wild Rose
	Rubus strigosus	Wild raspberry
RUTACEAE	*Ptelea trifoliata*	Narrowleaf hoptree
SALICACEAE	*Populus tremuloides*	Aspen
	P. angustifolia	Narrowleaf cottonwood
	Salix spp.	Willow
SAXIFRAGACEAE	*Jamesia americana*	Cliffbush
	Philadelphus microphyllus	Mockorange
	Ribes cereum	Wax current
SCROPHULARIACEAE	*Castilleja integra*	Foothills paintbrush
	Penstemon barbatus	Scarlet bugler
	P. secundiflorus	Beardtongue
	P. virgatus	Variegated penstemon
	Verbascum thapsus	Mullein
SOLANACEAE	*Solanum nigrum*	Black nightshade
	Physalis foetens	Groundcherry
ULMACEAE	*Ulmus* sp.	Elm
UMBELLIFERAE	*Pseudocymopterus montanus*	Yellow mountain parsley
VALERIANACEAE	*Valeriana acutiloba*	Valeriana
VITACEAE	*Parthenocissus inserta*	Virginian creeper

References: Foxx and Hoard 1984; Martin and Hutchins 1980.

APPENDIX B. Vegetation Data Tables.

Table 1: Density of trees/acre in the ponderosa pine plant community.

PLOT	PONDEROSA PINE	PINYON PINE	ONE-SEED JUNIPER	TOTAL
1	20	0	0	
2	140	0	0	
3	60	0	0	
4	20	20	60	
5	20	0	0	
6	80	0	20	
7	140	0	0	
8	140	0	0	
9	300	0	20	
10	420	0	0	
11	180	120	0	
TOTAL	1640	140	100	1880
AVG TREES/ ACRE	137	12	8	157

Table 2: Total percent cover of vegetation in the ponderosa pine plant community.

PLOT	TREE	SHRUB	FORB	GRASS
1	2	2	T	1
2	1	2	1	2
3	1	2	1	2
4	1	1	1	3
5	T	2	T	2
6	1	2	1	1
7	2	2	T	1
8	2	T	1	1
9	3	1	T	2
10	2	1	T	T
11	1	1	1	1
12	2	1	T	2

T=Trace

Table 3. Density of trees/acre in the pinyon-juniper plant community.

PLOT	PONDEROSA PINE	PINYON PINE	ONE-SEED JUNIPER	TOTAL
1	0	100	20	
2	40	20	40	
3	40	60	80	
4	0	100	140	
5	0	280	80	
6	0	200	40	
7	0	460	0	
8	0	160	100	
9	0	60	60	
TOTAL	80	1410	157	2010
AVG TREES/ ACRE	9	157	58	223

The following key applies to Table 4 and 6 through 15.

Phenology	Tree Size	Cover Class (% cover)
1 sprout/leaf bud	1 4" or less	1 5
2 vegetative	2 4-6"	2 6-25
3 flower bud	3 7-8"	3 26-50
4 full bloom	4 9-10"	4 51-75
5 seed set	5 10-12"	5 76-95
6 dehiscence	6 12-14"	6 96-100
7 begin dormancy	7 15-16"	0 Trace
8 dormancy	8 16-20"	
	9 20" or more	

Table 4: Total percent cover of vegetation in the pinyon-juniper plant community.

PLOT	TREE	SHRUB	FORB	GRASS
1	2	2	1	1
2	1	1	1	3
3	1	T	T	2
4	2	2	2	1
5	3	1	T	T
6	2	1	T	1
7	2	1	T	T

T=Trace

Table 5. Density of trees/acre in the riparian plant community.

PLOT	PONDEROSA PINE	GAMBEL OAK	BOX MAPLE	TOTAL
1	240	0	60	
2	60	20	40	
3	0	80	560	
4	0	80	40	
5	40	120	0	
TOTAL	280	300	700	1280
AVG TREES/ACRE	56	60	140	256

Foxx 1986

Table 6: Total percent cover of vegetation in the pinyon-juniper plant community.

PLOT	TREE	SHRUB	FORB	GRASS
1	3	5	2	4
2	1	T	4	1
3	4	2	4	1
4	2	2	3	1
5	5	3	3	1

T=Trace
Foxx 1986

Table 7. Vegetation Data for Mortandad Canyon, West End, Northeast of TA-48.

COVER, LAYER, AND PHENOLOGY DATA

Trees	Cover Class	Layer Class	Phenology Class
Populus tremuloides	T	3	7
Pinus ponderosa	1	3	7
Pseudotsuga menziesii	1	3	7
Shrubs			
Quercus sp.	1	2	1
Salix sp.	1	2	3
Fallugia paradoxa	T	2	5
Forbs			
Epilobium paniculatum	1	1	2
Verbascum thapsus	T	2	2
Achillea lanulosa	T	1	3
Typha angustifolia	4	3	3

Circium ochrocentrum	1	1	3
Chrysopsis villosa	T	1	3
Vicia americana	T	1	3
Melilotus albus	T	1	3
Lactuca serriola	T	1	2
Gutierrezia sarothrae	T	1	1
Tragopogon dubius	T	1	4
Artemisia frigida	T	1	1
Penstemon barbatus	T	1	3
Graminoids			
Poa fendleriana	1	1	4
Juncus sp.	2	1	3
Cyperus fendlerianus	2	1	4
Bromus tectorum	1	1	4
Agrostis semiverticillata	2	1	3

STAND TREE AGE/SIZE DATA	Size Classes						
	seedlings	1	2	3	4	5	6
total							
Pinus ponderosa			1			(193)	2
Pseudotsuga menziesii		1					1
Populus tremuloides	3	2	1				6

* Numbers in parentheses represent individual tree age.

Table 8. Vegetation Data for Mortandad Canyon, West End, Northeast of TA-48, Moist Area.

COVER, LAYER, AND PHENOLOGY DATA

Trees	Cover Class	Layer Class	Phenology Class
Pinus ponderosa	2	3	7
Acer negundo	T	2	1
Shrubs			
Quercus sp.	T	2	1
Gutierrezia sarothrae	1	2	1
Cercocarpus montanus	1	2	5
Rosa woodsii	T	2	1
Forbs			
Typha angustifolia	5	3	3
Vicia americana	T	1	3
Melilotus albus	T	1	3
Artemisia frigida	T	1	1
Potentilla anserina	T	1	1
Eriogonum jamesii	T	1	3
Grindelia aphanactis	T	1	2
Graminoids			
Poa fendleriana	1	1	3
Juncus sp.	2	1	3
Carex sp.	2	1	3
Bromus tectorum	T	1	4
Agrostis semiverticillata	1	1	3

STAND TREE AGE/SIZE DATA	Size Classes							
	seedlings	1	2	3	4	5	6	total
Pinus ponderosa		1		(57)	(60)	(97)		4
Acer negundo	1							1

* Numbers in parentheses represent individual tree age.

Table 9. Vegetation Data for Mortandad Canyon, Directly Below TA 42.

COVER, LAYER, AND PHENOLOGY DATA

Trees	Cover Class	Layer Class	Phenology Class
Pinus ponderosa	2	3	7
Shrubs			
Quercus gambelii	1	2	1
Fallugia paradoxa	T	2	5
Cercocarpus montanus	2	2	1
Yucca angustissima	T	1	5
Forbs			
Opuntia erinacea	T	1	1
Penstemon barbatus	T	1	3
Penstemon virgatus	T	1	4
Graminoids			
Agropyron smithii	T	1	2
Aristida longiseta	2	1	1
Carex sp.	T	1	1

STAND TREE AGE/SIZE DATA	Size Classes					
	seedlings	1	2	3	4	5	6
total							
Pinus ponderosa					(156) (195) (161)	(176)	(169) 5

* Numbers in parentheses represent individual tree age.

Table 10. Vegetation Data for Mortandad Canyon, Directly North of TA 42 in Stream Channel.

COVER, LAYER, AND PHENOLOGY DATA

Trees	Cover Class	Layer Class	Phenology Class
Pinus ponderosa	2	3	7
Pseudotsuga menziesii	1	3	7
Shrubs			
Quercus gambelii	1	2	1
Rosa woodsii	2	2	3
Cercocarpus montanus	T	2	1
Salix sp.	1	2	3
Forbs			
Typha angustifolia	4	2	3
Rhus radicans	2	1	1
Parthenocissus inserta	1	1	2
Carex sp.	2	1	3
Circium ochrocentrum	T	1	2
Thermopsis pinetorum	1	1	5
Fragaria americana	T	1	1
Geranium richardsonii	T	1	4
Epilobium sp.	T	1	2
Vivia americana	T	1	3
Juncus sp.	1	1	3
Pterospora andromedea	T	1	1
Graminoids			
Poa sp.	T	1	3
Koeleria cristata	T	1	3
Agrostis semiverticillata	T	1	1

STAND TREE AGE/SIZE DATA	Size Classes						
	seedlings	1	2	3	4	5	6
total							
Pinus ponderosa		1	(42)	(46)			(65) (45) (170)
Pseudotsuga menziesii							6 1 1

* Numbers in parentheses represent individual tree age.

Table 11. Vegetation Data for Mortandad Canyon-Along Stream Bed, North of TA 35.

COVER, LAYER, AND PHENOLOGY DATA

Trees	Cover Class	Layer Class	Phenology Class
Pinus ponderosa	1	3	7
Pseudotsuga menziesii	3	3	7
Juniperus scopulorum	1	3	7
Abies concolor	1	3	7
Pinus flexilis	1	3	7
Shrubs			
Quercus gambelii	1	2	1
Jamesia americana	T	2	4
Berberis fendleri	T	2	5
Forbs			
Frageria ovalis	T	1	1
Galium triflorum	T	1	3
Smilacina racemosa	T	1	6
Opuntia erinacea	T	1	3
Penstemon barbatus	T	1	3
Clematis ligusticifolia	T	1	7
Senecio fendleri	T	1	3
Gutierrezia sarothrae	T	1	1
Graminoids			
Muhlenbergia montana	T	1	1
Muhlenbergia torreyi	T	1	1

STAND TREE AGE/SIZE DATA	Size Classes						
	seedlings	1	2	3	4	5	6
total							
Pinus ponderosa						(179)	(201) 2
Pseudotsuga menziesii	1	2	3 (56)	(171)			
Pinus flexilis	1						2 3
Abies concolor				(45)			
1							

* Numbers in parentheses represent individual tree age.

Table 12. Vegetation Data for Mortandad Canyon North of TA 35-Along Stream Bed, East of Bee Hives.

COVER, LAYER, AND PHENOLOGY DATA

Trees	Cover Class	Layer Class	Phenology Class
Pinus ponderosa	1	3	7
Pinus flexilis	T	1	7
Shrubs			
Cercocarpus montanus	T	2	5
Rosa woodsii	T	2	6
Berberis fendleri	1	2	5
Forbs			
Gutierrezia sarothrae	T	1	2
Potentilla anserina	T	1	1
Pseudocymopterus montanus	T	1	5
Antennaria parvifolia	1	1	5
Penstemon barbatus	T	1	3
Thermopsis pinetorum	2	1	5
Senecio fendleri	T	1	4
Artemisia frigida	T	1	1
Arctostaphylos uva-ursi	1	1	5
Lithospermum incisum	T	1	4
Senecio sp.	1	1	1
Euphorbia sp.	T	1	2
Penstemon virgatus	T	1	5
Graminoids			
Muhlenbergia wrightii	2	1	1
Lolium perenne	T	1	3
Koeleria cristata	1	1	3

STAND TREE AGE/SIZE DATA	Size Classes							
	seedlings	1	2	3	4	5	6	total
Pinus ponderosa	3	6					2	11
Pinus flexilis		1						1

* Numbers in parentheses represent individual tree age.

Table 13. Vegetation Data for Mortandad Canyon, Mid-Portion Along Stream Bed.

COVER, LAYER, AND PHENOLOGY DATA

Trees	Cover Class	Layer Class	Phenology Class
Pseudotsuga menziesii	4	3	7
Acer negundo	1	3	7
Quercus gambelii	2	3	7
Juniperus monosperma	T	1	1
Pinus flexilis	1	3	7
Shrubs			
Prunus virginiana	2	2	1
Rosa woodsii	1	2	1
Jamesia americana	1	2	4
Berberis fendleri	1	2	5
Forbs			
Fragaria ovalis	T	1	6
Galium triflorum	T	1	4
Ribes cereum	T	1	1
Circium ochrocentrum	T	1	1
Clematis ligusticifolia	T	1	1
Lithospermum multiflorum	T	1	4
Smilacina stellata	T	1	5
Graminoids			
Muhlenbergia wrightii	1	1	5

STAND TREE AGE/SIZE DATA	Size Classes						
total	seedlings	1	2	3	4	5	6
Pseudotsuga menziesii	1	5			1	(60) (106) (52)	(149) 11
Acer negundo		6					6
Pinus flexilis	10 (rodent cache)						10
Juniperus monosperma	1						1

* Numbers in parentheses represent individual tree age.

Table 14. Vegetation Data for Mortandad Canyon Stream, Mid-Portion East of TA 35.

COVER, LAYER, AND PHENOLOGY DATA

Trees	Cover Class	Layer Class	Phenology Class
Pinus ponderosa	2	3	7
Quercus gambelii	1	3	7
Shrubs			
Ribes cereum	T	2	4
Rosa woodsii	T	2	4
Robinia neomexicana	T	2	1
Forbs			
Verbascum thapsus	2	2	3
Artemisia ludoviciana	1	1	1
Typha angustifolia	3	2	3
Penstemon barbatus	T	1	3
Senecio fendleri	T	1	4
Lactuca serriola	T	1	1
Heterotheca villosa	T	1	2
Antennaria parvifolia	T	1	6
Tragopogon dubius	T	1	7
Taraxacum officinale	T	1	7
Erigeron sp.	T	1	4
Allium cernuum	T	1	2
Circium ochrocentrum	T	1	3
Opuntia erinacea	T	1	3
Rhus radicans	T	1	1
Potentilla sp.	T	1	1
Chenopodium album	T	1	1
Graminoids			
Carex sp.	1	1	1
Agrostis gigantea	3	1	3
Agrostis alba	1	1	3
Poa compressa	T	1	3
Bromus tectorum	1	1	3
Koeleria cristata	T	1	3

STAND TREE AGE/SIZE DATA	Size Classes						
	seedlings	1	2	3	4	5	6
total							
Pinus ponderosa		5					(175)
			(144)	(165)			1
				(124)			1 11

* Numbers in parentheses represent individual tree age.

Table 15. Vegetation Data for Mortandad Canyon-South Slope, Directly North of TA 42.

COVER, LAYER, AND PHENOLOGY DATA

Trees	Cover Class	Layer Class	Phenology Class
Pinus ponderosa	5	3	7
Pseudotsuga menziesii	2	3	7
Juniperus scopulorum	T	2	7
Shrubs			
Quercus gambelii	T	1	1
Rosa woodsii	T	2	3
Cercocarpus montanus	T	2	1
Forbs			
Erigeron sp.	T	1	2
Gilia sp.	T	1	1
Graminoids			
Poa sp.	T	1	1

STAND TREE AGE/SIZE DATA	Size Classes						
total	seedlings	1	2	3	4	5	6
Pinus ponderosa	9	3	(42)	(60)			(194)
			(57)				
			(53)				
			(51)				
			(49)				19
							(170) 6
Pseudotsuga menziesii	1	4	1				
			(50)	(51)			
			(43)	(48)			
			(53)				11

* Numbers in parentheses represent individual tree age.

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

ENDANGERED SPECIES PRINTOUT: RADIOACTIVE LIQUID WASTE TREATMENT FACILITY

POTENTIAL SPECIES OCCURRING IN LOS ALAMOS COUNTY

ANIMALS

AMPHIBIAN

FAMILY BUFONIDAE

SCIENTIFIC NAME: Bufo boreas

COMMON NAME: *WESTERN TOAD*

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: NM: endangered (Group 2). First listed May 21, 1976 (NM regulation 563). Listed also as a C2 candidate.

DISTRIBUTION: Northern New Mexico. Only known in three localities in the San Juan Mountains; Lagunitas, Trout and Canjilon Lakes.

SPECIFIC REQUIREMENTS: High mountains, beaver ponds, standing or running water for breeding.

HABITAT:LAKES-PONDS BREEDING HABITAT: LAKES-PONDS

MINIMUM ELEVATION: 8580 MAXIMUM ELEVATION: 0

THREATS TO TAXON:DESTRUCTION OF BEAVER PONDS, ACID RAIN AND POLLUTION.

BRIEF KEY DESCRIPTION: Dorsal color is light gray-green, green, tan, or gray-brown, spotted with dark brown. Venter is cream,, yellowish wash on groin. Very warty toad--90 mm.

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

COMMENTS:

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

ANIMALS

AMPHIBIAN

FAMILY PLETHODONTIDAE

SCIENTIFIC NAME: Plethodon neomexicanus

COMMON NAME: *JEMEZ MOUNTAINS SALAMANDER*

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico Endangered (group 2), first listed in 1/24/75 (nm reg. 563). There no exist a cooperative agreement between the U.S. Fish and Wildlife, U.S. Forest Service and NM Dept. of Game and Fish for the Protection of the Salamander.

The salamander is also listed as C1 species.

DISTRIBUTION: Endemic to North-Central NM. Known in various locations of the Jemez Mountains, Sandoval, Los Alamos and Rio Arriba Counties, NM.

SPECIFIC REQUIREMENTS: Cool moist and shaded wooded habitats where elevations are 2190 - 2800 m.

HABITAT:SPRUCE-FIR BREEDING HABITAT: SPRUCE-FIR

MINIMUM ELEVATION: 7225 MAXIMUM ELEVATION: 9250

THREATS TO TAXON:HABITAT ALTERATIONS

BRIEF KEY DESCRIPTION: Lungless salamander, hairline furrow that extends from nostril to edge of upper lip. Enlongated with small fore and hind limbs, brownish with fine brassy strippling. Length is between 50-110 mm.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: YES
LA REFERENCE OF OCCURRENCE:SCHMITT, ET AL., 1985; EDESKUTY AND BENNETT, 1991
GENERAL MAP LOCATION:UPPER PAJARITO CANYON

COMMENTS:

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

ANIMALS

BIRD

FAMILY ACCIPITRIDAE

SCIENTIFIC NAME: Accipiter gentilis

COMMON NAME: *NORTHERN GOSHAWK*

STATUS: CANDIDATE FOR FEDERAL REGISTER

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

DISTRIBUTION:

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

HABITAT:PONDEROSA BREEDING HABITAT: PONDEROSA

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:LOGGING

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

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: YES
LA REFERENCE OF OCCURRENCE:KENNEDY, P.L., 1987
GENERAL MAP LOCATION:

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

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

ANIMALS

BIRD

FAMILY ACCIPITRIDAE

SCIENTIFIC NAME: Buteogallus anthracinus

COMMON NAME: *COMMON BLACK HAWK*

STATUS: STATE-ENDANGERED

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

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

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

HABITAT:RIPARIAN ZONES BREEDING HABITAT: RIPARIAN ZONES

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

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

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

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

COMMENTS:

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

ANIMALS

BIRD

FAMILY ACCIPITRIDAE

SCIENTIFIC NAME: Haliaeetus leucccephalus

COMMON NAME: *BALD EAGLE*

STATUS: FEDERALLY-ENDANGERED

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

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

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

HABITAT:RIPARIAN ZONES BREEDING HABITAT: RIPARIAN ZONES

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:PESTICIDES AND STREAM DEGRADATION.

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

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: YES
LA REFERENCE OF OCCURRENCE:FIELD SIGHTINGS, 1991-1992
GENERAL MAP LOCATION:NEAR ANCHO CANYON IN WHITE ROCK CANYON

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

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

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

ANIMALS

BIRD

FAMILY ACCIPITRIDE

SCIENTIFIC NAME: Ictinia mississippiensis

COMMON NAME: *MISSISSIPPI KITE*

STATUS: STATE-ENDANGERED

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

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

SPECIFIC REQUIREMENTS: Riparian zones, shelterbelts and golf courses.

HABITAT:RIPARIAN ZONES BREEDING HABITAT: RIPARIAN ZONES

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:DESTRUCTION OF RIPARIAN ZONES.

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

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

COMMENTS:

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

ANIMALS

BIRD

FAMILY EMBERIZINAE

SCIENTIFIC NAME: Ammodramus bairdii

COMMON NAME: *BAIRD'S SPARROW*

STATUS: STATE-ENDANGERED

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

Also a federal C2 species.

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

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

HABITAT:JUNIPER-GRASSLAND BREEDING HABITAT: JUNIPER-GRASSLAND

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:HABITAT LOSS AND ALTERATIONS

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

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

COMMENTS:

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

ANIMALS

BIRD

FAMILY FALCONIDAE

SCIENTIFIC NAME: Falco Peregrinus

COMMON NAME: *PEREGRINE FALCON*

STATUS: FEDERALLY-ENDANGERED

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

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

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

HABITAT:PONDEROSA-PINON BREEDING HABITAT: PONDEROSA-PINON

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:DDT, DESTRUCTION OF HABITAT

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

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: YES
LA REFERENCE OF OCCURRENCE:LA-6898-PR, PP.94
GENERAL MAP LOCATION:PUEBLO CANYON

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

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

ANIMALS

BIRD

FAMILY GRUIDAE

SCIENTIFIC NAME: Grus americana

COMMON NAME: *WHOOPING CRANE*

STATUS: FEDERALLY-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico: Endangered (Group 2), 12/5/75 (NMGF Reg. 563); Federal: Endangered, 3/11/67.

DISTRIBUTION: Migrate into New Mexico in autumn, and most winter in the central Rio Grande Valley.

SPECIFIC REQUIREMENTS: Foraging areas are agricultural fields and valley pastures, roost on sand bars in the Rio Grande.

HABITAT:RIVERS-STREAMS BREEDING HABITAT: RIVERS-STREAMS

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:HABITAT LOSS AND ALTERATIONS

BRIEF KEY DESCRIPTION: White plumage, black wingtips, long necks and legs, and red forehead, legs black and iris and bills are yellowish. Wingspan is 2.2 m. Length is 1.3 m and weight is 5.4 kg.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: YES
LA REFERENCE OF OCCURRENCE:HUBBARD, 1985
GENERAL MAP LOCATION:

COMMENTS: Adults breed for life and return to their old wintering and breeding territories in subsquent years.

Whooping cranes following the path of the Rio Grande River during migration. They fly over LANL, but have not been known to stop. May stop at sand bars in White Rock Canyon---not known .

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

ANIMALS

BIRD

FAMILY LARIDAE

SCIENTIFIC NAME: Sterna antillarum

COMMON NAME: *LEAST TERN*

STATUS: FEDERALLY-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico: Endangered (Group 1), 5/21/76 (NMGF Reg. 563); Federal: "Interior", S.a. athalassos Endangered, 5/28/85.

DISTRIBUTION: Breed in the vicinity of Roswell. Occurs in migration in Eddy Co. and as vagrants in Espanola, Sumner Lake (Debaca Co.), Socorro Co., Las Cruces and Alamogordo.

SPECIFIC REQUIREMENTS: Ground nesting. Sites that are sandy and vegetation free. Such as sandbars and alkali flats.

HABITAT:RIVERS-STREAMS BREEDING HABITAT: RIVERS-STREAMS

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:HUMAN DISTURBANCE, NEST FLOODING AND ENVIRONMENTAL CONTAMIN.

BRIEF KEY DESCRIPTION: The adult plumage is largely white, with back and upper surfaces of the wings gray, and the cap and the outermost primaries black. The immature plumage is similar, but the crown is gray, and there is more blackish in the wings. The juvenille plumage resembles that of the immature, but the gray coleration is duller and marker with dusky. The iris is brown and the feet yellowish (in adults and juveniles) or blackish (immatures). the bill is light in junveniles and blackish in immatures. Measurment of adults: wing length = 166-176 mm in males and 161-169 in females; tail length = 70.5-92.5 and 67.5-83.

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

COMMENTS:

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

ANIMALS

BIRD

FAMILY PHASIANIDAE

SCIENTIFIC NAME: Lagopus leucurus

COMMON NAME: *WHITE-TAILED PTARMIGAN*

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico: Endangered (Group 1), 01/24/75 (NMGF Reg 563).

DISTRIBUTION: Sangre de Cristo Mountains, Costilla, Latir, Wheeler, Truchas and associated peaks.

SPECIFIC REQUIREMENTS: Alpine tundra and timberline above 3200 m.

HABITAT:ALPINE-TUNDRA BREEDING HABITAT: ALPINE-TUNDRA

MINIMUM ELEVATION: 10500 MAXIMUM ELEVATION: 0

THREATS TO TAXON:DESTRUCTION OF HABITAT DUE TO LIVESTOCK

BRIEF KEY DESCRIPTION: Winter all whire. In the summer large areas of pale cinnamon-rufous, with white and black mottling. Adults have red comb over each eye. Young resemble a domestic chick.

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

COMMENTS:

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

ANIMALS

BIRD

FAMILY STRIGIDAE

SCIENTIFIC NAME: Strix occidentalis lucida

COMMON NAME: *MEXICAN SPOTTED OWL*

STATUS: FEDERALLY-THREATENED

FEDERAL/STATE REFERENCE: Currently listed as federaly threatened, 50 CFR PART 17, Vol. 58, No. 49, March 16, 1993, "Endangered and Threatened Wildlife and Plants: Final Rule to list Mexican Spotted Owl as Threatened Species, pp.14248-14271.

DISTRIBUTION: New Mexico, Arizonia, Texas, Colorado, Utah and Mexico.

SPECIFIC REQUIREMENTS: The owl inhabitats forested mountains and canyons. Its habitat is primarily uneven-aged, multi-storied forest with closed canopies.

HABITAT:MIXED-CONIFER BREEDING HABITAT: MIXED-CONIFER

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:LUMBERING

BRIEF KEY DESCRIPTION:

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

COMMENTS:

REFERENCE: FEDERAL REGISTER 50 CFR PARTT 17, VOL.55, NO.60, 3/28/90.

ANIMALS

BIRD

FAMILY THRESKIORNITHIDAE

SCIENTIFIC NAME: Plegadis chihi

COMMON NAME: *WHITE-FACED IBIS*

STATUS: CANDIDATE FOR FEDERAL REGISTER

FEDERAL/STATE REFERENCE:

DISTRIBUTION: The white-faced ibis is more western in range tnah the Glossy ibis; generally restricted to the Gulf Coast and southeastern states. Migration path crosses New Mexico. Counld possibly breed in portions of New Mexico.

SPECIFIC REQUIREMENTS:

HABITAT:WETLAND BREEDING HABITAT: WETLANDS

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:

BRIEF KEY DESCRIPTION: Told from the Glossy Ibis, only in the breeding season, by the broad white line around the adult's eye and under chin. Immatures are identical to Glossy. Call of low quacks.

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

COMMENTS: Can also be associated with streams and rivers such as the Rio Grande. In Los Alamos County, the associations is probably the strongest around the Rio.

REFERENCE: FEDERALLY LISTED PLANT/ANIMAL COUNTY LIST, NM 8/18/93

ANIMALS

BIRD

FAMILY TROCHILIDAE

SCIENTIFIC NAME: Cynanthus latirostris

COMMON NAME: *BROAD-BILLED HUMMINGBIRD*

STATUS: STATE-ENDANGERED

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

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

SPECIFIC REQUIREMENTS: Riparian woodlands, low to moderate elevations.

HABITAT:RIPARIAN ZONES BREEDING HABITAT: RIPARIAN ZONES

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:DESTRUCTION OF HABITAT

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

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

COMMENTS:

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

ANIMALS

BIRD

FAMILY TYRANNIDAE

SCIENTIFIC NAME: Empidonax traillii

COMMON NAME: *WILLOW FLYCATCHER*

STATUS: CANDIDATE FOR FEDERAL REGISTER

FEDERAL/STATE REFERENCE: New Mexico: "Southwestern", E.T. extimus, only. Endangered , Group 2, 01/09/88 (NMGF reg 657). Federal: Notice of Review as Endangered/Threatened.
*****
Species is now listed as a federally PROPOSED.
********PROPOSED AS ENDANGERED**********

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

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

HABITAT:RIPARIAN ZONES BREEDING HABITAT: RIPARIAN ZONES

MINIMUM ELEVATION: 3700 MAXIMUM ELEVATION: 8900

THREATS TO TAXON:LOSS OF RIPARIAN HABITAT

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

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

COMMENTS:

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

ANIMALS

BIRD

FAMILY VIREONIDAE

SCIENTIFIC NAME: Vireo vicinior

COMMON NAME: *GRAY VIREO*

STATUS: STATE-ENDANGERED

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

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

SPECIFIC REQUIREMENTS: Open wooodlands, domainated by juniper and oaks in the sourthern range.

HABITAT:JUNIPER-GRASSLAND BREEDING HABITAT: JUNIPER-GRASSLAND

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

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

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

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

COMMENTS:

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

ANIMALS

FISH

FAMILY CYPRINIDAE

SCIENTIFIC NAME: Hybognathus amarus

COMMON NAME: *RIO GRANDE SILVERY MINNOW*

STATUS: CANDIDATE FOR FEDERAL REGISTER

FEDERAL/STATE REFERENCE: New Mexico: Endangered (Group 2), First listed as the Mississippi silvery minnow H. nuchalis, May 25, 1979 (NMGF Reg. 563).
****

Now federally PROPOSED as Endangered.

DISTRIBUTION: Endemic species of the Rio Grande Drainage. Now confined to perennial reaches of the Rio Grande from Santo Domingo Pueblo (Sandoval Co.) south to Socorro.

SPECIFIC REQUIREMENTS:

HABITAT:RIVERS-STREAMS BREEDING HABITAT: RIVERS-STREAMS

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:

BRIEF KEY DESCRIPTION: Large minnow (100-150 mm in length). This minnow is coarsely scaled, dorsal fin that is distinctly pointed at tip. Color is yellowish-olive with a broad dusky-greenish-golden stripe.

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

COMMENTS: Mintenance of perennial flows in the Rio Grande basin is essential to the perservation of this species. In addition, the introduction of the plains minnow in the Rio Grande drainage should be avoided.

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

ANIMALS

FISH

FAMILY CYPRINIDAE

SCIENTIFIC NAME: Notropis simus

COMMON NAME: *BLUNTNOSE SHINER*

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico: ("Rio Grande" subspecies N.s. simus): Endangered (Group 1), listed 1/24/75 (NMGF Reg. 563). N.s. pecosensis: Endangered (Group 2) 5/21/76 (NMGF Reg. 563). Federal "Pecos" Threatened 5/11/84.

DISTRIBUTION: Endemic to the Rio Grande and Pecos. N.s. simus occurs in the Rio Grande and N.s. pecosensis occurs in the Pecos.

SPECIFIC REQUIREMENTS: May need perennial flow for breeding.

HABITAT:RIVERS-STREAMS BREEDING HABITAT: RIVERS-STREAMS

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:DEWATERING OF HABITAT AND FLOW/TEMPERATURE CHANGES-POLLUTION

BRIEF KEY DESCRIPTION: Color is pallid grayish-greenish brown dorsally, whitish or silver ventrally. Silver lateral stripe is present. Deep body and spindled shape. The total length is 75 mm.

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

COMMENTS: May be extinct in the Rio Grande, but surveys for it should conitue.

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

ANIMALS

MAMMAL

FAMILY MUSTELIDAE

SCIENTIFIC NAME: Martes americana

COMMON NAME: *PINE MARTEN*

STATUS: STATE-ENDANGERED

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

DISTRIBUTION: San Juan and Sangre de Cristo Mountains and reported without verification in the Jemez Mountains.

SPECIFIC REQUIREMENTS: Mature old-growth spruce-fir communities with more than 30% canopy cover and fallen logs.

HABITAT:SPRUCE-FIR BREEDING HABITAT: SPRUCE-FIR

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:TRAPPING FOR FUR AND LOGGING.

BRIEF KEY DESCRIPTION: Shaggy fur, dark coloration, except for buffy throat and chest. Tail is about 1/2 the length of the head and body. Nose is black. Total length 570-1240 mm.

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

COMMENTS: Past report's of martens have indicated that they are intolerant of man's presence.

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

ANIMALS

MAMMAL

FAMILY OCHOTONIDAE

SCIENTIFIC NAME: Ochotona princeps nigrescens

COMMON NAME: *GOAT PEAK PIKA*

STATUS: CANDIDATE FOR FEDERAL REGISTER

FEDERAL/STATE REFERENCE: Listed as a C2 species

DISTRIBUTION:

SPECIFIC REQUIREMENTS:

HABITAT:ALPINE-TUNDRA BREEDING HABITAT: ALPINE-TUNDRA

MINIMUM ELEVATION: 9000 MAXIMUM ELEVATION: 0

THREATS TO TAXON:

BRIEF KEY DESCRIPTION:

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

COMMENTS:

REFERENCE: FINELY, ET AL., 1975, MAMMALS OF NEW MEXICO

ANIMALS

MAMMAL

FAMILY VESPERTILIONIDAE

SCIENTIFIC NAME: Euderma maculatum

COMMON NAME: *SPOTTED BAT*

STATUS: STATE-ENDANGERED

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

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

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

HABITAT:MULTIPLE BREEDING HABITAT: MULTIPLE

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:POSSIBLY PESTICIDES

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

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

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

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

ANIMALS

MAMMAL

FAMILY VESPERTILIONIDAE

SCIENTIFIC NAME: Myotis lucifugus occultus

COMMON NAME: *OCCULT LITTLE BROWN MYOTIS*

STATUS: CANDIDATE FOR FEDERAL REGISTER

FEDERAL/STATE REFERENCE: Listed as a C2 species.

DISTRIBUTION:

SPECIFIC REQUIREMENTS: Is a water bat in that most specimens have been taken in the vicinity of large permanent water sources, such as streams or lakes.

HABITAT:RIVERS-STREAMS BREEDING HABITAT: N/A

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:

BRIEF KEY DESCRIPTION:

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

COMMENTS:

REFERENCE: FINDLEY, J.S., ET AL., 1975, MAMMALS OF NEW MEXICO

ANIMALS

MAMMAL

FAMILY ZAPODIDAE

SCIENTIFIC NAME: Zapus hudsonius

COMMON NAME: *MEADOW JUMPING MOUSE*

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico: Endangered (Group 2), 07/22/83 (NMGF Reg. 624). Federal (Subspecies "New Mexico" Z.H. luteus) notice of review as endangered/threatened.

DISTRIBUTION: Localli in San Juan, Jemez and Scaramento Mountains in central-northern and central Rio Grande Valley. Has been recorded once in the Sangre de Cristo Mountains.

SPECIFIC REQUIREMENTS: Confined to holarctic region, mesic habitats, permanent streams and wet meadows.

HABITAT:WETLAND BREEDING HABITAT: WETLANDS

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:HABITAT DESTRUCTION-GRAZING

BRIEF KEY DESCRIPTION: Well developed hind legs, long tail, jumping ability. Shades of brownish above and whitish below, sides yellow/orange brown. Feet are whitish. Length is 188-216 mm.

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

COMMENTS: Reports for Los Alamos are unsubstantiated or pre-1960 records.

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

ANIMALS

MOLLUSK

FAMILY LYMNAEIDAE

SCIENTIFIC NAME: Lymnaea caperata

COMMON NAME: *SAY'S POND SNAIL*

STATUS: STATE-ENDANGERED

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

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

SPECIFIC REQUIREMENTS:

HABITAT:WETLAND BREEDING HABITAT: WETLANDS

MINIMUM ELEVATION: 3700 MAXIMUM ELEVATION: 8600

THREATS TO TAXON:OVERGRAZING, POLLUTION, DEVELOPMENT AND DEATERING

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

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

COMMENTS:

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

ANIMALS

MOLLUSK

FAMILY SPHAERIIDAE

SCIENTIFIC NAME: Pisidium lilljeborgi

COMMON NAME: *LILLJEBORG'S PEA-CLAM*

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE: New Mexico: Endangered (Group 2), frist listed 7/22/83 (NMGF Reg. 624).

DISTRIBUTION: The species is known only in Nambe Lakes, Sangre de Cristo Mountains (Santa Fe Co.).

SPECIFIC REQUIREMENTS: Lakes at higher altitudes.

HABITAT:LAKES-PONDS BREEDING HABITAT: LAKES-PONDS

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:POLLUTION

BRIEF KEY DESCRIPTION: Tiny (4.5 mm), shell that is 15 mm or less than total length. Has a thin delicate and weakly sculptured. Length is always less than 5 mm in NM species. Color is tan to pale yellow.

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

COMMENTS:

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

PLANTS

CACTUS

FAMILY CACTACEAE

SCIENTIFIC NAME: Mammillaria wrightii, Engelm.

COMMON NAME: *WRIGHT FISHHOOK CACTUS*

STATUS: STATE-ENDANGERED

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

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

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

HABITAT:PINON-JUNIPER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 3000 MAXIMUM ELEVATION: 7000

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

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

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

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

CACTUS

FAMILY CACTACEAE

SCIENTIFIC NAME: Opunita clavata, Engelm.

COMMON NAME: *DAGGER-THORN CHOLLA*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

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

SPECIFIC REQUIREMENTS:

HABITAT:JUNIPER-GRASSLAND BREEDING HABITAT: N/A

MINIMUM ELEVATION: 6000 MAXIMUM ELEVATION: 8000

THREATS TO TAXON:NONE KNOWN

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

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

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

CACTUS

FAMILY CACTACEAE

SCIENTIFIC NAME: Opunita viridiflora, Britt. and Rose.

COMMON NAME: *SANTA FE CHOLLA*

STATUS: STATE-ENDANGERED

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

DISTRIBUTION: Santa Fe County, New Mexico.

SPECIFIC REQUIREMENTS:

HABITAT:PINON-JUNIPER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 7200 MAXIMUM ELEVATION: 8000

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

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

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

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

CACTUS

FAMILY CACTACEAE

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

COMMON NAME: *GRAMMA GRASS CACTUS*

STATUS: STATE-ENDANGERED

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

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

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

HABITAT:PINON-JUNIPER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 5000 MAXIMUM ELEVATION: 7300

THREATS TO TAXON:OVERCOLLECTION, OVERGRAZING AND URBANIZATION.

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

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: YES
LA REFERENCE OF OCCURRENCE:
GENERAL MAP LOCATION:

COMMENTS:

REFERENCE: NM NATIVE PLANT PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

FORB

FAMILY APIACEAE

SCIENTIFIC NAME: Aletes sessiliflorus, Theobald and Tseng

COMMON NAME: *SESSILE-FLOWERED FALSE CARROT*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

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

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

HABITAT:PINON-JUNIPER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 6500 MAXIMUM ELEVATION: 8100

THREATS TO TAXON:NONE KNOWN

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

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

COMMENTS:

REFERENCE: NM NATIVE PLANT PROTECTION ADVISORY COMMITTEE, 1984

PLANTS

FORB

FAMILY ASTERACEAE

SCIENTIFIC NAME: Cirsium inornatum, Woot. and Standl.

COMMON NAME: *PLAIN THISTLE*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Cibola, Lincoln, Otero, Rio Arriba, and Taos Counties.

SPECIFIC REQUIREMENTS:

HABITAT:MOUNTAIN SLOPES BREEDING HABITAT: N/A

MINIMUM ELEVATION: 7500 MAXIMUM ELEVATION: 9000

THREATS TO TAXON:NONE KNOWN

BRIEF KEY DESCRIPTION: Stems to 1 m tall, simple below the middle; leaves lance shaped to nearly filamentous in outline, to 20 cm long; flowersyellowish to greenish-yellow.

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

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984

PLANTS

FORB

FAMILY ASTERACEAE

SCIENTIFIC NAME: Tetradymia filifolia, Greene

COMMON NAME: *THREADLEAF HORSEBRUSH*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

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

SPECIFIC REQUIREMENTS: Limestone or highly gypseous soils.

HABITAT:PINON-JUNIPER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 6000 MAXIMUM ELEVATION: 7000

THREATS TO TAXON:NONE KNOWN

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

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

COMMENTS:

REFERENCE: NM NATIVE PLANT PROTECTION ADVISORY COMMITTEE, 1984

PLANTS

FORB

FAMILY BORAGINACEAE

SCIENTIFIC NAME: Mertensia viridis, A. Nels.var. caelestina L.O.Wil

COMMON NAME: *ALPINE BLUEBELL*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Rio Arriba, Santa Fe, and Taos counties, New Mexico.

SPECIFIC REQUIREMENTS:

HABITAT:MOUNTAIN SLOPES BREEDING HABITAT: N/A

MINIMUM ELEVATION: 12000 MAXIMUM ELEVATION: 13000

THREATS TO TAXON:NONE KNOWN

BRIEF KEY DESCRIPTION: Stems to 35 cm tall; leaves lance shaped; flowers clusters densely coiled; petals blue; fruits divided into four nutlets. flowers from July to September.

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

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984

PLANTS

FORB

FAMILY CARYOPHYLLACEAE

SCIENTIFIC NAME: Silene plankii, Hitchc. & Maguire

COMMON NAME: *PLANK'S CATCHFLY*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE: Federal Register, 15 December 1980, candiadate for federal protection. 1991 NM Natural Heritage Program working plant list indicates status change to a 3C---no longer under consideration for federal listing.

DISTRIBUTION: Bernalillo, Dona ana, Sandoval, Sierra, and Socorro counties, New Mexico.

SPECIFIC REQUIREMENTS: Cervices and pockets in protected cliff faces of igneous rock.

HABITAT:PINON-JUNIPER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 5000 MAXIMUM ELEVATION: 6000

THREATS TO TAXON:BROWSED BY BIG HORN SHEEP.

BRIEF KEY DESCRIPTION: Low, clumped perinnial, wooly rootstock, 10-15 cm tall, finely hairy, glandular sticky near flowers, stem leaves in 5-8 pr, lance shaped; flowers scarlet-few.

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

COMMENTS:

REFERENCE: NM NATIVE PLANT PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

FORB

FAMILY FABACEAE

SCIENTIFIC NAME: Astragalus cyaneus, Gray

COMMON NAME: *CYANIC MILK-VETCH*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

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

SPECIFIC REQUIREMENTS: Sandy or gravelly hillsides.

HABITAT:PINON-JUNIPER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 5500 MAXIMUM ELEVATION: 6500

THREATS TO TAXON:NONE KNOWN

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

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

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

FORB

FAMILY FABACEAE

SCIENTIFIC NAME: Astragalus feensis M.E. Jones

COMMON NAME: *SANTA FE MILKVETCH*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

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

SPECIFIC REQUIREMENTS: Dry slopes.

HABITAT:PINON-JUNIPER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 5000 MAXIMUM ELEVATION: 6500

THREATS TO TAXON:NONE KNOWN

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

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

COMMENTS:

REFERENCE: NEW MEXICO NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984

PLANTS

FORB

FAMILY FABACEAE

SCIENTIFIC NAME: Astragalus kentrophyta Gray var. neomexicanus

COMMON NAME: *SPINY-LEAF MILK-VETCH*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Bernalillo, Cibola, McKinley, San Juan, Sandoval, Santa Fe, and Valencia Counties, New Mexico.

SPECIFIC REQUIREMENTS: Gullied bluffs, badlands, dunes and roadsides.

HABITAT:JUNIPER-GRASSLAND BREEDING HABITAT: N/A

MINIMUM ELEVATION: 5300 MAXIMUM ELEVATION: 6900

THREATS TO TAXON:

BRIEF KEY DESCRIPTION: Low bushy, branched at the base, stems 4-30 cm tall;leaves stiff, pickly and green; petals whitish; pod egg shaped; flowers from June to September.

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

COMMENTS:

REFERENCE: NEW MEXICO NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984

PLANTS

FORB

FAMILY FABACEAE

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

COMMON NAME: *MATHEW'S WOOLLY MILK-VETCH*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

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

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

HABITAT:PINON-JUNIPER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 5000 MAXIMUM ELEVATION: 6000

THREATS TO TAXON:NONE KNOWN

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

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

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984

PLANTS

FORB

FAMILY FABACEAE

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

COMMON NAME: *TAOS MILK-VETCH*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Rio Arriba and Taos counties, New Mexico.

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

HABITAT:PINON-JUNIPER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 7000 MAXIMUM ELEVATION: 0

THREATS TO TAXON:NONE KNOWN

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

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

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

FORB

FAMILY FABACEAE

SCIENTIFIC NAME: Dalea scariosa Wats.

COMMON NAME: *LA JOLLA PRAIRIE CLOVER*

STATUS: STATE-SENSITIVE

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

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

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

HABITAT:JUNIPER-GRASSLAND BREEDING HABITAT: N/A

MINIMUM ELEVATION: 4900 MAXIMUM ELEVATION: 5030

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

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

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

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

FORB

FAMILY LILIACEAE

SCIENTIFIC NAME: Fritillaria atropurpurea

COMMON NAME: *CHECKER LILY*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Los Alamos county??

SPECIFIC REQUIREMENTS:

HABITAT:MIXED-CONIFER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 0 MAXIMUM ELEVATION: 0

THREATS TO TAXON:

BRIEF KEY DESCRIPTION:

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: YES
LA REFERENCE OF OCCURRENCE:TIERNERY, G.D., 1987
GENERAL MAP LOCATION:

COMMENTS:

REFERENCE: TIERNERY, G.D., 1987

PLANTS

FORB

FAMILY LILIACEAE

SCIENTIFIC NAME: Lilium philadelphicum var. andium

COMMON NAME: *WOOD LILY*

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE:

DISTRIBUTION: OT, RA, SA, SF, SM

SPECIFIC REQUIREMENTS:

HABITAT:MIXED-CONIFER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 6000 MAXIMUM ELEVATION: 10000

THREATS TO TAXON:COLLECTION AND HABITAT DESTRUCTION.

BRIEF KEY DESCRIPTION: Stems to 2 ft, leaves linear to lance-shaped, margin smooth, lower leaves alternate. flowers large, showy red or orange-red with purplish-black spots at base.

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: YES
LA REFERENCE OF OCCURRENCE:KOELLE, A., 1978; FOXX, T., 1979; KOSIEWICZ
GENERAL MAP LOCATION:UPPER PAJARITO, WATER AND FRIJOLES CANYON

COMMENTS: can be found in ponderosa to mixed-conifer.

REFERENCE: FOXX & HOARD, 1984; NRIS, 1986; HARRINGTON, 1964

PLANTS

FORB

FAMILY MALVACEAE

SCIENTIFIC NAME: Iliamna grandiflora (Rydb.) Wiggins

COMMON NAME: *WILD HOLLYHOCK*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Bernalillo, Santa Fe Counties, New Mexico.

SPECIFIC REQUIREMENTS:

HABITAT:MOUNTAIN SLOPES BREEDING HABITAT: N/A

MINIMUM ELEVATION: 7000 MAXIMUM ELEVATION: 11000

THREATS TO TAXON:NONE KNOWN

BRIEF KEY DESCRIPTION: Pernnial herb, stems to 1 m tall; leaves simple, hairy, petiolate-3-7-lobes; flowers white to rose-purple; base of petals densley hairy; flowers in July and August.

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

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

FORB

FAMILY NYCTAGINACEAE

SCIENTIFIC NAME: Abronia bigelovii, Heimerl

COMMON NAME: *TUFTED SAND VERBENA*

STATUS: STATE-SENSITIVE

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

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

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

HABITAT:PINON-JUNIPER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 6000 MAXIMUM ELEVATION: 0

THREATS TO TAXON:GYPSUM MINING.

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

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

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

FORB

FAMILY ORCHIDACEAE

SCIENTIFIC NAME: Epipactis gigantea

COMMON NAME: *HELLEBORINE ORCHID*

STATUS: STATE-ENDANGERED

FEDERAL/STATE REFERENCE:

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

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

HABITAT:RIPARIAN ZONES BREEDING HABITAT: N/A

MINIMUM ELEVATION: 6000 MAXIMUM ELEVATION: 8500

THREATS TO TAXON:

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

HAS THE SPECIES PREVIOUS BEEN FOUND IN LOS ALAMOS COUNTY?: YES
LA REFERENCE OF OCCURRENCE:FOXX, T.S., 1984
GENERAL MAP LOCATION:SPRING IN WHITE ROCK CANYON

COMMENTS:

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

PLANTS

FORB

FAMILY POLEMONIACEAE

SCIENTIFIC NAME: Phlox caryophylla, Wherry

COMMON NAME: *PAGOSA PHLOX*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Rio Arriba County, New Mexico.

SPECIFIC REQUIREMENTS: Open slopes in open woods in mountains.

HABITAT:PONDEROSA-PINON BREEDING HABITAT: N/A

MINIMUM ELEVATION: 6500 MAXIMUM ELEVATION: 7500

THREATS TO TAXON:NONE KNOWN

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

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

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.

PLANTS

FORB

FAMILY SAXIFRAGACEAE

SCIENTIFIC NAME: Heuchera pulchella, Woot. and Standl.

COMMON NAME: *SANDIA ALUMROOT*

STATUS: STATE-SENSITIVE

FEDERAL/STATE REFERENCE:

DISTRIBUTION: Bernalillo, Sandoval, San Miguel, Sierra, Socorro, and Torrance Counties, New Mexico.

SPECIFIC REQUIREMENTS: Cliff-loving plant, endemic to the Mountains of Central New Mexico.

HABITAT:MIXED-CONIFER BREEDING HABITAT: N/A

MINIMUM ELEVATION: 8000 MAXIMUM ELEVATION: 12000

THREATS TO TAXON:NONE KNOWN

BRIEF KEY DESCRIPTION: Perennial herb with leaves clustered at the base; leaf blades wide, toothed, upper surface with hairs; low glandular flowers crowded along one side. Flowers from July through September.

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

COMMENTS:

REFERENCE: NM NATIVE PLANTS PROTECTION ADVISORY COMMITTEE, 1984.