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Author(s): **Dan Dunham**

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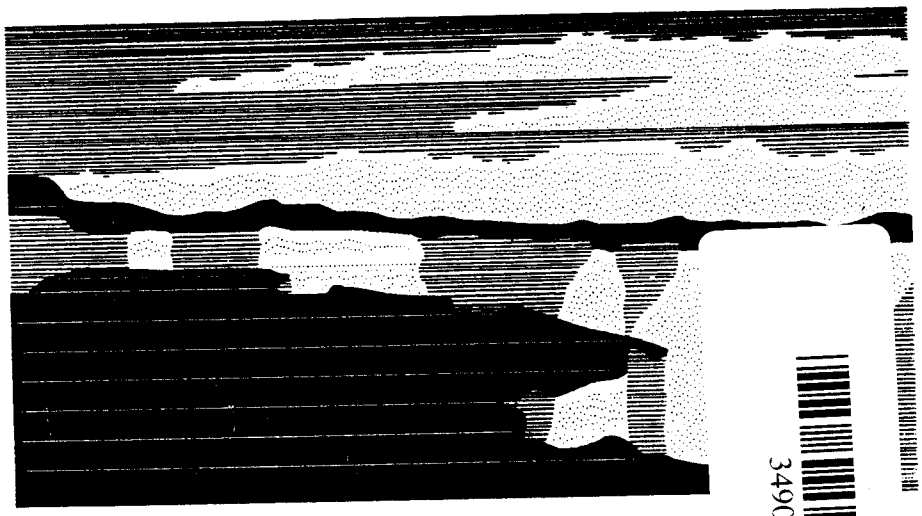

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Biological and Floodplain/Wetland Assessment for the Steam Plant Replacement Project

(TA-16 and TA-9)

Dan Dunham

Los Alamos
NATIONAL LABORATORY
Los Alamos, New Mexico 87545

TABLE OF CONTENTS

SUMMARY 1

PROPOSED ACTION 1

PROJECT AREA 1

PREVIOUS BIOLOGICAL STUDIES 3

MOST RECENT STUDIES 3
PREVIOUS VEGETATION STUDIES 4
PREVIOUS WILDLIFE STUDIES 4
Insects 5
Mollusks 5
Reptiles and Amphibians 5
Birds 5
Fish 6
Mammals 6

RESULTS 6

LEVEL 1 (RECONNAISSANCE SURVEY) 6
Vegetation 7

LEVEL 3 (SPECIES SPECIFIC) SURVEYS 8

Vegetation 8
Wildlife 8
Threatened, Endangered, and Sensitive Species 9
IDENTIFICATION OF WETLANDS 9

DISCUSSION 10

LEVEL 2 SURVEY (HABITAT EVALUATION) 10
LEVEL 3 (SPECIES SPECIFIC) SURVEY 10
Species Dismissed From Further Consideration 10
Vegetation 10
Wildlife 11
Species for Which Level 3 Surveys were Conducted 11
WETLAND AND FLOODPLAIN ASSESSMENTS 14
Wetland Survey 14
Floodplain Studies 14

IMPACTS 14

NON-SENSITIVE SPECIES 14
Vegetation 14
Wildlife 14
THREATENED, ENDANGERED, AND SENSITIVE SPECIES 15
Wood Lily and Helleborine Orchid 15
Northern Goshawk 15
Mexican Spotted Owl 15
Spotted Bat 15
Meadow Jumping Mouse 15
Jemez Mountains Salamander 15
Southwestern Willow Flycatcher 16
WETLANDS AND FLOODPLAINS 16

MITIGATION **16**

NON-SENSITIVE SPECIES 16
Vegetation *16*
Wildlife *16*
THREATENED, ENDANGERED, AND SENSITIVE SPECIES 16
FLOODPLAINS/WETLANDS 17

SUMMARY OF PERTINENT REGULATIONS **17**

REFERENCES **17**

Biological and Floodplain/Wetland Assessment for the

Steam Plant Replacement Project (TA-16 and TA-9)

SUMMARY

Information gathered from previous field surveys was compared with habitat requirements of protected species (threatened, endangered, or sensitive) for the purpose of compliance with Federal Endangered Species Act, New Mexico's endangered species laws, and the Floodplain and Wetland Executive Orders 11990 and 11988. The purpose of the surveys was threefold: to determine if species protected by the state or federal government were present; to determine if sensitive habitats were present; and to gather baseline data for future studies on plant and wildlife species in the project area. Survey data indicated that the general area of the proposed project could incorporate habitat for several protected species: the northern goshawk, Mexican spotted owl, spotted bat, Jemez Mountains salamander, meadow jumping mouse, willow flycatcher, wood lily, and Helleborine orchid. No extraordinary mitigation measures are required to ensure no adverse impacts affect these species because the project area (impact zone) is in previously disturbed areas or near buildings. The Ecological Studies Team used the National Wetland Inventory Maps and field checks to record all floodplains and wetlands, the project is not expected to have an adverse effect on any wetland. Information has been provided to aid in revegetating any area disturbed by the proposed project, including any disturbance caused by off-road vehicular travel.

PROPOSED ACTION

Los Alamos National Laboratory (LANL) proposes to replace the steam plant that serves Technical Area (TA)-16 and TA-9. The existing plant would be replaced by 15 boilers at various locations within these two TAs that would steam heat 70 buildings that are presently served by the existing steam plant. The existing aboveground steam distribution lines in TA-16 and TA-9 would be upgraded in place, and existing utility (water, sanitary, and natural gas) service entrance lines at each steam heated building will be replaced. The operation and maintenance of the proposed facility would be contracted to a third party for a projected annual savings of $3.8 million.

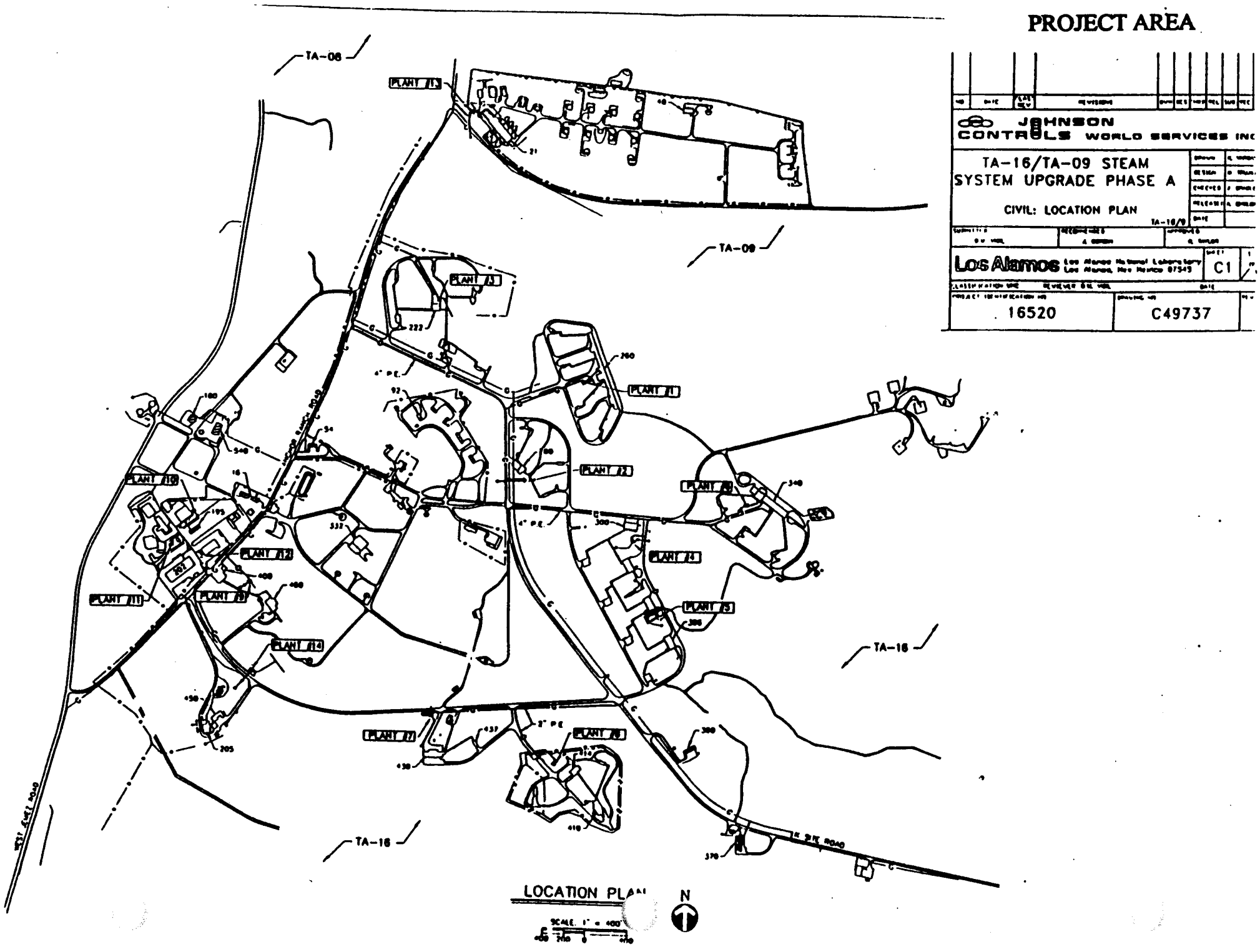
PROJECT AREA

The terrain surrounding the Steam Plant Replacement Project area is composed of two types of topographic features: moderately steep to steep canyons and their adjacent mesa tops. The canyon systems include upper Water Canyon, Potrillo Canyon, and Cañon del Valle. The project area (herein refers to the immediate zone of impact) is located on a mesa top within TA-16 and TA-9. Most of the project area (zone of impact) is disturbed and includes roads, drainages, cleared fields, and LANL facilities (Fig. 1).

All portions of the general area (includes zone of impact and surrounding canyons) are primarily within a ponderosa pine community with some mixed conifer. Other overstory species found in the project area are one-seed juniper, Gambel oak, Douglas fir, and white fir. The common midstory species are Gambel oak and Fendler's rose.

MAP 1

PROJECT AREA



This is a Digitized project area with roads drainages closed fields and PLANT facilities

Understory species varied between transects. The dominant species in the drainage channel are a rush species, bluegrass, and a rose species. Open meadows are dominated by bluegrass, false tarragon, and trailing fleabane. The canyon tributaries are dominated by mountain muhly, red top, bluegrass, and sedge. The north-facing slopes are dominated by a carex species, mountain muhly, pussy toes, and western yarrow. The mesa tops and south-facing slopes are dominated by mountain muhly. Soil crust, desert trumpet, and little bluestem are also found on the mesa top. Prairie junegrass was also recorded for the south-facing slopes.

PREVIOUS BIOLOGICAL STUDIES

Databases containing historical information and biological reports of any previous surveys within or near the project area were reviewed and are summarized within this document to provide background information concerning the site.

Most Recent Studies

During the summer months of 1992, field surveys were conducted by the Ecological Studies Team (EST) of the Environmental Assessments and Resource Evaluations Group (ESH-20) for Operable Unit (OU) 1157, and OU 1082 (Banar 1994 and Raymer 1993). These studies were performed for the LANL Environmental Restoration Program's proposed site characterization sampling.

EST conducted these Level 2 (habitat evaluation) surveys after searching an ESH-20 database. The database contained the habitat requirements for all state and federally listed threatened, endangered, and sensitive (TES) plant and animal species known to occur within the boundaries of the Laboratory and the surrounding areas. Level 2 surveys were conducted using a combination of line transects and Daubenmire plots (Daubenmire 1959). These techniques are designed to gather data on the percent cover, density, and frequency of both understory and overstory components of the plant community.

The purpose of EST's surveys was threefold. The first was to determine the presence or absence of any state or federal TES plant or wildlife species or their critical habitat within the OU boundaries. Secondly, surveys were conducted to identify the presence or absence of any sensitive areas, such as floodplains and wetlands, that are present within the sites to be sampled, as well as the extent of such areas, and their general characteristics. The third purpose was to provide additional plant and wildlife species data that will help define the habitat types within the OU.

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

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

In each location to be sampled, all wetlands and floodplains within the survey area were noted using the National Wetland Inventory Maps followed by field checks. Characteristics of wetlands, floodplains, and riparian areas are noted using criteria outlined in the "Federal Manual For Delineating Jurisdictional Wetlands," (USFWS 1985). However, wetland boundaries were not delineated during these surveys due to the continual fluctuation.

Database searches indicated that potential species of concern for this OU (based on habitat or known occurrences) are the northern goshawk, Mexican spotted owl, peregrine falcon, common black hawk, bald eagle, southwestern willow flycatcher, broad-billed hummingbird, Mississippi kite, spotted bat, Say's pond snail, meadow jumping mouse, Jemez Mountains salamander, wood lily, checker lily, Helleborine orchid, Sandia alumroot, and Pagosa phlox.

As a result of a habitat evaluation of the project area, 8 of these species appear to have a moderate to high potential for occurrence in the general project area (includes surrounding canyons): the northern goshawk, Mexican spotted owl, meadow jumping mouse, spotted bat, Jemez Mountains salamander, willow flycatcher, wood lily, and Helleborine orchid. The results of the field habitat evaluation indicate that the habitat elements needed for these species are present.

Before the 1992 surveys, several site-specific studies had been completed within or immediately adjacent to the project area. These studies, gathered at sites of proposed Laboratory activities, include information on threatened and endangered species, vegetation, wildlife baseline and inventory data.

Previous Vegetation Studies

A few vegetation analyses and surveys have been conducted within portions of the canyons and mesa tops of the project area and in surrounding areas. The surveys are noted on Table 1. These studies include previous floristic surveys of the Los Alamos National Laboratory, a study conducted on outfalls throughout the Laboratory, and observational data. All of these studies and surveys were conducted before 1993, and conducted as observational data or by quadrat method (Daubenmire 1959) on a line transect. A complete checklist of plant species identified during these surveys, in addition to the most recent field surveys is given in Appendix A.

Table 1: Previous Surveys on Plant Species Within or Near the Project

PROJECT	DATE	AUTHORS
Biological Survey 77-008	1977-78	Foxx and Tierney
Flora of Los Alamos Lab	1980	Foxx and Tierney
Flora of Los Alamos Lab	1984	Foxx and Tierney
Flora of Los Alamos Lab	1985	Foxx and Tierney
Memo Report HSE8-85-842	1985	Foxx and Tierney
Potential Use of NPDES Outfalls for Wildlife Watering	1992	Edeskuty, Foxx, and Raymer

The survey of NPDES outfalls included several outfalls within the project area. All the outfalls surveyed drained various effluents into canyons in the project area. Length of flow was not always determined because not all outfalls were flowing at the time of the survey.

Previous Wildlife Studies

Table 2 lists several surveys and observational data describing the fauna within portions of the canyons and mesa tops within or adjacent to the project area and surrounding areas. These studies are discussed below with species lists provided in Appendix B

Table 2: Previous Surveys on Wildlife Species Within or Near the Project

PROJECT	DATE	AUTHORS
Movements of Mule Deer on the Los Alamos National Environmental Research Park	1979	Eberhardt and White
Biotelemetry Studies on Elk	1981	White
Seismic Trench Study	1991	Edeskuty and Bennett
The Ants of Los Alamos County (Hymenoptera: Formicidae)	1986	Mackay et al.
Atlas of Breeding Birds of Los Alamos County	1991	Travis
Outfall Study	1992	Edeskuty, Foxx, and Raymer
Species Diversity and Composition of Small Mammals along an Elevational Gradient in the LASL Environs	1980	Miera and Eberhardt

Insects

No insect studies have been completed within the project area. However, one insect study conducted at the Laboratory could have limited application to this OU because of similarity of habitats. MacKay et al. (1986) used pitfall traps and hand-collecting to procure ants in Los Alamos County during the summer of 1986. He also supplied data from previously conducted studies. Appendix B lists those species potentially in the area and in habitats similar to what is found in the project area.

Mollusks

No extensive or formal field surveys have been conducted for mollusks in the project area.

Reptiles and Amphibians

No extensive or formal field surveys have been conducted for reptiles and amphibians within the project area.

Birds

A list of bird species potentially within or near the project area was extracted from the "Atlas of Breeding Birds of Los Alamos County, New Mexico" (Travis 1992). The county was divided into 60 square blocks, each 2.5 kilometers (1.55 mi) on a side. The census attempted to confirm breeding of all bird species in every block by surveying each block at least twice during the breeding season (variously midwinter to early autumn) using line transects as described by Hall (1964) from 1984 through 1988. Species recorded on general observation sheets also provided species observed in the area. Appendix B lists bird species that actually occur, and could probably occur in the vicinity of the project area.

Fish

There are no suitable fish habitats located within the project area, therefore no fish species are expected to occur in the area.

Mammals

Small Mammals. Appendix B lists those species captured or observed in the study sites and species observed or captured in related studies. Species listed in the outfall study and Miera's survey were included because of similar habitat types. Both surveys utilized Sherman live traps in trapping grids of parallel lines with stations set 10 m apart. Traps were baited for at least three consecutive nights of mark and release procedures. Data from these surveys can be extrapolated to habitat types in this area.

Large Mammals. Eberhardt and White (1979) conducted a study entitled "Movements of mule deer on the Los Alamos National Environmental Research Park," on LANL land from 1975 to 1978. They captured 36 deer, marking 11 with radio-collars and 24 with visual markings (ear tags, streamers, and neck collars). Deer home ranges tended to be elongated following the mesas and canyons of LANL. Average home range size was 5.0 to 13.7 km^2. Because deer do not make large seasonal migrations, they are considered a resident population. Eberhardt and White found that mule deer do not seem to avoid areas of high human activity, but their movements are affected by the Laboratory's 2.6-m high security fences.

Gary White conducted a biotelemetry study on elk from 1978 to 1980 (White 1981). He radio-collared 30 elk and found that, in general, elk use areas in early successional stages, and Cerro del Medio (Baca Location in Valle Grande) for calving and nursing. During the study years, the radio-collared elk did not tend to use areas with high human activity at LANL. Observations indicate that elk are not following the same patterns, and resident herds occupy Laboratory land, particularly in the project area.

RESULTS

Level 1 (Reconnaissance Survey)

To determine whether the project area could support any TES plant and animal species, we reviewed the TES database containing information on previously documented occurrences and existing habitat. For this survey, we used the TES lists generated for the site characterization sampling in TA-16 and TA-9, rather than specific mesa-top construction locations. Table 3 lists those species selected in the TES database.

Table 3: Threatened, Endangered, and Sensitive Species List (Banar 1994 and Raymer 1993)

Plants

Federal Candidate	
Wood lily	*Lilium philadelphicum* var. *andium*
State Endangered	
Wood lily	*Lilium philadelphicum* var. *andium*
Helleborine orchid	*Epipactis gigantea*

State Sensitive

Checker lily	*Fritillaria atropurpurea*
Sandia alumroot	*Heuchera pulchella*
Pagosa phlox	*Phlox caryophylla*

Wildlife

Federal Endangered

Peregrine falcon	*Falco peregrinus*
Southwestern willow flycatcher	*Empidonax trailii*

Federal Threatened

Mexican spotted owl	*Strix occidentalis lucida*
Bald eagle	*Haliaeetus leucocephalus*

Federal Candidate

Northern goshawk	*Accipiter gentilis*
Meadow jumping mouse	*Zapus hudsonius*
Spotted bat	*Euderma maculatum*
Jemez Mountain salamander	*Plethodon neomexicanus*

State Endangered

Meadow jumping mouse	*Zapus hudsonius*
Spotted bat	*Euderma maculatum*
Jemez Mountain salamander	*Plethodon neomexicanus*
Say's pond snail	*Lymneae captera*
Broad-billed hummingbird	*Cynanthus latirostris*
Mississippi kite	*Ictinia mississippiensis*
Common black hawk	*Buteogallus anthracinus*

Vegetation

Federally Listed Species: One federally listed candidate plant species could occur within the general project area.

Candidate

Wood lily	*Lilium philadelphicum* var. *andium*

State Listed Species: There were two plant species listed as state threatened or endangered (Foxx and Hoard 1984).

Endangered

Wood lily	*Lilium philadelphicum* var. *andium*
Helleborine orchid	*Epipactis gigantea*

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 species occurring within the state that are considered rare because of restricted distribution or low numerical density. Since these plants are considered rare, they are sensitive to long-term or cumulative land use impacts and are vulnerable to biological or climatic events. These species are monitored by the state to determine if they should be elevated to endangered status. The following species are listed as State Sensitive:

Checker lily	*Fritillaria atropurpurea*
Sandia alumroot	*Heuchera pulchella*
Pagosa phlox	*Phlox caryophylla*

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, maimed, and from having nests disturbed.

Level 3 (Species Specific) Surveys

Vegetation

EST conducted no species-specific surveys for vegetation. However, while conducting the vegetation transects for Level 2 surveys, no TES plant species were found.

Wildlife

Small Mammals. During the 1992 field season, seven species of small mammals were captured: long-tailed vole (*Microtus longicaudus*), montane vole (*Microtus montanus*), brush mouse (*Peromyscus boylii*), white-footed mouse (*Peromyscus leucopus*), deer mouse (*Peromyscus maniculatus*), least chipmunk (*Eutamias minimus*), and Colorado chipmunk (*Eutamias quadrivittatus*). Only one capture was made in the medium-size mammal traps: rock squirrel (*Spermophilus variegatus*).

Threatened, Endangered, and Sensitive Species

Northern goshawk. During the northern goshawk inventory (Sinton and Kennedy 1993), no goshawks were observed within the LANL inventory area. However, active territories and nest sites have been found just outside Laboratory boundaries, and the home ranges of the birds include portions of Laboratory land. The habitat components necessary for goshawks do exist within the general project area, and a part is a known foraging area.

Sinton's team also recorded other raptors seen during this survey. In upper Pajarito Canyon they found a great horned owl nest with pellets. In Cañon del Valle, a great horned owl was sighted just outside the eastern edge of OU 1157. An unidentified raptor nest about Cooper's hawk size was also found.

Mexican spotted owl. During surveys conducted for Mexican spotted owls in Cañon del Valle, a nesting pair was located approximately 1.75 miles east of the project area (Fig 2). In addition, potential roosting habitat is located about 0.50 miles north of the project area.

Spotted bat. At the pond in TA-8, 44 bats from 10 species were captured in three nights of mist netting. A complete list of species can be found in Appendix C. No spotted bats were captured in this pond or on Laboratory land. In addition, surveys conducted outside this area in lower Pajarito Canyon in 1992 resulted in no spotted bat captures. However, this is not conclusive evidence that this species does not exist on Laboratory lands. Due to limited sampling efforts, a more complete survey should be conducted (Tyrell and Brack 1992).

Meadow jumping mouse. Of the one survey conducted for this species, no meadow jumping mice were found. However, failure to capture this species is not conclusive evidence that it does not exist in the area.

Identification of Wetlands

Both floodplains and wetlands were located within TA-16 and TA-9 but within canyon systems only. Wetlands were restricted to upper Pajarito Canyon and permanent ponds near West Jemez Road. Both Pajarito Canyon and Cañon del Valle bottoms should be considered floodplains.

Three factors can be examined to declare an area a wetland: hydrology, hydric soils, and hydrophytic plants. EST examined only hydrology and hydrophytic plants for the project area to determine riparian areas.

Any stream flow in Potrillo Canyon, Cañon del Valle, and Water Canyon is the result of intermittent runoff. Pajarito Canyon on the north boundary of TA-9 is intermittent. No hydric soils or hydrophytic vegetation surveys were conducted in this canyon. The National Wetlands Inventory maps do not indicate any areas that meet the wetland criteria from the aerial mapping protocol. A previous study conducted by McLin (1992) has identified these canyons as floodplains.

The steam plant discharge feeds a small grass/rush wetland. Discharge sufficient to maintain this wetland would continue until the cumulative impacts of proposed outfall closures were analyzed in the LANL Site-Wide Environmental Impact Statement and a decision made to continue or discontinue outfall flow.

Fig. 2. Sensitive area in Cañon del Valle where a nesting pair of Mexican spotted owls was observed.

DISCUSSION

Level 2 Survey (Habitat Evaluation)

The vegetation surveys indicate that there is primarily one vegetation community present within or adjacent to OU 1157: the Rocky Mountain Montane Conifer Forest. This community can be further separated into series, and more specifically, habitat types.

Based on the species composition of the transects and their locations within the project area, it could be seen that differences in species dominance were associated with the various topographic differences. The following are descriptions of the vegetation community and its phase or habitat type.

Rocky Mountain Montane Conifer Forest. This community consists of primarily one vegetation series, ponderosa pine. Of the habitat types in the Ponderosa Pine Series, six are present in OU 1157. The mesa top is in a climax stage of ponderosa pine habitat type. Open meadows on the mesa are highly disturbed and can be classified in the Ponderosa Series as a Poa habitat type. Ponderosa pine/Gambel oak is found on the south-sloping area and in the Juncus phase in the drainage channel. In the canyon tributaries, there are *Juniperus* and *Muhlenbergia montana* habitat types. The *Muhlenbergia* habitat type continues on the north-facing slope.

Level 3 (Species Specific) Survey

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

Species Dismissed From Further Consideration

Based on the information gained from the Level 1 and Level 2 field surveys and previous data, the following species have been ruled out as being present in the project area, or are not expected to be affected by the proposed project:

Vegetation

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

Sandia alumroot has been found previously in Bernalillo, Sandoval, San Miguel, Sierra, Socorro, and Torrance Counties but not in Los Alamos County. This species is a cliff-loving plant that occurs in mixed conifer at a minimum elevation of 8000 ft. The highest elevation in the project area is 7800 ft. Cliffs are confined to the eastern edge of the project and are lower in elevation than the elevation that this species requires. This species was not observed during previous Levels 1 and 2 surveys (Banar 1994 and Raymer 1993) and is not expected to be present.

Checker lily is found in mixed conifer habitat. This species has not been found in the project area although it has been observed in Los Alamos County in the past. Vegetation surveys show that there are very few mixed conifer species, such as Douglas fir and white fir, within the project area. This species was not observed during Levels 1 and 2 surveys and is not expected to be present.

Pagosa phlox is found in ponderosa-piñon habitat on open slopes of open woods in mountains. The highest elevation this species is known to occur at is 7500 ft. The project area does not have piñon species in the project areas. In addition, openings in the canopy are confined to relatively flat mesa tops. This

species has never been recorded in Los Alamos County and was not observed during Level 2 surveys. Pagosa phlox is not expected to be present.

Wildlife

Say's pond snail is known to occur only in the Cerro la Jara area of the Jemez Mountains in Sandoval County which is the key habitat area in the state. The Say's pond snail is found in vegetated ditches, marshes, streams, and ponds that are seasonally dry, or in areas of perennial water. It is not expected to occur in Los Alamos.

Broad-billed hummingbird is found in riparian woodlands typically 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 near Los Alamos as vagrants. The riparian areas in the project area do not have the tree species mentioned above, and therefore, do not fulfill this species' habitat requirements for a riparian woodland.

Mississippi kite generally inhabits the middle and lower Rio Grande and lower Pecos Valleys. It is known to regularly breed and summer in the Clovis, Portales, and Hobbs regions. This species occurs in riparian zones and shelter belts with permanent streams and are also common around manicured environments such as parks and golf courses. Riparian areas in the general project area are limited in size and extend to springs and a small perennial stream in upper Pajarito Canyon. This area borders the northeastern edge of the project area and is not considered to be large enough to support this species. In addition, this species has never been reported in the Los Alamos area.

Common black hawk occurs at lower elevations in the Gila, San Francisco, and Mimbres drainages. This species requires cottonwoods and other riparian woodlands along permanent streams. The common black hawk is not expected to be in the project area due to limited riparian habitat and a lack of suitable cottonwood. In addition, this hawk has never been recorded in Los Alamos County.

Bald eagle inhabits riparian habitat areas and is found most often near streams and lakes. It requires sites with large trees and protection from wind. This species' migration path extends along the Rio Grande from the northern border of the state to winter roosts. Bald eagles have been found in the Gila, lower Rio Grande, the middle Pecos and Canadian Valleys, and near Cochiti Lake in Rio Arriba and Sandoval Counties. Bald eagles have been sighted on Laboratory property near the Rio Grande. Suitable roost areas appear to be confined to Mortandad Canyon but roosts have not been confirmed. The project area has a small riparian area limited in extent, most of the canyons in this area are shallow with low canyon walls. The structures of Water Canyon and Cañon del Valle in the general project area exhibit some steeper cliffs. The largest average diameter at breast height of trees in any transect conducted in the project area is 18 in. The project area does not have suitable sheltering or roosting areas for the bald eagle, and therefore, impacts to this species should not occur.

Peregrine falcon has been found in Los Alamos County and adjacent to Laboratory land. This species occurs in ponderosa-piñon areas and requires steep cliffs in wooded or forested habitats for breeding. The cliffs in the project area are not high enough or suitable for sheltering this species during nesting. In addition, Terrell Johnson, the state expert on peregrines, reports that Pueblo/Bayo Canyons and Los Alamos Canyon are the only habitat suitable for this species on Laboratory property (Johnson 1992). Therefore, the peregrine falcon is not expected to be in this area.

Species for Which Level 3 Surveys were Conducted

Data from previous studies and the Level 1 and Level 2 surveys show that the project area could support habitat requirements for the northern goshawk, Mexican spotted owl, spotted bat, meadow jumping mouse, Jemez Mountains salamander, willow flycatcher, wood lily, and Helleborine orchid. Species-specific

surveys were conducted (where possible) to help establish the presence or absence of the species within the project area. However, Level 3 surveys have not been conducted for all these TES species.

Northern goshawk is currently a candidate species for listing by the United States Fish and Wildlife Service and is currently a "Category 2 species." In the Southwest, goshawks inhabit ponderosa pine, mixed conifer, and spruce-fir habitat (Kennedy 1988 and Reynolds et al. 1992). During the breeding season, they nest in dense, mature, or old growth, coniferous forests containing trees of at least 18 in. in diameter (Reynolds 1989). In addition, goshawks appear to nest within a quarter mile of water (Kennedy 1988). The home range for the goshawk usually includes a variety of forest conditions. The foraging areas consist of relatively open canopy cover, with habitat components of snags, downed logs, woody debris, large trees, and herbaceous and shrubby understories, and with an interspersion of forest age classes (Reynolds et al. 1992). Post-fledgling family areas (PFA) are characterized by snags, downed logs, woody debris, and forest interspersed with smaller canopy openings, and a majority of trees with at least a 12-in. diameter. Goshawk nests have been found on Santa Fe National Forest land adjacent to Laboratory lands, and in the northwestern portion of Los Alamos County (Kennedy and Stahlecker 1993 and Travis 1992). PFAs and foraging areas for this species overlap the Laboratory (Sinton and Kennedy 1993).

Mexican spotted owl. The Mexican spotted owl inhabits mixed-conifer and ponderosa-Gambel oak forest in mountains and canyons in the southwestern US and northern Mexico. This habitat has the following characteristics (USFWS 1990):

- high canopy closure,
- high stand diversity,
- multi-layered canopy resulting from an uneven age stand,
- large, mature trees,
- downed logs,
- snags, and
- stand decadence as indicated by the presence of mistletoe.

In addition, spotted owls favor narrow steep canyons with cool temperatures and little light penetration. They tend to prefer north-facing slopes (Ligon 1926 and Erlich et al. 1988) and nest in trees, crevices or small caves (Travis 1992).

Terrell Johnson (1993) has developed a topographic model of potential spotted owl habitat in New Mexico. In addition to this model, Johnson has started developing a similar model to be used for the Laboratory. Results from initial modeling activity have indicated three areas within Laboratory boundaries that could have potential owl habitat. The areas include the junction of Two-Mile and Pajarito Canyons (nesting habitat), a section of Los Alamos Canyon below TA-2, and an area near the junction of Water Canyon and Cañon del Valle. Because the model is based on topographic features, the nature of the forest stand is unaccounted for. A nest site has been located east of the project area about 1.75 miles away during the 1995 surveys and roosting habitat has been found approximately 0.50 miles away.

Spotted bat is a federally listed Candidate 2 (C2) species, and a state-listed Endangered, Group 2. Under this category, survival of this species is likely to be at risk in the foreseeable future. Spotted bat distribution covers much of the western United States and northwestern Mexico (Watkins 1977), but capture of this bat is rare. Its presence was first recorded in New Mexico in 1961 when two spotted bats were captured at Ghost Ranch, Rio Arriba County (Constantine 1961). Since then, the Museum of Southwestern Biology has captured a few specimens (Findly 1972). Spotted bats have been found at Lake

Roberts, Mt. Taylor, and in the Jemez Mountains. This species has not previously been found in Los Alamos County.

The spotted bat's habitat can vary. It has been observed in grassland, desert shrub, piñon-juniper, ponderosa, mixed conifer, spruce-fir, and riparian habitats (NMDGF 1988). It has most often been seen in areas with sage brush, rabbitbrush, short grasses, and open ponderosa pine (3D/ Environmental Services, Inc. 1990). This species requires a source of water with standing pools for foraging. The bat's diet seems to consist mainly of nocturnal moths (Leonard and Fenton 1983). During the day the spotted bat roosts in rock crevices on high cliff faces or will take shelter under loose rocks or boulders (Easterla 1969). Bats will return to the same roost sites night after night. The conditions described above are considered key habitat for the spotted bat.

Suitable roost sites are present in the extreme eastern end of the general project area. Open water sources are limited to small reaches of narrow streams within some canyons. The dominant tree species, ponderosa pine, in the project area may also provide habitat for the spotted bat.

Meadow jumping mouse occurs in known populations in New Mexico. This species is found close to permanent free-flowing water, such as streams and ditches, in riparian zones, and wet meadows near cattail marshes associated with major rivers (Morrison 1992). Dry, higher ground near waterways provides locations for nesting and hibernation. Soil is damp or moist with no standing water with dense, tall (.5 m or greater) vegetation dominated by grasses and forbs providing thick cover and food sources. The major activity for mice in the Jemez Mountains-Española area is June through September, with breeding occurring between May and September. There is potential for meadow jumping mice to inhabit riparian areas of upper Pajarito Canyon along the border of TA-9. Although no captures were made during the 1992 survey, this could be due to the fact that the survey was done at a less than optimal time of the season, and thus, does not preclude the potential of meadow jumping mouse occurring in this canyon.

The Jemez Mountains salamander is designated as a state threatened (Group II) species and is a candidate (C1) species for federal listing. The species is endemic to north-central New Mexico and is known only from the Jemez Mountains. This is a relict species which has a restricted range and narrow ecological requirements. The species occurs in coniferous areas with cool, moist, and shaded habitat. All areas found to contain the salamander are considered key habitat.

Jemez Mountains salamanders occur in shady wooded sites ranging from 2190 to 3290 m asl. They spend most of their lives under rocks and in well-decayed logs in mixed conifer communities. The greatest numbers of salamanders have been found in stabilized talus slopes. Their skins must remain moist at all times or they will quickly die. The major threat to salamanders is habitat alteration, especially changes resulting in drier conditions, such as logging and other vegetation removal (NMDGF 1988).

In 1991, EST surveyed a number of canyons for Jemez Mountains salamanders. Three of these surveys were conducted in upper Cañon del Valle; and upper Pajarito and upper Two-Mile Canyons, but did not extend into the project area. Salamanders were only found in upper Pajarito Canyon. Moist wooded canyon sides are present within the OU and may provide habitat for the salamander.

Southwestern willow flycatcher is listed in the Federal Register as threatened on the endangered species list (NMDGF 1993). This species (*Empidonax trailii*) was formerly included with the alder flycatcher (*Empidonax alnorum*) as Traill's flycatcher. Willow flycatchers winter from southern Mexico to Panama and migrate throughout New Mexico in summer. They are present in New Mexico from early May to mid-September and breed from late May to late July (Verner and Boss 1984). Their elevational range of breeding in the state is 3700 ft to 8900 ft, but breeding over 6958 ft is known to occur only in the north. They have been found regularly in the San Juan, Chama, Rio Grande, San Francisco, and Gila Valleys, and in the San Juan Mountains. Willow flycatchers have been recorded in the Jemez Mountains during the breeding season, but breeding has not been confirmed. The Pajarito Ornithological Society survey (Travis

1992) found no willow flycatchers in Los Alamos County, and to date, the presence of this species has not been recorded in Los Alamos County.

In the breeding season, willow flycatchers typically inhabit swamps and thickets dominated by willow (Ehrlich et al. 1988) and riparian woodlands dominated by cottonwoods (Hubbard 1978). They spend most of their time in the understory canopy of small trees or tall shrubs, especially willows (*Salix* spp.) or salt cedar (*Tamarix chinensis*) (NMDGF 1988), near areas of surface waters in the Rio Grande Valley. Willow flycatchers need at least 20% shrub cover for suitable habitat. Nesting habitat (e.g., riparian zones with cottonwoods, willows, Russian olive, or salt cedar) for this species is not present in the project area.

Wood lily has been found in Rio Arriba, Sandoval, San Miguel, and Santa Fe Counties, in addition to Los Alamos County. This species is found in moist areas in ponderosa pine to mixed conifer, and ranges in elevation of 6000 to 10000 ft. The wood lily was not found during vegetation surveys in the project area, but has been previously recorded in the upper Pajarito Canyon area. The habitat in the project area is dominated by ponderosa pine which fits the requirements for this species. Therefore, this species may be present.

Helleborine orchid has been found from British Columbia to Montana, and in New Mexico, California, and southern to western Texas. This species has been found in Los Alamos County in the past. The orchid's habitat consists of damp woods, seepage slopes, springs, streams, and riparian areas within the elevation range of 6000 to 8500 ft. The Helleborine orchid was not found during vegetation surveys but the riparian canyon bottoms in the general project area may support this species.

Wetland and Floodplain Assessments

Wetland Survey

The springs and perennial reaches of streams below the springs met wetland criteria. National Wetlands Inventory aerial maps provide a general definition of the wetland. In addition, certain outfalls within the project may be classified as wetlands. The proposed construction is not scheduled within these areas. The outfall from the existing steam plant is associated with a wet meadow dominated by sedges and grasses.

Floodplain Studies

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

IMPACTS

Non-Sensitive Species

Vegetation

Currently, existing roads should be able to maintain sufficient access into project areas. Vehicle usage off road, indiscriminate construction equipment, and material storage could result in loss of vegetative cover.

Wildlife

The habitat in the proposed project area is suitable for nesting, foraging, and perching for a variety of birds, large mammals, and other wildlife species. Excessive disturbance or disturbance during critical periods could result in one or more of the following:

- Loss of habitat due to removal of trees, vegetation, and other habitats that serve for nesting, perching, cover, and foraging in the project area.
- Abandonment of nests and loss of young could occur due to excessive noise or other disturbance during critical times that could interfere with mating, breeding, or rearing young.
- Contamination of wildlife water sources from fuel spills or leaks from vehicles, machinery, etc. resulting in illness or mortality of wildlife species.
- The disruption of migration routes (i.e., elk and deer) by excessive noise or disturbance from heavy vehicle and equipment use within those areas.

Threatened, Endangered, and Sensitive Species

Wood Lily and Helleborine Orchid

The proposed construction is projected to occur only within previously disturbed areas or near buildings. However any use of heavy equipment or travel off established roads could present a threat to these species, especially in moist areas.

- Removal or excessive disturbance to existing vegetative cover could result in an increase or initiation of erosion or alterations of drainage patterns.

Northern Goshawk

The proposed construction will be conducted on the mesa tops in areas of existing physical and human disturbance. Construction will take place primarily around buildings. No impacts are expected to occur to this species.

Mexican Spotted Owl

The proposed construction will occur on the mesa tops in areas that have existing physical and human disturbances. The proposed construction will occur outside the boundaries of a known spotted owl nesting area.

Spotted Bat

The proposed construction will be confined to the mesa tops. No impacts are expected to occur to this species.

Meadow Jumping Mouse

Construction is not proposed along the canyon bottoms, therefore, this species is not expected to be impacted.

Jemez Mountains Salamander

Construction is not proposed on any canyon slopes, therefore this species is not expected to be impacted.

Southwestern Willow Flycatcher

The primary impact to the willow flycatcher is damage or destruction of riparian habitat. No construction is proposed near stream channels and riparian areas of any canyons.

Wetlands and Floodplains

The proposed construction will remain outside of wetland areas and therefore no impacts are expected. A sedge-dominated wet meadow is associated with the existing steam plant outfall. Decommissioning of the steam plant could reduce the present size of the meadow and wildlife value of the wetland.

MITIGATION

Non-Sensitive Species

Vegetation

Off road vehicle travel will not be allowed. Revegetation could be required in areas bared by construction activities and not maintained as gravel driveways. The proposed storage area for construction materials is an existing unused asphalt parking lot. From the survey information gathered, species that could be used for revegetation include a mixture of native grasses, forbs, and other herbaceous plants. Species given in the vegetation section represent a few of the species that could be used. Further consultation with EST or state or federal agencies can help determine use of other species.

Wildlife

Activities associated with the proposed project should result in only temporary avoidance of the construction sites during the period of actual disturbance. We do not anticipate any adverse effects on wildlife because:

- Wildlife habitat loss will be minimized by restricting construction activities to previously disturbed mesa top areas and by EST's inspection of large trees for direct wildlife use before removal is approved.
- Most construction will occur near buildings in disturbed areas after the mating , breeding, and fledgling seasons which will minimize the effects of disturbance or construction noise.
- Containment of storm water as required by the construction pollution prevention plan will also minimize the effects of spills or leaks during construction.
- Construction will be staged. Therefore, activities and disturbance will not be at the same level simultaneously at all fifteen sites. The canyons in the general project area will be free of disturbance and construction activities and will be available to migrating wildlife.

Threatened, Endangered, and Sensitive Species

The project is restricted to previously disturbed sites, near buildings on mesa tops, and no canyon bottoms and slopes are expected to be disturbed. Off road vehicle usage will not be allowed, and construction materials will be restricted to an existing fenced asphalt parking lot. However, EST must inspect large trees for direct wildlife use before they are removed.

Spotted owl

Spotted owls have been identified northeast of the project area. In addition, roosting habitat may occur in Water Canyon south of the project area. However, because no impacts are expected, no extraordinary mitigation measures are required.

Floodplains/Wetlands

The wetland at the steam plant is man-induced and less than one acre in size. Water from the existing source in Water Canyon will be diverted to the steam plant outfall as an interim measure to minimize the loss of wildlife habitat.

SUMMARY OF PERTINENT REGULATIONS

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

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

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

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

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

REFERENCES

3D/ Environmental Services, Inc., *Proposal to Conduct Studies on the Spotted Bat (Euderma maculatum) on Los Alamos National Environmental Research Park*, 3D/ Environmental Services, Inc. (1990).

10 CFR 1022, Compliance with Floodplain/Wetlands Environmental Review Requirements, Department of Energy, 720–727.

Banar, A., " Biological and Floodplain/Wetland Assessment for Operable Unit 1157 TA-8, 9, 23, 69," Los Alamos National Laboratory unpublished report (1994).

Constantine, D.G., "Spotted bat and big-free-tailed bat in northern New Mexico," *Southwestern Nat.* 6:92–97 (1961).

Daubenmire, R., "A canopy-coverage method of vegetation analysis," *Northw. Sci.* 33:43–64 (1959).

Eberhardt, L.E. and G.C. White, "Movements of Mule Deer on the Los Alamos National Environmental Research Park," Los Alamos National Laboratory report LA-7742 (1979).

Edeskuty, B., and K. Bennett, "Endangered Species Report for Seismic Trench Study, Los Alamos National Laboratory," Los Alamos National Laboratory unpublished report (1991).

Edeskuty, B., T. Foxx, and D. Raymer, "Potential Use of NPDES Outfalls for Wildlife Watering," Los Alamos National Laboratory unpublished internal document (1992).

Ehrlich, P.R., D.S. Dobkin, and D. Wheye, *The Birders Handbook: A Field Guide to the Natural History of North American Birds*, (Simon & Schuster Inc 1988).

Easterla, D.A., "First Records of the Spotted Bat in Texas and Notes on its Natural History," *Am. Midl. Nat.* **83**:306–308 (1969).

Executive Order 11988 "Floodplain Management," President Jimmy Carter (1977).

Executive Order 11990 "Protection of Wetlands," 3 CFR 121 (1978) as amended by Executive Order 12608, 52 Fed. Reg. 34617 (1987).

Foxx, T. S., and D. Hoard, *Flowers of Southwestern Forests and Woodlands* (Los Alamos Historical Society 1984).

Foxx, T. S., and G. D. Tierney, "Biological Survey 77-008", Los Alamos National Laboratory unpublished report (1978).

Foxx, T. S., and G. D. Tierney, "Status of the Flora of the Los Alamos National Environmental Research Park," Los Alamos Scientific Laboratory report LA-8050-NERP Vol. I (1980).

Foxx, T. S., and G. D. Tierney, "Status of the Flora of the Los Alamos National Environmental Research Park, A Historical Perspective," Los Alamos National Laboratory report LA-8050-NERP, Vol. II. (1984).

Foxx, T. S., and G. D. Tierney, "Status of the Flora of the Los Alamos National Environmental Research Park. Checklist of Vascular Plants of the Pajarito Plateau and Jemez Mountains," Los Alamos National Laboratory report LA-8050-NERP Vol. III (1985a).

Foxx, T. S., and G. D. Tierney, "Memo Report HSE-8-85-842," Los Alamos National Laboratory unpublished report (1985b).

Findly, J. S., "Status of the Southwest Bat Population," Symposium on Rare and Endangered Wildlife of the Southwest, NMDGF (1972).

Hall, G.A., "Breeding-Bird Censuses- Why and How," *Audubon Field Notes* **18:3,** 413–416 (National Audubon Society 1964).

Hubbard, J.P., "Revised Checklist of the Birds of New Mexico," New Mexico Ornithological Society publication 6 (1978).

Johnson, T.H., "R-30 Peregrine Falcon Habitat Management Plan," prepared for Los Alamos National Laboratory (1992).

Johnson, T.H., "Topographic Model of Potential Spotted Owl Habitat in New Mexico," developed for New Mexico Department of Game and Fish, Contract 80-516.6-56 (1993).

Kennedy, P.L., "Habitat characteristics of Cooper's hawks and northern goshawks nesting in New Mexico," Proceedings Southwest Raptor Management Symposium and Workshop, National Wildlife Federation, pp. 218–227 (1988).

Kennedy, P.L., "Reproductive strategies of northern goshawks and Cooper's hawks in north-central New Mexico," Ph.D. Dissertation, Utah State University (1991).

Kennedy, P.T., and D.W. Stahlecker, "Responsiveness of nesting northern goshawks to taped broadcasts of three conspecific calls," *J. Wildl Manage.* **57**:249–257 (1993).

Ligon, J., S., "Habitats of the Spotted Owl," *Auk,* **43**, 421–429 (1926).

Leonard, M.L., and M.B. Fenton, "Habitat use by spotted bat (Euderma maculatum, Chiroptera: Vespertilionidae) roosting and foraging behavior," *Can. J. Zool.* **61**:1478–1491 (1983).

MacKay, W., W. D. Lowrie, A. Fisher, E. Mackay, and F. Barnes, "The Ants of Los Alamos County, New Mexico (Hymenoptera; Formicidae)," Los Alamos National Laboratory unpublished report (1986).

McLin, S.G., "Determination of 100-year Floodplain Elevations at Los Alamos National Laboratory," Los Alamos National Laboratory report LA-12195-MS (1992).

Miera, F.R., Jr., and L. E. Eberhardt, "Species diversity and composition of small mammals along an elevational gradient in the LASL environs," Los Alamos Scientific Laboratory unpublished report (1980).

Morrison, J.L., "Presistence of the Meadow Jumping Mouse, Zapus Hudsonius Luteus, In New Mexico,", *The Southwest Natualist* **37:3,** 308–311(1992).

NMDGF, *Handbook of Species Endangered in New Mexico,* **378**:1–2 (1988).

NMDGF, *Handbook of Species Endangered in New Mexico,* **G-217**:1–2 (1988).

NMDGF, "Endangered and Threatened Wildlife and Plants: Proposal to list the Southwestern Willow Flycatcher as Endangered with Critical Habitat," *Federal Register* **58:40** (1993).

Sinton, D.T., and P.L. Kennedy, "1993 Northern Goshawk Inventory on Portions of Los Alamos National Laboratory, Los Alamos, NM," final report, subcontract 9-XQ2-Z7115, Department of Fisheries and Wildlife Biology, Colorado State Univiersity (1993).

Raymer, D., "Biological and Floodplain/Wetland Assessment for Operable Unit 1082," Los Alamos National Laboratory unpublished report (1993).

Reynolds, R. T., "Accipiters," Proc. of the Western Raptor Management Symposium and Workshop, National Wildlife Federation Scientific and Technical Series No. 12, 92–101 (1989).

Reynolds, R. T., R. T. Graham, M. H. Reiser, R. L. Basset, P. L. Kennedy, D. A. Boyce, Jr., G. Goodwin, R. Smith, and E. L. Fisher, "Management Recommendations for the Northern Goshawk in the Southwestern United States," USDA gen. tech. report RM-217 (1992).

Travis, J.R., "Atlas of the Breeding Birds of Los Alamos County, New Mexico," Los Alamos National Laboratory report LA-12206 (1992).

Tyrell, K., and V. Brack, "Survey for Bats in the Los Alamos National Environmental Reaserch Park, with Special Emphasis on the Spotted Bat, *Euderma maculatum*," 3D/ Environmental Services, Inc. (1992).

U. S. Fish and Wildlife Service, "Endangered and Threatened Wildlife and Plants Finding on Petition to List Mexican Spotted Owl as Threatened/Endangered," *Federal Register* **55:60** 11413 (1990).

U. S. Fish and Wildlife Service, "User's Guide, National Wetlands Inventory Maps," Information and Legend for Map Products (June 1985).

Verner, J., and A.S. Boss, "California Wildlife and Their Habitats: Western Sierra Nevada," US For. Serv. gen. tech. rep. PSW-37 p.439 (1984).

Watkins, L. C., "Euderma Maculatum," *American Society of Mammologists,* 77, 1–4 (1977).

White, G.C., "Biotelemetry Studies on Elk," Los Alamos National Laboratory report LA-8529-NERP (1981).

APPENDIX A. PLANT CHECKLIST FOR TA-16 AND TA-9

Plant Checklist for TA-16, -9

FAMILY	SCIENTIFIC NAME	COMMON NAME	INDICATOR STATUS
ANACARDIACEAE	*Rhus radicans*	Poison Ivy	NW
BERBERIDACEA	*Berberis fendleri*	Fendler barberry	NW
BORAGINACEAE	*Lithospermum sp.*	Puccoon	NW
	Lithospermum multiflorum	Puccoon	
CHENOPODACEAE	*Chenopodium album*	Lamb's quarters	ECO
COMPOSITAE	*Achillea lanulosa*	Western yarrow	NW
	Antennaria parviflora	Pussytoes	NW
	Artemisia carruthii	Wormwood	NW
	Artemisa dracunculus	False Tarragon	NW
	Aster sp.	Aster	NW
	Bahia dissecta	Wild Chrysanthemum	
	Chrysopsis foliosa	Leafy golden aster	
	Circium sp.	Thistle	
	Conyza canadensis	Horseweed	ECO,UPL, FAC,FACU
	Erigeron divergens	Fleabane Daisy	NW
	E. flagellaris	Trailing Fleebane	NW,FAC, FACU
	Grindelia sp.	Gumweed	NW
	Grindelia aphanactis	Gumweed	NW
	Helianthus sp.	Sunflower	
	Helianthus petiolaris	Praire sunflower	ECO
	Hymenoxys richardsonii	Bitterweed	NW
	Lactuca sp.	Chicory	
	Ratibida sp.	Coneflower	
	Tragopogon dubius	Satisfy, Goatsbeard	ECO
	Viguiera multiflora	Goldeneye	
CONVOLVULACEAE	*Ipomonea spp.*	Morning glory	NW
CUPRESSACEAE	*Juniperus monosperma*	One-Seeded juniper	NW
CYPERACEAE	*Carex spp.*	Sedge	NW

FAGACEAE	*Quercus gambelii*	Gambel oak	NW
GERANIACEAE	*Geranium sp.*	Geranium	
	Geranium caespitosum	James geranium	
GRAMINEAE	*Agropyron sp.*	Wheatgrass	
	Agrostis alba	Redtop	FACW,OBL
	Andropogon scoparius	Little bluestem	NW
	Bromus anomalus	Nodding brome	NW
	Bromus sp.	Bromegrass	
	Buchloe dactyloides	Buffalo grass	
	Elymus canadensis	Canada wildrye	NW, FACU, FAC
	Hordeum sp.	Barley	
	Hordeum jubatum	Foxtail barley	ECO,FAC, FACW
	Koeleria sp.	Junegrass	NW
	Koeleria cristata	Prairie junegrass	NW
	Muhlenbergia montana	Mountain muhly	NW
	Poa spp.	Bluegrass	
	Poa fendleriana	Bluegrass	NW
	Sitanion hystrix	Bottlebrush squirreltail	NW
	Sporobolus cryptandrus	Sand dropseed	NW,FAC, FACU,UPL
JUNCACEAE	*Juncus sp.*	Rush	NW
	Juncus interior	Inland rush	NW,FACU, FACW
LABIATAE	*Monarda menthaefolia*	Horsemint	NW
LEGUMINOSAE	*Melilotus albus*	White sweet clover	COL,FACU FAC
	Melilotus officialis	Yellow sweet clover	COL,FACU, FAC
	Robinia neomexicana	New Mexico locust	NW
	Vicia americana	American vetch	NW,FAC
LILIACEAE	*Allium cernuum*	Nodding onion	ECO
LINACEAE	*Linum neomexicanum*	New Mexico flax	
LOASACEAE	*Mentzelia sp.*	Blazing star	NW
MALVACEAE	*Sphaerlacea spp.*	Globe mallow	NW
ONAGRACEAE	*Oenothera caespitosa*	White stemless primrose	

ORCHIDACEAE	*Malaxis sp.*	Orchid	NW
PINACEAE	*Abies concolor*	White fir	NW,FACU,
	Pinus ponderosa	Ponderosa pine	FAC,UPL
	Pseudotsuga menziesii	Douglas fir	NW
PLANTAGINACEAE	*Plantago purshii*	Whooly indian-wheat	ECO,FACU, FACW
POLEMONIACEAE	*Ipomopsis aggregata*	Scarlet trumpet	NW
POLYGONACEAE	*Rumex sp.*	Dock/sorrel	
RANUNCULACEAE	*Clematis pseudoalpina*	Rocky Mt. clematis	
	Thalicurum fendleri	Fendler meadowrue	NW,UPL, FAC,FACU
ROSACEAE	*Fragaria americana*	Wild strawberry	
	Potentilla sp.	Cinquefoil	
	Prunus virginia	Chokecherry	NW,FAC, FACU
	Robinia neomexicana	New Mexico locust	
	Rosa spp.	Wild rose	
	Rosa woodsii	Wild rose	NW,FAC, UPL,FACU
	Rubus strigosus	Wild raspberry	
SALICACEAE	*Salix sp.*	Willow	NW,FAC, FACW
SAXIFRAGACEAE	*Jamesia americana*	Cliffbush	NW,UPL, FAC,
	Ribes inreme	Whitestem gooseberry	NW,FACU
SCROPHULARIACEAE	*Penstemon sp.*	Beardtongue	
	Verbascum thapsus	Mullein	ECO
TYPHACEAE	*Typha latifolia*	Cattail	NW,OBW
URTICACEAE	*Urtica gracilis*	Stinging nettle	
VALERIANACEAE	*Valeriana capitata*	Tobacco root	
VERBENACEAE	*Verbena sp.*	Vervain	
VIOLACEAE	*Viola adunca*	Western dog violet	
	Viola canadensis	Canada violet	NW

* INDICATOR CODES

NW =Non-weedy
COL =Colonizing

Indicator codes cont.

ECO	=Econonic
FAC	=Facultative plants are equally likely to occur in wetlands or nonwetlands
FACW	=Facultative wetland plants usually occur in wetlands.
FACU	=Facultative upland plants usually occur in nonwetlands.
OBL	=Obligate wetland plants occur almost always in wetlands.
UPL	=Obligate upland plants occur almost always in nonwetlands.

Checklist of Birds in TA-16, -9

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
ACCIPITRIDAE	*Accipiter cooperii*	Cooper's hawk	1
	A. striatus	Sharp-shinned hawk	1
	Buteo jamaicensis	Red-tailed hawk	1,2
APODIDAE	*Aeronautes saxatalis*	White-throated swift	1
CAPRIMULGIDAE	*Chordeiles minor*	Common nighthawk	1
	Phalaenoptilus nuttallii	Common poorwill	1
CATHARTIDAE	*Cathartes aura*	Turkey vulture	2
COLUMBIDAE	*Columba fasciata*	Band-tailed pigeon	2
	Zenaida macroura	Mourning dove	2
CORVIDAE	*Amphelocoma coerulescens*	Scrub jay	1
	Cyanocitta stelleri	Steller's jay	1,2
	Corvus corax	Common raven	1,2
	Nucifraga columbiana	Clark's nutcrackerird	1
	Carduelis pinus	Pine siskin	1
		warbler	
	Junco hyemalis	Dark-eyed junco	1,2
	Melospiza lincolnii	Lincoln's sparrow	1
	Molothrus aster	Brown-headed cowbird	1
	Oporonis tolmiei	Macgillivaray's warbler	1
	Pheucticus melanocephalus	Black-headed grosbeak	1,2
	Pheucticus erythrophthalmus	Rufous-sided towhee	1,2
	Pipilo chlorurus	Green-tailed towhee	1
	Piranga ludoviciana	Western tanager	1,2
	Pooecetes gramineus	Vesper sparrow	1
	Spizella passerina	Chipping sparrow	1,2
	Sturnella neglecta	Western meadowlark	1
	Vermivora celata	Orange-crowned warbler	1
	Vermivora virginiae	Virginia's warbler	1
	Vireo gilvius	Warbling vireo	1
	Vireo solitarius	Solitary vireo	1
	Zonotrichia leucophrys	White-crowned sparrow	2
FALCONIDAE	*Falco sparverius*	American kestrel	1,2
FRINGILLIDAE	*Carduelis pinus*	Pine siskin	1
	C. psaltria	Lesser goldfinch	1
	Hesperiphona vespertina	Evening grosbeak	1

	Loxia curvirostra	Red crossbill	1,2
GALLINACEOUS	*Meleagris gallopavo*	Wild turkey	1
HIRUNDINIDAE	*Tachycineta thalassina*	Violet-green swallow	1
MIMIDAE	*Catharus guttatus*	Hermit thrush	1
MUSCICAPIDAE	*Myadestes townsendi*	Townsend's solitaire	1
	Regulus calendula	Ruby-crowned kinglet	1
	Sialis currucoides	Mountain bluebird	1,2
	S. mexicana	Western bluebird	1,2
	Turdus migratorius	American robin	1,2
PARIDAE	*Parus gambeli*	Mountain chickadee	1,2
PICIDAE	*Colaptes auratus*	Northern flicker	1,2
	Melanerpes lewis	Lewis's woodpecker	2
	Picoides pubescens	Downy woodpecker	1
	P. villosus	Hairy woodpecker	1,2
	P. tridactylus	Three-toed woodpecker	1
	Sphyrapicus nuchalis	Red-naped sapsucker	1
	S. thyroideus	Williamson's sapsucker	1
SITTIDAE	*Certhia americana*	Brown creeper	1
	Sitta spp.	Nuthatch	2
	Sitta canadensis	Red-breasted nuthatch	1
	S. carolinensis	White-breasted nuthatch	1
	S. pygmaea	Pygmy nuthatch	1,2
STRIGIDAE	*Glaucidium gnoma*	Northern pygmy-owl	1
STURNIDAE	*Sturnus vulgaris*	European starling	2
TROCHILIDAE	*Selasphorus playtcerus*	Broad-tailed hummingbird	1
TROGLODYTIDAE	*Troglodytes spp.*	Wren	2
	Troglodytes aedon	House wren	1,2
	T. troglodytes	Winter wren	1
TYRANNIDAE	*Contopus borealis*	Olive-sided flycatcher	1
	Contopus sordidulus	Western wood-pewee	1,2
	Empidonax hammondii	Hammond's flycatcher	1
	E. oberholseri	Dusky flycatcher	1
	E. occidentalis	Cordilleran flycatcher	1
	Mytarchus cinerascens	Ash-throated flycatcher	1
	Sayornis saya	Say's Phoebe	1,2
TYTONIDAE	*Bubo virginianus*	Great horned owl	1
VIREONIDAE	*Vireo gilvus*	Warbling vireo	1
	V. solitarius	Solitary vireo	1

1=Breeding Bird Atlas
2=Observations Sheets

LIBELLULIDAE	*Libellula spp.*		3
MYRMICINEA	*Crematogaster cerasi*	Ponderosa pine, riparian	1
	Leptothorax crassipilis	Ponderosa pine-riparian	1
	Le. muscorum	Pond.pine-riparian, Pond.pine	1
	Le. nitens	Pond.pine-riparian, disturbed areas	1
	Le. obliquicanthus	Highly disturbes areas	1
	Le. texanus texanus	Ponderosa pine-riparian	1
	Le. tricarinatus	Ponderosa pine-riparian	1
	Monomorium cyaneum	Juniper, disturbes areas	1
	Mo. minimum	Ponderosa pine-riparian	1
	Myrmecina americana	Ponderosa pine-riparian	1
	Myrmica bravispinosa	Riparian	1
	M. emeryana	Riparian-Ponderosa pine	1
	M. hamulata	Ponderosa pine-riparian	1
	Polyerqus breviceps	Ponderosa pine	1
	Pheidole ceres	Pond.pine, Pond.pine-riparian, disturbed areas	1
	Ph. hyatti hyatti	Riparian	1
	Ph. sitarches soritis	Disturbed areas	1
	Ph. wheelerorum	Pond.pine-riparian, disturbed sites	1
	Pogonomyrmex occidentalis	Pond.pine-riparian, Pond.pine, disturbed areas	1
	Solenopsis molesta	Riparian, Pond.pine-riparian, disturbed areas	1
	Stenamma occidentale	Ponderosa pine-riperian	1
NYMPHALIDAE	*Phyciodes spp.*		3
	Vanessa virginiensis		3
PAPILIOIDAE	*Papilio polyxenes asterius*		3
	Papilio bairdii		3
PONERINAE	*Hypoponera opaciceps*	Riparian	1

1= Mackay, W.
2= Outfall Study
3= Observation Sheets

Checklist Of Insects in TA-16, -9

SUBFAMILY	SCIENTIFIC NAME	HABITAT	SOURCE
CHRYSOPIDAE	*Chrysopa spp.*	Riparian	3
CULICIDAE	*Aedes spp.*	Riparian	2
DOLICHODERINAE	*Liometopum apiculatum*	Ponderosa pine-riparian	1
	Li. luctuosum	Ponderosa pine-riparian	1
	Tapinoma sessile	Ponderosa pine-riparian	1
FORMICINAE	*Acanthomyops interjectus*	Ponderosa pine	1
	A. latipes	Ponderosa pine-riparian	1
	Campontonus herculeanus	Spruce, riparian	1
	C. laevigatus	Ponderosa pine-riparian	1
	C. sansabeanus	Ponderosa pine	1
	C. vicinus	Pond.pine-riparian, pond.pine	1
	Formica argentea	Pond.pine-riparian, disturbed sites	1
	F. densiventris	Ponderosa pine-riparian	1
	F. fusca	Ponderosa pine-riparian	1
	F. hewitti	Pond.pine-riparian, grassy areas	
	next to ponderosa pine, riparian	1	
	F. lasioides	Ponderosa pine-riparian	1
	F. limata	Ponderosa pine-riparian	1
	F. neogagates	Highly disturbes areas	1
	F. neorufibarbis	Riparian	1
	F. obscuripes obscuripes	Ponderosa pine-riparian	1
	F. obscuriventris clivia	Ponderosa pine-riparian	1
	F. occulta	Ponderosa pine-riparian	1
	F. pergandei	Disturbed area	1
	F. planipilis	Ponderosa pine-riparian	1
	F. podzolica	Ponderosa pine-riparian	1
	F. subnuda	Ponderosa pine	1
	Lasius alienus	Ponderosa pine-riparian	1
	L. crypticus	Ponderosa pine-riparian	1
	L. flavus	Ponderosa pine-riparian	1
	L. neoniger	Ponderosa pine-riparian	1
	L. pallitarsis	Pond.pine-riparian, Pond.pine	1
	L. sitiens	Ponderosa pine	1
	L. subumbratus	Ponderosa pine-riparian	1

Checklist of Mammals found in TA-16, -9

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
CANIDAE	*Canis latrans*	Coyote	1,2
CERVIDAE	*Cervus elaphus* subsp. *candensis*	Elk	1,2
	Odocoileus hemionus	Mule deer	1,2
CRICETIDAE	*Microtus longicaudus*	Long-tailed vole	1,3
	Microtus montanus	Montane vole	1,3
	Peromyscus boylii	Brush mouse	1,3
	P. leucopus	White-footed mouse	3
	P. maniculatus	Deer mouse	1,3
LEPORIDAE	*Sylvilagus* spp.	Cottontail	2
SUIURIDAE	*Eutamias spp.*	Chipmunk	2
	Eutamias minimus	Least chipmunk	1,3
	Eutamias quadrivittatus	Colorado chipmunk	1,3
	Sciurus aberti	Abert's squirrel	2
	Spermophilus spp	Squirrl spp	1
	S. variegatus	Rock squirrel	3
URSIDAE	*Ursus americanus*	Black bear	2

1=Outfall Study 2=Observations 3=1992 Survey