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BIOLOGICAL ASSESSMENTFOR THE TRANSFER OF THE DP LAND TRACT.

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BIOLOGICAL ASSESSMENT
FOR THE
TRANSFER OF THE DP LAND TRACT

Los Alamos National Laboratory, Los Alamos, New Mexico

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Biology Team

Ecology Group, ESH-20

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SUMMARY

The Department of Energy (DOE) is proposing to transfer to the County of Los Alamos up to 10-ha (25-ac) of federal land located in Technical Area-21 to be developed for commercial uses. Previous studies for the proposed land transfer area indicate that potential habitat for four threatened, endangered, and sensitive species occurs in or adjacent to the proposed land transfer area. These include the northern goshawk (federal species of concern), Mexican spotted owl (federal threatened), the spotted bat (federal species of concern, state threatened), the peregrine falcon (federal endangered, state endangered), and the. In order to determine the possible influences of the land transfer on these organisms, information from species-specific surveys was collected. These surveys were used to confirm the presence of these species or to infer their absence in or near the project area. It was concluded that none of the above mentioned species occur in the project area. Stretches of the stream channel within Los Alamos Canyon have been identified as palustrine and riverine, temporarily flooded wetlands. The proposed land transfer should not affect these wetlands.

1.0 PROPOSED ACTION

DOE is proposing to transfer to the County of Los Alamos a tract of federal land that totals approximately 10-ha (25-ac) that would be developed for commercial uses. This tract is located in Technical Area (TA) 21 at Los Alamos National Laboratory (LANL). The tract known as the DP land tract is part of adjoining parcels that is separated by a public roadway. The land proposed for transfer is a previously disturbed site that is now covered with grass and scrub vegetation. There are no LANL structures currently located on the tracts proposed for transfer to the County. The site is bounded by a publicly accessible road, DP Road, and another DOE land tract on its northern boundary. The site is bounded by federally-owned and LANL-managed property on its' west, south, and east borders.

The ownership of the DP tract would be transferred to the County of Los Alamos which could retain ownership or sell it to a third party. The owner of the land would be restricted to development of the site for light commercial uses as long as TA-21 maintains currently projected levels of radioactive materials inventories. No heavy industry or residential uses would be anticipated within the foreseeable future. Any controls regarding the type, extent, and intensity of development imposed on the transferred tract would be the responsibility of the County. The transfer of this tract would result in a permanent change to the existing DOE property boundaries for TA-21. All improvements to the site, including utilities, roads, new construction, and support services would be the primary responsibility of the County or of a third party.

Any structures built on the tract would be constructed in accordance with applicable County construction codes and zoning ordinances. Development and construction activities on the transferred land could occur concurrently or in phases. Development of the tract would be expected to be complete within a five to ten year time frame.

2.0 Affected Environment

2.1 General Setting

The Laboratory and the communities of Los Alamos and White Rock are situated in Los Alamos County in north-central New Mexico (Figure 1). This region is located approximately 100-km (60-mi) north-northwest of Albuquerque and 40-km (25-mi) northwest of Santa Fe. Los Alamos County is on the eastern slope of the Jemez Mountains on the Pajarito Plateau.

The Pajarito Plateau is composed of numerous narrow mesas defined by canyons. From the base of the Jemez Mountains, the Plateau slopes gently downward to the east-southeast for more than 24-km (15-mi) to end in a scarp that drops to the Rio Grande. The upper reaches of the Plateau are approximately 2380-m (7800-ft) above sea level, and its lower edge, on the rim of White Rock Canyon, is at 1890-m (6200-ft). Plateau canyons are 46–91-m (150–300-ft) deep and 91–183-m (300–600-ft) wide.

2.2 DP Land Transfer Area

The DP land tract is located in the northeastern quadrant of the Laboratory (Figure 2). The land tract is located on the eastern end of South Mesa, which is bounded on the north by DP Canyon and on the south by Los Alamos Canyon. This area formerly was used as a residential trailer park. The elevation of the DP transfer site is between 2040 and 2200-m (6680 and 7220-ft). The topography of South Mesa is gently sloping eastward. The adjacent canyons, Los Alamos and DP Canyons, vary from shallow to vertical cliff faces.

The geology and soil composition of the project area is welded Bandelier Tuff with a soil composition of Hackroy sandy loam, Totavi gravelly loam sand and, rock outcrop (Nyhan, et al., 1978). The potentiometric surface of the main aquifer in the Los Alamos area lies about 1790 to 1825 m (5870 to 5990 ft). Over 305-m (1000-ft) of unsaturated tuff and volcanic rock separate the surface from the aquifer at TA-21 (the DP land tract) (IT, 1987a).

Initial surveys designed to locate potential habitat for threatened, endangered, or sensitive (TES) species, indicate the presence of five vegetation communities in or near the project area with at least 30 mammal species (including 15 bat species), 80 bird species, 7 reptile and amphibian species, and 154 plant species. Several large game animals including elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), and black bear (*Ursus americanus*) use the area.

2.3 Relevant Studies

In order to address possible impacts of the proposed land transfer to the biota of the area, ESH 20's Biology Team (BT) collected information on wildlife and plant communities gathered at several locations within and adjacent to the proposed land transfer area. Several biological assessments and site assessments were prepared for various Environmental Restoration projects, public and Laboratory utility projects, and smaller Laboratory operations. Locations of data collection included Los Alamos Canyon, and DP Canyon, and mesa tops adjacent to these canyons. Extensive plant surveys were conducted on the mesa tops, in canyon bottoms, on south-facing slopes, and north-facing slopes. Appendix A contains the data from the various vegetation studies done in the vicinity of the proposed land transfer area. In addition, BT conducted studies on various trophic levels of wildlife (Appendix A) that includes birds, small mammals, terrestrial and aquatic arthropods, and some large mammals in the vicinity of the proposed land transfer area. Table 1 contains a list of documents and surveys previously completed within and near the project area.

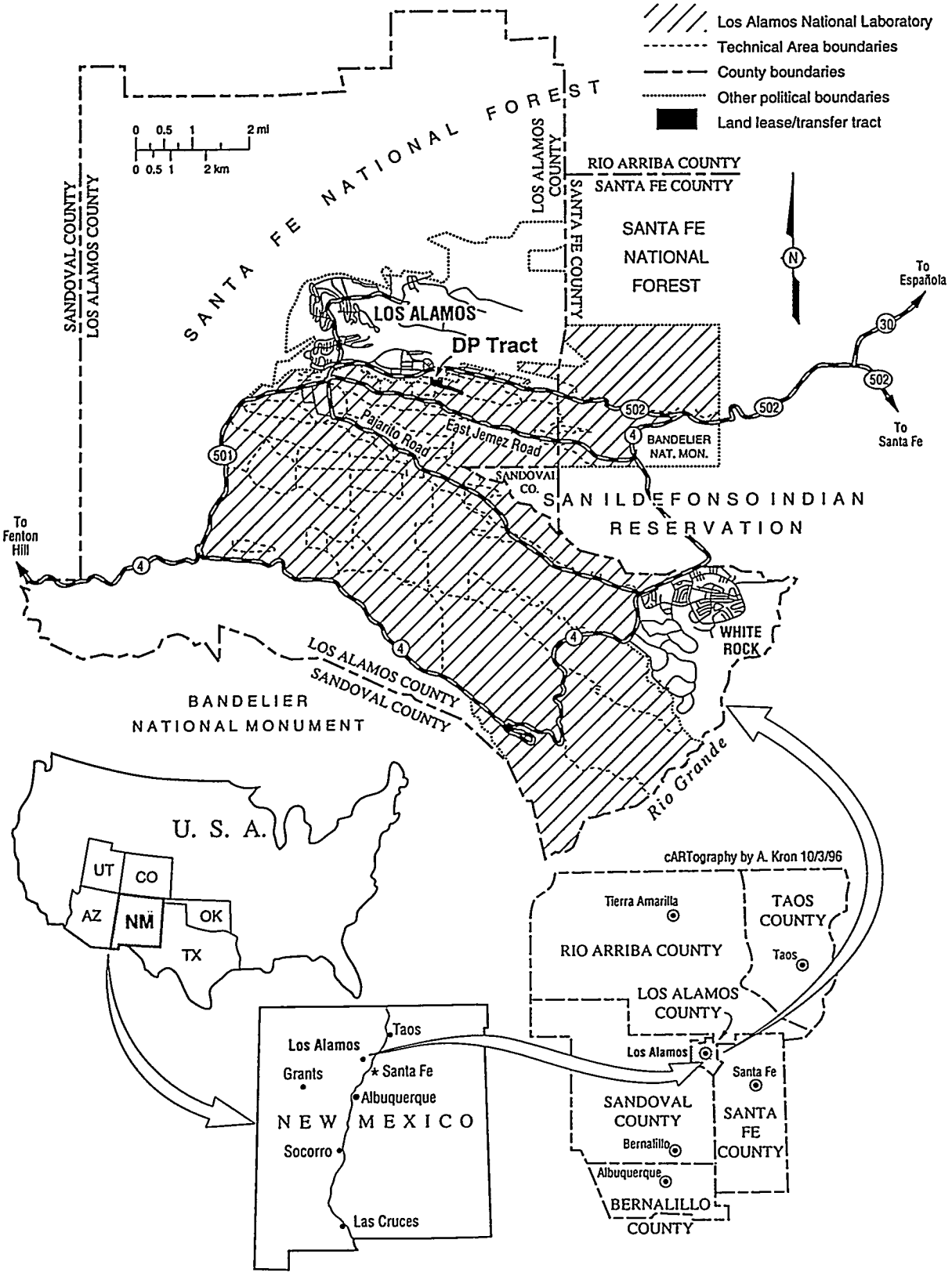

Figure 1. Location of Los Alamos National Laboratory.

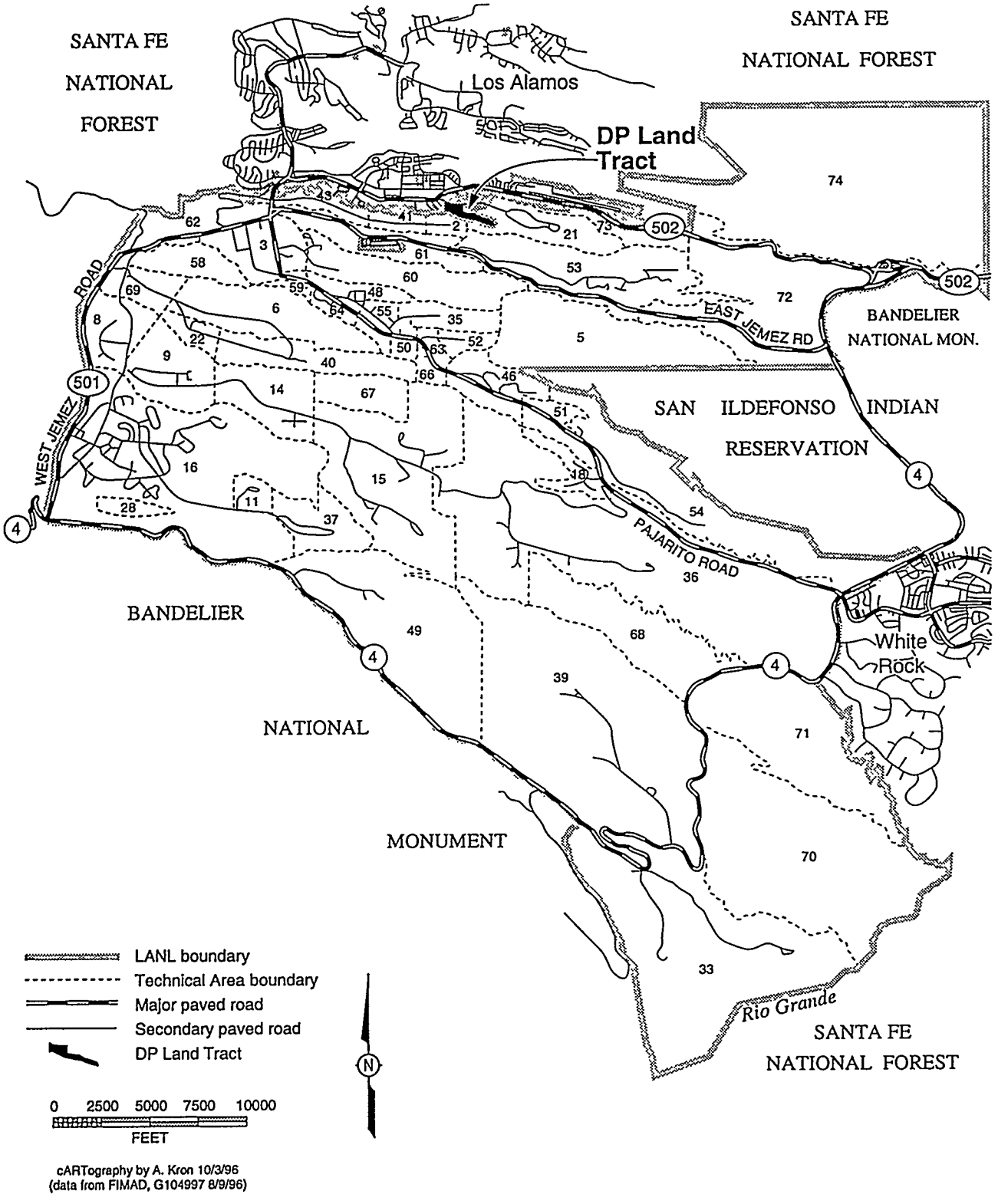

Figure 2. The location of the DP Land Tract.

TABLE 1. A List of Documents and Surveys Previously Completed in or Adjacent to the Proposed DP Tract Land Transfer Area

PROJECT	DATE	AUTHORS
Biological Evaluation for Environmental Restoration Program Operable Units 1106 & 1078	1993	Bennett
Reconnaissance survey of Los Alamos C. RV storage	1991	Bennett and Edeskuty
Biological Assessment for the ISF Gas Line - Townsite Portion	1993	Biggs and Dunham
Meadow Jumping Mouse Survey - Los Alamos Canyon	1992	Biggs and Raymer
Bat Surveys at Los Alamos National Lab	1991-1996	3D Environmental and National Biological Survey
The amphibians and reptiles of the Los Alamos National Environmental Research Park	1986	Bogart
Ecological risk baseline studies	1995	BT
Movements of mule deer on the Los Alamos National Environmental Research Park	1979	Eberhart and White
Summary of small mammal trapping-1980	1980	Felthauser
Considerations for revegetation of areas A, U, T, E, and K	1987	Foxx
Vegetation survey for municipal well	1988	Foxx
Floodplain assessment of Los Alamos Canyon at a proposed water well	1988	Foxx and Mclin
Status of the flora of the LANL research park	1980	Foxx and Tierney
Status of the flora of the LANL research park-checklist of vascular plants	1985	Foxx and Tierney
R-30 Peregrine falcon habitat management plan	1992	Johnson
Mexican spotted owl surveys	1994-95	Keller
Bird Surveys in Los Alamos Canyon	1993-95	Keller
Habitat characteristics of Cooper's and northern goshawks in New Mexico	1986	Kennedy
Nesting ecology of Cooper's and northern goshawks in northcentral New Mexico	1987	Kennedy
Habitat management of two species of raptors in Los Alamos Canyon	1988	Kennedy
Raw data of bird plots in Los Alamos Canyon for a new municipal well	1988	Kennedy and Foxx
Small mammal survey	unpubl.	Kent
The Ants of Los Alamos County, New Mexico (Hymenoptera: Formicidae)	1986	MacKay et al.
Mammal survey of at waste disposal sites Los Alamos Scientific Laboratory	1971	Martin et al.
Small mammal studies in Los Alamos liquid waste disposal areas	1974	Miera and Hakonson
Bird database of Los Alamos National Laboratory	1986-88	Morrison
Survey of telephone cable line in Los Alamos Canyon	1985	Olinger
Comparison of Small Mammal Species Diversity near Outfalls, Natural Streams, and Dry Canyons at Los Alamos National Laboratory	1994	Raymer and Biggs
Northern goshawk inventory of LANL	1994	Sinton and Kennedy
Atlas of the breeding birds of Los Alamos County, New Mexico	1991	Travis
Survey for bats in Los Alamos National Environmental Research Park with special emphasis on the spotted bat, *Euderma Maculatum*	1992	Tyrell and Brack

Much of the DP land tract terrain has been previously disturbed, however, based on nearby studies in undisturbed areas of the mesa, the natural overstory is a ponderosa pine (*Pinus ponderosa*) plant community. In the disturbed areas, the understory is comprised of various grasses such as western wheat grass (*Agropyron smithii*), Canada bluegrass (*Poa compressa*), bottlebrush squirreltail (*Sitanion hystrix*), cheat grass (*Bromus tectorum*), and sand dropseed (*Sporobolus cryptandrus*) and a variety of forbs such as

summer cypress (*Kochia scoparia*), prickly lettuce (*Lactuca* spp.), and horseweed (*Conyza canadensis*). Many of these grasses and forbs are more commonly found in disturbed soils. The overstory of the disturbed portions of South Mesa consist of mountain mahogany (*Cercocarpus montanus*) and scattered American elm (*Ulmus americana*) trees. Only a few of the original ponderosa pine exist on the site. Appendix B lists the species identified in the project area.

The overstory of Los Alamos Canyon is dominated by ponderosa pine with a variety of shrubs present depending on the topography or elevation. The understory is dominated by numerous grasses such as mountain muhly (*Muhlenbergia montana*), brome grass (*Bromus* spp), bluegrass (*Poa fendleriana*), and blue grama (*Bouteloua gracilis*) and a variety of composites and other forbs.

DP Canyon consists of a ponderosa pine dominated forest with a shrub layer of Gambel's oak (*Quercus gambelii*) and mountain mahogany. The understory is dominated by numerous grasses (bromegrass, mountain muhly, and bluegrass), upland sedges (*Juncus* spp.), and a variety of forbs.

3.0 Survey Methods

3.1 Floodplains and Wetlands

In 1990, the US Fish and Wildlife Service (USFWS) mapped wetlands at LANL using the methodology outlined by Cowardin et al. (1979) in accordance with the National Wetlands Inventory (NWI) standards. The method employs a classification system based solely on aerial photography, which may not detect small wetlands and those in deep canyons. Level 1 surveys also include an inventory of wetlands in the vicinity of proposed project locations. Some wetlands occur in the bottom of Los Alamos Canyon in the vicinity of the project area. These are classified as palustrine-temporarily flooded and riverine-intermittent and temporarily flooded (Figure 3). These wetlands are not within the boundaries of the project area.

3.2 Levels 1, 2, and 3 Surveys

BT initiated three levels of survey within or near the proposed land transfer area. The primary purpose of these surveys was to evaluate habitat and determine if there were any species of concern or sensitive areas (floodplains and wetlands) that could be affected.

3.2.1 Level 1 (Reconnaissance) Survey

The Level 1 survey is a walk-through of the general project area to note general habitats and site features. It is the initial survey of the project area and is designed to determine placement of line transects for vegetation surveys, presence or absence of water sources and floodplains, and evidence of previous disturbance. Level 1 surveys were conducted within Los Alamos and DP Canyons and on South Mesa. The general plant communities of the area, disturbance level, terrain, and physical features of the site were also noted. Previous plant transect data exists for some of the disposal areas in TA-21 (Appendix C). Canyon slopes adjacent to the proposed land transfer area were relatively free from heavy development and disturbance. However, several large scale disturbances exist within a portion of the canyon bottom of Los Alamos Canyon. This includes buildings, asphalt parking lots, and paved roads. Within undisturbed portions of Los Alamos and DP Canyons, Level 2 surveys were needed to adequately evaluate the habitat and its components to determine if Level 3 surveys would be necessary.

3.2.2 Level 2 (Habitat-Evaluation) Surveys

Based on the general descriptions of vegetation from the Level 1 survey, Level 2 surveys were designed to quantitatively define habitat. BT used the information gathered in these surveys to define habitat and determine if any habitat that could be used by TES species was present. For this assessment, standard

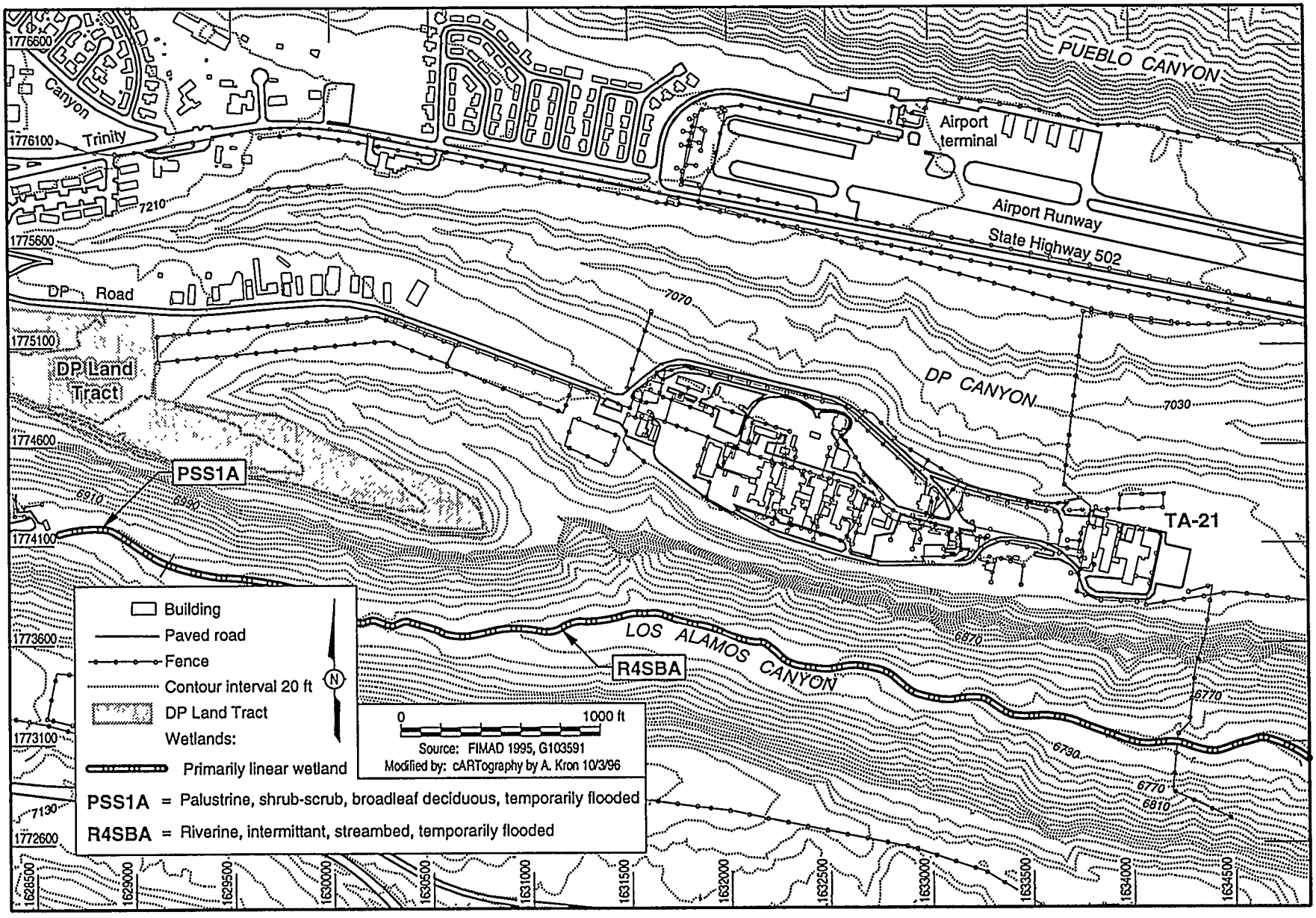

Figure 3. Wetland map for the DP Land Tract based on the U.S.F.S. National Wetland Inventory survey.

ecological techniques were used to analyze cover, density, and frequency of species in overstory and understory vegetation. Information obtained from the vegetation studies was categorized into vegetation types. BT then compared the vegetation types with specific habitat requirements for TES species as established by USFWS. If the habitat requirements of a particular TES species were not met, BT considered the site unsuitable habitat, and no further studies for that species were conducted. Conversely, if any of the habitat could be used by listed species, BT initiated Level 3 surveys.

The classification for vegetation types for the Pajarito Plateau is based on descriptions by Brown (1982). BT made no attempt to designate new habitat types in the proposed land transfer area. Vegetation associations in the project area that did not fit within designated habitat types were classified with the habitat types they most closely resembled.

Using this approach, BT surveyed various sites. For purposes of analysis, BT separated woody species into two categories, trees and shrubs. All woody species were classified as shrubs if their diameter at breast height (DBH) was less than 7.6-cm (3-in) and their height was less than 0.9-m (3-ft). BT recorded the DBH of trees and counted the number of stems of shrubs. BT identified and measured both understory and overstory vegetation for Los Alamos and DP Canyons.

3.2.3 Overstory and Shrub Layer Evaluation

BT used the line intercept technique (Lindsey 1955, Woodin and Lindsey 1954) to characterize the overstory in coniferous forests. Transects were established in the habitat, and data were collected within a 6-m (20-ft) wide strip centered on the 213-m (700-ft) transect line. Within the strip, BT measured the DBH of all single-stemmed trees and counted all shrub stems greater than 0.9-m (3-ft) tall. To determine foliar cover, BT measured the distance along the center line of the transect that was covered by a vertical projection of overstory onto the transect. Plant frequency was measured along the transect within rectangular plots measuring 15 x 6-m (45 x 20-ft) long.

BT used a circular plot technique to measure the overstory components within riparian zones and piñon-juniper woodlands. Circular plots were established every 30.5-m (100-ft) along a transect line within the habitat to be evaluated. From a center point on the transect line, basal diameters of all multistemmed trees within a 9.1-m (30-ft) radius were measured. For single-stemmed trees within a 9.1-m (30-ft) radius, DBH was measured. BT also counted all shrub stems and estimated overstory cover within each quarter of the circular plot.

Analysis also included calculating an importance index, the measure of species dominance within a transect, for all tree and shrub species within the transects. The importance index is calculated by averaging relative cover, relative density, and relative frequency for each species.

3.2.4 Understory Evaluation

BT used the quadrat method with a 20 x 50-cm (7.9 x 19.7-in.) Daubenmire plot to measure percent cover of cryptogamic and herbaceous plants, bare soil, and litter, and shrubs less than 0.9-m (3-ft) tall (Daubenmire 1959). The quadrats were placed on the same transect that was established for overstory evaluation. BT estimated percent cover and species composition within each quadrat. Quadrats were read along the transect at 3-m (10-ft) intervals for a minimum of 213-m (700-ft) or until no new species within several successive plots were recorded.

We used Martin and Hutchins (1980), Foxx and Hoard (1984), and Foxx and Tierney (1985) to identify all plants. BT also collected voucher specimens to be archived in the ESH-20 Herbarium. Any plant identifications that were questionable, were confirmed at the University of New Mexico herbarium.

3.3 Level 3 Surveys

Based on Level 2 surveys, it was determined that Level 3 surveys were needed for the northern goshawk (*Accipter gentilis*), Mexican spotted owl (*Strix occidentals lucida*), spotted bat (*Euderma maculatum*), and peregrine falcon (*Falco peregrinus*).

3.3.1 Northern Goshawk

The northern goshawk nests primarily in dense, mature, or old growth coniferous forest. The northern goshawk is known to nest in the northwest quadrant of LANL. Studies by Sinton and Kennedy (1994) indicate that the highest percentage of nests are in the ponderosa pine-Gambel oak habitat type. In the summer of 1993, Kennedy's team surveyed for the northern goshawk throughout the Lab, including Los Alamos Canyon. Sinton and Kennedy of Colorado State University did a northern goshawk inventory of 2254-ha (5567-ac) in Santa Fe National Forest, and in LANL lands on the eastern slope of the Jemez Mountains. The survey involved playing and amplifying conspecific goshawk calls from a transect walked at the bottom of canyons. Distance between calling stations was 150-m (492-ft). The inventory, conducted during daylight hours from May 12 to July 30, 1993, coincided with goshawk incubation, nesting, and fledgling-dependency stages (Sinton and Kennedy 1993). Los Alamos Canyon was surveyed as part of this effort.

3.3.2 Mexican Spotted Owl

Mexican spotted owl surveys were conducted in Los Alamos Canyon adjacent to the proposed DP tract area. The USDA Forest Service protocol used for those surveys was as follows:

Once an area of potential habitat was identified, a survey route was planned. The route was designed to cover all of the available habitat within 0.8-km (0.5-mi) of the calling route. From approximately 2 AM until sunrise, surveys were performed by broadcasting the call of the spotted owl and waiting for an owl to respond. The surveyor walked the canyon edge and bottom and played the call to cover the habitat in the area of the survey. The area was covered completely in one survey outing. If an owl was found, the preliminary surveys were discontinued and more intensive nest location surveys were begun.

If owls were present, nest locations were found using a technique called "mousing." A live mouse was used as an attractant for the owls. If a pair of owls is nesting, they will return the mouse to the nest. If they are not nesting, the mouse is generally consumed on the spot. If after several mousing attempts (noting male and female owl behavior), and no nest was located, it was reasonable to assume that a pair was not nesting. If an area was surveyed and no owls were found, a series of four or more surveys per breeding season are required for a total of two years before a site can be cleared for disturbance activities during the spotted owl breeding season.

3.3.3 Spotted Bat

To survey for spotted bats, BT conducted mist netting in areas of highest spotted bat habitat suitability. Because of the high flight patterns of spotted bats, mist nets were placed on 6 to 9-m (20 to 30-ft) high poles. Multiple mist nests were placed on each pole. Nets were deployed at dusk and inspected every fifteen minutes. If a bat was found in a net, it was removed and the species, sex, age, reproductive condition, location, net height, direction of entry to the net, and date and time of capture were recorded on data forms. Bats were released after the information was recorded.

3.3.4 Peregrine Falcon

Johnson (1992) and Keller (1994 and 1995) examined locations within lower Los Alamos Canyon to determine the presence of peregrine falcons and to determine the suitability of the canyon for breeding habitat for peregrine falcons. The southern cliff faces were examined visually for evidence of peregrine falcon activity. Active nest holes, determined by white wash (bird droppings), and the presence of any peregrines were noted. Johnson stated that lower Los Alamos Canyon >1.6-km (1-mi) east of the project area provides breeding habitat that would have been designated as suitable were it not for the presence of the more attractive habitat in nearby Pueblo Canyon. However, this comparison was based on physical features alone and did not take into account the level of disturbances in Pueblo Canyon.

4.0 RESULTS

4.1 Floodplains and Wetlands

There are no wetlands or floodplains occurring within the boundaries of the proposed land transfer area on the DP land tract. However, within Los Alamos Canyon there are stretches of riverine and palustrine wetlands adjacent to the project area. Much of the sections of Los Alamos and DP Canyons below the DP land transfer area contain ephemeral seasonal streams that flow primarily in the summer months.

Riverine systems include all wetlands and deep-water habitats contained within a channel with the exception of wetlands dominated by trees, shrubs, persistent emergents, mosses, or lichens. Whereas a palustrine system includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, mosses or lichens (Cowardin, et al., 1979). A floodplain also exists within Los Alamos Canyon. Floodplains were modeled using Army Corps Of Engineer's Hydrologic Engineering Center Hec-1 and Hec-2 computer-based models (McLin, 1992).

4.2 Threatened, Endangered, and Sensitive Species

4.2.1 Level 1 (Reconnaissance) Surveys

During the Level 1 Survey, BT conducted general observations of wildlife, terrain, and the degree of disturbance at the site. In addition, the reconnaissance surveys identified five general plant zones that are in or near the proposed land transfer area to use as search criteria in the BT TES species database:

- Mixed conifer
- Ponderosa pine/Piñon pine
- Ponderosa pine
- Wetlands
- Riparian areas

4.2.2 Species Identified in the BT Database Search

The initial search of the BT TES species database revealed a number of species whose general habitat requirements matched the vegetation types identified in or adjacent to the proposed land transfer area. These include plants and animals from state and federal listings.

4.2.2.1 Federal and State Listed Threatened and Endangered Plants

Due to the high amount of disturbance on South Mesa, no federally or state listed plant species are expected to occur within the DP tract land transfer area. However, the surrounding habitats resulted in a

number of potential species that could occur in the area. Furthermore, vegetation studies conducted on the limited undisturbed terrain on South Mesa have resulted in no listed species being found. Although riverine and palustrine wetlands are present within Los Alamos Canyon, these wetlands are not well defined and lack extensive riparian zones. Surface flows occur during periods of storm events. The lack of extensive and well-established wetland and riparian areas adjacent to the project area within Los Alamos Canyon and DP Canyon most likely precludes species associated with these habitats from occurring near the project area.

4.2.2.2 State Listed Sensitive Plants

Under the Endangered Species Act and New Mexico State statutes, only those plant species that are listed or are a candidate for listing are protected. New Mexico also lists those species occurring within the state that are considered rare because of restricted distribution or low density. Rare plants are sensitive to long-term or cumulative land use impacts and are vulnerable to biological or climatic events. The State monitors these species to determine if they should be evaluated for endangered status. No state sensitive plant species are expected to occur within the project area boundaries due the high amount of disturbance in those areas. Table 2 lists federal and state listed wildlife species that could occur in the project area based on existing habitat, their status, and habitat requirements of the surrounding area.

4.2.2.3 Federal and State Listed Wildlife

Table 2 lists federal and state listed wildlife species that could occur in the project area based on existing habitat, their status, and habitat requirements.

Federal Listed Species: Ten TES wildlife species met the search criteria.

State Listed Species: Four wildlife species met the search criteria that were either state endangered (Group 1) or threatened (Group 2) species.

TABLE 2: Threatened, Endangered, and Sensitive Species Potentially Occurring in the DP Land Transfer Area, October 1996.

SCIENTIFIC NAME	COMMON NAME	STATUS *	HABITAT	POTENTIAL TO OCCUR⊗
Wildlife				
Accipiter gentilis	Northern goshawk	FSOC	Ponderosa pine/Gambel's oak, ponderosa pine/gray oak, mixed conifer	Moderate
Strix occidentalis lucida	Mexican spotted owl	FT	Forested mountains and canyons. Generally uneven-aged, multi-storied forest with closed canopy.	Moderate
Euderma maculatum	Spotted bat	FSOC SPG1	Ponderosa, piñon-juniper; cliffs and rock crevices	Moderate
Falco peregrinus	Peregrine falcon	FE SPG1	Ponderosa-piñon; cliffs and rock outcrops on cliffs	Moderate
Zapus hudsonius	Meadow jumping mouse	FSOC SPG2	Riparian, Mixed Conifer, lush grassy meadows.	Low
Empidonax trailii extimus	Southwestern willow flycatcher	FT	Riparian areas with stands of willow, buttonbush, or tamarisk	Low
Haliaeetus leuccephalus	Bald Eagle	FE	Permanent rivers, lakes, and large streams cliffs or large trees	Low
Grus americana	Whooping Crane	FE	Rivers, marshes, and swamps	Low
Mustela nigripes	Black-footed Ferret	FE	Greater than 80 ac of prairie dog towns.	Low

Plethodon neomexicanus	Jemez Mountain Salamander	FSOC SPG1	Coniferous areas with cool, moist, shaded woods, downed logs, talus slopes,7183 - 10791 ft	Low
Plants				
Aletes sessiliflorus, Theobald & Tseng	Sessile-flowered false carrot	SS	Piñon-juniper; rocky canyons or slopes, usually basaltic or sandstone areas; 6500-8100 ft	Low
Astragalus cyaneus, Gray	Cyanic milk vetch	SS	Piñon-juniper; sandy or gravelly hillsides; 5500-6000 ft	Low
Astragalus feensis, M.E. Jones	Santa Fe milk vetch	SS	Piñon-juniper; dry slopes; 5000-6500 ft	Low
Astragalus mollissimus, Torr. var. *mathewsii* (Wats)	Mathew's woolly milk vetch	SS	Open slopes and ridges in piñon pine forests; sometimes in canyons; 5000-6000 ft	Low
Astragalus puniceus, Osterh. var. *gertudis* (Green)	Taos milk vetch	SS	Open, loose soil in piñon and juniper areas; ~7000 ft	Low
Lilium philadelphicum var. *andium*	Wood lily	SE3	Ponderosa to mixed conifer; 6000-10,000 ft	Low
Mammillaria wrightii, Engelm.	Wright fishhook cactus	SE2	Desert grassland to piñon-juniper; gravely or sandy hills or plains; 3000-7000 ft	Low
Opunita viridiflora, Britt. and Rose.	Santa Fe cholla	FSOC	Piñon-juniper; 7200-8000 ft	Low
Silene plankii, Hitchc. and Maguire	Plank's catchfly	FSOC SS	Piñon-juniper; crevices and pockets in protected cliff faces of igneous rock; 5000-6000 ft	Low
Phlox caryophylla, Wherry	Pagosa phlox	SS	Ponderosa-piñon, 6500-7500 ft, open slopes in open woods	Low
Tetradymia filifolia, Greene	Threadleaf horsebrush	SS	Piñon-juniper; limestone or highly gypseous soils; 6000-7000 ft	Low
Tourneya papyracantha, (Engelm.) Britt., Rose.	Grama grass cactus	FSOC	Sandy soil in piñon-juniper; basalt outcrops; 5000-7300 ft	Low

*CODES FOR LEGAL STATUS

FE = federally endangered
FPT = federally proposed as threatened
FT = federally threatened
FSOC = federal species of concern
SE1 = state protected and listed as threatened or endangered under the Federal Endangered Species Act
SE2 = state protected, so rare across its entire range with limited distribution and population size that unregulated collection jeopardize its survival in New Mexico
SE3 = state protected, widespread in or adjacent to New Mexico, but its numbers are being significantly reduced to such a degree that its survival within New Mexico is jeopardized
SPG1 = state protected as a Group 1 species (endangered)
SPG2 = state protected as a Group 2 species (threatened)
SS = state sensitive

⊗POTENTIAL TO OCCUR

High= species is known to occur in the area
Moderate= the area has some species habitat components
Low = the area does not have species habitat components

4.3 Species Dismissed from Further Consideration

Of the species identified in the Level 2 (database) search, BT eliminated six animal species and twelve plant species from further consideration in this study. These species are not expected to occur in the project area for the reasons given below.

- Meadow jumping mouse prefers wetlands and other mesic habitats, such as permanent streams and wet meadows. Joan Morrison, state expert on the jumping mouse, evaluated habitat in Los Alamos Canyon west of the project area where the flows are intermittent but dependable in late spring to early summer because of releases from Los Alamos Reservoir. She reported an area near the reservoir that may have suitable habitat (Morrison 1990). Meadow jumping mouse habitat includes permanent free-flowing water, riparian zones along steams and ditches, or wet meadows near cattail marshes associated with major rivers (Morrison 1992). BT conducted a survey for meadow jumping mice approximately 2.4-km (1.5-mi) upcanyon from the DP land tract. This area was deemed marginal habitat, at best, to support this species. No meadow jumping mice were captured during this survey. BT did not trap near the project area where the flow was intermittent and less dependable than the upcanyon site that was trapped. Given the low quality of the habitat near the project area, and based on previous studies upcanyon, the meadow jumping mouse is not expected to occur in the project area.

- The southwestern willow flycatcher inhabits areas near water with 4- to 7-m-high (23-ft) thickets of willow (*Salix* spp.), buttonbush (*Cephalanthus occidentalis* var. *pubescens*), seepwillow (*Baccharis glutinosa*), and tamarisk (*Tamarix pentandra*) (Tibbitts et al. 1994). Occasionally, a sparse overstory of cottonwoods (*Populus* spp.) are associated with this species. This species has not previously been found on LANL property of Los Alamos County. Because the small wetlands near the project area does not contain suitable habitat for the flycatcher this species was not considered likely to occur.

- The Bald Eagle winters along the Rio Grande. Winter roosts have been observed at Cochiti Lake and north along the Rio Grande. The DP land transfer area and the adjacent Los Alamos Canyon and DP Canyons are far removed from Cochiti Lake and the Rio Grande. No suitable habitat exists in the area surrounding the DP land tract for the bald eagle.

- Whooping crane nest in marshy areas among bulrushes, cattails, and sedges that provide protection from predators as well as food. The project area is located 5.8 km (3.6 mi) from the Rio Grande. The area in or adjacent to the DP land transfer does not have suitable nesting or wintering habitat for the whooping crane.

- The Black-footed ferret had a historical range that includes 12 States (Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, and Wyoming) and the Canadian Provinces of Alberta and Saskatchewan. Ferret range is coincident with that of prairie dogs, with no documentation of black-footed ferrets breeding outside of prairie dog colonies. Only prairie dog colonies with greater than 32-ha (80-ac) or smaller adjacent colonies totaling 32-ha (80 ac) that are less than 8-km (5-mi) apart are large enough to require surveys. No prairie dog colonies exist in or adjacent to the DP land transfer.

- Jemez Mountains salamanders live in shaded forest habitats at elevations of 2201 to 2720-m (7225 to 9250-ft), usually on north-facing slopes. In the summer of 1985, Cynthia Ramotnik found the Jemez Mountains salamander on the north-facing slope of Los Alamos Canyon, 0.8-km (0.5-mi) east of the Los Alamos bridge outside of the project area. She also reported specimens near the Los Alamos Reservoir. In 1991, BT conducted a salamander survey on the north-facing slope of Los Alamos Canyon approximately one-quarter mile west of the bridge. The area was a mixed conifer plant community with less than 5% cover of downed logs, and soil moisture was relatively low. The survey

did not reveal any salamanders. Due to the lower quality of habitat within Los Alamos Canyon adjacent to the DP tract project area, this species is not expected to occur near the DP land tract.

- The sessile-flowered false carrot lives in rocky canyons and slopes, usually on substrates of basalt or sandstone. This species was not included in further analyses in this study because it is found primarily in south-central New Mexico and has not been found in Los Alamos County.

- The cyanic milkvetch inhabits sandy or gravelly slopes in piñon-juniper vegetation. The species usually grows adjacent to the Rio Grande and has not been found in Los Alamos County. No habitat for this species occurs in the project area, it was eliminated from further study because numerous surveys in similar habitat throughout LANL did not encounter it (Foxx and Tierney 1985, Banar 1993).

- The Santa Fe milkvetch is found on dry slopes in piñon-juniper woodlands. The species has not been recorded for Los Alamos County and was not found during the Level 2 Surveys.

- Mathew's wooly milkvetch inhabits slopes, ridges, and canyons in open country. The species has not been recorded for Los Alamos County and was not found during the Level 2 Surveys.

- Taos milkvetch lives on dry slopes in open areas of piñon pine-ponderosa woodlands. This species was dismissed from further consideration because numerous surveys did not find it anywhere in Los Alamos County, nor was it found in any of the Level 2 Surveys.

- The wood lilly occurs in moist ponderosa pine and mixed conifer habitats. It ranges in elevation from 1876 to 3126-m (6150 to 10250-ft). The wood lilly has been found previously in Los Alamos County near seeps and streams in well shaded areas. Habitat for the wood lilly does not exist in the DP land transfer area. BT found no specimens of this lilly during Level 1 and Level 2 Surveys.

- The Wright fishhook cactus grows on gravelly and sandy hills or plains, desert grasslands, and piñon pine-juniper zones (NMNPPAC 1984). However, there are not piñon-juniper woodlands in the project area. The cactus was not found during field surveys.

- The Santa Fe cholla has been found only in an urban area in Santa Fe County. They appear to be strongly associated with south- and west-facing slopes in piñon-juniper woodlands at about 2195-m (7200-ft) (NMNPPAC 1984). The project area does not include terrain at this elevation, and BT found no specimens of this cactus during Level 1 and Level 2 Surveys.

- Plank's catchfly grows in piñon-juniper habitats and is known to inhabit igneous rock crevices along the Rio Grande. It is restricted to mountains characterized by steep to sheer rocky canyons in protected areas that receive little direct sunlight. It has not been found in Los Alamos County and was not encountered during the Level 2 Surveys.

- Pagosa phlox requires open mountain slopes within ponderosa-piñon forest. Similar habitat near the project area is limited to either steep slopes or cliff faces. This species was not identified during an extensive Level 2 vegetation survey conducted across the Laboratory, nor has it ever been identified

within Los Alamos County. The Pagosa phlox, therefore, is not expected to occur within or near the project area.

- The threadleaf horsebrush lives on limestone or gypsiferous soils. This species has not been recorded for Los Alamos County and was not encountered during the Level 2 Surveys.

- Grama grass cactus inhabits sandy soils within basalt outcrops in piñon-juniper woodlands. There are not piñon-juniper woodlands in the project area, and no specimens of this cactus were found during Level 1 and Level 2 Surveys.

4.4 Species Selected for Level 3 Surveys

The Level 2 survey identified habitat in or near the proposed land lease area suitable for the wildlife and plant species listed below; BT completed species-specific surveys, where possible, to confirm their presence or to infer their absence in the proposed land lease area.

4.4.1 Northern Goshawk

Northern goshawk nests primarily in dense, mature, or old growth coniferous forest. Studies by Patricia Kennedy (1987) indicate the highest percentage of nests were in ponderosa pine and Gambel's oak habitat type. Surveys for raptors within Los Alamos Canyon or surrounding areas have been conducted by Patricia Kennedy and David Sinton in 1987, 1988, 1991, and 1993. Although some of the habitat components exist in the general region for the northern goshawk (Kennedy 1986), none have been found within this canyon system in the vicinity of the DP land tract.

4.4.2 Mexican Spotted Owl

Mexican spotted owl inhabits mixed conifer and ponderosa-Gambel oak forests in mountains and canyons in the southwestern U.S. and northern Mexico with the following characteristics (USFWS 1995):

- high canopy closure,
- high stand diversity,
- multilayered 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 where there is little light penetration and temperatures are cool. Therefore, spotted owls tend to prefer north-facing slopes (USFWS 1995). Spotted owls nest in trees, crevices, or small caves (Travis 1992). The region in and adjacent to the proposed land lease area contains suitable owl habitat. The habitat in the adjacent canyons to the DP land tract sites were determined to be capable of supporting the Mexican spotted owl and two years of surveys were conducted in the suitable habitat surrounding the DP land tract (Keller 1994, 1995). There were no Mexican spotted owls located during the two years of survey.

4.4.3 Spotted Bat

The spotted bat is a federal species of concern and is listed by the New Mexico Department of Game and Fish State Game Commission as Endangered, Group 2. Under this category, a species' prospects of survival are 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. It was first recorded in New Mexico in 1961, when two spotted bats were captured at Ghost Ranch in Rio Arriba

County (Constantine 1961). Spotted bats have been found at Lake Roberts, Mt. Taylor, and the Jemez Mountains.

The spotted bat's habitat varies. 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 (Tyrell and Brack 1992). Key habitat for this species includes.

- a source of water with standing pools for foraging,
- rock crevices on high cliff faces, and
- loose rocks or boulders under which to shelter during the day.

The area west of the project area, where water is present more often than in the vicinity of the DP tract project area, contains suitable spotted bat habitat. During 1991, limited bat mist netting on Laboratory lands did not capture any spotted bats. Also, a team of independent contractors supported by BT personnel again surveyed Los Alamos Canyon for bats in the summer of 1992. No spotted bats were captured during two nights of mist netting (Tyrell and Brack 1992). Furthermore, during 1995 and 1996, the National Biological Service surveyed Laboratory lands and found no spotted bats.

4.4.4 Peregrine Falcon

Johnson concluded that Los Alamos Canyon provides viable alternative nesting habitat. Johnson recommended that lower Los Alamos Canyon be maintained in an undeveloped condition, so as to provide alternative nesting habitat with low levels of disturbance. This area is outside of the proposed DP tract land transfer area.

5.0 IMPACTS

5.1 Floodplains and Wetlands

Although floodplains and wetlands are not present within the DP tract area, they do exist within Los Alamos Canyon downslope of the South Mesa. Because the proposed land lease area occurs adjacent to wetlands, precautions must be taken to avoid impacts to the associated stream channel. If development within the proposed land transfer area disturbs the stream channel within Los Alamos or DP Canyons, the following impacts could occur:

- Excessive disturbance to the vegetation and soil surface of the mesa top could result in an alteration of intermittent water flows or a widening of the channel due to erosion and sedimentation off the canyon slope.
- Hazardous fuel spills or leaks from vehicles on South Mesa could drain into the canyon and ultimately within the stream channel, subsequently dispersing downstream during flow periods.

5.2 Protected Species

5.2.1 Northern Goshawk

Proposed activities associated with the DP land transfer site will not remove habitat components from the northern goshawk. The area of South Mesa is heavily disturbed and disturbances associated with the DP land tract should not effect this species from future colonization of the adjacent canyons.

5.2.2 Mexican Spotted Owl

No Mexican spotted owls have been found during two years of surveys conducted in Los Alamos Canyon near the DP land tract. Although some habitat components exist near the project area, the proposed land transfer is not expected to adversely impact this species.

5.2.3 Spotted Bat

Spotted bats are not known to occur in Los Alamos Canyon, but all habitat components are present to support this species. The primary impact to bats would be destruction of roosting sites (rock cervices). The proposed action is not expected to impact rock cervices within Los Alamos or DP Canyons. All development activity is expected to be contained on South Mesa.

5.2.4 Peregrine Falcon

Although potentially viable nesting habitat has been identified in lower Los Alamos Canyon >1.6-km (1-mi) east of the project area, the proposed land transfer does not occur within known or potential nesting areas for peregrine falcons. Construction and operational activities on South Mesa within the designated proposed DP tract land transfer should not affect peregrine falcons.

5.3 Nonprotected Species

5.3.1 Vegetation

Construction of the research park could destroy up to 10-ha (25-ac) of various shrub and grass species.

5.3.2 Wildlife

Although minimally suitable habitat for wildlife species exists within the land transfer area (due to the high amount of disturbance), the following impacts to wildlife species could occur:

- Excessive disturbance along the canyon slopes could cause the direct removal of nesting, perching, cover, and similar habitats for various birds.
- Disturbance immediately along the slopes during critical periods may cause nest abandonment by birds, which could result in nest failure.
- Excessive noise or other disturbance during critical times, such as during breeding periods, could result in the loss of young.
- Large mammals' (such as elk, mule deer and black bear) movement corridors, breeding areas, and foraging areas may be permanently altered. At least three deer are known to utilize a portion of the land transfer area for foraging on a regular basis.

6.0 MITIGATION

6.1 Floodplains and Wetlands

Wetlands, as defined by the NWI maps, are found within Los Alamos Canyon adjacent to the DP land tract. Erosion and runoff controls shall be employed to reduce soil loss along the mesa top, and a buffer zone with erosion controls near the edge of the canyons shall be created to dissipate runoff and soil movement from the site of development.

6.2 Protected Species

No adverse impacts to any threatened or endangered species is expected to occur as a result of the proposed DP tract land transfer. However, due to the proximity of suitable habitat and possible future occupation in Los Alamos Canyon for some of the previously discussed species, mitigation measures are provided as "best management practices" for the protection of the cliffs and canyons adjacent to the DP land transfer area.

6.2.1 Northern Goshawk

- Disturbance in Los Alamos Canyon adjacent to the DP land tract should be kept to a minimum.
- Any tree cutting, live or dead, in Los Alamos or DP canyons will be cleared through ESH-20 biologists.
- Erosion and runoff controls should be employed to reduce soil loss, and a 15-m (50-ft) buffer zone with erosion controls near the edge of the canyons should be created to dissipate runoff and soil movement from the site of development.

6.2.2 Mexican Spotted Owl

- Disturbance in the upper part of Los Alamos Canyon adjacent to the DP land tract should be kept to a minimum.
- Development that affect the cliff face or the mixed conifer habitat of upper Los Alamos Canyon should be done between the months of September through February, leaving the months of March through August free of heavy disturbance.

6.2.3 Spotted Bat

- If development on the south-facing slope of Los Alamos Canyon is conducted, a biologist from ESH-20 should be contacted prior to disturbance to conduct a survey of all rock cervices in the area to be disturbed. If any evidence of bats is found in the development area, an evaluation may be made for alternative times in which the disturbance should take place.
- Erosion and runoff controls should be employed to reduce soil loss, and a buffer zone with erosion controls near the edge of the canyons should be created to dissipate runoff and soil movement from the site of development.
- The mitigation measures for the spotted bat will ensure that other bats of concern will not be impacted by this land transfer.
- Avoid removing vegetation along mesa edges; if possible, leave a minimum of a 15-m (50-ft) buffer of undisturbed vegetation along mesa edges.

6.2.4 Peregrine Falcon

- Disturbance to Los Alamos Canyon slopes adjacent to the DP land tract should be kept to a minimum.
- Development occurring along the south-facing cliff face of Los Alamos Canyon should be done between the months of September through February, leaving the months of March through August free of heavy disturbance.
- Erosion and runoff controls should be employed to reduce soil loss, and a buffer zone with erosion controls near the edge of the canyons should be created to dissipate runoff and soil movement from the site of development.
- Avoid removing vegetation along mesa edges; if possible, leave a minimum of a 15-m (50-ft) buffer of undisturbed vegetation along mesa edges.

6.3 Nonprotected Species

6.3.1 Plants

Recommended mitigation measures include

- Avoid unnecessary disturbance (e.g., excessive parking areas or equipment storage areas, off-road travel, materials storage areas, crossing of streams or washes) to vegetation along mesa edges during construction.
- Avoid removal of vegetation along drainage systems and stream channels leading into the adjacent canyons.
- Avoid removing vegetation along mesa edges; if possible, leave a minimum of a 15-m (50-ft) buffer of undisturbed vegetation along mesa edges.

6.3.2 Wildlife

The following mitigation measures would reduce the potential for impacts on all wildlife

- Avoid removing vegetation along mesa edges; if possible, leave a minimum of a 15-m (50-ft) buffer of undisturbed vegetation along mesa edges.
- When possible, avoid construction activities from March 1 to September 1.

7.0 CONCLUSION

To provide background information concerning the site, databases containing historical information and biological reports of any previous surveys within the area were summarized. Based on this information, habitats were characterized. The TES species database was searched for a listing of potential species that could occur within the habitat types associated with the DP land tract. Species on the State or Federal protection list known to occur in ponderosa pine, ponderosa pine/piñon pine, mixed conifer, wetland, or riparian areas of Los Alamos and surrounding counties were identified. A habitat-evaluation survey was conducted to determine if the specific requirements of the species could be met in the project locations.

Specific species surveys were conducted for the northern goshawk, Mexican spotted owl, spotted bat, and the peregrine falcon. Using established protocols for each species, surveys were conducted. None of these species were found. Therefore, no adverse impact to any threatened, endangered, or species of concern is expected to occur as a result of the DP tract land transfer. Best management practices have been included to aid in the protection of undisturbed areas adjacent to the DP tract.

Within the DP land transfer area, all wetlands and floodplains were noted using the NWI Maps and field surveys. Wetlands identified as palustrine-temporarily flooded and riverine-temporarily flooded, are located within Los Alamos Canyon adjacent to the DP land tract. However, these have very limited riparian zones associated with them and surface water typically occurs during storm events or snowmelt. Mitigation measures are provided to protect the slopes and subsequently the canyon bottom wetlands from erosion and sedimentation.

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APPENDIX A
WILDLIFE SPECIES LISTS

Reptiles and Amphibians of Los Alamos Canyon

FAMILY	SCIENTIFIC NAME	COMMON NAME	LOCATION
	AMPHIBIANS		
PLETHODONTIDAE	*Plethodon neomexicanus*	Jemez Mountains salamander (1)	Upper LA Canyon near reservoir
	REPTILES		
COLUBRIDAE	*Masticophis taeniatus*	Striped whipsnake (1)	Lower LA Canyon near Rio
	Thamnophis elegans	Western terrestrial garter snake (1, 2)	Within all LA Canyon
	Opheodrys vernalis	Smooth green snake (1)	Upper LA Canyon near reservoir
IGUANIDAE	*Crotaphytus collaris*	Collared lizard (1)	Lower LA Canyon near Rio
	Sceloporus undulatus	Eastern fence lizard (1, 2)	Within all LA Canyon
TEIIDAE	*Cnemidophorus exsanguis*	Chihuahuan spotted whiptail1	Lower LA Canyon near Rio
VIPERIDAE	*Crotalus atrox*	Western diamond back rattlesnake (1)	Lower LA Canyon near Rio
	C. viridis viridis	Prairie rattlesnake (1, 2)	Within Mid to Lower LA Canyon
1=Bogart 78-79 2=observations			

Birds of Los Alamos Canyon

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
ACCIPITRIDAE	*Accipiter cooperii*	Cooper's hawk	3
	Buteo albonatus	Zone-tailed hawk	1
	B. jamaicensis	Red-tailed hawk	1,2
AEGITHALIDAE	*Psaltriparus minimus*	Bushtit	
APODIDAE	*Aeronautes saxatalis*	White-throated swift	1,2
CAPRIMULGIDAE	*Chordeiles minor*	Common nighthawk	1
	Phalaenoptilus nuttallii	Common poorwill	1
CARTHARTIDAE	*Cathartes aura*	Turkey vulture	1
CERTHIIDAE	*Certhia americana*	Brown creeper	
COLUMBIDAE	*Zenaida macroura*	Morning dove	1,3
CORVIDAE	*Amphelocoma coerulescens*	Scrub jay	1
	Corvus corax	Common Raven	
	Cyanocitta stelleri	Steller's jay	1,3
	Nucifraga columbiana	Clark's nutcracker	1,2
EMBERIZIDAE	*Agelaius phoeniceus*	Red-winged blackbird	
	Calamospiza grammacus	Lark sparrow	
	Carduelis pinus	Pine siskin	1
	Carduelis psaltria	Lesser goldfinch	
	Carpodacus mexicanus	House Finch	

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
	Cuccathraustes vespertinus	Evening grosbeak	
	Dendroica coronata	Yellow-rumped warbler	3
	D. gracial	Grace's warbler	1,3
	Junco hyemalis	Dark-eyed junco	3
	Molothrus aster	Brown-headed cowbird	1,3
	Pheucticus melanocephalus	Black-headed grosbeak	1,3
	Pipilo chlorurus	Green-tailed towhee	1,2
	P. erythrophthalmus	Rufous-sided towhee	1,2
	Piranga flava	Hepatic tanager	1
	P. ludoviciana	Western tanager	1,3
	Pooecetes gramineus	Vesper sparrow	1
	Spizella passerina	Chipping sparrow	1,2,3
	Sturnella neglecta	Western meadowlark	1
	Vermivora virginiae	Virginia's warbler	1,3
FALCONIDAE	*Falco sparverius*	American kestrel	1
FRINGILLIDAE	*Carduelis pinus*	Pine siskin	3
	C. psaltria	Lesser goldfinch	1,2,3
	Carpodacus cassinii	Cassin's finch	3
	C. mexicanus	House finch	3
	Hesperiphona vespertina	Evening grosbeak	3
	Loxia curvirostra	Red crossbill	1,3
HIRUNDINIDAE	*Hirundo pyrrhonota*	Cliff swallow	1
	Tachycineta thalassina	Violet-green swallow	1,2,3
MUSCICAPIDAE	*Catharus guttatus*	Hermit thrush	1,3
	Myadestes townsendii	Townsend's solitaire	3
	Polioptila caerulea	Blue-grey gnatcatcher	1,3
	Sialis currucoides	Mountain bluebird	1,2,3
	S. mexicana	Western bluebird	1,2,3
	Turdus migratorius	American robin	1,2,3
PARIDAE	*Parus gambeli*	Mountain chickadee	1,3
	P. inornatus	Plain titmouse	1
PICIDAE	*Colaptes auratus*	Northern flicker	1,3
	Melanerpes formicivorus	Acorn woodpecker	1
	M. lewis	Lewis' woodpecker	1
	Picoides villosus	Hairy woodpecker	1,3
	P. pubescens	Downy woodpecker	1
	P. tridactylus	Northern three-toed woodpecker	3
SITTIDAE	*Sitta carolinensis*	White-breasted nuthatch	1,2,3
	S. pygmaea	Pygmy nuthatch	1,3
STURNIDAE	*Sturnus vulgaris*	Euopean starling	1
TROCHILIDAE	*Selasphorus platycercus*	Broad-tailed hummingbird	1,2,3

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
	S. rufus	Rufous hummingbird	2
TROGLODYTIDAE	*Catherkes mexicanus*	Canyon wren	1,3
	Salpinctes obsoleuts	Rock wren	1,2,3
	Thromanes bewickii	Bewick's wren	1
	Troglodytes aedon	House wren	1,3
TYRANNIDAE	*Contopus sordidulus*	Western wood-pewee	1,2,3
	Empidonax hammondii	Hammond's flycatcher	3
	E. oberholseri	Dusky flycatcher	1
	E. occidentalis	Cordilleran flycatcher	1,3
	Myiarchus cinerascens	Ash-throated flycatcher	1,2,3
	Sayornis saya	Say's Phoebe	1
	Tyrannus vociferans	Cassin's kingbird	1
TYTONIDAE	*Buto virginianus*	Great horned owl	1
	Glaucidium gnoma	Northern pygmy owl	3
VIREONIDAE	*Vireo gilvus*	Warbling vireo	1,3
	V. solitarius	Solitary vireo	1,3
1=Travis 1992; 2=Moeur and Guthrie 1981; 3=Wauer and Johnson 1981			

Mammals of TA-21 and TA-1, Los Alamos and DP Canyon			
FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
CANIDAE	*Canis latrans*	Coyote	4
	Vulpus vulpus	Red fox	4
CERVIDAE	*Cervus elaphus*	Elk	4
	Odocoileus hemionus	Mule deer	4
CRICETIDAE	*Neotoma mexicana*	Mexican woodrat	4
	Microtus pennsylvanicus	Meadow vole	2,3
	Peromyscus maniculatus	Deer mouse	1,2,3
	P. trueii	Pinon mouse	1,2,3
	Reithrodontomys megalotis	Western harvest mouse	2,3
ERETHIZONTIDAE	*Erethizon dorsatum*	Porcupine	4
FELIDAE	*Felis concolor*	Mountain lion	4
	Lynx rufus	Bobcat	4
LEPORIDAE	*Sylvilagus spp.*	Cottontail	2
MURIDAE	*Mus musculus*	House mouse	1
MUSTELIDAE	*Mustela frenata*	Long-tailed weasel	4
	Taxidae taxus	Badger	4
SCIURIDAE	*Eutamius minimus*	Least chipmunk	2,3
	E. quadrivittatus	Colorado chipmunk	1
	Sciurus aberti	Abert's squirrel	2,4
URSIDAE	*Ursus americanus*	Black bear	4

FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE
VESPERTILIONIDAE	*Antrozous pallidus*	Pallid bat	5
	Eptesicus fuscus	Big brown bat	5
	Lasionycteris noctivagans	Silver-haired bat	5
	Lasiurus cinereus	Hoary bat	5
	Myotis thysaodes	Fringed myotis	5
	Myotis volans	Long-legged myotis	5
1=Martin, Haas, and Swickard, 1971; 2=Miera, Hakonson, 1974 ;3=Felthauser, 1980 4=Observations or probable occurrence			

Potential ant species within Operable Unit 1078 and 1106 (Los Alamos and DP Canyons)

SUBFAMILY	SCIENTIFIC NAME	HABITAT TYPE	AUTHORITY
DOLICHODERINAE	*Acanthomypos interjectus*	Ponderosa	Mayr
	Brachymyrmex depilis	Ponderosa	Emery
	C. sansabeanus	Pinon-juniper and ponderosa	Buckley
	C. vicinus	Pinon-juniper and ponderosa	Mayr
	F. argentea	Disturbed	Wheeler
	F. neogagates	Pinon-juniper and disturbed	Emery
	F. pergandei	Disturbed	Emery
	F. podzolica	Pinon-juniper and disturbed	Francoeur
	F. subnuda	Ponderosa	Emery
	L. pallitarsis	Ponderosa	Provancher
	L. sitiens	Pinon-juniper and ponderosa	Wilson

Bats netted at LANL sites during 1995 and 1996. Asterisks denote species of concern.

	Species	Male	Female	Total	% Male	% Frequency
	M. californicius	4	4	8	50	2
*	*M. ciliolabrum*	22	7	29	76	7
*	*M. evotis*	15	13	28	54	7
*	*M. thysanodes*	7	5	12	58	3
*	*M. volans*	24	11	35	69	9
*	*M. yumanensis*	0	0	0	0	0
	L. cinereus	3	0	3	100	1
	L. noctivagans	182	5	187	97	48
	P. hesperus	1	0	1	100	0
	E. fuscus	22	28	50	44	13
*	*E. maculatum*	0	0	0	0	0
*	*C. townsendii*	2	0	2	100	1
	A. pallidus	36	0	36	100	9
*	*T. brasiliensis*	1	0	1	100	0
	N. macrotis	0	0	0	0	0
	TOTAL	319	73	392	81	100

APPENDIX B
PLANT SPECIES LISTS

Plant Checklist for Los Alamos Canyon, DP Canyon, and South Mesa (C=Canyon; M=Mesa Top)			
FAMILY	SCIENTIFIC NAME	CODE	COMMON NAME
ANACARDIACEAE	*Rhus radicans* (C)	RHRA	Poison Ivy
	Rhus trilobata (C, M)	RHTR	Skunk Bush
ASCLEPIADACEAE	*Asclepias tuberosa* (C)	ASTU	Butterflyweed
	Asclepias subverticillata (M)	ASSU	Poison Milkweed
BERBERIDACEAE	*Berberis fendleri* (C)	BEFE	Fendler Barberry
BETULACEAE	*Alnus tenuifolia* (C)	ALTE	Thin Leaf Alder
BORAGINACEAE	*Cryptantha jamesii* (C)	CRJA	James Hiddenflower
	Lappula spp. (C)	LAPX	Stickseed
	Lithospermum spp.(C)	LITX	Puccoon
CACTACEAE	*Opuntia imbricata* (C)	OPIM	Walkingstick Cholla
	Opuntia spp.(C)	OPUX	Prickly Pear Cactus
CAMPANULACEAE	*Campanula rotundifolia* (C)	CARO	Hare Bell
CAPPARIDACEAE	*Cleome serrulata* (C)	CLSE	Rocky Mountain Beeweed
CHENOPODIACEAE	*Atriplex canescens* (M)	ATCA	Four-Wing Saltbush
	Kochia scoparia (M)	KOSC	Summer Cypress
	Salsola kali (M)	SAKA	Russian Thistle
COMPOSITAE	*Achillea lanulosa* (C)	ACLA	Yarrow
	Antennaria parvifolia (C)	ANPA	Pussytoes
	Artemisia carruthii (C, M)	ARCA	Wormwood
	Artemisia dracunculus (C, M)	ARDR	False Tarragon
	Artemisia frigida (C)	ARFR	Estafiata
	Artemisia ludoviciana (C)	ARLU	Wormwood
	Bahia dissecta (C, M)	BADI	Wild Chrysanthemum
	Brickella spp. (C)	BRIX	Bricklebush
	Chrysopsis foliosa (C, M)	CHFO	Golden Aster
	Chrysothamnus nauseosus (C, M)	CHNA	Chamisa, Rabbitbrush
	Cirsium spp. (M)	CIRX	Thistle
	Conyza canadensis (C, M)	COCA	Horseweed
	Cosmos parviflorus (C)	COPA	Cosmos
	Erigeron divergens (C, M)	ERDI	Fleabane Daisy
	Erigeron flagellaris (C)	ERFL	Spreading Fleabane
	Grindelia aphanactis (M)	GRAP	Gumweed
	Gutierrezia sarothrae (C, M)	GUSA	Snakeweed
	Gaillarida pulchella (M)	GAPU	Firewheel
	Helianthus annus (M)	HEAN	Annual Sunflower
	Helianthus petiolaris (C)	HEPE	Sunflower
	Hymenoxys richardsonii (C)	HYRI	Bitterweed
	Lactuca spp.(C)	LACX	Prickly Lettuce
	Rudbeckia lacinata (C)	RULA	Cutleaf Coneflower
	Senecio fendleri (C)	SEFE	Fendler's Senecio
	Senecio spp.(C)	SENX	Groundsel
	Solidago spp. (C)	SENX	Goldenrod
	Taroxacum officinale (C)	TAOF	Dandelion
	Thelesperma megapotimicum (C)	THME	Indian Tea, Cota
	Thelesperma trifidum (C, M)	THTR	Greenthread

FAMILY	SCIENTIFIC NAME	CODE	COMMON NAME
	Townsendia incana (C)	TOIN	Townsend's Aster
	Tragopogon dubius (C, M)	TRDU	Salisfy, Goatsbeard
	Verbesina enceliodes (C, M)	VEEN	Crownbeard
CRUCIFERAE	*Capsella bursa-pastoris* (C, M)	CABU	Shepherd's Purse
	Dithyrea wislizenii (M)	DIWI	Spectacle Pod
	Erysium capitatum (C)	ERCA	Western Wallflower
	Thelypodium wrightii (C)	THWR	Thelypody
CUPRESSACEAE	*Juniperus monosperma* (C, M)	JUMO	One-Seeded Juniper
	Juniperus scopulorum (C, M)	JUSC	Rocky Mountain Juniper
CYPERACEAE	*Carex* spp. (C, M)	CARX	Sedge
ELAEAGNACEAE	*Elaeagnus angustifolia* (C, M)	ELAN	Russian Olive
EQUISETACEAE	*Equisetum* spp. (C)	EQUX	Horsetail
ERICACEAE	*Plerospora andromedea* (C)	PLAN	Pinedrops
EUPHORBIACEAE	*Croton texesis* (C)	CRTE	Doveweed
	Euphorbia dentata (C, M)	EUDE	Wild Poinsetta
FAGACEAE	*Quercus gambelii* (C, M)	QUGA	Gambel Oak
	Quercus undulata (C)	QUUN	Wavyleaf
GERANIACEAE	*Gereanium caespitosum* (C, M)	GECA	James Geranium
	Erodium cicutarium (M)	ERCI	Cranesbill
GRAMINEAE	*Agropyron desertorum* (M)	AGDE	Crested Wheatgrass
	Agropyron smithii (C, M)	AGSM	Western Wheatgrass
	Agropyron spp. (C, M)	AGRX	Wheatgrass
	Agropyron trachycaulum (C)	AGTR	Slender Wheatgrass
	Agrostis alba (C)	AGAL	Red Top
	Andropogon scoparius (C)	ANSC	Little Bluestem
	Aristida longiseta (C)	ARLO	Red Three-Awn Grass
	Blepharoneuron tricholepsis (C)	BLTR	Pine Dropseed
	Bouteloua gracilis (C, M)	BOGR	Blue grama
	Bromus inermis (C)	BRIN	Smooth Brome
	Bromus marginatus (C)	BRMA	Mountain Bromegrass
	Bromus spp. (C, M)	BROX	Bromegrass
	Bromus tectorum (C, M)	BRTE	Downy Chess
	Buchloe dactyloides (M)	BUDA	Buffalo Grass
	Dactylis glomerata (M)	DAGL	Orchard Grass
	Elymus canadensis (C)	ELCA	Canadian Wildrye
	Festuca octiflora (C)	FEOC	Six-Weeks Fescue
	Festuca spp. (M)	FECX	Fescue
	Hilaria jamesiim (M)	HIJA	Galleta
	Hordeum spp. (M)	HORX	Barley Grass
	Koeleria cristata (C)	KOCR	Junegrass
	Muhlenbergia montana (C)	MUMO	Mountain Muhly
	Muhlenbergia wrightii (C)	MUWR	Spike Muhly
	Oryzopis hymenoides (C)	ORHY	Indian Rice Grass
	Panicum capillare (M)	PACA	Witchgrass
	Phleum pratense (C)	PHPR	Common Timothy
	Poa fendleriana (C, M)	POFE	Bluegrass
	Poa spp. (C, M)	POAX	Bluegrass

FAMILY	SCIENTIFIC NAME	CODE	COMMON NAME
	Sitanion hystrix (C, M)	SIHY	Bottlebrush Squirreltail
	Sporobolus cryptandrus (C, M)	SPCR	Sand Dropseed
	Stipa comata (C, M)	STCO	Needle-Grass
JUNCAEAE	*Juncus* spp. (C)	JUNX	Rush
LABIATAE	*Monarda menthaefolia* (C)	MOME	Horesmint
	Monarda pectinata (C)	MOPE	Ponymint
	Salvia retroflexa (C)	SARE	Rocky Mountain Sage
LEGUMINOSAE	*Astragalus spp* .(C)	ASTX	Milkvetch
	Lotus wrightii (C)	LOWR	Deer Vetch
	Lupinus caudatus (C)	LUCA	Lupine
	Medicago lupulina (C)	MELU	Black Medic
	Medicago sativa (M)	MESA	Alfalfa
	Melilotus albus (M)	MEAL	White Sweet Clover
	Melilotus officinalis (C)	MEOF	Yellow Wild Clover
	Petalostemum candidum (C)	PECA	White Prairie Clover
	Petalostemum spp. (M)	PETX	Prairie Clover
	Robinia neomexicana (C)	RONE	New Mexico Locust
	Thermopsis divosicarpa (C)	THDI	Golden Banner
	Thermopsis pinetorum (C)	THPI	Big Golden-Pea
	Vicia americana (C, M)	VIAM	American Vetch
LILIACEAE	*Yucca baccata* (C)	YUBA	Banana Yucca
MALVACEAE	*Malva neglecta* (M)	MANE	Cheese Mallow
	Spheralceae coccinea (M)	SPCO	Globe Mallow
NYCTAGINACEAE	*Oxybaphus linearis* (C)	OXLI	Desert Four O'Clock
OLEACEAE	*Forestiera neomexicana* (C)	FONE	New Mexico Olive
ONAGRACEAE	*Oenothera coronopifolia* (C)	OECO	Cutleaf Evening Primrose
	Oenothera hookeri (C)	OEHO	Hooker's Evening-Primrose
OXALIDACEAE	*Oxalis metcalfei* (C)	OXME	Woodsorrel
PINACEAE	*Abies concolor* (C)	ABCO	White Fir
	Pinus edulis (C, M)	PIED	Piñon Pine
	Pinus ponderosa (C, M)	PIPO	Ponderosa Pine
	Pseudotsuga menziesii (C)	PSME	Douglas Fir
PLANTAGINACEAE	*Plantago purshii* (C)	PLPU	Wooly Indian Wheat
POLEMONIACEAE	*Ipomopsis aggregata* (C)	IPAG	Scarlet Trumpet
POLYGONACEAE	*Eriogonum jamesii* (C)	ERJA	Antelope Sage
	Polygonum convolvulus (C)	POCO	Black Binweed, Cornbind
	Polygonum spp. (M)	POLX	
	Rumex mexicanus (C)	RUME	Dock
RANUNCULACEAE	*Clematis pseudoalpina* (C)	CLPS	Rocky Mountain Clematis
	Thalictrum fendleri (C)	THFE	Fendler Meadowrue
ROSACEAE	*Cercocarpus montanus* (C, M)	CEMO	Mountain Mahogany
	Fallugia paradoxa (C)	FAPA	Apache plume
	Fragaria bracteata (C)	FRBR	Wild Strawberry
	Potentilla spp. (C)	PONX	Cinquefoil
	Prunus virginiana var.		
	melanocarpa (C)	PRVI	Western Black Chokecherry
	Rosa arizonica (C)	ROAR	Arizonia Rose

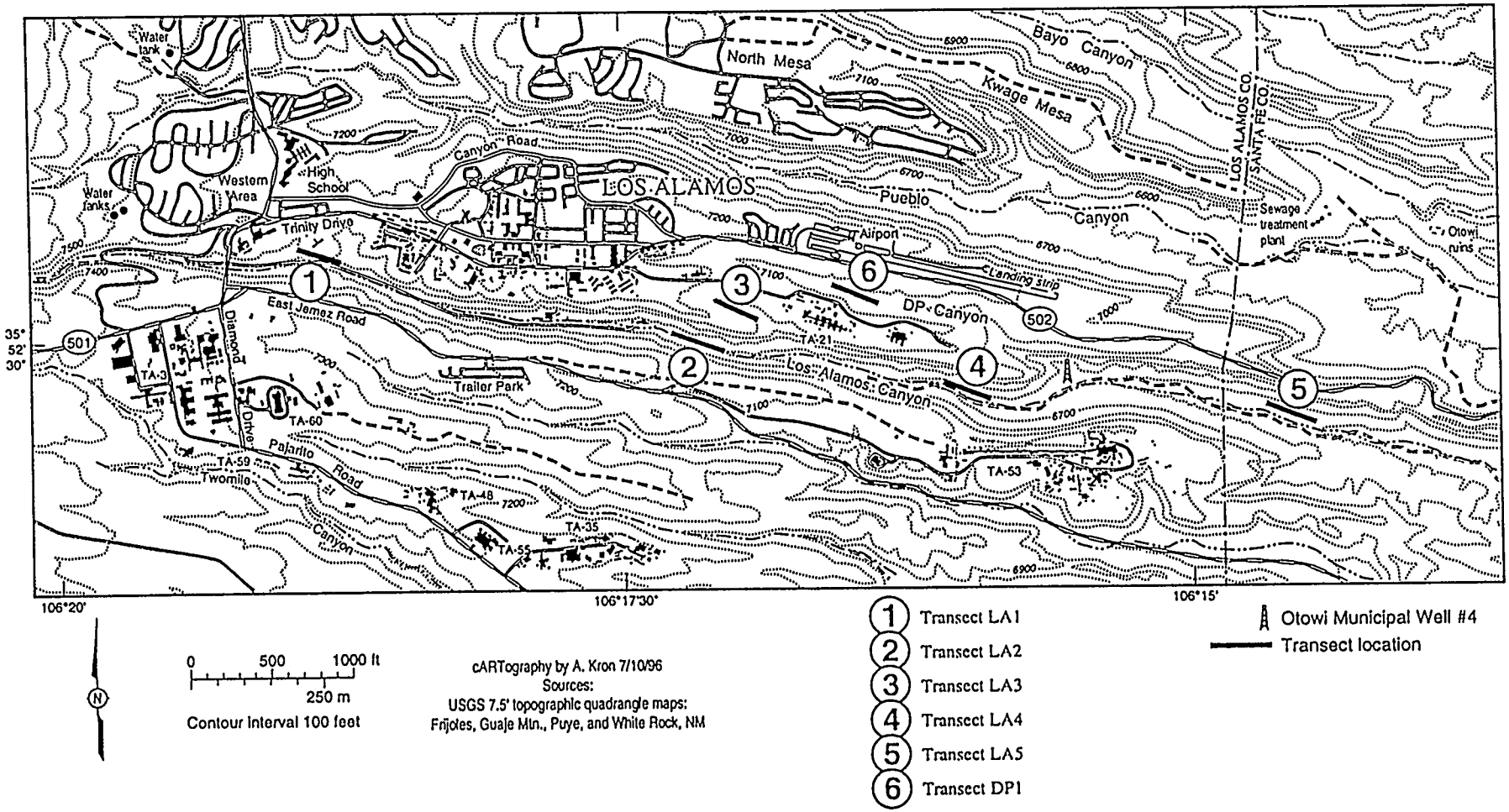
SUBFAMILY	SCIENTIFIC NAME	HABITAT TYPE	AUTHORITY
	Polyergus breviceps	Ponderosa	Emery
MYRMICINAE	*Crematogaster cerasi*	Ponderosa	Fitch
	C. colei	Disturbed	Buren
	Leptothorax muscorum	Ponderosa	Nylander
	L. nitens	Disturbed	Emery
	L. obliquicanthus	Disturbed	Cole
	Monomorium cyaneum	Disturbed	Wheeler
	Pheidole ceres	Ponderosa,	Wheeler
		disturbed, and burned ponderosa	
	P. wheelerorum	Pinon-juniper and disturbed	MacKay
	Pogonomyrme x occidentalis	Pinon-juniper and ponderosa	Cresson
	Solenopsis molesta	Pinon-juniper and Disturbed	Say
Ponderosa areas are within Los Alamos Canyon and DP Canyon. Disturbed areas are found on the Mesa top.			
Ant species found in Riparian (R) and Ponderosa-riparian (P-R) habitats similar to those found in Los Alamos and DP Canyons			
SUBFAMILY NAME	SCIENTIFIC NAME	HABITAT	AUTHORITY
MYRMICINAE	*Leptothorax crassipilis*	R	Wheeler
	L. muscorum	P-R	Nylander
	L. nitens	P-R	Emery
	L. texanus texanus	P-R	Wheeler
	L. tricarinatus	P-R	Emery
	Monomorium cyaneum	P-R	Buckley
	Myrmecina americana	P-R	Emery
	Myrmica emeryana	P-R	Forel
	Myrmica hamulata	P-R	Weber
	Pheidole ceres	P-R	Wheeler
	P. wheelerorum	P-R	MacKay

SUBFAMILY NAME	SCIENTIFIC NAME	HABITAT	AUTHORITY
	Pogonomyrme x occidentalis	P-R	Cresson
	Solenopsis molesta	P-R and R	Say
	Stenamma occidentale	P-R	M R Smith
DOLICHODERI NAE	*Tapinoma sessile*	P-R	Say
	Acanthomyops latipes	P-R	Walsh
	Camponotus laevigatus	P-R	F Smith
	C. vicinus	P-R	Mayr
	Formica argentea	P-R	Wheeler
	F. densiventris	P-R	Viereck
	F. fusca	P-R	Linnaeus
	F. hewitti	P-R	Wheeler
	F. lasioides	P-R	Emery
	F. limata	P-R	Wheeler
	F. neorufibarbis	R	Emery
	F. obscuripes obscuripes	P-R	Forel
	F. obscurivrntris clivia	P-R	Creighton
	F. occulta	P-R	Francoeur
	F. planipilis	P-R	Creighton
	F. podzolica	P-R	Francoeur
	Lasius alienus	P-R	Foerster
	L. crypticus	P-R	Wilson
	L. flavus	P-R	Fabricius
	L. neoniger	P-R	Emery
	L. niger	P-R	Linnaeus
	L. pallitarsis	P-R	Provancher
	L. subumbratus	P-R	Viereck
	Liometopum apiculatum	P-R	Mayr
	L. luctuosom	P-R	Wheeler

FAMILY	SCIENTIFIC NAME	CODE	COMMON NAME
	Rosa spp. (C)	ROSX	Wild Rose
	Rosa woodsii var. *fendleri* (C)	ROWO	Fendler's Rose
	Rubus strigosus var.	RUST	Red Raspberry
	arizonicus (C)		
RUBIACEAE	*Galium* spp. (C)	GALX	Bedstraw
RUTACEAE	*Ptelea trifoliata* (C)	PTTR	Narrowleaf Hoptree
SALICACEAE	*Populus angustifolia* (C, M)	POAN	Narrowleaf Cottonwood
	Populus tremuloides (C)	POTR	Aspen
	Salix spp. (C, M)	SALX	Willow
SAXIFRAGACEAE	*Jamesia americana* (C)	JAAM	Cliffbush
	Philadelphus microphyllus (C)	PHMI	Mockorange
	Ribes cerceum (C)	RICE	Wax Current
SCROPHULARIACEAE	*Castilleja integra* (C)	CAIN	Indian Paintbrush
	Penstemon barbatus (C)	PEBA	Penstemon, Beardtongue
	Penstemon spp. (C)	PENX	Penstemon, Beardtongue
	Verbascum thapsus (C, M)	VETH	Mullein
SOLANACEAE	*Physalis* foetens (C)	PHFO	Groundcherry
	Solanum spp. (M)	SOLX	Black Nightshade
TYPHACEAE	*Tylpha latifolia* (C)	TYLA	Cattails
VALERIANACEAE	*Valeriana* spp.(C)	VALX	Valerian, Tobacco Root
VERBENACEAE	*Verbena bracteata* (M)	VEBR	Prostrate Verbenea
VITACEAE	*Parthenocissus inserta* (C)	PAIN	Virginia Creeper

* Plant list was complied from the present data and previous surveys listed below.
Bennett and Edeskuty, 1991; Olinger, 1985; Foxx and Tierney, 1985a; Foxx and Tierney, 1985b; Foxx, 1987a; Foxx, 1987b; Foxx, and Mclin, 1988; and Martin, Haas, and Swickard, 1971.

APPENDIX C
PLANT DATA (RAW AND SUMMARIZED)



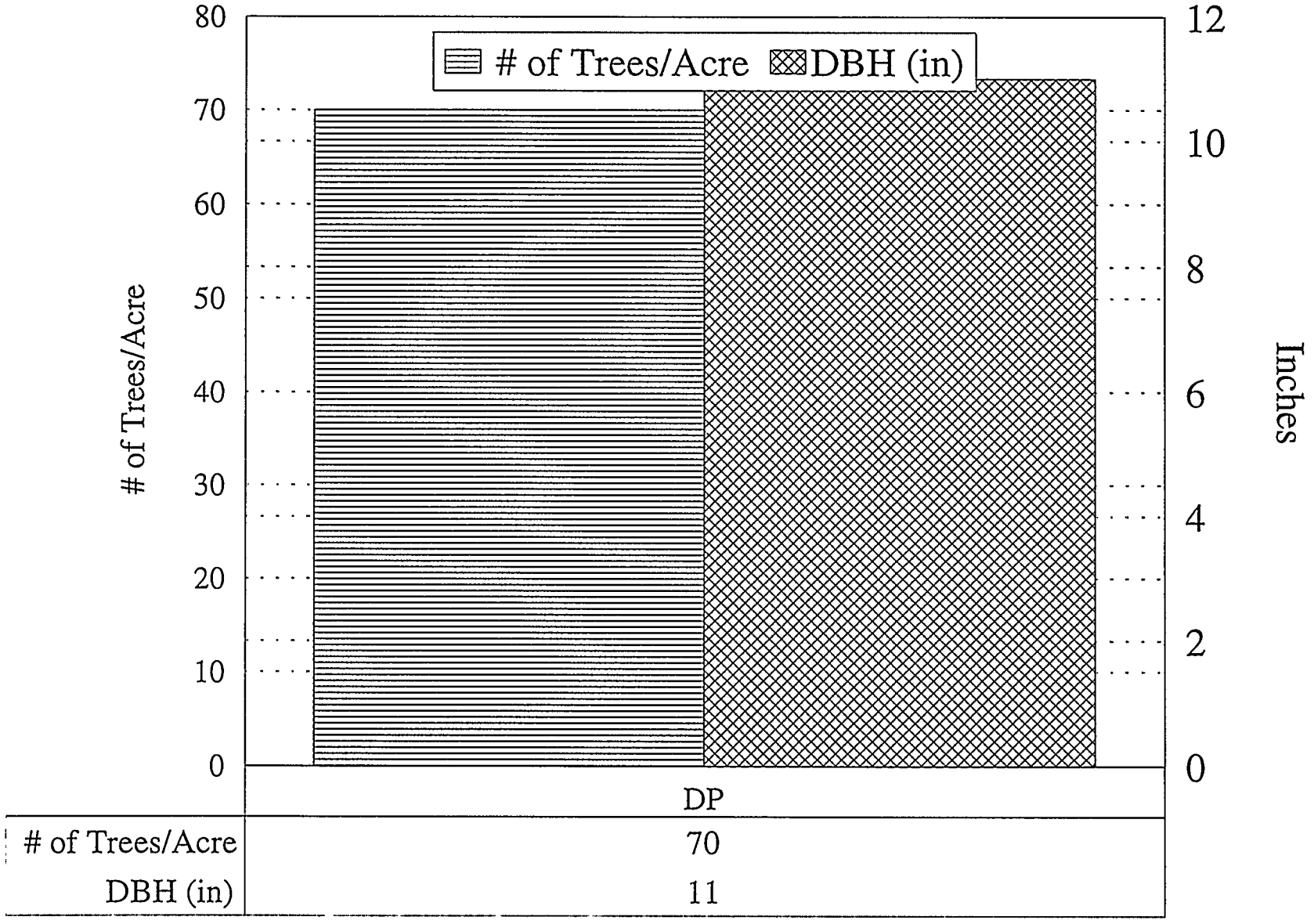
The transect locations within Los Alamos and DP Canyons

Listing of Dominant and Codominant Shrub Species Found

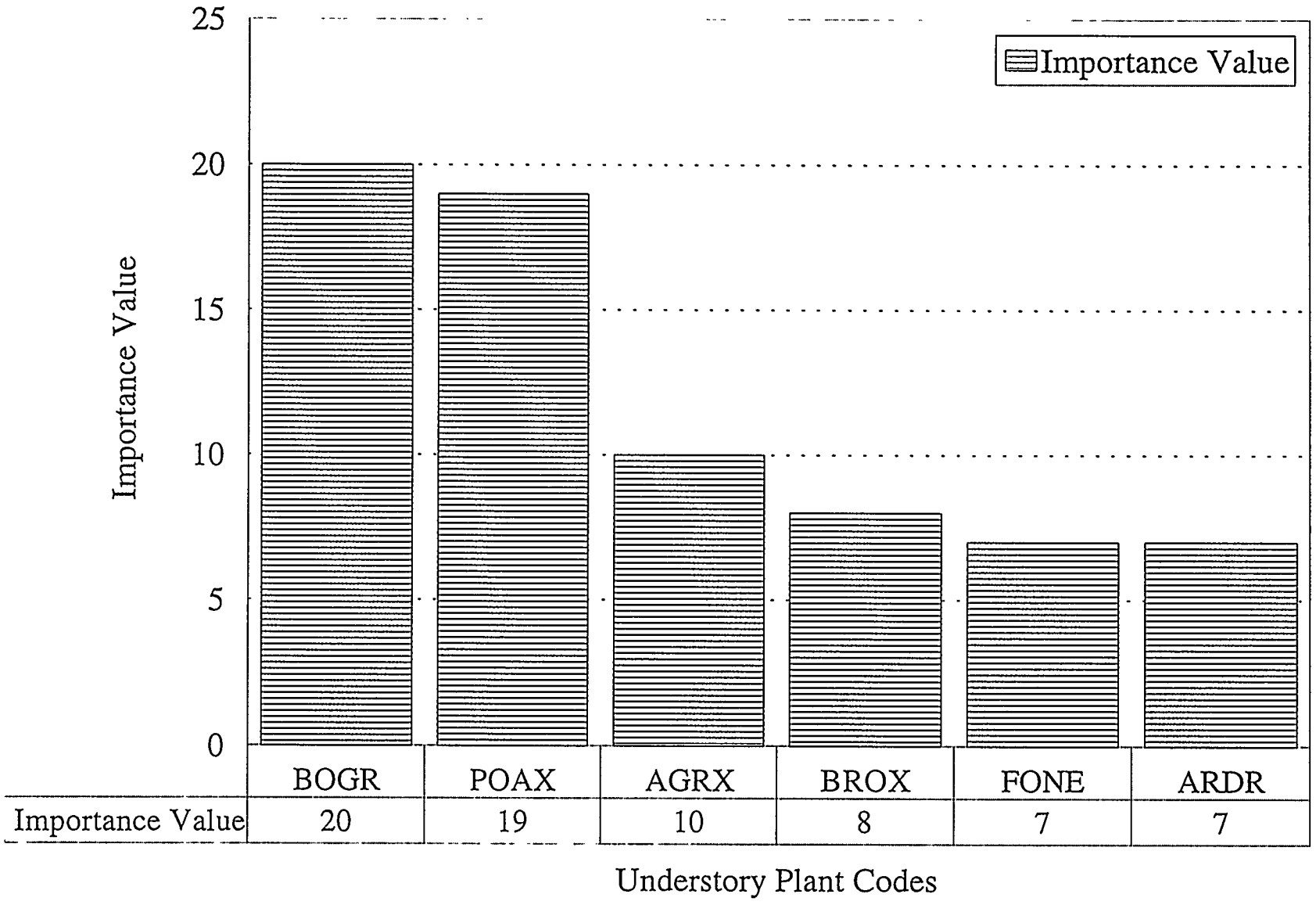
within Los Alamos and DP Canyon

Species	Dominant Species	Codominant Species
LA1		
QUUN	X	
CEMO		X
RHTR		X
LA2		
SALX	X	
RHTR		X
QUGA		X
LA3		
QUGA	X	
CEMO		X
PHMI		X
LA4		
QUGA	X	
FONE		X
RHTR		X
LA5		
FONE	X	
RHTR		X
DP1		
QUGA	X	
CEMO		X

Average DBH (Diameter Breast High) and Number of Dominant Trees per Acre in DP Canyon

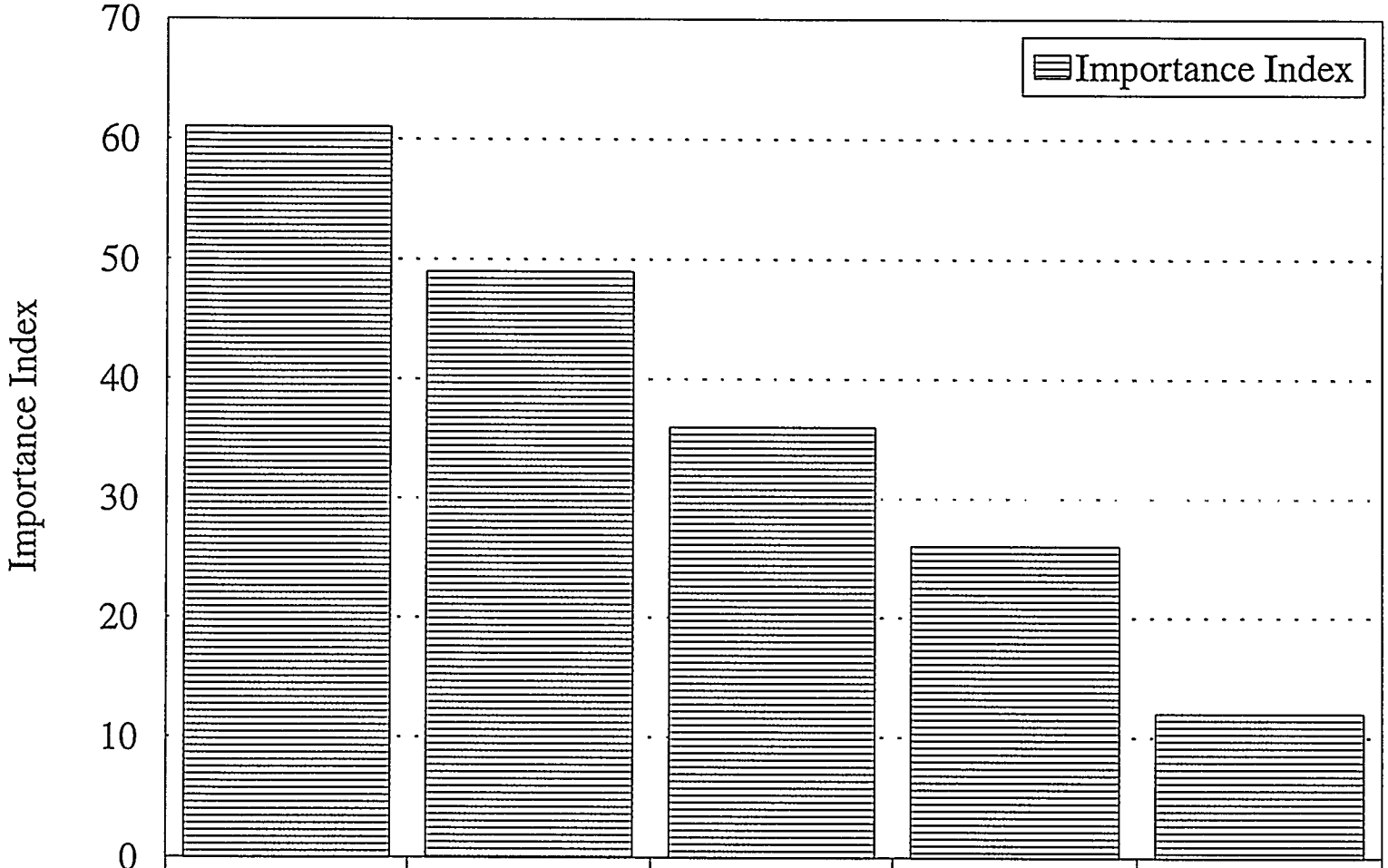


Importance Values of Understory Species Within Transect LA5
Located in Los Alamos Canyon



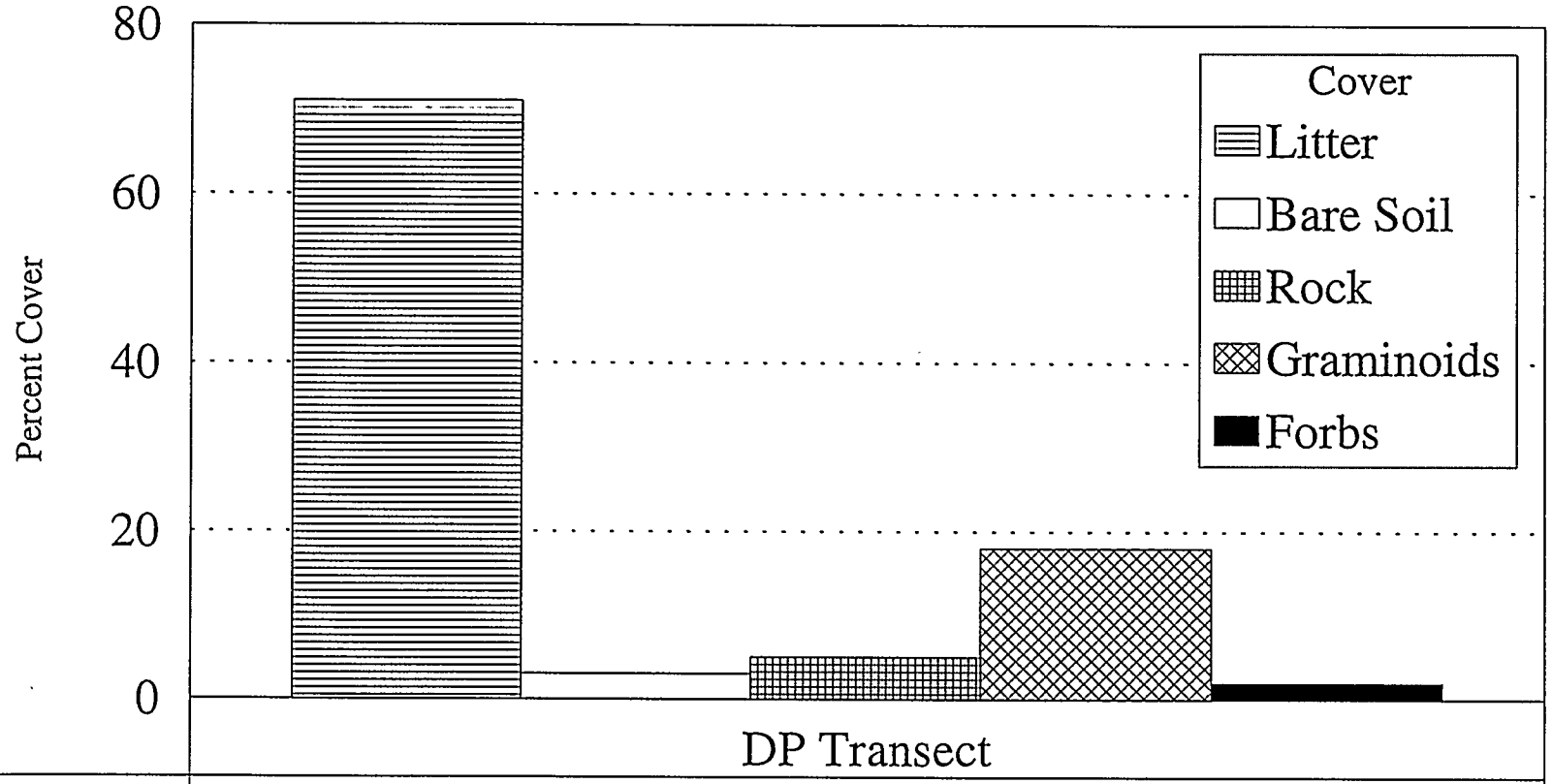
	BOGR	POAX	AGRX	BROX	FONE	ARDR
Importance Value	20	19	10	8	7	7

Importance Values of Overstory Species within
Transect Located in DP Canyon



	PIPO	QUGA	CEMO	JUMO	PSME
Importance Index	61	49	36	26	12

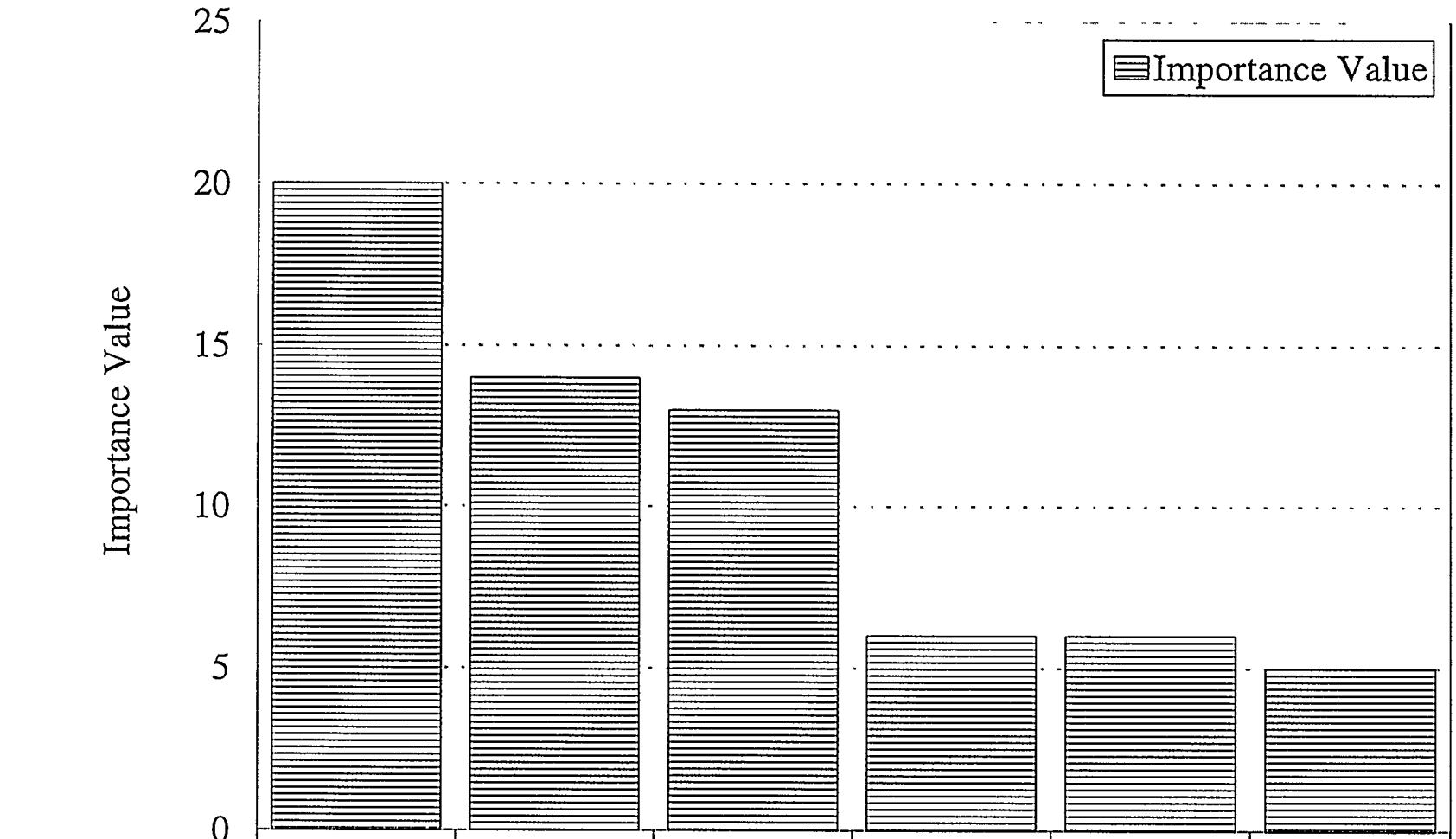
Understory Cover of DP Canyon



	DP Transect
Litter	71
Bare Soil	3
Rock	5
Graminoids	18
Forbs	2

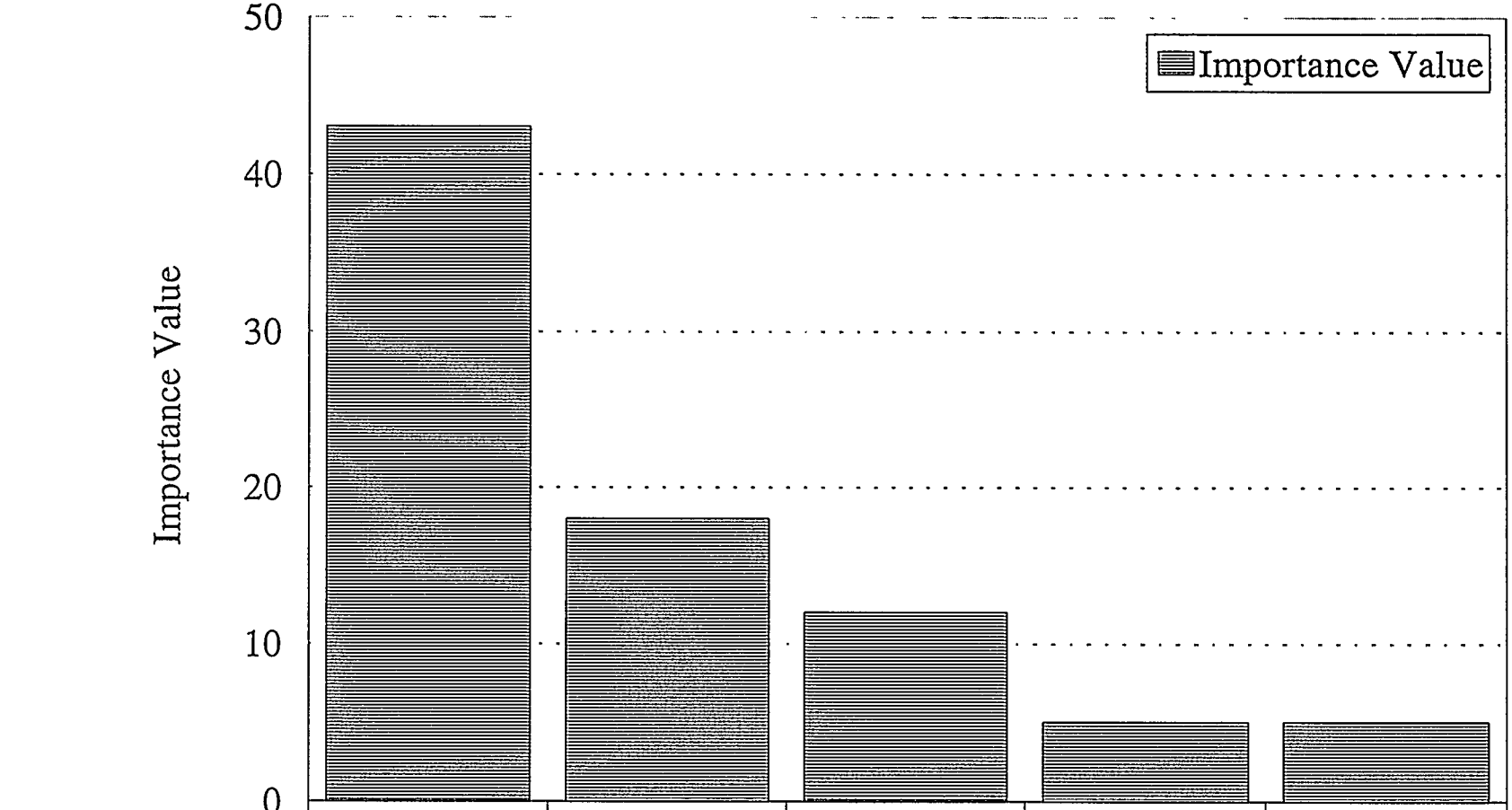
Transect

Importance Values of Understory Species Within Transect LA4
Located in Los Alamos Canyon



	POAX	CARX	BOGR	BROX	MUMO	GECA
Importance Value	20	14	13	6	6	5

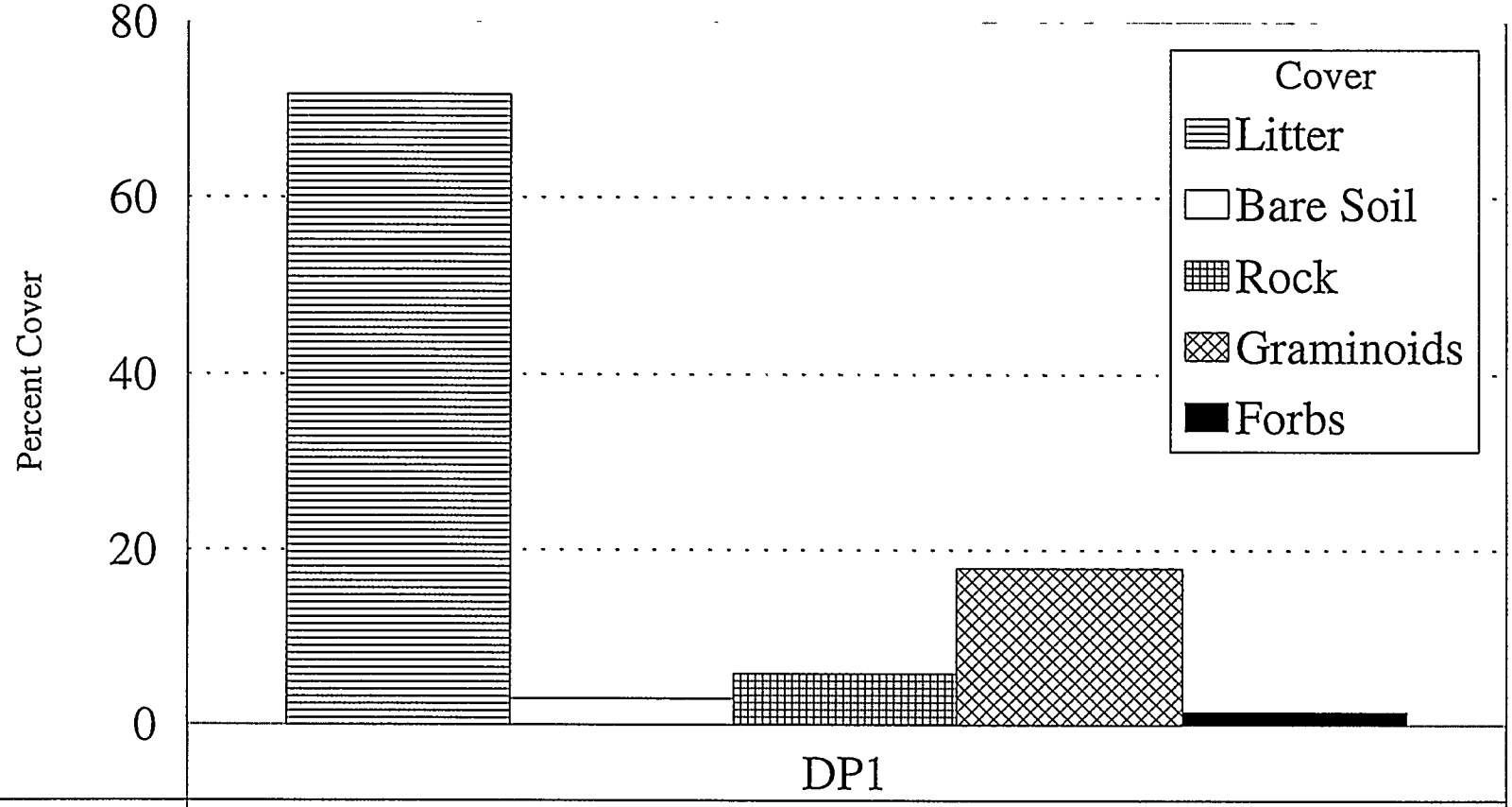
Importance Values of Understory Species Within Transect
Located in DP Canyon



	CARX	BROX	MUMO	ARLU	POAX
Importance Value	43	18	12	5	5

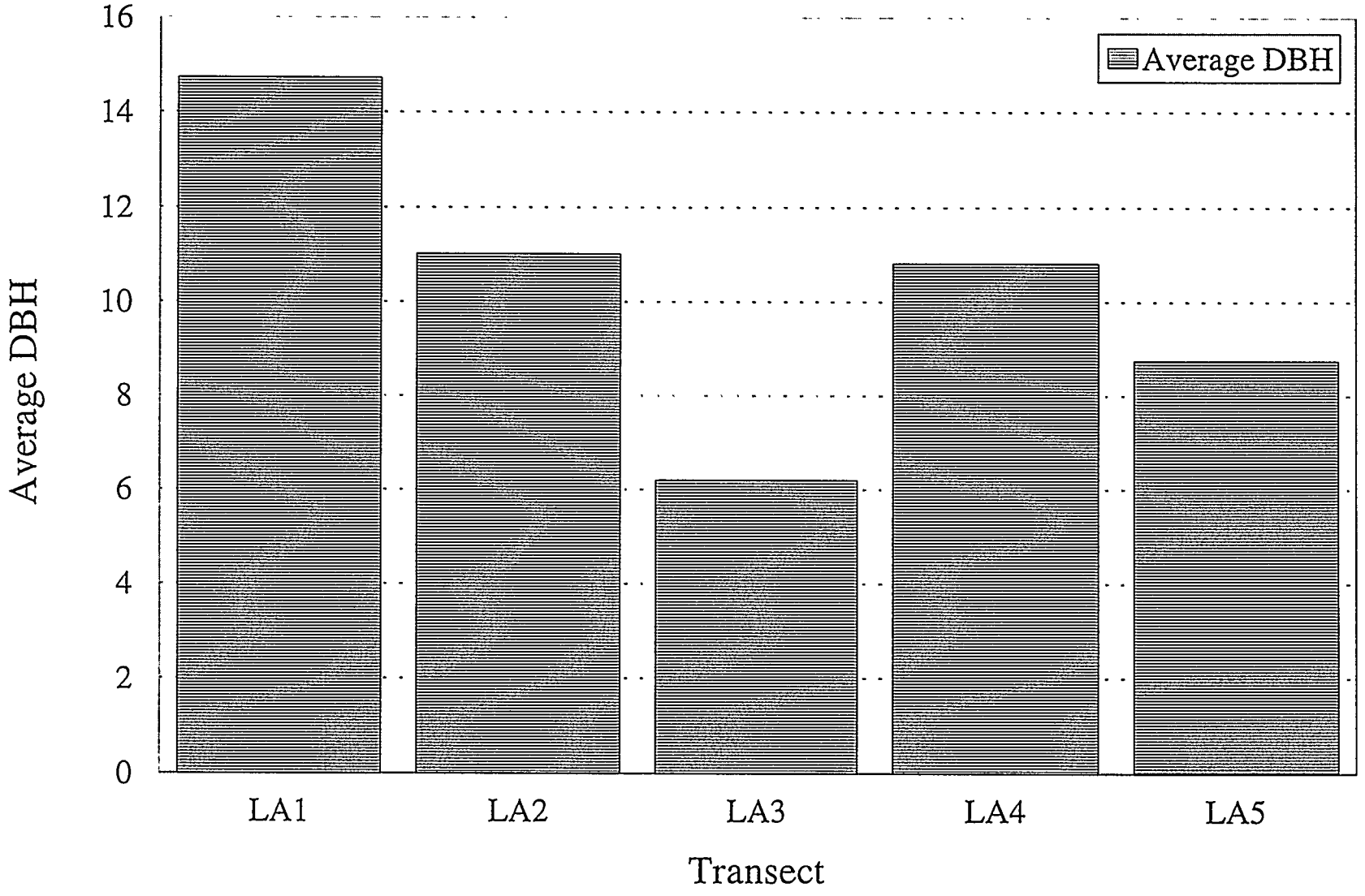
Understory Plant Codes

Understory Cover of DP Canyon

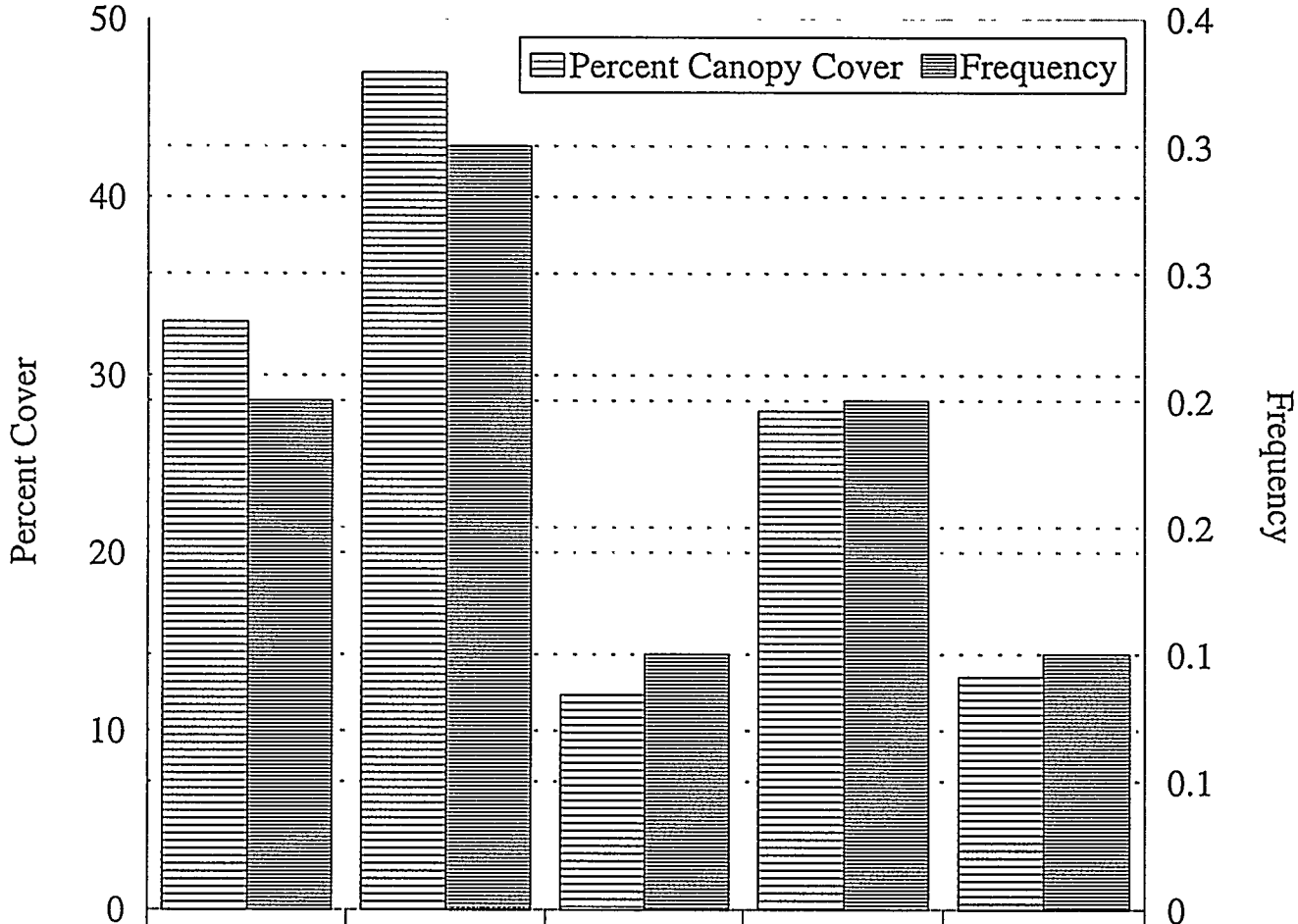


	DP1
Litter	71.7
Bare Soil	3
Rock	5.8
Graminoids	17.9
Forbs	1.5

Average DBH (Diameter Breast High) of Dominant Tree Species within Los Alamos Canyon by Transect

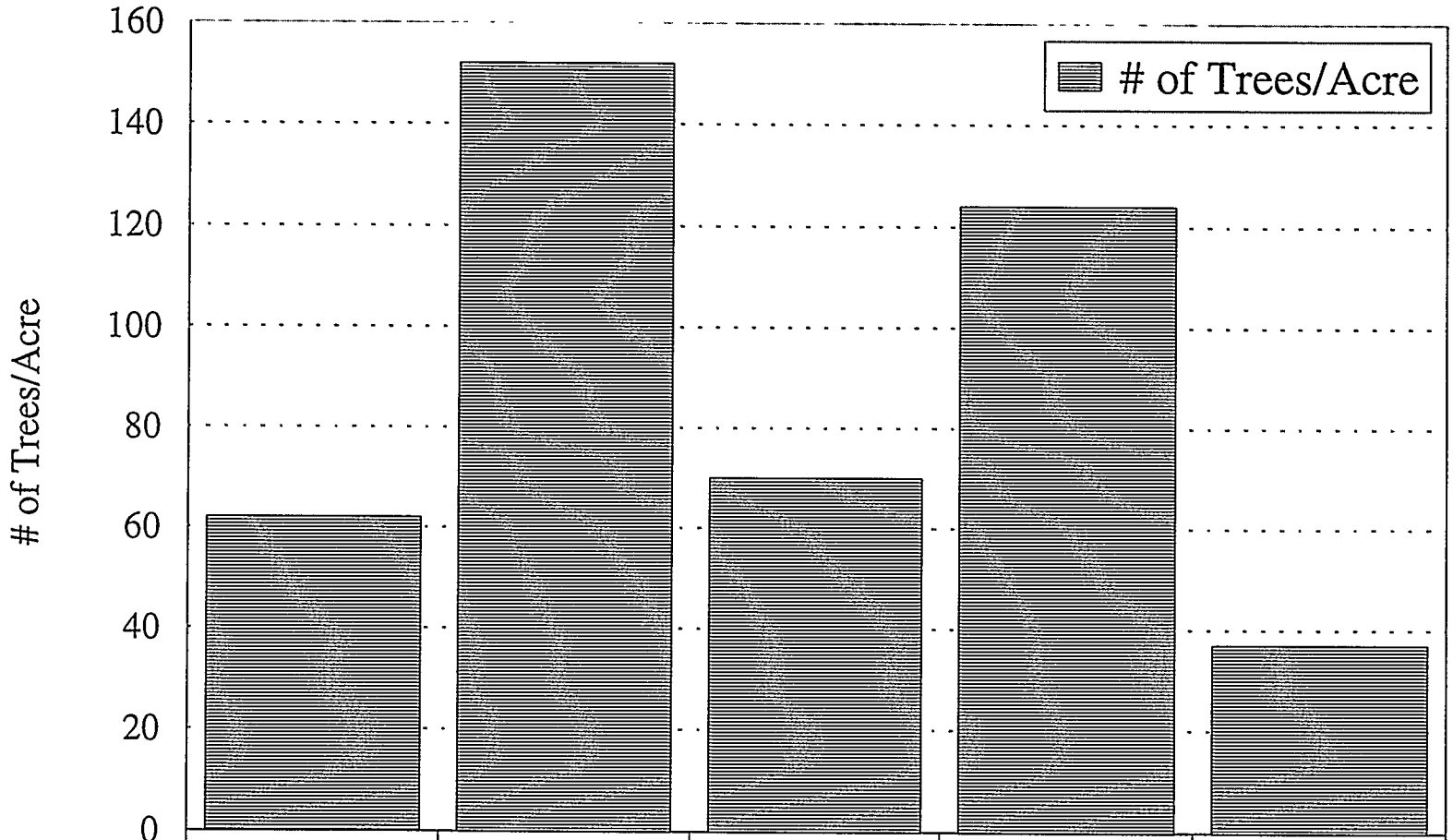


Percent Canopy Cover and Frequency of
Dominant Tree Species within Los Alamos Canyon by Transect



	LA1	LA2	LA3	LA4	LA5
Percent Canopy Cover	33	47	12	28	13
Frequency	0.2	0.3	0.1	0.2	0.1

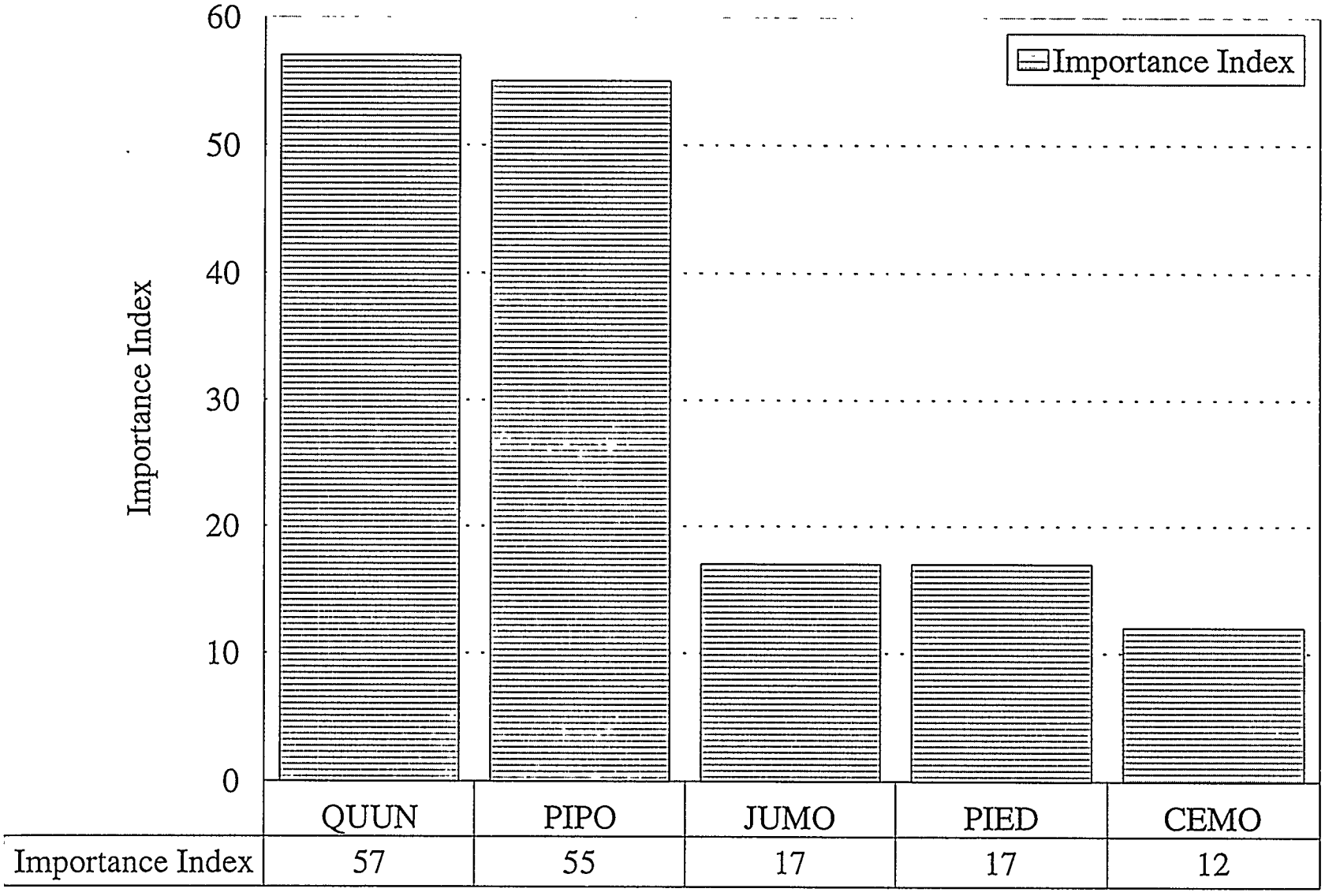
Number of Dominant Trees per Acre
in Los Alamos Canyon by Transect



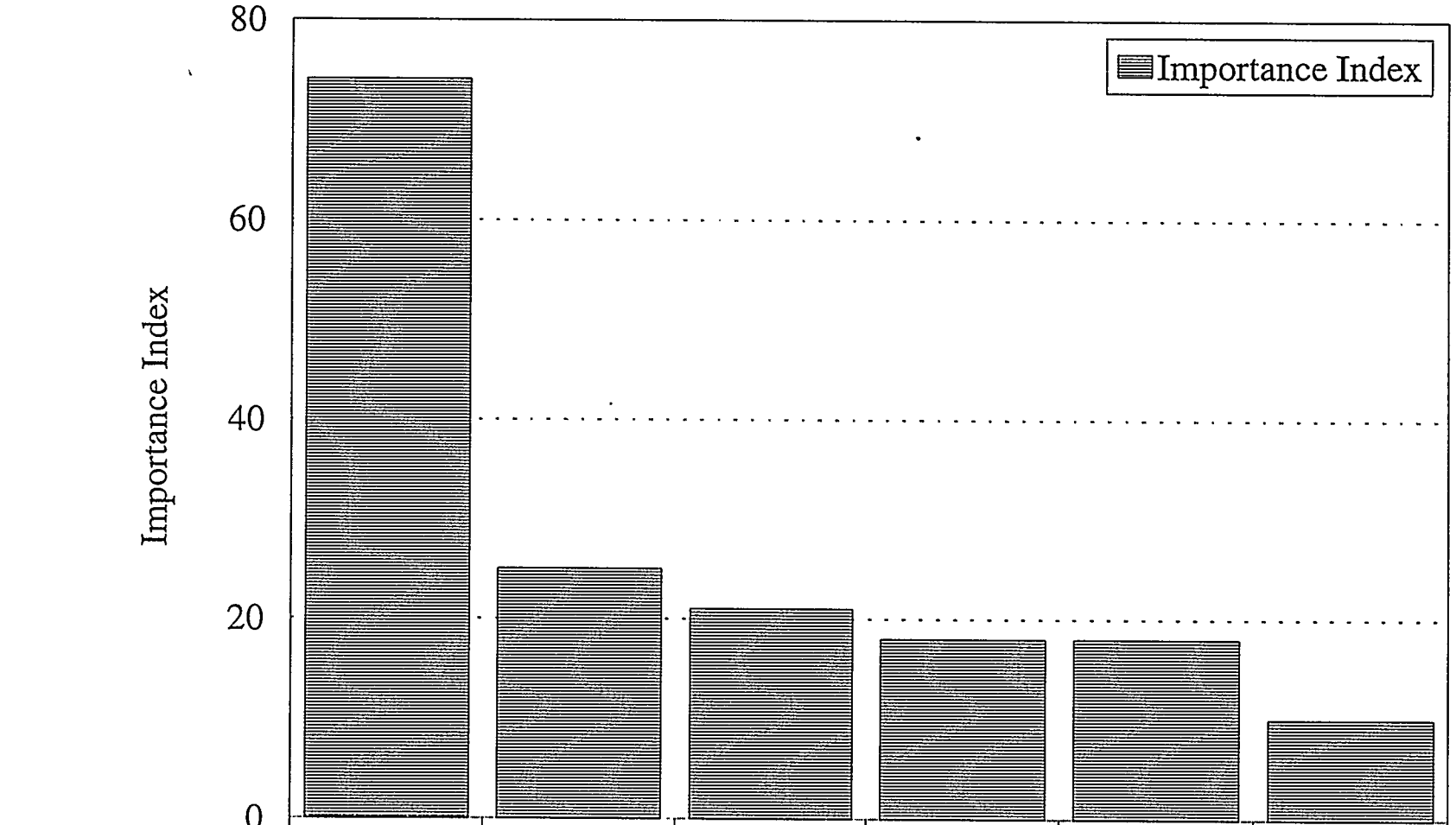
	LA1	LA2	LA3	LA4	LA5
# of Trees/Acre	62	152	70	124	37

Transect

Importance Values of Overstory Species within
Transect LA1 located in Los Alamos Canyon



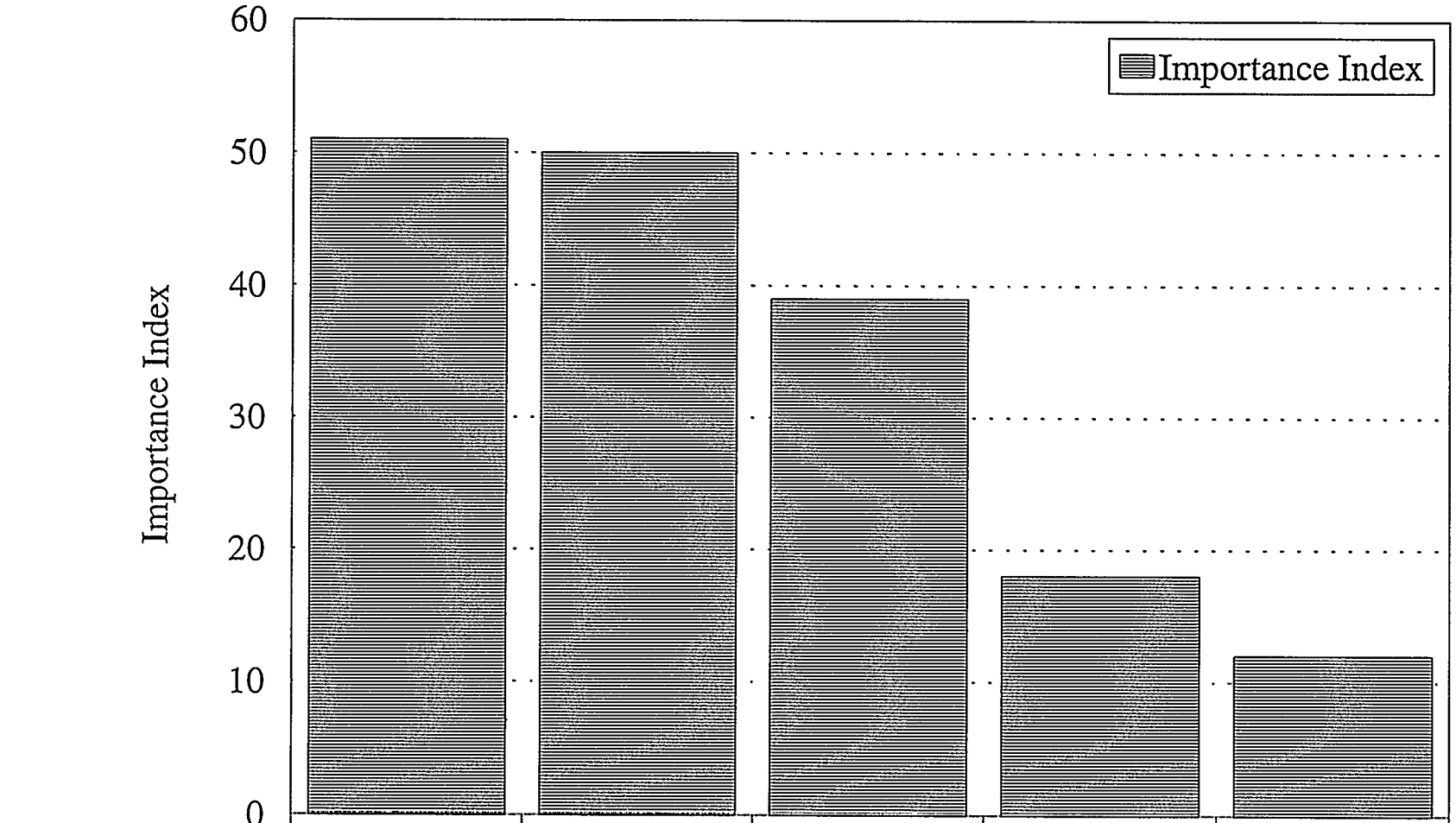
Importance Values of Overstory Species within
Transect LA2 located in Los Alamos Canyon



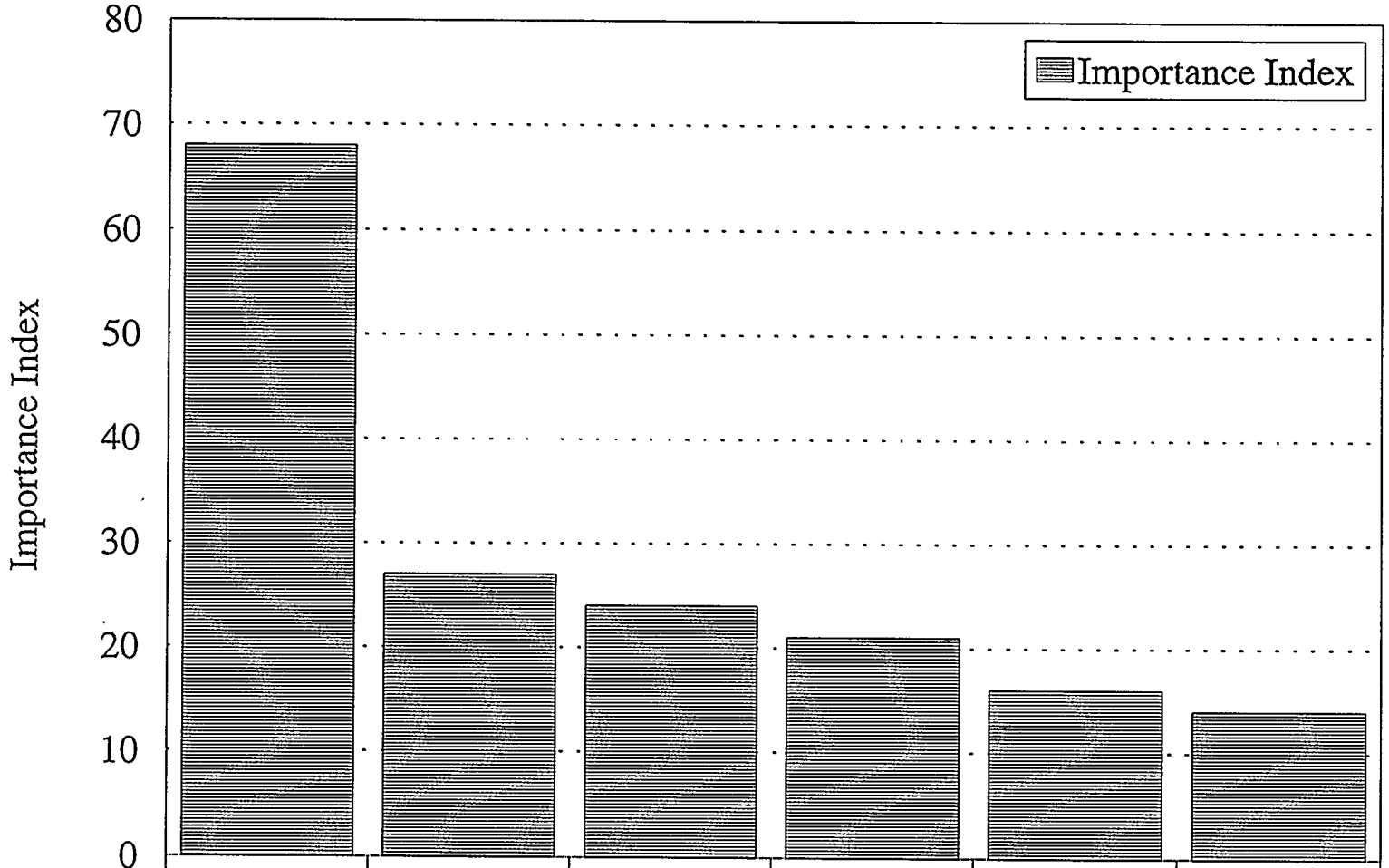
	PIPO	SALX	RHTR	JUMO	QUGA	BEFE
Importance Index	74	25	21	18	18	10

Plant Codes for Overstory Species

Importance Values of Overstory Species within
Transect LA3 located in Los Alamos Canyon



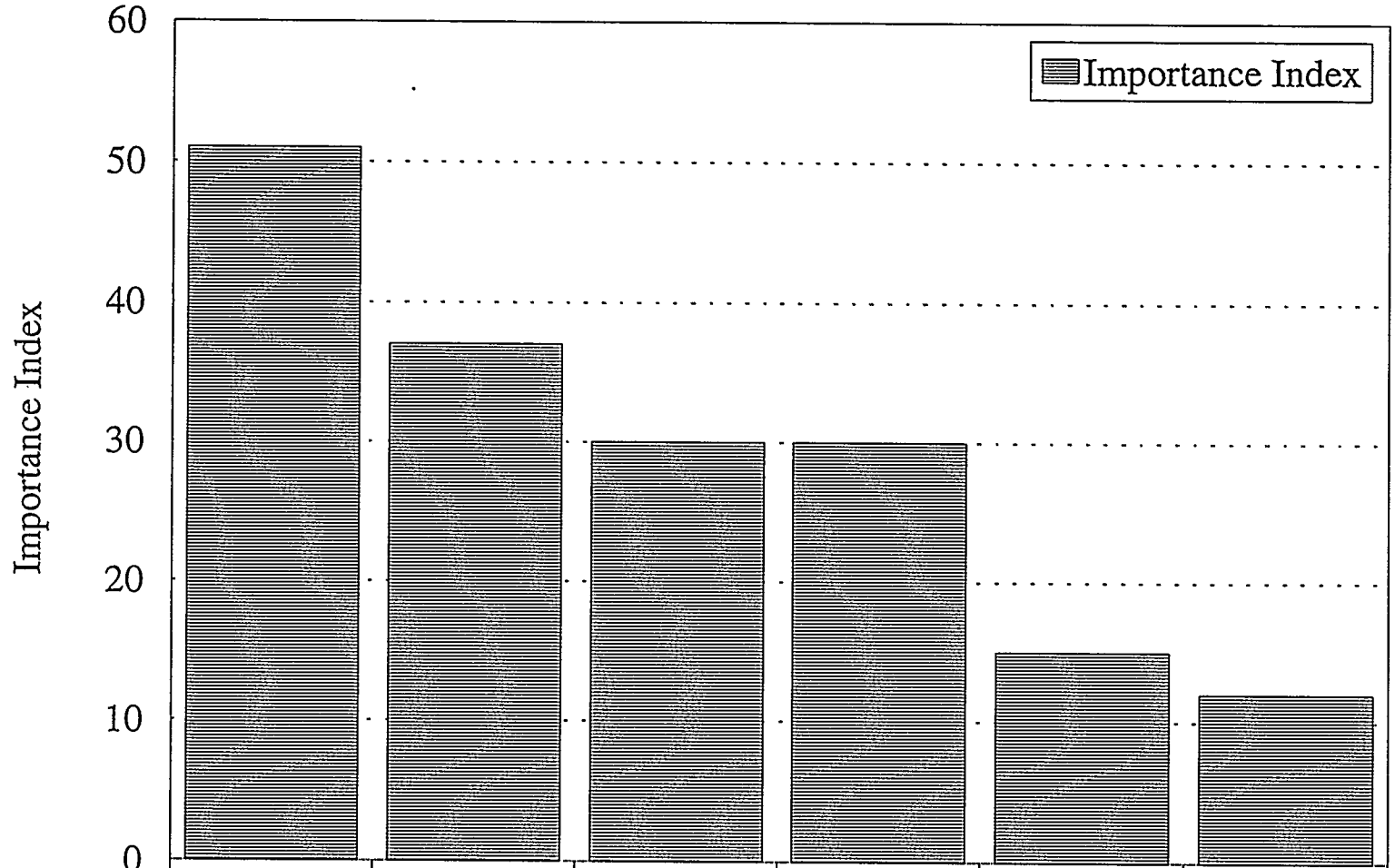
Importance Values of Overstory Species within
Transect LA4 located in Los Alamos Canyon



	PIPO	QUGA	FONE	JUMO	RHTR	FAPA
Importance Index	68	27	24	21	16	14

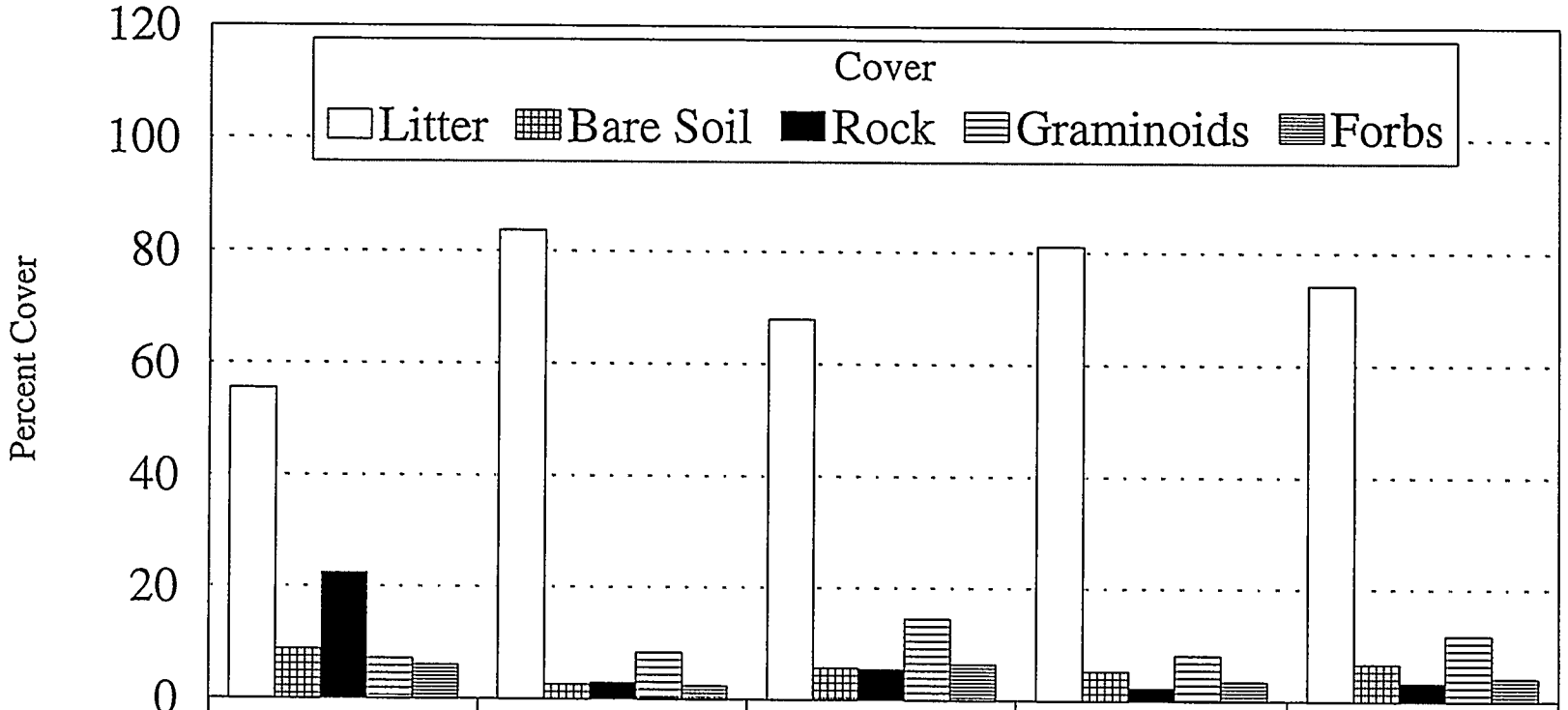
Plant Codes for Overstory Species

Importance Values of Overstory Species within
Transect LA5 located in Los Alamos Canyon



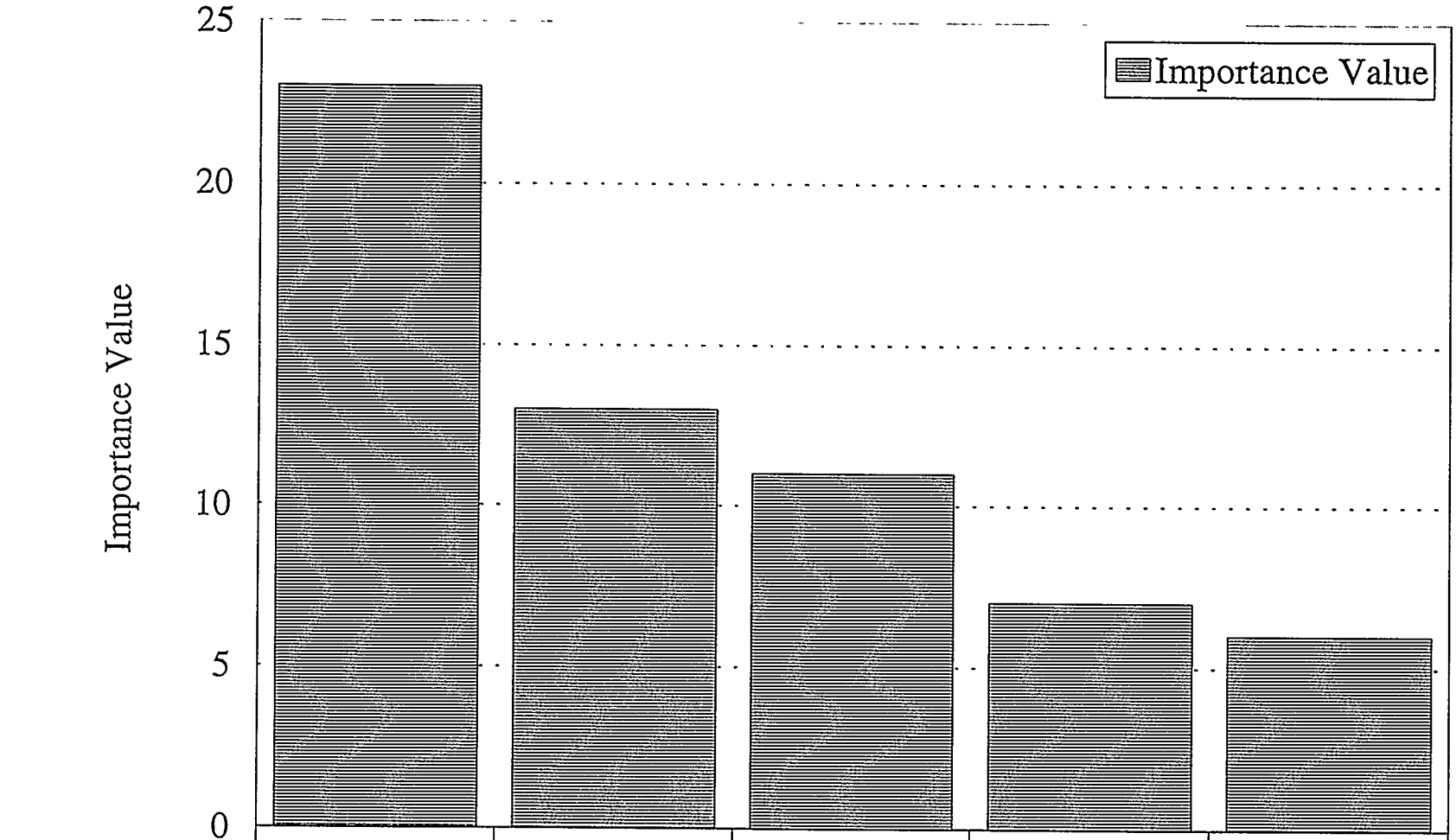
	FONE	PIPO	JUMO	RHTR	POAN	JUSC
Importance Index	51	37	30	30	15	12

Understory Cover of Los Alamos Canyon

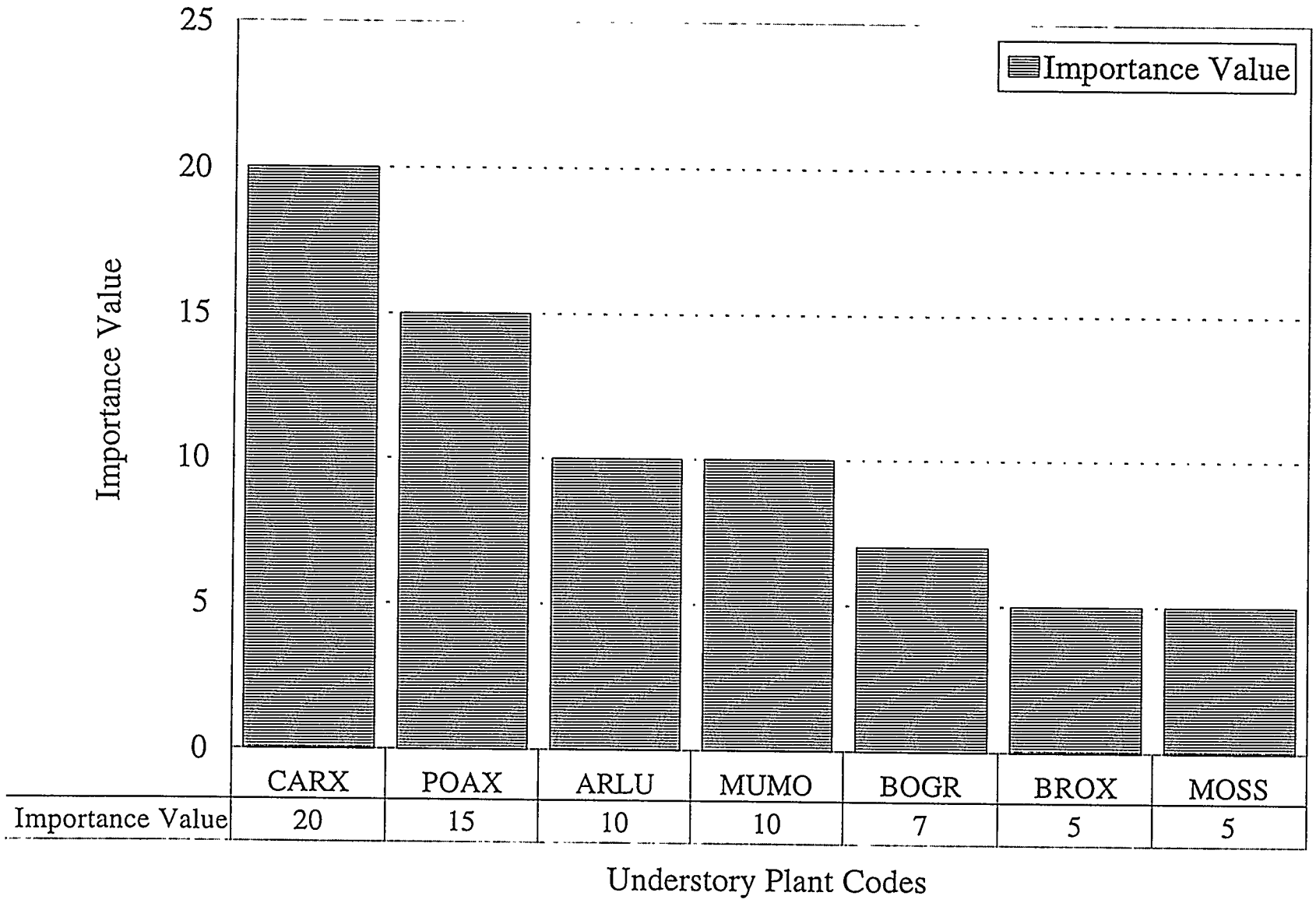


	LA1	LA2	LA3	LA4	LA5
Litter	55.5	83.6	67.9	81	74.2
Bare Soil	8.8	2.6	5.7	5.3	6.6
Rock	22.5	3	5.5	2.3	3.3
Graminoids	7.2	8.4	14.5	8.1	11.7
Forbs	6	2.4	6.4	3.4	4.1

Importance Values of Understory Species Within Transect LA1
Located in Los Alamos Canyon

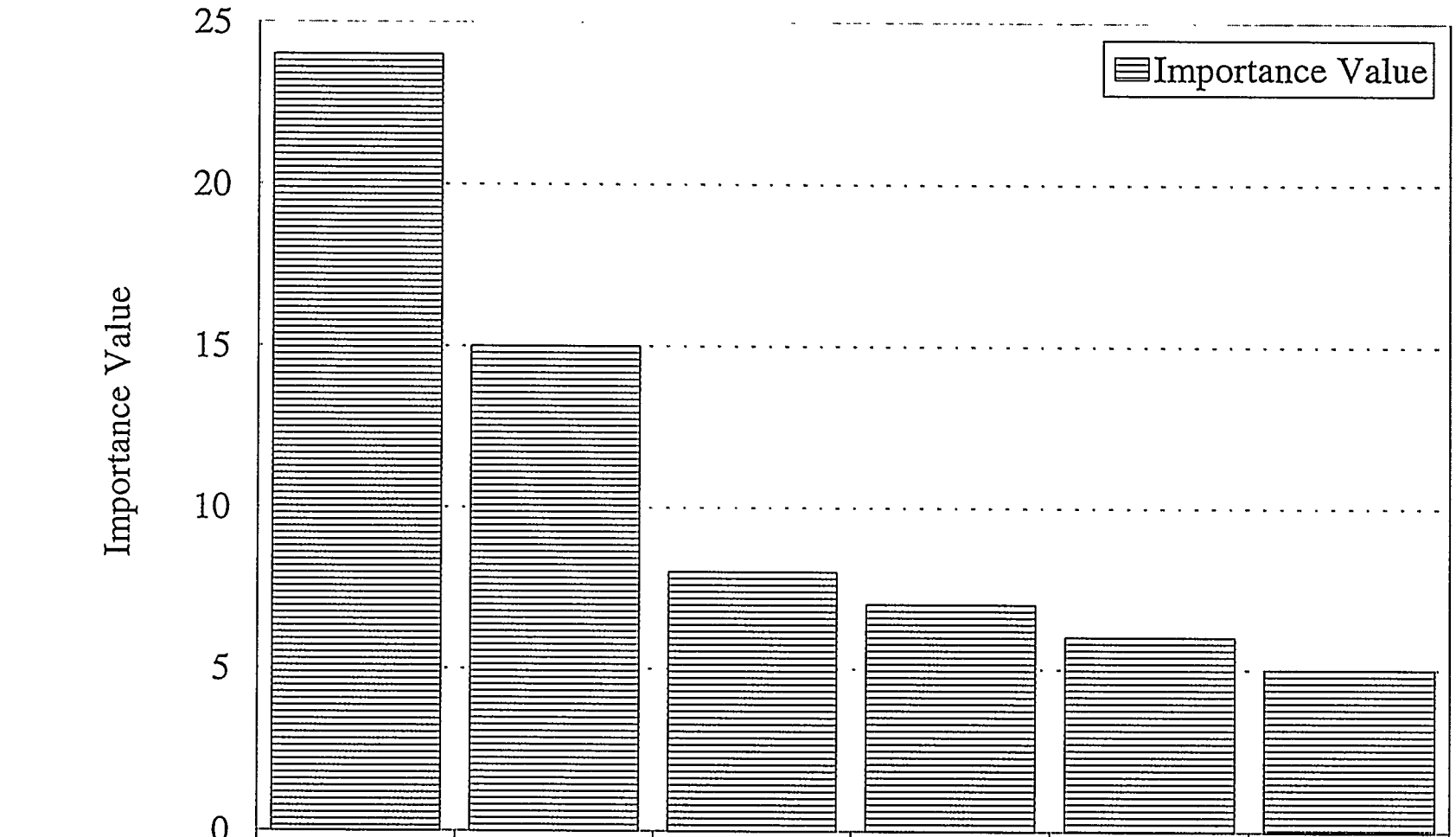


Importance Values of Understory Species Within Transect LA2
Located in Los Alamos Canyon



	CARX	POAX	ARLU	MUMO	BOGR	BROX	MOSS
Importance Value	20	15	10	10	7	5	5

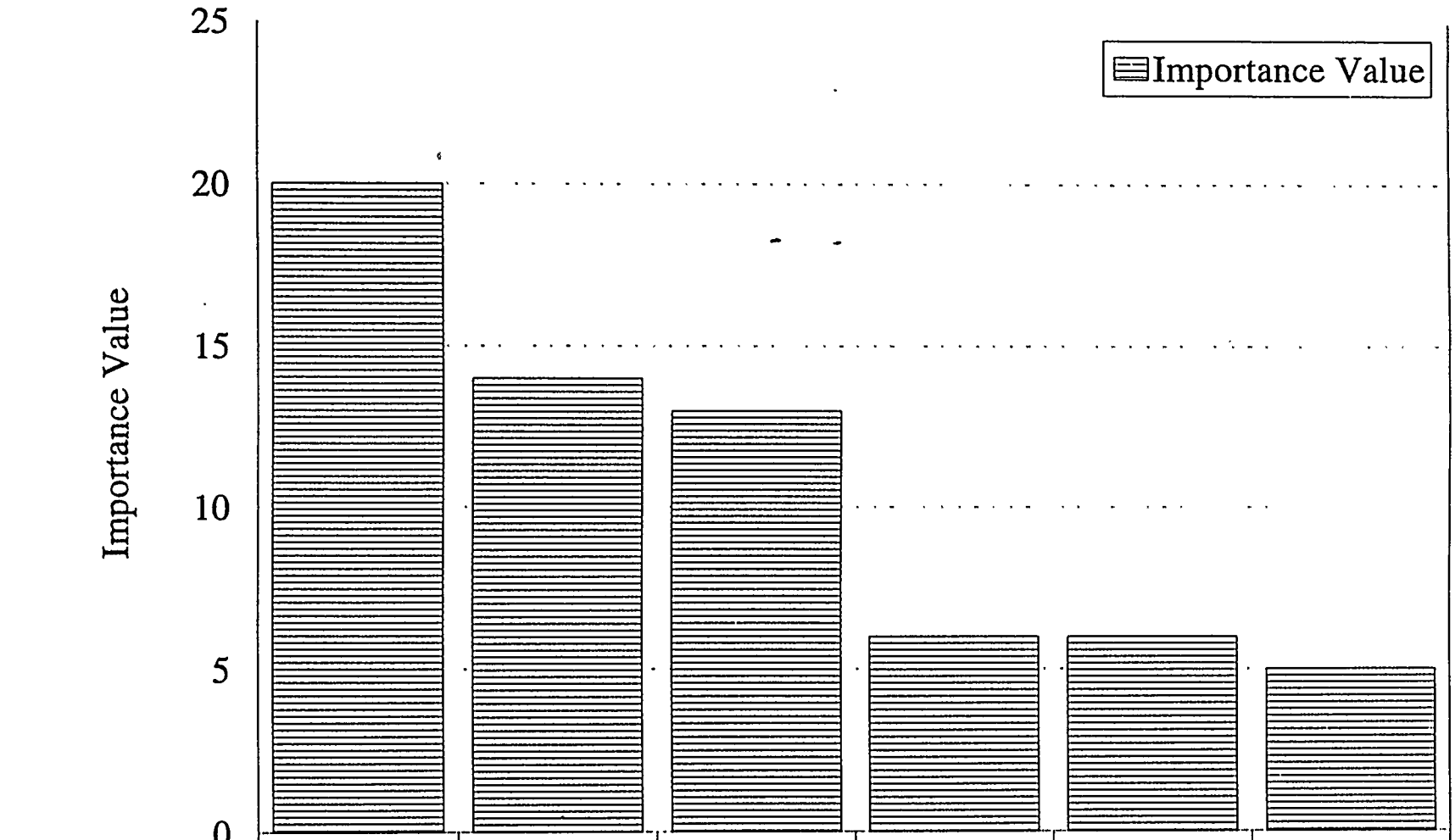
Importance Values of Understory Species Within Transect LA3
Located in Los Alamos Canyon



	MUMO	POAX	QUGA	ARCA	ANSC	CARX
Importance Value	24	15	8	7	6	5

Understory Plant Codes

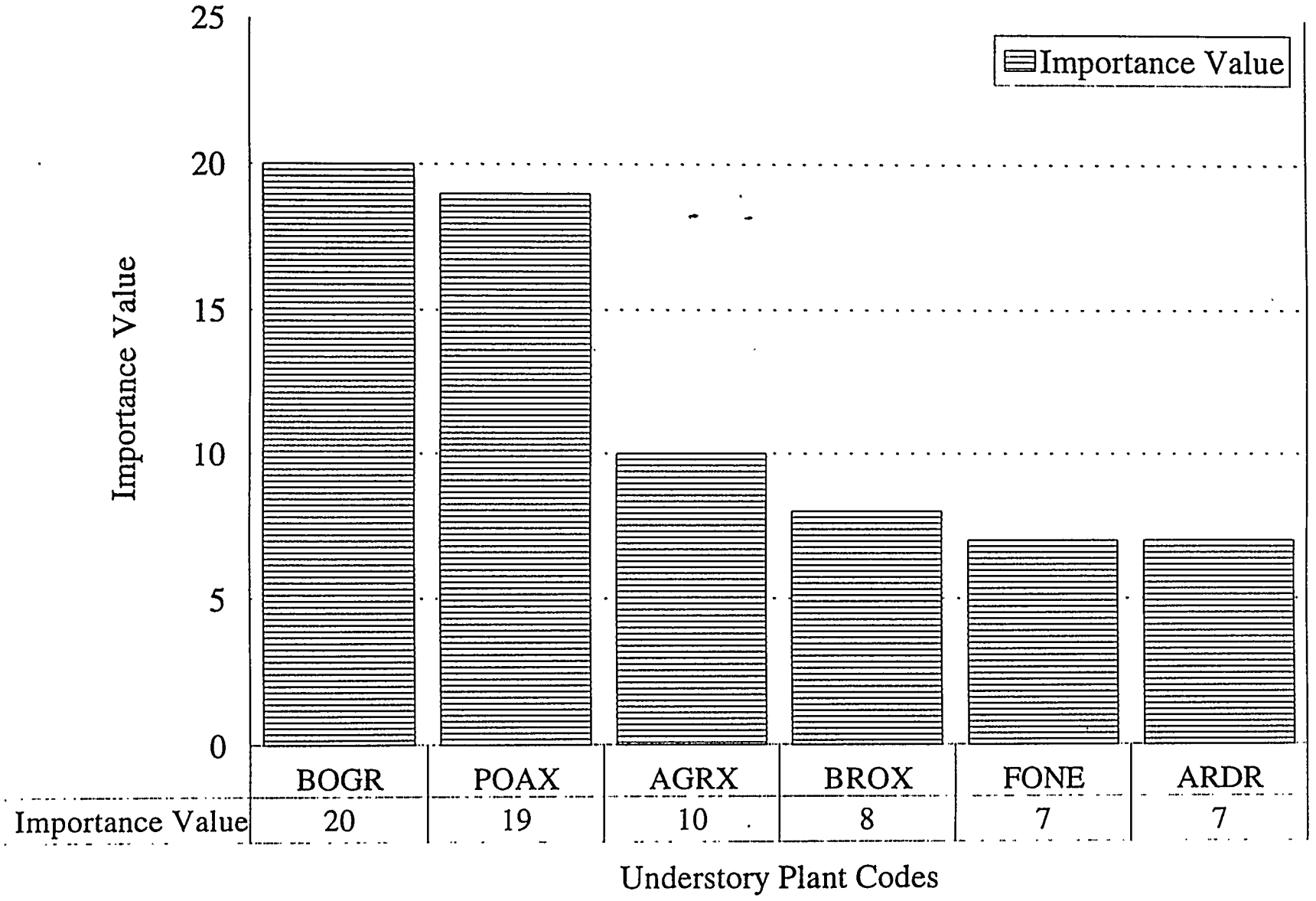
Importance Values of Understory Species Within Transect LA4
Located in Los Alamos Canyon



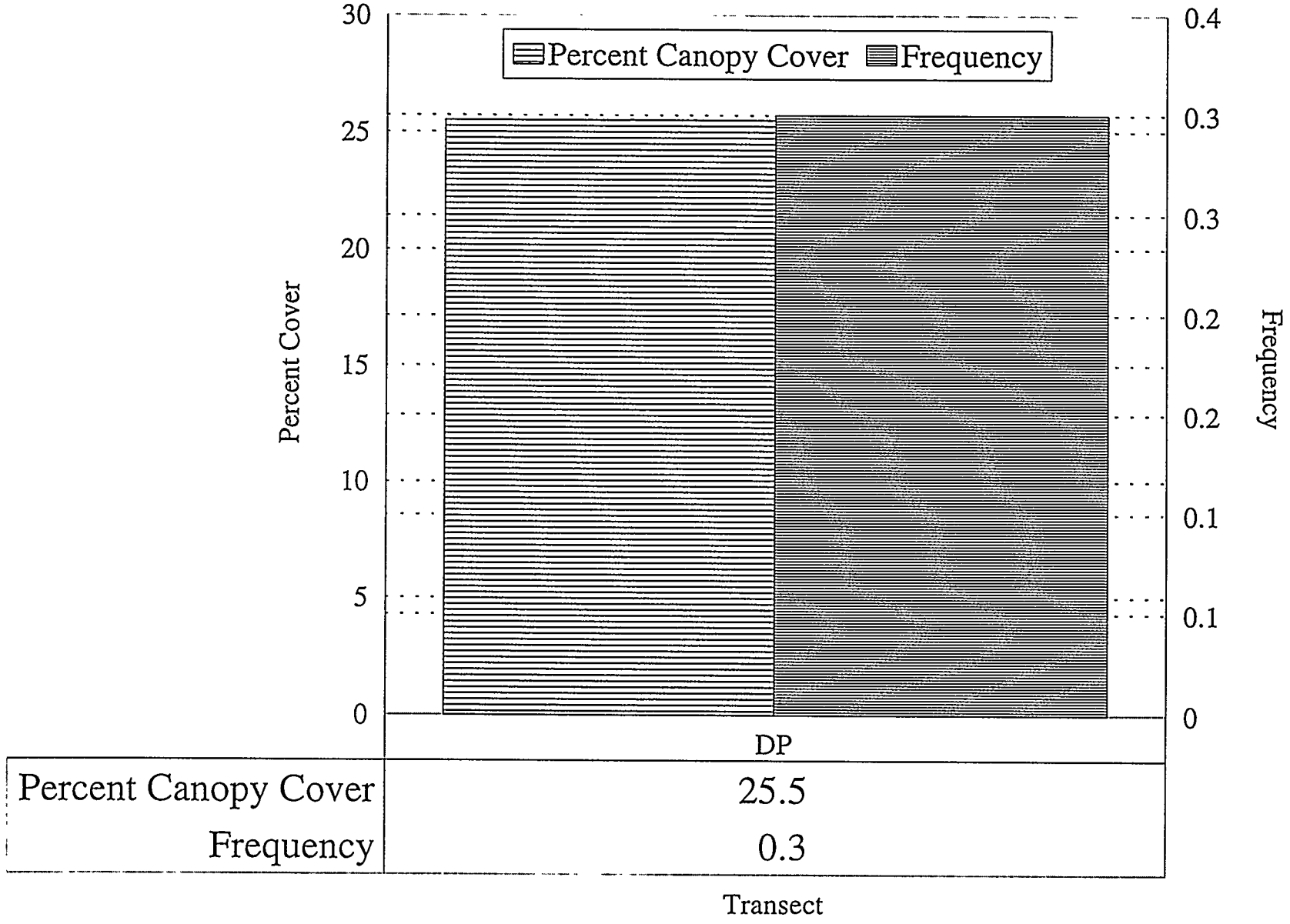
	POAX	CARX	BOGR	BROX	MUMO	GECA
Importance Value	20	14	13	6	6	5

Understory Plant Codes

Importance Values of Understory Species Within Transect LA5
Located in Los Alamos Canyon



Percent Canopy Cover and Frequency of Dominant Tree Species within DP Canyon



Percent Canopy Cover	25.5
Frequency	0.3