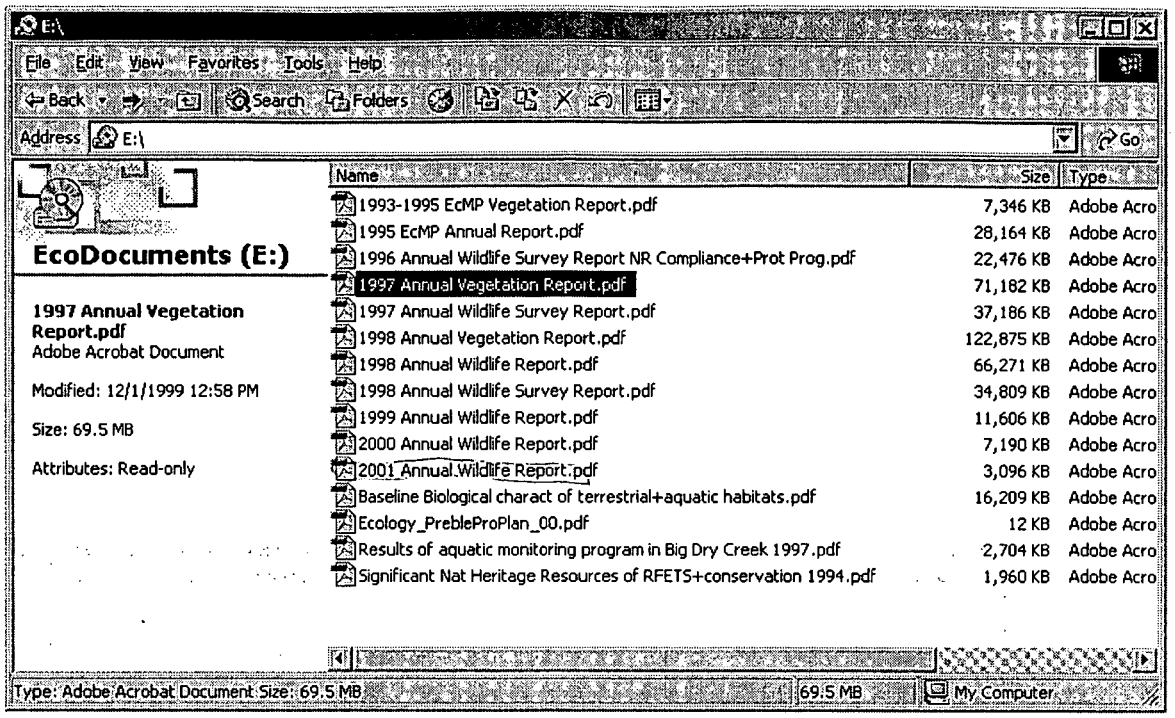
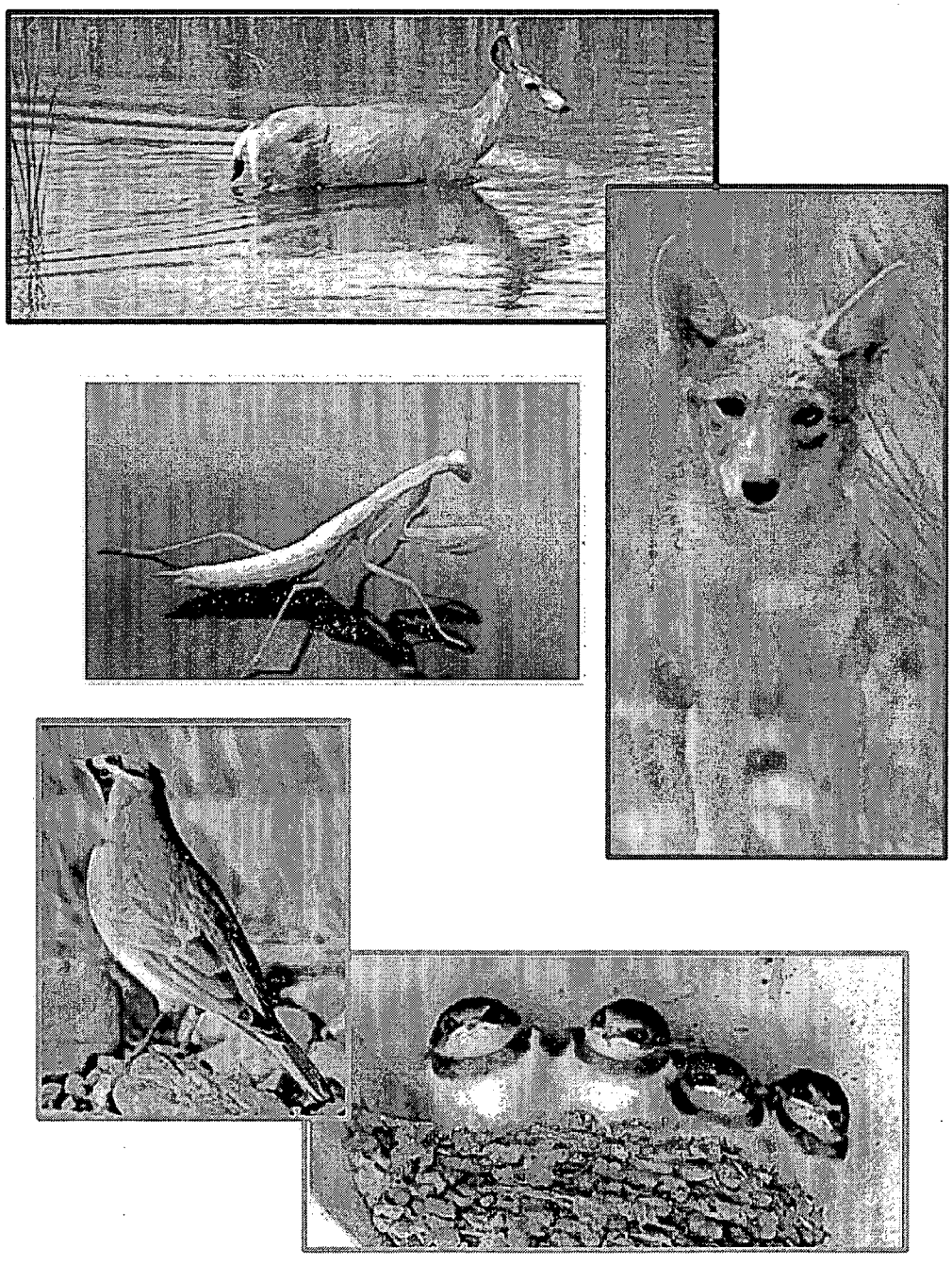


ADMIN RECORD

2001 Annual Wildlife Report

ECOLOGY

2001 Annual Wildlife Monitoring Report for the Rocky Flats Environmental Technology Site



This report has been classified and released for public review.

Title: 2001 Annual Wildlife Report for the RFETS
Classification Number: RFP-5477

2001 Annual Wildlife Report for the Rocky Flats Environmental Technology Site

Kaiser-Hill, LLC
Rocky Flats Environmental Technology Site
Golden, Colorado 80402-0464

August 2002

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Executive Summary

The K-H Ecology Program monitors the status of wildlife and plant communities to provide information used to ensure that operations at the Site remain in compliance with state and federal wildlife protection statutes and regulations, and with U.S. Department of Energy orders. Wildlife species monitored include big game mammals, small mammals, migratory birds, waterfowl, raptors, herpetiles, and the Preble's meadow jumping mouse.

Migratory bird monitoring was redesigned for 2001. Previously used transects in the Buffer Zone had provided substantial baseline information on bird species richness and abundance at the Site. The revised monitoring was designed to document changes in bird richness and abundance as the Industrial Area is removed and returned to a natural grassland state. Circle plot surveys were conducted in the Industrial Area, the interface area, and the grasslands of the Buffer Zone to compare bird assemblages in these areas. The Industrial Area had the highest density of birds and was dominated by exotic species or those requiring cliff type habitats. Grasslands at the Site were dominated by native grassland bird species. As closure of the site progresses and the IA is restored to a grassland habitat, changes in bird populations are expected to occur. These surveys will provide a means to document and compare bird population changes over time, in addition to providing an additional success criteria for the revegetation efforts in the Industrial Area.

Multi-species census surveys were conducted throughout the Buffer Zone in many of the different habitat types. A wide range of wildlife species was observed throughout the year during these surveys. Some of the most common animals observed were the red-winged blackbird, mallard, mule deer and coyote. The diversity of wildlife in the Buffer Zone continues to provide evidence of the high quality of habitat at the Site.

Boreal chorus frog vocalization monitoring was conducted in the Buffer Zone in 2001. Boreal chorus frogs were found at every location sampled in 2001. There was a 60 percent increase from year 2000 to year 2001 in the number of sample sites with full choruses of frogs calling. Amphibian species are generally considered good indicators of the health of wetlands because of their semi-aquatic nature. The abundance of the boreal chorus frogs at the Site continues to provide evidence of the high quality wetland and aquatic environments that occur in the Buffer Zone at the Site.

Sitewide wildlife driving surveys were conducted monthly to monitor the presence of significant wildlife species. Species recorded during these surveys are primarily large and mid-size mammals, raptors, and waterfowl. The abundance of significant species such as coyote, mule deer, and mallards remained fairly constant compared to previous years. Results from 2001 continued to show steady populations of these species occur at the Site. No substantial changes in wildlife abundances were noted.

The Preble's meadow jumping mouse has been the focus of small mammal monitoring at the Site for several years because of its status as threatened under the ESA. During 2001, Preble's mouse monitoring focused on Smart Ditch, a drainage in the south Buffer Zone, where only a single Preble's mouse had been captured before. Results from 2001 continued to show only a small population occurring in the drainage. Only one Preble's mouse was captured in Smart Ditch all summer. The most likely explanation for the low number of captures has to do with the lack of available, surface water in the creek. The channel in Smart Ditch was dry for most of the field season. Deer mice, meadow voles, and Mexican woodrats accounted for over 90% of all captures made.

Early season trapping for Preble's mice was also conducted in Woman Creek in 2001, where trapping had been conducted the previous year. The capture rate in Woman Creek was almost four times higher in 2001 than in 2000.

The long-term, year-round ecological monitoring program continues to be an important tool for identifying and quantifying wildlife populations at the Site. The data produced help in predicting and avoiding ecological impacts resulting from human activities. Monitoring results can also guide the natural resource management decision-making process so that it continues to accomplish the goals of the Site's policies. Serious environmental health problems can be indicated if sensitive species disappear. These data provide a baseline of information on the wildlife species that occur at the Site. As cleanup and closure activities continue at the Site, monitoring data continue to provide Site Ecologists with information that will be used to assess and minimize impacts from projects.

1. Circle Plot Bird Surveys

1.1 Introduction

Site ecologists use several methods to monitor the presence of wildlife, habitat use, seasonal residence, species densities and abundance, breeding areas, and other pertinent wildlife parameters. Since 1991, migratory bird surveys have recorded bird species and numbers of individuals along established permanent transects. Data from these surveys were entered into the Migratory Bird Database, a component of the Sitewide Ecological Database (SED). Because of the changing data needs as Site closure progresses, and because data recorded along the permanent transects over the past decade have shown little change in bird populations in unaffected, non-industrial areas, the bird monitoring methodology was redesigned for 2001. Rather than continue the sampling effort only in unaffected areas, it was determined that examining the changes brought about by building demolition and Site closure is now appropriate. To address this need, migratory bird monitoring was redesigned such that the urban setting of the Industrial Area (IA) could be characterized and compared against surrounding natural areas with habitat that is comparable to the proposed end-state of the Site.

The questions addressed by this sampling effort include:

- What bird species are present in the IA, interface, and reference grasslands at the Site?
- How do the diversity and densities of bird species in the IA, interface, and reference grasslands areas compare?
- How are bird species richness, diversity, and density changing in the IA as compared to interface and reference areas as Site closure progresses?

1.2 Methods

1.2.1 Site Selection

The study was designed to document changes in bird species richness, diversity, and abundance in the IA as buildings and other structures are removed and the area is transformed to a native grassland habitat. To evaluate these changes monitoring locations were placed within the IA, at the IA/grassland interface, and at grassland (control) locations in the Buffer Zone (Figure 1-1). Eight circle plots (100m diameter) were located in each of the three habitat classifications for a total of 24 plots. Plot center points were located and mapped using GPS equipment and entered into the Site GIS.

Plot locations in the IA were selected on the basis of accessibility, visibility, and the ability to continue conducting surveys safely from the center of the plot throughout the closure process. The IA was defined as the built up industrial/urban area largely surrounded by the old security perimeter fence, but including newer installations such as the 130 trailer complex and other buildings. Plot locations in the interface (IA/grassland) were selected such that the center of the plot was no closer to the IA perimeter fence, or the edge of any outer parking lot, than the distance of the radius (50m). These plots were placed such that they would not include the perimeter fence. The interface areas were defined as a narrow band just outside the perimeter fence and 130 trailer complex. Plot locations in the native grasslands

(reference/control plots) were selected such that they excluded non-grassland habitat and were minimally influenced by the IA and associated structures or activities. Grassland reference plots were greater than 1 km from buildings and other human activity centers at the Site (including ponds, areas awaiting remedial action, the shooting range, and other disruptive activities), but would not necessarily be distant from existing powerlines and fences which are expected to remain in place as closure progresses.

1.2.2 Data Collection

Migratory bird species richness, diversity, and population density data were collected from each 100m circle plot. Surveys were performed by a qualified ecologist who observed from the center of each plot. Observations were made for 10 minutes. Each observation period was started with a two-minute waiting period during which the observer remained quietly at the plot center. All birds observed or heard within the plot during the 10 minute observation period were recorded on the Circle Plot Bird Data Form. Any raptors in flight or perched within 300m of the plot center were recorded on the form as well. These surveys were performed four times for each plot between mid-May and the end of June. To eliminate timing bias, the plots were surveyed in a different order each session. All surveys were done between sunrise and 10:30 AM.

1.2.3 Data Analysis

Data were entered into a database and quality checked for accuracy prior to analysis. Because this was the first year of bird data collected in this study, comparisons were made between habitat classifications (IA, interface, and grassland). Species lists, species richness, diversity, and bird densities were calculated for each classification. No statistical analyses were conducted on the data. Richness is defined as the total number of species observed in each classification. Diversity was calculated using a Shannon-Weaver diversity index (TIEM, 2002). Density was calculated as the number of birds/hectare. Relative abundance was calculated within each classification as the total number of observations of an individual species/total number of observations of all species.

1.3 Results and Discussion

During June 2001, 33 species of birds were recorded within the circle plots (Table 1-1). The IA and interface areas had 21 species each, while the grassland areas had 14 species. The IA is dominated by urban species, with the most common species being the house finch, European starling and barn swallow. The most common grassland species are the vesper sparrow, western meadowlark and grasshopper sparrow. The Interface area has an assemblage of species that includes birds from both the industrial and grassland areas. The most common species occurring are the house finch, western meadowlark and vesper sparrow. Bird densities are shown in Table 1-1.

Bird density was highest in the IA with a mean density for all species of 13.1 birds/hectare (Figure 1-2). The grassland areas had the lowest density of birds at only 4.1 birds/hectare. The higher density of birds in the IA could be attributed to the fact that urban species, such as barn swallows, tend to nest in colonies or have very small territory requirements. Grassland birds require more breeding territory. The vesper sparrow can require over three hectares of territory (Dechant, et al, 2001). Bird diversity, calculated using a Shannon-Weaver diversity index, was highest in the interface area (Figure 1-3). This was expected since species of both areas are present in the interface. Little difference was observed in the bird diversity between the IA and grassland areas. Bird relative abundance is shown in Table 1-1 and Figure 1-4. Two exotic species, the house finch and European starling, accounted for over 63% of the bird relative

abundance in the IA. On the grasslands however, these species accounted for less than 7%, while western meadowlarks and vesper sparrows accounted for over 58% of the observations.

As closure progresses, artificial nesting platforms provided by the buildings will be removed, and grasslands will be recreated. It is anticipated that over time the bird assemblage within the IA will shift from an urban species-dominated assemblage toward a grassland species-dominated assemblage. Additionally, with the removal of the "artificial cliffs" provided by some buildings, the density of cliff and barn swallows is expected to return to levels normally observed in open grasslands.

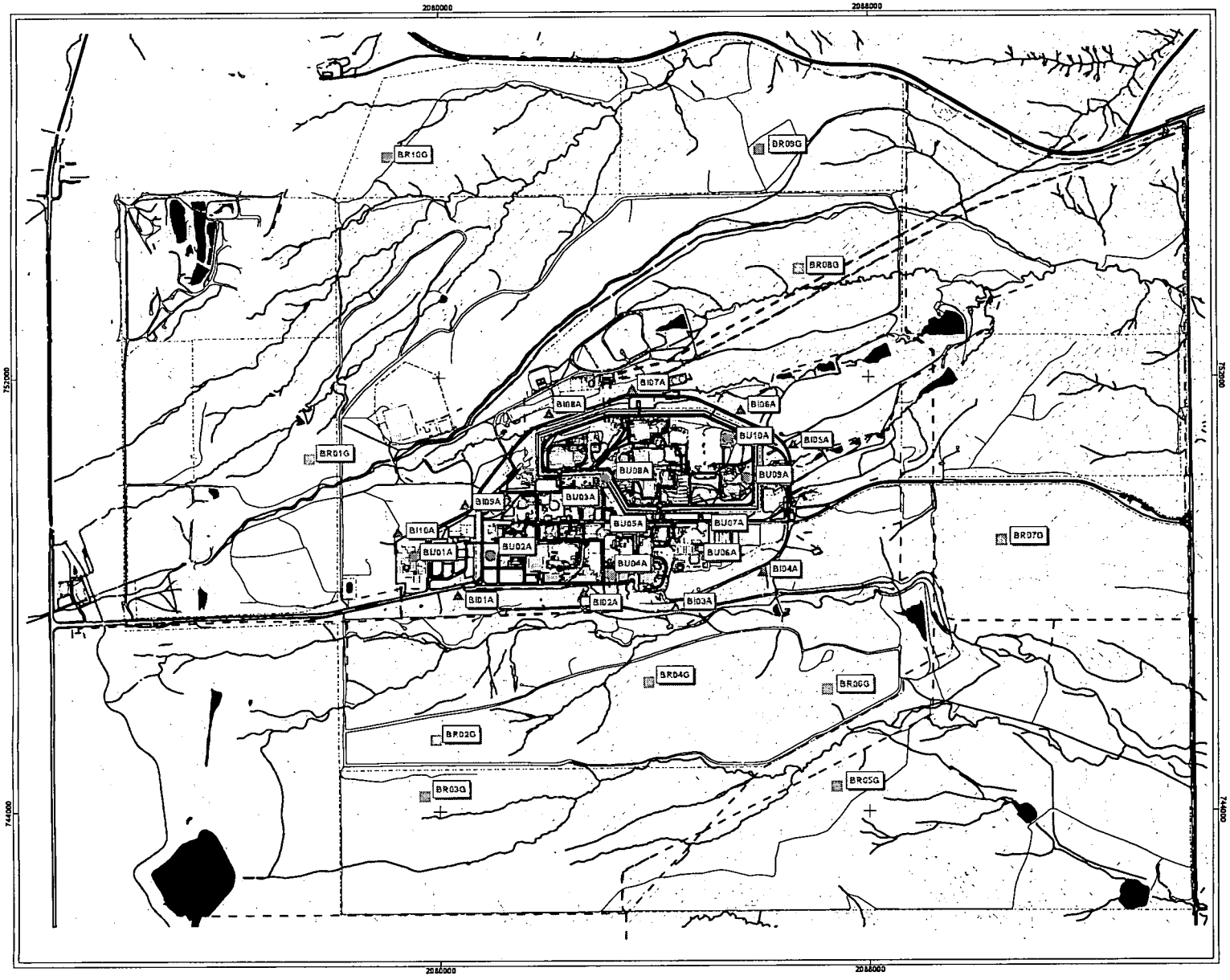
1.4 Conclusions

This study has provided a baseline of information on the bird species that occur in the IA relative to the grasslands in the Buffer Zone. As would be expected, the birds that occur in the IA are either exotic species or those that require "cliff" type habitats. As Site cleanup and closure continues and the IA is transformed into a more native grassland habitat, changes in bird populations are expected to occur. Future monitoring of these sample locations will provide a means to quantitatively document those changes.

1.5 References

Dechant, J. A., M. F. Dinkins, D. H. Johnson, L. D. Igl, C. M. Goldade, and B. R. Euliss. 2001. Effects of management practices on grassland birds: Vesper Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/literatr/grasbird/fpvesp/fpvesp.htm (Version 29FEB2000).

TIEM. 2002. Diversity indices: Shannon's *H* and *E*. Internet address http://www.tiem.utk.edu. The Institute for Environmental Modeling.



2001 Bird Monitoring Locations

Figure 1-1

LEGEND

- Industrial Area Locations
- Interface Locations
- Reference Locations

Standard Features

- Buildings
- Lakes & ponds
- Landfill
- Streams & ditches
- Fences
- Paved roads
- Dirt roads
- Contours (20 ft)
- Power Lines

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G REI, Las Vegas.
Digitized from the orthophotographs, 1/65
Hypsography derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~10 meter resolution. The DEM post-processing performed by MK Winter 1997.

Data Source Ecology Features:
Location data provided by LABAT.
K-H Ecology Group POC: Karan North 303-966-9876.

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300 0 300 600 Meters

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: LABAT For: Kaiser-Hill Company, LLC

RFETS GIS Dept. 303-966-7707

MAP ID: 01-0442

July 23, 2002

Table 1-1. Density and relative abundance of bird species in the Industrial, Interface, and Grassland areas of Rocky Flats.

		Industrial		Interface		Grassland	
Species Code	Common Name	Density	Relative Abundance	Density	Relative Abundance	Density	Relative Abundance
AGPH1	Red-winged blackbird	0.08	0.606%	0.28	2.954%		
AMSA1	Grasshopper sparrow			0.44	4.641%	0.36	8.824%
BUJA1	Red-tailed hawk			0.24	2.532%		
BUSW1	Swainson's hawk	0.04	0.303%				
CAME2	House finch	6.13	46.670%	1.79	18.987%	0.28	6.863%
CAME3	Lark bunting			0.32	3.376%		
CAPS1	Lesser goldfinch	0.20	1.515%	0.08	0.844%		
CATR1	American goldfinch	0.08	0.606%	0.08	0.844%	0.04	0.980%
CHMI1	Common nighthawk	0.08	0.606%				
COLI1	Rock dove	0.12	0.909%	0.48	5.063%		
EUCY1	Brewer's blackbird	0.20	1.515%	0.04	0.422%	0.24	5.882%
FAME1	Prairie falcon	0.04	0.303%	0.04	0.422%		
FASP1	American kestrel	0.04	0.303%	0.16	1.688%	0.04	0.980%
HIPY1	Cliff swallow	0.32	2.424%	0.64	6.751%	0.28	6.863%
HIRU1	Barn swallow	1.63	12.424%	0.80	8.439%	0.08	1.961%
ICGA1	Bullock's oriole					0.04	0.980%
MOAT1	Brown-headed cowbird	0.08	0.606%	0.04	0.422%	0.04	0.980%
PADO1	House sparrow	0.44	3.330%				
POGR1	Vesper sparrow			1.15	12.236%	1.31	32.353%
QUQU1	Common grackle	0.52	3.939%				
SASA1	Say's phoebe	0.36	2.727%	0.16	1.688%	0.08	1.961%
SEPL1	Broad-tailed hummingbird	0.04	0.303%				
STNE1	Western meadowlark			1.43	15.190%	1.07	26.471%
STVU1	European starling	2.15	16.364%	0.64	6.751%		
TATH1	Violet-green swallow	0.08	0.606%				
TUMI1	American robin	0.48	3.636%	0.28	2.954%	0.08	1.961%
TYVE1	Wesern kingbird	0.04	0.303%	0.04	0.422%	0.12	2.941%
ZEMA1	Mourning dove			0.32	3.376%		

Most common species are shaded.

Figure 1-2. Total densities of birds in three areas of Rocky Flats

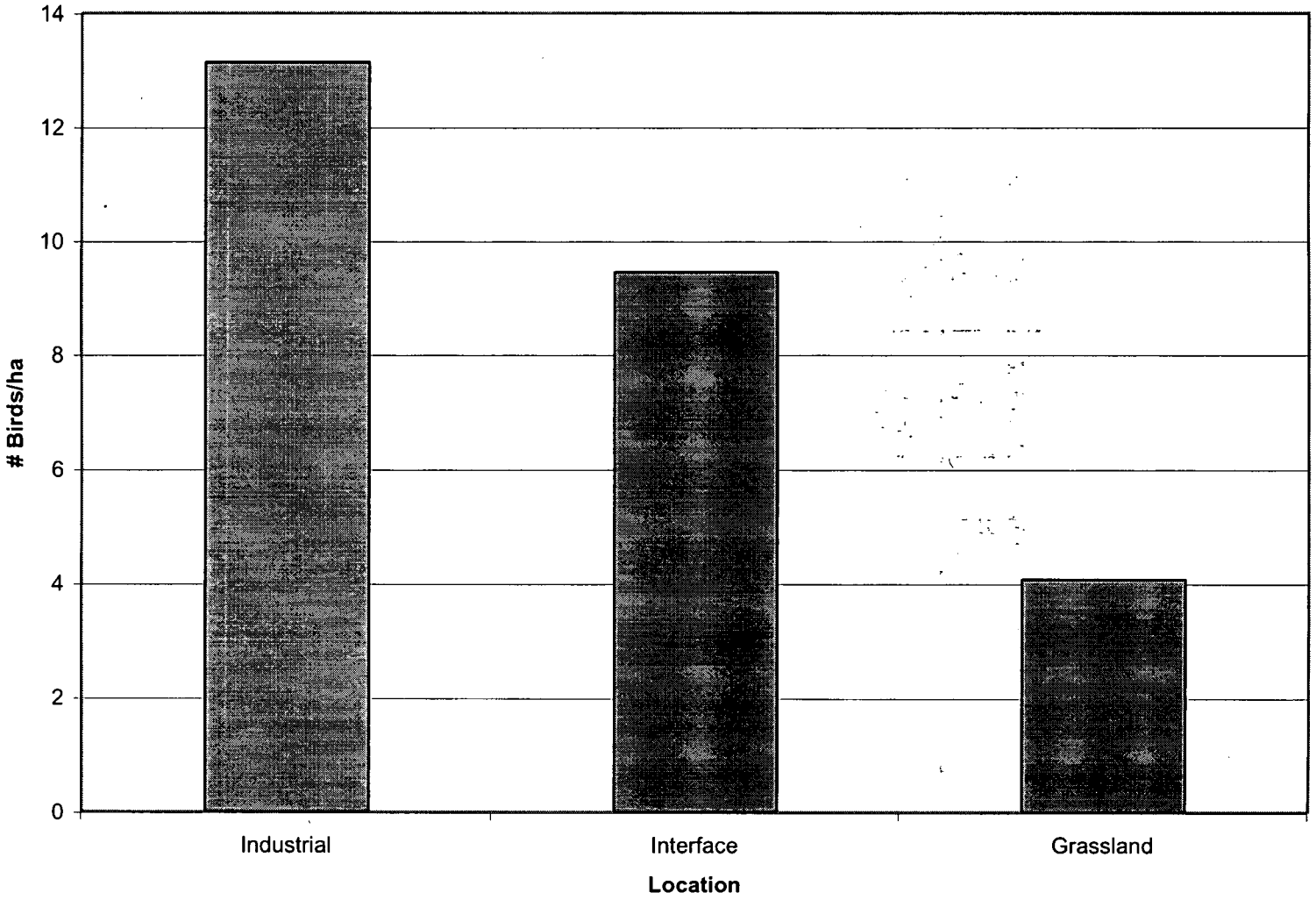


Figure 1-3. Diversity of bird species using the Shannon-Weaver Diversity Index

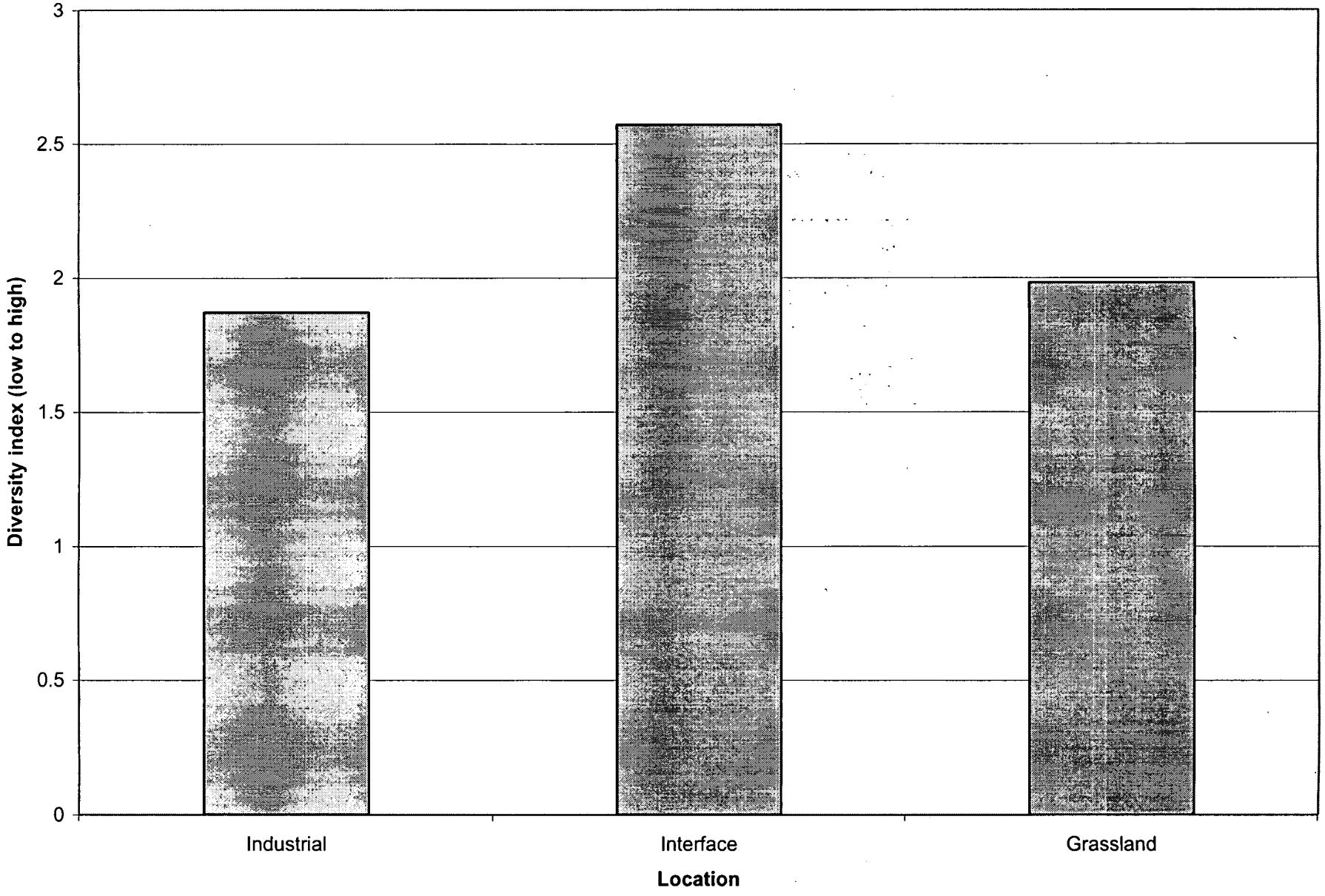
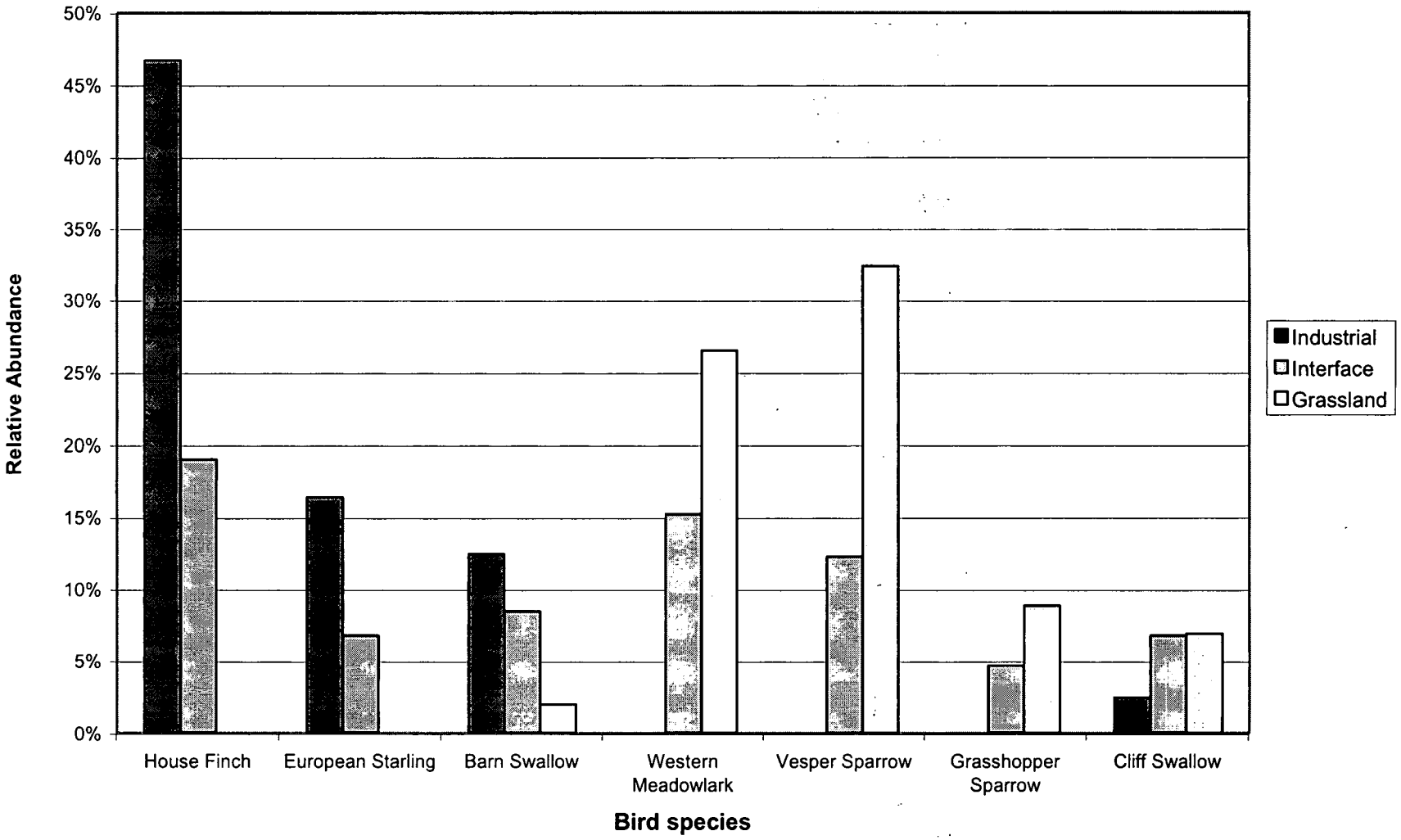


Figure 1-4: Relative abundance of most common bird species in three areas of Rocky Flats



2. Sitewide Wildlife Surveys

2.1 Introduction

Site ecologists monitor for the presence of significant wildlife species through the use of sitewide wildlife surveys. Sitewide wildlife surveys are conducted monthly along established roads in the Buffer Zone. This monitoring provides information on what animals use the site, the relative abundance of each of those species, and locational information on the species. The questions under investigation included:

- What wildlife species use the Buffer Zone at the Site?
- What is the relative abundance of these species?
- At what locations are certain species most commonly found?

2.2 Methods

During 2001, sitewide wildlife surveys were performed monthly along all passable, established Buffer Zone roads (Fig. 2-1). Road selection was made on the basis of all-season accessibility. Areas surveyed were limited to those areas that were visible from these roads. Preference is given to fair weather to optimize observation availability and driving conditions. During these surveys all visible individuals of significant species observed during a short time-span (3 to 4 hours) over the entire property were recorded. These surveys were performed both diurnally and nocturnally.

Significant species are defined as big game mammals, large rodents, lagomorphs, carnivores, waterfowl, raptors, fish, and herpetiles. It essentially excludes most songbirds. A list of significant species that is used for these surveys is shown in Table 2-1.

Diurnal sitewide surveys were performed monthly throughout 2001. A nocturnal survey was performed in September 2001 between dusk and midnight. The purpose of the nocturnal survey was to document the presence of nocturnal species that are rarely observed during daylight hours. Data recorded include species, location, activities, habitat, number of individuals, and age and sex classifications.

2.3 Results and Discussion

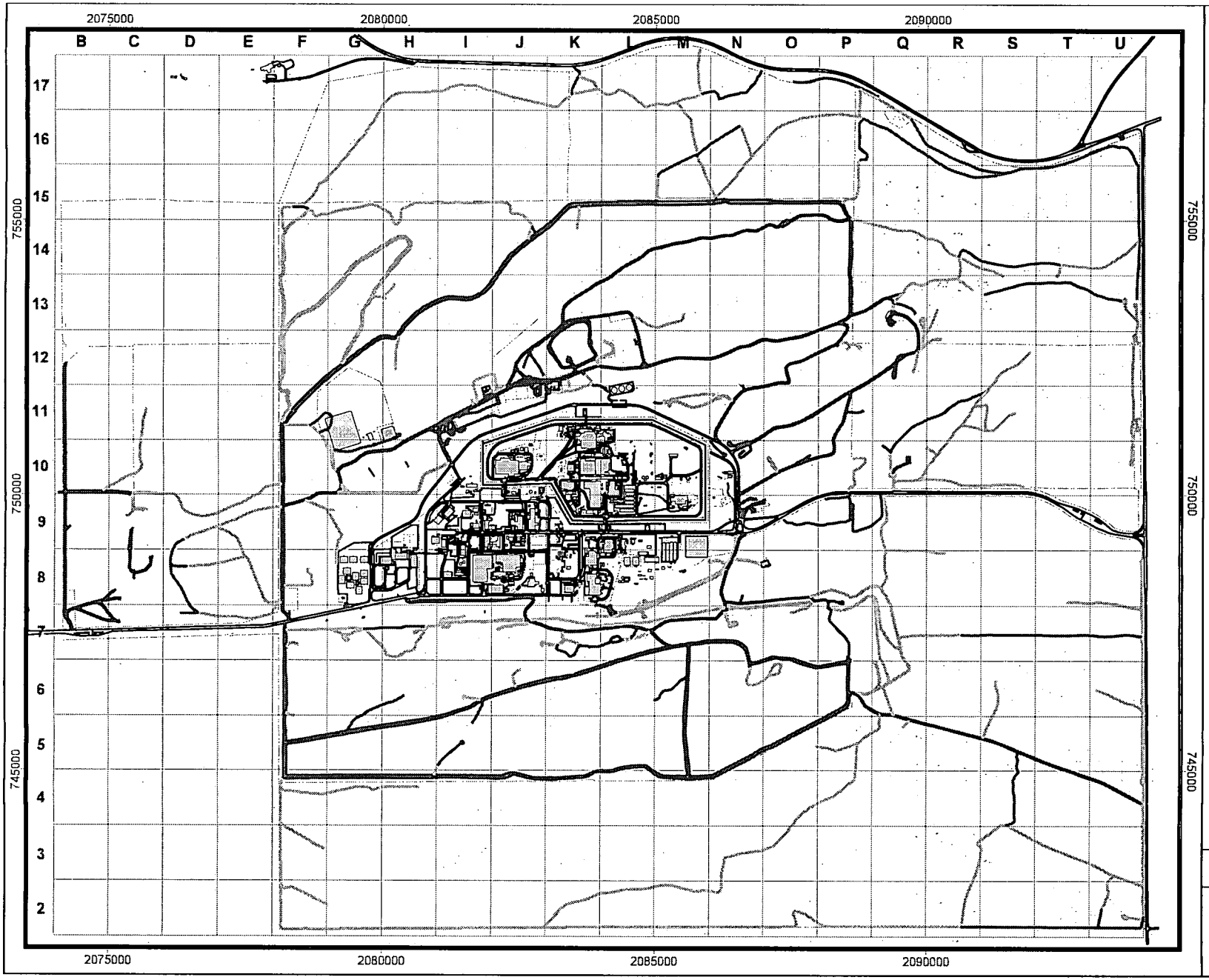
The most common animal observed at the Site during sitewide surveys was the mule deer, with a relative abundance of about 44 percent of all species observed. Figure 2-2 shows the areas at the Site where deer were observed throughout the year. This data suggests that mule deer are widely distributed throughout the site. Most observations of deer occurred in the mesic grassland areas. Although white-tailed deer and elk continue to populate the Site in small numbers, they were not observed during the sitewide surveys. A year-end population census for big game was obtained during the December sitewide wildlife survey. The census recorded 125 mule deer. Often, not all deer at the site are visible to the observer due to tree and shrub cover. Therefore, not every deer is counted and the census number would be a low estimate. Figure 2-3 shows how the population estimate has fluctuated from 1994 to 2001.

Mallards are the second most abundant animals at the Site. The number of species of waterfowl observed decreased slightly during 2001. This difference could be the result of fortuitous sightings, such as the ruddy duck, Wilson's phalarope, and northern shoveler, during the 2000 sitewide survey. If these species with only one observation were removed from the 2000 data, the number of species remains fairly constant. Figure 2-4 compares the number of species observed each year from 1999 to 2001.

The boreal chorus frog was also a common animal at the Site in 2001. It had a relative abundance of 4.054 percent. Boreal chorus frogs are discussed in greater detail in Section 4 of the Annual Report.

Coyotes were observed in all major habitats, but were most visible in the grasslands. The annual sitewide relative abundance of coyotes was 2.235. Figure 2-5 shows the relative abundance of coyotes over the past several years. While this survey does not attempt to quantify the population of coyotes at the site, the evidence of a steady population over time is a good indication that prey species continue to be abundant.

Common raptors at the Site include the red-tailed hawk, American kestrel, and great horned owl. The relative abundance of these and several other species is shown in Table 1-1. The relative abundance of the most common raptor species for the past 5 years is shown in Figure 2-6. Golden eagles, rough-legged hawks, and northern harriers had the greatest increase in relative abundance during 2001. Swainson's hawk abundance continues to remain low compared to pre-1999 levels. Red-tailed hawks appear to fluctuate in abundance from year to year, possibly due to fluctuations in the prey populations.



Buffer Zone Road Access

Figure 2-1

LEGEND

- Dirt roads, authorized for general use
- Dirt roads, access by permission* only
- Closed to vehicle use

Standard Features

- Buildings
- Lakes & ponds
- Streams & ditches
- Fences
- Paved roads

* Permission obtained through the Buffer Zone Office.

Updated March, 2001.
Supersedes previous versions.

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs, 1/95.

Data Source Ecology Features:
Road categories provided by Exponent.
K-H Ecology Group POC: Karan North 303-966-8876.

N

1:21619

1000 0 1000 2000 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: LABAT

For: Kaiser-Hill Company, LLC

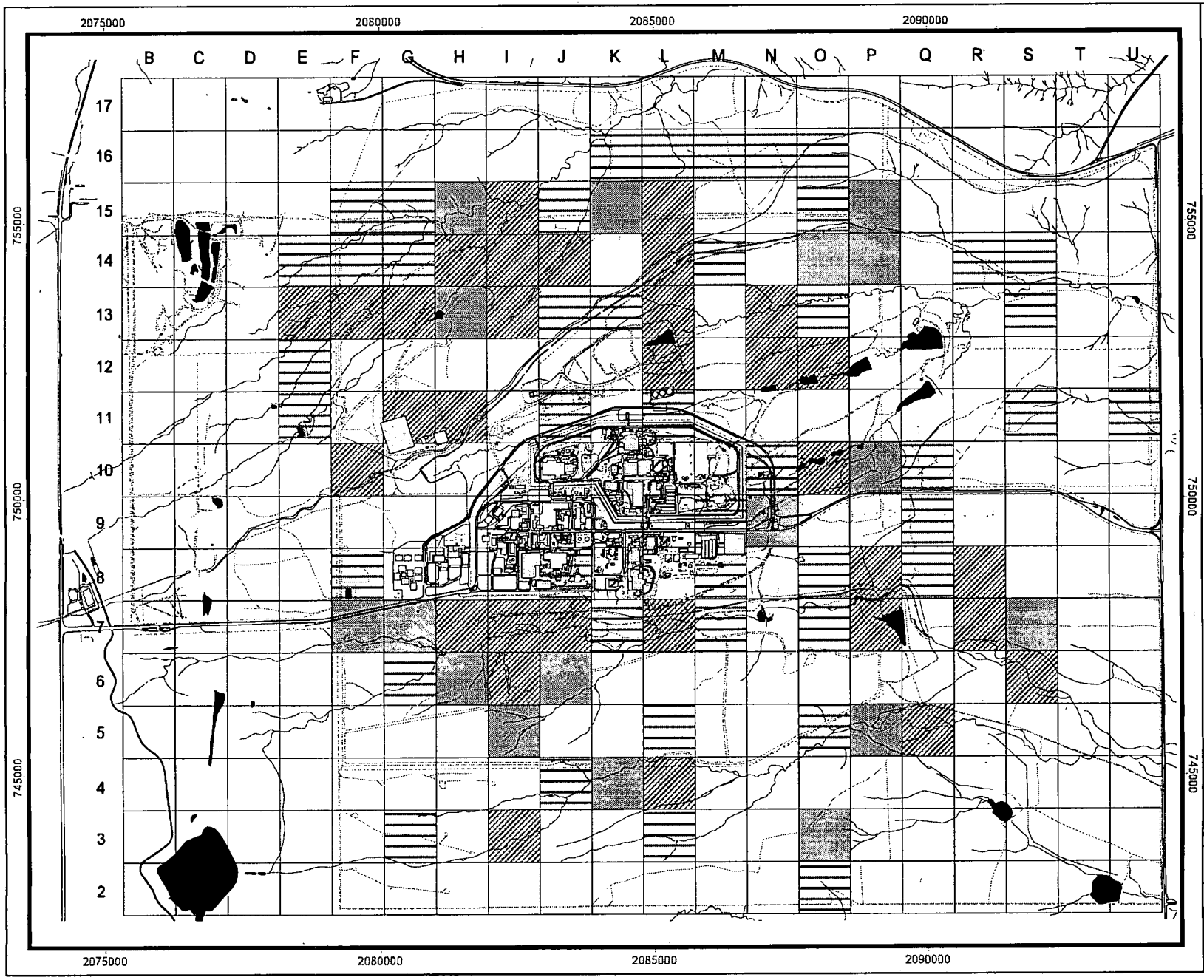
RFETS GIS Dept. 303-966-7707

MAP ID: 99-0468 May 16, 2002

W:\ECO_projects\projects\99-0468\cd_apr\Roads with Grid 8 - Figure 1

Table 2-1. Relative abundance of all species observed during the 2001 Sitewide surveys.

Species code	Common Name	Relative Abundance
ODHE1	Mule deer	44.283
ANPL1	Mallard	17.412
PSTR1	Boreal chorus frog	4.054
FUAM1	American coot	3.378
AYCO1	Ring-necked duck	3.222
POPO1	Pie-billed grebe	3.170
CALA1	Coyote	2.235
BUAL1	Bufflehead	1.871
ANCR1	Green-winged teal	1.715
ANDI1	Blue-winged teal	1.663
ODVI1	White-tailed deer	1.611
AYAM1	Redhead	1.611
FASP1	American kestrel	1.195
BUJA1	Red-tailed hawk	1.143
PHAU1	Double -crested cormorant	1.091
ANST1	Gadwall	1.091
BUVI1	Great horned owl	1.040
BRCA1	Canada goose	0.988
CHPI1	Western painted turtle	0.780
ARHE1	Great blue heron	0.780
BULA1	Rough-legged hawk	0.780
CICY1	Northern harrier	0.728
BUCL1	Common goldeneye	0.676
AQCH1	Golden eagle	0.624
SYAU1	Desert cottontail	0.520
MEME1	Common merganser	0.520
CYLU1	Black-tailed prairie dog	0.416
ANCY1	Cinnamon teal	0.312
PEER1	American white pelican	0.260
ONZI1	Muskrat	0.156
BUSW1	Swainson's hawk	0.104
BURE1	Ferruginous hawk	0.104
FAME1	Prairie falcon	0.104
AYAF1	Lesser scaup	0.104
CEEL1	Elk	0.052
EGTH1	Snowy egret	0.052
NYNY1	Black-crowned night-heron	0.052
PRLO1	Raccoon	0.052
CAAU1	Turkey vulture	0.052



2001 Annual Deer Use at Rocky Flats

Figure 2-2

LEGEND

- Low Density (1-5 observations)
- Medium (6-15 observations)
- High (16+ observations)

Standard Features

- Buildings
- Demolished Buildings
- Lakes & ponds
- Streams & ditches
- Fences
- Paved roads
- Dirt roads
- Contours (20 ft. intervals)

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G REI, Las Vegas.
Digitized from the orthophotographs, 1/85.

N

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1000 0 1000 2000 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: LABAT — For: Kaiser-Hill Company, LLC

RFETS GIS Dept. 303-966-7707

MAP ID: 02-0011 July 23, 2002

O:\Projects\FY2002\02-0011\200 deer.apr

Figure 2-3. Total number of mule deer in winter (1994-2001)

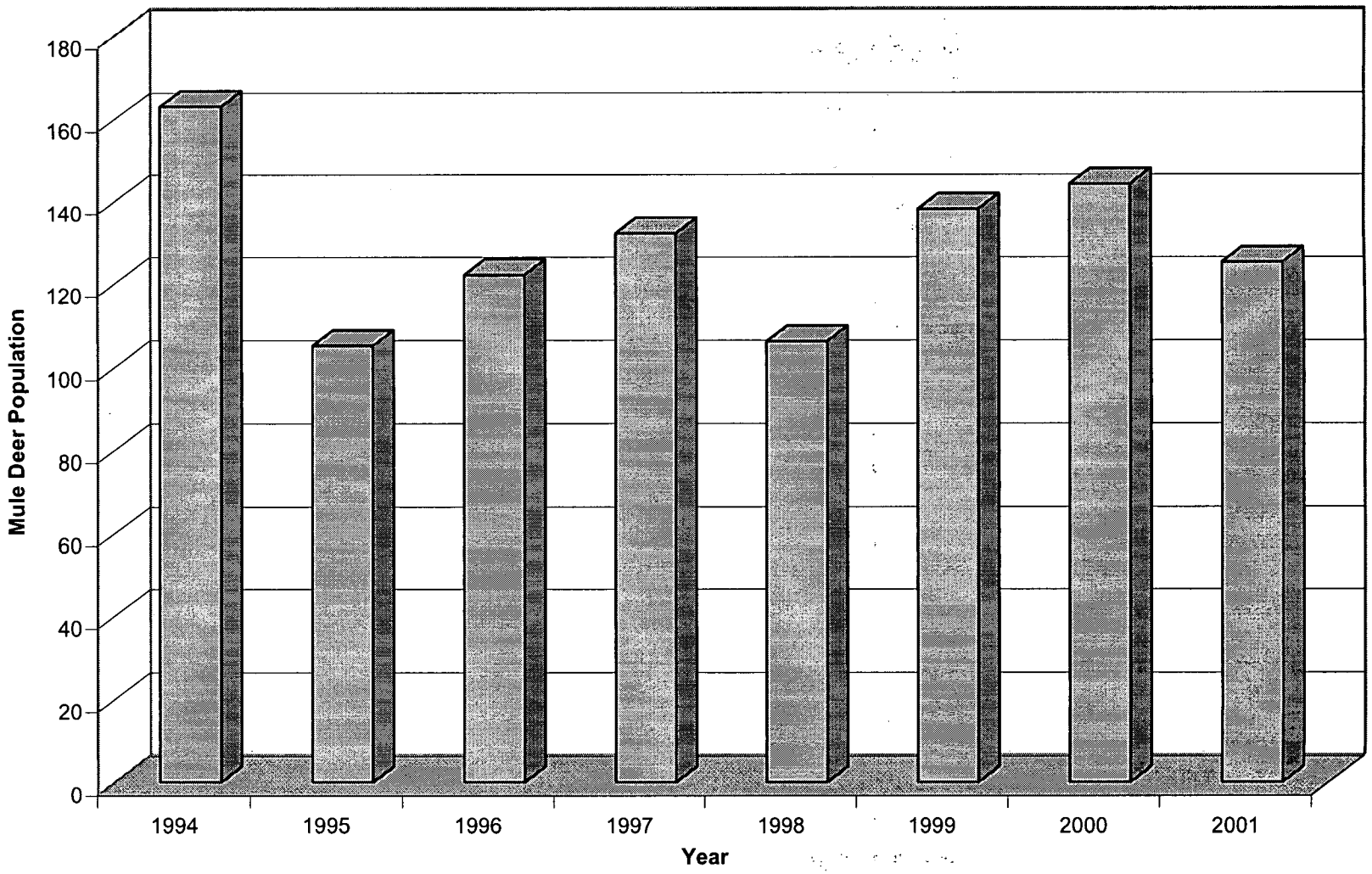


Figure 2-4. Comparison of waterfowl species numbers observed at Rocky Flats (1999 - 2001)

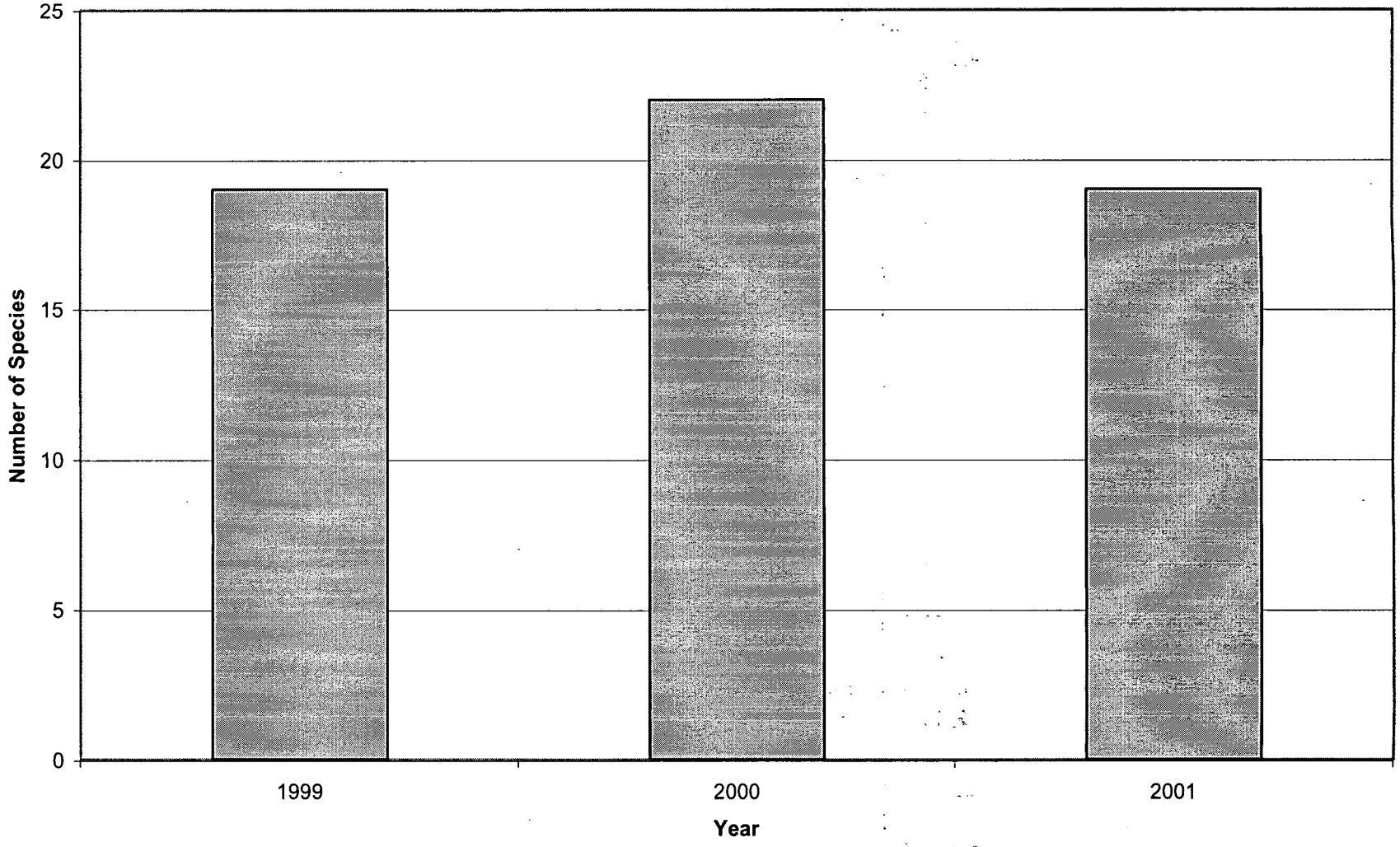


Figure 2-5. Relative abundance of coyotes at Rocky Flats (1999-2001)

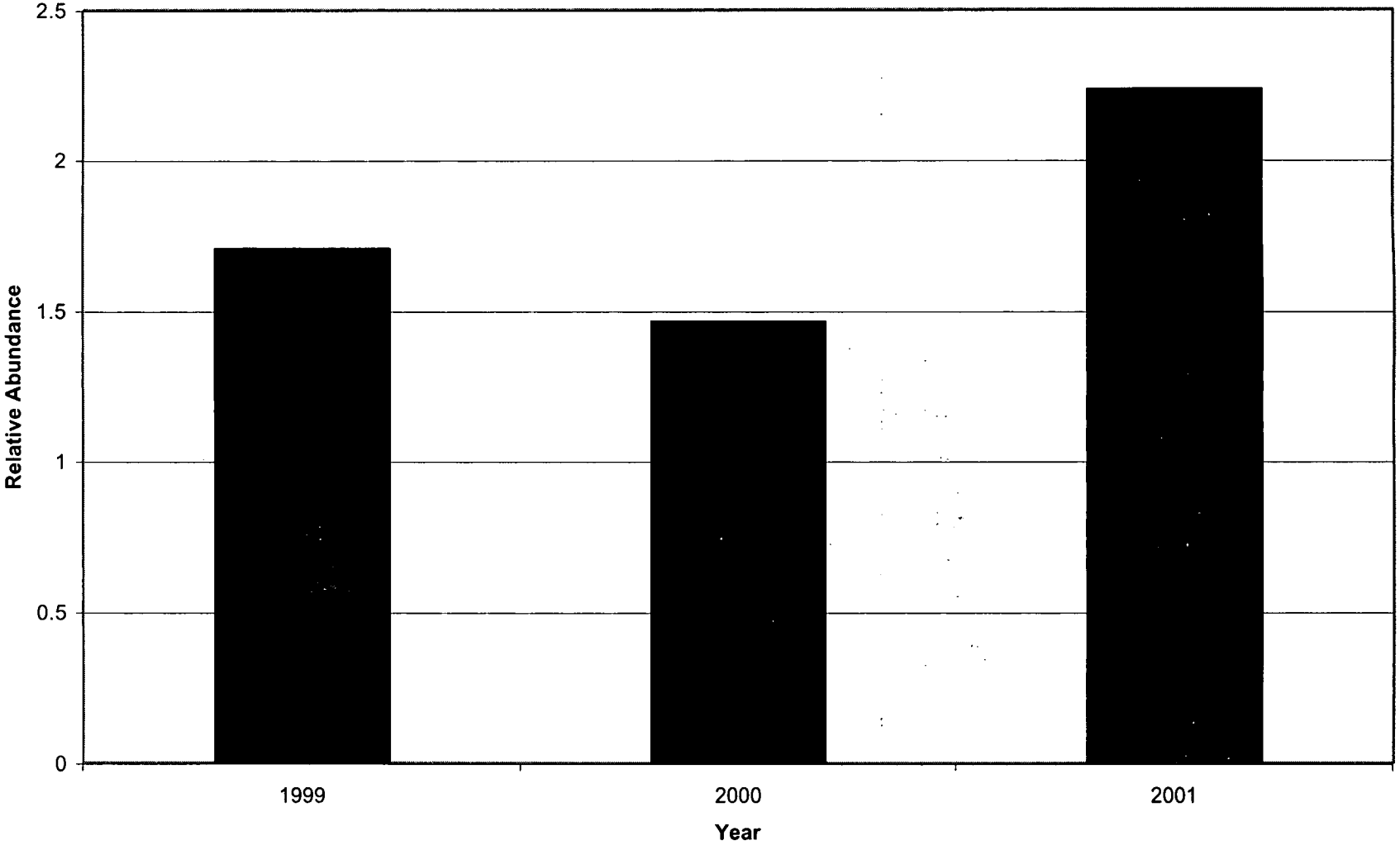
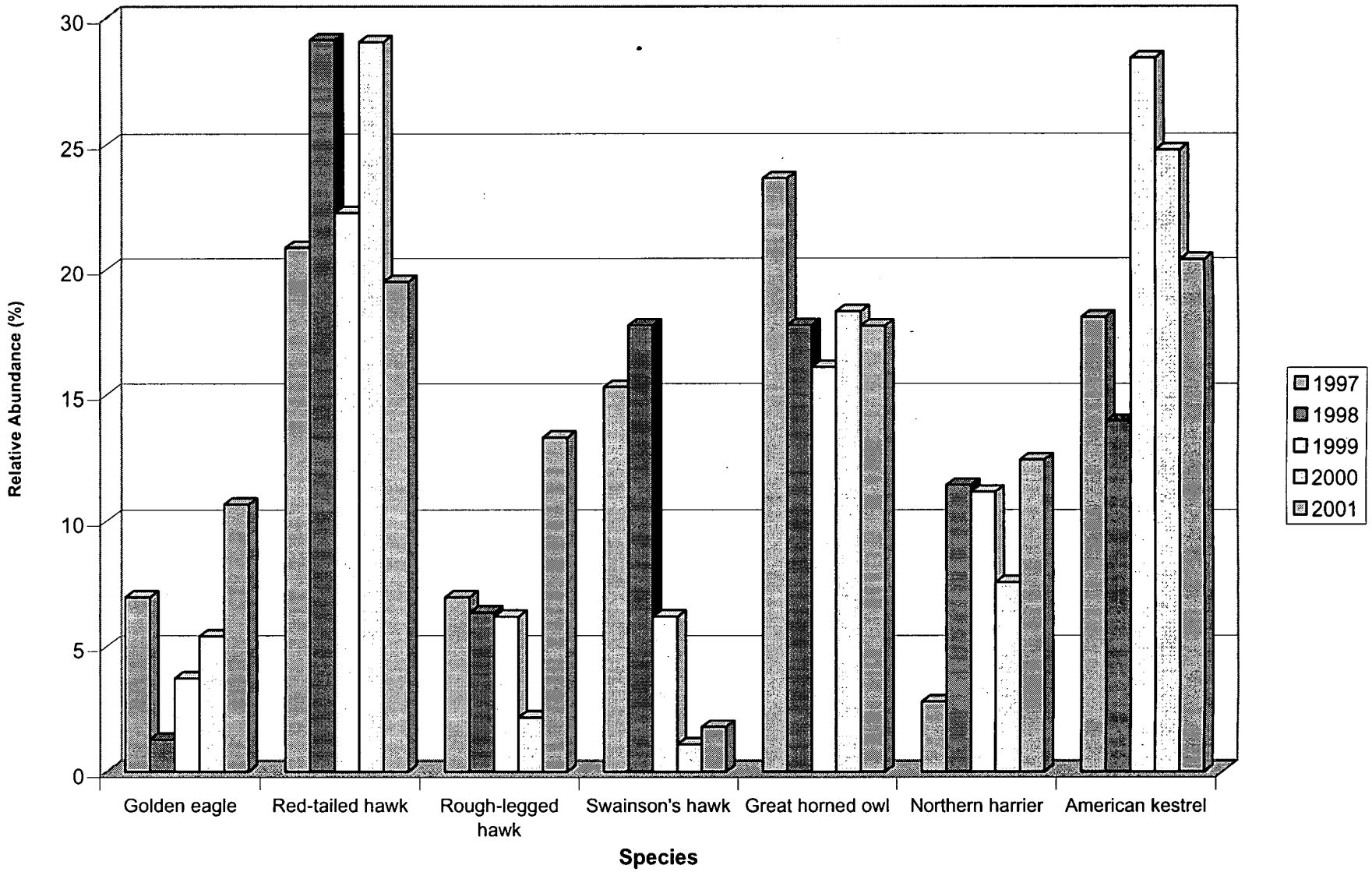


Figure 2-6. Relative abundance of common raptor species (1997-2001)



3. Multi-Species Census Survey

3.1 Introduction

Wildlife at Rocky Flats has been monitored at the Site since the early 1990's. Several methodologies have been used over the years to document the presence and abundance of different wildlife groups that occur at the Site. Multi-species surveys were designed to document all wildlife species that occur in the different habitat types in the Buffer Zone.

The questions under investigation from the multi-species census surveys are:

- What is the relative abundance of the different wildlife species at the Site?
- What species within the different wildlife groups (mammals, herptiles, raptors, waterfowl, and songbirds) are most abundant at the Site?

3.2 Methods

In 2001, multi-species census surveys were performed monthly on 16 established survey routes (Figure 3-1). Monthly performance of these surveys allows collection of data to estimate the relative abundance of significant species year-round. These surveys were performed in accordance with procedures described in the *EMD Operating Procedures Manual Volume V* (DOE 1994a). Surveys were performed by a qualified ecologist who walked established transects and recorded data for all animal species observed during the survey. Data was entered into an electronic database and quality checked for accuracy prior to analysis. Relative abundance was calculated using the following formula:

RA = (total number of observations of species X / total number of observations for all species) * 100.

Relative abundance was calculated across the entire year using all transects combined.

3.3 Results and Discussion

A total of 157 species of wildlife were observed during multi-species surveys in 2001. As expected, the most common animals observed during the census surveys at the Site were birds (Table 3-1). Red-winged blackbirds, vesper sparrows, and meadowlarks were the most frequently observed songbirds, while the great horned owl and the red-tailed hawk were the most common raptors. Mallards were the most frequently observed waterfowl (Table 3-2). Herpetiles were also fairly abundant, accounting for over nine percent of all animal species observed (Table 3-2). The most common amphibian was the northern leopard frog. Mule deer and coyotes were the most common mammals observed during the census surveys. Figure 3-2 compares mule deer and coyote abundance from 1999 to 2001. Coyote abundance has remained stable while mule deer abundance has increased slightly each year. This increase could be due to good range condition and the protection afforded them by the prohibition of hunting at the site. The lack of disturbance in the Buffer Zone provides protection from stress and could promote a good fawn survival rate.

3.4 Conclusions

During 2001, multi-species census surveys documented a wide range of wildlife species that use the habitat in the Buffer Zone at the Site. Although many species reside at the Site year-round, many species, especially the birds utilize the Site during different times of the year (migration, nesting). The diversity of wildlife in the Buffer Zone continues to substantiate the high quality of habitat available at the Site.

Locations of multi-species census survey transects.

Figure 3-1

LEGEND

- Active survey transects
- Discontinued survey transects
- Rocky Flats grid

Standard Features

- Dirt roads
- Paved roads
- Streams & ditches
- Fences
- Contours (25 ft)
- Buildings & structures
- Lakes & ponds

Transect locations and lengths are approximate.

DATA SOURCE:
Transects & grid provided by Exponent, 2000.
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs, 1/85
Hypsography derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours.
The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~10 meter resolution.
The DEM post-processing performed by MK, Winter 1997.

N

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1000 0 1000 2000 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: LABAT

For: Kaiser-Hill Company, LLC

MAP ID: 2K-0208

May 8, 2000

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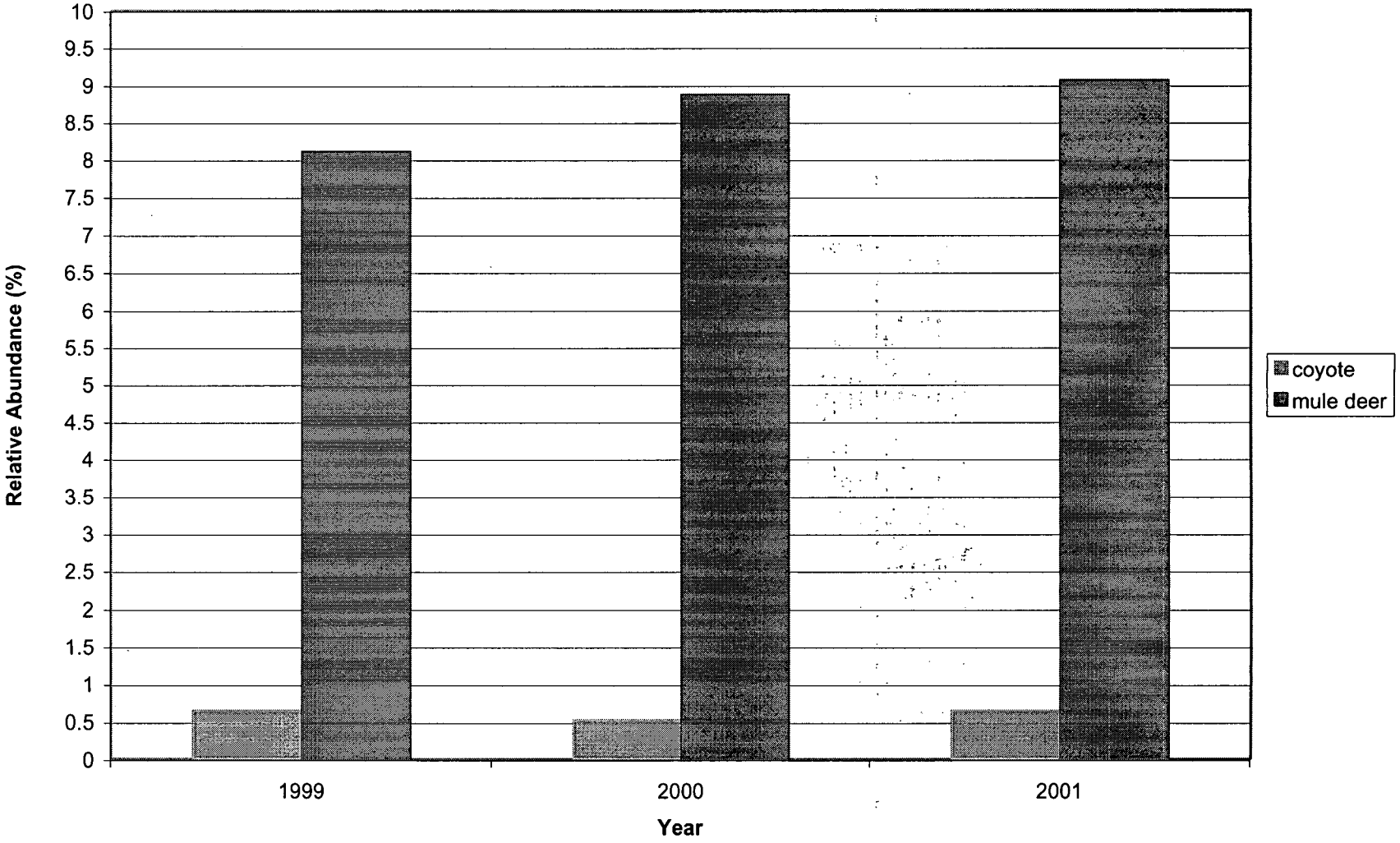
Table 3-1. Songbird species observed during 2001 multi-species census surveys

Species Code	Common Name	Relative Abundance	Species Code	Common Name	Relative Abundance
AGPH1	Red-winged blackbird	10.238	SASA1	Say's phoebe	0.291
POGR1	Vesper sparrow	6.876	TYTY1	Eastern kingbird	0.291
STNE1	Meadowlark	5.852	CHGR1	Lark sparrow	0.221
STVU1	European starling	4.386	WIPU1	Wilson's warbler	0.221
CAME2	House finch	3.390	ZOLE1	White-crowned sparrow	0.221
SPAR1	American tree sparrow	3.348	ERAL1	Horned lark	0.152
PIPI1	Blackbilled magpie	3.251	JUHY1	Dark-eyed junco	0.097
MEME2	Song sparrow	3.099	RECA1	Ruby-crowned kinglet	0.083
CATR1	American goldfinch	3.071	COSO1	Western wood pewee	0.069
ZEMA1	Mourning dove	2.836	CALA1	Lapland longspur	0.055
GETR1	Common yellowthroat	1.965	COCO1	Common raven	0.055
PIER1	Spotted towhee	1.951	VEVI1	Virginia's warbler	0.055
ICGA1	Northern oriole	1.467	DECO1	Yellow-rumped warbler	0.042
PAAT1	Black-capped chickadee	1.079	OPTO1	MacGillivray's warbler	0.042
AMSA1	Grasshopper sparrow	1.065	PIPU1	Downy woodpecker	0.042
MOAT1	Brown-headed cowbird	0.941	SEPL1	Broad-tailed hummingbird	0.042
HIPY1	Cliff swallow	0.844	SERU1	Rufous hummingbird	0.042
TUMI1	American robin	0.802	ANRU1	American pipit	0.028
TYVE1	Western kingbird	0.761	CAME3	Lark bunting	0.028
DEPE1	Yellow warbler	0.719	CHMI1	Common nighthawk	0.028
GUCA1	Blue grosbeak	0.678	CYCR1	Blue jay	0.028
COAU1	Northern flicker	0.567	LALU1	Loggerhead shrike	0.028
EUCY1	Brewer's blackbird	0.540	POCA2	Blue-gray gnatcatcher	0.028
XAXA1	Yellow-headed blackbird	0.470	SAPH1	Eastern phoebe	0.028
TRAE1	House wren	0.429	CEAL1	Belted kingfisher	0.014
ICVI1	Yellow-breasted chat	0.415	DUCA1	Gray catbird	0.014
CAPS1	Lesser goldfinch	0.360	QUQU1	Common grackle	0.014
HIRU1	Barn swallow	0.332	SPPA1	Chipping sparrow	0.014
PICH1	Green-tailed towhee	0.291	VECE1	Orange-crowned warbler	0.014

Table 3-2. Mammal, amphibian, raptor, and waterfowl species observed during 2001 multi-species census surveys

Species Code	Common Name	Relative Abundance	Species Code	Common Name	Relative Abundance
	MAMMALS			WATERFOWL	
ODHE1	Mule deer	9.062	ANPL1	Mallard	6.212
ODVI1	White-tailed deer	0.457	ANDI1	Blue-winged teal	0.982
CEEL1	Elk	0.097	FUAM1	American coot	0.955
			BRCA1	Canada goose	0.927
CALA1	Coyote	0.650	POPO1	Pie-billed grebe	0.761
FECO1	Mountain lion	0.028	BUAL1	Bufflehead	0.664
LYRU1	Bobcat	0.014	ANCR1	Green-winged teal	0.609
URAM1	American black bear	0.014	AYCO1	Ring-necked duck	0.609
			CHVO1	Killdeer	0.415
SYAU1	Desert cottontail	0.152	GAGA1	Common snipe	0.415
CYLU1	Black-tailed prairie dog	0.111	PHAU1	Double-crested cormorant	0.304
ONZI1	Muskrat	0.014	ANCY1	Cinnamon teal	0.263
SCNI1	Eastern fox squirrel	0.014	ARHE1	Great blue heron	0.235
			ANST1	Gadwall	0.221
	RAPTORS		ACMA1	Spotted sandpiper	0.097
BUVI1	Great horned owl	0.553	BUCL1	Common goldeneye	0.042
BUJA1	Red-tailed hawk	0.512	ANCL1	Northern shoveler	0.028
FASP1	American kestrel	0.374	AYAM1	Redhead	0.028
CICY1	Northern harrier	0.152	AYVA1	Canvasback	0.028
AQCH1	Golden eagle	0.111	TRSO1	Solitary sandpiper	0.028
BULA1	Rough-legged hawk	0.083	LADE1	Ring-billed gull	0.014
BUSW1	Swainson's hawk	0.042	LOCU1	Hooded merganser	0.014
BURE1	Ferruginous hawk	0.028	NYNY1	Black-crowned night-heron	0.014
ACST1	Sharp-shinned hawk	0.014	PEER1	American white pelican	0.014
	AMPHIBIANS/REPTILES				
RAPI1	Northern leopard frog	5.548			
PSTR1	Boreal chorus frog	1.633			
CHPI1	Western painted turtle	1.093			
RACA1	Bullfrog	0.913			
CRVI1	Prairie rattlesnake	0.014			

Figure 3-2. Mule deer and coyote relative abundance from 1999-2001



4. Boreal Chorus Frog Vocalization Monitoring

4.1 Introduction

As a taxonomic group, the frogs and toads at the Site are only occasionally recorded during normal wildlife monitoring. Until vocalization monitoring was instituted in 1998, most observations of amphibians had been fortuitous. Although this approach provided an annual presence/absence record for these species at the Site, the lack of a repeatable monitoring methodology prevented effectively tracking population abundance or the distribution of these species on Site. Because such information can provide additional insight and act as an additional tool for detecting changes in the health of the Site aquatic ecosystems, monitoring for these species has been instituted. Amphibians are an important group to track because their semi-aquatic nature makes them particularly sensitive to aquatic impacts (Blaustein 1995). The boreal chorus frog (*Pseudacris triseriatus*) was chosen as the best candidate for vocalization monitoring. This species can also serve as an indicator species for tracking general amphibian population abundance on the Site.

4.2 Methods

The methods used for the amphibian vocalization surveys in 2001 generally followed the guidelines provided in Mossman et al. (1998). Additional information used for the surveys was taken from the Wisconsin Department of Natural Resources (Mossman and Hine 1984, 1985) and the National Biological Survey (NBS 1997). Some modification of these guidelines was necessary to adapt the surveys for use at the Site.

A total of 20 locations were sampled for species presence/absence and population abundance in 2001 (Figure 4-1). This approach followed the modifications of the protocol implemented in 1999 (K-H 2000). The 20 locations were divided almost evenly between the north and south Buffer Zone areas (using the east and west access roads as the dividing line between north and south). Eleven sites were in the north Buffer Zone and nine were in the south Buffer Zone. Monitoring was conducted in the north and south Buffer Zone on two separate nights, starting at dusk, to keep the total sampling time each evening within two hours of sunset. In 2001, surveys were conducted on April 30 and May 11. All comparisons between 2001 data and 1998 – 2000 data were performed using only the locations that were sampled during all four years.

Vocalizations were categorized using one of the following vocalization indices:

0 = No calling heard.

1 = Individuals can be counted; calls not overlapping, there is space between calls.

2 = Calls of individuals are distinguishable but some calls overlap.

3 = Full chorus; numerous frogs can be heard; calls are constant, continuous, and overlapping.

Additional information recorded at each survey location included: air temperature (°C), water temperature where feasible (°C), wind speed, cloud cover, precipitation, and noise interference.

4.3 Amphibian Monitoring Data Results /Analyses

Boreal chorus frogs were recorded at all 20 of the sample locations (100%) surveyed in 2001. Fifty percent of the locations sampled had full choruses of calling frogs (vocalization index 3), 25 percent had multiple individuals calling with overlaps between the calls (vocalization index 2) and twenty-five had individuals calling with no overlap in calls (vocalization index 1). The distribution of boreal chorus frog vocalization indices for the 2001 Site survey is shown in Figure 4-2.

On the evenings when sampling was conducted, the average water and air temperatures were 14.2°C and 11.1°C, respectively. Cloud cover averaged about 50 percent on April 30 and 20 percent on May 11.

Data from 1998 through 2001 was compared using only the locations that were sampled during all four years. Table 4-3 shows the data from the 16 comparable sample sites. The number of sites with any vocalization (vocalization index 1, 2 and 3) increased from 15 sites in 2000 to 16 sites in 2002, an increase of about 6 percent. The mean vocalization index for 2001 increased from 2.06 in 2000 to 2.31, which is an increase of 12 percent. The most dramatic increase is a 60 percent increase from year 2000 to year 2001 in the number of sample sites with full choruses (vocalization index 3). The increase in the frog populations at the Site is probably due to the increase in rainfall in 2001. The average monthly rainfall for 2001 was 1.33 inches, which is a 22 percent increase from the previous year. Because amphibian species are semi-aquatic they are often considered good indicators of aquatic community change (Blaustein 1995). The presence and general abundance of the boreal chorus frogs at the Site provide evidence of the high quality wetland and aquatic environments that occur in the Buffer Zone at the Site.

4.4 References

Blaustein, A.R., and D.B. Wake. 1995. The puzzle of declining amphibian populations. Scientific American 272(4):52–57.

K-H. 2000. 1999 annual wildlife report for Rocky Flats Environmental Technology Site. Prepared by Exponent for Kaiser-Hill Company, LLC. Rocky Flats Environmental Technology Site, Golden, CO. (June).

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Mossman, M.J., L.M. Hartman, J. Hay, and J. Sauer. 1998. Monitoring long term trends in Wisconsin frog and toad populations. Ch. 21. In: Lannoo, M.J. (ed.). Status and conservation of Midwestern amphibians. University of Iowa Press, Iowa City, IA.

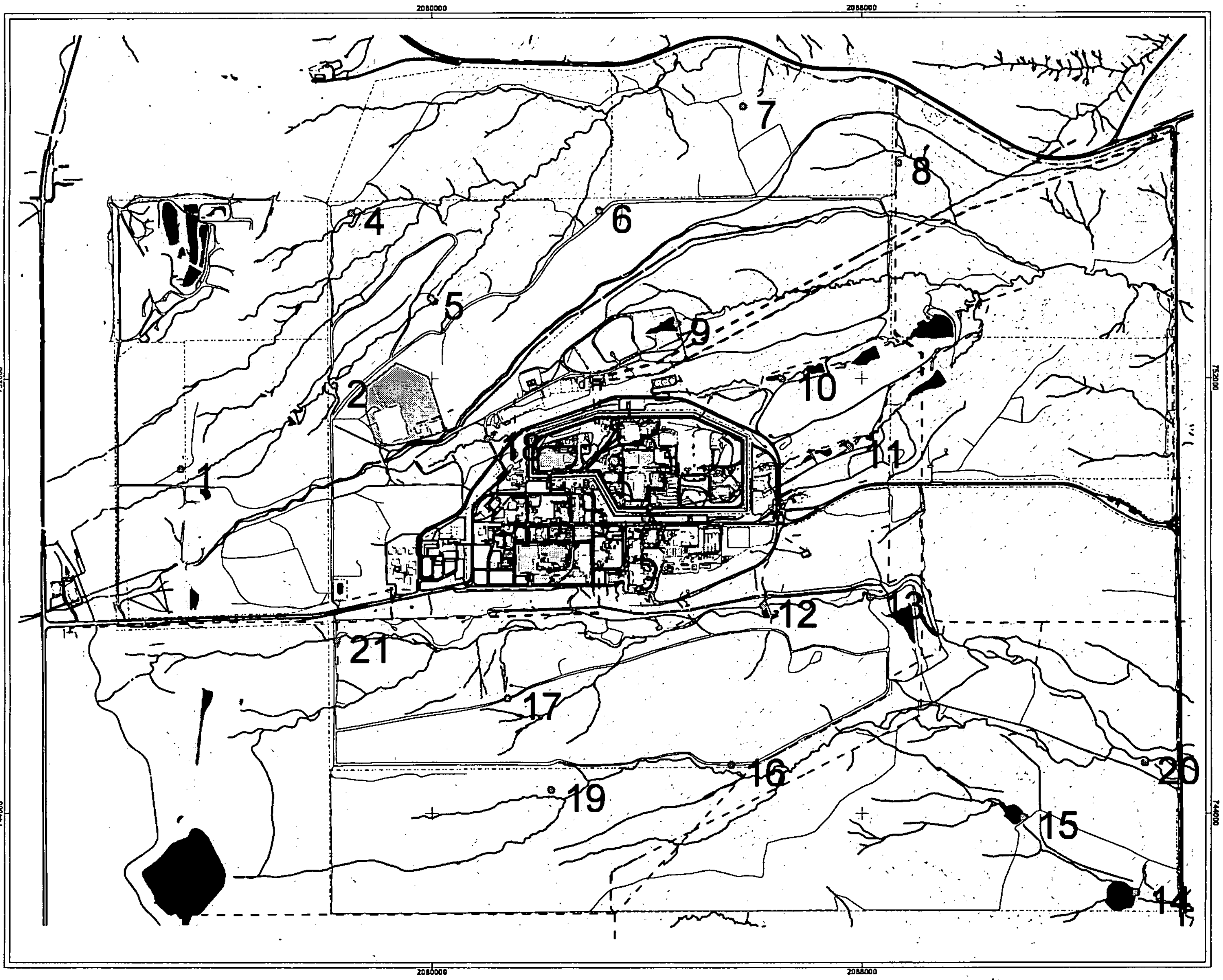
Mossman, M.J., and R. Hine. 1984. The Wisconsin frog and toad survey: Establishing a long-term monitoring program. Wisconsin Endangered Resources Report 9. Wisconsin Department of Natural Resources, Bureau of Endangered Resources, Madison, WI.

Mossman, M.J., and R. Hine. 1985. Wisconsin's frog and toad survey, 1984. Wisconsin Endangered Resources Report 16. Wisconsin Department of Natural Resources, Bureau of Endangered Resources, Madison, WI.

NBS. 1997. Calling amphibian surveys. Online protocols for amphibian monitoring. Http://www.im.nbs.gov//amphib/naampcall.html. National Biological Survey.

2001 Boreal Chorus Frog Monitoring Locations

Figure 4-1



LEGEND

Boreal Chorus Frog Monitoring Locations

Standard Features

Buildings
Lakes & ponds
Landfill
Streams & ditches
Fences
Paved roads
Dirt roads
Contours (20 ft)
Power Lines

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs, 1/95
Hypsography derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours.
The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~10 meter resolution.
The DEM post-processing performed by MK, Winter 1997.

Data Source Ecology Features:
Location data provided by LABAT
Locations are approximate.
K-H Ecology Group POC; Karan North 303-966-8876.

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1000 0 1000 2000 Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: LABAT

For: Kaiser-Hill Company, LLC

RFETS GIS Dept. 303-966-7707

MAP ID: 01-0458 July 23, 2002

Figure 4-2. 2001 Boreal Chorus Frog Vocalization Index Frequency Summary

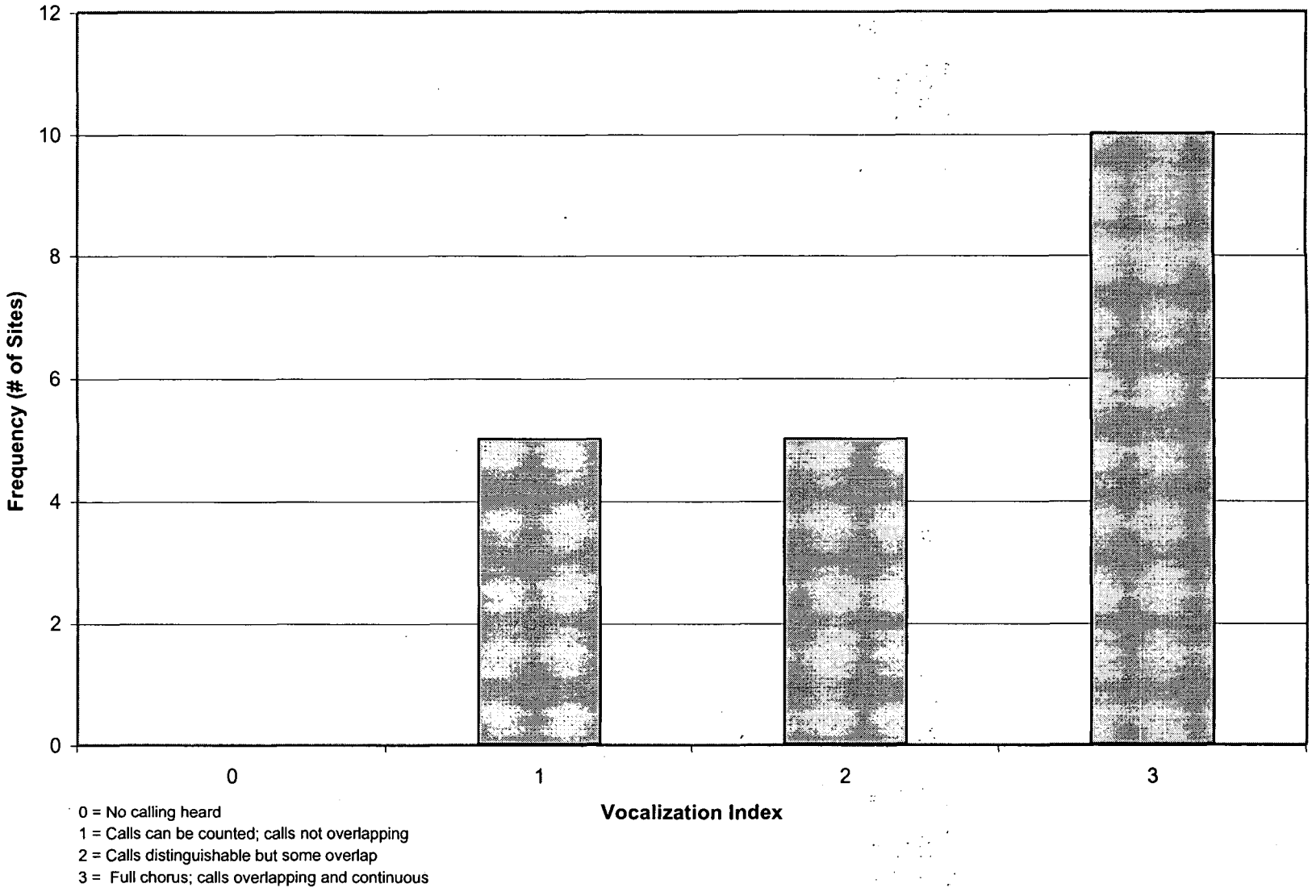
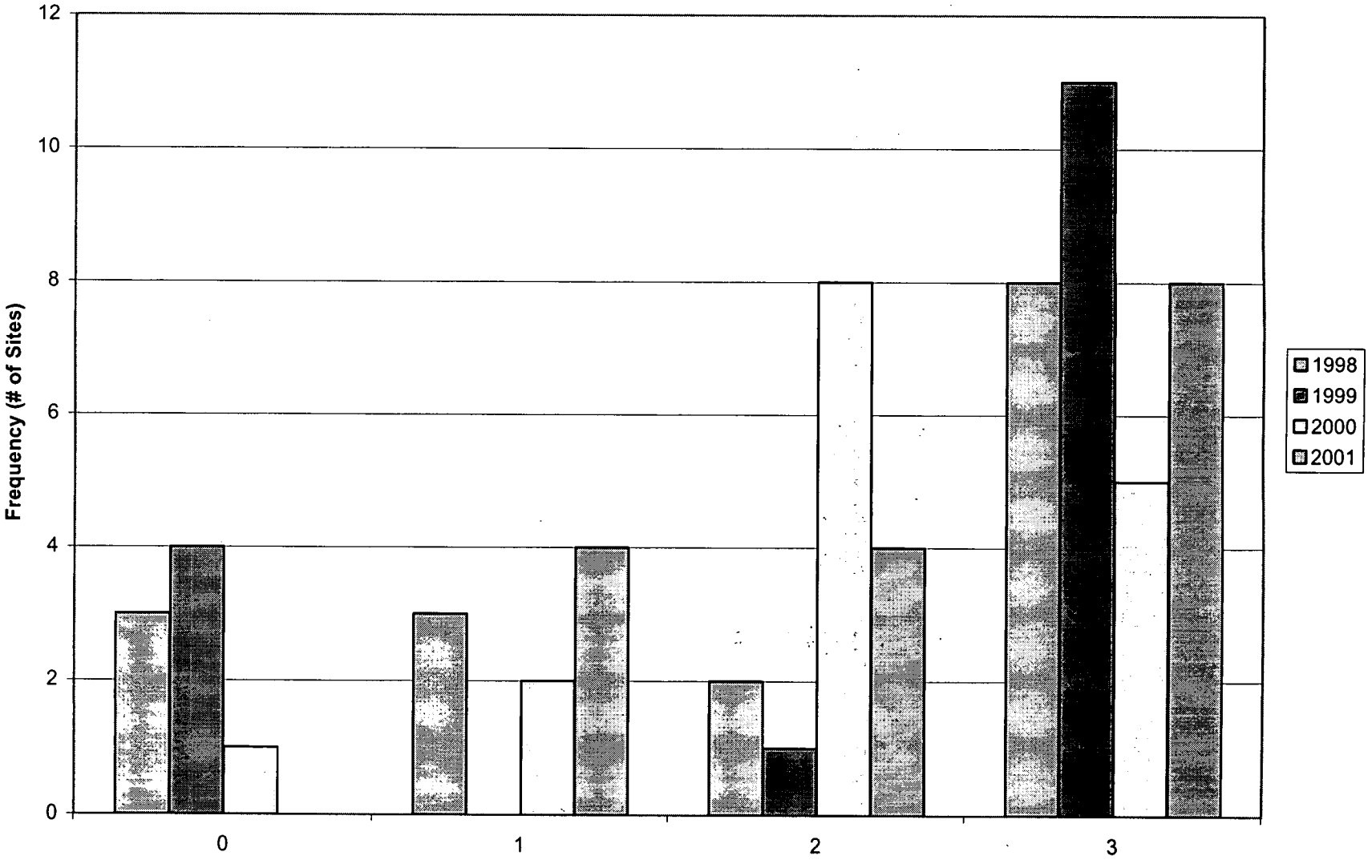


Figure 4-3. 1998-2001 Boreal Chorus Frog Vocalization Index Frequency Summary



0 = No calling heard
1 = Calls can be counted; calls not overlapping
2 = Calls distinguishable but some overlap
3 = Full chorus; calls overlapping and continuous

Data based only on the 16 locations sampled in common across all four years.

5. 2001 Preble's Mouse Monitoring

5.1 Introduction

Since 1995, small mammal monitoring at the Rocky Flats Environmental Technology Site (Site) has concentrated on collecting natural history, habitat characterization, and population data on the Preble's meadow jumping mouse (Preble's mouse; *Zapus hudsonius preblei*). The Preble's mouse has been the focus of interest since it was listed as threatened under the Endangered Species Act. It is the only year-round resident species at the Site that is protected by the federal Endangered Species Act.

Since 1991, all drainages on the Site have been surveyed for Preble's mice, with the main channels of Rock Creek, Walnut Creek, and Woman Creek having been the subject of intensive trapping efforts. In 2001, Preble's mouse monitoring took place in the riparian habitat of Smart Ditch and Woman Creek. In addition to the trapping efforts, habitat characterization was conducted in Smart Ditch to determine if the habitat at Smart Ditch exhibits different characteristics than other drainages on Site.

Smart Ditch, a tributary of Woman Creek, begins at Rocky Flats Lake and drains to its confluence with Woman Creek. This drainage had previously been subject to limited Preble's mouse trapping. A single Preble's mouse was captured in Smart Ditch in 1993 (DOE 1994a), but none were observed in a subsequent effort in 1996. Suitable habitat for Preble's mice exists along the central portion of Smart Ditch, but the degree to which this habitat is occupied was unknown. Stream flow is largely dependent on the discharge of private water rights from Rocky Flats Lake, and the channel is often dry. Suitable areas of Smart Ditch were trapped in 2001 to ascertain if the Preble's mouse was still present, and to determine population locations and estimated abundance. Habitat characterization was done on the areas trapped.

Preble's mouse monitoring in Woman Creek during 2001 concentrated in areas where second session 2000 captures were most numerous. In 2000, Preble's mice were captured all along areas of contiguous habitat in Woman Creek from the western boundary fence to Pond C-2 (K-H 2001a). The majority of second session captures occurred along the downstream two-thirds of this portion of the creek. This was consistent with the current theory that Preble's mice follow the presence of free water and will migrate with the available water as the headwaters of a stream dry up over the summer (Meaney et al. 2000; Shenk 2000, pers. comm.; K-H 2001a). To add a measure of over-winter survival to current population demographic estimates (K-H 2001a), these high-probability areas of Woman Creek were trapped in spring 2001 to attempt recapture of marked individuals after they emerged from hibernation.

5.2 Study Objectives

The objectives of the 2001 Preble's trapping effort were to:

- Obtain a population estimate of Preble's mice in the Smart Ditch drainage.
- Characterize the available Preble's mouse habitat in the Smart Ditch drainage and compare to the other drainages at the Site.
- Attempt to obtain an estimate of over-winter survival for Preble's mice by re-trapping areas where individuals were captured during 2000 in Woman Creek.

5.3 Methods

5.3.1 Sample Site Selection and Trapping

During each portion of the 2001 monitoring effort, trapping for Preble's meadow jumping mice followed the procedures for small mammals outlined in the *EMD Operating Procedures Manual Volume V* (DOE 1994b), and conformed to the U.S. Fish and Wildlife Service *Interim Survey Guidelines for Preble's Meadow Jumping Mouse* (USFWS 1999).

Animals were trapped in Sherman small-mammal live traps using Purina® Sweet Feed as bait, unless otherwise noted. Every small mammal captured was identified by species, age, and sex. Any evidence of breeding activity, such as lactating or pregnant females and breeding males, was also noted. All Preble's mice captured were measured for key identifying characteristics, including head and body length, ear length, tail length, hind-foot length, and body weight. All data was recorded on approved field data sheets, entered into the Ecology database, verified, and validated. Weather conditions at the time the traps were checked were also recorded.

5.3.2 Smart Ditch

Smart Ditch was selected for the 2001 effort in keeping with the staggered schedule called for by the Site Integrated Monitoring Plan (K-H 1999). The intent of monitoring each population center only every few years is to minimize the habitat damage and stress to the population that can result from intensive trapping programs.

In 2001, trapping took place in Smart Ditch during two sessions, early (June 11-28) and late (August 20-September 2). In the first session, eight trap sites were selected at random from the sampling frame (Figure 5-1). Random selection is required for deriving population estimates from the mark-recapture data. However, after no Preble's mice were caught within these sites during the first session, the focus shifted to determining presence/absence of Preble's mice. Therefore, during the second trapping session, eight sites were selected based on apparent habitat quality (Figure 5-1). For both sessions, 50-trap transects were established within each selected sampling site. Traps were laid as two rows of 25 each running parallel to the stream channel in appropriate habitat. The traps were spaced approximately 5-m apart, with the two parallel rows about 10-m apart. A transect is considered a representative sample of the 1-hectare (ha) site.

During the first session, each transect was run for seven consecutive days. The seven-day trapping period approximates a "closed population" (i.e., no migration or deaths), while still allowing for multiple mark-recapture estimates to be made. A closed site is a basic assumption for making mark-recapture population estimates (White et al. 1982). All second session transects were also to be run for seven days, but a staff injury resulted in a schedule adjustment. Four of the eight transects were run for seven days, with the other four run for three days.

5.3.3 Woman Creek

Nine out of twelve transects run in Woman Creek in 2000 had Preble's mouse captures. 2001 trapping efforts for Woman Creek were conducted early in the season (June 4-8) and in areas where Preble's mice were known to be late in the summer in 2000. New transects were laid and run with the aim of maximizing the possibility of recaptures, rather than attempting to duplicate the level of effort or exact transect positions in 2000. As such, four transects of 50 traps each (following the basic layout described

above for Smart Ditch) were laid out along Woman Creek in what were anticipated to be the most likely areas for success (Figure 5-1). These transects were run for five consecutive days.

5.3.4 Marking of Individual Small Mammals

All Preble's mice captured were scanned with a passive integrated transponder (PIT) tag reader to determine if they had been previously marked. Every new (unmarked) individual Preble's mouse captured was marked using a PIT tag, which serves as permanent identification for that individual. Population estimation using traditional mark-recapture methodology requires that every individual captured be uniquely marked.

5.3.5 Habitat Characterization of Smart Ditch

Preble's mouse habitat was characterized at the trap station (microsite) level for Smart Ditch only. Habitat characterization was conducted in July at all first session sampling sites. Ten individual trap stations from each site were characterized and the data pooled to characterize the entire transect. The ten stations are predetermined as stations 2, 7, 12, 17, 21, 28, 32, 36, 42, and 46.

Three different types of habitat information were gathered within a 3-m radius (28.3 m^2) of the selected trap stations: plant species composition, physical habitat, and vegetation structure. Physical habitat composition measurements are non-vegetative, abiotic features of the habitat.

Characterizing plant species composition entailed identifying the habitat types, determining the plant species richness within the 3-m radius (center located at the trap station), and noting all woody species that made up the canopy at the trap station.

Eight physical measurements were taken: 1) the trap position in relation to the canopy, 2) slope aspect, 3) slope angle, 4) slope position, 5) moisture gradient, 6) soil texture at the trap station, 7) distance to the stream and if the trap station is outside of the canopy, and 8) distance to the nearest continuous woody riparian canopy. Table 1 lists the habitat endpoints and the methods used to measure them.

The following three vegetation structural measurements were made at each trap station: 1) tree/shrub canopy cover; 2) vertical vegetation density; and 3) a visual estimate of foliar cover for trees, shrubs, subshrubs, grass, and forbs.

Tree/shrub canopy cover was measured using a spherical crown densiometer placed 1 m above the ground at the center of the 3-m radius. A vegetation profile board (1-m^2 graduated by decimeters; after Nudds 1977), read at a distance of 10-m, was used to measure vertical vegetation density. Foliar cover estimates were determined using cover classes (Table 2).

5.4 Results

5.4.1 Smart Ditch Monitoring Trapping Results

Trapping effort in Smart Ditch totaled 4,800 trap nights in 2001 (2,800 first session, 2,000 second session). During these trap nights, 936 captures of nine small mammal species were made. Only one capture was a Preble's mouse. Table 5-3(a) provides a breakdown by species, age, and sex of all captures made in Smart Ditch.

Averaged over all transects and both sessions, trap availability for the capture of Preble's mice was 79%, which is equivalent to 3,783 available trap nights over the season. Traps considered unavailable to

Preble's mice are those that captured other small mammal species, that were sprung but empty, that were disturbed by raccoons or other animals, or that were otherwise not functioning properly.

A single Preble's mouse was caught once in Smart Ditch in 2001. A juvenile female was captured at transect Z01-110 during the second trapping session (August 22, 2001). Naturally, calculation of a population estimate is not possible with only one capture. Other questions relating to demography and over-summer residency were also not feasible to answer given the low capture results.

5.4.2 Woman Creek Monitoring Trapping Results

Woman Creek was trapped for 5 days, June 4-8, resulting in 1,000 trap nights. During this effort, 348 captures of five small mammal species were made. Eighteen of these captures were of Preble's mice. Table 5-3(b) provides a breakdown by species, age, and sex of all captures made. Trap availability for the capture of Preble's mice in Woman Creek was 64%, or 636 trap nights.

The 18 captures of Preble's mice were of seven individuals, four males and three females, all adults. Three of the males were recaptures from 2000 (identified as mice #151, 162, and 163). All three had been classified as adults in 2000 based on weight. None had radio collars attached going into hibernation in 2000.

Six of the seven Preble's mice caught in Woman Creek in 2001 were subsequently recaptured one to three times. Mouse #167 was first captured on the last day of trapping, so there was no opportunity for recapture. Five of the six individuals with multiple captures did not move more than 56 m (184 ft) between captures, with average movement being 35 m (115 ft), based on straight-line distances between capture locations. Mouse #151, however, moved at least 452 m (1,483 ft) upstream within 24 hours. This is a minimum distance moved based on straight-line distances. If mouse #151 traveled along the stream channel, which is more likely, then the distance traveled is closer to 564 m (1,850 ft). A subsequent recapture of mouse #151 two days later was only 16 m (52 ft) away from the last point of capture. Most movement of recaptured individuals was not directional, but rather back and forth along sections of the creek channel. Of the mice that were recaptures from 2000, individuals #151 and #163 were both last recorded in 2000 approximately 100 m (328 ft) upstream from where they were initially captured in 2001. Mouse #162 was captured only 8 m (26 ft) in 2001 from where it was last captured in 2000.

5.4.3 Smart Ditch Habitat Characterization

Vegetation and physical measurements were made at all eight originally selected Smart Ditch sample sites in 2001 to describe Preble's mouse habitat. Table 5-4 summarizes the vegetation and physical characteristics measured at the eight sample sites, and compares these data to those gathered at Walnut Creek (1999), Rock Creek (1998), and Woman Creek (1997). The table is divided by year/location and by successful and non-successful sites. Successful sites were those where at least one Preble's mouse was trapped. Habitat characterization surveys were conducted for both successful and non-successful sites in 1997 and 2001, but were only conducted for the successful sites in 1998 and 1999. Only one sample site was successful in 2001, therefore no range of data was provided for that site. Habitat characterization data collected in 2000 was gathered using a different sampling method and has been excluded from the table.

Mean tree and shrub canopy, as measured with a spherical densiometer, was lower at the non-successful sites in Smart Ditch than all previously monitored successful trapping locations in Rock Creek, Walnut Creek, and Woman Creek. It was similar to the non-successful trapping locations in Woman Creek in 1997 and the one successful site from Smart Ditch in 2001. The mean woody index value was the second lowest observed from any of the drainages. The only lower value was from the non-successful sites in Woman Creek in 1997. Conversely the mean herbaceous index value was highest at the non-successful

sites in Smart Ditch in 2001 compared to all previous locations. One other interesting measure that was substantially different at non-successful sites is the distance to canopy edge. At all non-successful sites monitored since 1997 the mean distance to canopy edge has ranged from 24 to 27 meters, whereas at the successful sites the distances have all averaged less than 9 meters. The other vegetation and physical habitat characterization measurements in Smart Ditch during 2001 were all within range of either all or at least one of the values observed previously at other Preble's mouse sample sites. Statistical analyses of the habitat characteristic data was done previously (KH, 2000 add to references) to compare 1997, 1998 and 1999 data. No statistical analysis was conducted using the 2001 data.

A detrended correspondence analysis (DCA) ordination technique was used to summarize the multiple years of data from the Preble's habitat characterization data. This technique reveals patterns between sample sites (i.e. trapping transects) based on species richness. Results of a DCA are projected on to two dimensions in such a way that samples most similar to one another are close together, and samples most dissimilar from one another will appear farther apart (Gauch 1982). DCA ordination results based on species richness at each site for the years 1997, 1998, 1999 and 2001 are shown in Figure 5-2. The ordination results show a clear separation between the Smart Ditch (2001) sample site and the other three drainages on Site along Axis 1, signifying some differences in species richness.

5.5 Discussion

The overall capture rate (all small mammals) during trapping efforts in 2001 (Smart Ditch and Woman Creek) was the lowest since 1997 (Table 5-5a). Capture rate is defined as the number of captures per 100 trap nights. These results were similar to that found on the xeric mixed grasslands where low capture rates were also observed in 2001 compared to earlier studies (see the Xeric Grassland Small Mammal Monitoring section in this annual report).

5.5.1 Smart Ditch Trapping

Only one Preble's mouse was captured during 2001 in the Smart Ditch drainage. Smart Ditch does not flow year-round, and the channel was dry or contained only pools during most of the 2001 field season. Preble's mice require free drinking water and are known to follow the presence of flowing water over the duration of the active season (Wunder 1998; Meaney et al. 2000; Shenk 2000, pers. comm.; K-H 2001a). The presence of the single Preble's mouse caught along Smart Ditch in 2001 coincided with a brief period of flowing water. For four days in August (22-25), water flowed through a stretch of Smart Ditch about 1 km (0.6 mile) long. The Preble's mouse was captured within this area of flowing water, at site Z01-110. The channel above and below this area was completely dry, indicating that the flow must have originated from a hillside seep partway along the drainage, and either went underground again or was completely evapotranspired downstream by a relatively dense patch of willows immediately downstream of Z01-110.

In May, 1993, a single adult male Preble's mouse was captured roughly 200 m (656 ft) downstream of the 2001 Preble's mouse capture location. It seems likely that this area of Smart Ditch is a population sink for Preble's mice, that is, an area where individuals disperse to but apparently do not remain and/or survive to establish a viable population. The lack of continuously running water is undoubtedly the limiting factor, preventing such a population from establishing.

It is not known where the juvenile caught in 2001 originated, and where it went after it was released. This mouse might have immigrated from upstream Smart Ditch – though upstream areas with even marginal habitat were trapped during the first session without success. It may also have come from downstream Smart Ditch and/or the Woman Creek confluence – but stream channel of Smart Ditch downstream from Z01-110 was dry at the time, and remains dry most summers. Additionally, the reach of Woman Creek below Pond C-2 to which Smart Ditch is a tributary, has not yielded Preble's mouse captures. The water

rights ditch itself is likelier to have water if the owner is running water from Rocky Flats Lake, but suitable habitat is unavailable from the diversion point to the downstream stock ponds. Antelope Springs in the Woman Creek drainage is another potential source area. This would be approximately 800 m (2,600 ft) northwest from Z01-110 across a firebreak dirt road and over a hill with a xeric grassland community. Past telemetry results indicate that this travel corridor would be unlikely – particularly in light of the fact that no Preble's mice have yet been recorded in the Antelope Springs tributary of Woman Creek.

5.5.2 Woman Creek Trapping

Over-winter survival of Preble's mice appears relatively good in the Woman Creek drainage, given that 16% (3 out of 19) of the potentially surviving individuals caught in 2000 were recaptured in 2001 with only 13% of the trapping effort (1,000 trap nights versus 7,700). Two qualifications must be made regarding this statement: 1) the 2001 trapping survey in Woman Creek was designed to maximize the chance of recapturing individuals marked in 2000, whereas the 2000 effort was designed to randomly sample available habitat, and 2) only adult males without radio collars were re-captured in 2001, so that the apparent high rate of over-winter survival may not apply to juveniles, females, or individuals wearing collars.

The capture rate for Preble's mice in Woman Creek in 2001 (1.80 captures/100 trap nights) was almost four times higher than the capture rate in 2000 (0.47). There were also more recaptures of individuals in Woman Creek in 2001 than there have ever been recorded on the Site since individuals began to be reliably marked with PIT tags in 1998 (captures/individuals – 1998: 1.2, 1999: 1.5, 2000: 1.6, 2001: 2.6). Use of radio telemetry collars coincided with use of PIT tags from 1998 – 2000, whereas collars were not used in 2001. It is conceivable that the stress of being anaesthetized and fitted with a radio collar predisposed individuals to become trap shy (i.e., to avoid recapture).

5.5.3 Smart Ditch Habitat Characterization

In general, the means and range of values for most of the vegetation and physical parameters measured in Smart Ditch during 2001 were not different from values observed in Rock Creek, Walnut Creek, or Woman Creek during past monitoring efforts (Table 5-4). A few exceptions, however, were apparent. Spherical densiometer measurements of tree and shrub canopy cover were substantially lower for the non-successful locations as compared to successful locations across the Site (Table 5-4). Woody index values also paralleled this trend, suggesting that perhaps the non-successful locations have somewhat less tree and shrub cover than the mice might desire for protection from predators. Additionally, an absence or reduced amount of tree and shrub cover could correlate to less water availability for growth. It has been previously mentioned that Preble's mice require free drinking water and are known to follow the presence of flowing water over the duration of the active season (Wunder 1998; Meaney et al. 2000; Shenk 2000, pers. comm., K-H 2001a). Observations during 2001 continued to substantiate previous observations that little available surface water is present during the summers in Smart Ditch.

Distance to canopy edge was substantially different at the non-successful locations compared to the successful locations (Table 5-4). At the non-successful locations the distances from trap locations to a continuous canopy edge were much further than at successful locations. This makes sense if less tree and shrub canopy is available and might again relate to cover necessary for protection from predators and available water for growth.

The DCA ordination analysis also showed Smart Ditch as an outlier compared to the other drainages in terms of species richness (Figure 5-2). While this analysis does show a difference in vegetation species richness between Smart ditch and other drainages, the reason for this difference is not conclusive. Since

this area is known to have little surface water, the difference in species richness could be attributed to water. But without more hydrological studies this theory can not be substantiated.

5.6 Conclusions

Small mammal trapping for Preble's mice in the Smart Ditch drainage during 2001 resulted in a single capture. Habitat characterization results suggest less cover from trees and shrubs, possibly resulting from and/or in conjunction with less available free water in the stream in Smart Ditch may account for the few captures of mice in this drainage over the past several years. Additional trapping in Woman Creek resulted in several recaptures of mice that were tagged and released in 2000. These results suggest good overwinter survival of the mice.

5.7 References

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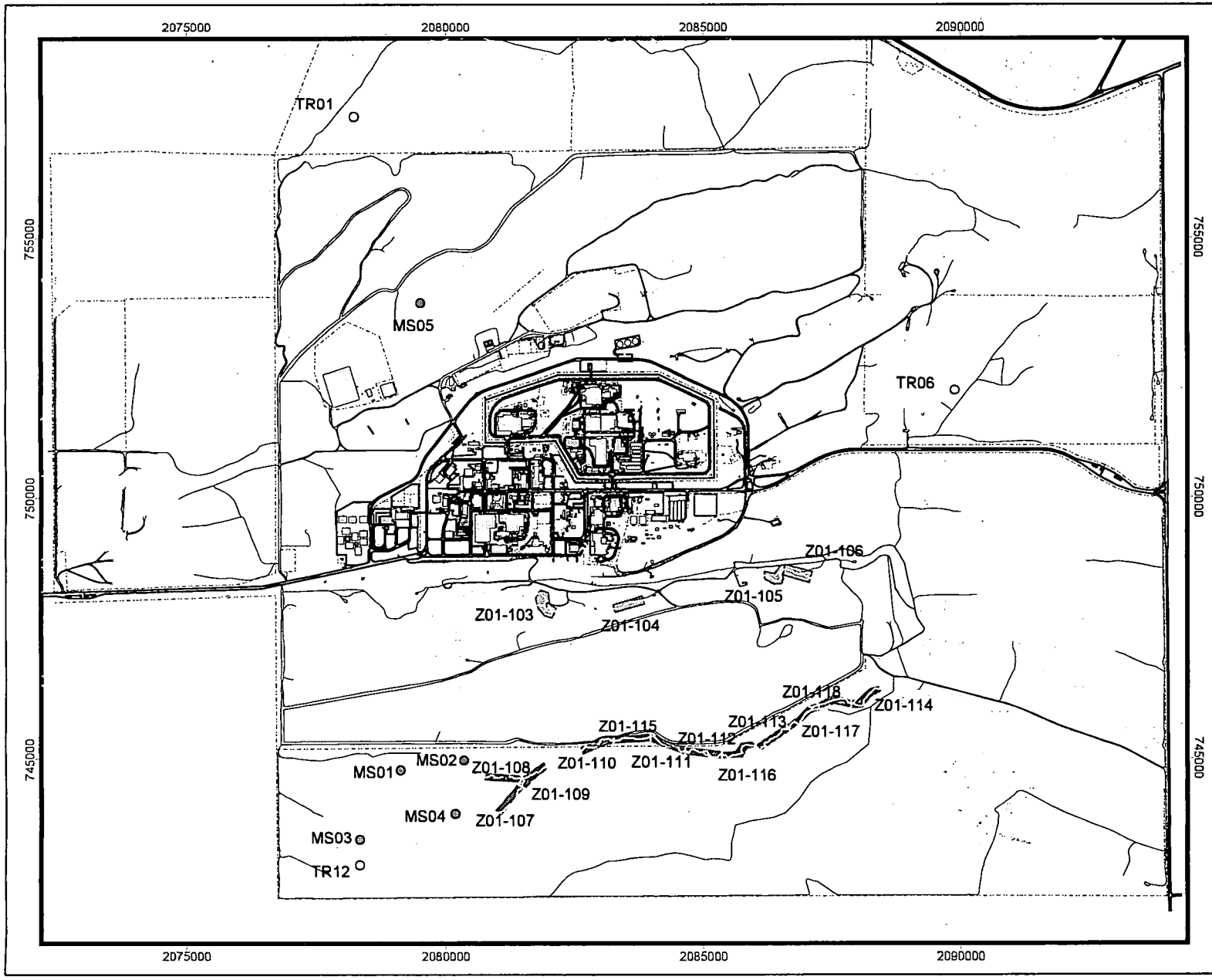

2001 Small Mammal Sampling Sites

Figure 5-1

LEGEND

- Xeric EcMP Trapping Web
- Mound Trapping Web
- Woman Creek Preble's Mouse Transects
- Smart Ditch Preble's Mouse Transects

Standard Features

- Buildings
- Lakes & ponds
- Streams & ditches
- Fences
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs, 1:85
Hypsography derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours.
The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~10 meter resolution.
The DEM post-processing performed by MK, Winter 1997.

Data Source Ecology Features:
Site locations provided by LABAT.
K-H Ecology Group POC; Karan North 303-966-9876.

N

1:21680

500 0 500 Meters

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by: LABAT For: Kaiser-Hill Company, LLC

RFETS GIS Dept. 303-966-7707

MAP ID: 01-0154 July 24, 2002

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Figure 5-2. Detrended Correspondence Analysis (DCA) using vegetative species richness data from Preble's mouse sampling sites (1997-1999, 2001)

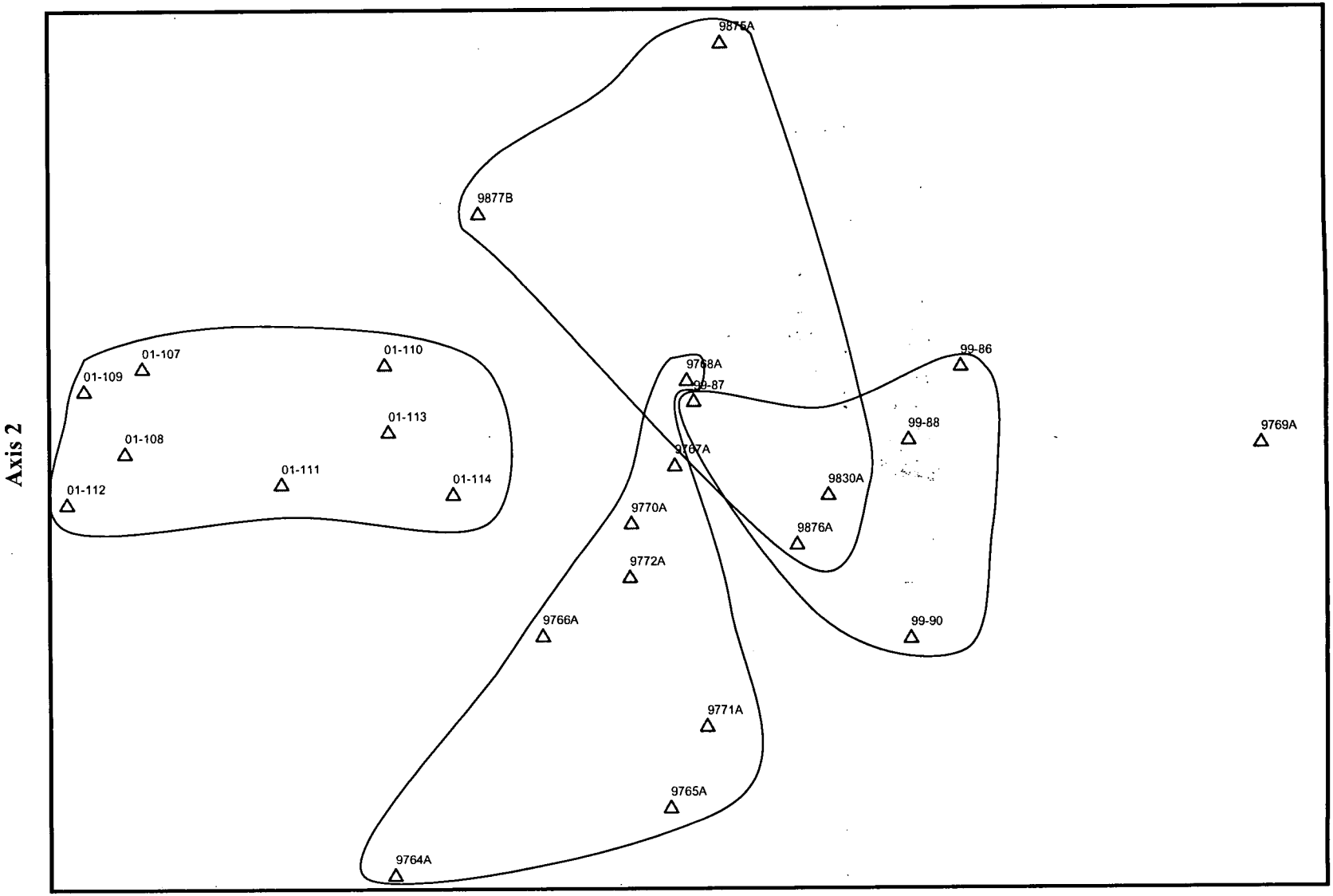

Table 5-1. Habitat characterization endpoints and methods

Endpoints	Variables	Methods
Slope angle	0-90 degrees	Clinometer
Slope aspect	360 degrees	Compass
Slope position	P, T, U, M, B, R	Visual estimate
Moisture gradient	Hydric, humic, mesic, xeric	Visual estimate
Distance to stream (m)	Trap to stream edge	Meter tape
Distance to canopy edge (m)	Nearest contiguous riparian canopy does not include snowberry, rose, or skunkbush sumac	Meter tape
Habitat types	Primary, secondary, tertiary, quaternary	Use habitat codes
Trap canopy position	In, out, edge	Visual estimate
Tree and shrub canopy cover	Percent of closure (100=closed)	Spherical crown densiometer
Tree canopy species	Species code	RFETS codes
Shrub canopy species	Species code	RFETS codes
Herbaceous vertical density	Portion of m2 grid	Vegetation board
Foliar cover	Percent for tree, shrub, subshrub, grass, forb	Cover classes
Soil condition	Cobbly, gravelly, sandy, loamy, silty, clayey	Visual estimate

Table 5-2. Percent Cover Classes

r	solitary, with small cover
+	few, with small cover
1	numerous, < 5% cover
2	5-25%
3	26-50%
4	51-75%
5	>75%

Table 5-3. Capture summaries for the 2001 Preble's mouse trapping efforts at Rocky Flats Environmental Technology Site.

a. Smart Ditch

Species	Total Captures	Percent	Adult	Juvenile	Unknown Sex	Female	Male	Unknown Sex
Peromyscus maniculatus	**659**	70.41%	581	78	0	314	342	3
Microtus pennsylvanicus	**170**	18.16%	101	69	0	80	90	0
Neotoma mexicana	**63**	6.73%	49	14	0	29	31	3
Reithrodontomys megalotis	**21**	2.24%	13	8	0	4	17	0
Microtus ochrogaster	**9**	0.96%	8	1	0	4	5	0
Chaetodipus hispidus	**6**	0.64%	6	0	0	3	3	0
Reithrodontomys montanus	**6**	0.64%	6	0	0	0	6	0
Sorex merriami	**1**	0.11%	0	1	0	0	0	1
Zapus hudsonius preblei	**1**	0.11%	0	1	0	1	0	0
Totals	**936**	**100%**	**764**	**172**	**0**	**435**	**494**	**7**

b. Woman Creek

Species	Total Captures	Percent	Adult	Juvenile	Unknown Sex	Female	Male	Unknown Sex
Peromyscus maniculatus	**260**	74.71%	204	56	0	121	139	0
Neotoma mexicana	**54**	15.52%	34	20	0	31	22	1
Zapus hudsonius preblei	**18**	5.17%	18	0	0	5	13	0
Microtus pennsylvanicus	**14**	4.02%	8	6	0	5	9	0
Reithrodontomys megalotis	**2**	0.57%	2	0	0	0	2	0
Totals	**348**	**100%**	**266**	**82**	**0**	**162**	**185**	**1**

Table 5-4. 1997-1999 and 2001 Preble's Mouse Habitat Characterization Parameters.

Year	2001			1999		1998		1997			
Drainage	Smart			Walnut		Rock		Woman			
Successful (S), Nonsuccessful (NS)	S	NS		S		S		S		NS	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
# Species/ Trapsite	27.50	20.20-35.40	28.41	11.80-15.90	14.30	31.90-41.20	36.43	20.10-32.40	26.58	20.20-29.00	25.82
Herbaceous Density	73.73	41.20-86.93	62.20	31.98-80.78	55.62	37.58-91.95	65.13	43.08-83.08	71.90	31.60-71.40	50.77
Tree/Shrub Canopy	9.88	0-31.51	10.98	11.13-44.93	23.56	2.70-34.22	14.87	0.21-58.40	24.19	0.00-34.55	10.10
Woody Index Value	57.85	7.20-81.85	40.87	34.50-66.15	45.41	25.40-79.00	45.78	29.20-85.25	66.56	6.10-78.95	30.70
Herbaceous Index Value	65.65	69.95-101.75	82.46	59.65-79.35	69.95	47.40-74.25	63.94	49.20-92.80	66.81	27.15-101.70	65.06
Tree Cover (%)	0.00	0.00-26.95	4.12	0.00-41.95	14.95	0.00-8.75	2.99	0.10-47.75	20.40	0.00-26.85	6.34
Shrub Cover (%)	36.25	0.00-51.50	21.22	2.20-20.05	12.96	13.70-72.50	29.13	25.30-65.00	41.43	0.05-46.80	20.31
SubShrub Cover (%)	21.60	5.40-32.30	15.54	11.10-25.85	17.50	3.30-24.80	13.66	2.95-8.25	4.74	0.00-8.70	4.05
Graminoid Cover (%)	41.80	48.00-77.50	57.26	45.05-57.75	51.71	24.35-50.25	36.68	24.90-63.10	41.41	24.20-80.00	51.13
Forb Cover (%)	23.85	15.00-37.75	25.20	5.60-24.00	18.24	21.75-35.50	27.26	14.40-32.30	25.40	2.95-21.70	13.93
Slope Angle	9.20	6.10-21.40	14.43	2.70-19.20	10.53	5.90-22.8	14.43	5.90-9.60	7.00	5.00-13.60	9.60
Distance to Stream	1.45	1.35-2.45	1.66	1.53-2.20	1.82	0.50-2.14	1.26	1.09-2.08	1.58	0.79-2.26	1.60
Distance to Embankment	2.00	0.35-7.65	2.48	1.61-5.20	3.82	1.70-3.00	2.28	2.90-9.97	4.93	0.56-4.83	2.49
Distance to Canopy Edge	0.90	0.85-72.20	24.50	0.30-14.00	7.98	0.10-23.00	8.68	0.00-1.94	0.57	0.14-85.95	26.82
Sample Size	1		7		4		4		4		5

S = Successful Sites, NS = Non-Successful Sites

All values are means. For each sample site n = 10.

Table 5-5. Capture rates during Preble's mouse trapping efforts from 1997 - 2001.

a. Overall capture rates.

	1997	1998	1999	2000	2001
Trap nights	11000	8198	8750	7700	5800
Captures	1966	4112	4332	2337	1284
Capture Rate	**17.9**	**50.2**	**49.5**	**30.4**	**22.1**

b. Capture rates by drainages trapped each year.

	1997	1998	1999	2000	2001
Rock Creek		55.4			
Smart Ditch					19.5
Walnut Creek	28.6	19.5	49.5		
Woman Creek	15.5			30.4	34.8
Overall	17.9	50.2	49.5	30.4	22.1

Capture rate = captures per 100 trap nights
Note that overall capture rates are not additive, but are instead proportional by trapping effort in each drainage.
Substantially different trapping methodology was used prior to 1997, so earlier results are not considered here.
Data sources for previous years: K-H (1998, 1999, 2000, 2001).

6. Xeric Grassland Small Mammal Monitoring

6.1 Introduction

Two monitoring efforts aimed at characterizing small mammal communities in upland areas at the Site were conducted in 2001. One effort focused on characterizing the small mammal species living in proximity to "burrow-mounds", peculiar surficial structures on the xeric tallgrass prairie at the Site. Additional monitoring was conducted to re-characterize the small mammal community of the xeric grasslands at the Site, last monitored in 1993 and 1994, with special emphasis on pocket mice, several species of which are considered rare (CNHP 1999).

6.1.1 Burrow-Mound Investigation

Numerous mounds of earth, the apparent result of small mammal burrowing, have been visible in aerial photographs of the Rocky Flats vicinity since at least 1937. These burrow-mounds occur all across the Rocky Flats alluvium soils of the western portion of the Site, which coincides with much of the xeric grassland found on Site. These burrow-mounds have become a subject of interest because of questions on unidentified "excavations" that can be seen in old aerial photographs, as well as their tendency to harbor reservoirs of weed infestations even in areas that have been recently treated with herbicides. This investigation was designed to study conditions on the burrow-mounds that might be conducive to weed infestation, as well as to identify and census species currently using the areas as burrow sites.

Certain weed control efforts at the Site are currently being confounded by weed establishment on the burrow-mounds; aerial application of herbicides is not as effective on the burrow-mounds as elsewhere (K-H 2001). This may be due to uneven application over the mound topography, differences in soil characteristics such as moisture, texture, or nutrient availability, continued soil disturbance by small mammals, or possibly a combination of these factors. In 1960, at a location a few miles southwest of the Site, only a few of the burrow-mounds were actively occupied by northern pocket gophers (*Thomomys talpoides*), with the rest apparently being inactive. The author of a report speculated they might have been inactive since perhaps the early 20th century or possibly earlier (Branson et al. 1965). There is no direct evidence that gophers (family Geomyidae) currently occupy these burrow-mounds at the Site, though in other areas on the Site, pocket gopher populations are present. Many small mammal species dig burrows, sometimes using areas that have been previously disturbed by other species, and it was deemed probable that other species, such as thirteen-lined ground squirrels (*Spermophilus tridecemlineatus*), prairie voles (*Microtus ochrogaster*), or deer mice (*Peromyscus maniculatus*) currently occupy some of these burrow-mounds. Previous aerial photographic evidence, compared to recent photographs of the same areas across the Site shows that some of these present-day burrow-mounds occupy the same locations that were occupied by prairie dog mounds during the 1960s and early 1970s (Murdock, 2001).

6.1.2 Historic Xeric Grassland Site Monitoring

The Colorado Natural Heritage Program (CNHP) lists eight species and sub-species of pocket mice (*Perognathus spp.*) as of special concern (CNHP 1999). One of these, a sub-species of the olive-backed pocket mouse (*Perognathus fasciatus infraluteus*) has been previously captured at the Site (DOE 1994a). A single individual olive-backed pocket mouse was captured in 1993 at TR12, a permanent xeric

grassland monitoring site. Three other pocket mice occur at the Site, the hispid pocket mouse (*Chaetodipus hispidus*), a sub-species of plains pocket mouse (*P. flavescens flavescens*), and a sub-species of silky pocket mouse (*P. flavus bunkeri*). Other sub-species of both the plains and silky pocket mice are listed by the CNHP as of special concern, but these do not occur in the vicinity of the Site (Fitzgerald et al. 1994).

6.2 Study Objectives

The objectives of the 2001 xeric grassland small mammal monitoring field effort were to:

- Survey areas on the Site where burrow-mounds are prevalent to determine the associated small mammal species composition.
- Characterize the level of soil disturbance and the vegetation composition of the burrow-mounds and look for differences in the vegetation compared to the surrounding inter-mound areas.
- Re-survey the historic xeric grassland monitoring sites to determine which species of pocket mice persist.

6.3 Methods

6.3.1 Sample Site Selection and Trapping

During each portion of the 2001 monitoring effort, trapping small mammals followed the procedures for small mammals outlined in the *EMD Operating Procedures Manual Volume V* (DOE 1994b).

Animals were trapped in Sherman small-mammal live traps using Purina® Sweet Feed as bait, unless otherwise noted. Every small mammal captured was identified by species, age, and sex. Any evidence of breeding activity, such as lactating or pregnant females and breeding males, was also noted. All Preble's mice, and pocket mice of the genus Perognathus, captured were measured for key identifying characteristics, including head and body length, ear length, tail length, hind-foot length, and body weight. All data was recorded on approved field data sheets, entered into the Ecology database, verified, and validated. Weather conditions at the time the traps are checked were also recorded.

6.3.1.1 Burrow-Mound Sites

The area on the Site of greatest interest, because of burrow-mound density and poor performance of aerial herbicide applications, is in the southwest corner of the Buffer Zone, near historic monitoring site TR12 (See Figure 5-1 in previous section). To avoid confounding effects of placing burrow-mound sampling plots too close to TR12, these plots were placed well north of TR12. Four plots of 100 traps each were located within this area (Figure 5-1). Plots were randomly selected with two constraints; 1) plots could not overlap, and 2) plots could not be placed such that they overlapped vegetation sampling plot BC1 (a prescribed burn control plot), to avoid trampling of this area. Sampling plots were designed as "trapping webs" after Buckland et al. (1993). The randomly selected point used to choose the plot location was treated as the center point of the web. From the center point of each web, 10 lines of 20 traps each radiated out in a circle. Traps were placed 4-m apart along each radial line, so that the total length of each line was 40-m (Figure 6-1). Traps were run for four consecutive days in early August, with two plots being run the first week, and the other two run the second week. Additionally, a fifth trapping web of 100 traps was placed in another area of interest east of the New Landfill and run in conjunction with the three

historic xeric monitoring sites. By trapping four sampling sites close together and four widely spread over the Site, a comprehensive picture of the small mammal community of the xeric grasslands on the Site was obtained.

All small mammals caught were marked with food coloring. Subsequent recaptures of marked individuals were noted on the data sheets. This sampling scheme allows the data to be analyzed with a distance sampling density estimation model, a robust model that requires less intense effort than traditional mark-recapture techniques (Buckland et al. 1993). Because trap raiding by raccoons was not a significant concern on these prairie sites, shelled raw peanuts were added to the bait to attempt to attract a wider range of small mammals.

6.3.1.2 Historic Xeric Grassland Sites

These sites were established in 1993 as part of a suite of permanent terrestrial monitoring sites at Rocky Flats. Within these sites, vegetation and small mammal monitoring transects were established. The small mammal transect consisted of two parallel trap lines 500-m long and 10-m apart, with traps placed at 10-m intervals for a total of 100 traps per site (DOE 1994a). However, 2001 trapping efforts at these sites were designed to be comparable to trapping efforts at the burrow-mound sites. One trapping web of 100 traps was placed at each xeric monitoring site – TR01, TR06, and TR12 (Figure 5-1) and run for four consecutive days in July.

6.3.2 Marking of Individual Small Mammals

For the trapping web plots, it was not necessary that mammals caught be uniquely marked, only that they be identified as having been previously captured. Therefore, for trapping web efforts, food grade dye was used to mark all individuals, regardless of species, the first time they are captured. The dye wears off within a few days, but remains long enough to complete the trapping survey.

6.3.3 Burrow-Mound Characterization

Burrow mound characterization methods and results are presented in the 2001 Annual Vegetation Report for the Rocky Flats Environmental Technology Site (K-H 2002).

6.4 Results and Discussion

6.4.1 Burrow-Mound Trapping Webs

The five trapping webs on the burrow mounds were run for four days each, for a total of 2,000 trap nights. The trapping effort on the burrow mounds yielded a total of 42 small mammal captures from seven different species (Table 6-2). The most commonly captured species were the deer mouse (*Peromyscus maniculatus*), plains pocket mouse (*Reithrodontomys montanus*), and the hispid pocket mouse (*Reithrodontomys megalotis*). Looking at all the small mammals combined, most were adults with a sex ratio of 2:1, males to females.

The low number of animals captured in the burrow mound areas is similar to that found at the historic xeric grassland sites. Potential reasons for the low capture numbers may be the fact that it was mid-summer and after the active breeding season. Trapping during the spring may have yielded greater numbers, but the trapping effort at this time did document seven species of small mammals that are active

in the area of the burrow mounds. The role each of these species has in maintaining a disturbed state on the mounds is unknown, but it is important to know which species are using the general area.

The 2001 burrow-mound habitat characterization results are discussed in detail in the 2001 Annual Vegetation Report (KH, 2001).

6.4.2 Historic Xeric Grassland Trapping Webs

Three trapping webs were run for four days each, for a total of 1,200 trap nights. During this effort, only 23 captures of three small mammal species were made. Three of these captures were of hispid pocket mice. No pocket gophers were caught. Table 6-1 provides a breakdown by species, age, and sex of all captures made.

Capture rates in the xeric grassland in 2001 were an order of magnitude lower than they were in 1994, when the xeric monitoring transects were last sampled. In 1994, nine small mammal species were captured at the three xeric sites: TR01, TR06, and TR12. In 2001, only 3 species were caught in these areas (Table 6-3). Deer mice were the most commonly captured species, but in 1994 the capture rate for deer mice was 17.8 captures/100 trap nights, whereas in 2001, the capture rate was only 1.3 (Table 6-4).

Methodologies used, however, make these differences in capture success arguably incomparable. In addition to the differences in trap placement, in 1994 each site was trapped in two sessions, April/May and October, for 3 consecutive days each session. In 2001, each site was run only once, in July, for 4 days. The seasonal difference may have also contributed to lower capture rates.

Mid-summer is not the ideal time for catching an abundance of small mammals. Small mammals tend to be most easily caught 1) during the active breeding season and 2) after the young have dispersed. A number of small mammal species breed continuously and have multiple litters throughout the warmer months but, in general, optimal capture times tend to be in the spring and fall. The xeric grassland trapping schedule was opportunistic more for personnel utilization than designed for optimum small mammal densities.

Another potential flaw with the xeric trapping web effort was that the size of the trapping webs might have been too small for the habitat. Traps were spaced 4-m (13 ft) apart to cover an area of 0.5 ha (1.2 ac). Anderson et al. (1983) and Buckland et al. (1993) recommend webs with more traps and covering a larger area. However, the 2001 level of effort was based on capture rates seen in the xeric grassland transects on Site in 1994, and the initial intention to characterize the small-area burrow-mounds. In retrospect, traps were probably too close together relative to the distances normally traveled by grassland small mammal species within their home ranges. Even though each trapping web encompassed an average of 5 burrow-mounds, not all mounds showed signs of current small mammal occupancy. If this study were to be repeated, trap spacing of 6-8 m (20-26 ft) and at least 5 more traps per line would be recommended.

6.5 References

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Table 6-1. Capture summaries for the 2001 Xeric Grassland Small Mammal trapping effort.

Species	Total Captures	Percent	Adult	Juvenile	Female	Male	Unknown Sex
Chaetodipus hispidus	**3**	13.04%	2	1	3		
Microtus ochrogaster	**5**	21.74%	4	1	2	3	
Peromyscus maniculatus	**15**	65.22%	15		5	10	
Total	**23**	**100%**	**21**	**2**	**10**	**13**	

Table 6-2. Capture summaries for the 2001 Burrow-Mound trapping effort.

Species	Total Captures	Percent	Adult	Juvenile	Female	Male	Unknown Sex
Chaetodipus hispidus	**2**	6.98%	1	1	1	1	
Mus musculus	**1**	2.32%	1		1		
Peromyscus maniculatus	**18**	41.86%	18		5	13	
Reithrodontomys megalotis	**6**	13.95%	5	1	5	1	
Reithrodontomys montanus	**10**	23.26%	10		2	8	
Spermophilus tridecemlineatus	**1**	2.32%	1				1
Perognathus flavescens	**4**	9.31%	4			4	
Total	**42**	**100%**	**40**	**2**	**14**	**27**	**1**

Table 6-3. Capture rate comparison of historic xeric grassland sites sampled in both 1994 and 2001.

Site	1994	2001
TR01	35.0	3.8
TR06	26.8	1.3
TR12	9.2	0.5
Overall	**23.7**	**1.9**

Capture rate = captures per 100 trap nights
Note that different methodologies were employed each year (see text).
1994 data source: DOE (1995)

Table 6-4. Capture rate comparison by species for historic xeric grassland sites sampled in both 1994 and 2001.

Species	1994		2001	
	Captures	Capt. Rate	Captures	Capt. Rate
Peromyscus maniculatus	321	17.8	15	1.3
Microtus ochrogaster	28	1.6	5	0.4
Reithrodontomys megalotis	26	1.4	0	0.0
Spermophilus tridecemlineatus	15	0.8	0	0.0
Perognathus flavescens	13	0.7	0	0.0
Chaetodipus hispidus	9	0.5	3	0.3
Microtus pennsylvanicus	6	0.3	0	0.0
Reithrodontomys montanus	6	0.3	0	0.0
Perognathus flavus	2	0.1	0	0.0
Mus musculus	0	0.0	0	0.0
Total	**426**	**23.5**	**23**	**2.0**

Capture rate = captures per 100 trap nights
1994 trap nights = 1,800 2001 trap nights = 1,200
Note that different methodologies were employed each year (see text).
1994 data source: DOE (1995)

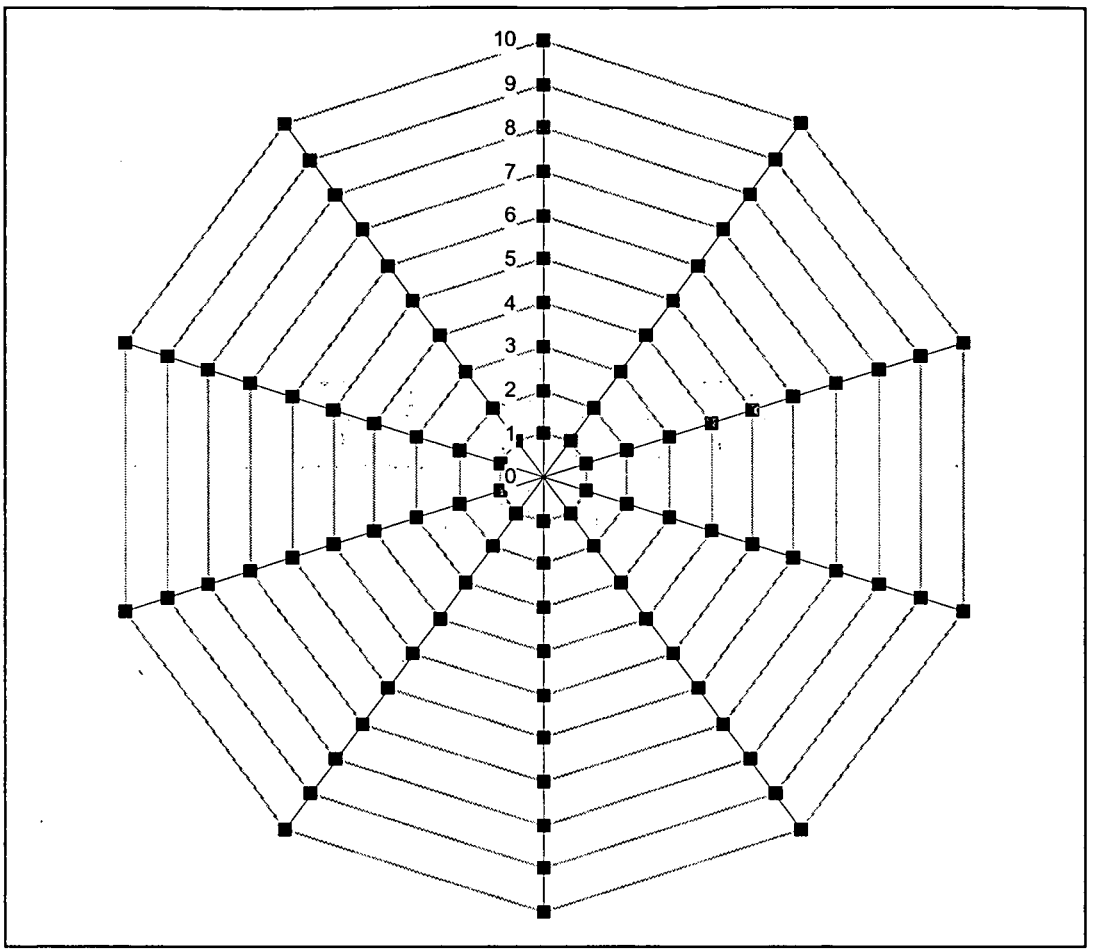

Figure 6-1. Design of a trapping web used for characterizing mound sites, adapted from Buckland et al. (1993). Each square represents a trap; ten traps were placed on each of ten lines at 4 m intervals for a total of 100 traps covering 0.5 ha.