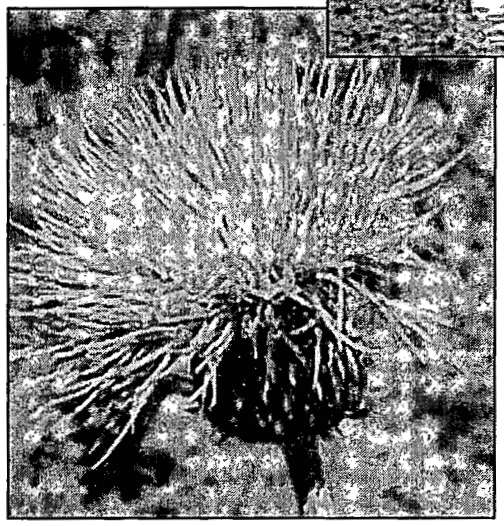
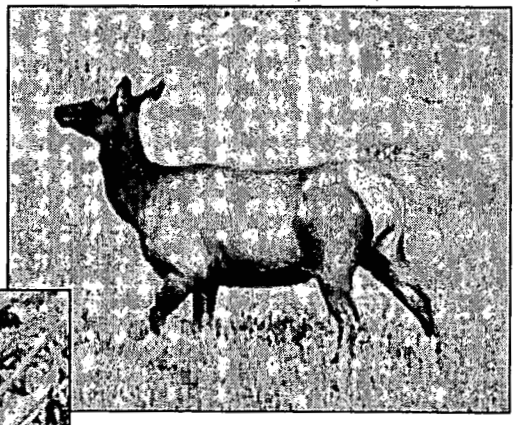
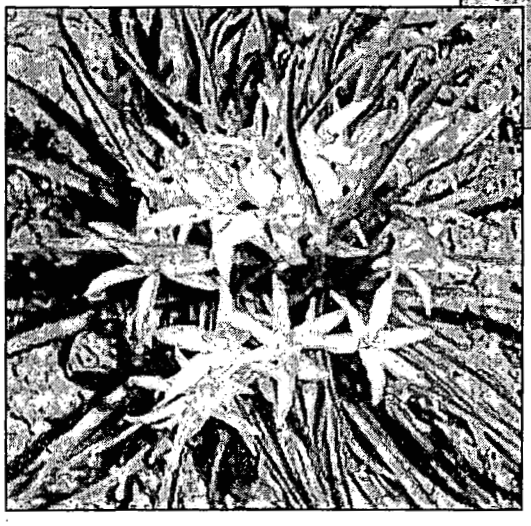
ECOLOGY

2003 Annual Ecology Report for the Rocky Flats Environmental Technology Site







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9. Boreal Chorus Frog Vocalization Monitoring

9.1 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 was 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 Site.

9.2 Methods

The methods used for the amphibian vocalization surveys in 2003 generally followed the guidelines provided in Mossman et al. (1998). Additional information used for the surveys were 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 2003 (Figure 9-1). This approach followed the modifications of the protocol implemented in 1999 (K-H 2000a). 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 for all locations was conducted in one night, starting at dusk. In 2003, the vocalization surveys for all monitoring locations were conducted on May 7th.

After arriving at each sample location, the vehicle engine was shut off, and the observer exited the vehicle and waited for approximately one minute before beginning the survey. The waiting period provided time of adjustment for the frogs to become accustomed to the observer. After the one-minute period, the observer listened to vocalizations for approximately three minutes. 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 (°C, where feasible), wind speed, cloud cover, precipitation, and noise interference.

9.3 Results and Discussion

Boreal chorus frogs were recorded at 12 of the 20 (60%) sample locations surveyed in 2003. Figure 9-2 portrays the frequency of the different vocalization indices at all 20 locations sampled in 2003. Three (15%) of the locations sampled had full choruses of frogs calling (vocalization index 3). Five (25%) sampling locations had multiple individuals calling with overlaps between the calls (vocalization index 2). Four (20%) had a vocalization index of 1, where individuals could be counted but the calls were not overlapping. The remaining eight (40%) had no calling at all, vocalization index 0.

On the evenings when sampling was conducted, the average water and air temperature (°C) was 13° and 11.6°, respectively. No precipitation occurred on the day when sampling was conducted and the mean cloud cover was about 14%.

In order to compare data between years, data from only the locations that were sampled during all five years were used. This restricted the number of sites that could be compared to 16 locations (Table 9-1). Out of these sixteen sites, only one site in 2003 had a vocalization index that was noticeably higher than previous years (location 15). Location 15 is the D-1 pond. This is the only location where the abundance in 2003 was the highest during all years of the survey. The vocalization index at six locations stayed about the same as previous years. The vocalization index at the remaining nine locations were lower than previous years (eight were located in the north buffer zone). Overall, the average vocalization index for 2003 was 1.4, which is lower than any of the four previous years (overall average from all five years is 1.96, Table 9-1, Figure 9-3).

The much lower average vocalization index in 2003 is probably due to the very low precipitation in 2002. 2002 was a drought year, which would have a negative effect not only on the breeding of this species (fewer and smaller pools), but would also have a negative effect on tadpole development throughout the first part of summer (pools drying out faster). In the spring, the frogs congregate at pools of water to breed. Most of these pools are ephemeral, and dry up during the dry summer months of the year. Breeding occurs from March to May, with most activity occurring in April. Eggs are laid on submerged vegetation or sticks in water, and hatch in up to 15 days. The tadpoles metamorphose into froglets in about 60 to 90 days. Once the froglets develop the ability to survive outside of the water, the species becomes more terrestrial and precipitation does not affect the species as much. So, since the whole breeding cycle does not end until the end of July (assuming longest hatching and metamorphosis time), population survival will be most affected by precipitation levels in the months of March, April, June and July (March through May being the wettest months of the year). Total precipitation in 2002 during this time period was lower than any other year since this vocalization study began (Figure 9-4). This drought likely affected the entire breeding cycle of the frog, and therefore had a large effect on the entire population of frogs on Site (mostly the north BZ). And even though the 2003 March – July precipitation was back to the same level as in 2001, most of the precipitation occurred in March and April, and the May through July precipitation was below average. The low population of frogs that survived the 2002 drought, may have also been affected by pools drying out a little earlier in the year of 2003. So even though the precipitation in 2003 was higher than in 2002, the frog populations have yet to recover to the levels found in previous years.

There is a striking difference between in the average vocalization index of northern sample locations, and southern sample locations. Splitting the locations along the north and east access roads into the northern and southern locations, the averages for the two sides differ for each year. The south average is lower (substantially lower in 1998 and 1999) than the north average for all years except 2003 (Table 9-1). In 2003, the average vocalization index for the southern locations was actually higher than for the northern locations. In general, there is more habitat available in the north Buffer Zone than in the south Buffer Zone. So it is not unexpected to see higher

vocalization indices in the northern areas, however, why it changed in 2003 is somewhat a mystery.

9.4 Conclusions

Vocalization surveys conducted in 2003 continued to document the presence of the boreal chorus frogs at the Site, even though the chorus frog abundance in 2003 was lower than some previous years. The 2002 drought may have been a factor contributing to the low boreal chorus frog abundance in 2003. Other variables may have played a role in the population reductions, such as timing of the survey and other climatic or environmental conditions. The continued presence of the boreal chorus frogs at the Site, even after drought years, provides evidence of the resilience of this amphibian species and presence of good habitat at the Site.

9.5 References

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

Johnson, Douglas H. and Ronald D. Batie. 1996. Surveys of calling amphibians in North Dakota. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/distr/herps/amsurvey/amsurvey.htm (Version 16JUL97).

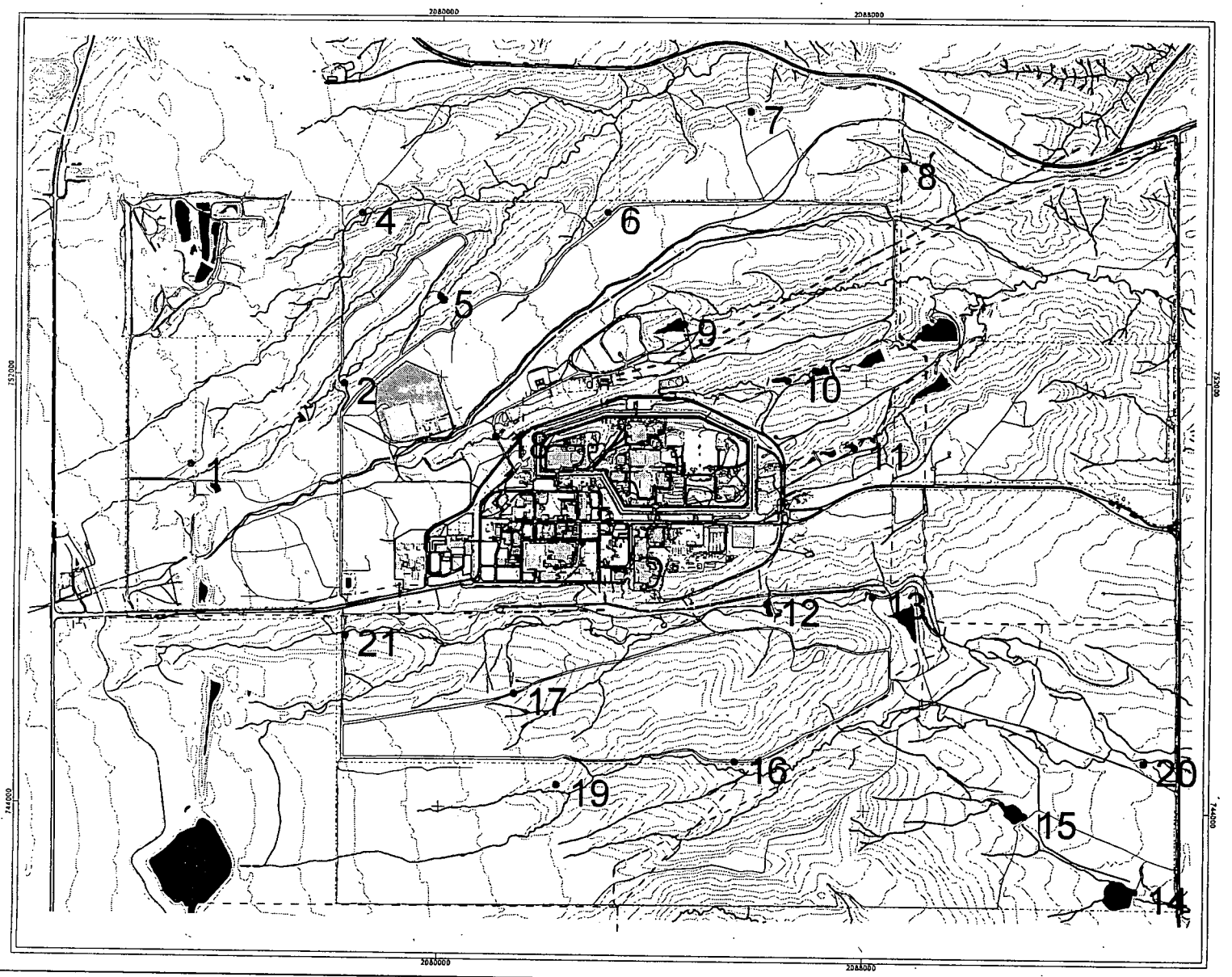
K-H. 2000. 1999 annual wildlife report for Rocky Flats Environmental Technology Site. Prepared by Exponent for Kaiser-Hill Company, LLC. Rocky Flats Environmental Technology Site, Golden, CO. (June).

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.

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.

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



2003 Boreal Chorus Frog Monitoring Locations

Figure 9-1

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 flyover data captured by EG&G REL 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.

N

1:23675

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

April 4, 2003

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Figure 9-2: 2003 Boreal Chorus Frog Vocalization Results. Frequency of vocalization indices from all 20 sites sampled in 2003.

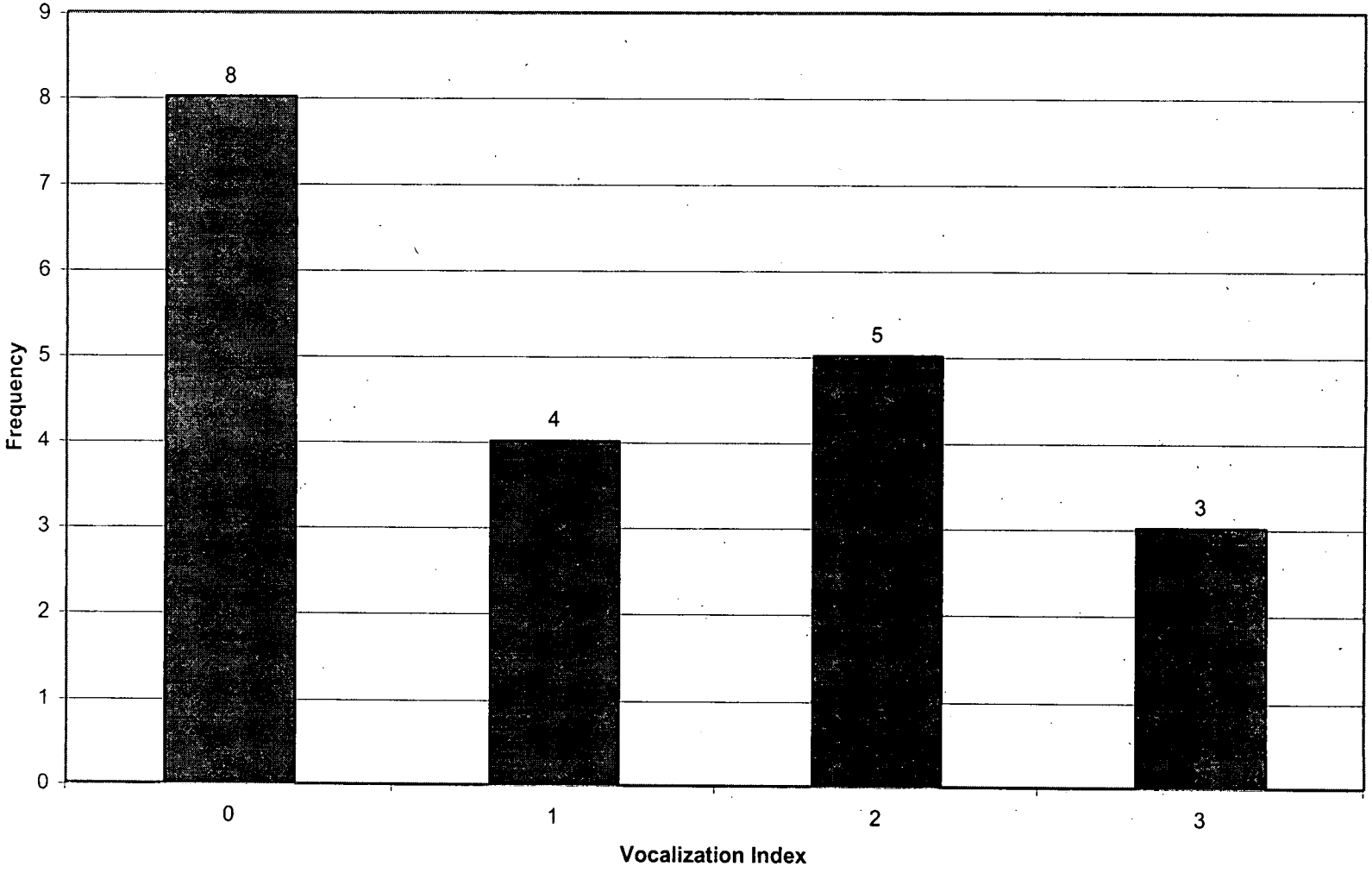
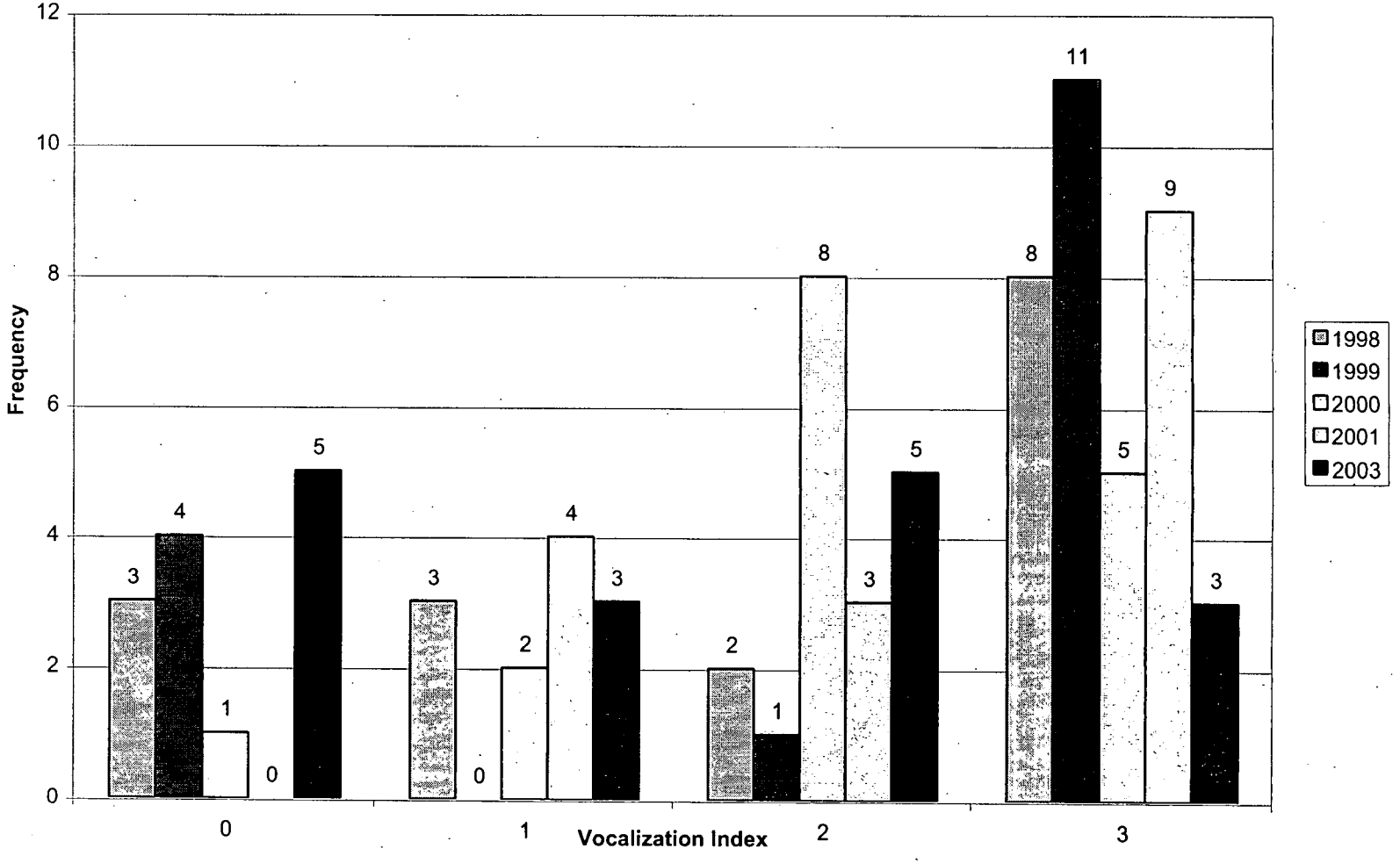


Figure 9-3: Comparison of Vocalization Indices between 1998-2001, and 2003



Frequency data based only on the 16 locations sampled in common across all five years.

Figure 9-4: Total precipitation from March through July at the Rocky Flats Environmental Technology Site.

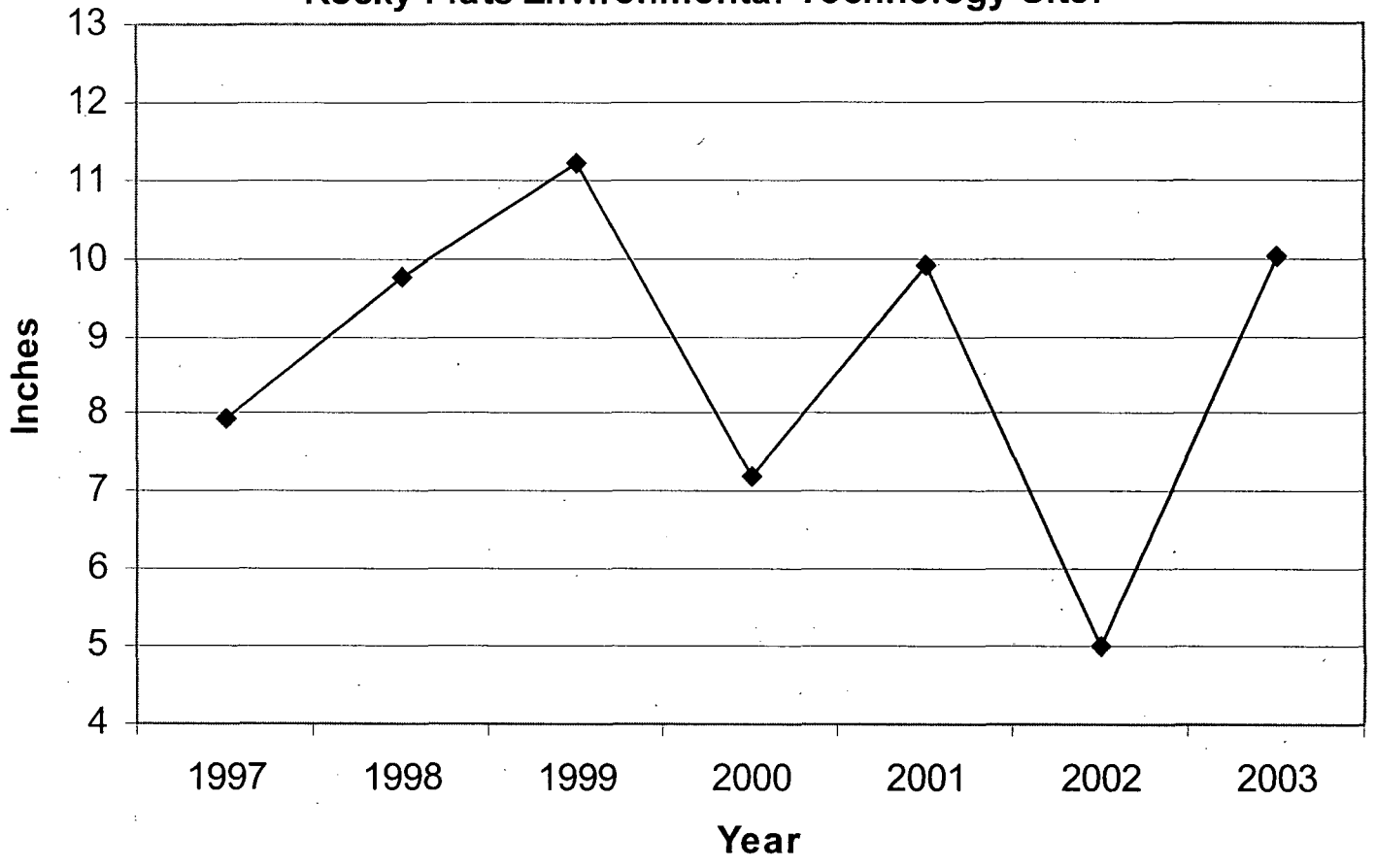


Table 9-1: Boreal Chorus Frog Vocalization Indices Data (1998-2003)

Site/ Location in BZ*	1998	1999	2000	2001	2003	Average
1 / N	3	3	2	1	1	2.0
2 / N	3	3	2	3	2	2.6
4 / N	2	3	2	3	0	2.0
5 / N	3	3	3	3	0	2.4
6 / N	3	3	2	2	2	2.4
7 / N	3	3	2	3	0	2.2
9 / N	1	2	2	2	0	1.4
10 / N	3	3	3	3	3	3.0
11 / N	3	3	1	3	1	2.2
12 / S	0	0	3	1	2	1.2
13 / S	3	3	3	3	3	3.0
14 / S	2	3	3	3	2	2.6
15 / S	0	0	2	2	3	1.4
16 / S	0	0	1	3	1	1.0
17 / S	1	0	0	1	0	0.4
18 / N	1	3	2	1	2	1.8
Overall average	**1.9**	**2.2**	**2.1**	**2.3**	**1.4**	2.0
North average	**2.5**	**2.9**	**2.1**	**2.4**	**1.1**	2.2
South average	**1.0**	**1.0**	**2.0**	**2.2**	**1.8**	1.6

* The locations either occurred north of the North Access road (that runs east and west through the center of the Site), or south of the North Access road.

8.3.3 Raptors

One of the largest groups of predators that utilize the Site is the raptor group. Ecologically, raptors are an important taxonomic group because they require very specific nesting sites (mostly riparian woodland) and help limit the populations of other small mammal prey species.

During the 2003 sitewide surveys, there were 66 observations of raptors on Site, which is lower than the 97 observations made in the 2002 survey. The most common raptor on Site during 2003 was the Red Tailed Hawk (*Buteo jamaicensis*) with a relative abundance of over 40 percent. The American Kestrel (*Falco sparverius*) followed in second place with a relative abundance of over 20 percent. And the great horned owl (*Bubo virginianus*, third most common raptor on Site) had a relative abundance of 12 percent (Table 8-3). These three species are common on Site throughout the whole year, and have either been seen or are believed to be nesting on Site.

Other species of raptors, such as the Swainson's hawk (*Buteo swainsoni*), were observed during parts of the year when those raptors are located in Colorado. In the case of the Swainson's hawk, there were two observation of the summer resident species during the May survey. The rough-legged hawk (*Buteo lagopus*) is a winter resident of the area and uses the same niche as the Swainson's hawk, but during different parts of the year. The rough-legged hawk was observed once during the January survey. Other species of raptors observed on Site and their relative abundance are shown in Table 8-3.

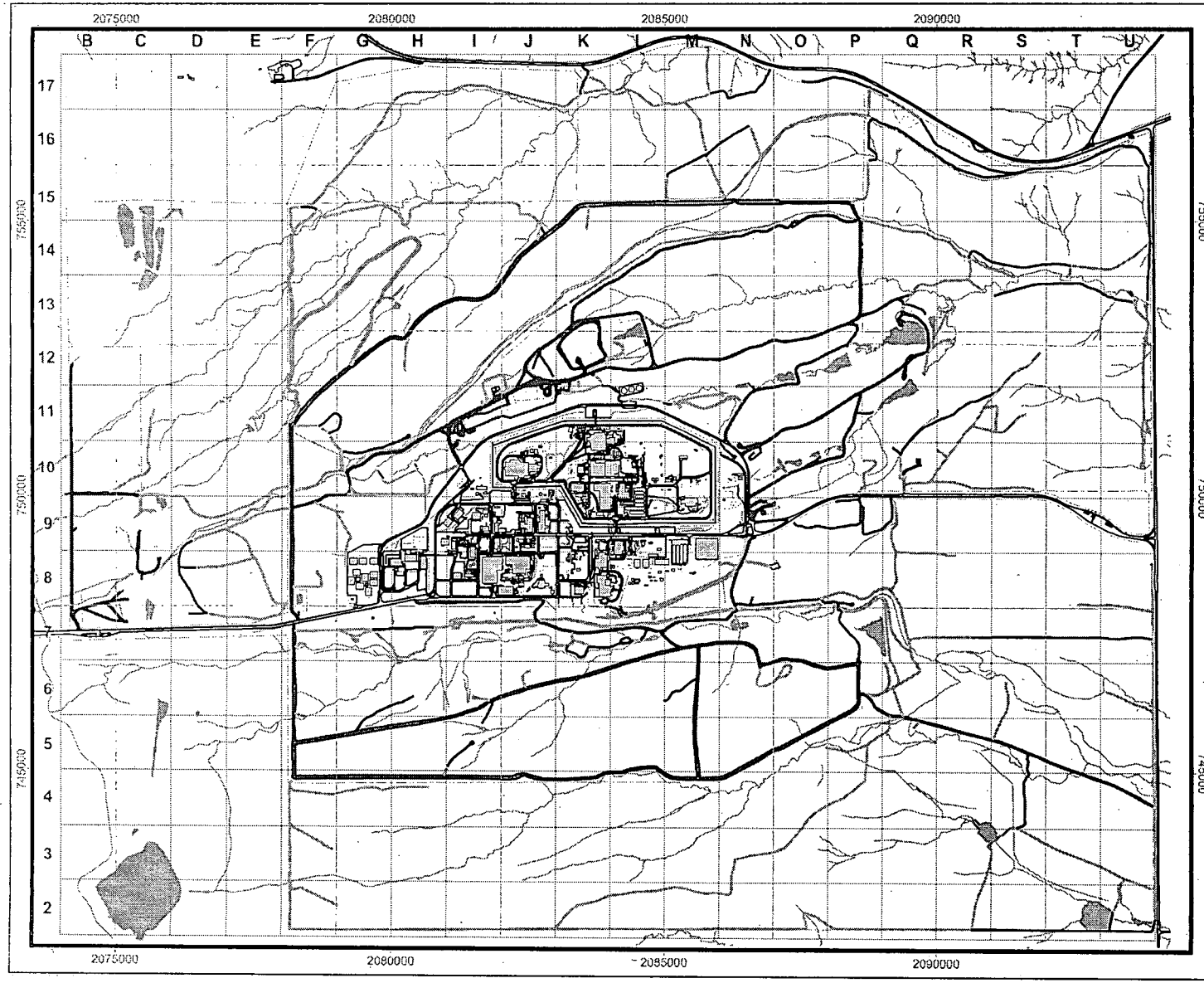
An interesting interaction between two species of raptor and a songbird was observed during the January sitewide survey. A prairie falcon (*Falco mexicanus*) was seen taking a pigeon (rock dove, *Columba livia*) from mid-air. After a few minutes, while the falcon fed on the pigeon, a rough-legged hawk was seen circling the area. The falcon exhibited aggressive behavior towards the hawk and vocalized loudly until the hawk left the area.

8.3.4 Waterfowl

The relative abundance for the waterfowl taxonomic group was calculated, and the mallard duck was the species with the highest relative abundance (29.80%, Table 8-4). As expected, waterfowl observations were mostly made near water structures such as the man-made ponds in Walnut and Woman Creek (Figure 8-8). The only areas not associated with some kind of a water structure, but used by waterfowl, were grid 5R (where a cormorant [*Phalacrocorax auritus*] was seen in flight), grid 12H (where a great blue heron [*Ardea herodias*] was seen in flight), and at grid 10G (where a flock of Canada geese [*Branta canadensis*] were resting on the hillside). It is expected that waterfowl will continue using the Site's water features in future years.

8.4 Conclusions

The sitewide survey continued to document the presence of many of the significant wildlife species at the Site. Annual variations in relative abundance from 2002 to 2003 were documented, but are expected given this type of survey. Surveys conducted in 2003 continued to verify the high quality of habitat available in the Buffer Zone at the Site.



Buffer Zone Road Access

Figure 8-1

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 303-966-9876.

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State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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

Prepared by: Exponent®
For: Kaiser-Hill Company, LLC

RFETS GIS Dept. 303-966-7707

MAP ID: 99-0468

March 05, 2001

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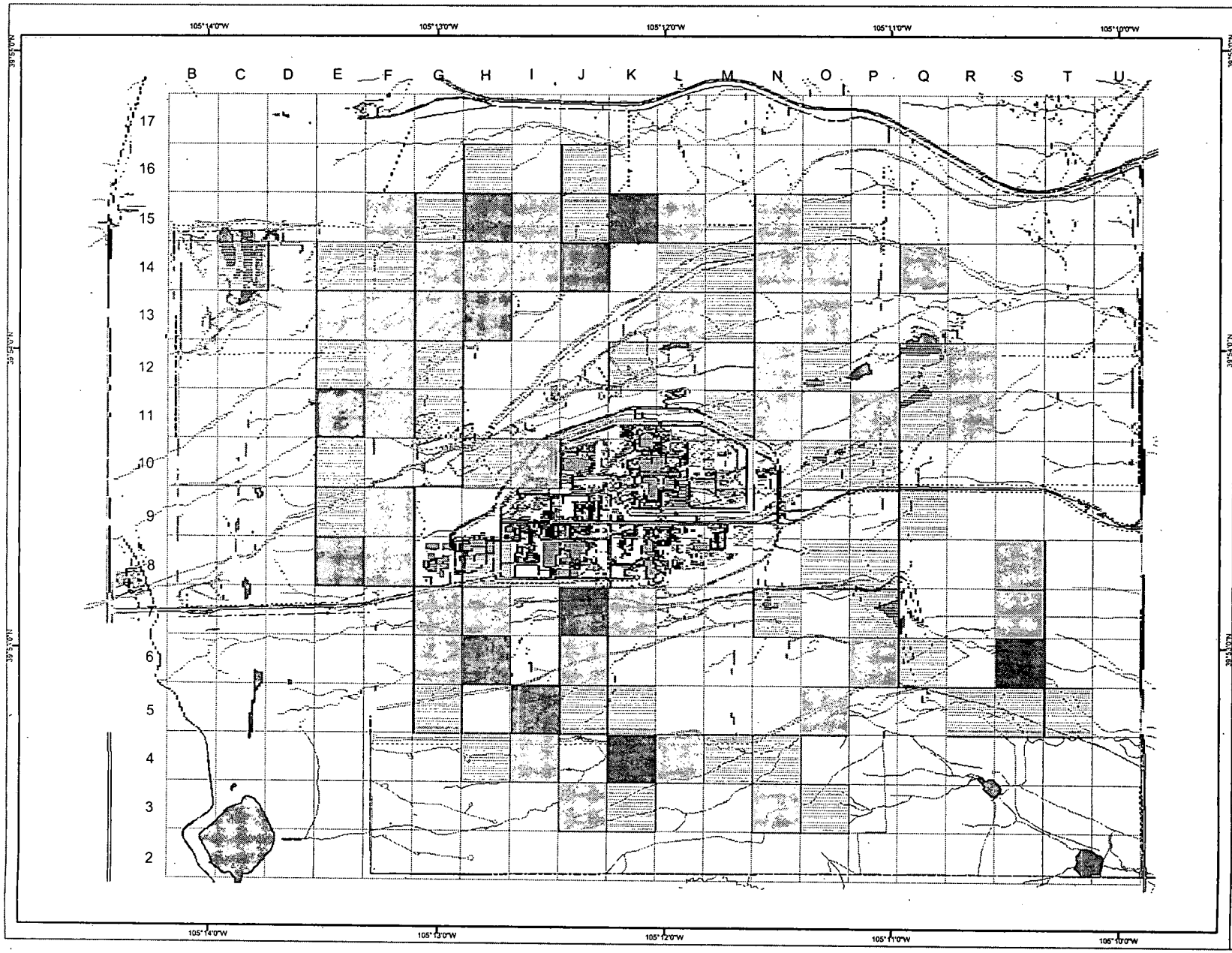

2003 Annual Mule Deer Area Use at Rocky Flats

Figure 8-2

Legend

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

Standard Features

- Buildings
- Demolished Buildings
- Lakes
- Streams
- Boundary Fence
- Fences
- Trails
- Dirt Roads
- Paved 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, 1/95.

1,000 0 1,000 2,000
Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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

Prepared by: Professional Environmental Group, LLC

For: Kaiser-Hill Company, LLC

RFETS GIS Dept.
303-966-7707

MAP ID:04-0023 March 19, 2004

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Common Name	Scientific Name	2001 RA	2002 RA	2003 RA
White-faced Ibis	*Plegadis chihi*	*	*	**0.06**
Northern Flicker	*Colaptes auratus*	*	*	**0.06**
Redhead	*Aythya americana*	1.61	2.08	*
Sandhill Crane	*Grus canadensis*	*	0.20	*
Cattle Egret	*Bubulcus ibis*	*	0.15	*
Greater Scaup	*Aythya marila*	*	0.15	*
American Wigeon	*Anas americana*	*	0.10	*
Greater Yellowlegs	*Tringa melanoleuca*	*	0.10	*
Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatus*	*	0.05	*
Long-eared Owl	*Asio otus*	*	0.05	*
Ferruginous Hawk	*Buteo regalis*	0.10	*	*
Snowy Egret	*Egretta thula*	0.05	*	*
Raccoon	*Procyon lotor*	0.05	*	*

* Species was not observed this year during Sitewide Surveys.

Table 8-2. Relative abundance (RA) of the mammal species observed during the 2002 and 2003 Sitewide Surveys.

Common Name	Scientific Name	2002 RA	2003 RA
Mule deer	*Odocoileus hemionus*	89.65	**81.44**
Black-tailed prairie dog	*Cynomys ludovicianus*	1.62	**7.79**
Elk (Wapiti)	*Cervus elaphus*	*	**4.81**
Coyote	*Canis latrans*	4.59	**4.24**
Desert cottontail	*Sylvilagus audubonii*	0.54	**0.92**
Muskrat	*Ondatra zibethicus*	0.36	**0.57**
White-tailed deer	*Odocoileus virginianus*	3.24	**0.23**

* Species was not observed this year during Sitewide Surveys.

Table 8-3. Relative abundance (RA) of the raptor species observed during the 2002 and 2003 Sitewide Surveys

Common Name	Scientific Name	2002 RA	2003 RA
Red-tailed Hawk	*Buteo jamaicensis*	30.21	**42.42**
American Kestrel	*Falco sparverius*	29.17	**21.21**
Great Horned Owl	*Bubo virginianus*	17.71	**12.12**
Turkey Vulture	*Cathartes aura*	3.13	**7.58**
Prairie Falcon	*Falco mexicanus*	1.04	**4.55**
Northern Harrier	*Circus cyaneus*	7.29	**4.55**
Swainson's Hawk	*Buteo swainsoni*	1.04	**3.03**
Bald Eagle	*Haliaeetus leucocephalus*	1.04	**1.52**
Rough-legged Hawk	*Buteo lagopus*	5.21	**1.52**
Golden Eagle	*Aquila chrysaetos*	3.13	**1.52**
Long-eared Owl	*Asio otus*	1.04	*

*Species was not observed this year during Sitewide Surveys.

Table 8-4. Relative abundance (RA) of the waterfowl species observed during the 2002 and 2003 Sitewide Surveys.

Common Name	Scientific Name	2002 RA	2003 RA
Mallard	*Anas platyrhynchos*	32.55	**29.80**
American Coot	*Fulica americana*	1.71	**13.33**
Gadwall	*Anas strepera*	0.79	**9.93**
Canada Goose	*Branta canadensis*	7.74	**8.63**
Pied-billed Grebe	*Podilymbus podiceps*	2.76	**6.80**
Ring-necked Duck	*Aythya collaris*	10.76	**6.41**
Bufflehead	*Bucephala albeola*	4.2	**5.10**
Double-crested Cormorant	*Phalacrocorax auritus*	3.54	**3.40**
Blue-winged Teal	*Anas discors*	5.77	**3.40**
American White Pelican	*Pelecanus erythrorhynchos*	2.1	**2.22**
Cinnamon Teal	*Anas cyanoptera*	8.14	**2.09**
Common Goldeneye	*Bucephala clangula*	1.97	**1.83**
Green-winged Teal	*Anas crecca*	6.17	**1.70**
Great Blue Heron	*Ardea herodias*	1.05	**1.57**
Lesser Scaup	*Aythya affinis*	*	**1.31**
Northern Pintail	*Anas acuta*	*	**0.52**
Common Snipe	*Gallinago gallinago*	*	**0.52**
Ruddy Duck	*Oxyura jamaicensis*	*	**0.39**
Sora	*Porzana carolina*	*	**0.39**
Black-crowned Night-heron	*Nycticorax nycticorax*	0.39	**0.26**
White-faced Ibis	*Plegadis chihi*	*	**0.13**
Upland Sandpiper	*Bartramia longicauda*	*	**0.13**
Common Merganser	*Mergus merganser*	3.02	**0.13**
Redhead	*Ardea herodias*	5.51	*
Sandhill Crane	*Nycticorax nycticorax*	0.52	*
Greater Scaup	*Phalacrocorax auritus*	0.39	*
Greater Yellowlegs	*Podilymbus podiceps*	0.26	*
American Wigeon	*Tringa melanoleuca*	0.26	*

*Species was not observed this year during Sitewide Surveys.

9. Boreal Chorus Frog Vocalization Monitoring

9.1 Introduction

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A total of 20 locations were sampled for species presence/absence and population abundance in 2003 (Figure 9-1). This approach followed the modifications of the protocol implemented in 1999 (K-H 2000a). 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 for all locations was conducted in one night, starting at dusk. In 2003, the vocalization surveys for all monitoring locations were conducted on May 7th.

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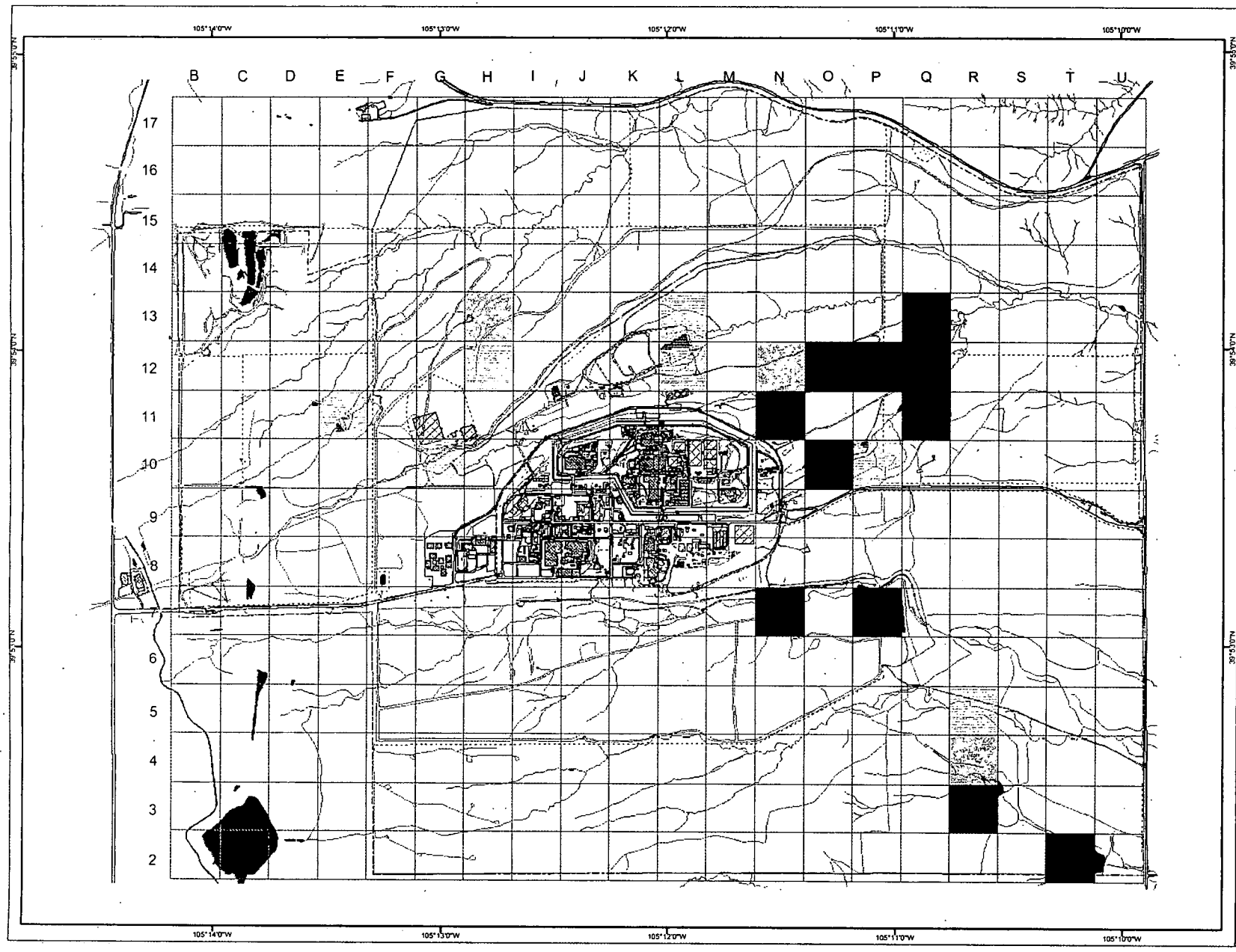

2003 Annual Waterfowl Area Use at Rocky Flats

Figure 8-8

Legend

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

Standard Features

- Buildings
- Demolished Buildings
- Lakes
- Streams
- Boundary Fence
- Fences
- Trails
- Dirt Roads
- Paved 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, 1/95.

1,000 0 1,000 2,000
Feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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

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