

2006 Boreal Chorus Frog Vocalization Monitoring

Introduction

General monitoring for wildlife at the Rocky Flats Site (Site) began in 1993. Although occasional frog observations were noted while monitoring other species, there were no specific attempts to monitor frog populations until 1998. Even though an annual presence/absence record for amphibians was being established as a part of general wildlife monitoring, the lack of a specific methodology precluded the ability to effectively track population abundance or distribution of these species at the Site. In an effort to better track amphibian populations and use that information as an indicator for detecting changes in the health of aquatic ecosystems, a systematic and recognized monitoring program was initiated that was based on nationally recognized protocol for monitoring frogs. Amphibians are an important group to track because their semi-aquatic nature makes them particularly sensitive to aquatic impacts (Blaustein and Wake 1995). The boreal chorus frog (*Pseudacris triseriatus*) was chosen as the best candidate for vocalization monitoring and can also serve as an indicator species for tracking general amphibian population abundance onsite.

Methods

The methods used for the amphibian vocalization surveys in 2006 generally followed the guidelines provided in Mossman et al. (1998). Additional resources that provided information related to frog monitoring included reports and information prepared by the Wisconsin Department of Natural Resources (Mossman and Hine 1984, 1985), the National Biological Survey (NBS 1997), and personal communication between Site Ecologists and Mike Mossman (Wisconsin Department of Natural Resources; Nelson 1998). Frog vocalization or calling surveys are used instead of actual population counts due to the difficulty of capturing or observing the frogs themselves. The vocalization surveys provide a useful index of frog abundance that can be tracked annually. Some modification of these guidelines was necessary to adapt the surveys for use at the Site. The protocols initially called for multiple surveys to be conducted throughout the spring and summer to document the presence of different frog species that mate and call at different times. In 1998, vocalization surveys were begun at the Site (K-H 1999). Three separate surveys were conducted throughout the spring and summer (April, June, and July) in 1998 to evaluate what species might be present and calling at the Site. The June and July observations recorded only two and one vocalization respectively, at all the locations sampled. Because there were so few vocalizations noted during the June and July surveys, beginning in 1999, monitoring was reduced to one evening in early spring. Monitoring at this time provides information on the boreal chorus frog. Since that time the following approach has been used for the annual monitoring.

In 2006, 20 locations were sampled for species presence/absence and population abundance (Figure 1). This approach followed the modifications of the protocol implemented in 1999 (K-H 2000). The original locations where sampling was conducted in 1998 were modified after it was determined that some locations were too close together and that some locations on Site that should have been sampled had not been sampled. The current sample locations have been used since 1999. The final locations were chosen to represent a variety of likely frog habitats across

the Site that included the edges of ponds, streams, and wetlands. In addition, the 20 locations were divided almost evenly between the north and south portions of the Site (using the east and west access roads as the dividing line between north and south). Eleven sites were in the north and nine were in the south. Monitoring at all locations was conducted in one night, starting at dusk. Based on the protocols, the preferred conditions for the night selected for sampling included water temperatures above 10° C and low winds. These conditions were present on May 2, 2006. 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. This information was collected because it could be used to aid in determining what conditions might be most conducive for frog calling at the Site. Studies have shown that variations in these factors have been known to influence the calling abundance of frogs (Mossman and Hine 1984).

Results and Discussion

Boreal chorus frogs were recorded at 11 of the 20 (55%) sample locations surveyed in 2006 (Table 1). Figure 2 shows the frequency of the different vocalization indices at all 20 locations sampled in 2006. Four of the locations (20%) sampled had full choruses of frogs calling (vocalization index 3). Four locations (20%) had multiple individuals calling with overlaps between the calls (vocalization index 2). Three locations (15%) had a vocalization index of 1, where individuals could be counted but the calls were not overlapping. The remaining nine locations (45%) had no frogs calling (vocalization index 0).

On the evening when sampling was conducted in 2006, the average water and air temperature (°C) was 16° and 16°, respectively. No precipitation occurred on the day when sampling was conducted and the mean cloud cover was approximately 89%.

Table 1 and Figure 2 show the 2006 results in comparison to the data collected since 1999. The 1998 data is not shown because of the different sample locations used in 1998. The 2006 vocalization results tied for the lowest of all the years sampled thus far. The mean vocalization index in 2006 was 1.2 versus the annual mean of 1.9 (1999-2006; Table 1). Because the boreal chorus frog requires water to mate and lay eggs in, the overall abundance of the frogs at the Site appears to be related to how much water is available at the Site during the spring. From the available monitoring data, frogs were least abundant in 2003, the year after the drought in 2002 (Table 1, no data was collected in 2002). In 2004 and 2005, abundant precipitation resulted in higher abundances of vocalizations. However, during the fall and winter of 2005–2006, drought conditions were experienced again at the Site which left few locations with standing pools of water available for breeding in spring 2006. Additionally, many of the ponds at the Site were drained in midsummer 2005 for sediment sampling. The lack of precipitation after they were

drained resulted in little to no water present at many of these locations. Although the 2006 data shows decline in the boreal chorus frog abundance at the Site, at this point there is no reason to assume it is nothing more than a normal perturbation resulting from the lack of water.

Summary

The vocalization index for the 2006 frog vocalization survey tied the lowest of all previously sampled years. Frogs were heard calling at only 55% of the locations sampled in 2006. These results are similar to those which occurred in 2003 after the 2002 drought. Although the 2006 data shows a decline in the boreal chorus frog abundance at the Site, if an increase in precipitation occurs in winter 2005-2006, the abundance of the frogs should increase again as it has in the past

References

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Nelson, 1998. Personal communication between Jody Nelson (Rocky Flats) and Mike Mossman (Wisconsin Department of Natural Resources) regarding frog vocalization methodology, October 28, 1998.

Frog Vocalization Monitoring Locations

Figure 1

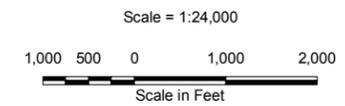
LEGEND

● Monitoring Locations

STANDARD FEATURES

- Roads
- ~ Streams, ditches, and other drainage features
- ☪ Lake or pond
- Topographic contour (20-foot interval)
- Topographic contour (100-foot interval)

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.



State Plane Coordinate System
Colorado Central Zone
North American Datum of 1927

U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

Work Performed by
S.M. Stoller Corporation
Under DOE Contract
No. DE-AC01-02GJ79491

DATE PREPARED:
January 26, 2007

FILENAME:
S0296100-01

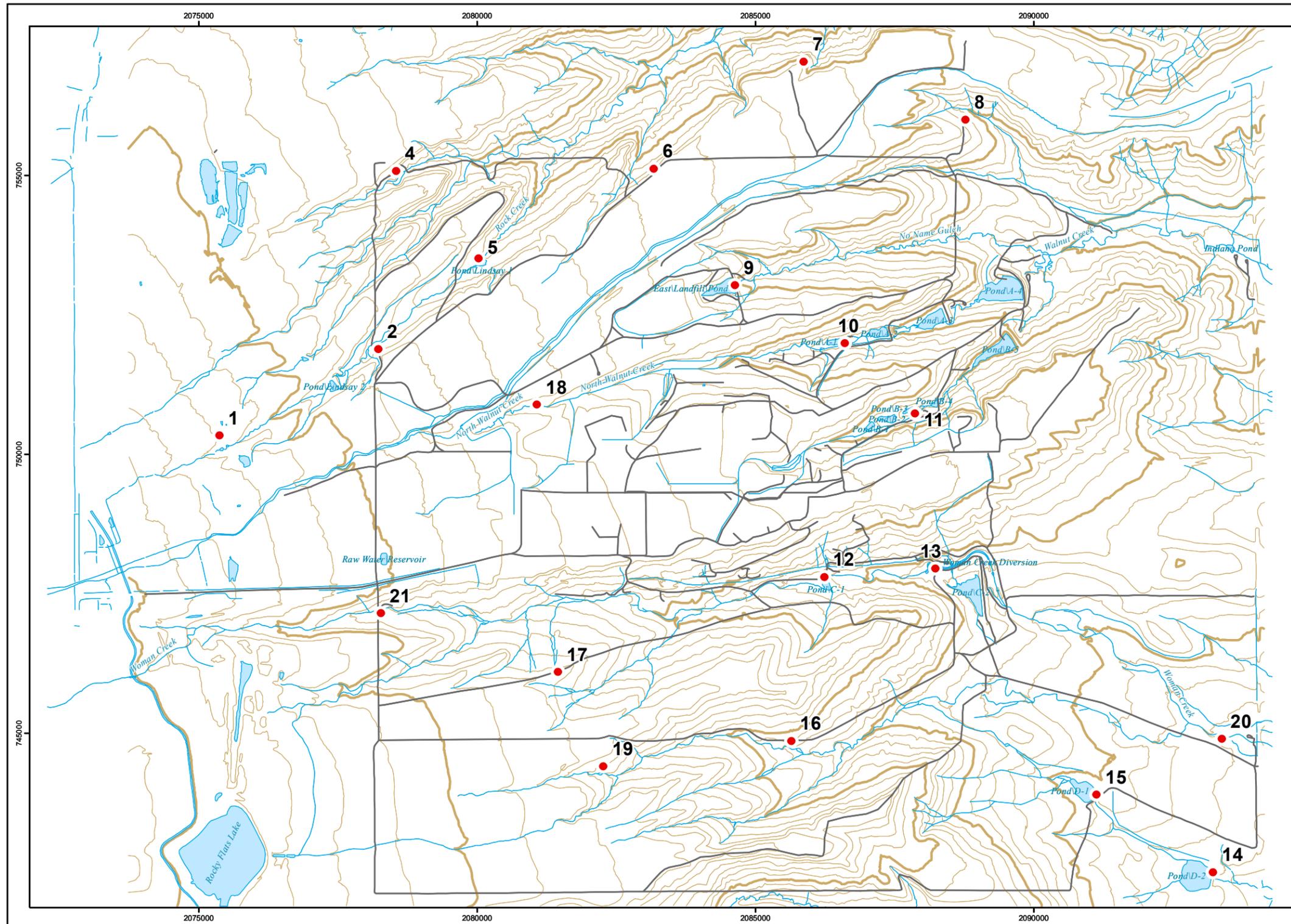


Figure 2. Frog Vocalization Summary

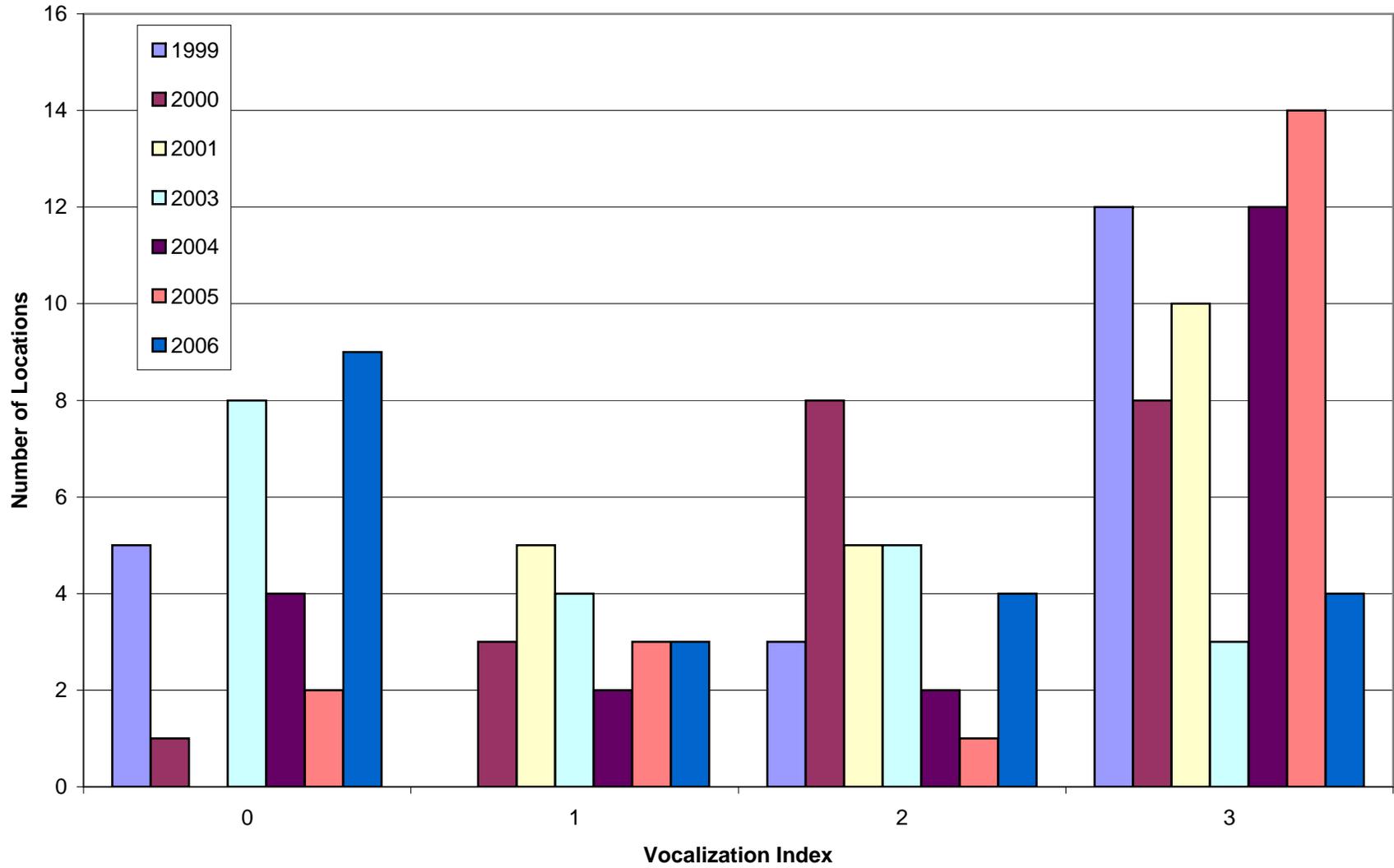


Table 1. Frog Vocalization Summary 1999-2006

Site Number	1999	2000	2001	2003	2004	2005	2006
1	3	2	1	1	3	3	1
2	3	2	3	2	2	3	2
4	3	2	3	0	1	1	0
5	3	3	3	0	3	3	0
6	3	2	2	2	3	3	0
7	3	2	3	0	3	3	3
8	3	3	2	0	3	3	3
9	2	2	2	0	1	1	1
10	3	3	3	3	3	3	0
11	3	1	3	1	3	2	2
12	0	3	1	2	3	3	3
13	3	3	3	3	3	3	3
14	3	3	3	2	3	3	2
15	0	2	2	3	0	3	0
16	0	1	3	1	0	0	0
17	0	0	1	0	2	1	0
18	3	2	1	2	3	3	1
19	2	3	2	1	0	3	0
20	2	3	3	0	3	3	2
21	0	1	1	0	0	0	0
Mean Vocalization Index	2.1	2.2	2.3	1.2	2.1	2.4	1.2
Grand Mean (1999-2006)	1.9						

Values are vocalization indices.