2007 Boreal Chorus Frog Vocalization Monitoring

Introduction

General monitoring for wildlife at the Rocky Flats Site (Site) began in 1993. Although frogs were observed occasionally while other species were being monitored, 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 prevented effective tracking of 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 semiaquatic 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 on site.

Methods

The methods used for the amphibian vocalization surveys in 2007 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 because of the difficulty of capturing or observing the frogs. 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 began at the Site (K-H 1999). Three separate surveys were conducted in April, June, and July 1998 to evaluate what species might be present and calling at the Site. The June and July observations recorded only two and one vocalizations, 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 that time provides information on the boreal chorus frog. Since that time the following approach has been used for the annual monitoring.

In 2007, 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 (the east and west access roads were used 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. According to 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 April 18 and 28, 2007. After the observer arrived 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 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 the following vocalization indices:

0 = No calling heard.
1 = Individuals can be counted; calls are 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 16 of the 20 sample locations (80 percent) surveyed in 2007 (Table 1). Figure 2 shows the frequency of the different vocalization indices at all 20 locations sampled in 2007. Nine of the locations sampled (45 percent) had full choruses of frogs calling (vocalization index 3). Two locations (10 percent) had multiple individuals calling with overlaps between the calls (vocalization index 2). Five locations (25 percent) had a vocalization index of 1, where individuals could be counted but the calls were not overlapping. The remaining four locations (20 percent) had no frogs calling (vocalization index 0).

On the evenings when sampling was conducted in 2007, the average water and air temperature was 12 °C and 15 °C, respectively, on April 18 and 18 °C and 16 °C, respectively, on April 28. No precipitation occurred on the days when sampling was conducted, and evening cloud cover was 75 percent on April 18 and 13 percent on April 28.

Table 1 and Figure 2 show the 2007 results in comparison to the data collected since 1999. The 1998 data are not shown because sample locations were different from those of 1999 and later. The 2007 mean vocalization index (1.8) is midway in the range of values observed from previous years, which have ranged from 1.2 to 2.4. Because the boreal chorus frog requires water to mate and lay eggs in, the overall abundance of the frogs at the Site appears be related to how much water is available at the Site during the spring. Available monitoring data indicate that frogs were least abundant in 2003 and 2006 (Table 1, no data were collected in 2002). In 2002, the drought limited the available surface water for breeding and affected abundance into 2003. During the fall and winter of 2005−2006, drought conditions prevailed 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. In winter 2006–2007, an above-average snowfall at the Site resulted in an abundance of standing surface water in spring 2007. This abundance of surface water is reflected in the increased abundance of frogs in 2007 compared to 2006. Overall, the abundance of boreal chorus frogs at the Site in 2007 was good and was indicative of the good quality of the aquatic and riparian habitat available at the Site.

In addition, during the surveys on April 28, near sample location 1 in the western portion of the Site, a large chorus of Woodhouse's toads was heard, and the toads were observed in the upper reaches of the main channel of the Rock Creek drainage. A vocalization index of 3 was recorded in this part of the drainage. Photographs were taken of the toads near an old stock pond in the drainage (Figure 3). Although occasionally a Woodhouse's toad has been observed or heard calling at the Site, this degree of abundance has not been recorded or noted since at least the early 1990s, when more intensive ecological studies began at the Site. Perhaps the abundance was related to the heavy snowfalls at the Site during the winter of 2006–2007.

Summary

The 2007 boreal chorus frog vocalization surveys recorded an increased number of frogs compared to the 2006 data. The 2007 mean vocalization index (1.8) was midway in the range of previously recorded values (1.2–2.4). Frogs were heard calling at 80 percent of the sampling locations. An abundance of Woodhouse's toads was also heard and observed near one of the sampling locations in the western part of the Site. The abundance of amphibians in spring 2007 is probably related to the abundant snowfall and precipitation in the winter of 2006–2007. The abundance of frogs and toads indicates that good aquatic and riparian habitat is present at the Site.

References

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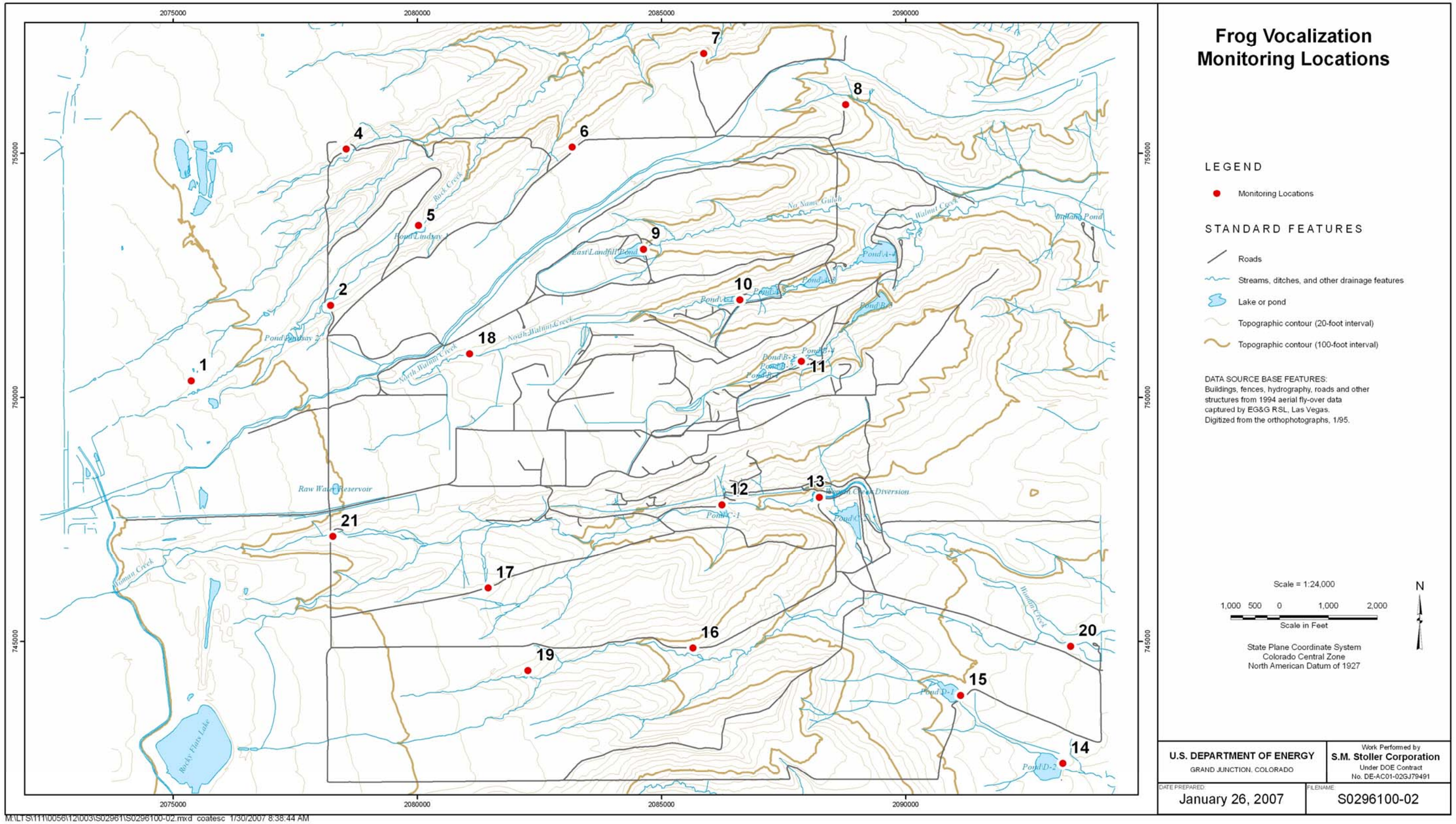

Figure 1. 2007 Frog Vocalization Monitoring Locations.

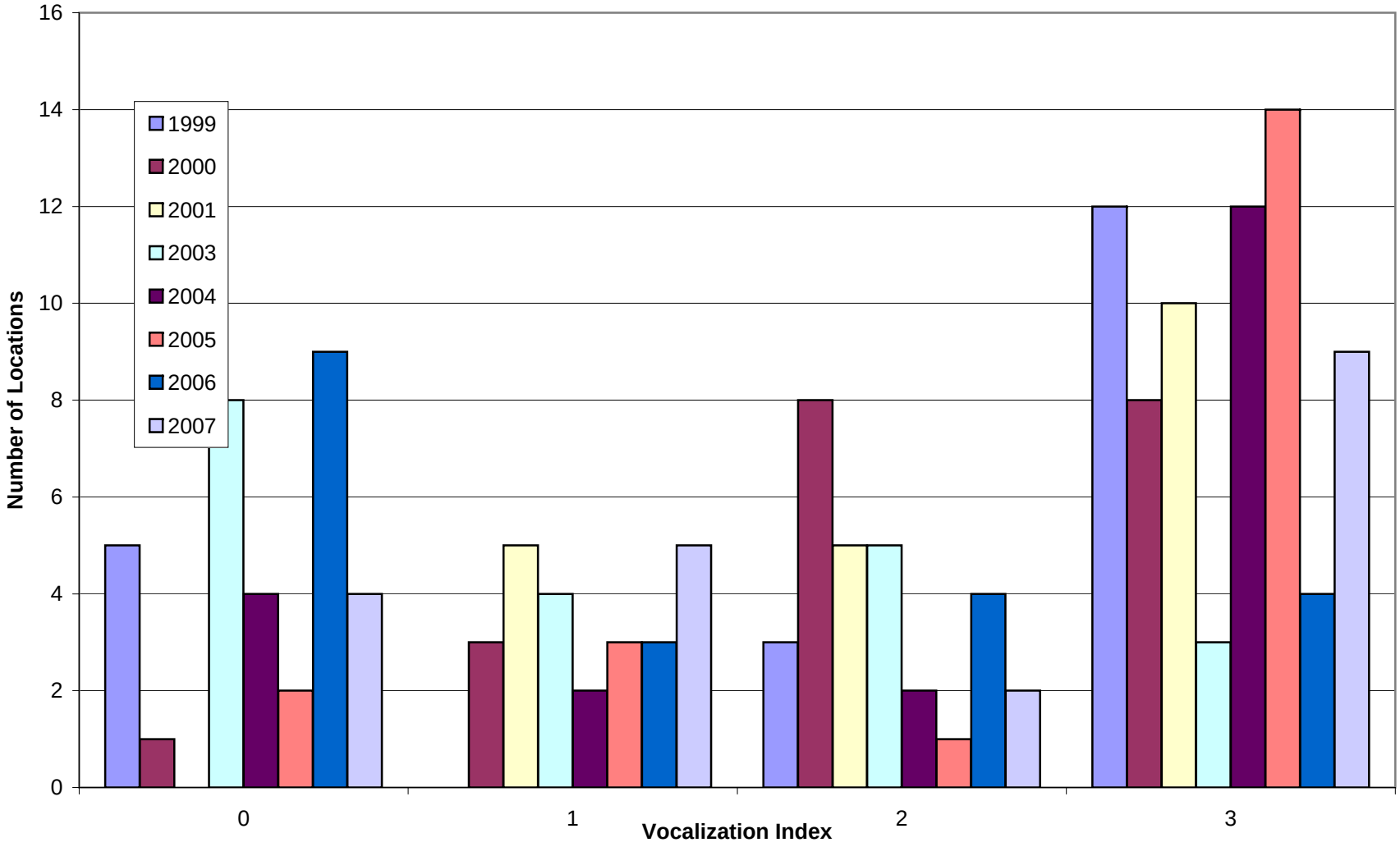

Figure 2. Frog Vocalization Summary

Figure 3. Woodhouse's toads along the edge of an old stock pond in the western part of the Site on April 28, 2007.

Table 1. Frog Vocalization Summary 1999-2007

Site Number	1999	2000	2001	2003	2004	2005	2006	2007
1	3	2	1	1	3	3	1	3
2	3	2	3	2	2	3	2	3
4	3	2	3	0	1	1	0	1
5	3	3	3	0	3	3	0	1
6	3	2	2	2	3	3	0	0
7	3	2	3	0	3	3	3	3
8	3	3	2	0	3	3	3	2
9	2	2	2	0	1	1	1	3
10	3	3	3	3	3	3	0	3
11	3	1	3	1	3	2	2	3
12	0	3	1	2	3	3	3	3
13	3	3	3	3	3	3	3	2
14	3	3	3	2	3	3	2	3
15	0	2	2	3	0	3	0	3
16	0	1	3	1	0	0	0	0
17	0	0	1	0	2	1	0	0
18	3	2	1	2	3	3	1	1
19	2	3	2	1	0	3	0	1
20	2	3	3	0	3	3	2	1
21	0	1	1	0	0	0	0	0
Mean Vocalization Index	2.1	2.2	2.3	1.2	2.1	2.4	1.2	1.8
Grand Mean (1999-2007)	1.9							

Values are vocalization indices.