

Amphibian Monitoring at Beaverhill Lake, Alberta

Introduction

The decline of amphibians first became a major concern in 1989 when scientists at a herpetology conference noticed a disturbing downward trend in amphibian populations (Gardner 1990). Today it is known that amphibians are declining at a rate faster than birds or mammals and populations are going extinct at a rate 211 times greater than the expected background extinction rate (Stuart et al. 2001; MaCallum 2007). Additionally, it is not uncommon for amphibian populations to abruptly disappear from their habitat even when it appears unaltered (Stuart et al. 2009). The Northern Leopard Frog (*Rana pipiens*), for instance, was previously widespread throughout central and southern Alberta, but experienced a sudden population decline in the 1970s (Wagner 1997). It is critical to have baseline population data to determine if a species is in decline. The goal of this project was to assess the population status of amphibians in and around Beaverhill Natural Area, Alberta.

The Beaverhill Natural Area is located 60 kilometers east of Edmonton, Alberta. The area contains Beaverhill Lake, a large “prairie pothole” lake that has dried up significantly (Michell et al. 1990). In (YEAR?) Ducks Unlimited Canada constructed a weir on the south end of Beaverhill Lake; the weir directs water flow toward Lister Lake, an artificially created basin. The Beaverhill Lake is an important staging area for several bird species and has consequently been extensively studied (Michelle et al. 1990). The Beaverhill Bird Observatory (BBO) participated in Researching Amphibian Numbers in Alberta (RANA) from 1997 to 2000 (Takats 2001). This study found that Tiger Salamanders (*Ambystoma tigrinum*), Wood Frogs (*Lithobates sylvaticus*), and Boreal Chorus Frogs (*Pseudacris maculata*) were all present in the area. The population status of these species at the BBO has not been re-assessed since 2000.

Methods

This study consisted of call surveys and visual searches for amphibians. A call survey involved a five minute point count in which every amphibian species heard was recorded; the relative intensity of their call was also recorded. Call surveys occurred at eight different sites, four locations within the Beaverhill Natural Area and four outside of it. They took place either between the hours of 13:30 and 17:30 or 19:30 and 22:00. Surveys were conducted from April 24th to June 12th and only on days with no rainfall and wind less than 3 on a Beaufort scale. Call intensity was ranked on a scale from 0 to 4, as outlined by the Alberta Fish and Wildlife survey protocol for the Northern Leopard Frog (Kendell 2002). This scale uses the following criteria:

0 - None heard.

- 1 - One frog heard (individual counted).
- 2 - Individuals counted. Two or more calling frogs are detected, no overlapping calls.
- 3 - Several individuals are heard at the same site. Calls distinguishable.
- 4 - Full continuous chorus. Calls overlapping, but not distinguishable.

Visual surveys were a 20 minute walk around the perimeter of a wetland. During this time every amphibian species observed was recorded. Visual surveys occurred at four sites within the Beaverhill Natural Area, and were the same sites used during call surveys. They were carried out from May 15 to August 21 between 13:30 and 16:30.

Results

Boreal Chorus Frogs were heard during 69% of call surveys and Wood Frogs, had a detection rate of 36% (Table 1). In general, both species were more likely to call during the evening surveys. No Wood Frogs were heard during the day, but during the evening they had a 59% detection rate (Table 1). Boreal Chorus Frogs were heard 73% of the time during nighttime surveys and 69% during afternoon surveys (Table 1). The call intensity for Wood Frogs and Boreal Chorus Frogs increased after 21:00 (Table 4; Figure 1.). Wood Frogs were heard from April 29 to May 8, but were not heard after May 8 (Table 2). Boreal Chorus Frogs were heard from April 29 to June 12 (Table 2). No other amphibian species were heard during call surveys.

A total of twenty-two amphibians were spotted during visual survey (Table 6). The majority of these amphibians were Wood Frogs; twenty Wood Frogs were detected compared to two Boreal Chorus Frogs (Table 6). Wood Frogs had a detection rate of 36% for visual surveys, whereas Boreal Chorus Frogs had a detection rate of 7% (Figure 4). More frogs were spotted at the Sora pond than any other site; there were ten Wood Frogs and two Boreal Chorus Frogs observed (Table 7). This was the only site where Boreal Chorus Frogs were seen. Lister Lake 1 had the second highest amount of amphibians seen with seven Wood Frogs (Table 7). Two Wood Frogs were seen at Lister Lake 2 and there were no frogs detected at Lister Lake 3 (Table 7). Only Wood Frogs and Boreal Chorus Frogs were seen during visual surveys.

Discussion

This study detected the presence of two amphibian species in the Beaverhill region; Boreal Chorus Frog and Wood Frog. The presence of other amphibian species, however, cannot be ruled out. Tiger Salamanders were found in 1998 and 1999 at the BBO using pitfall traps, although only one specimen was observed each year (Takats 2001); they were also seen in large numbers in 1997 later in the summer away from wetlands (L. Priestley pers. comm.). It is possible that the methods used by this study were not sufficient for finding Tiger Salamanders. Tiger Salamanders are a cryptic, nocturnal species that spend most of their life underground, which makes them difficult to detect during visual surveys (Loredo et al. 1996). Additionally,

Tiger Salamanders become more visible in late summer as they move away from wetlands to find places to overwinter. Although Tiger Salamanders were not found in this study, they may still be present in the Beaverhill Area.

This study is also inconclusive about whether or not Canadian Toads (*Anaxyrus hemiophrys*) are in the area. The BBO falls within the range of the Canadian Toad and the toads have been heard and observed at nearby Elk Island National Park (Takats and Priestley 2002). Canadian Toads, however, were not found during previous RANA studies (Takats 2001) at Beaverhill Natural Area and were not detected during this study. It is possible that the range of the Canadian Toad has decreased as previous data has suggested that Canadian Toads are declining from central Alberta (Browne 2009). Another possibility is that the timing of call surveys did not coincide with the Canadian Toad's calling behavior. The triggers for Canadian Toad calling are poorly understood and they may call later at night (Takats and Priestley 2002). Further studies are needed before it can be concluded that Canadian Toads are not in the area.

The call intensity of Wood Frogs and Boreal Chorus Frogs was highest in late April and early May. These results are similar to other studies that have found late April/early May to be the peak calling time of Wood Frogs and Boreal Chorus Frogs (Eaton et al. 2011). Call intensity also peaked after 21:00, which roughly corresponds to sunset. Although there are many factors that could influence frog calling behaviour, it appears that sunset may be a major trigger for calling.

It has been found that call intensity is positively correlated with the number of breeding males and egg masses (Stevens and Paszkowski 2004). Wood Frogs were heard calling at a full continuous chorus at three sites within the area on April 29. Boreal Chorus Frogs were also heard calling in a chorus at three sites in the area and on four different days (April 29, May 8, May 15, and May 29). It is difficult to extrapolate exact population numbers from call surveys, but the results suggest that Wood Frogs and Boreal Chorus Frogs are common in the Beaverhill region.

Visual surveys confirmed the presence of Wood Frogs and Boreal Chorus Frogs. Boreal Chorus Frogs likely had a lower detection rate than Wood Frogs likely because they are smaller and more inconspicuous than Wood Frogs. The results do not necessarily mean that Wood Frogs have a higher population than Boreal Chorus Frogs. A 36% detection rate of Wood Frogs suggests that Wood Frogs are present and abundant at the BBO. Overall visual surveys had a lower detection rate than call surveys, which may suggest that call surveys are a more time-effective method to search for frog species. However, visual surveys confirm breeding success.

Caveats

One of the major drawbacks to this study was the amount of surveys conducted. There was only one visual survey carried out in July and two in August. August is a key time for spotting amphibian populations because it is when the young of the year emerge from the pond. Therefore, additional surveys late in the summer may be needed to properly assess amphibian populations. Another drawback was that the call surveys were only conducted until 22:00 and many surveys took place before sunset. Previous studies have found that amphibian call rate increases half an hour after sunset (Takats and Priestly 2002). Call surveys later in the evening may reveal species undetected by this study. This study is also hindered by errors in observation; it is possible that the observer missed amphibians and the actual number of amphibians has been underreported.

Future Directions

Future studies are needed to monitor the amphibian population at the BBO. It would be useful to set up pitfall traps to look for cryptic species such as Tiger Salamanders. More call surveys conducted over the long term would also be useful to track changes in the population. Nighttime call surveys conducted earlier in April and later in June could provide more insight into amphibian populations. Additionally more call surveys during the season may be needed to detect species such as Canadian Toads.

Visual studies were only conducted around the wetlands. Future visual studies could expand to other habitat within the BBO, such as forest and grassland. Not only would this increase the possibility of finding other species, it could shed light on the habitat use of amphibians in the Beaverhill region.

Conclusions

Wood Frogs and Boreal Chorus Frogs are present in the Beaverhill Natural Area. Further studies are needed to conclusively rule out the presence of other species such as Tiger Salamanders and Canadian Toads. The results of this study can be used as baseline data for future amphibian studies in the Beaverhill region. It is important to conduct more studies in the area to properly assess the status of the amphibian populations.

Tables and Figures

	Wood Frog Detection Rate	Boreal Chorus Frog Detection Rate	Number of Call Surveys
Overall	0.36	0.69	36
Afternoon	0	0.64	22
Evening	0.59	0.73	14

Table 1. Detection rate of Wood Frogs and Boreal Chorus Frogs during call surveys at the BBO. Afternoon call surveys were conducted between 13:00 and 17:30; evening call surveys were conducted between 19:30 and 22:00

Date	Average Call Intensity of Wood Frogs	Average Call Intensity of Boreal Chorus Frogs
April 29	2.13	3.25
May 8	1.00	2.25
May 29	0	1.00

Table 2. Average call intensity of Wood Frogs and Boreal Chorus Frogs during night call surveys. Night call surveys were conducted at 8 sites between the hours of 19:30 and 22:00.

Date	Average Call Intensity of Wood Frogs	Average Call Intensity of Boreal Chorus Frogs
May 15	0	2.33
May 21	0	2.50
June 4	0	1.33
June 12	0	1.00
June 26	0	0

Table 3. Average call intensity of Wood frogs and Boreal Chorus Frogs during afternoon call surveys. Afternoon call surveys were conducted at 4 sites within the BBO between the hours of 13:00 and 17:30.

Time	Average Call Intensity of Wood Frogs	Average Call Intensity of Boreal Chorus Frogs	Sampling Effort
19:00-19:30	1.00	2.00	2
19:30-20:00	1.60	1.57	5
20:00-20:30	1.33	2.20	5
20:30-21:00	0.60	1.33	5
21:00-21:30	3.67	3.33	3
21:30-22:00	4.00	3.50	2

Table 4. Average call intensity of Wood Frogs and Boreal Chorus Frogs during night call surveys. Night call surveys were conducted at 8 sites and between the hours of 19:30 and 22:00. The sampling effort represents how many call surveys took place in that time period.

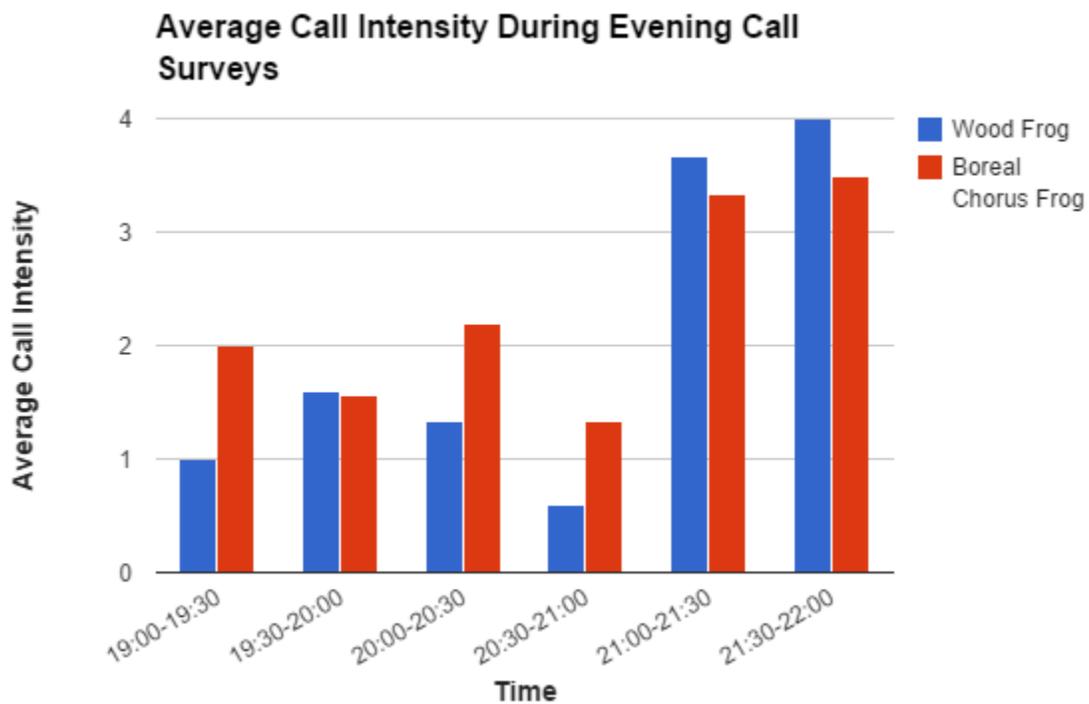


Figure 1. Average call intensity of Wood Frogs and Boreal Chorus Frogs during night call surveys. Night call surveys were conducted at 8 sites and between the hours of 19:30 and 22:00. The sampling effort represents how many call surveys took place in that time period.

Time	Average Call Intensity of Wood Frogs	Average Call Intensity of Boreal Chorus Frogs	Sampling Effort
13:00-13:30	0	3	1
13:30-14:00	0	1.5	2
14:00-14:30	N/A	N/A	0
14:30-15:00	0	2	3
15:00-15:30	0	1	3
15:30-16:00	0	1.25	4
16:00-16:30	N/A	N/A	0
16:30-17:00	0	0	1
17:00-17:30	0	1	1

Table 5. Average call intensity of Wood Frogs and Boreal Chorus Frogs during afternoon call surveys. The sampling effort represents how many call surveys took place in that time period.

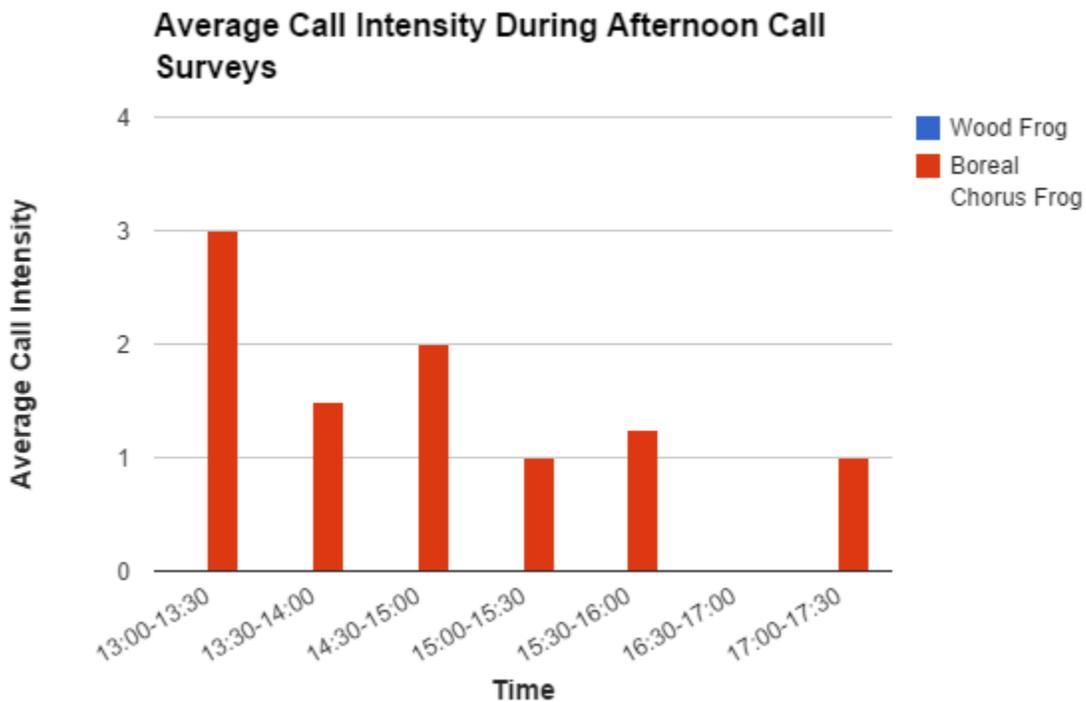


Figure 2. Average call intensity of Wood Frogs and Boreal Chorus Frogs during afternoon call surveys. Afternoon call surveys were conducted at 4 sites within the BBO between the hours of 13:00 and 17:30.

Date	Number of Wood Frogs	Number of Boreal Chorus Frogs	Total
May 15	2	0	3
May 21	4	1	5
June 4	4	1	5
June 12	3	0	3
June 26	0	0	0
July 9	2	0	2
August 5	2	0	2
August 21	2	0	2
Total	19	2	21

Table 6. Results of visual surveys conducted at the BBO. Visual surveys occurred between 13:30 and 16:30 at four sites.

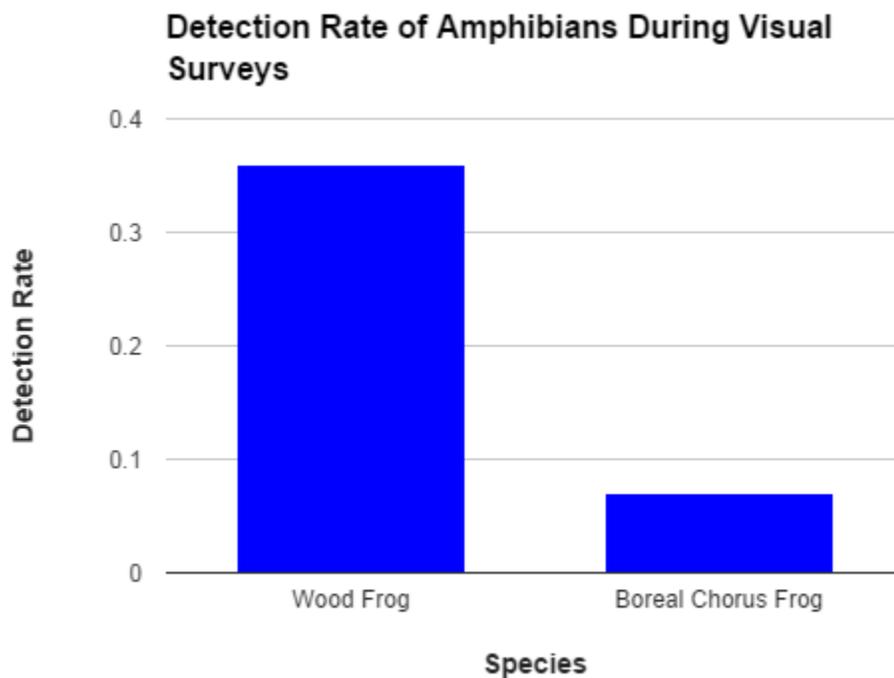


Figure 4. Detection rate of amphibians during visual surveys.

Site	Number of Wood	Number of Boreal	Total number of frogs
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	Frogs	Chorus Frogs	
Lister Lake 1	7	0	7
Lister Lake 2	2	0	2
Lister Lake 3	0	0	0
Sora Pond	10	2	12

Table 7. Number of Wood Frogs seen at each site.

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