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Amphibians and Reptiles in a Mixed-Grass Prairie in Northwestern North Dakota

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ABSTRACT -- There have been almost no surveys of herpetofauna at 109 km² Lostwood National Wildlife Refuge (LNWR) or surrounding counties in northwestern North Dakota, an area possibly undergoing significant environmental change from fossil fuel extraction and use. We used 30 m drift fences to survey amphibian and reptile species in prairie-wetland transition zones at LNWR during mid-May to early-July in 1985 to 1987, and again in 1999 and 2000. We captured only four amphibian and two reptilian species and noted one other reptilian species incidental to our survey. Several species expected to occur in the area were not detected.

Key words: amphibians, biological diversity, Great Plains, mixed-grass prairie, North Dakota, reptiles, wildlife refuges.

Lostwood National Wildlife Refuge (LNWR) in northwestern North Dakota is the most extensive, publicly owned tract of native prairie pothole habitat in the northern Great Plains region. Surprisingly, little is known of reptiles and amphibians in the refuge and surrounding counties and it is unclear how these faunal elements might respond to significant environmental changes in the area.

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Class I air quality must be maintained in the refuge's 2257 ha Wilderness Area (United States Fish and Wildlife Service 1998). Although air and water quality data collected at LNWR during the late 1980's and early 1990's did not indicate elevated levels of pollutants associated with the fossil fuel industry (Smith et al. 1999), unusually high levels of methylmercury were documented recently in refuge wetlands (K. Johnson, United States Fish and Wildlife Service, Bismarck, North Dakota, and D. Krabbenhoft, United States Geological Survey, Middleton, Wisconsin, unpublished data). Here we report relative abundances of amphibian and reptilian species in prairie-wetland transition areas characteristic of LNWR. Our goal was simply to help substantiate baseline refuge resources in the face of possible broad ecological changes and to improve on the limited knowledge of faunal distributions in northwestern North Dakota.

STUDY AREA and METHODS

LNWR covers 109 km² of rolling to hilly moraine in Burke and Mountrail counties, North Dakota (48°37' N; 102°27' W). Wetlands, covering 20% of the refuge, are numerous (\bar{x} = 40 basins/km²); they vary markedly in area, hydroperiod, and salinity. Uplands are mostly native needlegrass-wheatgrass association (*Stipa-Agropyron*; Coupland 1950), although one-fourth of uplands are composed of previously cropped fields revegetated with native and introduced species of plants. Area climate is semi-arid, with nearly one-half of the mean annual precipitation of 42 cm falling as rain in May to July. Annual precipitation was average to below average (46, 45, and 31 cm) during our 1985 to 1987 sampling period but was above average (73 and 70 cm) during 1999 to 2000 sampling (United States Fish and Wildlife Service, unpublished data).

We used drift fences (Gibbons and Semlitsch 1981, Vogt and Hine 1982) to survey reptiles and amphibians. In spring 1985, we established five drift fence sites in representative mesic prairie communities, 0.8 to 1.4 km apart across the center of LNWR and 0.1 to 3.3 km south of the refuge's Wilderness Area. Each of the five sites included two 30 m drift fences, 50 to 80 m apart. We installed each drift fence parallel to and between borders of xeric prairie and a nearby (2 to 25 m away) seasonal or semipermanent wetland. Each drift fence consisted of partly buried, 0.6 m tall aluminum flashing with a 0.3 x 0.3 x 0.8 m long, 0.6 cm mesh funnel trap in the center and a total of eight 20 l pitfall traps with funnel rims. Pitfalls were paired on either side of the fence, at both fence ends and midway between fence ends and the funnel trap (modification of Fig. 17b in Vogt and Hine [1982]). Drift fences were checked every 2 to 3 days and operated continuously from mid-May through early-July. We maintained 3 to 6 cm of water in pitfall traps to keep amphibians alive. Specimens were identified and released 2 to 3 m on the side of the fence opposite that where captured.

For each species and sampling year, we calculated relative abundance as the mean number of individuals captured/100 drift fence days, where one drift fence day represented 15 m of drift fence open for 24 hr (Vogt and Hine 1982). We broadly classified species relative abundance based on total of years of occurrence and mean captures/100 drift fence days/sampling period: (1) common - all years, mean number of individuals captured/period greater than 5.0; (2) uncommon - all years in at least one sampling period, mean number captured/period 0.2 to 5.0.

RESULTS and DISCUSSION

We recorded only four amphibian species and two reptilian species (Table 1). Variable annual occurrence and abundance of western chorus frog (*Pseudacris triseriata*) and tiger salamander (*Ambystoma tigrinum*) in drift fences appeared related mainly to water conditions in local wetlands; relatively minor variation in weather and precipitation strongly influence the population ecology of herpetofauna (e.g., Semlitsch 1985). Northern leopard frog (*Rana pipiens*) was uncommon during the first sampling period but was not detected despite greater precipitation levels during the second sampling period. Western chorus frog was the most abundant amphibian, due in part to a high number of captures ($n = 639$) during 3 days in late June 1999, which likely represented the emergence of recently metamorphosed juveniles. Tiger salamander was caught each year and was particularly common in 1987. The initial appearance of the wood frog (*R. sylvatica*) in 1999 and 2000 probably reflected local distributional change. The first record of wood frog in western North Dakota occurred about 17 km northeast of LNWR in 1984, followed by records on the northeastern boundary of LNWR in 1986, then about 3 km further south and west of the refuge in 1987 (Murphy 1987). By the mid-1990's, the species could be heard calling from seasonal and semi-permanent wetlands over the entire refuge on warm April evenings (Robert K. Murphy, personal observation).

Plains garter snake (*Thamnophis radix*) was uncommon throughout the study, whereas smooth greensnake (*Opheodrys vernalis*) was rare, captured only in 1986. Perhaps smooth greensnake was represented poorly because some individuals might have escaped through the relatively large, 0.6 x 0.6 cm diameter mesh of our funnel traps. The species is observed infrequently in the area (Robert K. Murphy, personal observation). Painted turtle (*Chrysemys picta*) was not detected in drift fences but a specimen was recorded incidental to our study near the center of LNWR in 1987 (Robert K. Murphy and United States Fish and Wildlife Service, Kenmare, North Dakota, unpublished data).

Several reptilian and amphibian species were expected on the basis of distributional range maps but were not detected. We did not detect red-sided garter snake (*T. sirtalis*; nearest records 25 km east, and 25 km southwest of LNWR),

Table 1. Relative abundances of amphibian and reptilian species in areas of transition between upland mixed-grass prairie and seasonal or semi-permanent wetland at Lostwood National Wildlife Refuge, northwestern North Dakota, based on the mean capture rate among five drift fence sampling sites during mid-May to early-July. Total numbers of individuals captured are in parentheses.

Species	Mean \pm SE no. individuals captured/100 drift fence days ^a						\bar{x}	\bar{x}
	1985	1986	1987	1988	1989	2000		
Tiger salamander (<i>Ambystoma tigrinum</i>)	0.5 \pm 0.4 (5)	0.9 \pm 0.4 (9)	5.2 \pm 2.3 (52)	2.2	0.8 \pm 0.4 (7)	0.8 \pm 0.3 (7)	0.8	0.8
Western chorus frog (<i>Pseudacris triseriata</i>)	1.0 \pm 0.4 (10)	3.9 \pm 0.8 (39)	7.7 \pm 3.4 (77)	4.2	79.0 \pm 43.7 (711)	2.4 \pm 0.9 (21)	40.7	40.7
Northern leopard frog (<i>Rana pipens</i>)	8.0 \pm 6.0 (80)	0.9 \pm 0.4 (9)	0.3 \pm 0.2 (3)	3.1	0	0	0	0
Wood frog (<i>R. sylvatica</i>)	0	0	0	0	0.3 \pm 0.1 (3)	0.2 \pm 0.1 (2)	0.3	0.3
Plains gartersnake (<i>Thamnophis radix</i>)	0.3 \pm 0.2 (3)	1.4 \pm 0.7 (14)	1.5 \pm 0.2 (15)	1.1	0.2 \pm 0.1 (2)	2.1 \pm 0.4 (18)	1.2	1.2
Smooth greensnake (<i>Opheodrys vernalis</i>)	0	0.3 \pm 0.2 (3)	0	0.1	0	0	0	0
n sampling days	50	50	50	45	45	43		
n 15 m drift fence days	1000	1000	1000	900	900	860		

^aAbundance for each species was calculated at each drift fence site annually as the total number of individuals captured/100 drift fence days. One drift fence day = 15 m of drift fence open for 24 hr (Vogt and Hine 1982). Thus, two 30 m drift fences at each of the five sites yielded four 15 m drift fence days every 24 hr.

western hog-nosed snake (*Heterodon nasicus*; nearest record 100 km southeast of LNWR), or any of three *Bufo* spp. (nearest records 100 km southeast of LNWR; Wheeler and Wheeler 1966). There have been no incidental observations of any of these five species at LNWR despite multiple biological investigations in the 1980's and 1990's. We are unsure why, except that sandy soils needed by the western hog-nosed snake and Great Plains toad (*Bufo cognatus*) are unavailable at LNWR, and red-sided garter snake tends to be associated with woodland more than prairie at northern latitudes (Russell and Bauer 1993).

Our baseline data suggest a relatively limited diversity of reptilian and amphibian species occurred in mixed-grass prairie characteristic of LNWR during a 3 year sampling period (1985 to 1987) that overlapped years of acceptable Class I air quality standards at the refuge. We failed to detect one of these species, the northern leopard frog, during a subsequent sampling period (1999 to 2000). This change was not readily explained by differences in precipitation levels between sampling periods.

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LITERATURE CITED

- Coupland, R. T. 1950. Ecology of mixed prairie in Canada. *Ecological Monographs* 20:271-315.
- Gibbons, J. W., and R. D. Semlitsch. 1981. Terrestrial drift fences with pitfall traps: an effective technique for quantitative sampling of animal populations. *Brimleyana* 7:1-16.
- Murphy, R. K. 1987. Observations of the wood frog in northwestern North Dakota. *Prairie Naturalist* 19:262.
- Russell, A. P., and A. M. Bauer. 1993. The amphibians and reptiles of Alberta. University of Calgary Press, Calgary, Alberta, and University of Alberta Press, Edmonton, Alberta.
- Semlitsch, R. D. 1985. Analysis of climatic factors influencing migrations of *Ambystomatalpoideum*. *Copeia* 2:477-489.
- Smith, K. A., T. L. Shaffer, N. H. Euliss, D. A. Buhl, W. E. Newton, and D. W. Mushet. 1999. Ambient air quality, precipitation chemistry, and wetland chemistry at Lostwood National Wildlife Refuge, North Dakota 1986-1991. United States National Park Service, Air Resources Division and United States Geological Survey, Biological Resources Division, Final Interagency Report No. IA2350-96-0005.

- United States Fish and Wildlife Service. 1998. Comprehensive conservation plan: Lostwood National Wildlife Refuge. United States Fish and Wildlife Service, Kenmare, North Dakota.
- Vogt, R. C., and R. L. Hine. 1982. Evaluation of techniques for assessment of amphibian and reptile populations in Wisconsin. Pp 201-217 *in* U.S. Herpetological communities: a symposium of the Society for the Study of Amphibians and Reptiles and the Herpetologists' League (N. J. Scott, editor). United States Fish and Wildlife Service Research Report 13.
- Wheeler, G. C., and J. Wheeler. 1966. The amphibians and reptiles of North Dakota. University of North Dakota Press, Grand Forks, North Dakota.

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