

WISCONSIN ENDANGERED RESOURCES REPORT 9

THE WISCONSIN FROG AND TOAD SURVEY: ESTABLISHING A LONG-TERM MONITORING PROGRAM

by Michael J. Mossman and Ruth Hine

SUMMARY

Wisconsin's auditory survey of frogs and toads began in 1981. During the first 3 years, ca 100 cooperators surveyed a total of 68 routes, 2 of which were in adjacent parts of Iowa and Minnesota. Data were collected on the distribution, abundance and song phenology of Wisconsin's 12 anuran species. The chorus frog, American toad, and green frog were the most widespread species. Spring peepers appeared to be absent from urban areas. Pickerel frogs occurred mostly in the driftless area. Bullfrogs occurred uncommonly, but mostly in northern Wisconsin and along the Mississippi River. The endangered cricket frog, once common in Wisconsin, was reported in low numbers at 10 of ca 400 sites surveyed in 1983, although none of these were verified. Misidentifications apparently occurred infrequently, most probably between the Cope's and eastern gray tree frogs.

During these years, survey procedures and data forms were tested and modified and the technique now appears suitable to a long-term monitoring program. This monitoring program, the first of its kind, begins in 1984 and consists of ca 50 permanent survey routes each consisting of 10 wetland sites. Each site is visited 3 times annually during which a "call index" value is recorded as an estimate of abundance for each species.

Several criteria must be met if the program is to be effective: survey routes should be described accurately and run consistently within the given guidelines; alternate observers should be available to ensure continuous coverage of each route; records of rare species or extralimital populations must be verified.

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INTRODUCTION AND BACKGROUND

Wisconsin is home to 11 native species of frogs and 1 species of toad. Over the past decade observers have expressed concern over the apparent rarity, decline and/or population die-offs of several species, most notably the leopard frog (*Rana pipiens*), pickerel frog (*R. palustris*), bullfrog (*R. catesbiana*), and cricket frog (*Acris crepitans blanchardi*) (Les 1979, Hine et al. 1981, Vogt 1981, DNR unpubl. data). However, until the work of Jansen and Anderson (1981) there was no method by which to monitor populations of anurans over either short- or long-term periods. In the Jansen and Anderson method, an observer determines an index to the abundance of each anuran species based on the intensity of calls heard during 3 evening visits to a specific wetland site. The call index values for a particular species are used for rough comparisons between years at a particular site. In 1981, we began to enlist "frogwatchers" to participate in a statewide inventory and monitoring program using this survey technique.

This report describes the first 3 years of the survey, summarizes distribution and phenology data collected thus far, and discusses strengths and problems of the monitoring system that have surfaced. With this report we also use the lessons of the past 3 years to establish and describe a long-term, statewide monitoring program to be initiated in spring 1984.

METHODS

Cooperators were enlisted over the 1981-83 period by word of mouth, notices in the newsletters of the Wisconsin Phenological Society and Wisconsin Wetlands Association, and through contact with reliable observers from other cooperative programs such as the statewide black tern survey and the scientific and natural areas breeding bird survey. Interested individuals were sent: a cassette tape produced by the University of Wisconsin-Stevens Point with the calls and call descriptions of all 12 Wisconsin anuran species (in return for a blank cassette); instructions and data forms; and an informational packet which described the survey, call phenology, and the distribution and characteristics of each species. We also included suggestions for route placement to avoid duplication with nearby routes.

Cooperators chose their own survey routes subjectively to include a representative sample of the wetland types available in their area. Among these were hardwood, conifer, and shrub swamps, lakes, streams, extensive marshes, potholes, roadside ditches, and ephemeral ponds. All sites were located along roads or had ready access. Cooperators were asked to survey 15

sites in 1981, but some felt these were too many sites to complete comfortably in a single evening, and the suggested number of sites was subsequently reduced to 10. Each route was run on a single night, beginning after sunset. Most 10-site routes were 10-25 mi long and were completed in 2-3 hr. At each site, the observer listened for 5 min (or for up to 10 min if necessary due to traffic or sporadic calling) and recorded one of the following call index values for each species heard:

- 1 = individuals can be counted; there is space between calls.
- 2 = calls of individuals are distinguishable but some calls overlap.
- 3 = full chorus; calls are constant, continuous, and overlapping.

Water temperatures were recorded at convenient sites, and air temperature was recorded at the beginning and end of each route. Cooperators were encouraged to take along at least one other reliable observer who could then run the survey alone if the primary cooperator was unable to do so at some time.

Because the annual calling period of each species is fairly short and is different from the calling periods of other species, cooperators were asked to run each route a total of 3 times each year, once each during the following time periods:

- early spring = 15-30 April, when pond temperatures have reached 50°F.
- late spring = 20 May-5 June, when pond temperatures have reached 60°F.
- summer = 1-15 July, when pond temperatures have reached 70°F.

In 1981, a separate form was filled out during each visit to each site. In 1982, instructions were improved and data forms were streamlined so that one night's data for all 10 sites were recorded on a single sheet. Locations and descriptions of sites were recorded on a separate form. In 1983, cooperators were sent county maps on which to plot their sites. As these were returned and our time permitted, we sent back photocopies of appropriate topographic maps on which cooperators could plot exact site locations. These were returned to us as a permanent record of the survey route. In 1983, we also stressed the need to establish and maintain permanent, unchanging routes.

RESULTS AND DISCUSSION

Approximately 100 cooperators surveyed a total of 66 routes during the period 1981-83 (Table 1). Two additional routes were run along the Mississippi River in Iowa and Minnesota. Cooperators included private individuals, and personnel from DNR, colleges, and the U.S. Fish and Wildlife Service. Several routes were surveyed for more than one year, but most of these underwent some addition, deletion, or replacement of sites during the 3 years.

The main problem encountered in the survey program has been in establishing permanent routes and assuring that each is surveyed completely during all 3 periods each year. Sites were occasionally missed but more frequently site substitutions were made as cooperators found more accessible, less noisy, or more productive sites. One or two of the 3 survey periods were often missed because of poor weather, vacations, and/or general lack of cooperators' time. Table 1 indicates the year in which each route began (or will hopefully begin)

TABLE 1. Wisconsin frog and toad survey routes, 1981-83.

New Route Number	Former Route Number	Route Name (county-area)	Primary Observer(s)	Number of Sites*						First Year of Permanent Route		
				1981 Period		1982 Period		1983 Period				
041	1	Bayfield - Northwest	Fred Strand	15	15	15	10	10	10	10	10	1981
042	2	Bayfield - Grandview	Steve and Rory Sorenson	--	--	--	10	10	10	10	10	1984
051	3	Brown - Green Bay	Randy Korb	--	8	13	7	7	--	7	2	1984?
071	4	Burnett - Crex Meadows	Jim Hoefler	14	14	14	--	10	10	10	--	1984
081	5	Calumet - Brown	Dick Nikolai	16	16	16	20	20	10	10	10	1983
101	--	Clark - Withee	Doug Fields, Roxana Reitz	--	--	--	--	--	10	10	10	1983
111	6	Columbia - Arlington	Mark and Sue Martin	15	15	15	10	10	10	10	10	1982
112	--	Columbia - Otsego	Summer Matteson, Jim T. Harris	--	--	--	--	--	10	10	10	1983
--	7	Dane - Verona	Russell Hefty, Marlon Moran	15	15	7	10	--	--	--	--	---
131	8	Dane - Arboretum	Marlon Moran	--	--	--	5	5	5	6	6	1984?
132	9	Dane - Stoughton	Gary Birch	5	4	3	5	5	5	10	10	1983
--	10	Dane - Madison NE	Barb and Dayton Reuter	--	--	--	9	9	--	--	--	---
133	11	Dane - Cherokee	Lu Severson, Maarit Threlfall	--	--	--	9	9	10	10	10	1983
134	12	Dane - Middleton	Louise Eberhart, Jobelle Shands	--	--	--	10	10	10	10	10	1983
135	13	Dane - Martinsville	N. Heiden, S. Marek, M. Van Alstyne	--	--	--	10	10	10	10	10	1983
--	14	Dane - Oregon	Elaine Andrews, Vicki Martin	--	--	--	10	10	10	(7)	7	(7)
136	--	Dane - Blue Mounds	Peggy Lison	--	--	--	--	--	--	9	9	1984
--	--	Dane - Kegonsa	Sue and Bruce Folley	--	--	--	--	--	--	8	8	---
141	15	Dodge - Horicon West	Jerry Bartelt	15	15	15	10	10	10	10	--	1984
142	16	Dodge - Horicon East	Bill Wheeler, Ken Hein	--	14	15	10	10	10	10	10	1982
151	--	Door - Sturgeon Bay	J. J. Goodwin	--	--	--	--	--	--	10	10	1983
161	--	Douglas - Gordon	Kevin Morgan	--	--	--	--	--	--	10	10	1983
181	17	Eau Claire - Washington	Terry Balding	16	17	15	8	8	10	10	10	1983
182	--	Eau Claire - Seymour	Michael Weil	--	--	--	--	--	--	10	10	1983
183	--	Eau Claire - Brunswick	Karen Voss	--	--	--	--	--	--	10	10	1984
--	18	Forest - Grandon	Robert Read	10	10	--	--	--	--	--	--	1984
221	--	Grant - Mississippi	John Lyons	--	--	--	--	--	--	--	7	1984
251	44	Iowa - Arena	Robert Ellarson	--	--	--	10	10	10	10	10	1983
261	--	Iron - Mercer	John Olson	--	--	--	--	--	--	10	--	1984
262	19	Iron - Montreal	Carol and Charlie Zinsmaster	--	--	--	10	10	10	--	--	1984
281	--	Jefferson - Lake Mills	Karen Etter Hale, Jim Hale	--	--	--	--	--	--	10	10	1983
--	20	Jefferson - Oakland	Jim and Elizabeth Zimmerman	16	15	--	--	--	--	--	--	---
282	--	Jefferson - Waukesha	Ron Kurowski	--	--	--	--	--	--	(10)	(10)	1984
291	--	Juneau - Lyndon	Stephan Carlson	--	--	--	--	--	--	10	10	1984
292	--	Juneau - Camp Williams	Michael Ebersold	--	--	--	--	--	--	8	8	1984
301	--	Kenosha - Bong	Mike Ripp	--	--	--	--	--	--	--	--	1984

*Parentheses indicate route was run too far outside of suggested survey period.

TABLE 1. Wisconsin frog and toad survey routes, 1981-83.

New Route Number	Former Route Number	Route Name (county-area)	Primary Observer(s)	Number of Sites*			1983 Period	1985 Period	First Year of Permanent Route
				1981 Period	1982 Period	1983 Period			
--	21	Marathon - Mead West	Bruce Bacon	15	15	13	--	--	--
--	22	Marathon - Mead East	Pete Segerson	15	15	15	--	--	--
421	23	Monroe - Tomah	Kim and Vicki Mello	15	--	--	--	(10)	1984
441	--	Oneida - Rhineland	Ron Eckstein	--	--	--	--	--	1984
442	--	Oneida - McNaughton	Ron Eckstein	--	--	--	--	--	1984
--	24	Oneida - Southeast	P. Vanderschaegen, R. Eckstein	15	15	12	--	--	--
--	25	Oneida - Vilas	Bruce Bacon	15	15	15	--	15	15
--	43	Oneida - Kemp Station	Jim and Elizabeth Zimmerman	--	--	--	--	--	--
451	--	Outagamie - Ellington	Arlene Laird	--	--	--	--	--	1984
--	--	Richland - Rockbridge	Barb Duerksen, Laura Kaplan	--	--	--	--	(10)	10
561	--	St. Croix - Stanton	Bruce Bacon	--	--	--	--	10	10
571	27	Sauk - South	Karl and Dorothy Legler	15	15	15	10	10	10
572	28	Sauk - Merrimac	Ken Lange	15	15	--	10	10	10
573	--	Sauk - Fairfield	Lisa Hartman	--	--	--	--	10	10
601	29	Sheboygan - Fond du Lac	Roger Rief	--	--	--	--	10	10
641	30	Vilas - Boulder Junction	Ron Eckstein	--	--	--	10	10	10
--	31	Walworth - Kettle Moraine	Ron Kuroski, Andrea Sperr	13	14	15	--	--	--
651	32	Walworth - East Troy	Robert and Lois Pullian	--	--	--	10	10	10
652	--	Walworth - Whitewater	Galen Smith	--	--	--	10	10	10
--	33	Washburn - Spooner	Richard Thiel, Sevener	15	15	--	--	--	--
671	--	Washington - Hartford	Judy Haseleu	--	--	--	--	10	10
681	34	Waukesha - Ottawa	John Bielefeldt	4	--	--	--	--	1983
--	35	Waukesha - Oconomowoc	Marlin Johnson	7	5	--	--	--	1984
--	36	Waukesha - Mukwonago	Don Reed	--	--	--	9	--	--
--	37	Waukesha - Eagle	Don Reed	--	--	--	7	--	--
--	38	Waukesha - Vernon Marsh	Don Reed	--	--	--	6	--	--
691	39	Waupaca - New London	James S. Anderson	--	--	--	10	10	10
711	40	Winnebago - Oshkosh	Kay Rilli, Anita Carpenter	--	--	15	10	10	10
--	41	Winnebago - Algoma	Anita Carpenter	--	--	--	10	--	--
712	26	Winnebago - Outagamie	D. Evenson, E. and H. Brenneke	16	15	15	10	10	10
721	42	Wood - Babcock	John Kubisiak	15	15	15	10	10	10
801	--	Allamakee (Iowa) - Mississippi River	Margaret Anderson	--	--	--	10	10	10
901	--	Houston (Minnesota) - Mississippi River	Margaret Anderson	--	--	--	10	10	10

*Parentheses indicate route was run too far outside of suggested survey period.

to be run on a permanent, thorough, and non-changing basis. Other routes are deleted from a long-term monitoring program due to a lack of cooperators or overlap with adjacent routes. The distribution of the expected permanent routes is shown in Figure 1.

Another infrequent but important problem encountered thus far is that of possible misidentifications, although we feel this was minimized by the instructional materials and tape of frog calls provided to cooperators. However, the range of cooperators' previous experience with frog calls was wide. Most were evidently very careful in their identification, and some described specific problems with the identification of particular calls at specific sites, which helped our interpretation of the data and allowed us to suggest means of obtaining positive identification. In a few other cases, species were recorded at unlikely dates or from outside their known geographic range. The main problems of this sort appeared to be with pickerel vs. leopard frogs, Cope's (Hyla chrysoscelis) vs. eastern (H. versicolor) gray tree frogs, and cricket frog. The most questionable records were omitted from the present analysis of 1983 data. We requested sight verification of pickerel frogs, but this was obtained in only a few cases.

Some cooperators encountered problems with background noise -- mostly traffic, but also industrial noise and barking dogs. We encouraged observers to replace these with quieter sites. Noise interference sometimes came from the frogs themselves, i.e., a din of spring peeper (Hyla crucifer) chorus that drowned out the calls of other species. One observer handled it thus:

"Where spring peepers and chorus frogs were very abundant it was sometimes difficult to ascertain who else was present. Tried slamming car door and calling out "Be Quiet!" or "Hey!" to the frogs to get them to stop singing. Then, as they began singing again after the brief silence, I could distinguish leopard, wood, and pickerel frogs as well."

The first 3 years of the survey have provided some information on species' distribution, abundance, and song phenology. Table 2 summarizes the 1983 survey results. Figure 2 illustrates the song phenology of all species but the rare cricket frog, based on their frequency of occurrence at ca. 400 sites surveyed in 1983. The graphs indicate that all 3 survey periods are necessary to assure that all species are monitored near the height of their calling periods. The 3 periods also provide a degree of redundancy for those species with a long calling period; that is, on a particular route one species is often recorded at different sites during different survey periods.

The wood frog (Rana sylvatica) was recorded only during the early spring survey period. It occurred throughout the state, most abundantly in central and northern counties, and very infrequently on the various routes in Dane County. The chorus frog (Pseudacris triseriata) was the most prevalent species, being recorded on every 1983 route but one.

Our data on spring peepers concurs with Vogt's (1981) observations that this species does poorly in urban and intensively agricultural areas, and that it is especially abundant in moist woodlands. The survey showed it to be fairly widespread in Wisconsin but rare to absent in urban areas (Madison, Oshkosh),

Figure 1. Locations of expected permanent routes, Wisconsin Frog and Toad Survey.

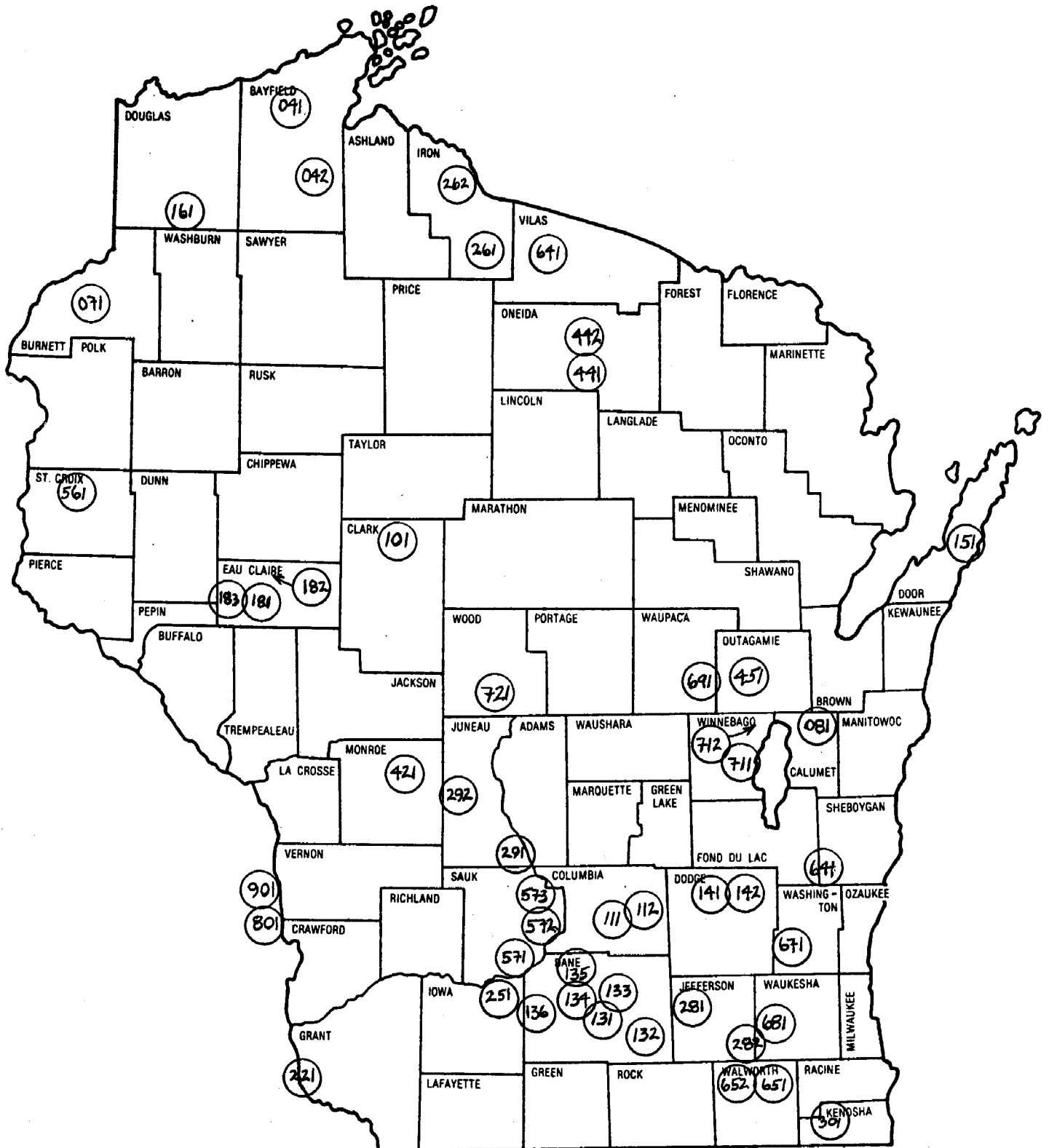


TABLE 2. Summary of 1983 Wisconsin frog and toad survey results by route.

Route Number	County	Number of sites at which species was recorded															Total Number of Species
		Wood Frog	Chorus Frog	Spring Peeper	Leopard Frog	Pickering Frog	American Toad	Eastern Gray Tree Frog	Gray Tree Frog	Cope's Gray Tree Frog	Cricket Frog	Mink Frog	Green Frog	Bull Frog	Number of Species		
041	Bayfield	5	0	10	2	0	0	7	5	5	0	0	0	2	3	0	7
042	Bayfield	6	3	10	0	1	1	1	7	5	0	0	0	0	4	0	7
051	Brown	6	2	6	5	0	3	3	2	0	0	0	0	0	4	2	8
071	Burnett	10	9	10	0	0	0	0	5	1	0	0	0	0	6	0	6
081	Calumet	9	10	1	6	2	10	10	2	0	1	0	0	0	3	0	9
101	Clark	6	4	10	8	?	6	6	10	1	0	0	0	0	6	0	8
111	Columbia	2	5	10	9	0	8	8	9	8	0	0	0	0	7	0	8
112	Columbia	2	9	10	9	0	9	9	8	9	1	0	0	0	7	0	9
131	Dane	0	5	0	1	0	0	6	0	0	0	0	0	0	2	0	4
132	Dane	0	5	0	1	0	0	6	0	0	0	0	0	0	2	0	4
133	Dane	0	6	0	6	0	0	0	0	0	2	0	0	0	1	0	4
134	Dane	?	6	3	?	?	?	7	0	1	0	0	0	0	0	0	4
135	Dane	1	5	8	1	0	0	8	2	0	0	0	0	0	5	1	8
136	Dane	0	5	9	3	6	8	8	7	4	0	0	0	0	7	0	8
--	Dane (Kegonsa)	0	8	2	4	0	0	1	0	3	0	0	0	0	4	0	6
141	Dodge	0	5	0	5	0	0	1	0	0	0	0	0	0	0	0	3
142	Dodge	0	6	1	9	0	10	10	0	0	0	2	0	0	5	0	6
151	Door	3	4	6	0	0	5	5	3	0	2	0	0	0	0	0	6
161	Douglas	1	8	10	10	0	5	5	2	3	0	0	3	7	1	10	
181	Eau Claire	9	7	10	9	0	9	9	9	10	0	0	0	0	7	0	8
182	Eau Claire	8	5	8	9	0	8	8	2	0	0	0	0	0	0	0	6
221	Grant	0	3	0	0	0	6	6	6	0	0	0	0	0	2	2	5
251	Iowa	1	7	9	6	5	0	0	6	3	0	0	0	0	8	0	8
261	Iron	8	2	10	4	0	0	0	0	0	0	0	1	5	4	7	
281	Jefferson	0	6	6	9	0	6	6	2	0	1	0	0	8	0	7	
282	Jefferson	0	4	5	1	0	3	3	8	0	0	0	0	8	1	7	
291	Juneau	5	2	9	3	0	1	1	3	2	0	0	0	8	0	8	
292	Juneau	5	7	8	3	0	6	6	5	5	1	0	0	2	0	9	
421	Monroe	2	7	10	7	0	10	10	8	4	?	0	0	8	0	8	
--	Oneida	8	6	10	1	0	5	5	5	0	0	0	0	0	0	0	6
451	Outagamie	4	4	6	0	0	8	8	7	0	0	0	0	5	0	0	6

TABLE 2 (continued)

Route Number	County	Number of sites at which species was recorded														Total Number of Species
		Wood Frog	Chorus Frog	Spring Peeper	Leopard Frog	Pickering Frog	American Toad	Eastern Gray Tree Frog	Cope's Gray Tree Frog	Cricket Frog	Mink Frog	Green Frog	Bullfrog			
--	Richland	0	2	9	5	3	4	0	0	0	0	0	0	0	0	5
561	St. Croix	7	7	9	4	0	8	8	0	0	0	0	0	0	0	6
572	Sauk	7	3	10	7	2	9	10	?	0	0	0	9	0	0	8
572	Sauk	2	4	6	5	2	1	2	2	0	0	0	6	0	0	9
573	Sauk	7	5	10	2	6	6	7	4	0	0	0	2	0	0	9
601	Sheboygan	5	3	7	5	1	0	0	0	0	0	0	5	0	0	6
641	Vilas	8	3	10	1	0	6	2	0	0	0	5	4	6	0	9
651	Walworth	0	5	6	3	0	8	0	3	0	0	0	6	0	0	6
652	Walworth	0	6	8	4	0	3	1	6	0	0	0	7	1	0	8
671	Washington	0	6	2	0	0	5	6	1	1	0	0	5	1	0	7
691	Waupaca	7	2	8	8	0	8	8	0	1	?	8	0	0	0	8
711	Winnebago	1	2	0	6	0	0	0	0	0	0	0	2	0	0	4
712	Winnebago	5	4	0	4	0	7	4	0	0	0	0	3	1	0	7
721	Wood	7	1	10	5	5	9	10	6	0	0	10	0	1	0	10
801	Mississippi R. (Iowa)	5	7	10	10	0	9	10	0	0	0	0	8	7	0	8
901	Mississippi R. (Minnesota)	2	3	7	9	0	9	10	0	0	0	10	9	9	0	8

and in the Winnebago-Calumet-Washington-Dodge County region. In this latter region, the peeper was common only on the Kettle Moraine State Forest route (Sheboygan County, no. 601).

There is little apparent pattern to leopard frog distribution in Table 2. The species was surprisingly absent from scattered routes. It was especially abundant in Columbia and Eau Claire counties and was generally least abundant in northwoods areas. Mass movements of 1-2" leopard frogs were noted near Horicon Marsh, Dodge County, on 12 and 18 July 1983: "leopard frogs by the millions on Old Marsh Road. The road was black for 1 1/2 miles".

The pickerel frog, formerly on Wisconsin's threatened species list, was found at scattered localities, mainly in the driftless area in Richland, Sauk, Iowa, and western Dane counties.

The American toad (Bufo americanus) was nearly ubiquitous. This species has a relatively short, intense calling period, and most of those routes that failed to record the species evidently did so because the late spring survey period was not run, or was run before or after the toad's calling period.

According to Vogt (1981), the eastern and Cope's gray tree frogs both occur throughout the state, except in the southeastern counties where the eastern species is absent, and in the heavily forested northcentral counties where Cope's is absent. In the 1983 survey, the eastern gray tree frog was recorded more frequently than was Cope's, but was relatively less abundant in some southeastern counties (Dane, Walworth). Cope's gray tree frog was absent from all but 1 of the northwoods routes. This concurs somewhat with Vogt's findings, but the several "extralimital" records for both species in 1983 suggests that observers misidentified the easily-confused calls of these 2 species, and/or that the northcentral and southeastern sections of the state harbor low densities (rather than an absence) of one species or the other.

This survey confirms the rarity of the endangered cricket frog. It was reported from only 10 sites in 1983, in all cases at a call index value of 1. Misidentifications might have occurred in a couple instances based on comments from observers, and reports of this species from unlikely sites north of its known breeding range or from previous to the normal late spring calling period.

The mink frog (Rana septentrionalis) breeds mainly in bogs and was recorded from approximately half of the bogs surveyed during the summer period, at a total of 11 sites.

Like the chorus frog and toad, the green frog (R. clamitans) was common throughout the state. Of the routes on which it was not recorded, most were not run during the species' summer calling period.

Local populations of bullfrogs were recorded in 21 sites scattered throughout the state. The largest populations appear to be in northern Wisconsin, presumably "where the shoreline vegetation has not be denuded and they have not been overcollected" (Vogt 1981), and along the Mississippi River. Along the Iowa and Minnesota side of the Mississippi, bullfrogs were found at 16 of

20 sites. During the past year several observers expressed concern over the disappearance of bullfrogs from localities in southern, eastern, and northern Wisconsin.

ESTABLISHING A LONG-TERM MONITORING PROGRAM

During the first 3 years of the frog and toad survey, the list of competent and willing cooperators has grown substantially. Problems with the technique, data forms, and the administration of the survey have been identified and minimized. The survey is clearly adaptable to a long-term monitoring program.

This monitoring program begins in spring of 1984 and is based on a set of ca. 50 permanent survey routes throughout the state (Fig. 1). Each route consists of 10 wetland sites chosen subjectively by the cooperator to represent the range of wetland types available in the area. Each site is visited once during each of 3 survey periods. The observer listens for 5-10 minutes at each site and records a call index value of 1, 2, or 3 for each species calling. See the new field data sheet (Appendix A) and instructions (Appendix B) for descriptions of survey periods and call index values, and other information.

Each route is run thrice annually, for a period of 5 years. This is followed by a period of 2-5 years (to be determined) during which the route is not run, and during which cooperators are encouraged to inventory other miscellaneous sites in their area. Another 5-yr period of surveys then follows (using the original permanent routes), etc. Changes in a species' frequency of occurrence and/or mean call index within a particular route or group of routes will be tested between 5-yr samples. Our decision to use 5-yr samples is tentative and may be modified as we learn more about the year-to-year variability of data from permanent routes.

It is advisable in 1984 to establish new survey routes in those areas of the state with poor coverage, particularly the Mississippi River, driftless area, and the northcentral and northeastern counties.

Cooperators unable to commit themselves to a permanent route, or who wish to provide additional inventory data, are encouraged to record observations on the "miscellaneous observations" form (Appendix C).

Several criteria must be met if the long-term monitoring program is to be successful:

- 1) Each year of the survey, all permanent routes are run once during each of the 3 survey periods. When a survey period is missed, or if surveys are done much beyond the suggested periods, the data are difficult to interpret and impossible to compare between years or areas.
- 2) On a particular route, no sites should be changed or eliminated, even for just a single run. The same 10 sites must be surveyed on each run, even if a site has been altered or has dried up. Monitoring will be severely limited if data are collected otherwise.

- 3) Each route must have a main observer and at least one alternate who is familiar with the route, the calls, and the survey procedure. This helps ensure that the route will be run within the designated periods each year, in the event that the main observer is temporarily or permanently unable to run the route.
- 4) All sites must be precisely mapped and described. Examples are found in Appendix D.
- 5) Observers must be careful to identify all species correctly through close scrutiny of the instructional tape, and if necessary by field recordings of dubious calls or by specimens. All records of species outside their known geographic range, and all records of cricket frogs must be verified by either a) tape recording, b) testimony of 2 experienced observers, or c) a specimen.

We will be better able to interpret the monitoring data if we gain some measure of the variability of anuran song activity, and determine the effects of date, geographic locality, temperature, and other factors on this activity. Beginning in 1984 we will begin soliciting help from cooperators in different areas of the state who could monitor song activity and temperature at a nearby wetland at 3- to 6-day intervals.

SUMMARY

Wisconsin's auditory survey of frogs and toads began in 1981. During the first 3 years, ca 100 cooperators surveyed a total of 68 routes, 2 of which were in adjacent parts of Iowa and Minnesota. Data were collected on the distribution, abundance and song phenology of Wisconsin's 12 anuran species. The chorus frog, American toad, and green frog were the most widespread species. Spring peepers appeared to be absent from urban areas. Pickerel frogs occurred mostly in the driftless area. Bullfrogs occurred uncommonly, but mostly in northern Wisconsin and along the Mississippi River. The endangered cricket frog, once common in Wisconsin, occurred in low numbers at 11 of ca 400 sites surveyed in 1983. Misidentifications apparently occurred infrequently, most probably between the Cope's and eastern gray tree frogs.

During these years, survey procedures and data forms were tested and modified, and the technique now appears suitable to a long-term monitoring program. This monitoring program, the first of its kind, begins in 1984 and consists of ca 50 permanent survey routes each consisting of 10 wetland sites. Each site is visited 3 times annually during which a "call index" value is recorded as an estimate of abundance for each species.

Several criteria must be met if the program is to be effective: survey routes should be described accurately and run consistently within the given guidelines; alternate observers should be available to ensure continuous coverage of each route; records of rare species or extralimital populations must be verified.

ACKNOWLEDGEMENTS

We again express our appreciation to the cooperators -- too numerous to list -- whose efforts, comments, and tolerance have made this survey a successful one.

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APPENDICES

- A. Field data sheet.
- B. Instructions.
- C. Miscellaneous observations form.
- D. Sample route description and map.

WISCONSIN FROG AND TOAD SURVEY -- Field Data Sheet

Bureau of Endangered Resources
 Department of Natural Resources
 Box 7921, Madison, WI 53707

Observer name(s), RUN 1 _____ Route No. _____
 (Add address and phone on back.) RUN 2 _____ Year _____
 RUN 3 _____ County _____

INSTRUCTIONS: Use this form for new or established survey routes. Each route consists of 10 listening sites, and is repeated 3 times during the breeding season, according to the minimum water temperatures and approximate range of dates given below for each survey period. Run surveys after dark, when wind velocity is less than 8 mph. Listen 5-10 minutes at each site and record a call index value of 1, 2, or 3 (see below) for each species calling. See back of sheet for wind and sky codes and additional comments. Return to above address by 15 August.



SITE NAME	FIRST RUN Water 50°F; 15-30 April			SECOND RUN Water 60°F; 20 May - 5 June			THIRD RUN Water 70°F; 1-15 July		
	Date			Date			Date		
	BEGIN:	Time:	END:	BEGIN:	Time:	END:	BEGIN:	Time:	END:
	Wind:	Sky:	Air temp. (F):	Wind:	Sky:	Air temp. (F):	Wind:	Sky:	Air temp. (F):
	Water Temp (F)	Site Number	CALL INDEX*	Water Temp (F)	Site Number	CALL INDEX*	Water Temp (F)	Site Number	CALL INDEX*
1.	Wood frog	1.	Am. toad	1.	1.	1.	1.	1.	1.
2.	Spring peeper	2.	Pickering frog	2.	2.	2.	2.	2.	2.
3.	Leopard frog	3.	Leopard frog	3.	3.	3.	3.	3.	3.
4.	Chorus frog	4.	Spring peeper	4.	4.	4.	4.	4.	4.
5.	Wood frog	5.	Chorus frog	5.	5.	5.	5.	5.	5.
6.	Am. toad	6.	Leopard frog	6.	6.	6.	6.	6.	6.
7.	E. gray tree frog	7.	Pickering frog	7.	7.	7.	7.	7.	7.
8.	C. gray tree frog	8.	Leopard frog	8.	8.	8.	8.	8.	8.
9.	Mink frog	9.	Spring peeper	9.	9.	9.	9.	9.	9.
10.	Green frog	10.	Chorus frog	10.	10.	10.	10.	10.	10.
	Bullfrog		Wood frog						
			Water Temp (F)						
			Site Number						
			CALL INDEX*						
			Mean						
			Freq.						

*The call index is a rough estimate of the numbers of calling males of a particular species, according to the following index values:
 1 Individuals can be counted; there is space between calls.
 2 Calls of individuals can be distinguished but there is some overlapping of calls (intermediate between "1" and "3").
 3 Full chorus. Calls are constant, continuous and overlapping.

Please provide names, addresses, and phone numbers of all observers.
 Place asterisk by name of cooperator who should receive materials next spring.

Route No. _____
 Year _____
 County _____

Name _____
 Address _____
 Phone _____

Enter sky and wind codes on front of data sheet.

Sky code no.	Sky condition	Wind code no.	Wind speed (miles per hr.)	Indicators of wind speed
0	Clear or a few clouds	0	less than 1	Smoke rises vertically.
1	Partly cloudy or variable	1	1-3	Wind direction shown by smoke drift.
2	Cloudy (broken) or overcast	2	4-7	Wind felt on face; leaves rustle.
4	Fog	3	8-12	Leaves and small twigs in constant motion; wind extends light flag.
5	Drizzle	4	13-18	Raises dust and loose paper; small branches are moved.
6	Showers			

Comments (difficulties, background noise levels, uncertain calls, habitat changes since previous run or previous year, etc):

Site	Run 1	Run 2	Run 3
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____
4	_____	_____	_____
5	_____	_____	_____
6	_____	_____	_____
7	_____	_____	_____
8	_____	_____	_____
9	_____	_____	_____
10	_____	_____	_____

Misc. comments:

WISCONSIN FROG AND TOAD SURVEY
Bureau of Endangered Resources, Box 7921, Madison, WI 53707

INSTRUCTIONS

BACKGROUND AND PURPOSE

Wisconsin is home to 12 native species of anurans (frogs and toads). In recent years many observers have been concerned with the apparent rarity, decline, and/or population die-offs of several of these species. This concern was not only for the species themselves but also for the ecosystems on which they depend. Frogs and toads, like many other aquatic organisms are sensitive to changes in water quality and adjacent land use practices, and their populations undoubtedly serve as an index to environmental quality.

As a result, the Wisconsin frog and toad survey was initiated in 1981 to increase our knowledge of anuran abundance and distribution, and to monitor populations over the long term. A statewide system of permanent survey routes was initiated in 1984. Each route consists of 10 wetland sites which are visited 3 times annually -- in early spring, late spring, and summer -- by a volunteer observer. At each site the observer identifies the species present on the basis of their breeding season calls or "songs," and makes a simple estimate of abundance for each species, using "call index" values of 1, 2, or 3. Miscellaneous observations are also solicited from other than permanent survey routes. This cooperative survey -- the first of its kind -- will certainly provide us over the years with a wealth of information on the status of Wisconsin frog and toad populations, and help monitor the quality of our environment.

ESTABLISHING A NEW SURVEY ROUTE

1. First contact the Bureau of Endangered Resources. We will suggest areas in your part of the state that are in special need of survey data, and send you maps of nearby routes so that you do not duplicate established survey sites. We will also send you field data sheets and a route description form.
2. Determine a route consisting of 10 wetland sites. All sites must be easily accessible at night, preferably along roadsides. Avoid sites that require trespass on private lands. The route should extend no more than approximately 35 miles, and may be quite short (e.g., it may be contained within a particular State Wildlife Area, arboretum, or city), so long as the observer cannot hear the same individual frogs or toads from 2 different sites. Stay within county boundaries if convenient.

Try to include a variety of wetland types that represents the range of breeding sites available. Consider large vs. small, open vs. shrubby vs. wooded, stagnant vs. flowing, permanent vs. temporary, natural vs. artificial, and remote vs. agricultural vs. urban sites. Do not avoid ponds that dry up during the year, for they are often productive during spring. Do avoid swift streams, and deep or denuded shores of lakes. Also avoid areas with heavy background noise such as busy streets or highways, certain industrial sites, or farms with barking dogs.

Cooperators sometimes find that one or more of the sites originally chosen turn out to be unsuitable breeding habitat, or are poor sites because of unforeseen background noise, access problems, etc. In these cases it is usually necessary to replace the problem site with a new site sometime after the first survey run, thus voiding the entire first year's monitoring data. To avoid this, it is recommended that you begin with 11 or 12 sites for the first year and choose only the 10 most reliable sites for the permanent route. At the end of the first year, report results only for the 10 permanent sites.

3. Describe your route. Prior to, or early the first year the route is run, send us a county map (we will provide this upon request) with the locations of your sites clearly marked. We will return to you a set of photocopied topographic maps. Mark the precise locations of your 10 sites on these maps, and describe each listening point and wetland on the "survey route description" form. Sites should be numbered in a convenient route sequence. Return the maps and route description with your completed data forms at the end of the year, by 15 August.
4. Enlist one or more additional observers who will become familiar with the route and survey procedures, and who can run the route in the event that you are temporarily or permanently unable to do so.

SURVEYING A NEW OR ESTABLISHED ROUTE

1. Obtain and review instructional materials and data forms. The main, designated cooperator for each established route will automatically receive these materials in late March or early April. Call us if you have not received them by 7 April. Materials include:
 - a. Cover letter
 - b. Instructions
 - c. Route description
 - d. Route map (county)
 - e. Route map (topographic)
 - f. Field data sheet (2 copies)
 - g. Miscellaneous observations form
 - h. Natural history information
2. Know the calls, phenology, and general ranges of Wisconsin anurans. All cooperators are required to have a cassette tape of Wisconsin anuran calls. These are available for \$3.00 each, from Madison Audubon Society, Rt. 1, Box 128A, Arlington, WI 53911. New and experienced observers will both find it helpful to review the tape periodically, and to take it along during surveys to help identify uncertain calls. New observers can learn the calls gradually by starting with those species that may be calling during the early spring survey period (wood frog, spring peeper, leopard frog, chorus frog, and pickerel frog), followed by those that begin calling in late spring (American toad, cricket frog, and both tree frogs), and finally by those species that begin to call during the summer (mink frog, green frog, and bullfrog). It is highly recommended that new observers practice distinguishing calls in the field with the help of a more experienced observer.

Your instructional materials also include a "natural history" packet which summarizes the geographic range, status, calls, biology, and morphology of each species in Wisconsin. Use this information to help determine which species are likely to occur in a given region, habitat, and season. Although it is entirely possible that, for example, you may find an unusually early or late singer, or a breeding population outside a species' previously documented range, you should be aware that these unusual occurrences may require special scrutiny or verification.

3. Run the route 3 times, once during each designated period. The timing of the survey with the phenology of frog calling is essential. Data collected from outside the designated survey periods are difficult to interpret and impossible to compare between years or areas. In most areas, failing to make one of the 3 survey runs or failing to survey all 10 sites will severely limit or invalidate the entire year's data for monitoring purposes. Also consider minimum water temperatures, especially for the early spring survey period.

	<u>Survey Period</u>	<u>Range of dates</u>	<u>Minimum water temperature</u>
1.	early spring	15-30 April	50°F
2.	late spring	20 May-5 June	60°F
3.	summer	1-15 July	70°F

4. Run surveys after dark, under favorable conditions. Choose an evening when water temperatures are above the minimums stated above and when wind is less than 8 mph. Warm, cloudy evenings with little or no wind and high humidity (even drizzly) are ideal. Humidity and cloud cover are not critical, but temperature is: a sudden drop in air temperature will cause most anurans to cease calling. If part way through a survey run you find that conditions deteriorate significantly (e.g., rain begins, temperature drops, or wind increases), stop the survey and complete it at the nearest opportunity, within 2-3 days if possible.
5. Listen for calls at each site. Approach a listening point so as to cause minimal disturbance. The arrival of a car or a person on foot may cause frogs to stop calling for a short time. When feasible, during the early spring survey period, place a thermometer in the water near where the frogs are calling (don't forget to take it when you leave that site!). Water temperatures need be measured at only a few convenient sites during the later survey periods.

Listen for a minimum of 5 minutes after the frogs start calling again -- up to 10 minutes if necessary to be certain of all calls. Listen to all calls audible from your listening point, not just those emanating from a particular pond, one side of the road, etc. Some calls may be drowned out by others, especially by the full chorus of spring peepers or chorus frogs. Where you suspect this to be the case, and after carefully listening and recording your initial data, you may try to silence the chorus by making a loud noise with horn, car door or voice; and then listen for the less conspicuous species as the calling gradually resumes.

A tape recorder will enable you to record questionable situations that can be listened to and confirmed at a later time or date. A sound parabola is helpful in isolating subtle calls of individuals in a chorus of several species. Prescription hearing aids are helpful for listeners who have volume or frequency impairment.

6. Record your observations on the field data sheet. Include county, route number, date, observers names and addresses, weather conditions, time, and additional comments on noise levels, attempts to silence loud choruses, changes in habitat since previous visits, etc. At each site, record water temperature (if taken) and the call index value for each species heard, according to the following:

<u>Call index value</u>	<u>Criteria</u>
1	Individuals can be counted. There is space between calls.
2	Calls of individuals can be distinguished but there is some overlapping of calls.
3	Full chorus. Calls are constant, continuous, and overlapping.

7. Verify records of rare or extralimital occurrences. Verification is required for all records of the endangered cricket frog, and for records of other species found outside their previously documented range as indicated by the range maps provided. Verification can be accomplished by: a) a tape recording, b) testimony of 2 experienced observers, or c) a specimen. After an observer has verified the record, future records of the particular species in that area may not be required.

Please contact our office before collecting a cricket frog specimen. Specimens are best preserved in a 10% buffered formalin solution, which is generally available only through colleges, universities, or possibly high schools. Otherwise, preserve specimen in 70% alcohol and send to us as soon as possible via your local DNR office. Prop open the specimen's mouth to enhance preservation.

8. Return all materials by 15 August, but keep one copy of the field data sheet for your records. If you want your own copies of other materials, please photocopy them or request extras from us.
9. Important! Maintain one or more alternate observers whom you feel will be able to produce results comparable to yours, should you not be able to run the survey temporarily or permanently. The alternate(s) should accompany you on the survey periodically and be familiar with the calls, route, and procedure.

CONTRIBUTING MISCELLANEOUS OBSERVATIONS

Other sight or sound observations of anurans or other reptiles and amphibians should be submitted on the "Miscellaneous observations form: amphibians and reptiles." If for the purpose of inventory, you wish to run a non-permanent survey route of several wetland sites in an area, you may submit the data on a separate copy of the "Wisconsin frog and toad survey - field data sheet," along with a clear description of the locality of each site.

