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Field Surveys of Midwestern and Northeastern Fish and Wildlife Service Lands for the Presence of Abnormal Frogs and Toads

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The national distribution of information on the discovery of malformations in Minnesota frogs in 1995 stimulated collection and examination of newly metamorphosed frogs during 1996. By late summer and early fall of 1996, malformed frogs and toads were reported on U.S. Fish and Wildlife Service (USFWS) lands in Vermont (Northeast, Region 5) and Minnesota (Midwest, Region 3). In response to these reports, biologists in USFWS Regions 3 and 5 conducted a survey, during the summer of 1997 to determine the distribution and type of malformations in frogs and toads on selected Federal lands. Region 3 personnel surveyed 38 field stations at National Wildlife Refuges (NWR's) and Wetland Management Districts. Malformed frogs and toads were collected at 23 (61%) of the Region 3 sites. External malformations were detected in 110 of 6632 individuals representing seven of 13 frog species and one of three toad species examined for an overall total of 1.7% affected (percentages for affected species ranged from 0.4–5.2%). In Region 5, 17 NWR's and one National Park were surveyed. Malformed frogs were collected at 10 (56%) of the Region 5 sites. External malformations were detected in 58 of 2267 individuals representing six of 11 frog species and one of two toad species examined for an overall total of 2.6% affected (percentages for affected species ranged from 1.8–15.6%). The majority of malformations observed in frogs and toads collected in Regions 3 and 5 were partially or completely missing hind limbs and digits (50%) or malformed hind limbs and digits (14%). A few individuals had an extra limb or toe, missing or malformed front limb, missing eye or malformation of the mandible. Despite small sample sizes at some sites, malformations were confirmed to be present in eight species of frogs and two species of toads on Federal lands in USFWS Regions 3 and 5. Further study is needed to determine the extent and distribution of amphibian malformations in these Regions. Data from this study were provided to the national database on distribution of malformed amphibians.

INDEX DESCRIPTORS: amphibian, frog, malformation, National Wildlife Refuge, National Park, survey, toad.

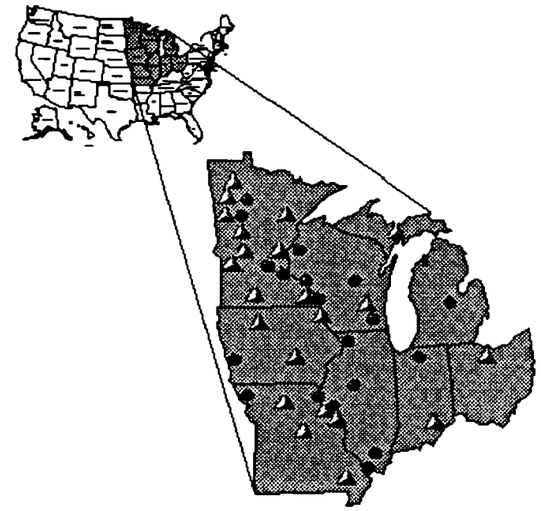
As information on the 1995 discovery of malformed frogs in Minnesota was distributed throughout the United States, there were increasing numbers of reports of malformed frogs and toads in other geographic regions, particularly the Northeast and Midwest. Frogs with malformations were also collected on state and private lands in Minnesota and Wisconsin in the summer of 1996, and a few malformed frogs were reported in Missouri, Iowa, and Ohio. Limited surveys on Federal lands during 1996 in Minnesota and a University of Minnesota research study resulted in detection of malformed frogs on Rydell National Wildlife Refuge (NWR) and Morris Wetland Management District (WMD) in Minnesota. Both sites are in Region 3 of the U.S. Fish and Wildlife Service (USFWS) which includes the states of Minnesota, Wisconsin, Michigan, Iowa, Missouri, Illinois, Indiana, and Ohio (Fig. 1). In the fall of 1996, malformed frogs were also reported in USFWS Region 5 which includes the six New England states, New York, New Jersey, Pennsylvania, Maryland, Delaware, West Virginia and Virginia (Fig. 2). The Vermont Agency of Natural Resources received reports of malformed frogs at 12 sites along Lake Champlain in northern Vermont, including Missisquoi NWR. In addition to Vermont sites, isolated reports of malformed amphibians were also received from Maine, Massachusetts and Virginia.

In response to 1996 reports of malformed frogs on Federal lands in Minnesota and Vermont, USFWS Regions 3 and 5 developed a methodology for surveying USFWS lands for malformed frogs in collaboration with the following two U.S. Geological Survey (USGS) Centers; the National Wildlife Health Center (NWHC) in Madison, Wisconsin, and Patuxent Wildlife Research Center (PWRC) in Laurel, Maryland. This monitoring effort was undertaken because lands under USFWS stewardship represent significant amphibian habitats in both regions. Very little information was available on the status of most amphibian populations in these Regions because of limited surveys of amphibian populations on Federal lands. This survey effort addressed public concern about amphibian malformations and contributed to similar monitoring efforts throughout the United States and Canada. The objectives of the survey were to: (1) determine regional distribution, type, and frequency of externally recognized malformations in frogs and toads in USFWS Regions 3 and 5; (2) initiate development of a database on land use surrounding sites with a mixture of malformed and normal frogs and with only normal frogs; (3) determine any need for future or more extensive monitoring; and (4) contribute data to amphibian population records and the North American Reporting Center for Malformations. This paper addresses the first and fourth objective.

METHODS

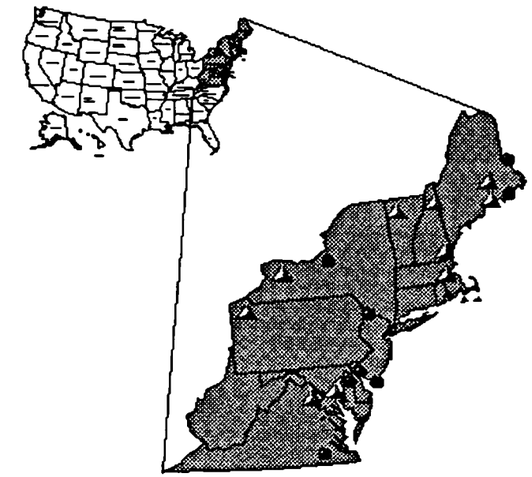
Each field station (NWR, WMD, or National Park [NP]) was given monitoring protocols and a malformation checklist developed cooperatively by USFWS biologists in Regions 3 and 5, and USGS biologists at NWHC and PWRC (Appendix). The survey methodology was intended to be simple and time-efficient as time and available staff was limited at field stations. Factors assumed to affect the success of the survey included variability in timing of egg laying, weather conditions, changed access to wetlands between spring and summer, water depth and quality, and limited experience and effort of survey teams. The goal of the survey was to collect a 100 (50 at a minimum) northern leopard frogs (*Rana pipiens*) or southern leopard frogs (*R. utricularia*) (first priority), green frogs (*R. clamitans*) (second priority), or other species available from each of two randomly chosen wetlands on each field station. Instructions were provided for conducting call surveys in the spring to identify potential survey sites. Protocols were included for collecting, handling, and holding frogs and toads. Once collected, frogs and toads were examined to identify and record external malformations using a standardized data sheet and malformations were further documented using photography.

Data from these surveys were entered into the North American Reporting Center for Amphibian Malformations (NARCAM) website administered by the Northern Prairie Wildlife Research Center, Jamestown, North Dakota (www.npwrc.usgs.gov/narcam).



● Sites with no malformed frogs or toads
▲ Sites with malformed frogs or toads

Fig. 1. Distribution of 38 National Wildlife Refuges and Wildlife Management Districts within USFWS Region 3, surveyed in 1997 for the presence of malformed frogs and toads; locations with malformed frogs and toads are indicated.



● Sites with no malformed frogs or toads
▲ Sites with malformed frogs or toads

Fig. 2. Distribution of 17 National Wildlife Refuges and one National Park within USFWS Region 5, surveyed in 1997 for the presence of malformed frogs and toads; locations with malformed frogs and toads are indicated.

RESULTS

Region 3

In USFWS Region 3, 38 field stations were surveyed and 6632 frogs and toads were captured (Table 1) including 6121 (92%) frogs of 13 species and 511 (8%) toads of three species (Table 2). Northern and southern leopard frogs and green frogs composed 76% of the frogs examined (Table 2).

External malformations were detected in 110 frogs and toads from 23 (61%) of the Region 3 sites (Fig. 1; Table 1); percentages of malformed animals at individual sites ranged from 0.4–9.2%. Malformations occurred in seven of 13 frog species and one of three toad species examined for an overall total of 1.7% affected (percentages for the eight affected species ranged from 0.4–5.2%) (Table 2). The most frequently observed malformations (Table 3) were the toes (33%) and the hind limb (21%). The wide variety of remaining malformations (20%) involved the front limb and foot, eye, mandible, and chest (one frog). The types of malformation for one group of samples (26%) were labeled "unknown" by the observers as predation by crayfish may have altered the original malformations (while frogs were held overnight pending examination).

Region 5

In Region 5, staff of 17 NWR's and the Acadia National Park in Maine sampled a total of 2267 frogs and toads (Table 4) including 2125 (94%) frogs of 11 species and 142 (6%) toads representing two species (Table 5). Missisquoi NWR was selected for an additional survey for malformed frogs in 1997 which explains the large sample size. Despite a strong effort, small numbers of frogs and toads were collected at many sites, and some field stations found only one site with frogs and toads. Green frogs and northern and southern leopard frogs composed 62% of the frogs captured in Region 5 (Table 5).

External malformations were observed in 58 frogs and toads from ten (56%) of the Region 5 sites (Fig. 2, Table 4); percentages of malformed animals at original sites ranged from 0.9 to 9.9%. Malformations were detected in six of 11 frog species and one of two toad species examined (Table 5) for an overall total of 2.6% affected (percentages for seven affected species ranged from 1.8 to 15.6%). The high 15.6% rate of malformations in the mink frog (*Rana sep-*

Table 1. Number of frogs and toads collected and frequency of malformations by locations, observed during a 1997 survey of 38 National Wildlife Refuges and Wildlife Management Districts within USFWS Region 3.

Location and state	Number Collected	n Frog species	n Toad species	n Malformed	% Malformed
National Refuge					
DeSota, IA	200	1	1	0	0.0
Union Slough, IA	127	1	0	2	1.6
Walnut Creek, IA	123	3	1	5	4.1
Brussels, IL	217	1	0	20	9.2
Crab Orchard, IL	186	2	0	0	0.0
Cypress Creek, IL	183	3	1	0	0.0
Illinois River, IL	5	1	1	0	0.0
Savanna, IL	186	1	0	0	0.0
Muscatatuck, IN	51	4	1	2	3.9
Seney, MI	223	4	0	1	0.4
Shiawassee, MI	200	2	0	0	0.0
Agassiz, MN	104	1	0	1	0.9
Big Stone, MN	200	1	0	2	1.0
Hamden Slough, MN	241	3	1	0	0.0
Minnesota Valley, MN	27	1	0	0	0.0
Rice Lake, MN	247	6	0	5	2.0
Rydell, MN	278	2	0	8	2.9
Sherburne, MN	107	1	0	2	1.9
Tamarac, MN	203	3	0	0	0.0
Winona, MN	90	2	0	3	3.3
Annada, MO	217	1	0	13	6.0
Big Muddy, MO	188	5	2	1	0.5
Mingo, MO	225	1	0	1	0.4
Squaw Creek, MO	98	2	0	0	0.0
Swan Lake, MO	194	4	0	2	1.0
Wapello, MO	54	1	0	0	0.0
Ottawa, OH	210	1	0	3	1.4
Horicon, WI	210	2	0	1	0.5
LaCrosse, WI	30	3	1	0	0.0
McGregor, WI	237	3	1	4	1.7
Necedah, WI	200	1	0	0	0.0
Trempealeau, WI	82	2	0	4	4.9
Wildlife Mgmt. Districts					
Detroit Lakes, MN	200	1	0	2	1.0
Fergus Falls, MN	172	4	0	8	4.7
Litchfield, MN	200	1	0	0	0.0
Morris, MN	571	2	1	11	1.9
Windom, MN	321	1	0	9	2.8
Leopold, WI	25	1	0	0	0.0
Total	6632	13	3	110	1.7

tentrionalis) is suspect because of the small sample size of 32 frogs. However, high rates of malformations were not seen in the other species with small sample sizes. The most frequently observed malformations were in the rear limb (50%), hind feet (17%), and toes (16%, front or rear) (Table 6). The remaining 17% of the malformations were observed in the front limb and foot, eye, and mandible.

DISCUSSION

The data collected during this survey are preliminary, but they indicate that malformations occur at low levels in several species sampled on lands managed by USFWS Regions 3 and 5. Despite the relatively low sampling success at many stations, the data suggest that there may be higher rates of malformations at some sites and in some species. Additional surveys of mink frog populations in Region 5 are needed to determine if the high rate of malformations observed in this species indeed exist.

This survey was primarily focused on collection of northern and southern leopard frogs or green frogs; leopard frogs composed 57% of the sample and green frogs composed 16%. However, an additional eight frog species and two toad species were collected in Region 5 and an additional 10 frog species and three toad species were collected in Region 3. Samples with small numbers of the selected species at some sites made comparison among sites difficult. Surveys for malformed frogs conducted during 1997 at 50 sites in Vermont, including the Missisquoi NWR included in this survey, further confirmed the presence of malformed frogs on Federal lands in that state.

This investigation determined the presence of multiple types of malformations in eight of 13 species of frogs examined and in two

Table 2. Frequency of malformations within species, observed during a 1997 survey of 38 National Wildlife Refuges and Wildlife Management Districts within USFWS Region 3.

Frog and Toad Species	n Captured	n Malformed	% Malformed
Northern leopard frog (*Rana pipiens*)	3598	73	2.0
Southern leopard frog (*Rana utricularia*)	969	18	1.9
Green frog (*Rana clamitans melanota*)	485	5	1.0
Gray treefrog (*Hyla versicolor*)	174	9	5.2
Wood frog (*Rana sylvatica*)	253	2	0.8
Dakota toad (*Bufo hemiophrys*)	225	1	0.4
Mink frog (*Rana septentrionalis*)	159	1	0.6
Bullfrog (*Rana catesbeiana*)	187	1	0.5
Cricket frog (*Acris crepitans*)	153	0	0.0
American toad (*Bufo americana*)	139	0	0.0
Fowler's toad (*Bufo woodhousei fowleri*)	147	0	0.0
Spring peeper (*Pseudacris crucifer*)	66	0	0.0
Chorus frog (*Pseudacris triseriata*)	45	0	0.0
Green tree frog (*Hyla cinerea*)	28	0	0.0
Plains leopard frog (*Rana blairi*)	4	0	0.0
Pickerel frog (*Rana palustris*)	0	0	0.0
Total	6632	110	1.7

Table 3. Classification and summary of malformations by type and species exhibiting malformations, observed during a 1997 survey of 38 National Wildlife Refuges and Wildlife Management Districts within USFWS Region 3.

Type of malformation	n malformations	% of total malformations	Species exhibiting malformation*
Missing/deformed toes	36	32.7	GF, NLF, SLF
Unknown	28	25.5	NLF, DT
Missing hind limb	14	12.7	NLF, SLF, GTF
Malformed hind limb	9	8.2	GF, NLF, GTF
Missing eye	5	4.5	NLF, GTF, MF
Missing front limb	4	3.6	GTF, SLF
Tail retained/fused	3	2.7	NLF, GF, SLF
Extra front limb	2	1.8	NLF
Missing hind foot	2	1.8	NLF, WF
Extra hind foot	2	1.8	NLF
Malformed mandible	2	1.8	BF, NLF
Malformed front limb	1	0.9	GTF
Chest protrusion	1	0.9	NLF
Bloated body	1	0.9	NLF
Totals	110	99.9	

* GF = Green frog. NLF = Northern leopard frog. BF = Bullfrog.
GTF = Gray treefrog. SLF = Southern leopard frog. MF = Mink frog.
WF = Wood frog. DT = Dakota toad.

of three species of toads. The highest frequency of malformations (73%) was detected in the hind limbs, feet and toes. It is unknown whether hind limb, foot, and toe malformations occur more frequently than other types of malformations in frogs or, alternatively, whether frogs with such malformations survive longer than frogs with malformations involving the front limbs, eye, or mandible. It seems reasonable to assume malformation of the front limbs would limit a recently metamorphosed frog or toad's ability to navigate outside of water and increase the risk of predation. Simularly, we suspect that malformations of the mandible would limit the frog's ability to eat, and malformation of the eyes would impair foraging success and increase the risk of predation. We theorize that many malformed frogs died during their earlier, tadpole, stages.

Further study is needed to determine the extent and distribution of amphibian malformations in both USFWS Regions and to determine the significance of the different types of malformations. The need to conduct future monitoring at individual sites on Service lands will be determined based on an evaluation of all data collected by the USFWS, other Federal and state agencies, and other cooperators. This survey heightened the level of interest and knowledge of Federal personnel relative to potential problems among amphibian populations. Hopefully, it created a cadre of individuals more likely

Table 4. Number of frogs and toads collected and frequency of malformations by locations, observed during a 1997 survey of 17 National Wildlife Refuges and one National Park, within USFWS Region 5.

Location and state	Number Collected	n Frog species	n Toad species	n Malformed	% Malformed
National Refuges					
Bombay Hook, DE	100	1	0	0	0.0
Great Meadows, MA	100	2	0	1	1.0
Patuxent, MD	92	4	0	3	3.3
Eastern Neck, MD	96	2	0	0	0.0
Moosehorn, ME	133	3	0	0	0.0
Petit Manan, ME	10	1	0	0	0.0
Sunkhaze Meadows, ME	224	6	0	11	4.9
Great Bay, NH	225	3	1	4	1.8
Umbagog, NH	56	5	0	2	3.6
Wallkill River, NJ	125	3	0	0	0.0
Cape May, NJ	50	3	1	0	0.0
Iroquois, NY	223	3	0	22	9.9
Montezuma, NY	27	1	0	0	0.0
Erie, PA	133	4	1	4	3.0
Great Dismal Swamp, VA	87	2	0	0	0.0
Mason Neck, VA	93	6	0	1	1.1
Missisquoi, VT	347	1	0	19	5.5
National Park					
Acadia, ME	320	4	0	3	0.9
Total	2267	11	2	58	2.6

Table 5. Frequency of malformations within species, observed during a 1997 survey of 17 National Wildlife Refuges and one National Park, within USFWS Region 5.

Frog and toad species	n Captured	n Malformed	% Malformed
Green frog (*Rana clamitans melanota*)	895	16	1.8
Northern leopard frog (*Rana pipiens*)	404	18	4.5
Bullfrog (*Rana catesbeiana*)	370	8	2.2
Pickerel frog (*Rana palustris*)	212	5	2.4
Southern leopard frog (*Rana utricularia*)	107	0	0.0
American toad (*Bufo americanus*)	98	3	3.1
Gray treefrog (*Hyla versicolor*)	55	3	5.5
Fowler's toad (*Bufo woodhousei fowleri*)	44	0	0.0
Spring peeper (*Hyla crucifer*)	42	0	0.0
Mink frog (*Rana septentrionalis*)	32	5	15.6
Upland chorus frog (*Pseudacris triseriata feriarum*)	5	0	0.0
Northern cricket frog (*Acris creptians crepitans*)	2	0	0.0
Wood frog (*Rana sylvatica*)	1	0	0.0
Total	2267	58	2.6

to conduct surveys and address the need for future reporting and studies of malformations in amphibians.

APPENDIX

SURVEYING DEFORMED FROGS ON USFWS NATIONAL WILDLIFE REFUGES IN REGIONS 3 AND 5, 1997

Background

In the last three years, an increasing number of frogs have been observed with severe malformations. Although historical records on amphibian populations are limited, available records suggest observations of malformations have been rare. Researchers and scientific collectors that have worked with amphibians for many years have only recently observed malformations among large numbers of frogs. Therefore, the present collective wisdom is that this is a relatively new problem. The problem has been found to be widespread in Minnesota and Wisconsin and parts of Ontario and Quebec, and most recently in the Lake Champlain Basin of Vermont and New York. Federal lands with affected frogs include two wetland management districts in Minnesota and possibly Missisquoi NWR in Vermont. The malformations found in frogs at these sites include missing feet, missing legs, missing eyes, one eye smaller than the other, webbing between the hind legs, missing toes, club feet, and extra hind legs. Some very recent research results in Minnesota document internal abnormalities such as ossification (extra bone) of the

Table 6. Classification and frequency of malformations by type and species exhibiting malformations, observed during a 1997 survey of 17 National Wildlife Refuges and one National Park, within USFWS Region 5.

Type of malformation	n malformations	% of total malformations	Species exhibiting malformation*
Partial hind limb	12	20.7	GF, NLF, BF, GTF, AT
Missing hind limb	7	12.1	GF, NLF, BF, GTF, AT
Missing toes	7	12.1	GF, NLF, BF
Missing hind foot	6	10.3	GF, NLF, BF, PF
Malformed hind limb	5	8.6	GF, NLF, BF, PF
Malformed hind foot	4	6.9	GF, NLF, BF, AT
Missing eye	4	6.9	GF, NLF, BF, GTF
Webbing hind limb	4	6.9	MF
Partial front limb	3	5.2	NLF, GTF
Malformed lower mandible	2	3.4	GF
Toes fused	1	1.7	NLF
Extra toe	1	1.7	MF
Extra hind limb	1	1.7	PF
Missing front foot	1	1.7	NLF
Totals	58	99.9	

* GF = Green frog. NLF = Northern leopard frog. BF = Bullfrog.
GTF = Gray treefrog. MF = Mink frog. PF = Pickerel frog.
AT = American toad.

spine and cranium. The most common species of frog found with malformations is the northern leopard frog, however, malformations have also been observed in the green frog, mink frog, bullfrog, gray treefrog, spring peeper, wood frog, pickerel frog, and American toad. More aquatic species are suspected to be more vulnerable.

Causation

All we have at present regarding causation are theories. There is some evidence that this phenomenon is being caused by exposure to contaminants. Substances which mimic retinoic acid in the body, (a natural substance responsible for cell differentiation during early development), are under suspicion. Methoprene, which is sprayed on wetlands for mosquito control and is put in cattle feed to repel flies, is one such substance. However, Methoprene is not used in Canada or Vermont. There is also some evidence that the leg malformations could be caused by a natural trematode parasite that burrows into the skin of the tadpole and interferes with leg development. However, the trematode theory does not provide an answer for all the abnormalities that have been observed. An increase in UV light due to depletion of the ozone layer is another theorized answer, and diseases caused by viruses or bacteria have not been ruled out. More information on the distribution of malformed amphibians and the types of sites they occur on should assist in teasing out what the causal factors might be.

Surveys

The specific purpose of surveying National Wildlife Refuges is to help determine whether this phenomenon/problem is occurring on Service lands. This information will also contribute to the overall body of knowledge on the distribution of this phenomenon. Given limited staff and time, and the desire to have some level of consistency among refuges, we have developed this methodology as a three-tiered approach. We expect that the sampling for all staffed refuges will require about two days for two people.

Equipment Needed

- Hip boots
- Five gallon buckets with lids
- Deformity check list sheets
- Large plastic container with a lid
- GPS unit, if available
- Dip nets or insect nets
- Data sheets
- Camera and slide film
- Peat moss (available at pet stores)

Sampling

We expect that this procedure will require two full days. Since the leopard frog has been the species most commonly found with malformations to date, we suggest focusing on northern or southern leopard frogs. If the refuge does not have leopard frogs, or leopard frogs can not be found, then green frogs should be captured instead. In the event that few frogs can be found, collect those frogs.. Ideally, refuge staff already know the locations with frogs. In the north it may not be too late to locate chorusing frogs (tapes with frog calls are available through Audubon Societies or bookstores).

Two wetlands should be randomly chosen (ideally from the wetlands known to have leopard frog populations). Random means that the choice is not biased in any way. Sampling the closest wetland to the headquarters is not random. Numbering the possible wetlands and pulling two numbers from a hat is random. Sampling should be conducted about the time that tadpoles are transforming into frogs. This may be the last two weeks of July in the north. Periodically spot-check sites or contact a state herpetologist for an estimated time of metamorphosis for your area. Leopard frogs come to the edge of the wetland at this time. Grassy wetland edge or emergent vegetation are the best places to look for this species. Find one location in the wetland that has a hatch of leopard frogs and try to catch 100 frogs from this location. Newly metamorphosed frogs should be caught with dip nets and by hand. If 100 frogs cannot be caught from one location move to another location within the same wetland complex. **However, frogs from the first location should be processed before moving to the next station** (fill out a new data sheet

for each station). Try to collect 100 frogs at two different wetlands (100 frogs from each wetland). If 100 frogs cannot be captured from the wetland, then choose another wetland (however, we realize time is limited so do your best). Please make sure that the sampling stations can be relocated. If possible, take a GPS reading for the location.

After frogs are collected, check each one carefully for the correct number of legs, eyes, toes, etc., and fill out the survey data sheet.

If you believe you have found malformations, please do the following:

1. Fill out the deformity check list
2. Take a photo of the frog (match up the photos with the data sheets). (Suggestion: To avoid strong shadows, take the photos in a shaded area outdoors without using a flash using a white or gray background).
3. Call Laura Eaton-Poole, Drew Major, or Ken Munney at NEFO or Tim Fannin at the Region 5 office.
4. In the meantime hold your deformed frogs in the following way: Drill holes in the top of a rectangular plastic container. Fill with peat moss or vegetation and a little water from the site that the frog was collected from (this is very important). Place the deformed frogs in the container and keep cool or refrigerate until a decision is made on how the frogs will be further examined or preserved.

What to do with the information

Please fill out the attached data sheet for all sampling events. Please send all information to Laura Eaton-Poole, U.S. Fish & Wildlife Service, 22 Bridge Street, Unit #1 Concord, NH 03301, (603) 225-1411 (fax: 603-225-1467).

All data gathered will be entered into a new Internet accessible deformed amphibian data base being developed by Dr. Douglas Johnson, Northern Prairie Science Center, Jamestown, ND. If the refuge has any historical data on frog populations, it would be helpful to include this information in the data base as well.

ACKNOWLEDGEMENTS

We sincerely thank field personnel and volunteers who found time to accomplish this important survey with very short notice. Additional thanks go to Sam Droege (PWRC) and Nina Fuller (USFWS Region 3) for their help and support with various aspects of this effort.

Deformed Frog or Toad Data Sheet

*These categories are for use with metamorphosing(4 legs) or adult frogs and toads.
*Start exam from the head and work toward the hind legs, noting any abnormalities seen by checking the boxes below.
*If a deformity is seen that does not fit into one of the categories below, please describe the deformity in the sections marked "other".
*Deformities that are difficult to describe can be drawn in on the frog diagram below.
*NOTE: "Left" and "Right" refer to viewing the frog from above as it would rest normally.

Eyes:

L R
❒ ❒ eye absent
❒ ❒ eye smaller than normal
❒ ❒ pupil abnormally shaped
❒ ❒ eye in unusual position(*describe*):_____
❒ ❒ extra eye(s) (*describe*):_____
❒ ❒ other (*describe*):_____

Jaws:

L R
❒ ❒ lower jaw shortened
❒ ❒ upper jaw shortened
❒ ❒ other deformity (*describe*):_____

Front limbs:

L R
❒ ❒ entire limb missing at shoulder
❒ ❒ limb partially missing:(*describe*):_____
❒ ❒ foot missing
❒ ❒ complete calf (tibiofibula) present, abnormal musculature
❒ enlarged
❒ small (atrophied)
❒ ❒ digits missing from foot (*specify digits*):_____
❒ ❒ digits fused or clubbed
❒ ❒ other (*describe*):_____

Spine:

L R
❒ ❒ curved to the left or right (scoliosis)
other (*describe*):_____

Webbing (cutaneous fusion):

L R
❒ ❒ between thigh and calf (femur and tibiofibula)
❒ ❒ other (*describe degree*):_____

Hind Limb:

L R
❒ ❒ entire limb present, unusual angle(twisted, rotated, etc.) (*describe*):_____
❒ ❒ entire limb present, abnormal size (atrophied, enlarged) (*describe*):_____
❒ ❒ digits missing from foot (*specify digits*):_____
❒ ❒ digits shortened, fused or clubbed:_____
❒ ❒ digits in abnormal location (*describe*):_____
❒ ❒ extra digits:(*describe*):_____
❒ ❒ foot missing (tarsal bones)
❒ ❒ complete calf (tibiofibula) present, abnormal musculature
❒ enlarged
❒ small (atrophied)
❒ ❒ portion of calf (tibiofibula) missing: (*estimate length of calf present*):_____
❒ ❒ entire calf (tibiofibula) missing
❒ ❒ complete thigh (femur) present, abnormal musculature
❒enlarged
❒small (atrophied)
❒ ❒ portion of thigh (femur) missing (*estimate length of thigh present*):_____
❒ ❒ entire limb missing
❒ ❒ other (*describe*):_____

❒ **Abnormal color or pattern:** (*describe and locate:*)_____

Extra Limbs:

How many extra limbs are present?_____

For each extra limb, describe location of origin (left or right, hip, knee, spine, etc.). Also specify musculature (larger or smaller than normal limb), and completeness (entire limb present, or portion of limb). If only part of an extra limb is present, try to specify which part is present (thigh, thigh and calf, foot, etc.). Draw the extra limbs on the frog diagram below.

extra limb #1
location_____
musculature_____
completeness_____

extra limb #2
location_____
musculature_____
completeness_____

Please describe other extra limbs on the reverse side.

❒ **Retained tail**
Fully:(length)_____
Partially (length):_____

❒ **Any bleeding or fresh injuries?** (*describe*):_____

❒ **Other abnormalities:** (*please describe*):_____