Executive Summary

Farm Ponds as Critical Habitats for Native Amphibians: Final Report

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EXECUTIVE SUMMARY

Result 1: Objective: *Identify land management practices that sustain healthy populations of amphibians in southeastern Minnesota farm ponds.*

We studied constructed farm ponds and natural wetlands in southeastern Minnesota during the spring and summer of 2000 and 2001. We collected amphibian and habitat data from 40 randomly selected ponds, 10 ponds in each of four surrounding land use classes: row crop agriculture, grazed grassland, ungrazed grassland, and natural wetlands. We identified 10 species of amphibians at the ponds, including the Tiger Salamander (*Ambystoma triginum),* American Toad (*Bufo americanus),* Gray Treefrog (*Hyla versicolor),* Western Chorus Frog (*Pseudacris triseriata),* Spring Peeper (*Pseudacris crucifer),* Green Frog (*Rana clamitans),* Wood Frog (*Rana sylvatica),* Northern Leopard Frog (*Rana pipiens),* Pickerel Frog (*Rana palustris),* and the Blue-spotted Salamander (*Ambystoma laterale).* The Blue-spotted Salamander was a new record for Houston County, Minnesota. Amphibian species richness among the pond types was similar and deformity rates were low (< 5% deformed individuals) at all ponds. The parasite, *Ribeiroia* (linked to amphibian malformations elsewhere), was identified at 3 of 16 ponds examined for parasites in 2000 and 6 of 13 ponds examined in 2001. Of the 260 amphibians necropsied for parasites only 11 were considered to be malformed and five of these harbored *Ribeiroia*. *Ribeiroia* was found only in Northern Leopard Frogs and Green Frogs. Six species of snakes and two turtle species were observed at the ponds over the two years of the study. The common garter snake (*Thamnophis sirtalis*) was the most frequently encountered reptile, followed by painted turtles (*Chrysemys picta*). One hundred species of birds were observed at the ponds. The song sparrow (*Melospiza melodia*) was the most frequently observed bird species, followed by the red-winged blackbird (*Agelaius phoeniceus*), common yellowthroat (*Geothlypis trichas*), and the American robin (*Turdus migratorius*). Eighteen species of mammals were recorded, based on tracks at scent stations. The raccoon (*Procyon lotor*) was found at the most ponds, followed closely by the white-tailed deer (*Odocoileus virginianus*). Five species of fish were identified from the ponds, with brook stickleback (*Culaea inconstans*) the most frequently observed. A wide variety of invertebrate taxa were observed in the ponds. Midge larvae (Chironomidae), crawling water beetles (Haliplidae), and water boatmen (Corixidae) were the most common invertebrate taxa observed.

We found the highest amphibian reproductive success in ponds lacking fish, and in those containing sparse vegetation, and low concentrations of nitrogen. Ponds used for watering cattle had elevated concentrations of nitrogen and higher turbidity, indicating lower quality habitat for amphibians. In a mesocosm study, there were no differences in amphibian larval survival between agricultural and natural wetlands. In a study of post-breeding habitat use for the Northern Leopard Frog, we found that frogs selected wetland, grassland, and forest/shrub habitats post-breeding. Hayfields were frequently used during the summer; mowing resulted in frog mortality.

Constructed farm ponds, designed to serve the needs of farmers, can be managed to provide valuable aquatic breeding habitat for amphibians in this region. Important management actions include restricting cattle access to the pond, not introducing fish, and maintaining a wide grass buffer strip around the pond to trap sediment and nutrients.

Result 2: Objective: ***Recommend monitoring methods suitable for assessing amphibian habitat quality.***

We describe our recommendations regarding amphibian monitoring methods in Chapter 6, *Resources for Monitoring Pond-breeding Amphibians in the Northcentral USA* and the *Field Guide to Amphibian Larvae and Eggs for Minnesota, Wisconsin, and Iowa*. Correct identification of eggs and larvae is critical to the success of amphibian monitoring programs and no suitable field guide existed. We found that the most efficient time frame for surveying amphibian larvae using dip nets was a six-week sampling frame, centered on June (last week of May through the first week of July). This time frame sampled six species in southeastern Minnesota (American Toad, Western Chorus Frog, Spring Peeper, Green Frog, and Northern Leopard and Pickerel Frogs). Two species (Gray Treefrog and Tiger Salamander) were most efficiently sampled during July.

We are distributing 2,500 amphibian larvae and egg keys, as well as 10,000 USGS Fact Sheets and 2,000 posters containing practical advice on managing farm ponds to benefit wildlife. The field guides are being distributed to wildlife biologists, herpetologists, and students. The USGS Fact Sheets and posters are being distributed to USDA Service Centers, US Fish and Wildlife Service offices, and state departments of natural resources in Minnesota, Wisconsin, and Iowa.

Contents of Final Report

7. Role of *Ribeiroia ondatrae* (Platyhelminthes: Trematoda) Metacercariae in the Development of Malformed Frogs in Minnesota and Wisconsin

Separately bound:

A. A Field Guide to Amphibian Larvae and Eggs of Minnesota, Wisconsin, and Iowa (in press).

B. Kapfer, J. M., and J. R. Parmelee. 2001. *Ambystoma laterale* (Blue-spotted salamander). Herpetological Review 32:267.

C. Farm Ponds Work for Wildlife (Fact Sheet/brochure).

D. Farm Ponds Work for Wildlife (Poster, in press).

E. Malformed frogs in Minnesota: an update. USGS Fact Sheet.

Acknowledgments

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Accomplishments

Publications

1. Kapfer, J. M., and J. R. Parmelee. 2001. *Ambystoma laterale* (Blue-spotted salamander). Herpetological Review 32:267.
2. Parmelee, J. R., M. G. Knutson, and J. E. Lyon. 2002. A field guide to amphibian larvae and eggs of Minnesota, Wisconsin, and Iowa. Information and Technology

Report USGS/BRD/ITR-2002-0004. U.S. Geological Survey, Biological Resources Division, Washington, D.C. 38 pp. In press.

3. Knutson, M. G. 2002. Farm Ponds Work for Wildlife. USGS Fact Sheet. FS-043-02. U.S. Geological Survey, Biological Resources Division, Washington, D.C.
4. Knutson, M. G. 2002. Farm Ponds Work for Wildlife-poster. USGS Poster. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin. In press.
5. Knutson, M. G., and M. Wise. 2002. Farm Ponds Work for Wildlife. People, Land, and Water. U.S. Department of the Interior. In press.

Scientific Presentations

1. Bly, B. L., D. A. Jobe, M. B. Sandheinrich, M. G. Knutson, B. R. Gray, and S. Weick. 2002. Flow cytometry as a tool for detecting geonotoxic effects in amphibians breeding in southeastern Minnesota farm ponds (poster). Proceedings of the Mississippi River Research Consortium 34:55. 25 April 2002.
2. Bourassa, S. J., J. E. Lyon, and M. G. Knutson. 2002. Amphibian Research and Monitoring Initiative (ARMI) in the Midwest (poster). Proceedings of the Mississippi River Research Consortium 34:56. 25 April 2002.
3. Kapfer, J. M., M. B. Sandheinrich, and M. G. Knutson. 2001. Effects of agricultural pond water on the survival of anurans in the Upper Midwest (poster) *in* National Society of Environmental Toxicology and Chemistry 22nd Annual Meeting. 15 November 2001. National Society of Environmental Toxicology and Chemistry, Baltimore, Maryland.
4. Kapfer, J. M., M. B. Sandheinrich, and M. G. Knutson. 2002. Effects of agricultural pond water on the survival of anurans in the Upper Midwest (seminar, won Best Student Paper Award) *in* Mississippi River Research Consortium 2002 Annual Meeting. 25 April 2002. La Crosse, Wisconsin.
5. Kapfer, J. M., M. B. Sandheinrich, M. G. Knutson, and D. R. Sutherland. 2001. Effects of agricultural pond water on the development and metamorphosis of anurans native to the Upper Midwest (poster) *in* Midwest Chapter of the Society of Environmental Toxicology and Chemistry. 26 April 2001. Midwest Chapter of the Society of Environmental Toxicology and Chemistry, Racine, Wisconsin.
6. Knutson, M. G. 1999. Riparian zones as breeding habitat for birds, reptiles, and amphibians, Riparian Management Symposium (seminar) *in* 61st Midwest Fish and Wildlife Conference. 7 December 1999. Chicago, Illinois.
7. Knutson, M. G. 2000. Declining amphibians: what's the big picture? (seminar) *in* Partnership Coordination Meeting. 15 March 2000. USGS Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin.
8. Knutson, M. G. 2000. Farm ponds, radios, and ARMI (seminar) *in* USGS ARMI, First Annual Workshop. 6 December 2000. USGS Amphibian Research and Monitoring Initiative (ARMI), Reston, Virginia.
9. Knutson, M. G. 2001. Managing farm ponds as amphibian breeding sites in the Driftless Area Ecoregion (seminar) *in* Wisconsin Chapter of the Wildlife Society, 2001 Winter Meeting. 29 February 2001. Eau Claire, Wisconsin.

10. Knutson, M. G. 2001. Managing farm ponds as amphibian breeding sites in the Driftless Area Ecoregion (seminar). 21 March 2001. Coulee Region Audubon Society, La Crosse, Wisconsin.
11. Knutson, M. G. 2001. Managing farm ponds as amphibian breeding sites in the Driftless Area Ecoregion (seminar). 25 April 2001. Black Hammer Lutheran Church, Ladies' Aide Society, Spring Grove, MN.
12. Knutson, M. G. 2001. New Direction: Amphibians (seminar). 12 April 2001. Upper Midwest Environmental Sciences Center Science Review, La Crosse, Wisconsin.
13. Knutson, M. G. 2001. USGS Amphibian Research and Monitoring Initiative and farm pond research (seminar) *in* Minnesota Frog Malformation Meeting. 17 January 2001. Mounds View, Minnesota.
14. Knutson, M. G. 2002. From frog ponds to forests and flyways: natural connections across the Driftless landscape (seminar) *in* Questions of Scale: integration of efforts within the Greater Blufflands Region. Holmen, Wisconsin.
15. Knutson, M. G., R. W. B., B. Knights, and S. Weick. 2002. Farm ponds are working wetlands: agriculture and biodiversity in the heartland (seminar) *in* People and Environment Lecture Series. 1 March 2002. University of Wisconsin - La Crosse,
16. Knutson, M. G., and W. B. Richardson. 2002. Farm ponds are working wetlands: conservation practice benefits amphibians (seminar) *in* Women in Science Lecture Series. 10 April 2002. Iowa State University, Ames, Iowa.
17. Pember, B., B. Knights, M. G. Knutson, S. Weick, and D. Sutherland. 2001. Effects of wetland type and land use practices on movement and habitat selection by northern leopard frogs (*Rana pipiens*) (poster) *in* USGS Upper Midwest Environmental Sciences Center Science Review. 10 April 2001. La Crosse, WI.
18. Pember, B., M. G. Knutson, B. Knights, and S. Weick. 2002. Effects of agricultural and urban land uses on movement and habitat selection by northern leopard frogs (*Rana pipiens*) (poster). Proceedings of the Mississippi River Research Consortium 34:68. 25 April 2002.
19. Sutherland, D. R., J. M. Kapfer, M. Lannoo, and M. Knutson. 2002. The role of *Ribeiroia ondatrae* (Platyhelminthes: Trematoda) metacercariae in the development of malformed frogs in Minnesota and Wisconsin. Working together in a climate of change to manage Minnesota's water resources (seminar). Minnesota Water 2002 and Minnesota Lakes and Rivers Conference, St. Cloud, Minnesota.
20. Weick, S., M. G. Knutson, W. B. Richardson, M. B. Sandheinrich, D. Sutherland, and J. Parmelee. 2002. Farm ponds as critical habitats for amphibians (poster). Proceedings of the Mississippi River Research Consortium 34:71. 25 April 2002.

Outreach/Education

1. Knutson, M. 2000. USGS Biological Resources Division national staff orientation to Upper Mississippi Science Center science projects (tour of farm ponds and Upper Mississippi River sites). 20 June 2000. USGS Upper Mississippi Science Center, Houston, Crawford, Allamakee, and La Crosse counties, MN, IA, and WI.

2. Knutson, M. G. 2000. Amphibian display, outdoor classroom. 12 May 2000. Dakota Elementary School, Dakota, Minnesota.
3. Knutson, M. G. 2000. USDA Natural Resources Conservation Service (NRCS) Technical Note uses USGS published research. 2 October 2000. (D. Stratman, Ed.). USDA Natural Resources Conservation Service, Indianapolis, Indiana.
4. Knutson, M. G. 2000-2001. Represented UMESC at a national stakeholder meeting to launch the USGS ARMI initiative. USGS, Shepherdstown, West Virginia.
5. Knutson, M. G. 2001. Led farm pond tour and described the importance of amphibian research in small farm ponds to USGS Headquarters staff, including USGS Director, Dr. Chip Groat. 8 June 2001. USGS Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin.
6. Jahimiak, J. 2002. Award: 2 Honorable Mentions, National Wetland Photo Contest: Gray Treefrog and American Toads, Houston County, Minnesota. May 2002. US Environmental Protection Agency, Washington, D.C.
7. Knutson, M. G., D. R. Sutherland, and W. B. Richardson. 2000. Discussion session on amphibian mesocosm research from field season 2000. 27 October 2000. Minnesota Pollution Control Agency, USDA Agricultural Research Service, USGS Upper Midwest Environmental Sciences Center, La Crosse Wisconsin.
8. Knutson, M. G., D. R. Sutherland, and W. B. Richardson. 2000. Planning session to discuss Minnesota amphibian deformities and results of field season 2000. 16 October 2000. Minnesota Pollution Control Agency, USGS Water Resources, USDA Natural Resources Conservation Service, USGS Upper Midwest Environmental Sciences Center, La Crosse Wisconsin.

Media Inquiries

1. Dankert, J. 2001. Newpaper article. *Leaping leopard frogs in* Winona Daily News. July 1, 2001. Winona, Minnesota.
2. Knutson, M. G. 2000. Newspaper interview prompted by USGS News Release on amphibian research, farm pond research. 29 March 2000. Reporter Tim Krohn, Mankato Free Press, Mankato, Minnesota.
3. Pember, B. 2001. Radio interview. *Leopard frogs as environmental bioindicators in southeastern Minnesota.* 29 November 2001. Morning Show with Bob Seebo, reporter, KWNO Radio, AM 1230, Winona, Minnesota.

Related Publications

1. Johnson, P. T. J., K. B. Lunde, E. M. Thurman, E. G. Ritchie, S. N. Wray, D. R. Sutherland, J. M. Kapfer, T. J. Friest, J. Bowerman, and A. R. Blaustein. 2002. Parasite (*Ribeiroia ondatrae*) infection linked to amphibian malformations in the western United States. Ecological Monographs 72:151-168.
2. Rosenberry, D. O. 2001. Malformed frogs in Minnesota: an update. USGS Fact Sheet. FS-043-01. U.S. Geological Survey, Water Resources Division, Mounds View, Minnesota, USA. (http://water.usgs.gov/pubs/FS/fs-043-01/)