FINAL REPORT

JUL 0 1 2002

1999 Project Abstract
For the Period Ending June 30, 2002

TITLE: Farm Ponds as Critical Habitats for Native Amphibians
PROJECT MANAGER: Melinda G. Knutson
ORGANIZATION: USGS Upper Midwest Environmental Sciences Center
ADDRESS: 2630 Fanta Reed Road, La Crosse, Wisconsin 54603
WEB SITE ADDRESS:
http://www.umesc.usgs.gov/terrestrial/amphibians/mknutson_5003869.html
FUND: Minnesota Environment and Natural Resources Trust Fund
LEGAL CITATION: ML 1999, Ch. 231, Sec. 16, Subd. 12 Benchmarks and Indicators, (i) Farm Ponds as Critical Habitats for Native Amphibians

APPROPRIATION AMOUNT: $250K

Overall Project Outcome and Results

We studied constructed farm ponds and natural wetlands in southeastern Minnesota during the spring and summer of 2000 and 2001. The objectives were to identify land management practices that sustain healthy populations of amphibians in southeastern Minnesota farm ponds and to recommend monitoring methods suitable for assessing amphibian habitat quality. We collected amphibian and habitat data from 40 randomly selected ponds, ten 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. Surveys indicated that at least five fish, six snake, two turtle, 18 mammal, and 100 bird species were associated with the study ponds. We found no differences in amphibian species richness among the pond types, and very few frogs had malformations. In a mesocosm study, there were no differences in amphibian larval survival between agricultural and natural wetlands. The highest amphibian reproductive success was found in ponds with no fish, low amounts of 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. 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 fencing cattle away from the pond, maintaining a wide grass buffer strip around the pond to trap sediment and nutrients, and avoiding fish introductions.

Project Results Use and Dissemination

We are distributing 2,500 amphibian larvae and egg field guides to wildlife biologists. State and federal agriculture and natural resources agencies are receiving 10,000 USGS Fact Sheets and 2,000 posters containing practical advice on how to manage farm ponds to benefit wildlife. Details of research documenting the above results are found in the attached report.

Date of Report: July 1, 2002
LCMR final Work Program Report

Date of Next Status Report: None

Date of Workprogram Approval:

Project Completion Date: June 30, 2002
Field work was conducted from March - July in 2000 and 2001. Field work for the radiotelemetry study will continue in 2002, with funding after June 30, 2002 from USGS. Data analysis, report production, and brochure development will extend from August 2001- June 2002.

LCMR Work Program 1999 - Study B15

I. PROJECT TITLE: Farm Ponds as Critical Habitats for Native Amphibians

Project Manager: Dr. Melinda G. Knutson, Research Wildlife Biologist
Affiliation: USGS Upper Midwest Environmental Sciences Center
(formerly Upper Mississippi Science Center)
Mailing Address: 2630 Fanta Reed Rd., La Crosse, WI 54603
Telephone Number: 608-783-7550 ext. 68
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Web Address: http://www.umesc.er.usgs.gov/

Total Biennial Project Budget:

$LCMR: $250,000.00	Match: $323K
-$LCMR Spent: $250,000.00	-$ Match Amount Spent: $323K
= $LCMR Balance: $0	= $Match Balance: $0

A. Legal Citation: ML 1999, Chapter 231, Section 16, Subdivision 12 Benchmarks and Indicators, (i) Farm Ponds as Critical Habitats for Native Amphibians

Appropriation Language: $125,000 the first year and $125,000 the second year are from the trust fund to the commissioner of natural resources for an agreement with the Upper Mississippi Science Center to study management practices that sustain healthy populations of amphibians in southeastern Minnesota farm ponds and to recommend monitoring methods suitable for testing amphibian habitat quality. This appropriation must be matched by at least $200,000 of nonstate contributions. This appropriation is available until June 30, 2002, at which time the project must

be completed and final products delivered, unless an earlier date is specified in the work program.

B. Status of Match Requirement: Match dollars included salaries of Upper Midwest Environmental Sciences Center science staff ($130K federal), funding for a University of Wisconsin-La Crosse graduate student ($45K federal), a USGS Amphibian Research and Monitoring Initiative grant ($98K federal), pesticide analysis of farm pond water (John Elder, USGS Water Resources; $10K federal), in-kind use of laboratory equipment (flow cytometer) by Gundersen-Lutheran Medical Center ($25K private, non-profit capital assets), and in-kind staff time (Fred Kollmann, USDA Natural Resources Conservation Service; $15K federal).

II. and III. FINAL PROJECT SUMMARY

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Project Results Use and Dissemination

We are distributing 2,500 amphibian larvae and egg field guides to wildlife biologists. State and federal agriculture and natural resources agencies are receiving 10,000 USGS Fact Sheets and 2,000 posters containing practical advice on how to manage farm ponds to benefit wildlife. Details of research documenting the above results are found in the attached report.

IV. OUTLINE OF PROJECT RESULTS:

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 (*Ambystoma laterale*) 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 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.

Details of research documenting the above results are found in an attached report.

LCMR Budget: $229.1K Match: $280K
LCMR Spent: $228,410.17 Match Spent: $280K
Balance: $689.83 Match Balance: $0K
Completion Date: June 30, 2002

Result 2: Objective: *Recommend monitoring methods suitable for assessing amphibian habitat quality.* We describe our recommendations regarding amphibian monitoring methods in the attached report, 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 Frog). Two species (Gray Treefrog and Tiger Salamander) were most efficiently sampled during July.

We are distributing 2,500 field guides to amphibian larvae and eggs, 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. We also distributed 40 farm monitoring toolboxes (Land Stewardship Program) to landowners participating in the study.

LCMR Budget: $20.9K Match: $43K
LCMR Spent: $21,589.83 Match Spent: $43K
Balance: -$689.83 Match Balance: $0K
Completion Date: June 30, 2002

V. DISSEMINATION:
A project summary is available at our website:
http://www.umesc.usgs.gov/terrestrial/amphibians.html
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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. Details of research documenting the above results are found in the attached report. Scientific findings are being disseminated in seminars and peer-reviewed journal articles. Data are archived at the USGS Upper Midwest Environmental Sciences Center, in accordance with Good Laboratory and Scientific Practices Standards. Study data will be available through the project manager.

VI. CONTEXT

A. Significance:

- Farm ponds may represent the only suitable breeding, rearing, and over-wintering habitat for amphibians in some agricultural regions of Minnesota, especially southeastern Minnesota, a landscape where natural wetlands are scarce. Informal surveys of these ponds indicate that despite intensive agricultural use adjacent to the ponds, especially cattle grazing, these ponds still have an abundance of frogs and toads.

- Southeastern Minnesota contains thousands of farm ponds constructed with cost-sharing dollars from the U.S. Department of Agriculture and the State of Minnesota. The purpose of these farm ponds is to prevent soil erosion and create wildlife habitat. This study provided critical information to State and federal agencies developing guidelines for farm pond construction and to landowners seeking to maximize both wildlife habitat and agricultural production on land adjacent to the ponds.

- This study increased our current knowledge of amphibians and their habitats. Recent research shows that frog and toad diversity and abundance are influenced by landscape level factors, especially wetland size and vegetation characteristics. In addition, commonly used agricultural chemicals may adversely affect amphibians, especially when used together. Amphibians' sensitivity to environmental contaminants makes them potentially excellent indicators of wetland health.

B. Time: Field work was conducted from approximately March - August in 2000 and 2001. Data analysis, report production, and brochure development were conducted from August 2000-June 2002.

C. Budget Context: We added new knowledge to a foundation of previous amphibian research in Minnesota undertaken by Dr. Susan Galatowitch and her students (LCMR), surveys conducted by the County Biological Survey, Minnesota Department of Natural Resources, and work on deformities conducted by the Minnesota Pollution Control Agency. The work provided a field test of landscape research on amphibians conducted by the Project Manager, Dr. Melinda Knutson ($58K - federal funds), and laboratory work on agricultural contaminants conducted by George Howe and Dr. Rick Gillis ($50,000 - federal and Wisconsin state funds).

1. BUDGET:

Personnel	$180.8K
Equipment	$ 39.8K
Acquisition	$ 0
Development	$ 0
Other	$ 29.4K
TOTAL	$250 K

2. Submit a budget detail with all the specifics as Attachment A.

Attachment A
Deliverable Products and Related Budget

LCMR Project Biennial Budget	**Objective/ Result**		
	Result 1	Result 2	Row Total
Budget Item	Farm pond research	Management guide/amphib key	
Wages, salaries & benefits	Field/lab technicians ~~$78.3K~~ $77,367.14 GIS technician 8% X 2 yr.= $17K	Editor/layout/ web design ~~$8.3K~~ $9,275.00	~~$103.6K~~ $103,642.14
Space rental, maintenance & utilities	$2K	$0	$2K
Printing & Advertising	$0	Brochure & field guide ~~$9K~~ $8,795.37	~~$9K~~ $8,795.37
Communications, telephone, mail, etc.	$2K	$0	$2K
Contracts			
Professional/ technical	Field/lab technicians – Coop Agreement with University of WI, La Crosse ~~$61.7K~~ $61,645.00 Rick Gillis, Ph.D., herpetologist 5% X 2 yr.$4K Jeff Parmelee, Ph.D., herpetologist	$0	~~$77.2K~~ $77,145.00

	12% X 1 yr. $5.5K David Reineke, Ph.D., statistician 10% X 1 yr. $6K		
Other contracts	Laboratory testing $0K	$0	$0K
Local automobile mileage paid	Travel to study sites ~~$15.1K~~ $15,249.83	$0	~~$15.1K~~ $15,249.83
Other travel expenses in Minnesota	Meetings with other scientists, presentation of results ~~$0.1K~~ $105.30	$0	~~$0.1K~~ $105.30
Travel outside Minnesota	Present results at scientific conferences $0	$0	$0
Office Supplies	$1K	$0	$1K
Other Supplies	Expendable lab/field equipment ~~$24.1K~~ $24,280.16	$0	~~$24.1K~~ $24,280.16
Tools and equipment	Durable lab/field equipment ~~$7.3K~~ $7,262.84	~~$2.4K~~ $2,385.46	~~$9.7K~~ $9,648.30
Office equipment and computers	~~$5K~~ $4,999.90	$0	~~$5K~~ $4,999.90
Other capital equipment	$0	$0	$0
Other direct operating costs		Land Stewardship Project Monitoring Toolboxes (for landowners) (40) ~~$1.2K~~ $1,134.00	~~$1.2K~~ $1,134.00

Land acquisition	$0	$0	$0
Land rights acquisition	$0	$0	$0
Buildings or other land improvement	$0	$0	$0
Legal fees	$0	$0	$0
COLUMN TOTAL	~~$229.1K~~ $228,410.17	~~$20.9K~~ $21,589.83	$250K

VII. COOPERATION:
The following individuals and grants cooperated or contributed to the project. Salaries paid by LCMR or contributing to Match $ are shown in parentheses.

- Dr. Melinda G. Knutson, Research Wildlife Biologist, USGS/Biological Resources Division, Upper Midwest Environmental Sciences Center, La Crosse, WI. (Salary $100K=Match)
- Dr. William Richardson, Research Aquatic Biologist, USGS/Biological Resources Division, Upper Midwest Environmental Sciences Center, La Crosse, WI. (Salary $30K=Match)
- Mark Sandheinrich, Ph.D., Toxicologist, University of Wisconsin, La Crosse, WI and graduate student, Josh Kapfer. ($45K=Match)
- Dean Jobe, Microbiology Research Laboratory, Gundersen-Lutheran Medical Center, La Crosse, WI. (In-kind use of laboratory and flow cytometer $25K=Match)
- John Elder, USGS Water Resources, Middleton, WI (In-kind pesticide analysis $10K=Match)
- Fred Kollmann, USDA/Natural Resources Conservation Service, Onalaska, WI. (In-kind staff assistance $15K=Match)
- USGS Amphibian Research and Monitoring Initiative (ARMI). Competitive grant for telemetry study ($98K=Match)
- Dr. Rick Gillis, Professor, Biology/Microbiology Department, University of Wisconsin, La Crosse, WI. ($4K=LCMR see Budget Detail above)
- Dr. Jeffrey Parmelee, Herpetologist, Simpson College, Indianola, IA ($5.5K=LCMR see Budget Detail above)
- Dr. David Reineke, Ph.D., Statistician, University of Wisconsin, La Crosse, WI ($6K=LCMR see Budget Detail above)
- John Moriarty, Scientific Coordinator, Minnesota Frog Watch, St. Paul, MN. (In-kind assistance)

- Arthur (Tex) Hawkins, Watershed Biologist, U.S. Fish and Wildlife Service, Private Lands Program, Winona, MN. (In-kind assistance)
- Mark Kunz, USDA/Natural Resources Conservation Service, Winona County, Lewiston, MN. (In-kind assistance)
- Greg Yakel, USDA/Natural Resources Conservation Service, Houston County, Caledonia, MN. (In-kind assistance)

VIII. LOCATION: Farm ponds in Houston and Winona Counties, Minnesota. Specific study sites were randomly selected and subject to agreement by land owners.

IX. REPORTING REQUIREMENTS: Work program progress reports were submitted in January 2001 and January 2002. A final work program report and associated products were submitted July 1, 2002.

X. RESEARCH PROJECTS: See attached detail of research and products.

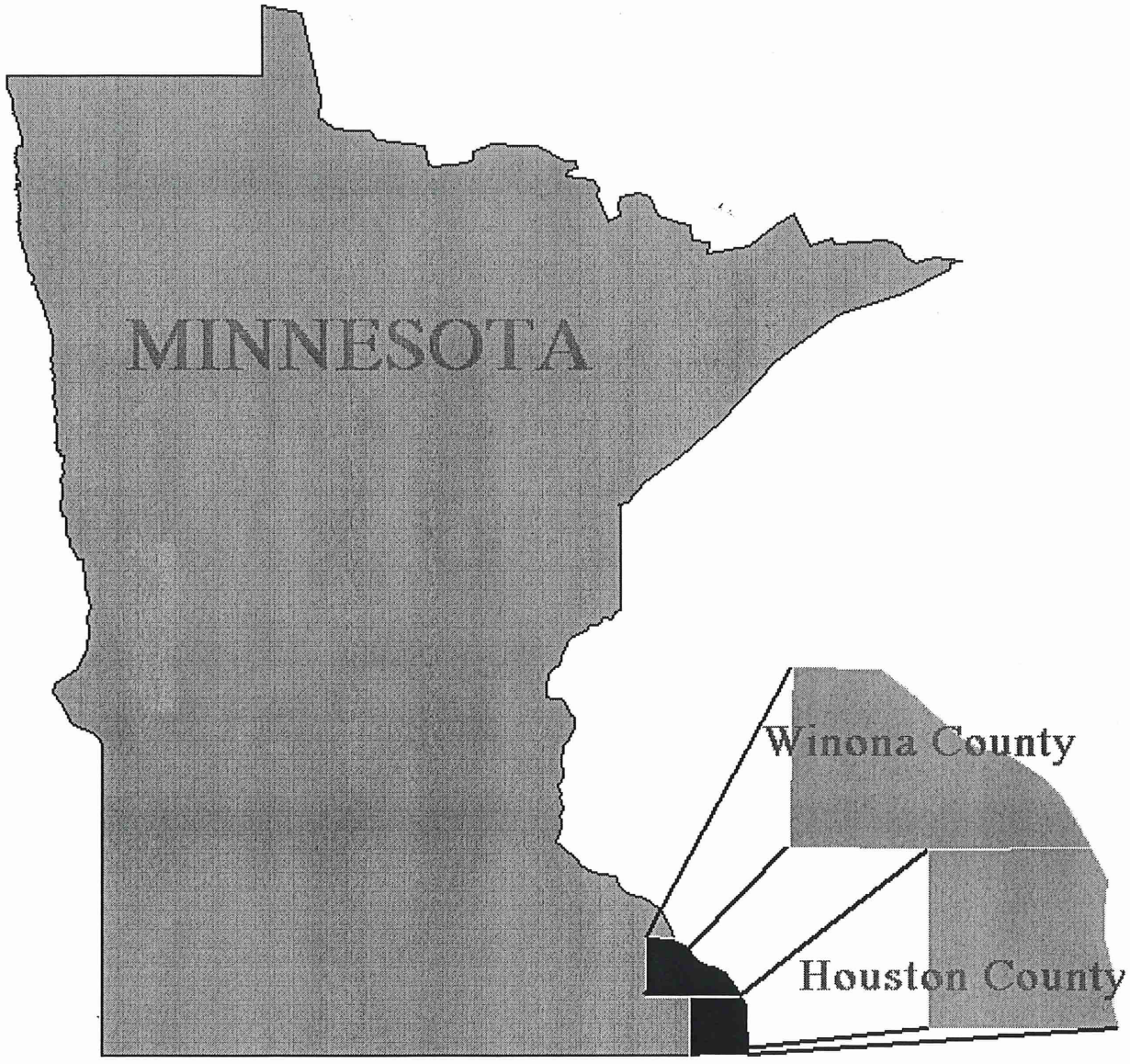

Figure 1. Study area for amphibian research in southeastern Minnesota, Houston, and Winona counties.