

**Environment and Natural Resources Trust Fund
2015 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 016-A

Turtle Population Dynamics in an Urban Lake

Category: A. Foundational Natural Resource Data and Information

Total Project Budget: \$ 258,603

Proposed Project Time Period for the Funding Requested: 3 years, July 2015 - December 2018

Summary:

Analyze the aquatic and terrestrial habitat parameters that affect the use of urban lakes by a three species turtle community and make specific recommendations to protect and enhance their populations.

Name: Jennifer McGuire

Sponsoring Organization: University of St. Thomas

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Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Map of Medicine Lake and surrounding area

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	



PROJECT TITLE: Turtle Population Dynamics in an Urban Lake

I. PROJECT STATEMENT

Habitat use of Spiny Softshell turtles is well known for riverine systems, but little is known about their behavior in lake systems. Further, effects of microhabitat variation on turtle distribution is largely unstudied. Many significant human impacts, such as road salt or fertilizer inputs, perturb these systems. Softshells are found in all of the major drainages in Minnesota (Moriarty and Hall 2014) and in the larger lakes in the east central part of the state, especially in the Minneapolis – St. Paul Metropolitan area. Most of these lakes are highly developed with residential properties that extend to the shore line. Much of the shoreline has been hardened with retaining walls or rip-rap. Reports of large softshells in the larger lakes, such as Minnetonka and White Bear, have been decreasing over the last 20 years.

Three Rivers Park District (TRPD) became aware of Spiny Softshells attempting to nest on the swimming beach in French Regional Park in 2005 (Linck, pers. comm.). TRPD began to monitor nesting Softshells at French Park in 2009. A fenced off sanctuary area was established that year and five nests were protected. The most recent (2013) nesting season had 35 nests in the sanctuary area. Prior to nesting, the female Softshells are observed in the “lagoon” area of the park, but there are not observations after nesting.

Medicine Lake also has populations of Painted Turtles and Snapping Turtles. These turtles are known to use the same basking habitat as the Softshells, but are more generalists for nesting. There is little information on interaction of the three species of turtles in Minnesota.

Similarly, there is little information on how human activities impact the distribution of nesting and other behaviors of Softshells which can be a challenge in generating and assessing management strategies. Human activities can lead to the addition of chemicals such as road salt and excess nutrients, increased aquatic sediment loads and altered groundwater flow patterns. These changes may or may not impact turtle population dynamics but knowing the extent to which they do is critical for appropriate future planning.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Turtle Trapping and telemetry

Budget: \$126,103

Population study - Spring trapping, nesting female capture, hatchling capture – all turtles will be weighed, measured, sexed, and PIT tagged. DNA samples will be collected from all adults and selected hatchlings
 Telemetry - 25 turtles (20 females and 5 males) of each species will be fitted with 36 month transmitters. Turtle will be located daily during the nesting season (June 1 – August 1), weekly during the rest of the active season and monthly in the winter, unless movements require more frequent visits. All locations will be entered into GIS and home range and habitat use will be determined.

Nesting - All nests within the French Park sanctuary will be located and protected. Nests outside the sanctuary will be protected when found. Hatchlings will be captured and PIT tagged.

Outcome	Completion Date
1. Habitat use by turtles using telemetry	December 30, 2018
2. Nest site ecology and success	December 30, 2018
3. Habitat and home range analysis	December 30, 2018
4. Genetic sampling and Analysis	December 30, 2018

Activity 2: Water Sampling and mapping

Budget: \$105,500

A critical component of the habitat survey will be the seasonal description of key water quality parameters as indicators of human activities that may impact turtle population dynamics. In late summer and fall 2015 as well as the early spring, late spring, summer, and fall of 2016, field water quality parameters (including dissolved oxygen, temperature, ORP (oxidation /reduction potential), salinity, nutrients, and trace metals)



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will be assessed across the lake to map the distribution of water types within the lake for comparison with habitat maps. These maps will be used to generate a refined sampling strategy that targets the areas of the lake where turtle communities are most impacted by human activities. In years 2 and 3, higher-resolution water chemistry measurements including description of chemical gradients at the highly active sediment-water interface would be completed in these targeted areas. The data would allow us to make recommendations regarding the impacts of activities such as road salt, nutrient loading, and physical shore design strategies.

Outcome	Completion Date
1. Whole-lake water chemistry and quality parameter Sample	December 30, 2016
2. Targeted high-resolution water chemistry and quality mapping and analysis	December 30, 2018

Activity 3: Habitat, water chemistry effects, management guidelines

Budget: \$27,000

GIS analysis of turtle habitat use in relation to physical and water quality variables. Development of urban lake turtle guidelines for use by land and water management agencies.

Outcome	Completion Date
1. GIS Developed maps for physical and water quality parameters	December 30, 2018
2. Lake guidelines for turtle management in Urban habitats	December 30, 2018

III. PROJECT STRATEGY

No salary or stipend funds to project team, just student and intern stipends. Funds assigned to each organization are for student/intern stipends, equipment, supplies and lab fees.

A. Project Team/Partners

University of St.Thomas, ENRTF funds \$258,603

Jennifer McGuire, Ph.D., Role: Water Sampling and analysis,

Tim Lewis, Ph.D., Role: Genetic analysis, GIS analysis of Turtle habitat use, Telemetry

Three Rivers Park District, ENRTF funds \$0

John Moriarty, M.S. Role: Turtle telemetry and nesting.

Madeleine Linck, M.S. Role: Turtle Nesting

B. Project Impact and Long-Term Strategy

Management Implications

The results of this study will be used to develop shoreline restorations and habitat management plans for urbanizing lakes in Minnesota. The water sampling results will be used to propose new pollution guidelines for contaminants as they relate to turtles. The findings will be disseminated to the MNDNR, MN PCA, watershed agencies and other organizations interested in urban lake management.

We feel that there will not be a need for additional LCCMR funding. Any continued work on turtle nesting habitat or habitat use will be funded through Three Rivers Park District.

C. Timeline Requirements

The water chemistry field work will start in the summer of 2015. Turtle capture and monitoring will start with the emergence of the turtles April 2016. The turtles will be followed for three nesting seasons through the fall of 2018. Targeted water samples will be taken in years 2017 & 2018. Final analysis will be done in the fall of 2018 with completion by December 30, 2018. Genetic samples will be collected throughout the field seasons with analysis complete by December 30, 2018.

2015 Detailed Project Budget

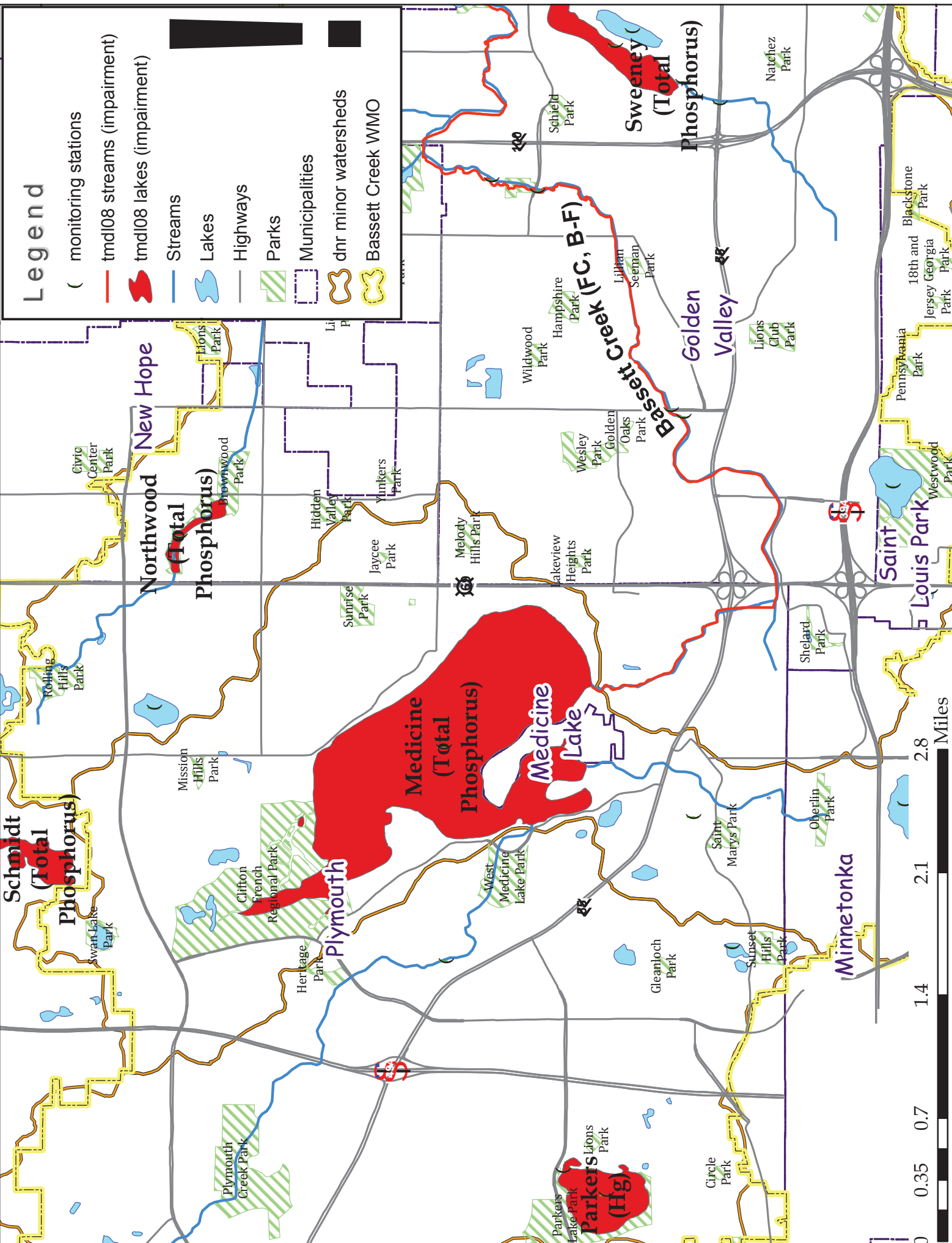
Project Title: Turtle Population Dynamics in an Urban Lake

IV. TOTAL ENRTF REQUEST BUDGET [Insert # of years for project] years

BUDGET ITEM	AMOUNT
Personnel:	\$ 126,803
University of Saint Thomas Personnel: Jennifer McGuire, Principal Investigator (PI), 1 months salary (8.33% effort) per year (totaling \$27,000 for 3 yrs) plus 7.65% fringe (\$ 2065.50) for 3 years).	29,065.50
University of Saint Thomas Personnel: Tim Lewis, Principal Investigator (PI), 1 months salary (8.33% effort) per year (totaling \$27,000 for 3 yrs) plus 7.65% fringe (\$ 2065.50) for 3 years).	29,065.50
Undergraduate students (individuals to be determined), Assist with field sampling and lab analyses. Two students during the academic year for a total of 1,700 hrs @ \$10/hr, totaling \$17,00 for three years, no fringe (0%). 4 students during each summer, 40 hrs/week for 10 weeks @ \$10/hour totaling \$48,000 plus 7.65% fringe (\$3,672) for 3 years.	68,672.00
Contracts:	\$ 43,000
\$15,000 for DNA analyses,	15,000
\$28,000 for interns at Three Rivers Park District	28,000
Equipment/Tools/Supplies:	\$ 84,975
Nets and trapping supplies	5,675
Telemetry equipment receivers, radios,	35,800
Misc supplies such as repair kits, gasoline, field supplies	3,000
Field Water sampling probes and consumables (\$20,500 Field sampling supplies (bottles, tubing, filters, reagents, Yellow Spring Instruments probes, colorimetric nutrient analyses, redox))	20,500
Laboratory water sampling probes and consumables (\$20,000 lab supplies (capillaries, reagents, filters, buffer solutions, trace metal analyses))	20,000
Travel:	\$ 3,825
Mileage	3,825
Additional Budget Items: none	-
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 258,603

V. OTHER FUNDS (This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not applicable.)

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ To Be Applied To Project During Project Period:	\$ -	Indicate: Secured or Pending
In-kind Services To Be Applied To Project During Project Period: Indicate any additional in-kind service(s) secured or applied for to be spent on the project during the project period. For each type of service, list type of service(s), estimated value, and indicate whether it is secured or pending. In-kind services listed must be specific to the project.	\$ -	Indicate: Secured or Pending
Madeleine Linck-(75% salary; 25% fringe) of 1 month per year (8.33%) for 3 years (\$16,000)		16,000
John Moriarty-(75% salary; 25% fringe) of 1 month per year (8.33%) for 3 years (\$26,000)		26,000
Three Rivers Equipment including storage space, boats, misc. supplies		3,000
University of St. Thomas Equipment including field and lab equipment, boats, misc. supplies		20,000



Legend

- () monitoring stations
- tmdl08 streams (impairment)
- tmdl08 lakes (impairment)
- Streams
- Lakes
- Highways
- Parks
- Municipalities
- dnr minor watersheds
- Bassett Creek WMO



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Project Managers Qualifications and Organization Description

The University of St. Thomas (UST) - Dr. Jennifer McGuire, PhD , Principal Investigator – Dr. McGuire has served as an Associate Professor at UST, St. Paul, MN (2008-present). From 2002-2008 she served as an Assistant Professor at Texas A&M University where she was tenured. She completed Ph.D. in Environmental Geoscience-Environmental Toxicology, at Michigan State University, 2002. Dr. McGuire has co-authored circa 20 research manuscripts that address chemical fate and transport and environmental biogeochemistry. Her research focuses on understanding the controls on the spatial and temporal variability of microbial metabolism which is necessary to evaluate health and safety concerns such as: chemical routes of exposure (risk assessment), natural attenuation and bioremediation capabilities, and the management of redox sensitive environments such as lakes, wetlands and estuaries. Dr. McGuire has been awarded, and has managed several externally-funded projects at UST (ca \$1,550,000) including MN PCA's Field Studies of Chemical and Microbiological Controls on Biodegradation Rates of Crude Oil in Aquifer and Wetland Systems and NSF's Biocomplexity in the Environment: Quantifying the Role of Mixing Interfaces in Biogeochemical Cycling in a Contaminated Aquifer-Wetland System: Linking Hydrogeological, Microbiological, and Geochemical Processes Grants.

The University of St. Thomas (UST) – Tim Lewis, PhD –

Ph.D. in Wildlife Ecology, University of Wisconsin Madison, September 1990 Minors: Geography, Forestry. Chair and Professor in Department of Biology (UST) (2009- present)
Long-term population monitoring of Emydid turtles using surveys, trapping, radio telemetry, PIT tags, GPS, genetic and statistical population modeling. Studied wood turtles (*Glyptemys insculpta*) since 1995 in close collaboration with the US Forest Service, Huron National Forest. Typically employ two undergraduate research students (total of 32 over the period of the study) with trapping (basking and by hand), tracking, and analyzing data and developing population models for survivorship determination. Published on turtle movements and habitat use. Continued long term study began in 2003 on painted turtles (*Chrysemys picta*) in the Twin Cities, MN, metropolitan area. Typically employ two undergraduate research students (total 9 over the period of the study) trapping (basking), tracking with radio telemetry, and modeling population dynamics in collaboration with John Moriarty and Todd Arnold. Has received \$4.1 million in external grants.

The University of St. Thomas (UST) – Institution Description

UST was founded in 1885 and emphasizes values-based education and career preparation, it helps solve community problems through education and service-learning programs. 56% of UST students receive need-based *scholarship or grant* aid. The largest private university in Minnesota (11,000 students, 461 full-time faculty), it offers bachelor's degrees in 85 major fields of study and 45 graduate degree programs, and is ranked as a National University. UST's Biology Department views -faculty research as essential - over the past 10 years, the faculty in Biology Department have received research grants from the NSF, NIH, USDA, USEPA, USGS, and multiple MN agencies (DNR, MPCA). Currently, the UST's Science Division has ca \$5.7 million of capital equipment, nearly half of which is owned/ maintained by Biology.