



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2015 Work Plan

Date of Report: October 15, 2014

Date of Next Status Update Report: October 1, 2015

Date of Work Plan Approval:

Project Completion Date: June 30, 2019

Does this submission include an amendment request?

PROJECT TITLE: Aquatic and Terrestrial Reptile Habitat

Project Manager: Jennifer T. McGuire, Ph.D.

Organization: University of St. Thomas

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Location:

Medicine Lake, Hennepin County, MN

Total ENRTF Project Budget:

ENRTF Appropriation: \$250,000

Amount Spent: \$0

Balance: \$250,000

Legal Citation: M.L. 2015, Chp. 76, Sec. 2, Subd. 03m

Appropriation Language:

\$250,000 the first year is from the trust fund to the commissioner of natural resources for an agreement with the University of St. Thomas in cooperation with the Three Rivers Park District to analyze the aquatic and terrestrial habitat parameters that affect the use of urban lakes by a three species turtle community and to make specific recommendations to protect and enhance their populations. This appropriation is available until June 30, 2019, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Aquatic and Terrestrial Reptile Habitat

II. 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. 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 (2014) nesting season had 43 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.

This projects seeks to conduct a study of the populations of Softshells, Painted, and Snapping Turtles in an urban lake environment, Medicine Lake, to discover the connections between water quality and turtle habitat use including nest site selection to inform management for this and similar lake systems. This will be accomplished by achieving the following:

- Turtle trapping and telemetry of 75 turtles (25 of each species)
- Genetic sampling and analysis of population size and inbreeding
- Water quality sampling that targets parameters as indicators of human activity as dictated by turtle dynamics
- GIS analysis of turtle home range, habitat use, and water quality parameters
- Preparing recommendations for turtle management in urban habitats

We expect this work will provide new knowledge of the linkages between aquatic characteristics, including water chemistry, and turtle population habitat usage. Surprisingly little is known about these connections in the environment and the need to understand is particularly acute in locations with a significant human impact such as urban lakes. These new data are critical to developing recommendations for urban lake management that responsibly balance human and wildlife needs.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of October 1, 2015:

Project Status as of April 1, 2016:

Project Status as of October 1, 2016:

Project Status as of April 1, 2017:

Project Status as of October 1, 2017:

Project Status as of April 1, 2018:

Project Status as of October 1, 2018:

Project Status as of April 1, 2019:

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

**ACTIVITY 1: Turtle Trapping and Telemetry
Description:**

Following specific turtles relative to microhabitats and estimating population size and inbreeding requires capture and processing of live specimens. We will capture 25 turtles each of three species using hoop nets and basking traps. We will focus most of our efforts on adult females as the breeding population is biologically most important, especially nesting and nesting movements, with 5 males and 20 females per species marked. Each captured turtle will be sexed, weighed, measured, and PIT (passive integrated transponder) tagged. These tags allow unique and permanent identification of each turtle. Turtles will each receive a radio transmitter to allow year-round locating and allow us to tie turtle locations to water quality sampling. All turtles will also have a small tissue sample removed for DNA analysis. For soft shells the tissue comes from a hole punched in the shell needed to affix the radio transmitter. For painted and snapping turtles this will be several scale clippings. DNA analysis provides a population size estimate independent of one derived from the mark and recapture data trapping affords. It will also allow linking turtles to nests if DNA can be obtained from egg shells. Population parameters will be analyzed using MARK software for live captures and BLAST or a similar program for DNA modeling.

Turtles will be radio 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 using ArcGIS.

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

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 127,705

Amount Spent: \$ 0

Balance: \$ 127,705

Outcome	Completion Date
1. Habitat use by turtles using telemetry	June 30, 2019
2. Nest site ecology and success	June 30, 2019
3. Habitat and home range analysis	June 30, 2019
4. Genetic sampling and Analysis	June 30, 2019

Activity Status as of October 1, 2015:

Activity Status as of April 1, 2016:

Activity Status as of October 1, 2016:

Activity Status as of April 1, 2017:

Activity Status as of October 1, 2017:

Activity Status as of April 1, 2018:

Project Status as of October 1, 2018:

Project Status as of April 1, 2019:

Final Report Summary:

ACTIVITY 2: Water Sampling and mapping

Description:

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, surveys of field water quality parameters (including dissolved oxygen, temperature, ORP (oxidation /reduction potential), and salinity) will be assessed across the lake to map the distribution of water types within the lake for comparison with habitat maps. To accomplish this, teams of students from the University of St. Thomas will be trained in field and laboratory water chemistry techniques. Selected sites will also be targeted for nutrients, chloride and trace metals based on a review of the existing historical data, areas of human impact, and/or major water inputs. 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. Beginning spring 2017, higher-resolution water chemistry measurements will be conducted in these target areas and may include description of chemical gradients at the highly active sediment-water interface, major water recharge or discharge areas, or surface water interfaces such as those that may exist between the slough/lagoon area and the major waterway within the lake. The data would allow us to make recommendations regarding the impacts of activities such as road salt, nutrient loading, and physical shore design strategies.

Methods and Procedures:

Field Chemistry: A multi-parameter sonde (Yellow Springs Instruments) will be used to characterize lake and wetland water samples for temperature, pH, dissolved oxygen, Eh, and specific conductance. Dissolved iron (Fe^{2+}) will be determined in the field photometrically (phenanthroline method) using a Spectronic20D+ spectrophotometer (Thermo Spectronic, Rochester, NY). Alkalinity will be determined by potentiometric titration (Gran method).

Laboratory Methods and Procedures: Water samples collected for anions (including tracer (Cl^- or Br^-) and electron acceptors (SO_4^{2-} and NO_3^-)) and NH_4^+ will be syringe-filtered using Millex-HA 0.45 μm filters (Millipore, Bedford, MA). Anion samples will be preserved with formaldehyde and NH_4^+ samples will be preserved by flash freezing. Analyses will be conducted in UST geochemistry labs using a capillary electrophoresis system (Agilent Technologies, Wilmington, DE). Major cation and trace metal samples will be syringe-filtered using Millex-HA 0.45 μm filters (Millipore, Bedford, MA), acidified to less than pH2 and analyzed on an Inductively Coupled Plasma-Mass Spec (ICP-MS).

Summary Budget Information for Activity 2:

ENRTF Budget: \$ 97,295

Amount Spent: \$ 0
Balance: \$ 97,295

Outcome	Completion Date
1. Whole-lake water chemistry and quality parameters	December 30, 2016
2. Targeted high-resolution water chemistry and quality mapping and analysis	June 30, 2019

Activity Status as of October 1, 2015:

Activity Status as of April 1, 2016:

Activity Status as of October 1, 2016:

Activity Status as of April 1, 2017:

Activity Status as of October 1, 2017:

Activity Status as of April 1, 2018:

Project Status as of October 1, 2018:

Project Status as of April 1, 2019:

Final Report Summary:

ACTIVITY 3: Habitat, water chemistry effects, management guidelines

Description:

ArcGIS analysis of turtle habitat use in relation to physical and water quality variables. Development of urban lake turtle guidelines that will maintain healthy turtle populations for use by land and water management agencies.

Summary Budget Information for Activity 3:

ENRTF Budget: \$ 25,000
Amount Spent: \$ 0
Balance: \$ 25,000

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	June 30, 2019

Activity Status as of October 1, 2015:

Activity Status as of April 1, 2016:

Activity Status as of October 1, 2016:

Activity Status as of April 1, 2017:

Activity Status as of October 1, 2017:

Activity Status as of April 1, 2018:

Project Status as of October 1, 2018:

Project Status as of April 1, 2019:

Final Report Summary:

V. DISSEMINATION:

Description:

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 in urban lake environments. The findings will be disseminated to the MNDNR, MN PCA, watershed agencies and other organizations interested in urban lake management. Further, we will present the findings of our work at regional, national, and international scientific conferences as appropriate opportunities allow. This will benefit the scientific community as we explore the relationship between turtle population dynamics and environmental factors such as shoreline habitat, aquatic vegetation, and water chemistry, and it will benefit the project as we gain valuable insight from recognized experts in the field.

Status as of October 1, 2015:

Status as of April 1, 2016:

Status as of October 1, 2016:

Status as of April 1, 2017:

Status as of October 1, 2017:

Status as of April 1, 2018:

Project Status as of October 1, 2018:

Project Status as of April 1, 2019:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	\$ Amount	Overview Explanation
Personnel:	\$ 136,825	University of Saint Thomas Personnel: Note: Drs. McGuire and Lewis are on normal academic 9 month (Sept.-May) salaried contracts and request 1 month of summer salary each to complete this work. Personnel Costs based on current wages and assumed increases: <i>Jennifer McGuire</i> , Principal Investigator (PI), 1 month

		summer salary (8.33% FTE) per year (totaling \$28,374 for 3 yrs) plus 7.65% fringe (\$ 2170.61) for 3 years). <i>Tim Lewis</i> , Principal Investigator (PI), 1 month summer salary (8.33% FTE) per year (totaling \$34,936 for 3 yrs) plus 7.65% fringe (\$ 2672.60) for 3 years). <i>Undergraduate Research Assistants (individuals to be determined)</i> , Assist with field sampling and lab analyses. Two students during the academic year for a total of 1,700 hrs @ \$10/hr, totaling \$17,000 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.
Professional/Technical/Service Contracts:	\$41,000	\$13,000 for DNA analyses (DNA primer sequence \$4000each * 3 species) plus 75 turtles *\$14 per turtle analysis); \$28,000 for internships at Three Rivers Park District
Equipment/Tools/Supplies:	\$68,975	Nets and trapping supplies (\$4675), telemetry equipment including radios and receivers (\$25,300), Field supplies for water sampling (\$18,500), Laboratory supplies for water analyses (\$19,000), general field supplies including gasoline, repair kits (\$1500)
Travel Expenses in MN:	\$3200	Mileage to travel to Medicine Lake for PIs and Students from UST St. Paul Campus (19 miles one way). Note, this will provide support for 168 vehicle trips or roughly 60 per year.
TOTAL ENRTF BUDGET:		\$250,000

Explanation of Use of Classified Staff: N/A

Explanation of Capital Expenditures Greater Than \$5,000: N/A

Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 4.44 FTE

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: 1.43 FTE (Three Rivers Park District Internships)

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
Three Rivers Park District	\$42,000		In-kind salary support for Madeleine Linck and John Moriarity
Three Rivers Park District	\$3000		In-kind storage space, boats and miscellaneous supplies
University of St. Thomas	\$20,000	\$	In-kind support including field and lab equipment, boats and miscellaneous supplies

State			
	\$0	\$	
TOTAL OTHER FUNDS:	\$65,000	\$	

VII. PROJECT STRATEGY:

A. Project Partners:

University of St. Thomas, ENRTF funds \$222,000

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 \$28,000

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.

C. Funding History: N/A

VIII. FEE TITLE ACQUISITION/CONSERVATION EASEMENT/RESTORATION REQUIREMENTS:

N/A

IX. VISUAL COMPONENT or MAP(S):

Maps obtained from Minnesota Pollution Control Agency TMDL project web page:

<http://www.pca.state.mn.us/index.php/water/water-types-and-programs/minnesotas-impaired-waters-and-tmdls/tmdl-projects/upper-mississippi-river-basin-tmdl/project-medicine-lake-excessive-nutrients.html>

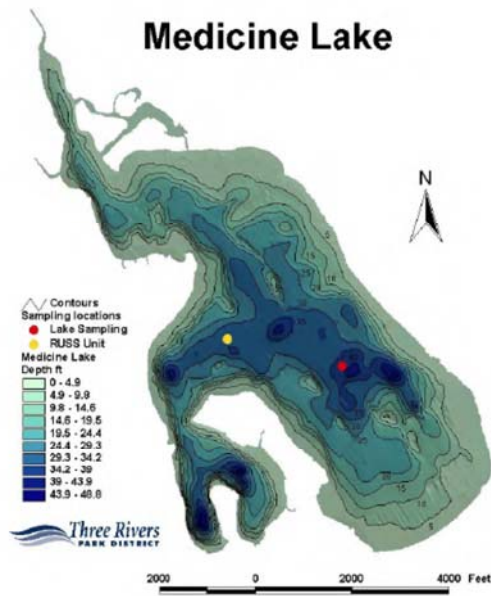


Figure 1-2. Medicine Lake Bathymetry.

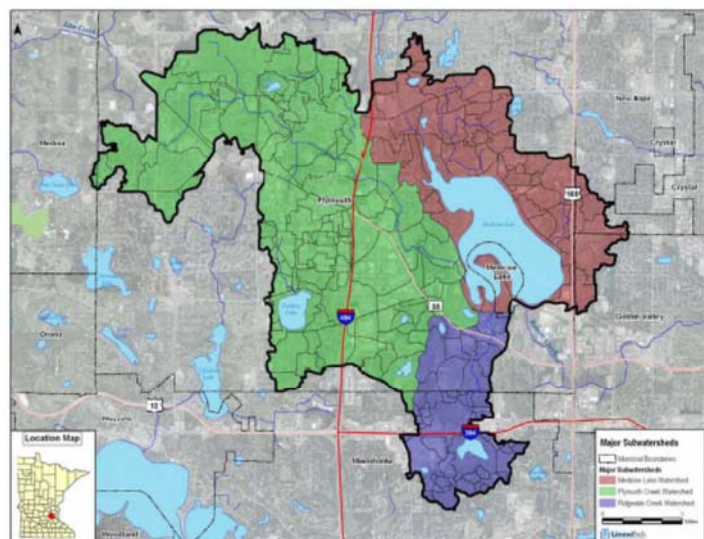


Figure 1-3. Medicine Lake Subwatersheds.

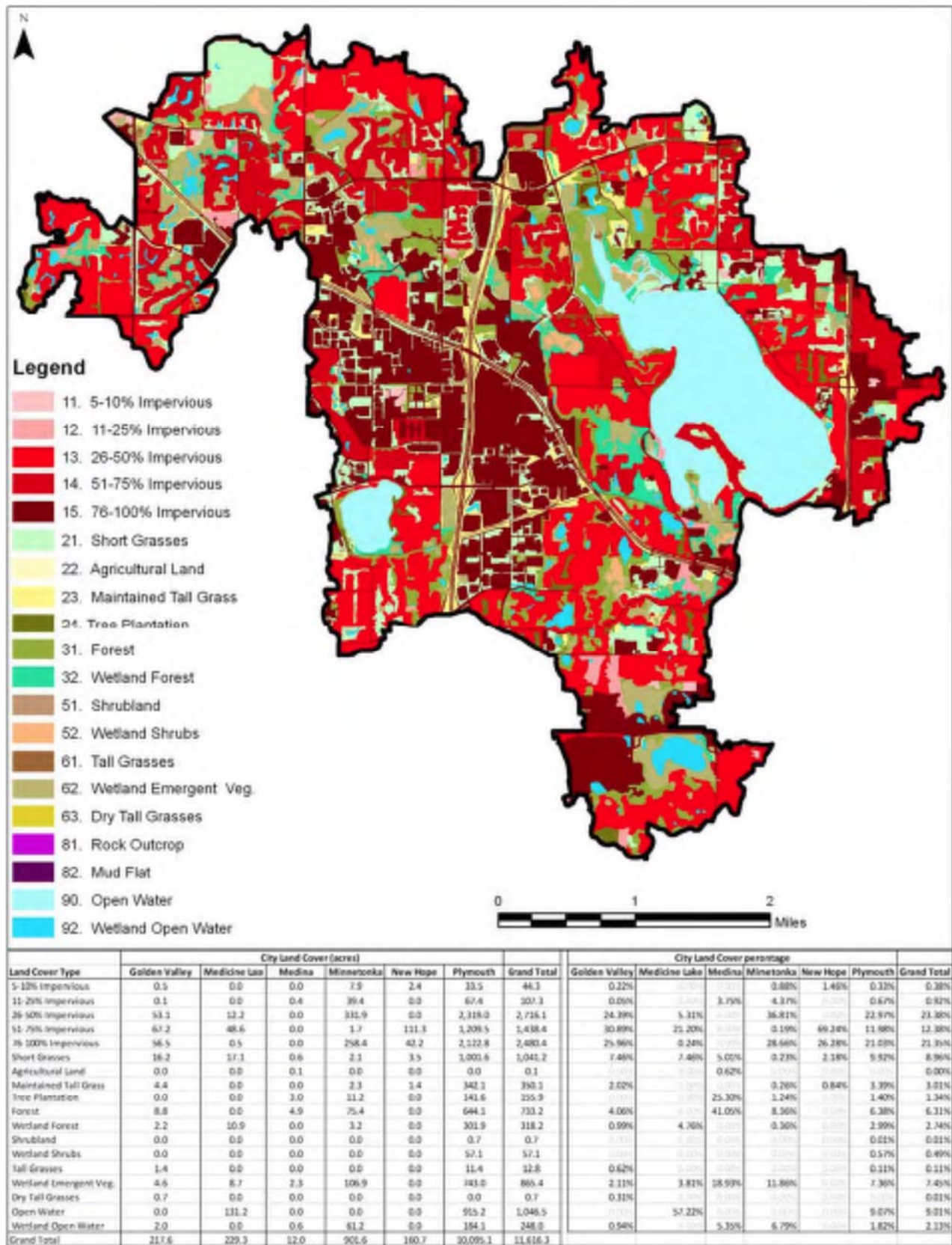


Figure 1-4. Medicine Lake Watershed Land Cover.

X. RESEARCH ADDENDUM: N/A

XI. REPORTING REQUIREMENTS:

Our project includes three full seasons of field work to be completed within 4 fiscal years beginning July 2015 and ending June 30, 2019. Periodic work plan status update reports will be submitted no later than October 1, 2015, April 1, 2016, October 1, 2016, April 1, 2017, October 1, 2017, April 1, 2018, October 1, 2018, and April 1, 2019. A final report and associated products will be submitted between June 30 and August 15, 2019.

**Environment and Natural Resources Trust Fund
M.L. 2015 Project Budget**



Project Title: Aquatic and Terrestrial Reptile Habitat

Legal Citation: M.L. 2015, Chp. 76, Sec. 2, Subd. 03m

Project Manager: Jennifer T. McGuire

Organization: University of St. Thomas

M.L. 2015 ENRTF Appropriation: \$ 250,000

Project Length and Completion Date: 4 Years, June 30, 2019

Date of Report: October 15, 2014

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	Activity 3 Budget	Amount Spent	Activity 3 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	<i>Turtle Trapping and telemetry</i>			<i>Water Sampling and mapping</i>			<i>Habitat, water chemistry effects, management</i>				
Personnel (Wages and Benefits) University of Saint Thomas Personnel: Note: Drs. McGuire and Lewis are on normal academic 9 month (Sept.-May) salaried contracts and request 1 month of summer salary each to complete this work. Personnel Costs based on current wages and assumed increases.	\$58,500	\$0	\$58,500	\$59,045	\$0	\$59,045	\$19,280	\$0	\$19,280	\$136,825	\$136,825
Jennifer McGuire, Principal Investigator (PI): \$30,544 = 1 month summer salary (8.33% FTE) per year (totaling \$28,374 for 3 yrs) plus 7.65% fringe (\$ 2170.61) for 3 years).											
Tim Lewis, Principal Investigator (PI): \$37,608 = 1 month summer salary (8.33% FTE) per year (totaling \$34,936 for 3 yrs) plus 7.65% fringe (\$ 2672.60) for 3 years).											
Undergraduate Research Assistants (individuals to be determined): \$17,000 = Assist with field sampling and lab analyses. Two students during the academic year for a total of 1,700 hrs @ \$10/hr, totaling \$17,000 for three years, no fringe (0%).											
4 students during each summer: \$51,672 = 40 hrs/week for 10 weeks @ \$10/hour totaling \$48,000 plus 7.65% fringe (\$3,672) for 3 years.											
Professional/Technical/Service Contracts											
DNA Analysis: DNA primer sequence \$4000each * 3 species) plus 75 turtles *\$14 per turtle analysis	\$13,000	\$0	\$13,000							\$13,000	\$13,000
Internships at Three Rivers Park District: 2 summer interns separate from the UST team to facilitate activities 1 & 3. 2 summer interns for 10 weeks, 40 hours per week at a rate of \$10 per hour plus fringe (7.65%) and 1 spring/fall intern for 20 weeks, 3.2 hours per week at a rate of \$10 per hour plus fringe (7.65%) each yer for 3 years.	\$22,280	\$0	\$22,280				\$5,720	\$0	\$5,720	\$28,000	\$28,000
Equipment/Tools/Supplies											
nets and trapping supplies	\$4,675	\$0	\$4,675							\$4,675	\$4,675
telemetry equipment (receivers, radios)	\$25,300	\$0	\$25,300							\$25,300	\$25,300
Field supplies for Water sampling for sonde measurements plus ~300 unique spatial/temporal samples per year for 3 years. Estimated costs of \$10, 650 in Year 1 (estimated \$3480 for YSI sensors and accessories for Multiparameter Water Quality Sonde, \$725 for pH electrodes/meters, \$2520 for samplers for surface water and porewater, \$ 3925 for bottles, filters, reagents, including calibration solutions, colorimetric nutrient analyses and redox field kits and general supplies such as batteries, baggies, generator oil/maintenance, ice/dry ice for sample storage). Estimated costs of \$3925 in years 2 and 3 for bottles, filters, reagents, including calibration solutions, colorimetric nutrient analyses and redox field kits and general supplies such as batteries, baggies, generator fuel, ice/dry ice for sample storage.				\$18,500	\$0	\$18,500				\$18,500	\$18,500

Laboratory Supplies for Water Analyses: In years 1&2 estimated costs of \$6500 (estimated 2 aqueous sample analyses kits for CE \$1212, 4 replacement buffer solution \$1072, 4 replacement capillaries \$1128, filters and general lab supplies \$538, and trace metal analyses \$2550 (\$17ea.*150 samples)), in year 3 estimated costs of \$6000 (estimated 2 aqueous sample analyses kits for CE \$1212, 4 replacement buffer solution \$1072, 4 replacement capillaries \$1128, filters and general lab supplies \$463, and trace metal analyses \$2125 (\$17ea.*125 samples)).				\$19,000	\$0	\$19,000				\$19,000	\$19,000
misc supplies such as gasoline, repair kits, and field supplies	\$750	\$0	\$750	\$750	\$0	\$750				\$1,500	\$1,500
Travel expenses in Minnesota											
Mileage to travel to Medicine Lake for PIs and Students from UST St. Paul Campus (19 miles one way). Note, this will provide support for 168 vehicle trips or roughly 60 per year.	\$3,200	\$0	\$3,200							\$3,200	\$3,200
COLUMN TOTAL	\$127,705	\$0	\$127,705	\$97,295	\$0	\$97,295	\$25,000	\$0	\$25,000	\$250,000	\$250,000