Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2019 ENRTF Work Plan (Main Document)

Today's Date: 14 August 2018

Date of Next Status Update Report: 1 March 2020

Date of Work Plan Approval: 5 June 2019

Project Completion Date: 30 June 2021

Does this submission include an amendment request? __NO

PROJECT TITLE: Quantifying Microplastics in Minnesota's Inland Aquatic Ecosystems

Project Manager: Kathryn M. Schreiner

Organization: University of Minnesota Duluth

College/Department/Division: Large Lakes Observatory

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Location: This project will involve work in 4 field locations representing 4 geographic regions within Minnesota: 1. Lake Peltier (Metro region), 2. White Iron Lake (Northeast region), 3. Elk Lake (Northwest region), and 4. Ten Mile Lake (Central region) in addition to laboratory facilities at the University of Minnesota Duluth.

Total Project Budget: $200,000

Amount Spent: $0

Balance: $200,000

Legal Citation: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 04d

Appropriation Language: $200,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota for the Natural Resources Research Institute in Duluth to quantify the amount, type, and source of microplastics in the water, sediment, and fishes of a range of Minnesota lakes.

I. PROJECT STATEMENT:

Microplastics, or small plastic pieces <5mm in size, have been found across terrestrial, aquatic, and marine environments worldwide. These small plastic particles can threaten their environment in a variety of ways:

- The microplastic size range overlaps with the size range of common food for birds, fish, and other aquatic life, leading to *false satiation*: i.e., the ingestion of plastic particles instead of needed food
- Microplastics can *sorb toxic chemicals*, which may be dangerous to aquatic food webs and humans who ingest fish
- Plastic particles affect the *aesthetics of the environment*, negatively impacting our naturally beautiful waterways and ecosystems

Despite these known environmental threats, microplastic abundance and uptake into fish populations has *never been studied in Minnesota inland waters*. Here, we propose to address this lack of knowledge with a coordinated three-component environmental study:

1. We will complete a survey of four Sentinel Minnesota inland lakes that span a continuum of aquatic environments and proximity to human settlement. We will measure the amount and type of plastics in the sediment, waters, and fishes of those lakes once per year with the Minnesota DNR.
2. We will join forces with a team of Minnesota citizen scientists to collect and analyze plastics in fish stomachs over the course of the two-year study. We will coordinate this effort with Lake Associations from the target lakes.
3. In collaboration with Minnesota SeaGrant, we will compile outreach materials that combine our findings from this survey of inland lakes with findings from ongoing research on plastic pollution in Lake Superior. These outreach materials will be targeted to Lake Associations, DNR officials, local and regional scientists and stakeholders, and state of Minnesota citizens.

II. OVERALL PROJECT STATUS UPDATES:

First Update March 1, 2020

Second Update September 1, 2020

Third Update March 1, 2021

Final Report between project end (June 30) and August 15, 2021

III. PROJECT ACTIVITIES AND OUTCOMES:

Activity 1: *Collection and analysis of water, sediment, and fish samples for plastic type and abundance*
Description: Lake water, sediment, and fish samples will be collected from four target lakes (Peltier, Elk, Ten Mile, and White Iron) in late summer 2019 and 2020. Because these lakes span a continuum of aquatic environments and proximity to human settlement, they will provide a baseline for the extrapolation of plastics pollution estimates to other Minnesota aquatic environments. Water, sediment, and fish samples will be collected and plastics will be extracted and analyzed. In Elk, Ten Mile, and White Iron Lakes, adult cisco and bluegill will be the target fish species. In Lake Peltier, where cisco are not present, adult bluegill will be the target fish species.

Activity 1 ENRTF BUDGET: $ 169,929

Outcome	Completion Date
1. Year 1 sediment, fish, water collection	*1 Sept 2019*
2. Year 1 plastic sample extraction and analysis	*30 June 2020*
3. Year 2 sediment, fish, water collection	*1 Sept 2020*
4. Year 2 plastic sample extraction and analysis	*1 May 2021*

First Update March 1, 2020

Second Update September 1, 2020

Third Update March 1, 2021

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Activity 2: *Integration with local and regional fishing organizations and citizen scientist plastic sample collection.*
Description: We will combine forces with local lake associations, county governments, and/or DNR water craft inspectors to enlist local property owners and fishermen as citizen-scientists to submit fish stomach samples for analysis. For lakes that have active Lake Associations, we will reach out to presidents to place information in Lake Association newsletters, and attend Lake Association meetings to disseminate information. For those lakes that do not have active Associations, we will contact county governments and DNR water craft inspectors to spread the word about our collection efforts. We will provide "Citizen Scientist Plastic Pollution Packs" (PPPs) which contain ID cards for anglers to fill out, sample collection vials, and a stamped padded envelope to return the samples to UMD for analysis. This will allow us to provide information on potential seasonal trends and differences between species on plastic pollution in inland lakes. At least one PI will visit each Lake Association twice during the duration of the project: at the beginning to explain our goals and reasons for the sample collection, and at the end to disseminate the results that we have.

Activity 2 ENRTF BUDGET: $ 28,011

Outcome	Completion Date
1. Contact local Lake Associations and County Governments, interface with local property owners and fishermen.	*1 Sept 2019*
2. Prepare Citizen Scientist PPPs for handout at Lake Association meetings, via DNR water craft inspectors, and/or direct mailings	*1 Sept 2019*
3. Collect Citizen Scientist PPPs with fish stomachs from local fishermen	*1 Sept 2020*
4. Prepare and analyze plastics from fish gut samples	*1 May 2021*

First Update March 1, 2020

Second Update September 1, 2020

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Activity 3: *Outreach efforts on plastic pollution in Minnesota waters*
Description: Outreach efforts will be led by Minnesota SeaGrant through co-PI Kitsen. Results from this funded study of Minnesota's inland waters as well as results from ongoing Lake Superior surveys let by PIs Schreiner, Minor, and Hrabik will be integrated to provide a full picture of plastics pollution in large and small aquatic systems in the state of Minnesota. These efforts will be focused on regional scientific groups as well as citizen groups.

Activity 3 ENRTF Budget: $2,060

Outcome	Completion Date
1. Prepare results for scientific publication and for regional scientific stakeholder meetings	*30 June 2021*
2. Final meeting with Lake Associations and local stakeholders to disseminate initial results	*30 June 2021*

First Update March 1, 2020

Second Update September 1, 2020

Third Update March 1, 2021

Final Report between project end (June 30) and August 15, 2021

IV. DISSEMINATION:

Description: We intend to disseminate the results of this project through two different, important means:

1. Scientific publications, targeted toward the aquatic researchers, limnologists, ecologists, and environmental scientists who study these issues.
2. Meetings and publications targeted toward the general public, specifically those citizens who assist us in the collection of samples from our target lakes.

The Minnesota Environment and Natural Resources Trust Fund (ENRTF) will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENRTF Acknowledgement Guidelines.

First Update March 1, 2020

Second Update September 1, 2020

Third Update March 1, 2021

Final Report between project end (June 30) and August 15, 2021

V. ADDITIONAL BUDGET INFORMATION:
A. Personnel and Capital Expenditures

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

Explanation of Use of Classified Staff: N/A

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

Enter Total Estimated Personnel Hours for entire duration of project: 3,744

Divide total personnel hours by 2,080 hours in 1 yr = TOTAL FTE: 1.8

Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: N/A

VI. PROJECT PARTNERS:

A. Partners outside of project manager's organization receiving ENRTF funding
N/A

B. Partners outside of project manager's organization NOT receiving ENRTF funding
Casey Schoenebeck, Fisheries Scientist, MN DNR. Program role: DNR Sentinel Lakes Coordinator

VII. LONG-TERM- IMPLEMENTATION AND FUNDING:

This project represents an initial step in determining the total amount and potential sources of microplastics in inland Minnesota aquatic environments, and the specific impacts to Minnesota fisheries. It directly addresses two LCCMR funding priorities for the 2019 cycle:

A. Foundational Natural Resource Data and Information
B. Water Resources

We intend that the results obtained from this study will lead to further surveys across the state and provide a baseline of data of the source, fate, and importance of plastic pollution in Minnesota's aquatic resources.

VIII. REPORTING REQUIREMENTS:

- Project status update reports will be submitted March 1 and September 1 each year of the project
- A final report and associated products will be submitted between June 30 and August 15, 2021

IX. SEE ADDITIONAL WORK PLAN COMPONENTS:

A. Budget Spreadsheet
B. Visual Component or Map

Attachment A:
Environment and Natural Resources Trust Fund
M.L. 2019 Budget Spreadsheet
Legal Citation: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 04d
Project Manager: Kathryn Schreiner
Project Title: Quantifying microplastics in Minnesota's Inland Aquatic Ecosystems
Organization: University of Minnesota Duluth
Project Budget: $200,000
Project Length and Completion Date: 24 months, 30 June 2021
Today's Date: 14 August 2018

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel: **Kathryn Schreiner, principle investigator, 1 summer month of salary + fringe each year for 2 years ($22,258)** **Elizabeth Minor, co-PI, 1/2 summer month of salary + fringe each year for 2 years ($15,971.50)** **Thomas Hrabik, co-PI, 1/2 summer month of salary + fringe each year for 2 years ($15,971.50)** **Marte Kitson, co-PI, 10% of salary and fringe each year for 2 years ($11,271)** **3 graduate students, 2 years of 50% summary salary only ($36,870)**	$ 152,060	$ -	$ 152,060
Professional/Technical/Service Contracts			
N/A	$ -	$ -	$ -
Equipment/Tools/Supplies			
Field supplies, sample processing supplies including gloves, solvents, glassware for 400 samples ($11,905) Citizen Science pack supplies, including envelopes & stamps, collection vials, and gloves for 300 PPPs	$ 15,420	$ -	$ 15,420
Capital Expenditures Over $5,000			
N/A	$ -	$ -	$ -
Fee Title Acquisition			
N/A	$ -	$ -	$ -
Easement Acquisition			
N/A	$ -	$ -	$ -
Professional Services for Acquisition			
N/A	$ -	$ -	$ -
Printing			
N/A	$ -	$ -	$ -
Travel expenses in Minnesota			
Travel to 4 field sites, including fuel, 1 night hotel stay for 4 people, and meals each year ($12,180) Travel to county governments and Lake Association meetings for 2 people each year ($3,045)	$ 15,225	$ -	$ 15,225
Other			
Pyrolysis-GCMS analysis to determine type of plastic of collected samples, assuming $40 per sample and 200 samples per year. Analysis to be performed at the Large Lakes Observatory, UMD ($16,240) Total organic carbon analysis of water samples from each lake, assuming 20 samples per year and $10 per sample. Analysis to be performed at the Large Lakes Observatory, UMD ($406) Elemental analysis (%OC and %N) of sediment samples from each lake, assuming 20 samples per year and $16 per sample. Analysis to be performed at the Large Lakes Observatory, UMD ($649)	$ 17,295	$ -	$ 17,295
COLUMN TOTAL	$ 200,000	$ -	$ 200,000

OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
Non-State:		$ -	$ -	$ -
State:		$ -	$ -	$ -
In kind:		$ -	$ -	$ -

PAST AND CURRENT ENRTF APPROPRIATIONS	Amount legally obligated but not yet spent	Budget	Spent	Balance
Current appropriation:		$ -	$ -	$ -
Past appropriations:		$ -	$ -	$ -