



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2019 ENRTF Work Plan (Main Document)

Today's Date: March, 26 201

Date of Next Status Update Report: March 1, 2020

Date of Work Plan Approval: June 5, 2019

Project Completion Date: 3 years, June 30, 2022

Does this submission include an amendment request? ___

PROJECT TITLE: Mapping Aquatic Habitats for Moose

Project Manager: Dr. Joseph K. Bump

Organization: University of Minnesota

College/Department/Division: Department of Fisheries, Wildlife, and Conservation Biology

Mailing Address: FWCB 135 Skok Hall, Upper Buford Circle

City/State/Zip Code: St. Paul, MN

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Web Address: <https://fwcb.cfans.umn.edu/personnel/joseph-bump>

Location: Northeast

Counties: Cook, Itasca, Koochiching, Lake, Lake of the Woods, St. Louis

Total Project Budget: \$199,600

Amount Spent: \$0

Balance: \$199,600

Legal Citation: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03I

Appropriation Language: \$199,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota to determine key water habitats used by moose in northern forested regions of Minnesota, measure the effects of moose foraging on aquatic plant and fish diversity, and provide educational programming materials for the public.

I. PROJECT STATEMENT:

- Moose use aquatic habitats for multiple reasons (e.g. to consume salt-rich plants), but almost nothing is known about what sort of aquatic habitats moose prefer and how moose can potentially create positive feedbacks in near-shore habitats critical to not only moose but also other lake plants and animals.
- **Goal:** We'll identify key aquatic habitats for moose and measure how moose affect aquatic habitats in shallow ponds and lakes to assess the potential for positive feedbacks in habitat quality.
- **Why?** Aquatic habitats are critical moose habitat. By feeding in aquatic habitats moose may significantly affect a variety of abiotic (e.g., temperature, nutrients) and biotic (e.g., periphyton, macrophytes, invertebrates, fish) functions in small lake, stream, and pond ecosystems. Small water bodies are also critical for moose nutrition, thermoregulation, and survival. By determining aquatic habitat selection and key effects of moose on aquatic habitats, we can then assess feedbacks to the moose populations and other species that depend on small lakes and ponds.

Our specific, direct outcomes are to:

1. Determine key water bodies used by moose in the Northern Forest region of Minnesota;
2. Measure key effects of moose on aquatic habitat productivity and community structure; and
3. Provide educational programming material for outreach to the general public.

We will achieve these goals and outcomes by:

1. Mapping high-to-low moose use in water bodies with existing data from GPS collared moose;
2. Using existing data and new measurements to assess moose effects on aquatic plants and fish; and
3. Create a short documentary film on the importance of aquatic habitats to moose and how, in turn, moose can affect aquatic habitats, which may create key positive feedbacks that favor moose population health and other aquatic life.

II. OVERALL PROJECT STATUS UPDATES:

First Update March 1, 2020

Second Update September 1, 2020

Third Update March 1, 2021

Fourth Update September 1, 2021

Fifth Update March 1, 2022

Final Report between project end (June 30) and August 15, 2022

III. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1 Title: Determine and map key water bodies that are used by moose in northeastern Minnesota.

Description: We will collaborate with multiple agencies and tribes to synthesize and analyze moose location data to determine and map water bodies that are heavily used by moose, moderately used, and used infrequently. The aim is to determine the key water bodies used by collared moose in NE MN so we can focus on those lakes to study at a finer scale. This effort will require synthesizing multiple data sources.

To determine which lakes moose use on a spectrum from high-low use, we will work within areas of known low- to-high moose density and previous research on populations in Northeastern, MN and the Greater Voyageurs Ecosystem.

We will also meet with regional biologists to help determine and map high-to-low moose across water bodies in northeastern Minnesota. These methods will allow us to determine key water bodies used by moose in Minnesota.

ACTIVITY 1 ENRTF BUDGET: \$50,800

Outcome	Completion Date
1. Preliminary analysis of existing data to determine and map high-to-low moose use across water bodies	<i>Feb. 1st 2020</i>
2. Meet with regional biologists to develop a field sampling plan use across water bodies.	<i>May 1st 2020</i>

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Activity 2: Assess moose effects on aquatic habitats, explore potential for positive feedbacks, and develop policy recommendations.

Description: We will use multiple methods to measure how aquatic foraging by moose affects key lake or pond productivity attributes, plants, and fish diversity.

To determine if increased foraging by moose is related to increased turbidity and/or primary production in lakes, we will measure chemical and biological characteristics in a number of lakes across a moose density gradient. The exact number of lakes to be sampled will depend on field conditions. Our hope is to sample at least a dozen lakes (N=12) across a gradient of moose density. This number could subsequently increase depending on access and feasibility. In each focal lake, fish diversity will be measured using three to six fyke nets. During summer sampling, we will visually assess the littoral zone of each lake to estimate proportion dominated by emergent, surface, and submerged aquatic vegetation. Snorkling or a plant rake collection approach will also be used to sample species.

ACTIVITY 2 ENRTF BUDGET: \$134,800

Outcome	Completion Date
<i>1. Measure moose foraging affects on aquatic habitat primary productivity and turbidity.</i>	<i>Feb. 1st 2021</i>
<i>2. Measure fish diversity associated with moose foraging in aquatic habitats</i>	<i>Feb. 1st 2021</i>
<i>3. Quantify aquatic plant coverage across a spectrum of high-to-low moose foraging</i>	<i>June 1st 2021</i>

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Activity 3: Create short documentary film on moose and aquatic habitats

Description: We will storyboard, script, and collect footage for a short documentary film highlighting the importance of aquatic habitats to moose and illustrating the ways in which aquatic foraging by moose in turn affects small lakes and ponds.

Activity 3 BUDGET: \$14,000

Outcome	Completion Date
<i>1. Storyboard and script documentary film</i>	<i>May 1st 2020</i>
<i>2. Collect footage</i>	<i>June 1st 2021</i>
<i>3. Complete preliminary film editing</i>	<i>June 1st 2021</i>

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IV. DISSEMINATION:

Description: Project results will be disseminated through professional presentations (The Wildlife Society annual meetings, Minnesota chapter), peer-reviewed publications, and a mini-documentary.

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](#).

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Third Update March 1, 2021

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Fifth Update March 1, 2022

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V. ADDITIONAL BUDGET INFORMATION:

A. Personnel and Capital Expenditures

Explanation of Capital Expenditures Greater Than \$5,000: The YSI sonde sensor package (\$ 17,700) is a key piece of equipment to measure lake primary productivity, turbidity, conductivity, temperature, dissolved oxygen, and total algae in aquatic habitats. For this project, it is essentially a mobile lab to assess important parameters in the aquatic habitats available to moose. This equipment will continue to be used in this capacity through its useful life after the project's completion.

Explanation of Use of Classified Staff:

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

Enter Total Estimated Personnel Hours for entire duration of project: 5,200	Divide total personnel hours by 2,080 hours in 1 yr = TOTAL FTE: 2.5
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Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation.

N/A	N/A
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VI. PROJECT PARTNERS:

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

Name	Title	Affiliation	Role
TBD	Masters Student	University of Minnesota	Research Assistant
TBD	Co-project manager	University of Minnesota	Co-leader; fish specialist
Joseph K. Bump	Project leader	University of Minnesota	Project PI

B. Partners outside of project manager's organization NOT receiving ENRTF funding

Name	Title	Affiliation	Role
Steve Windels	Research Biologist	National Park Service	Advise field sampling

VII. LONG-TERM- IMPLEMENTATION AND FUNDING: This project will provide foundational data and information for aquatic habitat monitoring for moose.

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, 2022

IX. SEE ADDITIONAL WORK PLAN COMPONENTS:

A. Budget Spreadsheet: please see below

B. Visual Component or Map: please see below

C. Parcel List Spreadsheet: N/A

D. Acquisition, Easements, and Restoration Requirements: N/A

E. Research Addendum

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. 03I

Project Manager: Joseph K. Bu

Project Title: Mapping Aquatic Habitats for Moose

Organization: University of Minnesota Project Budget: \$199,600

Project Length and Completion Date: 2 years, June 30, 2021

Today's Date: July 24, 2018

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits): subtotal = \$164,900			
TBD, Masters student, field work, analysis and modeling, paper publishing, and co-lead public outreach: (56% salary, 44% benefits) 50% FTE for 3 years.	\$ 89,900	\$	\$ 89,900
TBD, co-project management, co-analysis, paper publishing, and co-lead public outreach and communication: (82.3% salary,	\$ 65,000		\$ 65,000
Undergraduate Wildlife Field Assistant to assist with field work and data entry: (100% salary) 30 % FTE for 2	\$ 10,000		\$ 10,000
Professional/Technical/Service Contracts			
	\$ -	\$	\$ -
Equipment/Tools/Supplies			
Fyke nets (6 at \$500 each = \$3,000) to sample fish communities;	\$ 3,000		\$ 3,000
Capital Expenditures Over \$5,000			
YSI sonde sensor package to measure lake primary productivity, turbidity, conductivity, temperature, dissolved	\$ 17,700	\$	\$ 17,700
Travel expenses in Minnesota			
Mileage, lodging, for in-state travel by all project personnel to and from field sites for two seasons (multiple trips), data sharing partner offices (MN DNR, federal agencies, tribal wildlife agencies) and outreach presentation sites. All travel will adhere to the commissioner's plan. (1) Vehicle Rental = \$ 3,336 (2) Vehicle mileage = \$2,580 (3) Room rentals = \$ 4,084	\$ 10,000	\$	\$ 10,000
Other			
Publishing page costs for 2-3 peer-reviewed papers	\$ 4,000	\$	\$ 4,000
COLUMN TOTAL	\$ 199,600	\$	\$ 199,600
OTHER FUNDS CONTRIBUTED TO THE PROJECT	Budget	Spent	Balance
Non-State: N/A	\$ -	\$ -	\$ -
State: N/A	\$ -	\$ -	\$ -
In kind: \$88,560 Forgone organized research indirect costs associated with this project (54% MTDC). \$5,000 from Gullion Chair and UMN research start-up funds to Project Lead JK Bump will be used for travel to present results at regional, national (e.g. The Wildlife Society) or international professional conferences (e.g. Conservation Biology). \$20,000 from UMN research start-up funds to Project Lead JK Bump will be used for summer salary to deliver 3 weeks of summer salary for the project (75% salary, 25% benefits) 6% FTE for 2 years. \$5,000 + \$20,000 = \$25,000	\$ 113,560	\$	\$ 113,560
PAST AND CURRENT ENRTF APPROPRIATIONS	Budget	Spent	Balance
Current appropriation: N/A	\$ -	\$ -	\$ -
Past appropriations: N/A	\$ -	\$ -	\$ -

