Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2018 ENRTF Work Plan (Main Document)

Today's Date: December 13, 2017

Date of Next Status Update Report: January 31, 2019

Date of Work Plan Approval: 06/05/2018

Project Completion Date: June 30, 2022

Does this submission include an amendment request? __

PROJECT TITLE: Peatland Forest Management

Project Manager: Dr. Marcella Windmuller-Campione

Organization: University of Minnesota

College/Department/Division: Department of Forest Resources

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Location: Central, Northeastern, and Northwestern MN

Counties: Cook, Lake, St. Louis, Koochiching, Lake of the Woods, Beltrami, Clearwater, Hubbard, Cass, Crow Wing, Aitkin, Carlton, Wadena, Carlton, and Pine

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Total Project Budget: $600,000

Amount Spent: $0

Balance: $600,000

Legal Citation: M.L. 2018, Chp. 214, Art. 4, Sec. 02, Subd. 03d

Appropriation Language: $600,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to identify management actions to maximize benefits to wildlife, water quality, timber production, and native plant communities in peatland forests. This appropriation is available until June 30, 2022, by which time the project must be completed and final products delivered.

I. **PROJECT STATEMENT:**

Minnesotans rely on the ecosystem services and economic products derived from peatland forests. These ecosystems comprise 20% of all forestland (3 million acres) in Minnesota and range from unproductive bogs to productive peatland forests with tamarack (eastern larch*, Larix laricina*) and black spruce (*Picea mariana*). Peatland forest communities act as important filters of nutrients and pollutants, provide habitat for 100's of species of wildlife, and are home to a number of rare and threatened plants. In additional to the ecological benefits, peatlands are actively managed for a variety of forest products including black spruce decorative tops and pulp for high quality paper products ($ 4 million dollars in annual stumpage). However, due the remoteness and poor accessibility, peatland forests are vastly understudied. There is high uncertainty on how active management influences hydrology, water, and plant diversity. This uncertainty has been highlighted in two recent Minnesota Department of Natural Resources Reports.

This project is designed to provide foundational data to address uncertainty in the management of peatland forests. A network of research sites will be established in three dominant peatland forest types across three age classes and an unharvested control in northern Minnesota to assess the response of vegetation, hydrology, and wildlife change with time since harvest. This study will produce 1) foundational data in understudied peatland ecosystems for vegetation, hydrology, and wildlife and 2) integrate knowledge gained via updated management guidelines for peatland forests. There is a need for these products and we expect they will be used by natural resource managers, regardless of forest ownership, across northern Minnesota to maximize the benefits of peatland forests for multiple objectives.

II. OVERALL PROJECT STATUS UPDATES:

First Update January 31, 2019
Second January 31, 2020
Third Update January 31, 2021
Fourth Update January 31, 2022
Final Update between June 30 and August 15, 2022

III. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Establish a network of 48 research sites and quantify ecosystem function

Description:

With the aid of MN DNR, we will establish a network of 48 research sites across central and northern Minnesota. Sites will be selected in the three dominant peatland forest community types which have a history of regeneration harvests: Forested Rich Peatlands dominated by black spruce (FPn62 or FPn71), Forested Rich Peatlands dominated by tamarack (FPn81 or PFn82), and Acid Peatlands (APn80 or APn81). Time since the last regeneration harvest will be grouped into three age classes and an unharvested control. There will be four replicates in each peatland community and age class category (n = 48).

We will use standard forest inventory methods to assess the multiple layers of vegetation on the 48 different sites. Vegetation layers that will be assessed include: overstory, regeneration, understory including non-woody plants, herbaceous species, and bryophytes, and down dead wood. On a subset of tree we will use an increment borer to quantify tree ages through tree cores. Tree cores will be processed using standard dendrochronological methods at U of MN Silviculture Lab.

Based on data collected, we will be able to assess patterns in stand development through time. For each site we will use summary statistics, diameter distributions, and other statistical methods to explore impacts of

harvesting through time in the three different peatland forest types. We will use this data when developing the forest management strategies (Activity 4).

ENRTF BUDGET: $ 172,483

Outcome	Completion Date
1.Finalize selection of 48 field sites	September 2019
2. Field measurements at 48 sites in 3 peatland forest community types across 4 age classes	September 2021
3. Evaluation of management effects on plant communities and productivity	January 2022

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ACTIVITY 2: Assess relationships between water and management

Description:
Peatland hydrology will be primarily assessed with water table monitoring wells to calculate annual water budgets and estimate daily evapotranspiration. Hydrology measurements will occur at three of the four replications for each peatland forest community type and age class. At each of the selected sites, a well with two pressure transducers will be installed to measure groundwater tables and barometric pressure during the growing season. A tipping bucket rain gauge will also be deployed at each site during the growing season of each year to record precipitation inputs and air temperature.

Raw data will be processed using standard techniques to calculate daily, weekly, and seasonal trends for the different forest types and stand ages. We will use multiple statistical techniques including mixed model repeated measures to assess differences among forest types. We will use standard calculations to estimate evapotranspiration, net groundwater flow, and net change in the daily water table. Results will be incorporated into the forest management strategies developed in Activity 4.

ENRTF BUDGET: $ 199,899

Outcome	Completion Date
1. Monitoring wells and precipitation gauges installed at 36 sites	October 2019
2. Site hydrology and water budget measurements completed for the 48 research sites	October 2021
3. Hydrologic assessment completed and classification scheme for alteration completed	January 2022

First Update January 31, 2019
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ACTIVITY 3: Assess relationships between wildlife and management

Description:

Wildlife surveys will focus on characterizing data on the most abundant wildlife species which are the amphibian and avian communities. Data collection will occur in the spring and summer at the 48 research sites. We will use digital audio recorders (DARs) to remotely survey amphibian and bird communities from February to July. This survey method will allow us to detect different species, the presence and absence of types of species, and provide a permanent recording. This permanent recording will be important to compare among years for this study and provide important data for future researchers on current wildlife species in peatland forests. Birds will be recorded during the breeding season using standard point count techniques which used highly trained research associates to watch and listen for different bird species. Using the DARs and point count surveys will provide a comprehensive picture of wildlife species in peatland forests.

A subset of research sites will be targeted to gather additional data throughout the breeding cycle of two Species of Greatest Conservation Need, Connecticut Warbler and Boreal Chickadee. We will search for nests using standard nest searching methods. When nests are found, we will use cameras to monitor the progress. If the nest produces fledglings, we will tag the juveniles with radio-transmitters to monitor survival, habitat use, and general preferences during the post-fledgling period. This will give us information on what type of habitat these important birds species are and are not using. These data will provide important information that will help identify conservation priorities for Species in Greatest Conservation Need. We will use this data when developing the forest management strategies (Activity 4).

ENRTF BUDGET: $ 177,890

Outcome	Completion Date
1. Amphibian and bird community composition and diversity measured for 48 research sites. Connecticut Warbler and Boreal Chickadee habitat data collected at selected sites.	August 2021
2. Evaluation of management effects on amphibian and bird communities	September 2021

First Update January 31, 2019
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ACTIVITY 4: Develop forest management strategies to maximize peatland forest benefits

Description:
Peatland forests are actively managed. However, the management guidelines for black spruce have not been updated since 1977. There is increased interest in understanding how peatland forest management impacts multiple ecosystem functions. There currently exists a lack of data to update management guidelines. Activity 1, 2 and 3 will provide this data. The development of updated guidelines will be a collaborative effort. We will establish a Peatland Forest Stakeholders group, which will draw from multiple forest land management agencies and disciplines within Minnesota to create updated management recommendations for peatland forests which incorporate multiple benefits: water, vegetation, and wildlife. The Stakeholder group will be established by May of 2020. This will allow for the group to set guidelines and objectives, discuss current knowledge of peatland forests, and then integrate results from this study into management recommendations.

ENRTF BUDGET: $ 49,728

Outcome	Completion Date
1. Compilation and integration of vegetation, hydrology, and wildlife assessments	January 2022
2. Management strategies to maximize benefits for peatland forests completed	June 2022

First Update January 31, 2019
Second January 31, 2020
Third Update January 31, 2021
Fourth Update January 31, 2022
Final Update between June 30 and August 15, 2022

IV. DISSEMINATION:

Description:

Scientific publications: We expect that Activities 1, 2 and 3 will produce at least 2 peer reviewed journal articles in the fields of forest management, stand dynamics, hydrology, avian and amphibian population dynamics and management.

Presentations: Results will be disseminated through online webinars in coordination with the Sustainable Forest Education Cooperative and through local, regional, and national conferences.

Publically available data hosted through The Data Repository for University of Minnesota (DRUM) (https://conservancy.umn.edu/handle/11299/166578)

Formation of Peatland Forest Stakeholder Group and the development of Management Recommendation for peatland forests which will incorporate multiple ecological functions including vegetation, water, and wildlife. The guidelines will be distributed to all stakeholders and will be made available through the Internet as a Department of Forest Resources Staff Paper Report.

First Update January 31, 2019
Second January 31, 2020
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Fourth Update January 31, 2022
Final Update between June 30 and August 15, 2022

V. PROJECT BUDGET SUMMARY:

A. Preliminary ENRTF Budget Overview: See attached budget spreadsheet

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: **8.4**	Divide by 2,080 = TOTAL FTE
Windmuller-Campione: 480 (4 wks. for 3 years)	0.23
Grinde: 720 (6 wks. for 3 years)	0.35
Grad students (2 people half time for 3 years)	3.00
Research scientist (1 person three quarters time for 3 years)	2.25
Bird bander (1 person for 1 mos. for 2 years)	0.15

Undergraduate field technicians (3 people for 14 wks for 3 years)	2.42

Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: *None*

Enter Total Estimated Personnel Hours:	Divide by 2,080 = TOTAL FTE:

B. Other Funds:

SOURCE OF AND USE OF OTHER FUNDS	Amount Proposed	Amount Spent	Status and Timeframe
Other Non-State $ To Be Applied To Project During Project Period: *N/A*			
	$	$	
Other State $ To Be Applied To Project During Project Period: *N/A*			
	$	$	
In-kind Services To Be Applied To Project During Project Period: Total amount $483,874 (Secured)			
In-kind salary and fringe for Dr. R. Slesak over course of project: $24,000			
In-kind support from DNR Division of Ecological and Water Resources Division, Division of Forestry, and Division of Fish and Wildlife: $36,800			
In-kind assistance with periodic lodging at Div. Wildlife field station: $18,000			
Potetial use of Argo, truck, and trailer for site assess and transportation: $6,000			
Unrecovered indirect costs@ 54% (2018, 2019, 2020) of total direct cost $668,003: $376,628			
Past and Current ENRTF Appropriation: *N/A*			
	$	$	
Other Funding History: *N/A*			
	$	$	

VI. PROJECT PARTNERS:

A. Partners receiving ENRTF funding

Name	Title	Affiliation	Role
Marcella Windmuller-Campione	Assistant Professor	University of Minnesota, Twin Cities	Project Manager, Oversee all project activities, Lead on Activity 1 & 4
Alexis Grinde	Research Program Manager, Wildlife Ecologist.	Natural Resources Research Institute, University of Minnesota Duluth	Oversee Wildlife Work Activity 3.
Robert Slesak	Adjunct Assistant Professor	University of Minnesota, Twin Cities	Oversee Hydrology Work Activity 2

	Program Manager	Minnesota Forest Resources Council	

B. Partners NOT receiving ENRTF funding

Name	Title	Affiliation	Role
MN DNR (Divisions of Ecological Water Resources, Forestry, and Fish and Wildlife)	Multiple	MN DNR	Assist with site selection for Activities 1, 2, & 3. Assist with the development of colloborative partnership in Activity 4

VII. LONG-TERM- IMPLEMENTATION AND FUNDING:

The project will produce results in four key areas: forest stand development, hydrology, wildlife use, and management recommendations. A systematic study investigating vegetation, wildlife, and water has not been completed for forest peatlands in Minnesota. By studying these three components simultaneously, the final piece – management recommendations – will provide a holistic assessment of how forest management will influence each of the three components: vegetation, wildlife, and water.

The specific deliverables for the project will be (1) the establishment of a network of peatland forest sites distributed across forest types and age classes; (2) a dataset that will allow for the holistic assessment of forest vegetation development, hydrology, and wildlife ; (3) the formation of a collaborative partnership among stakeholders in peatland forest systems to provide guidance in the development of forest management guidelines which account for the multiple ecosystem services peatland forest communities provide; and (4) increased understanding of the importance of peatland forest communities by policy-makers, natural resource managers, and the public through educational and outreach opportunities via online material and webinars, seminars, reports, and conferences.

The increased knowledge of peatland forests will likely lead to additional questions including what are potential alternative forest management options that increase economic and ecological resilience and how does the timing of treatment influence other objectives including wildlife? The use of a collaborative partnership with the development of the management recommendations will lead to future opportunities to increase of understanding of this complex but understudied ecosystem.

VIII. REPORTING REQUIREMENTS:

- **The project is for 4 years, will begin on July 01, 2018, and end on June 30, 2022.**
- **Periodic project status update reports will be submitted** *[January 31*] **and** *[June 30*] **of each year.**
- **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
B. Visual Component or Map
C. Parcel List Spreadsheet - NA
D. Acquisition, Easements, and Restoration Requirements - NA
E. Research Addendum – Separate document

006-A Maximizing Wildlife, Water, and Productivity in Peatland Forests — Windmuller-Campione

Research Team: Marcella Windmuller-Campione (Department of Forest Resources, UMN); Alexis Grinde (Natural Resources Research Institute); Robert Slesak (MN Forest Resources Council)

Collaborators: MN DNR (Divisions of Ecological and Water Resources, Forestry, & Fish & Wildlife)

Rationale

- Peatland forests cover **20% (3 million acres) of all forest land** and 30% (1.5 million acres) of state land
- Minnesota has the most peatland forests in the lower 48.
- Peatlands are critical resource for wildlife, timber products, water quality, and biodiversity but are threatened by land-use conversion, altered hydrology, and forest pests
- DNR has a critical information need to guide integrated management of timber, wildlife, and water on state lands (see letter of support).
- Project team provides expertise in each of the 3 forest resources

Approach

- Develop network of sites that span a range of ages and conditions
- Determine how wildlife, water, and timber production vary with time and site conditions

Outcomes

- Integrated approaches for multi-resource management in peatland forests

- Strategies to address threats to peatland forests functions
- Continued supply of wildlife, water, and timber from remaining peatland forests.

Attachment A:
Environment and Natural Resources Trust Fund
M.L. 2018 Budget Spreadsheet

Project Title: Peatland Forest Management
Legal Citation: M.L. 2018, Chp. 214, Art. 4, Sec. 02, Subd. 03d
Project Manager: Dr. Marcella Windmuller-Campione
Organization: University of Minnesota
College/Department/Division: Dept. Forest Resources
M.L. 2018 ENRTF Appropriation:
Project Length and Completion Date: 4 years, June 30, 2022
Date of Report: February 20, 2018

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits)	$502,850	$0	$502,850
M. Windmuller-Campione, project manager: $35,197 (75% salary, 25% benefits), 8% FTE for years 1, 2, and 3. No salary during year 4.			
A. Grinde, research program manager at Natural Resources Research Institute: $39,396 (75% salary, 25% benefits), 12% FTE for years 1, 2, and 3. No salary during year 4			
Two graduate research assistants : $252,313 (52% salary, 48% benefits during academic year, 85% salary and 15% benefits during summer), 50% FTE for 3 years			
Research Scientist at Natural Resources Research Institute: $103,915 (80% salary, 20% benefits), 75% FTE for 3 years			
Bird bander: $5,938 (92.3% salary, 7.7% benefits), 8% FTE for 2 years			
Three undergraduate research assistants: $66,092 (100% salary, 0% benefits summer, 92% salary 8% benefit acedmic year), 0.2 FTE for 3 years			
Equipment/Tools/Supplies	$72,150	$0	$72,150
Forest inventory equipment (Activity 1): increment borers 2 @ $250.00 each, laser hypsometer 1 @ $1,500 each, calipers 2 @ $125 each (Total estimated amount $2,250)			
Pressure transducers for continuous water table monitoring - 2 at each of 36 sites (Activity 2): 72 @ $350.00 each (Total estimated amount $2,250)			
Tippping bucket rain gauges to continuously measure precipitation at 36 sites (Activity 2): 36 @ $450.00 each (Total estimated amount $16,200)			
15 Digitial Audio Recorders for longer-term monitoring of amphibian and bird communities at field sites (Activity 3): DARs; $900.00 each. We will also use 15 DARs purchased for previous LCCMR project. (Total estimated amount $28,500)			
Travel expenses in Minnesota	$25,000	$0	$25,000
Travel to 48 research sites multiple times each year to collect data related for Activity 1, 2, and 3. We estimate over 5000 miles traveled each year due to remote site location, long distances between sites, and many of the protect team members being based in the Twin Cities with sites located in northern Minnesota.Travel expenses includes lodging and meal allowance for graduate students, research associates, and field technicians			
COLUMN TOTAL	**$600,000**	**$0**	$600,000