

**Environment and Natural Resources Trust Fund
2017 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 020-A

Lowland Conifer Ecosystems: Holistic Assessment for Adaptive Management

Category: A. Foundational Natural Resource Data and Information

Total Project Budget: \$ 763,702

Proposed Project Time Period for the Funding Requested: 4 Years, July 2017 - June 2021

Summary:

Lowland conifer forests are predicted to be especially vulnerable to future threats. This project would provide foundational knowledge on forest productivity, hydrology, and wildlife use, informing and improving sustainable management.

Name: Marcella Windmuller-Campione

Sponsoring Organization: U of MN

Address: 1530 Cleveland Ave N
St. Paul MN 55108

Telephone Number: (612) 624-3699

Email mwind@umn.edu

Web Address _____

Location

Region: Central, Northwest, Northeast

County Name: Aitkin, Beltrami, Carlton, Cass, Clearwater, Cook, Crow Wing, Itasca, Koochiching, Lake, Lake of the Woods, Mahnomon, Marshall, Roseau, St. Louis

City / Township: _____

Alternate Text for Visual:

Extent of lowland conifer communities and that they provide important wildlife habitat, wood products, and hydrological function

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



Environment and Natural Resources Trust Fund (ENRTF)

2017 Main Proposal

Project Title: Lowland conifer ecosystems: holistic assessment for adaptive management

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I. PROJECT STATEMENT

Lowland conifer ecosystems are predicted to be especially vulnerable to direct and indirect impacts from a changing climate, insect and diseases, and invasive species. Previous monitoring has been limited in this understudied ecosystem and has generally focused on individual aspects of ecosystem function, missing complex interactions. This results in conflicting recommendations for management of multiple resources. Our project would fill this important data gap by providing foundational data in three critical areas (vegetation dynamics, wildlife habitat use, and hydrological function) that will inform and improve sustainable forest management of lowland conifer systems in Minnesota

Our specific objectives are to:

- 1) Provide a detailed assessment of vegetation dynamics, hydrology, and wildlife use across lowland conifer forest communities in northern Minnesota
- 2) Quantify how forest management practices influence wildlife habitat, hydrological functions, and forest productivity
- 3) Collaboratively develop multi-resource forest management strategies to increase ecological and economic resilience with MN DNR and other forest stakeholders.

Lowland conifer communities cover approximately 3 million acres (20% of forestland in Minnesota) and provide many economic and ecological benefits.

- **Economic:** Black spruce wood products annually provide millions of dollars in economic benefit to northern Minnesota communities and businesses.
- **Ecological:** Numerous Species of Greatest Conservation Need (SGCN) including Connecticut Warbler, Yellow-bellied Flycatcher, Spruce Grouse, and Boreal Chickadee are dependent on lowland conifer habitat (<http://www.dnr.state.mn.us/cwcs/index.html>).

There is a vast lack of information regarding the effects of lowland conifer management practices due to their remoteness and difficult access during summer months.

- **Current management:** clear cut during winter, aerially seeded following harvest, visual regeneration check, and then revisited before next harvest (50 – 75 years)
- **Lacking:** Detailed assessment of how management influences vegetation community, hydrological function, and wildlife use over time.
- **Inhibits:** the ability to assess whether current management practices are maintaining important ecosystem services and plan for future conditions
- **Future Need:** Increasing the economic and ecological resilience of these ecosystems is important. Urgent need to develop sound sustainable management approaches which account for complex interactions and tradeoffs in forest productivity, hydrological function, and wildlife use

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Establish a network of research sites and assess vegetation, wildlife, and hydrology over a 100-year period following forest harvest.

Budget: \$644,573

With the assistance of the MNDNR, we will identify 60 research sites in 3 dominant lowland conifer peatland community types across northern Minnesota: nutrient-rich black spruce forest, nutrient-rich tamarack swamp, and nutrient-poor, black spruce swamps and bogs. We will assess vegetation composition and structure, stand dynamics, hydrology, and wildlife abundance and diversity across 5 age classes following forest harvesting. At



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each site, overstory, regeneration, and ground cover will be measured and tree cores will be taken to quantify forest productivity and stand dynamics. Site hydrology will be assessed by continuously measuring water table fluctuations in groundwater monitoring wells, measuring precipitation inputs, and evaluating soil water dynamics on collected peat cores. We will use a variety of monitoring techniques such as point counts, camera traps, and track surveys to quantify bird and mammal abundance and diversity at the research sites.

Outcome	Completion Date
1. Identify 60 sample sites in 3 lowland conifer community types across 5 age classes	December 2017
2. Detailed sampling of vegetation community (overstory, understory, and tree cores) 5 plots x 60 sites = 300 vegetation plots 3 trees x 300 veg plot = 900 tree cores	September 2020
3. Quantify bird and mammal abundance, diversity, and habitat use at sample sites. 30 birds GPS'd; 60 of camera traps deployed; 60 surveys of birds and mammals	September 2020
4. Measure hydrology continuous at 36 sites with additional periodic measurements at 24 sites.	September 2020

Activity 2: Compilation of data and development of forest management strategies

Budget: \$119,129

General models will be developed to quantify forest succession in each lowland conifer community type, which will then be related to overall changes in productivity, hydrology, and wildlife habitat and use that occur over time following forest harvesting. Management strategies will be collaboratively developed with land managers to meet multiple ecosystem objectives. Results will be distributed in multiple formats including peer-reviewed literature, conferences, online formats, and through Sustainable Forestry Education Cooperative (SFEC).

Outcome	Completion Date
1. Compilation of data that will be stored and freely available for future use	June 2020
2. Development of forest succession, growth & productivity models in 3 lowland conifer community types.	June 2020
3. Quantify the effects of management and succession on bird and mammal abundance, diversity, and habitat use.	June 2020
4. Develop models to evaluate the effects of forest succession on hydrology.	June 2020
5. Create and publish forest management strategies for lowland conifer ecosystems aimed at habitat and wildlife managers across the state.	June 2021

III. PROJECT STRATEGY

A. Project Team/Partners

The project team includes Dr. Marcella Windmuller-Campione from the University of Minnesota Twin Cities, Dr. Alexis Grinde from the University of Minnesota Duluth, and Dr. Rob Slesak from the MN Forest Resources Council. The project team represents expertise in each area: forest dynamics (Windmuller-Campione), hydrology (Slesak), and wildlife (Grinde). The project team will work closely with multiple divisions within the MN DNR including the Division of Forestry, Ecological and Water Resources, and Wildlife and Fisheries.

B. Project Impact and Long-Term Strategy

The project will provide the data to assess if current forest management practices are maintaining multiple ecological functions. Adaptive management recommendations for long term sustainability will be developed through a collaborative process that accounts for the complex interactions between plant community dynamics, hydrological function, and wildlife use.

C. Timeline Requirements

Three full field seasons are required with an additional year of data analysis for a total of four years.

2017 Detailed Project Budget

Project Title: Lowland conifer ecosystems: holistic assessment for adaptive management

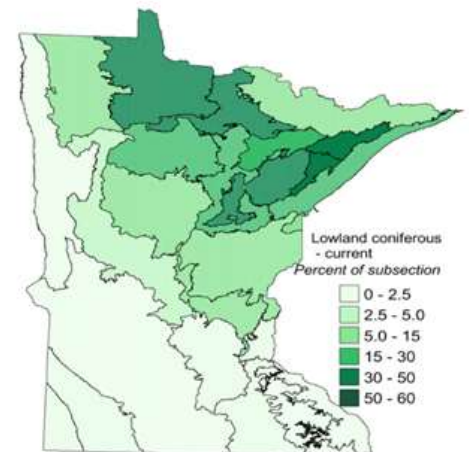
IV. TOTAL ENRTF REQUEST BUDGET 4 years

BUDGET ITEM	AMOUNT
Personnel:	
Dr. Marcella Windmuller-Campione, University of Minnesota (66.3% salary, 33.7% benefits); 12% FTE each year for 3 years summer salary	\$ 52,374
Dr. Alexis Grinde, UMN Duluth/Natural Resource Research Institute. (66.3% salary, 33.7% benefits); 27.0% FTE each year for 3 years summer salary	\$ 60,801
UMN 3 graduate research assistants to collect, analyze, and evaluate data for vegetation, wildlife, and hydrology assessments (1 each). Salary and fringe (0.82) for 3 years each (0.5 FTE)	\$ 386,437
UMN Research associate coordinating collection of vegetation, wildlife, and hydrology data from lowland conifer forests; Salary and fringe (0.3040) for 3 years (0.75 FTE)	\$ 114,251
3 UMN undergraduate work study students to assist with summer data collection and processing. Salary and fringe (0.074) for 3 years.	\$ 59,439
Equipment/Tools/Supplies:	
Pressure transducers for continuous water table monitoring - 2 at each of 36 sites (72 @ \$350.00 each)	\$ 25,200
Tipping bucket rain gauges to continuously measure precipitation at 36 sites (36 @ \$450.00 each)	\$ 16,200
30 Trail cameras (\$150.00 each) for longer-term monitoring of wildlife habitat use at field sites.	\$ 4,500
Transmitters and telemetry equipment to assess breeding season habitat use for focal species.	\$ 15,000
Forest inventory equipment (increment borers 4 @ \$250.00 each, laser hypsometer 2 @ \$1,500 each, calipers 4 @ \$125 each)	\$ 4,500
Travel: Travel for mileage (75%) and lodging (25%) within Minnesota for researchers, the Research Associate, and Graduate Students to the project sites. A large amount of travel will be required because sites will be located across northern Minnesota and will be visited multiple times throughout the year for vegetation, wildlife, and hydrology assessments. Travel reimbursement will follow University of Minnesota protocols	\$ 25,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 763,702

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ To Be Applied To Project During Project Period:	N/A	N/A
Other State \$ To Be Applied To Project During Project Period:	N/A	N/A
In-kind Services To Be Applied To Project During Project Period: (Total amount \$483,874)		
In-kind salary and fringe for Dr. R. Slesak over course of project (0.05 FTE annually for 4	\$ 24,000	Secured
In-kind salary and fringe for DNR personnel contributing to the project (site selection, plant identification, survey assistance, etc. (Approximately 460 hours total)	\$ 27,520	Secured
In-kind assistance with periodic lodging at Div. Wildlife field station (assume 10 nights per year for 6 people = 180 user nights over 3 years * ~\$100 per room hotel cost)	\$ 18,000	Secured
In-kind assistance with site access and transport (truck and trailer for Argo transport, assume 15 days per year for 3 years @ 2000 miles on truck at \$1.09 per mile and \$300 total for use of trailer for 15 days per year for 3 years.	\$ 2,480	Secured
Unrecovered indirect costs @ 53% (2017), 54% (2018, 2019) of total direct cost \$768,202	\$ 411,874	Secured
Funding History:	N/A	N/A
Remaining \$ From Current ENRTF Appropriation:	N/A	N/A

Lowland conifer ecosystems: holistic assessment for adaptive management



Source: MN GAP 1993



Provide:

- Wildlife Habitat
- Forest Products
- Hydrological Function
- Carbon storage

- 1) How do lowland conifers communities develop and persist over time?
- 2) How does forest management influences overall community dynamics (wildlife, plant communities, and hydrology)?



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Project Manager Qualifications and Organization Description

Project Manager: Marcella A. Windmuller-Campione

Assistant Professor, Dept. of Forest Resources, University of Minnesota, St. Paul, MN 55108.

Professional Appointments and Preparation

- Assistant Professor, Forest Resources, University of Minnesota, 2015 – present
- Ph.D., Ecology, Utah State University, 2015
- M.S. Forestry, Michigan Technological University, 2011
- B.S. Forestry minor in Ecology, *magna cum laude*, Michigan Technological University, 2009

Areas of Expertise

Silviculture, adaptive management, forest ecology, plant community dynamics forest regeneration and dynamics, invasive species dynamics. My research spans numerous forest ecosystems in North America and explores how both traditional and alternative silvicultural approaches can be used to increase forest resistance and resilience to current and future threats. Below are a few selected publications.

- Windmuller-Campione, M.A. & Long, J.N. (2015). If Long-Term Resistance to a Spruce Beetle Epidemic is Futile, Can Silvicultural Treatments Increase Resilience in Spruce-Fir Forests in the Central Rocky Mountains? *Forests*, 6, 1157-1178
- Campione, M., Nagel, L. & Webster, C. (2012). Herbaceous-Layer Community Dynamics along a Harvest- Intensity Gradient after 50 Years of Consistent Management. *Open Journal of Forestry*, 2, 97-109

Project Management Experience and Responsibilities for this Project

As a new faculty member at the U of MN, I (Marcella Windmuller-Campione) have a background in using a holistic approach to solving complex forest management approach. I was part of an interdisciplinary team in Utah, exploring how forest managers could increase resistance and resilience of western ecosystems to an uncertain future. My work in Minnesota uses these same approaches to explore adaptive and alternative management strategies for forest communities in Minnesota. I am the Co-Director of the first module for the National Advanced Silvicultural Program (NASP) a two week, graduate level course for federal employees to become certified silviculturists. For this project, I will provide scientific leadership and serve as lead contact for this collaborative project. I will oversee and participate in all parts of this project to ensure the successful development of the expected outputs.

Organization Description

For over 100 years, the Department of Forest Resource at the University of Minnesota has been the leader in producing high quality research regarding natural resource management issues across the state of Minnesota.