

**Environment and Natural Resources Trust Fund  
2020 Request for Proposals (RFP)**

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**Project Title:**

**ENRTF ID: 003-A**

Win-Win Forestry: Maximizing Economic and Ecological Benefits

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**Category:** A. Foundational Natural Resource Data and Information

**Sub-Category:**

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**Total Project Budget: \$** 532,733

**Proposed Project Time Period for the Funding Requested:** June 30, 2026+ (6+ yrs)

**Summary:**

Experimental research sites will be established to study forest management strategies that maximize ecological and economic benefits between forest products, tree growth, water quality, soil health, and wildlife habitat.

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**Name:** Alexis Grinde

**Sponsoring Organization:** U of MN - Duluth

**Job Title:** Dr.

**Department:** Natural Resources Research Institute-Duluth

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Duluth MN 55811

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**Web Address**

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**Location:**

**Region:** Statewide

**County Name:** Statewide

**City / Township:**

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**Alternate Text for Visual:**

A graph depicting ecological and economic benefits in relation to harvest intensity is shown with the area of optimization emphasized. Text summarizes the main activities and project outcome along with pictures of the two focal forest types, timber, seedling, soil, water, and a bird to show the ecological attributes that will be studied.

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



**PROJECT TITLE: Win-Win Forestry: Maximizing Economic and Ecological Benefits**

**I. PROJECT STATEMENT**

There is an urgent need for the development of **science-based forest management** strategies that address the impact of **changing forest** conditions on multiple objectives including **water quality, soil health, wildlife habitat, wood fiber production, and biodiversity** conservation. We will implement a **large-scale, replicated, forest management experiment** in multiple cover types across the state to understand how to **maximize the ecological and economic benefits** of forestry.

Sustaining Minnesota’s forests requires comprehensive management strategies that incorporate multiple ecosystem services such as biodiversity, forest products, and clean water supply to maximize benefits to the public. However, most research has focused on these aspects separately, hindering **simultaneous optimization** of all **ecosystem services**. Direct and indirect effects of changing forest conditions (e.g., climate change, invasive species, etc.) are impacting forests ecosystems at unprecedented rates, and traditional management approaches may no longer be viable to maintain the suite of benefits that these complex forests provide. There is a large knowledge gap related to assessing the trade-offs of different forest harvesting treatments on multiple ecosystem services. This project will holistically assess **a suite of forestry practices** to increase our understanding of how to **maximize the ecological and economic benefits** of forestry through the establishment of a network of **long-term research sites** in Minnesota.

Specific objectives of the project are to:

- Quantify the effects of alternative harvest treatments on forest products, stand development and growth, hydrology and water quality, soil health, and wildlife habitat.
- Provide foundational data to aid in the development of science-based forest management strategies to maintain the resilience of Minnesota’s forests into the future.

**II. PROJECT ACTIVITIES AND OUTCOMES**

**Activity 1 Title: Establish a network of long-term experimental research sites to assess impacts of alternative forest harvest treatments on ecosystem functions.**

**Description:** We will work with our land management partners (e.g., MNDNR, counties, and private land owners- see below) to establish large scale, replicated experimental forest plots in two of the most common forest ecosystems in Minnesota: aspen hardwoods and pine (red, white, and jack pine) forests. Each study area will test and replicate three harvesting practices at the stand scale (25-35 acres): intensive management, business as usual (following MFRC Forest Management Guidelines), and multi-age structurally complex management.

**ENRTF BUDGET: \$ 140,900**

<b>Outcome</b>	<b>Completion Date</b>
<i>1. Eight study areas identified (four in aspen and four in pine forests) in cooperation with study partners. Each study area will have three harvest treatments (intensive, business as usual, and multi-age management), each treatment will be implemented on 25-35 acre stands, thus each study area will be ~75- 105 acres.</i>	<i>April 2021</i>
<i>2. Implementation of treatments at the study areas.</i>	<i>April 2022</i>
<i>3. Quantify differences in economic benefits between the three harvest treatments.</i>	<i>April 2022</i>

**Activity 2 Title: Acquire baseline data to quantify the effects of alternative forest harvest treatments on stand development and growth, hydrology and water quality, soil health, and wildlife.**

**Description:** In each of the forest types and treatments we will assess a holistic suit of ecosystem attributes to quantify the trade-offs of the different treatments for different ecosystem services. To assess **stand development and growth** we will use standard vegetation inventory techniques to quantify stand structure



**Environment and Natural Resources Trust Fund (ENRTF)  
2020 Main Proposal Template**

and composition. This would include a holistic assessment of all the layers of vegetation and structural attributes (down dead wood, snags, etc.) to assess the effects of management on forest plant biodiversity, forest development, and forest growth and yield. **Hydrology and water quality** will be assessed by measuring water table fluctuations and soil water dynamics at each of the experimental plots. We will also measure soil water nutrient loss at a subset of the sites. Net effects on water quantity and quality will be estimated at each site and scaled to the watershed level. **Soil health will be assessed** via comparison of pretreatment and post treatment soil properties including density, water holding capacity, and soil carbon and nutrient pools. We will establish long-term biodiversity monitoring plots to **monitor wildlife** in the experimental study areas. We will use a variety of methodology (i.e. bioacoustic recorders, camera traps, mist netting, and point counts) to assess wildlife communities. Plots will be monitored seasonally to provide a comprehensive assessment of management impacts on wildlife.

**ENRTF BUDGET: \$ 307,733**

<b>Outcome</b>	<b>Completion Date</b>
<i>1. Assessment of “before harvest” surveys of ecosystem functions (1 year).</i>	<i>Dec. 2021</i>
<i>2. Assessment of “after harvest” surveys of ecosystem functions (4 years).</i>	<i>Oct. 2025</i>

**Activity 3 Title: Use baseline data to identify and assess short-term trade-offs in ecosystem services for harvest treatments.**

We will utilize findings from Activity 2 to evaluate trade-offs between different harvest treatments in the focal cover types and use these data to develop predictive forest models for optimization of economic and ecological benefits across a range of forest management objectives. We will work with project partners to develop management strategies for addressing ecosystem service management across ownerships.

**ENRTF BUDGET: \$ 84,100**

<b>Outcome</b>	<b>Completion Date</b>
<i>1. Baseline data assessed and short-term tradeoffs quantified.</i>	<i>Dec. 2025</i>
<i>2. Longer-term forecasts of response completed and predicted optimal management identified.</i>	<i>June 2026</i>
<i>3. Statewide forest management strategies for addressing multiple ecosystem services.</i>	<i>June 2026</i>

**III. PROJECT PARTNERS AND COLLABORATORS:**

The project team includes Dr. Alexis Grinde and John DuPlissis from the Natural Resources Research Institute, Dr. Rob Slesak (Co-PI) from the MN Forest Resources Council, and Dr. Marcella Windmuller-Campione (Co-PI) from UMN. The project team will work closely with the Divisions of Forestry, Ecological and Water Resources, and Fish and Wildlife in MN DNR, the MN Association of County Land Commissioners, and the Superior and Chippewa National Forests to identify project sites and implement forest management treatments.

**IV. LONG-TERM IMPLEMENTATION AND FUNDING:**

This project will result in a final product that increases understanding of the near-term impacts and trade-offs of the three harvest treatments and develop much needed multiple-use management strategies for public and private forestlands. Strategies to maximize ecosystem benefits through forest management will be developed through a collaborative process that accounts for the complex interactions between vegetation dynamics, hydrological function, and wildlife use within the context of working forested landscapes that provide multiple economic and ecological benefits. We plan to continue long-term (6-12 years post-harvest) monitoring of the sites and will pursue additional funding to support the work. Findings from the project will be summarized and we will engage directly with practitioners and policy makers in natural resource management to communicate key messages, assessment tools, and broad recommendations.

**Attachment A: Project Budget Spreadsheet**  
**Environment and Natural Resources Trust Fund**  
**M.L. 2020 Budget Spreadsheet**



**Legal Citation:**

**Project Manager:** Alexis Grinde

**Project Title:** Win-Win Forestry: Maximizing Economic and Ecological Benefits

**Organization:** Natural Resources Research Institute, University of Minnesota Duluth

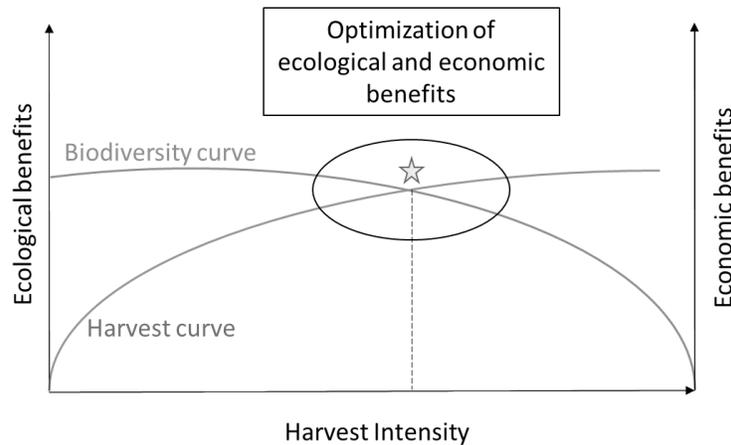
**Project Budget:** \$532,733

**Project Length and Completion Date:** 6 years; June 30, 2026

**Today's Date:** April 8, 2019

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET		Budget	Amount Spent	Balance
<b>BUDGET ITEM</b>				
<b>Personnel (Wages and Benefits)</b>		\$ 468,233	\$ -	\$ 468,233
A. Grinde, research program manager at Natural Resources Research Institute: \$38,148 (74% salary, 26% benefits), 5% FTE.				\$ -
M. Windmuller-Campione, Co-PI: \$39,841 (74% salary, 26% benefits), 5% FTE AY.				\$ -
John DuPlisiss, project partner: \$17,165 (74% salary, 26% benefits), 2% FTE.				\$ -
Two PhD graduate research assistants (forestry and water): \$ 240,108 (86% salary, 14% fringe) and tuition reimbursement in AY; 50% FTE AY and 100% FTE SUM for 3 years.			\$ -	\$ -
Research Scientist at Natural Resources Research Institute: \$66,981 (77% salary, 23% benefits), 15% FTE for 6 years .				\$ -
Three research assistants: \$65,990 (92% salary, 8% fringe), 20% FTE each for 3 years			\$ -	\$ -
<b>Equipment/Tools/Supplies</b>				
Forest inventory equipment (Activity 2): increment borers 2 @ \$250.00 each, laser hypsometer 1 @ \$1,500 each, calipers 2 @ \$125 each (Total estimated amount \$2,250)		\$ 2,250	\$ -	\$ 2,250
Wildlife monitoring equipment (Acitivity 2): 8 replacement bioacoustic recorders @ \$800.00 each (16 were purchased from previous LCCMR projects), 12 camera traps (12 @ \$150.00 each), mist netting and banding supplies (\$12,000), and batteries and misc field supplies (\$600.00).		\$ 20,800	\$ -	\$ 20,800
Water and hydrology monitoring equipment (Activity 2): Pressure transducers for continuous water table monitoring (6 @ \$375.00 each), tipping bucket rain gauges to continuously measure precipitation at sites (24 @ \$450.00 each), and soil moisture sensors (24 @ \$225 each).		\$ 18,450	\$ -	\$ 18,450
<b>Travel expenses in Minnesota</b>				
Travel to the 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		\$ 23,000	\$ -	\$ 23,000
<b>Other</b>				
		\$ -	\$ -	\$ -
<b>COLUMN TOTAL</b>		\$ 532,733	\$ -	\$ 532,733
<b>SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT</b>				
	<b>Status (secured or pending)</b>	<b>Budget</b>	<b>Spent</b>	<b>Balance</b>
<b>Non-State:</b>				
<b>In kind:</b> Rob Slesak (Co-PI), Minnesota Forest Resources Council. (Salary + fringe) 10% FTE: \$40,000.		\$ 40,000	\$ -	\$ 40,000
<b>In kind:</b> Indirect costs waived (54% of Total Direct Costs)		\$ 235,869	\$ -	\$ 235,869
<b>Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS</b>		<b>Budget</b>	<b>Spent</b>	<b>Balance</b>
Conserving Minnesota's Forest Birds of Management Concern (2019-2022)		466,136	33,864	466,136

# Win-Win Forestry: Maximizing Economic and Ecological Benefits



*Hypothesized optimization curve for maximizing ecological and economic benefits of forestry*

**Activity 1: Establish a network of long-term experimental research sites to assess impacts of alternative forest harvest treatments on ecosystem functions.**



**Activity 2: Quantify the effects of alternative harvest treatments on forest products, stand development and growth, hydrology and water quality, soil health, and wildlife habitat.**



**Provide foundational data to aid in the development of science-based forest management strategies to maintain the resilience of Minnesota's forests into the future.**

## **2020 LCCMR Project Manager Qualifications and Organization Description**

**Dr. Alexis Grinde, Natural Resources Research Institute, University of Minnesota Duluth**

### **Key Qualifications**

Dr. Grinde is a Wildlife Ecologist and Research Lab Manager at the Natural Resources Research Institute, University of Minnesota Duluth. She has over 15 years of research experience focusing on conservation ecology.

### **EDUCATION**

**Ph.D. Integrated Biological Sciences.** University of Minnesota, Duluth. **Thesis:** Spatio-temporal Ecology of Forest Birds. **Adviser:** Dr. Gerald Niemi.

**M.S. Biology.** University of North Dakota. **Thesis:** Ecological effects of wild pigs in California's oak woodlands. **Adviser:** Dr. Rick Swietzer.

**B.S. Biology.** Bemidji State University. **Thesis:** The Effects of Rainfall on Number of Nest Initiation Attempts by Nene in Hawaii Volcanoes National Park. **Adviser:** Dr. Elizabeth Rave.

### **RELEVANT RESEARCH EXPERIENCE**

**Research Program Manager and Wildlife Ecologist.** Natural Resources Research Institute, University of Minnesota Duluth. Dr. Grinde manages five full-time research scientists and multiple research projects and contracts focusing on the development of management strategies for habitats and wildlife. Her research focuses on conservation ecology including studying the large-scale impacts of environmental change on wildlife, biodiversity, and ecosystem functions. Applications of her research include informing forest management decisions in relation to changing land use patterns and providing recommendations for conservation plans for species of conservation concern.

**The Natural Resources Research Institute is a part of the University of Minnesota Duluth. NRRI's mission is to promote private sector employment based on natural resources in an environmentally sensitive manner.**