

**Environment and Natural Resources Trust Fund  
2019 Request for Proposals (RFP)**

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**Project Title:**

**ENRTF ID: 095-B**

Maintaining Supply of Clean Water from Working Forests

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**Category:** B. Water Resources

**Sub-Category:**

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**Total Project Budget: \$** 288,000

**Proposed Project Time Period for the Funding Requested:** June 30, 2022 (3 yrs)

**Summary:**

Concentrated forest disturbance can degrade water quality but thresholds are unknown. We will identify configurations of disturbance where water quality is degraded, and identify watersheds where potential impacts are greatest.

**Name:** Robert Slesak

**Sponsoring Organization:** U of MN

**Title:** \_\_\_\_\_

**Department:** Department Forest Resources

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St. Paul MN 55108

**Telephone Number:** (651) 603-6756

**Email** raslesak@umn.edu

**Web Address** https://www.forestry.umn.edu/

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**Location**

**Region:** Central, Northwest, Northeast

**County Name:** Aitkin, Becker, Beltrami, Carlton, Cass, Clearwater, Cook, Crow Wing, Hubbard, Itasca, Koochiching, Lake, Lake of the Woods, Mille Lacs, St. Louis

**City / Township:**

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**Alternate Text for Visual:**

Visual shows distribution of water monitoring data and forest disturbance products which will be combined to identify disturbance configurations where water is degraded. Figure at bottom is a conceptual response.

<input type="checkbox"/>	Funding Priorities	<input type="checkbox"/>	Multiple Benefits	<input type="checkbox"/>	Outcomes	<input type="checkbox"/>	Knowledge Base
<input type="checkbox"/>	Extent of Impact	<input type="checkbox"/>	Innovation	<input type="checkbox"/>	Scientific/Tech Basis	<input type="checkbox"/>	Urgency
<input type="checkbox"/>	Capacity Readiness	<input type="checkbox"/>	Leverage	<input type="checkbox"/>		TOTAL	<input type="checkbox"/> %
<input type="checkbox"/> If under \$200,000, waive presentation?							



**PROJECT TITLE: Maintaining supply of clean water from working forests**

**I. PROJECT STATEMENT**

One of the most important benefits provided from forests is the production and supply of clean water. About two-thirds of drinking water in the United States comes from forest lands, and Minnesota is no exception with nearly one-third of the state’s total land area forested which serves as a primary source of clean water. Maintenance of water quality in managed forested landscapes is essential to the sustainability of forest-based economies and public health. **Land use and forest disturbance (arising from forest harvesting and natural causes such as fires and wind) are the primary factors placing water quality at risk in forested watersheds because they control the amount of runoff to streams and lakes.** Change in the relative distribution of land use and disturbance threatens the supply of clean water from forested landscapes, and watershed assessments (e.g., MN PCAs Watershed Restoration and Protection Strategy (WRAPS)) and regional planning efforts (e.g., MN DNRs planning, MFRC Regional Landscape plans, etc.) are attempting to incorporate disturbance estimates in their analyses. **Although there is recognition of the potential influence of disturbance patterns on streamflow and water quality, actual threshold configurations where significant impacts occur, and the scale where they may be most pronounced (e.g., small catchment vs. major watershed), are unclear and poorly understood.** Because of this, there is broad support among state agencies and the forestry community to identify and refine thresholds to simultaneously maintain clean water and continued timber supply.

Managing Minnesota’s forests in a responsible manner will ensure the continued supply of clean water into the future. **There is great need for information related to forest disturbance/ land use configurations and water to identify at-risk watersheds and develop proactive strategies to maintain clean water.** We will address this information need using a multi-temporal forest disturbance algorithm and historical streamflow data to empirically determine relationships between landuse/disturbance and streamflow. Our objectives are to 1) identify configurations of forest disturbance where impacts to water occur, 2) determine the watershed scale where impacts are greatest, and 3) conduct an assessment to determine watersheds at greatest risk of impact.

**II. PROJECT ACTIVITIES AND OUTCOMES**

**Activity 1:** Update forest disturbance maps and metrics

**ENRTF BUDGET: \$ 42,000**

We will utilize Landsat imagery to update a spatial dataset that characterizes forest disturbance in Minnesota from 1972-2015. The four additional years of data that will be added to this dataset are incredibly important for this project because much of the stream flow data we will use has only recently been collected. Imagery will be acquired and processed to remove geometric errors and account for atmospheric effects (e.g., clouds). Images will be incorporated into the existing time series analysis using the Landtendr change detection algorithm and disturbance metrics recalculated (e.g., time since disturbance, total amount of disturbed area).

<b>Outcome</b>	<b>Completion Date</b>
1. Suitable Landsat imagery identified, downloaded, and preprocessed	Aug. 2019
2. Forest disturbance and land use metrics updated	Dec. 2019

**Activity 2:** Determine relationships between forest disturbance and surface water

**ENRTF BUDGET: \$ 181,000**

The updated disturbance dataset developed in Activity 1 will combined with other spatial datasets related to land use, topography, and water features (e.g., National Wetland Inventory), among others. We will acquire all stream gauge data available in Minnesota since 1972 (the start year of the disturbance dataset), and compile it into a uniform format for analysis. We will use a suite of spatial and time-series statistical



**Environment and Natural Resources Trust Fund (ENRTF)  
2019 Main Proposal Template**

techniques to relate disturbance and land use patterns to changes in water quantity as a baseline to water quality. Where available, water quality data will also be used. Analyses will be conducted across the range of watershed scales, based on data availability, to determine how thresholds vary with watershed size and identify the scale where changes in water are most pronounced.

<b>Outcome</b>	<b>Completion Date</b>
1. All datasets acquired and compiled in uniform format	Jan 2020
2. Threshold disturbance/land use configurations with impacts to water identified	Dec 2021

**Activity 3: Watershed risk assessment**

**ENRTF BUDGET: \$ 65,000**

Products from Activities 1 and 2 will be combined with other data, such as landform, soils, and precipitation, to identify forested watersheds approaching disturbance configurations where impacts to water quantity and quality may occur. We will conduct a geospatial analysis that incorporates other factors that may influence threshold configurations and future disturbance rates including forest cover type (to address disturbance associated with invasive species), regional economic factors, and historic disturbance rates. Using the above information, we will determine the existing and future risk for watersheds across Minnesota’s varying landscape over the next decade.

<b>Outcome</b>	<b>Completion Date</b>
1. Disturbance patterns (amount and configuration) quantified for forested watersheds	Dec 2021
2. Geospatial analysis of modifying factors completed	Mar 2022
3. Holistic risk assessment completed for all forested watersheds	Jun 2022

**III. PROJECT PARTNERS:**

**A. Partners receiving ENRTF funding**

<b>Name</b>	<b>Title</b>	<b>Affiliation</b>	<b>Role</b>
Dr. Robert Slesak	Program Manager	MN Forest Resources Council	Project investigator
Dr. Diana Karwan	Assistant Professor	UMN – Forest Resources	Project investigator
Dr. Jody Vogeler	Research Associate	UMN – Forest Resources	Project investigator

**B. Partners NOT receiving ENRTF funding**

<b>Name</b>	<b>Title</b>	<b>Affiliation</b>	<b>Role</b>
Amanda Kueper	Forest Policy Planner	MN DNR	Lead point of contact
Dr. Chuck Regan	Principle Modeler	MN PCA	Lead point of contact

**IV. LONG-TERM- IMPLEMENTATION AND FUNDING:** We will work closely with federal, state, and county agencies to incorporate our findings into statewide watershed assessments (e.g., modeling associated with MNPCA WRAPS) and regional planning efforts (e.g., DNR and USDA Forest Service planning, MFRC Regional Landscape plans). We will also work with the broader forestry community (via R. Slesak’s affiliation with the MN Forest Resources Council) to develop strategies that avoid threshold configurations while also maintaining the supply of fiber for forest industry and the economies dependent on it. We are working to identify a source of funds to support periodic updating of the disturbance dataset for future assessments related to water quality, wildlife management, and timber availability.

**V. TIME LINE REQUIREMENTS:** The project duration is for three years to allow sufficient time to update base information products, perform the analysis, and conduct the watershed risk assessment

## 2019 Proposal Budget Spreadsheet

**Project Title: Maintaining supply of clean water from working forests**

**PIs:** Rob Slesak (MFRC), Diana Karwan (UMN)

### IV. TOTAL ENRTF REQUEST BUDGET 3 years

BUDGET ITEM	AMOUNT
<b>Personnel:</b>	
Dr. Diana Karwan, Assistant Professor, University of Minnesota; 0.083% FTE (plus 0.342% fringe) each year for 3 years to assist with Activities 1-3 and advise graduate research assistant	\$ 42,474
Dr. Jody Vogeler, Research Associate, University of Minnesota; 0.5% FTE (plus 0.342% fringe) for 1 year to conduct disturbance mapping in Activity 1	\$ 41,990
Salary (0.5 FTE) and fringe (0.177) + 19.32/hr tuition for graduate students for 2 years	\$ 90,332
Salary (0.5 FTE) and fringe (0.23) for a postdoctoral researcher each year for 3 years	\$ 104,550
<b>Travel:</b> Travel for mileage (50%) and lodging (50%) within Minnesota for researchers, the Research Associate, and Graduate Student	\$ 6,000
<b>Additional Budget Items:</b> Costs associated with external hard drives for data storage and archiving (\$1500), manuscript page charges (\$1000) and poster printing (\$154) for presentation of findings,	\$ 2,654
<b>TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =</b>	<b>\$ 288,000</b>

### V. OTHER FUNDS *(This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not applicable.)*

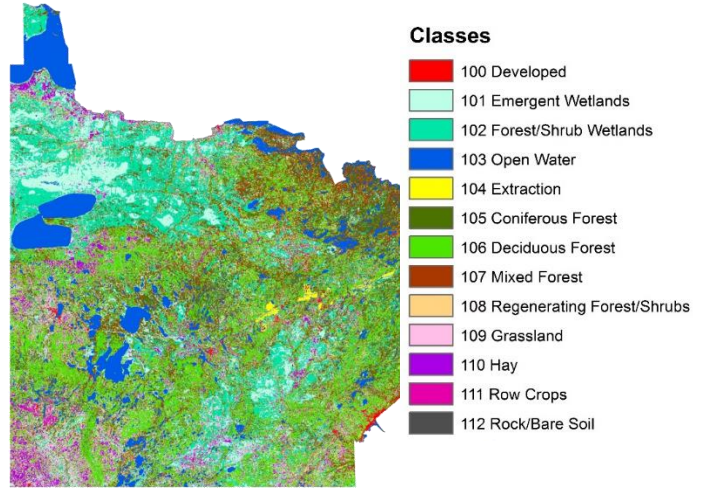
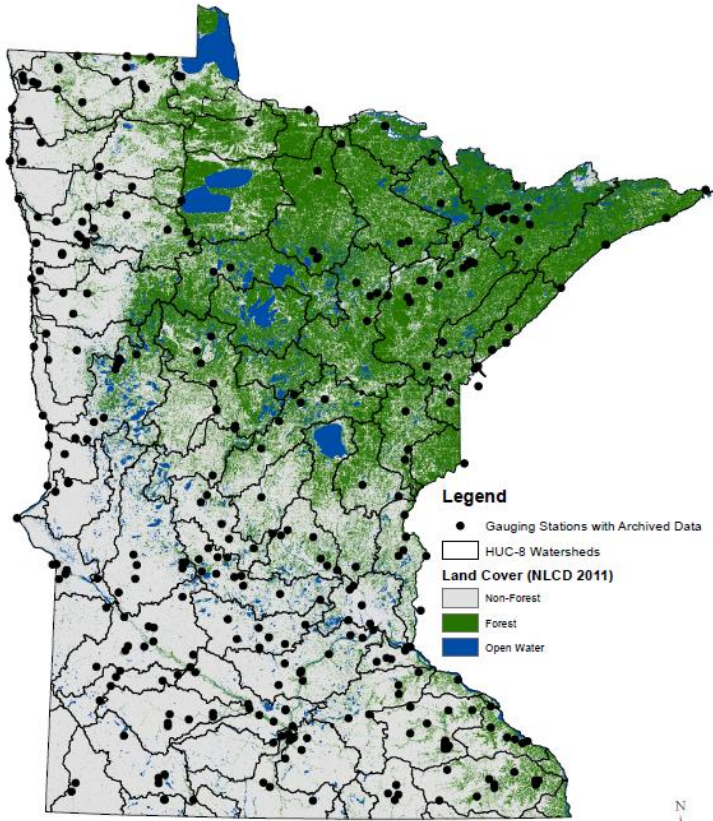
SOURCE OF FUNDS	AMOUNT	Status
<b>Other Non-State \$ To Be Applied To Project During Project Period:</b>	N/A	N/A
<b>Other State \$ To Be Applied To Project During Project Period:</b>	N/A	N/A
<b>In-kind Services To Be Applied To Project During Project Period:</b> in-kind salary from R. Slesak at 0.05 FTE over the course of the project period	\$ 18,500	<i>secured</i>
<b>Past and Current ENRTF Appropriation:</b>	N/A	N/A
<b>Other Funding History:</b> ENRTF: Foundational Dataset Characterizing Historic Forest Disturbance Impacts. "July 2015 - June 2018" M.L. 2015, Chp. 76, Sec. 2, Subd. 03g	\$ 200,000	N/A

**Water monitoring data from Cooperative Stream Gaging**

<https://www.dnr.state.mn.us/waters/csg/index>

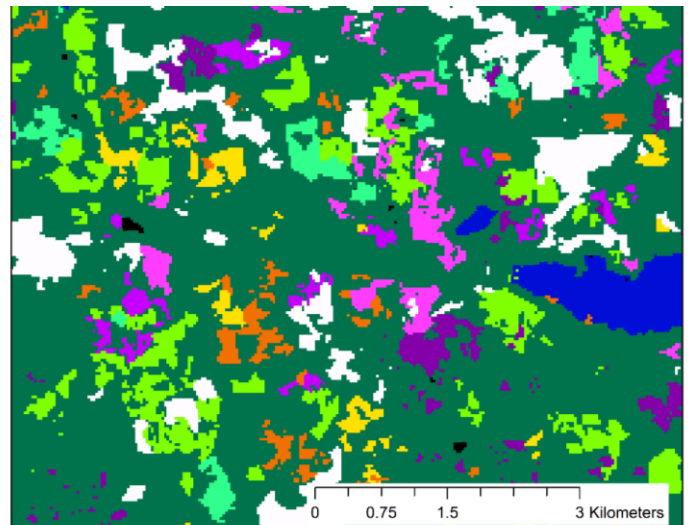
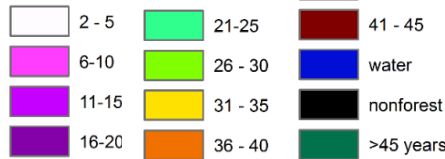


**Land use and forest disturbance data (derived during this project)**

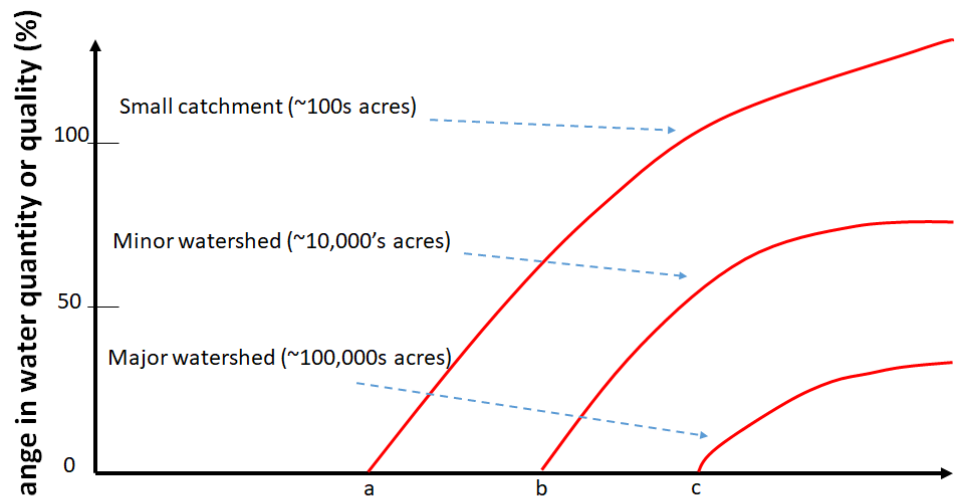


0 12.5 25 50 75 100 Miles

**Years since disturbance**



**Identification of threshold land use and forest disturbance patterns where impacts to water occur** →



**Increasing forest disturbance and land use conversion**

**\*\*a, b, and c are hypothetical thresholds where impacts begin to occur – actual thresholds are currently unknown\*\***

## **Maintaining supply of clean water from working forests**

### **Project manager qualifications**

**Robert A. Slesak**

#### **Qualifications**

Rob is Adjunct Assistant Professor in the Department of Forest Resources, University of Minnesota, and manager of the Site-level Program at the Minnesota Forest Resources Council. He is responsible for evaluation and development of Minnesota's Forest Management Guidelines, assessing their effectiveness with monitoring and research, and conducting research to address existing and emerging threats to sustainable forest management. Rob has extensive experience addressing complex forest resource issues including the identification of information needs for efficient and effective solutions to the challenges of sustainable forest management. He is a principal investigator and project manager on several ongoing projects related to invasive species, soil productivity, and forest sustainability, and has published a number of peer-reviewed journal papers related to these topics. Rob has a Ph.D in Forest Soils from Oregon State University, a M.S. in Forest Ecosystem Science from SUNY Environmental Science and Forestry (ESF), and a B.S. in Forest Resource Management from SUNY ESF. His research and professional interests are broadly focused on sustainable forest management, including identification of processes critical to ecosystem functions, evaluation of the potential for those processes and functions to be altered by management activities, and the application of management practices to restore degraded ecosystem functions.

#### **Organization description**

The Department of Forest Resources is part of the University of Minnesota, which is dedicated to the advancement of learning, sharing of knowledge, and to the application of this knowledge to benefit the people of the state, the nation, and the world

The Minnesota Forest Resources Council was established by the Sustainable Forest Resources Act to promote long-term sustainable management of Minnesota's forests.