**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**

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| **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** |  |

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| **Outcome** | **Completion Date** |
| *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.* | *April 2021* |
| *2. Implementation of treatments at the study areas.* | *April 2022* |
| *3. Quantify differences in economic benefits between the three harvest treatments.* | *April 2022* |

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| **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 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** | |  |
| **Outcome** | **Completion Date** |
| *1. Assessment of “before harvest” surveys of ecosystem functions (1 year).* | *Dec. 2021* |
| *2. Assessment of “after harvest” surveys of ecosystem functions (4 years).* | *Oct. 2025* |

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

**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.