Project Title: **ENRTF ID:**   025-A

Healthy Forests and Healthy Deer Populations in Minnesota

Category: A. Foundational Natural Resource Data and Information

Total Project Budget: $ 195,800

Proposed Project Time Period for the Funding Requested: 2 years, July 2017 – June 2019

Summary:

We seek to determine the economic and ecological impacts of white-tailed deer populations on the health and productivity of Minnesota's forests.

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Sponsoring Organization: U of MN

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Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Assimilating forest inventory data with deer population estimates collected across Minnesota will yield management strategies and research insights for better understanding healthy forests and healthy deer populations.

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

PROJECT TITLE: Healthy forests and healthy deer populations in Minnesota

I. PROJECT STATEMENT

We seek to determine the economic and ecological impacts of white-tailed deer populations on the health and productivity of Minnesota's forests. The US Fish and Wildlife Service estimates that hunters support over 12,000 jobs and generate $417 million in salaries and wages in Minnesota. Within the state's deer herd, problems with abundant populations include an increased rate of deer-motor vehicle collisions, a greater risk for the transmission of vector-borne diseases such as Lyme disease, and concerns about deer herd diseases such as chronic wasting disease and bovine tuberculosis. From an ecological perspective, white tailed-deer have a disproportionately large effect on their surrounding environment. Deer can have an immediate impact on forest health and biodiversity by reducing the abundance of commercially important tree species (e.g., pine, maple, and oak) through preferential browsing, or can influence forests indirectly by altering habitat availability for wildlife and other forest-dependent organisms. Deer can account for up to half of the variability in long-term forest vegetation dynamics, providing the need for addressing complex natural resource management solutions to simultaneously maintain healthy forests and healthy deer herd populations. Although long-term investigations of the impacts of deer on vegetation dynamics have been examined across Lake States forests, **this project is needed** to understand the economic consequences that deer play in shaping healthy and productive forests across Minnesota.

Not surprisingly, management strategies in forests with high white-tailed deer densities cost considerable time and effort if the goal is a diverse and productive forest that yields an economic return. As an example, The Nature Conservancy estimates **two out of every three dollars** used on forest restoration work in northeastern Minnesota is spent on protection from deer browsing. The **overall goal** of this project is to assess the economic and ecological impacts of varying deer densities on the health and productivity of Minnesota's forests. Specific objectives are to (1) link deer population estimates conducted by wildlife agencies with forest inventory information, (2) use deer density as a measure to better understand the growth and development of Minnesota's diverse forest types, and, (3) conduct economic and ecological scenario analyses that evaluate the influence of healthy and abundant deer herds on future forest structure and composition and potential losses in forest productivity. The **outcomes of this project** include understanding the influence of deer on tree growth and survival across Minnesota's forests, an assessment of the interactions between deer harvest levels and forest health for the state's strong deer hunting and conservation legacy, and a clearer link between forestry and wildlife information. We will achieve these goals by forming a team of researchers and professionals to investigate practical management approaches to maintain healthy forests and healthy deer herds.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Analysis of forest inventory and deer density data   Budget: $52,792

We will acquire state wildlife estimates of deer populations and forest inventory information that encompasses the forested regions of Minnesota. Specifically, deer populations (2012-present) collected by the MN Department of Natural Resources will be merged with forest inventory information collected by the USDA Forest Service, Forest Inventory and Analysis Unit (measurements including impacts of deer browse and invasive plant presence). We will consult natural resource professionals (e.g., county land departments and non-profits) to obtain data on forest management costs related to deer and perform a meta-analysis to develop maps of existing exclosure studies that examine the ecological impacts of deer across Minnesota's forests.

Outcome	Completion Date
1. Process and link forest inventory and deer population records	September 2017

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2. Perform analysis and produce map of deer exclosure studies in Minnesota	March 2018

Activity 2: Conduct field experiment to determine deer-forest vegetation dynamics   **Budget: $53,979**

Based on the meta-analysis and identified research gaps, we will install an experiment to investigate forest growth and development using a suite of management techniques including intensive (three exclosures 0.6 acres in size), extensive (e.g., budcapping and seedling protection), and no management of vegetation from deer. The Cloquet Forestry Center is ideal to perform this experiment as densities are likely in excess of 24 deer per square mile, hunting is not permitted on the 2,700 acre property, and the site provides a valuable opportunity for field tours and educational opportunities for natural resource managers.

Outcome	Completion Date
1. Identification of appropriate site locations at Cloquet and elsewhere in MN	January 2018
2. Pre-treatment measurements of sites and installation of fenced exclosures	August 2018

Activity 3: Forecasting future forests and project outreach   **Budget: $89,029**

Currently, no tools exist that identify the economic impacts of deer density to natural resource managers. We will use findings from Activity 1 to assess long-term tree regeneration viability using the compiled data sources. We will create a forest simulation tool that forecasts forests and is sensitive to varying deer densities and forest management strategies. We will implement and refine this tool across broad landscape ownerships (e.g., on county and/or non-profit landholdings). We will share research findings at a workshop for natural resource managers sponsored by the Sustainable Forests Education Cooperative.

Outcome	Completion Date
1. Release of the forest-deer simulation tool	April 2019
2. Workshop for natural resources managers: "Deer in the northern forest"	June 2019

III. PROJECT STRATEGY

A. Project Team/Partners

The University of Minnesota, Department of Forest Resources will receive the funding and form the leadership through the project's completion. This project will be led by Dr. Matthew Russell with collaboration from Dr. Robert Slesak (MN Forest Resources Council), Dr. Christopher Woodall (USDA Forest Service, Northern Research Station), Dr. Meredith Cornett (The Nature Conservancy/UMN), and Mark White, MS (The Nature Conservancy).

B. Project Impact and Long-Term Strategy

Given the fundamental importance of deer and their influence on forests (e.g., tree regeneration, presence of invasive plant species), we expect that natural resource professionals and researchers in forestry and wildlife decision-making processes will broadly utilize this information and associated results. Working across multiple state and federal agencies, this project will combine diverse information sources to make them available to both technical and nontechnical audiences. This effort will form the foundation for the continued development and refinement of future research to support strategic natural resource management planning. Such information is vital in Minnesota to effectively monitor and evaluate the ecological and economic impacts to forest health while maintaining healthy deer populations across the state.

C. Timeline Requirements

Project duration is two years. This amount of time is required to allow scientists to develop the research, implement the experiment, and analyze the project data for its intended use in to address forestry and wildlife management questions.

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2017 Detailed Project Budget

Project Title: Healthy forests and healthy deer populations in Minnesota

IV. TOTAL ENRTF REQUEST BUDGET: 2 years

| BUDGET ITEM	AMOUNT
Personnel:	
Postdoc: Salary and fringe (0.224) for a University of Minnesota researcher for 1 year. Researcher will lead the implementation of the proposed research and conduct economic analyses to inform natural resource managers in Minnesota.	$ 67,320
Graduate Research Assistant: Salary and fringe (0.824) for a University of Minnesota graduate student for two years at 50% time (20 hours/week). Includes tuition for the academic year, health care for the fiscal year, and Social Security and Medicare for summer pay periods. Graduate student will analyze the long-term ecological impacts of deer on forest health in Minnesota.	$ 69,336
Faculty: Summer salary (2 weeks in each year) and fringe (0.337) for Russell for for project leadership	$ 11,333
Undergraduate students: Salary and fringe (0.079) for two interns based at the Cloquet Forestry Center to assist in the implementation of the proposed experiment.	$ 13,811
Contracts: Contract with The Nature Conservancy (Cornett, White, and others as neccesary) for data analysis and testing of developed model on Nature Conservancy lands.	$ 25,000
Equipment/Tools/Supplies: Materials to establish deer exclosure study at the Cloquet Forestry Center. Includes woven wire deer fence for 1.8 acres, fence, posts, and fencing supplies.	$ 4,500
Travel: In-state mileage for project team members to meet regularly with project stakeholders (county land managers, federal and state natural resource managers).	$ 2,500
Additional Budget Items: Workshop administered through the Sustainable Forests Education Cooperative targeted to natural resource professionals across Minnesota showcasing the research results. Workshop expenses include printing of informational materials to participants and facility and bus rentals.	$ 2,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$ 195,800

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:		
Faculty support: Salary from Russell to provide project leadership and analysis ($2,103/year for 2 years)	$ 4,206	Secured
Funding History:		
Grant from University of Minnesota Office of Vice President of Research to PI Russell(2015-2016): "Assessing the impacts of deer on forest health attributes in the eastern US: current and projected trends"	$ 30,000	Secured; to be spent before July 2017
Portion of grant from Joint Powers Agreement between MN Department of Natural Resources and University of Minnesota-Department of Forest Resources (2015-2017): "Determine relationships between deer density and tree regeneration"	$ 10,000	Secured; ; to be spent before July
Remaining $ From Current ENRTF Appropriation:	N/A	N/A

Project title: Healthy forests and healthy deer populations in Minnesota

A browsed pine seedling

2011 Pre - Fawn Deer Density from Deer Population Model
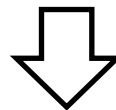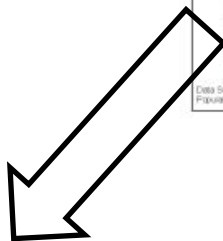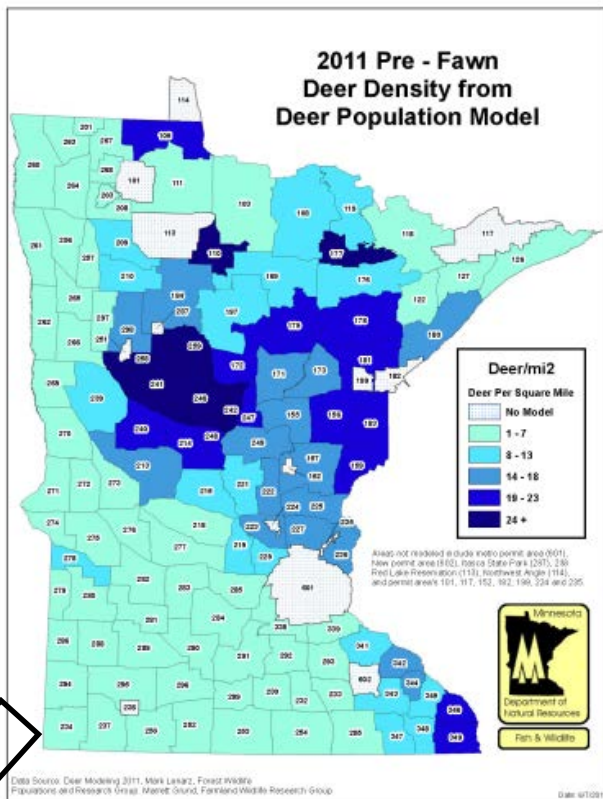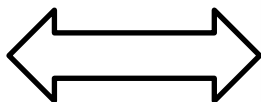
Budcapping: a management tool

Fenced exclosures: a research and management tool

Infographic: Assimilating forest inventory data with deer population estimates collected across Minnesota will yield management strategies and research insights for better understanding healthy forests and healthy deer populations.

06/07/2016 ENRTF ID: 026-A

PROJECT MANAGER QUALIFICATIONS AND ORGANIZATION DESCRIPTION

Project Manager:	Matthew B. Russell
Affiliation:	Department of Forest Resources, College of Food, Agricultural and Natural Resource Sciences, University of Minnesota
Title:	Assistant Professor/Extension Specialist

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Qualifications: Matthew Russell has a Ph.D. in forest resources from the University of Maine, an M.S. in forestry from Virginia Tech, and a B.S. in forestry from Paul Smith's College. He specializes in forest ecosystem health and is the team lead for the Forest Ecosystem Health program in the University of Minnesota's Extension Center for Agriculture, Food and Natural Resources. His research and Extension interests focus on managing natural resources in the face of environmental changes. From 2008-2012, he was Forest Data Manager for the US Forest Service Penobscot Experimental Forest, a long-term experiment focused on evaluating the ecological and environmental impacts of varying forest management techniques. From 2008-2009 he was Forest Data Manager for the Cooperative Forestry Research Unit, a forest industry-university research cooperative established at the University of Maine. He is an active member of the Society of American Foresters and Forest Products Society.

Organization: The mission of the Department of Forest Resources located at the University of Minnesota is to advance the science and management of forests and related natural resources, develop future leaders in forest and natural resource management through undergraduate and graduate education, and to serve citizens through outreach.