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

Project Title: **ENRTF ID: 021-A**

Including Wildlife Benefits in Forest Planning Models

Category: A. Foundational Natural Resource Data and Information

Total Project Budget: $ 397,750

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

Summary:

A collaborative team of experts will identify, test and demonstrate ways of integrating important wildlife habitat considerations into forest planning models used to better understand multi-resource trade-offs and opportunities.

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Sponsoring Organization: U of MN

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Web Address

Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Spatial solutions of wildlife habitat and trade-off concepts over a wide range of possibilities

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

PROJECT TITLE: Including Wildlife Benefits in Forest Planning Models

I. PROJECT STATEMENT

The overall objective of this project is to help forest management organizations in Minnesota better understand, visualize and evaluate tradeoffs between alternative forest management goals at the landscape level. This project will incorporate wildlife habitat metrics into existing forest planning models, then apply the improved models to quantify tradeoffs between wildlife habitat and timber production. Forest planning models are used to schedule the location and timing of management activities across large landscapes to achieve multiple resource goals. However, these models often do not directly consider forest fragmentation or landscape-scale habitat needs, such as the large patches of mature upland forest needed by northern goshawks or the juxtaposition of mature upland and mature lowland conifer forest needed by boreal owls (both state listed Species of Special Concern). Forest management investment activities are also likely under-valued substantially if not considered in a multi-resource, landscape context.

Forest management plans to balance economic, environmental and recreational goals can be improved substantially by utilizing scientific modeling tools from operations research that systematically search through and coordinate many site-level management combinations, recognizing important spatial and temporal detail for wildlife. Minnesota's forest management organizations have limited staff with operations research skills, which is why this project brings together experts in operations research from the University of Minnesota (UMN), experts in wildlife, ecosystem services and forest management from the Minnesota Department of Natural Resources (DNR), and experienced model users from Minnesota Forest Industries and The Nature Conservancy. This interdisciplinary and collaborative approach will leverage large amount of existing forest inventory and wildlife data in Minnesota to help better integrate multi-resource decision-making.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Identify and incorporate wildlife habitat metrics into forest planning model Budget: $ 150,000

Wildlife habitat objectives are difficult to integrate into forest planning because wildlife habitat metrics often include spatial measures that add complexities to planning models. UMN researchers will work closely with Minnesota DNR wildlife, forest ecology, and forest planning experts to identify forest wildlife habitat metrics to model explicitly. Tests will consider both overall metric adequacy for addressing wildlife habitat conditions and the difficulty each metric adds to a forest planning model. This work will build from our previous success using forest planning models for the Chippewa and Superior National Forests to sustain large patches of old-forest wildlife habitat on the landscape (Figure 1). These patches shift location and size over time, overcoming shortcomings of designating specific areas to a specific conservation objective (Figure 2). Multiple types of forest core area (interior habitat) will be considered as potential metrics, with core area definitions flexible in terms of forest cover type, stand age, buffer protection widths and required buffer conditions. Intent is to keep analyses simple, yet complex enough to recognize temporal and spatial detail important for wildlife habitat. Directly linking multiple models may be a key, using an iterative process to include both site-level detail and landscape-level objectives. Strategies to avoid relatively scarce and fluctuating habitat conditions will be addressed by recognizing that per unit resource values are higher with lower production levels, thus seeking management schedules that provide more diverse and stable forest conditions. This activity will be linked with Activity 2, adjusting wildlife habitat metrics for modeling as more is learned from direct testing.

Outcome	Completion Date
1. Identify wildlife habitat spatial metrics to test	December, 2017
2. Identify modeling system to integrate timber and wildlife objectives	July, 2018
3. Test and re-evaluate habitat metrics and modeling system in concert with Activity 2	December, 2018

Activity 2: Landscape-scale tests to assess multi-resource trade-offs and opportunities Budget: $247,750
UMN researchers will test the modeling system developed in Activity 1 and evaluate tradeoffs between wildlife habitat and timber production goals within one of Minnesota's forested subsections. This landscape-scale test will inform future Section Forest Resource Management Plans at MN DNR, but is not intended to delay or supplant current DNR planning processes. Consideration will be given initially to addressing combinations of simpler non-spatial wildlife habitat objectives that are substantially easier to track and schedule. Spatial facets will require substantial pre-processing of GIS data to identify interdependencies between specific stands. Tests will identify a broad range of efficient forest management possibilities -- a production possibilities frontier (Figure 3) for better understanding trade-offs over a wide range of multi-resource combinations of outcomes.

Tests will address potential to achieve better mixes of timber and wildlife values over time thru increased investments in forest management. From a site-level perspective, reforestation investments can be difficult to justify financially, as costs occur early and most direct financial returns occur many years later. Investments in reforestation have dropped substantially in Minnesota in recent years. With recognition of forest wildlife habitat values, and with a broader landscape context including wildlife habitat restoration, the net value of reforestation investments can be large. More of the forest might be used to achieve wildlife habitat objectives if investments can increase timber productivity. It is important to better understand forest management investment potentials in this multi-resource, system-wide context.

Outcome	Completion Date
1. Selected study area and developed data set for tests	December, 2017
2. Tests of multiple scenarios and associated tradeoff Information for multiple resources	April, 2019
3. Tests of Impacts of management Investments on Multi-Resource Potentials	July, 2019

III. PROJECT STRATEGY

A. Project Team/Partners
Dr. Howard Hoganson, UMN Dept. of Forest Resources (FR) provides multi-resource modeling experience for forest planning. A key will be collaborative work with experts in wildlife, forest ecology, timber management, and forest planning from multiple divisions of the MN DNR, including the divisions of Forestry, Ecological and Water Resources, and Fish and Wildlife. Dr. Alan Ek, UMN FR Dept. Head, will help integrate project with the UMN Interagency Information Cooperative. Dr. Jim Manolis, The Nature Conservancy and Dr. Ben Bagdon, Minnesota Forest Industries, will add modeling insights from forest stakeholder groups. Dr. Curtis VanderSchaaf, LA. Tech University and recent DNR analyst, adds knowledge of current DNR models for forest planning.

B. Project Impact and Long-Term Strategy
This project will help identify trade-offs and opportunities among timber, wildlife, and environmental values over large landscapes. It will utilize computer technologies and collaborative work of natural resource specialists to integrate many detailed site-level management options into landscape level plans to better achieve multi-resource objectives. It will help synthesize an enormous amount of foundational multi-resource information. It will consider long planning horizons, important for sustaining natural resource conditions and understanding broad, multi-resource value of potential forest management investments. Results will be timely, as public land management agencies are challenged in Minnesota to integrate resource objectives wisely.

C. Timeline Requirements
Project will be completed in two years.

2017 Detailed Project Budget

Project Title: Comprehensive Forest Analysis Tools for Interdisciplinary Planning

IV. TOTAL ENRTF REQUEST BUDGET 2.0 years

BUDGET ITEM	AMOUNT
Personnel: PI Hoganson -- U of MN faculty, Department of Forest Resources & North Central Research & Outreach Center (NCROC) in Grand Rapids -- 1.5 months of summary salary/year Includes 33.7% fringe and assumed 2.5% salary increase/yr	$ 52,500
Personnel: Research Scientist/Fellow -- University of Minnesota NCROC. Assists in all activities. Salary is 100% time each year and includes 33.7% fringe and 2.5 % salary incease per year. Position may split time between Grand Rapids and St Paul.	$ 151,750
Personnel: 2 Graduate Research Assistants -- University of Minnesota , Department of Forest Resources. 50% appointment for each for 2 years.	$ 172,000
Contract With Dr. Curtis VanderSchaaf, former forest planning analyst for DNR, will help integrate study with past DNR planning and help provide best available DNR data on growth and yield. VanderSchaff is now located in Louisana. Contract includes 100 hrs @ $100/hr including all fringe.	$ 10,000
Data Processing Needs including use of 4 personal computers and software	$ 6,500
Travel: 6 trips/year between Grand Rapids and St Paul Campus.	$ 5,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$ 397,750

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ To Be Applied To Project During Project Period: Cost-shared effort for Alan Ek at 1% over the life of the grant	$ 4,011	N/A
Other State $ To Be Applied To Project During Project Period: / Cost-shared effort from Minnesota DNR staff (Divisions of Wildlife and Ecosystem Services)	$18,000	Secured
In-kind Services To Be Applied To Project During Project Period: Unrecovered indirect direct costs, calculated at the University's federally negotiated rate of 52% Modified Total Direct Costs	$206,830	Secured
Funding History:	$ -	
Remaining $ From Current ENRTF Appropriation:	$ -	N/A

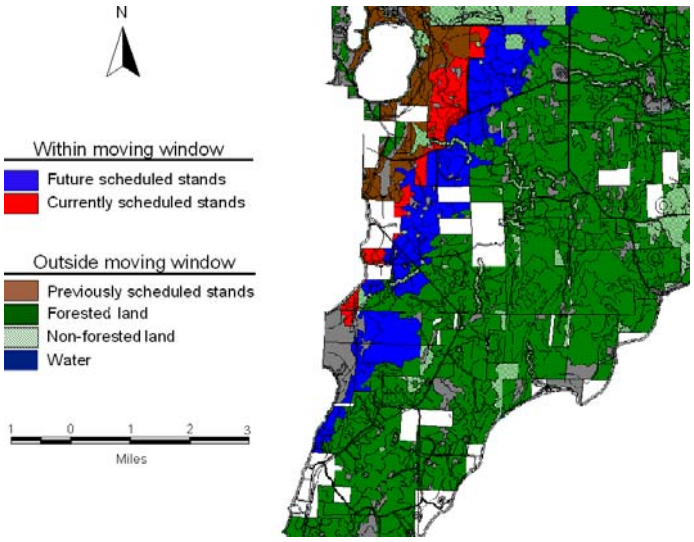


Figure1. Moving windows analysis to focus on spatial arrangement of forest conditions. Management options for each window (red and blue) are examined in spatial detail. Windows move across the landscape (NW to SE) with windows overlapping to overcome boundary effects of window design. Stands shown in blue are in window analysis but are not scheduled until spatial interaction with neighboring areas (green) are addressed in analyses of future windows, as the windows moves across the landscape. Areas in red are scheduled based on the analysis for the window pictured. Process utilizes important detail of existing GIS data and forest inventory information

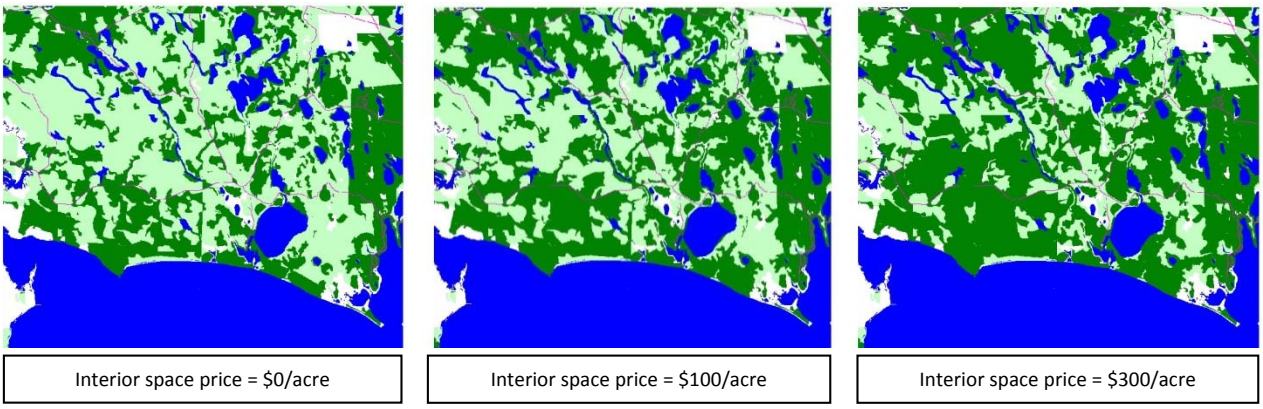
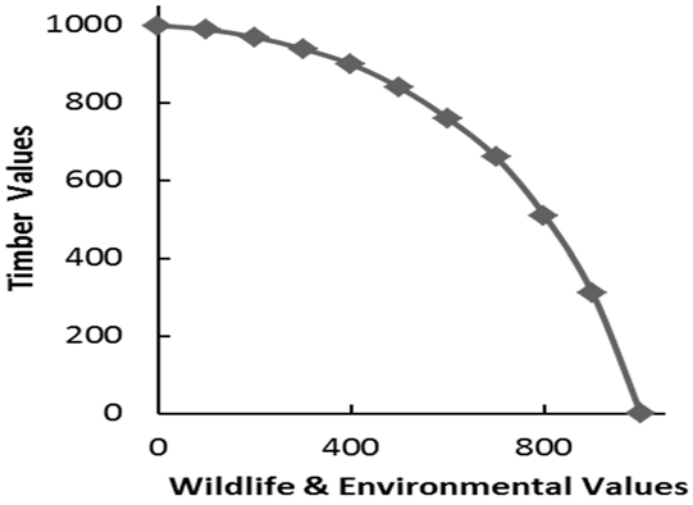


Figure2. Maps of projected future forest conditions in year 50 near the north side of Lake Winnibigoshish in the Chippewa National Forest under three different management alternatives that vary only in the assumed value of older forest interior space (core area). Dark green areas are areas of older forest. With no assumed value for core area of older forest (map on left), area of older forest is less and more fragmented.

Figure3. Understanding trade-offs involving multiple objectives is important. Multiple runs of optimization models can help identify a set of management plans along a production possibilities frontier. Forest plans developed with limited analysis can fall well short (inside) this frontier. With effective and efficient investment in forest management, the frontier can be expanded outward substantially for greater overall possibilities. This interdisciplinary project will help managers better understand forest possibilities over large landscapes.



Project Manager Qualifications/Organization

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Background: He has a B.S. degree in forestry from the University of Minnesota, a M.S. degree in forestry from the University of Washington, a M.S degree in operations research from the University of Minnesota and a Ph.D. in forest management from the University of Minnesota. He joined the U of MN faculty in 1987 after service as a Principal Economist with the USDA Forest Service North Central Research Experiment Station in Duluth, Minnesota and a faculty member in the Forestry Department at Virginia Polytechnic Institute and State University in Blacksburg, Virginia. He has authored numerous papers on forest management planning and served as an Associate Editor for *Forest Science* for five years. Recently he has served as lead analyst in forest harvest scheduling efforts for Interagency Information Center of the University of Minnesota. He has been recognized internationally for developing solution methods for forest management models that take advantage of the specific mathematical structure of forestry problems. These methods have been used in large-scale applications in US, Canada, Sweden, Brazil and Portugal. He is the instructor for forest management & planning courses for the Department of Forest Resources, University of Minnesota. He led the technical timber supply analysis for the Environmental Impact Statement for a proposed $700 million UPM Blandin Mill Expansion in Grand Rapids, MN and served as the lead analyst for the 2004 Forest Plan for the Chippewa and Superior National Forests in Minnesota. His research results served as the basis for scenario modeling for the Minnesota Generic Impact Statement (GEIS) on Timber Harvesting and Forest Management. Since the GEIS, he has often worked closely with the Minnesota Forest Resources Council (MFRC) and Minnesota DNR. He currently serves on the Information Management Committee of the MFRC. Recent research has emphasized spatial facets of forest management with applications to Kirtland's warbler habitat in Michigan on the Hiawatha National Forest. He is committed to linking operational planning and analysis with broad forest-wide objectives involving both environmental and economic objectives.

Responsibilities for the proposed project: Hoganson will oversee all aspects project, emphasizing integration of wildlife benefits and site-level detail with broad landscape objectives. Project will emphasize strong linkage with interdisciplinary team of experts from Minnesota DNR and key forest stakeholder groups concerned about broad forest management strategies. Dr. Ben Bagdon, Minnesota Forest Industries, is a recently trained PhD with strong background in operations research and multi-resource applications. Dr Jim Manolis, The Nature Conservancy, has experience applying operations research tools to wildlife habitat management. Dr. Curtis VanderSchaaf, former lead planning analyst with the Minnesota DNR will help in utilizing best data available. The importance and interdisciplinary nature of the project will help attract top graduate students and a research scientist. Overall emphasis by project team will be on better understanding trade-offs in forest values emphasizing ways of integrating resource values across the landscape.