



# Environment and Natural Resources Trust Fund (ENRTF) M.L. 2011 Work Plan

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**Date of Status Update:****Date of Next Status Update:** 1/1/2012**Date of Work Plan Approval:** 6/23/2011**Project Completion Date:** 6/30/2014**Is this an amendment request?** \_\_\_\_\_

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**Project Title: Evaluation of Biomass Harvesting Impacts on Minnesota's Forests****Project Manager:** Anthony D'Amato**Affiliation:** U of MN**Address:** 1530 N Cleveland Ave**City:** St Paul **State:** MN **Zipcode:** 55108**Telephone Number:** (612) 625-3733**Email Address:** damato@umn.edu**Web Address:** <http://www.forestry.umn.edu/silviclab/index.htm>

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**Location:****Counties Impacted:** Aitkin, Becker, Beltrami, Benton, Carlton, Cass, Clearwater, Cook, Crow Wing, Hubbard, Itasca, Koochiching, Lake, Lake of the Woods, Mahnomon, Marshall, Morrison, Otter Tail, Pennington, Pine, Polk, Red Lake, Roseau, St. Louis, Todd, Wadena**Ecological Section Impacted:** Northern Minnesota and Ontario Peatlands (212M), Northern Minnesota Drift and lake Plains (212N), Northern Superior Uplands (212L), Southern Superior Uplands (212J), Western Superior Uplands (212K)

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<b>Total ENRTF Project Budget:</b>	<b>ENRTF Appropriation \$:</b>	350,000
	<b>Amount Spent \$:</b>	<u>0</u>
	<b>Balance \$:</b>	350,000

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**Legal Citation:** M.L. 2011, First Special Session, Chp. 2, Art.3, Sec. 2, Subd. 03h**Appropriation Language:**

\$175,000 the first year and \$175,000 the second year are from the trust fund to the Board of Regents of the University of Minnesota to assess the impacts biomass harvests for energy have on soil nutrients, native forest vegetation, invasive species spread, and long-term tree productivity within Minnesota's forests. This appropriation is available until June 30, 2014, by which time the project must be completed and final products delivered.

## **I. PROJECT TITLE: Evaluation of biomass harvesting impacts on Minnesota's forests**

### **II. PROJECT SUMMARY:**

Minnesota's forests are currently being viewed as potential feedstocks for the production of renewable energy. A primary concern about harvesting forest biomass to generate renewable energy is the long-term impacts these harvests will have on soil nutrients and long-term ecosystem productivity. In particular, repeated nutrient removals in harvested material may result in soil nutrient depletion with negative cascading effects on important forest benefits by decreasing future forest growth, carbon storage, and reducing wildlife habitat.

This project is designed to increase our understanding of the ecological impacts of biomass harvesting through the establishment of a network of research sites in forests on nutrient poor soils in northern Minnesota. Treatments representing various levels of biomass removal and green-tree retention will be implemented at each site to evaluate the importance of site-level legacies (green trees and harvest residues) in maintaining the resilience and sustainability of these systems under different biomass harvesting regimes. In addition, empirically derived estimates of nutrient removals from these sites will be used to model the long-term effects of repeated biomass removals on ecosystem productivity. This project will establish treatment sites, collect and analyze baseline data, and implement harvest treatments to facilitate long-term monitoring of the ecological impacts of biomass harvesting. Results from this project will (1) provide critical information for informing management recommendations aimed at mitigating impacts of biomass harvesting on nutrient poor soils, and (2) will provide long-term predictions of the effects of this practice on the productivity of forest systems growing on nutrient poor sites.

### **III. PROJECT STATUS UPDATES:**

#### **PROGRESS SUMMARY AS OF 9/8/11:**

##### **Amendment Request (9/8/11)**

Amendment is requested to rebudget funds (\$15,000) from personnel to Professional/Technical Contracts. This amendment is being requested to support the hiring of a consulting forester to locate field research sites on nutrient poor soils for assessing the impacts of biomass harvesting (Activity 1). Hiring this contractor is the most cost-effective and efficient way to locate and establish these sites due to their vast experience working with forest lands on these soil types and evaluating the impacts of biomass harvests.

##### **Amendment Approved:**

**Project Status as of January 2012:**

**Project Status as of September 2012:**

**Project Status as of January 2013:**

**Project Status as of September 2013:**

**Project Status as of January 2014:**

**Project Status as of August 2014:**

### **IV. PROJECT ACTIVITIES AND OUTCOMES:**

#### **ACTIVITY 1: Develop a network of research sites on nutrient poor soils to assess impacts of biomass harvesting on biodiversity and productivity**

**Description:** Currently, little information exists on the potential impacts of biomass harvesting on aspen-dominated systems growing on nutrient poor soils. To address this need, we will establish large-scale manipulations of pine-dominated forests on nutrient poor sites allowing us to assess the ecological impacts of biomass harvesting on these systems, and to evaluate potential management

recommendations for sustaining the ecological functions of these site types within the context of this management regime. In particular, research will be conducted at 4 pine forest sites on nutrient poor outwash sands within northern Minnesota. Each site will be a minimum of 120 acres to accommodate each treatment, as well as buffers between treatment units. Study sites will be located on lands owned by county land departments and Minnesota Department of Natural Resources.

**Summary Budget Information for Activity 1:**

**ENRTF Budget: \$ 127,439**  
**Amount Spent: \$ 0**  
**Balance: \$127,439**

**Activity Completion Date: April 1, 2012**

<b>Outcome</b>	<b>Completion Date</b>	<b>Budget</b>
<i>1. Nutrient poor sites identified through work with MNDNR and counties</i>	October 2011	\$35,560
<i>2. Pre-harvest measurements of forest and soil conditions completed</i>	October 2012	\$81,879
<i>3. Timber sales completed on sites</i>	March 2012	\$10,000

**Activity Status as of January 2012:**

**Activity Status as of September 2012:**

**Activity Status as of January 2013:**

**Activity Status as of September 2013:**

**Activity Status as of January 2014:**

**Activity Status as of August 2014:**

**Final Report Summary:**

**ACTIVITY 2: Determine the impacts of biomass harvesting on regeneration and growth of ecologically important tree species and spread of invasive species**

**Description:** We will measure soil nutrient availability and monitor the survival and growth of planted tree regeneration and invasive plants in treatment areas. Seedlings monitored will consist of a mix of long-lived conifers, allowing us to address questions related to how these harvests affect potential restoration of those species. Results concerning the immediate impacts of biomass harvesting on soils, forest growth, and tree regeneration will be summarized in project reports and conveyed to managers through outreach activities.

**Summary Budget Information for Activity 2:**

**ENRTF Budget: \$ 181,956**  
**Amount Spent: \$ 0**  
**Balance: \$ 181,956**

**Activity Completion Date: June 30, 2014**

<b>Outcome</b>	<b>Completion Date</b>	<b>Budget</b>
<i>1. Post-harvest measurements of soils and vegetation conducted</i>	October 2012	\$100,450
<i>2. Assessment of soil nutrients and forest vegetation for 2 years</i>	October 2013	\$30,506
<i>3. Data synthesis and final report completion</i>	June 2014	\$51,000

**Activity Status as of January 2012:**

**Activity Status as of September 2012:**

**Activity Status as of January 2013:**

**Activity Status as of September 2013:**

**Activity Status as of January 2014:**

**Activity Status as of August 2014:**

**Final Report Summary:**

**ACTIVITY 3: Model long-term sustainability of biomass harvesting on nutrient poor soils**

**Description:** The ecological sustainability of biomass harvesting hinges on nutrient availability and potential nutrient limitations. We will integrate findings from Result 2 into ecological models to simulate multiple levels of biomass harvesting on a range of soil qualities. Results concerning sustainability of alternative biomass harvesting strategies will be summarized in project reports, conveyed to managers through outreach activities, and used to inform future revisions to Minnesota’s forest management guidelines.

**Summary Budget Information for Activity 3:**

**ENRTF Budget: \$ 40,605**  
**Amount Spent: \$ 0**  
**Balance: \$ 40,605**

**Activity Completion Date: June 30, 2014**

<b>Outcome</b>	<b>Completion Date</b>	<b>Budget</b>
<i>1. Characterization of initial ecological impacts of biomass harvesting completed</i>	November 2013	\$8,000
<i>2. Results incorporated into ecological models of long-term impacts</i>	November 2013	\$22,605
<i>3. Project summaries published</i>	June 2014	\$10,000

**Activity Status as of January 2012:**

**Activity Status as of September 2012:**

**Activity Status as of January 2013:**

**Activity Status as of September 2013:**

**Activity Status as of January 2014:**

**Activity Status as of August 2014:**

**Final Report Summary:**

**V. DISSEMINATION:**

**Description:** The final product of this project will be an interpretive report describing (a) the early initial impacts of forest biomass harvesting on the plant communities and nutrient status of forest systems growing on nutrient poor soils in northern Minnesota and (b) predictive models of the long-term impacts

of repeated biomass removals on these sites. This report will be made available on the internet as a Department of Forest Resources Staff Paper Report. In addition, several manuscripts will be written based on this research and submitted for publication in peer-reviewed journals. A fact sheet summarizing principal findings of this project will be distributed to LCCMR members and legislators at the state and federal level. Results will be presented at state and national forest management and forest health conferences, and notably to agency and individual participants in the Sustainable Forests Education Cooperative. All reports and publications from this project will be made available via the Department of Forest Resources web site ([www.forestry.umn.edu](http://www.forestry.umn.edu)).

**Status as of January 2012:**

**Status as of September 2012:**

**Status as of January 2013:**

**Status as of September 2013:**

**Status as of January 2014:**

**Status as of August 2014:**

**Final Report Summary:**

**VI. PROJECT BUDGET SUMMARY:**

The total budget request is 350,000 over a three-year period (July 2011-June 2014). This budget includes salary and fringe (0.1812) for one post-doctoral research associate is budgeted for two years. This post-doc will assess the initial impacts of biofuels harvests on soil nutrient availability, forest regeneration, and plant community composition. Salary and fringe (0.3230) for one research associate (0.1 FTE) is budgeted for 3 years. This research associate will assist with field sample processing and project coordination. One month of summer salary and fringe is budgeted for three years for the PI on this project, Dr. Anthony D’Amato. This salary will be used to pay for time spent on coordinating researchers, as well as analyzing and summarizing research results from this project. Salary and fringe (0.0743) for a work study student is budgeted for three years and this student will assist with summer field sampling and the processing of collected samples during the school year.

The subcontract with the U.S. Forest Service, Northern Research Station in Grand Rapids is to support salary and fringe for one full-time field technician for all three years of the study. This technician will be responsible for collecting field data, as well as for coordinating field crews. This subcontract also includes salary and fringe for two undergraduate summer employees for two years. The technician and summer students will be employed by the US Forest Service because that is the most cost-effective approach and our need to have personnel dedicated to this research study who are located close to the field sites. Finally, \$12,000 of this subcontract is for lab analysis of soil samples that will be conducted in the analytical laboratory at the Northern Research Station in Grand Rapids, MN.

The subcontract with a consulting forester is to support salary for locating and establishing research areas on nutrient poor soils in northern Minnesota. This consultant will be chosen out of a candidate pool of foresters that are qualified for conducting work of this nature; however, given the contract total (\$15,000) a competitive bid process is not required by the University of Minnesota.

Due to the high number of study sites and logistics associated with establishing the harvest treatments and baseline data collection, \$18,000 is budgeted for domestic travel within Minnesota. This money will be used to pay for mileage (75%) and lodging (25%) for researchers, the field technician, graduate students, and undergraduate students. Equipment for permanently marking research plots, collecting regeneration and soil samples, and measuring soil nutrient availability are budgeted at \$5999.

**A. ENRTF Budget:**

Budget Category	\$ Amount	Explanation
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Personnel:	\$199,001 <u>\$184,001</u>	-One month of faculty summer salary and fringe (0.1934) for three years(D'Amato, PI; 0.1FTE) -Salary and fringe (0.1812) for a post-doctoral researcher for two years (1.0 FTE) -Salary and fringe (0.3230) for a research associate for <del>2.75</del> <u>2.0</u> years (0.1 FTE) -Salary and fringe (0.0743) for a work-study undergraduate student for 3 years
Professional/Technical Contracts: U.S. Forest Service	\$127,000	This contract to Brian Palik includes: -funds for hiring one half-time field technician for all three years of the study (0.5 FTE; \$87,000). -salary and fringe for two undergraduate summer employees for two years (\$28,000). The technician and summer students will be employed by the US Forest Service because that is the most cost-effective approach and our need to have personnel dedicated to this research study who are located close to the field sites. -lab analysis of soil samples (\$12,000; <b>reduced rate</b> donated by US Forest Service)
Contracts: Consulting forester	\$15,000	This contract includes: <u>-funds for hiring a consulting forester to locate and identify candidate research sites on nutrient poor soils in Minnesota</u> <u>-funds support salary for hired consultant at \$50/hour</u>
Equipment/Tools/Supplies:	\$5,999	- Equipment includes rebar for permanently marking plot centers (\$350), supplies for constructing resin bags for soil nutrient measurements (\$4000), soil cores and corer (\$110), Haglof distance measuring equipment (\$700), stake whiskers for marking subplots (\$110), scintillation vials for soil analyses (\$730)
Travel Expenses in MN:	\$18,000	- This money will be used to pay for mileage (75%) and lodging (25%) for researchers, the field technician, graduate students, and undergraduate students working at the field research sites.
<b>TOTAL ENRTF BUDGET:</b>	<b>\$350,000</b>	

**Explanation of Use of Classified Staff:** N/A

**Explanation of Capital Expenditures Greater Than \$3,500:** N/A

**Number of Full-time Equivalent (FTE) funded with this ENRTF appropriation:** 3.1

**B. Other Funds:**

<b>Source of Funds</b>	<b>\$ Amount Proposed</b>	<b>\$ Amount Spent</b>	<b>Use of Other Funds</b>
<b>Non-state</b>			
USDA Grant	\$1,810,500	\$	Personnel for ecological simulation modeling, collection of field data, and processing of samples.
<b>TOTAL OTHER FUNDS:</b>	<b>\$1,810,500</b>	<b>\$</b>	

**VII. PROJECT STRATEGY:**

**A. Project Partners:**

In addition to the Project Manager, other project team members are noted below.

Charlie Blinn  
Department of Forest Resources  
University of Minnesota  
St. Paul, MN

John Bradford  
USDA Forest Service  
Northern Research Station  
Grand Rapids, MN

Shawn Fraver  
USDA Forest Service  
Northern Research Station  
Grand Rapids, MN

Robert Slesak  
Minnesota Forest Resources Council  
St. Paul, MN

Brian Palik (\$127,000)  
USDA Forest Service  
Northern Research Station  
Grand Rapids, MN

Randy Kolka  
USDA Forest Service  
Northern Research Station  
Grand Rapids, MN

**B. Project Impact and Long-term Strategy:**

Due to the large component of Minnesota’s forested landbase on nutrient poor soils, there is a critical need for research that can assess the potential impacts of biomass harvesting on our forests, as well as generate management strategies for sustaining the functioning of these systems in light of these management practices. This project is intended to be a 3-year study. This time period is necessary to allow for research site identification, treatment implementation, and 1 year of post-treatment measurements. This proposed project will build upon an existing project examining the impacts of biomass harvesting on nutrient rich sites within northern Minnesota established with \$294,000 in grants from the Minnesota Forest Resources Council (MFRC). Given the long-term nature of forest growth and management, we will seek additional funds to continue monitoring these sites beyond the 3 year project period. In particular, project participants are committed to long-term maintenance and monitoring of sites established in this proposed project. Although we anticipate subsequent proposals to LCCMR, we are also seeking additional funds from the USDA, DOE, US Forest Service Forest Health Monitoring Program, and the National Science Foundation to support this work.

**C. Spending History:**

<b>Funding Source</b>	<b>M.L. 2008 or FY 2009</b>	<b>M.L. 2009 or FY 2010</b>	<b>M.L. 2010 or FY 2011</b>
USDA grant			\$525,000
MFRC grant	\$98,000	\$98,000	\$98,000
USDA Forest Service			\$30,000

*(add or remove rows and columns as needed)*

**VIII. ACQUISITION/RESTORATION LIST:** N/A

**IX. MAP(S):**N/A

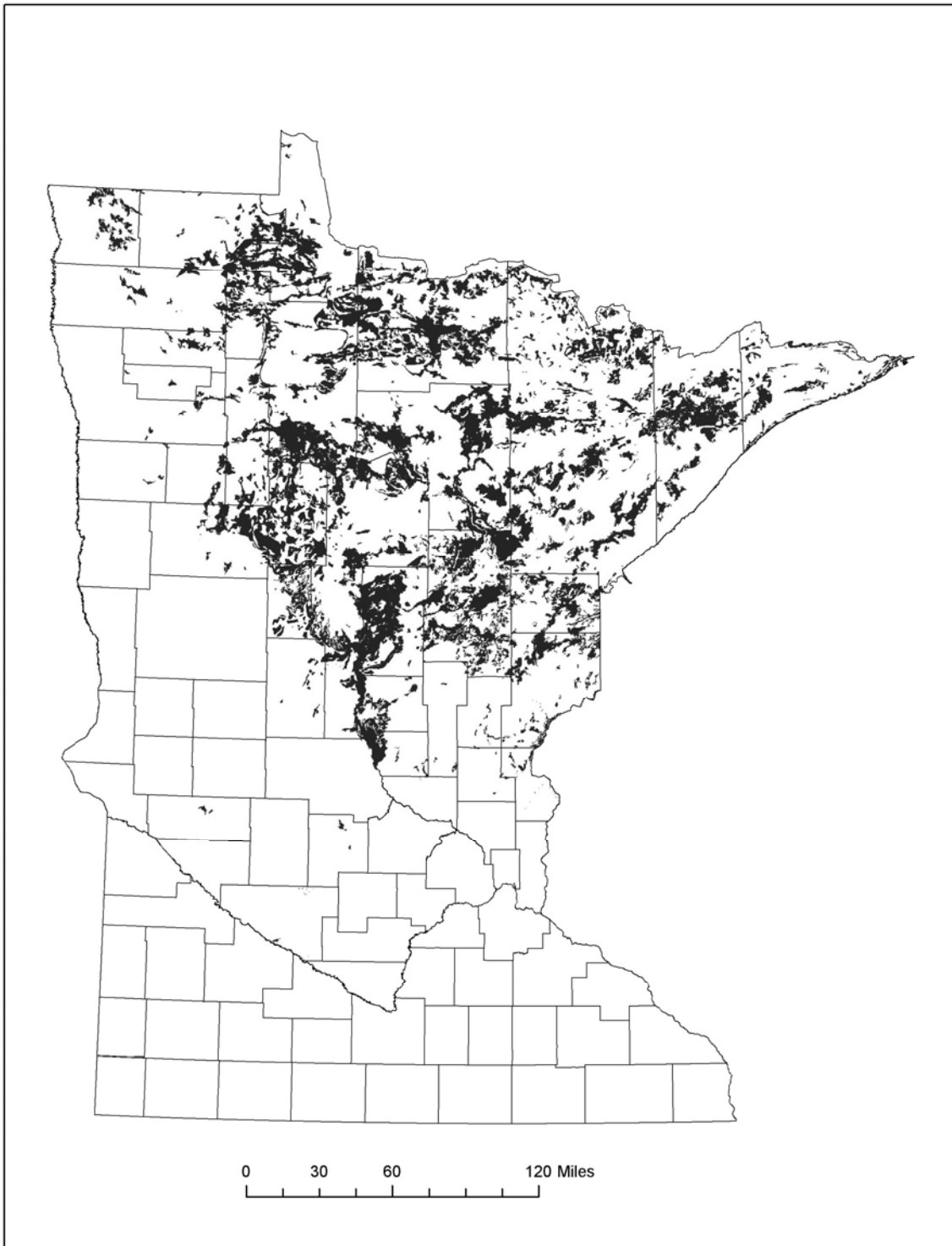
**X. RESEARCH ADDENDUM:** See Research Addendum

**XI. REPORTING REQUIREMENTS:**

Periodic work plan status update reports will be submitted not later than January 2012, September 2012, January 2013, September 2013, and January 2014. A final report and associated products will be submitted between June 30 and August 1, 2014 as requested by the LCCMR.



Attachment A: Budget Detail for M.L. 2011 (FY 2012-13) Environment and Natural Resources Trust Fund Projects													
Project Title: Evaluation of Biomass Harvesting Impacts on Minnesota's Forests													
Legal Citation: M.L. 2011, Chp. XXX, Sec. X, Subd 3(k)													
Project Manager: Anthony D'Amato													
M.L. 2011 (FY 2012-13) ENRTF Appropriation: \$ 350,000													
Project Length and Completion Date: 3 years; June 30, 2014													
Date of Update: May 18, 2011													
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET			Activity 1 Budget	Amount Spent	Balance	Activity 2 Budget	Amount Spent	Balance	Activity 3 Budget	Amount Spent	Balance	TOTAL BUDGET	TOTAL BALANCE
<b>BUDGET ITEM</b>			Develop a network of research sites on nutrient poor soils to assess impacts of biomass harvesting on biodiversity and productivity			Determine the impacts of biomass harvesting on regeneration and growth of ecologically important tree species and spread of invasive species			Model long-term sustainability of biomass harvesting on nutrient poor soils				
<b>Personnel (Wages and Benefits)</b>			45,000	0	45,000	121,474	0	121,474	32,527	0	32,527	199,001	199,001
Anthony D'Amato, Project Manager; \$30,999 (81% salary, 19% benefits); 10%FTE													
Post-doctoral researcher; \$100,709 (82% salary, 18% benefits); 100%FTE													
Research associate; \$40,605 (68% salary, 32% benefits); 10%FTE													
Undergraduate work-study; \$26,688 (93% salary, 7% benefits); 50%FTE													
<b>Professional/Technical Contracts</b>													
US Forest Service (Dr. Brian Palik): funds for hiring one half-time field technician for all three years of the study (0.5 FTE; \$87,000); salary and fringe for two undergraduate summer employees for two years (\$28,000); lab analysis of soil samples (\$12,000; reduced rate donated by US Forest Service			67,979	0	67,979	50,943	0	50,943	8,078	0	8078	127,000	127000
<b>Equipment/Tools/Supplies</b>												0	0
Equipment tools and supplies, such as rebar for permanently marking plot centers (\$350), supplies for constructing resin bags for soil nutrient measurements (\$4000), soil cores and corer (\$110), Haglof laser distance measuring equipment (\$700), stake whiskers for marking subplots (\$110), scintillation vials for soil analyses (\$730)			3,000	0	3,000	2,999	0	2,999				5,999	5,999
<b>Travel expenses for travel in Minnesota. This money will be used to pay for mileage (75%) and lodging (25%) for researchers, the field technician, graduate students, and undergraduate students working at the field research sites. Reimbursement of expenses is based on the University plan for travel expenditures and reimbursement.</b>			10,590	0	10,590	7,410	0	7,410				18,000	18,000
<b>COLUMN TOTAL</b>			<b>\$81,569</b>	<b>\$0</b>	<b>\$127,439</b>	<b>\$61,352</b>	<b>\$0</b>	<b>\$181,956</b>	<b>\$8,078</b>	<b>\$0</b>	<b>\$40,605</b>	<b>\$350,000</b>	<b>\$350,000</b>



**Figure 1.** Forested areas within Minnesota with nutrient poor soils. Biomass harvesting will remove disproportionately more soil nutrient capital at these sites, increasing the likelihood of reduced forest growth over time relative to nutrient-rich forest sites. These removals can also adversely affect carbon storage and biodiversity. Nutrient poor forest systems within figure include areas with high sand content, shallow soils, jack pine barrens, and nutrient poor peatlands.