

**Environment and Natural Resources Trust Fund  
2011-2012 Request for Proposals (RFP)**

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**LCCMR ID: 095-C3+4**

**Project Title:** Bush-Type Hazelnuts as an Alternative Perennial Crop

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**Category:** C3+4. Technical Assistance and Community-Based Planning

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**Total Project Budget: \$**  \$316,010

**Proposed Project Time Period for the Funding Requested:**  3 yrs, July 2011 - June 2014

**Other Non-State Funds: \$**  0

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**Summary:**

Planting native and bush-type hazelnuts on marginal lands would protect soil and water and provide wildlife habitat. We propose to select elite germplasm, propagate it, and develop best management practices.

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**Sponsoring Organization:**  U of MN

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**Location**

**Region:** Statewide

**Ecological Section:** Western Superior Uplands (212K), No. Minnesota Drift and Lake Plains (212N), Paleozoic Plateau (222L), Minnesota and NE Iowa Morainal (222M), Lake Agassiz, Aspen Parklands (223N), Red River Valley (251A), North Central Glaciated Plains (251B)

**County Name:** shington

**City / Township:**

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

## Bush-Type Hazelnuts as an Alternative Perennial Crop

**I. PROJECT STATEMENT.** The goal of this work is to develop American hazelnuts (*Corylus americana*), and hybrids of American hazelnuts and European hazelnuts (*C. avellana*), as perennial crops for use in multifunctional ‘working landscape systems’.

**Benefits of perennial crops** (2008 Minnesota Statewide Conservation and Preservation Plan, p.119-122):

- Perennials cover the soil and protect it from soil erosion year round;
- Perennials reduce runoff and leaching and thus protect water quality from sediments and nutrients;
- Perennials increase soil carbon sequestration and enhance soil quality;
- Perennials are less sensitive to drought and flooding than annual crops;
- Perennials provide habitat for wildlife. (Hazelnuts are especially good habitat because they need not be harvested until after nesting season is over and because they can be integrated with other natives.)
- Targeted plantings of perennials on marginal lands can provide these ecosystem services at the same time as providing income from conservation areas.

**Bush-type hazelnuts** are a uniquely multifunctional crop with a multi-tiered potential market: as a heart-healthy nutritious food for fresh-eating or as an ingredient, pressed for oil for cooking and skin care (with high protein press cake for animal feed), and as a potential biofuel which could be produced on-farm. (Hazelnut oil content is three times as high as soybeans and has superior quality for biodiesel.) The low requirements of hazelnuts for tillage, fertilizers, and pesticides make them an especially attractive crop for reducing fuel use in agricultural systems of the future.

The main bottleneck constraining the planting of hazelnuts is the lack of consistently high quality planting material of the type that is only possible through vegetative propagation. Mound layering, the only viable propagation method currently available, cannot supply the numbers of plants needed. Another method, micropropagation, could multiply the amount of planting stock exponentially, but needs to be developed for American and hybrid hazelnuts. This grant will build on work begun in 2006 with cultivated hybrid hazelnuts; elite germplasm identified after two years of evaluation was mound layered in 2008 and 2009 and is now established in evaluation trials. This grant is to continue that work and expand it to include native American hazelnuts. ***This proposal outlines an approach toward development of American hazelnuts and their hybrids as alternative crops for Minnesota with the following objectives:***

1. Identify and propagate native American hazelnuts with high yield potential in wild stands.
2. Develop low-cost and efficient micropropagation techniques.
3. Develop best-management practices for establishment and management of hazelnuts.
4. Educate growers and extension personnel about hazelnut benefits and best management practices.

<b>II. DESCRIPTION OF PROJECT ACTIVITIES</b>	<b>Completion Date</b>
<b>Activity 1. Hazelnuts with high yield potential identified and propagated</b>	<b>Budget: \$86,000</b>
<b>Outcome 1-1.</b> We will develop a plant evaluation and selection program for <i>C. americana</i> hazelnut plants. We propose to identify superior native hazelnut plants from 20 sites from across Minnesota. From these sites we will select a total of 20 plants with resistance to Eastern Filbert Blight (EFB) and big bud mite (BBM), and high nut yield and nut quality.	<i>20 superior plants identified by Oct. 2011</i>
<b>Outcome 1-2.</b> We will vegetatively propagate the elite plants identified in 1-1 by mound layering, and establish them in five evaluation nurseries, located in key ecozones, which will be the foundation of a long-term selection program.	<i>20 plants propagated and planted into nurseries Oct. 2012,</i>

<b>Activity 2. Develop low-cost propagation techniques.</b>		<b>Budget: \$126,000</b>
<i>Outcome 2-1. Micropropagation.</i> A graduate student will develop micropropagation techniques for <i>C. americana</i> : Sterile cultures established. Regeneration technologies developed and applied to selected germplasm. Micropropagated germplasm hardened off for planting outdoors.		Jan 2012 July 2013 July 2014
<b>Activity 3: Best-management practices developed for hazelnuts.</b>		<b>Budget: \$89,010</b>
<i>Outcome 3-1. Establishment methods for hazelnut plantings.</i> We will compare stock plant types, site preparation methods, and post-plant weed control methods.		Planting material generated 2011 and 2012. Trials established spring 2013. Establishment trails complete end of 2014, others complete end of 2015.
<i>Outcome 3-2. Cover cropping for weed control and nitrogen fertilization.</i> We will compare different cover crops seeded between hazel rows, including native perennials, for weed suppression, N fixation and provision of wildlife cover.		
<i>Outcome 3-3. Nitrogen fertilization of bearing plants.</i> We will compare three approaches to N fertilization, to improve N efficiency and to reduce N pollution.		
<b>Activity 4: Growers and extension personnel knowledgeable about hazelnuts</b>		<b>Budget: \$15,000</b>
<i>Outcome 4-1. Outreach.</i> We will host field days and winter seminars every year, plus one train-the-trainer workshop, and one regional hazelnut conference during the grant, to promote the crop and to improve the success of current and future hazelnut growers.		On-going

### III. PROJECT STRATEGY

#### A. Project partners receiving funds from this grant

- Lois Braun, Research Associate, Agronomy and Plant Genetics, U of M, will manage the project.
- Jerry Cohen, Professor, Horticultural Sciences, will supervise the micropropagation component.
- Jeff Jensen, Rural Advantage, Fairmont, will be the grower liaison.

#### Project partners contributing in-kind services to this project.

- Donald Wyse, Professor, Agronomy and Plant Genetics, U of M, will supervise Lois Braun.
- Members of the Minnesota Hazelnut Foundation will host on-farm trials.
- Jill Sackett, Extension Educator, U of M Extension, Fairmont will assist with outreach.

**B. Timeline Requirements.** Plant germplasm evaluation programs, are by nature, long-term, especially for slow-growing perennial plants such as hazelnuts. This grant will build on work begun in 2006 with cultivated hybrid hazelnuts; identification of elite native germplasm will begin in 2010. During the three year period of this grant we will complete identification of elite native germplasm, add it to the evaluation trials, and develop commercially viable micropropagation techniques. The trials of best management practices will be delayed by the need to first propagate plant material in the quantities required for replicated trials, and by the need to collect two or three years of baseline data, and thus will not be started until 2013, to be completed in 2015. We expect the hybrid hazelnuts in the evaluation trials to begin bearing nuts in 2012. After five years of evaluation, in 2017, we will select the best hybrid hazelnuts for dissemination to growers and/or for continued breeding work. .

**C. Long-Term Strategy.** Two grants, totalling \$70,000, currently fund hazelnut research at the U of M, through Oct. 2011. Two other proposals have been submitted and we will need to write more because of the long-term nature of this project. LCCMR funding will enable us to reach the 100% match required by federal programs such as the USDA Specialty Crop Research Initiative. Ultimately, we hope to generate sufficient funds to keep a hazelnut evaluation program going through a combination of revenue from the sale of production rights for improved varieties, support from the Minnesota Hazelnut Foundation, and from hazelnut buyers. But without public resources to help us get past the obstacles to development of a viable hazelnut industry in the region, there will be no industry to advance its own cause. The need for public support of hazelnut crop development mirrors the early needs of soybean crop development.

## Project Budget

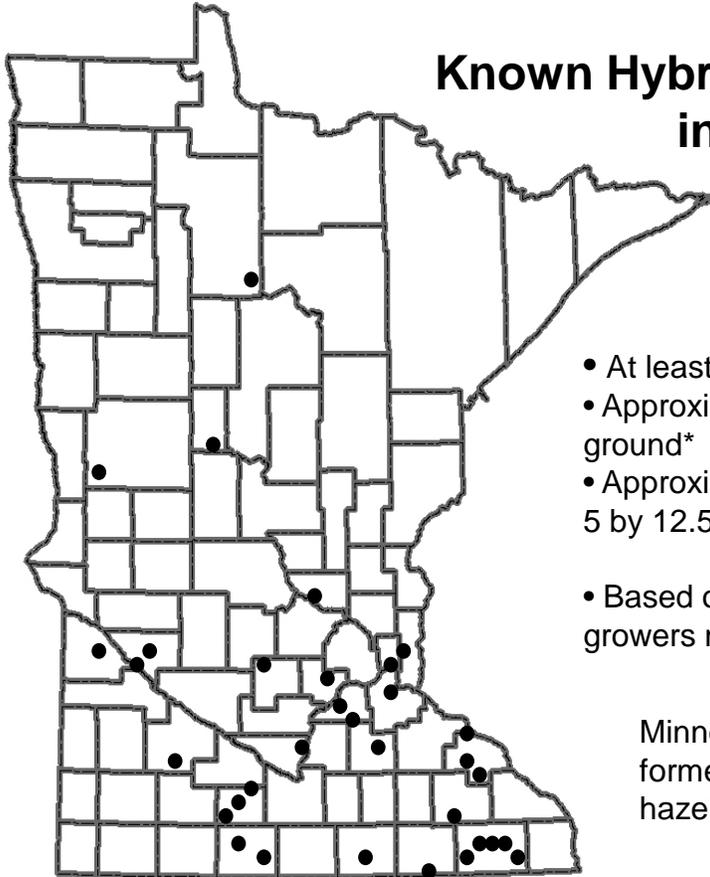
### IV. TOTAL PROJECT REQUEST BUDGET (three years: July 1, 2011 - June 30, 2014)

<b>Personnel:</b>		<b>\$ 282,000</b>
Post-doctoral Research Associate: \$40,108/yr + 19.99% fringe x 3 yrs	\$ 144,378	
Graduate Student stipend, fringe, and tuition: \$37,000 for 2011-2012 plus 3% increase for years 2-3.	\$ 114,363	
Outreach work through Rural Advantage: \$5,000/yr x 3 yrs	\$ 15,000	
Undergraduate Student Workers: 250 hrs/yr @ \$10/hr + \$253/yr fringe	\$8,259	
<b>Contracts:</b>		<b>\$ 4,508</b>
Leaf analysis: 750 leaf samples at \$2 each, in lab of USDA-ARS scientist Micheal	\$ 1,500	
Soil analysis: (14 complete soil analyses @ \$20 each = \$280) + (248 samples for organic matter only @\$5.50 each x 2 yrs) at the U of M soil analytical lab	\$ 3,008	
<b>Equipment/Tools/Supplies:</b>		<b>\$ 20,502</b>
Supplies needed for field and greenhouse work: landscape fabric, mulch, drip hose, greenhouse supplies, fertilizer, cover crop seed, etc.	\$ 3,000	
Supplies needed for micropropagation: petri dishes, growth medium, plant growth regulators, plant sterilants.	\$ 15,000	
Experiment Station plot fees: (4.17 acres at \$200/acre/year at U of M Experiment Stations at St. Paul, Lamberton and Rosemount, and at Staples Ag Center) x 3 years	\$ 2,502	
<b>Travel:</b>		<b>\$ 9,000</b>
To hazelnut survey and experimental plot sites: 5,000 mi/yr @\$0.50/mi x 3 yrs, plus \$500/yr for lodging	\$ 9,000	
<b>TOTAL PROJECT BUDGET REQUEST TO LCCMR</b>	<b>\$ 316,010</b>	<b>\$ 316,010</b>

### V. OTHER FUNDS

V. SOURCE OF OTHER FUNDS	AMOUNT	Status
<b>Other Non-State \$ Being Applied to Project During Project Period:</b>		
A three-year proposal is pending to the North Central Region SARE (Sustainable Agriculture Research and Education) for Oct.2010-Sept. 2013.	\$ 175,000	Pending
A collaborative five-year proposal with Wisconsin is pending to the USDA Specialty Crop Research Initiative for Oct.2010-Sept. 2015. Only the Minnesota portion of the budget is shown here.	\$ 235,073	Pending
<b>In-kind Services during Project Period:</b> Growers hosting germplasm performance and agronomic trials will donate land, space and machinery costs. \$200/yr x 3 yrs x 4 farmers	\$ 2,400	
<b>Funding History:</b>		
Three Rivers RC & D (Mankato) for Productive Conservation on Working Lands (Oct 2008 through Oct 2009) ( <i>Federal dollars distributed through NRCS and EQIP</i> )	\$ 40,000	entirely spent
Minnesota Agricultural Experiment Station Rapid Agricultural Response Grant (Oct 2009-Sept 2010) ( <i>State funds distributed through the University of Minnesota</i> )	\$ 30,000	currently spending
Minnesota Specialty Crop Block Grant (Nov. 2009-Oct 2011) ( <i>Federal funds distributed by the USDA through MDA</i> )	\$ 40,000	currently spending

## Known Hybrid Hazelnut Plantings in Minnesota



- At least 33 growers in Minnesota\*
- Approximately 16,000 live plants in the ground\*
- Approximately 42 acres planted (assuming 5 by 12.5 ft spacing)
- Based on 2007 and 2008 surveys; some growers may have been missed.

Minnesota Hazelnut Foundation formed in 2009 to advance a hazelnut industry in the state.

- Known hybrid hazelnut plantings from which to make selections.

## Hybrid Hazelnuts are a Cross Between:

**American Hazelnuts**  
(*Corylus americana*)  
(and beaked hazelnuts, *C. cornuta*)

**European Hazelnuts**  
(*Corylus avellana*)

X

- Both species native throughout Minnesota.
- American hazelnuts associated with oak savannas
- Beaked hazelnuts associated with aspen-pine woodlands.
- Extremely winter hardy in Minnesota.
- Resistant or tolerant to Eastern Filbert Blight.
- Small nuts borne in tight involucre (husks)
- Highly variable yields and nut quality.

- Basis of commercial hazelnut industry.
- Not winter hardy in Minnesota.
- Highly susceptible to the lethal disease Eastern Filbert Blight.
- Large nuts with good quality.
- High yields, but with alternate bearing habit.



**Beaked hazelnuts**



**American hazelnuts**



**European hazelnuts**

## **Project Manger Qualifications**

*Lois Braun, Research Fellow, Agronomy and Plant Genetics, University of Minnesota* will coordinate this project. Lois has a BA in Biology from Earlham College in Indiana (1984), a MS in Soil Science from the University of Georgia (1997), and a Ph.D. in Horticulture from the University of Minnesota (2008), where she completed her dissertation on nitrogen fertilization of hybrid hazelnuts. Before obtaining her Master's degree she was a Peace Corps volunteer in Southern Africa, and worked on a farm in Georgia, where she did on-farm research on organic systems. Between her Master's and PhD, she worked as an organic farm consultant in Minnesota. Since completing her PhD in May 2008, Lois has been working with hazelnuts as a post-doctoral research associate. She is a past graduate research fellow with the Land Institute in Kansas and is trained in Natural Systems Agriculture.

Lois has experience managing hazelnuts in the field and with hazelnut propagation. She also has working relationships with hazelnut growers throughout Minnesota and beyond. She also has experience managing research grants, starting with one she received for on-farm research on buckwheat through the MDA's Energy and Sustainable Agriculture Program while working as a farm consultant. As a doctoral student she received and managed two grants, and in her current position she has completed one and is now managing two others.

For this project, Lois will coordinate the selection of superior wild hazelnuts and its propagation, and will manage the evaluation nurseries and the agronomic trials. She will also assist with outreach, and provide guidance to the graduate student doing micropropagation.

## **Organizational Description,**

### ***Department of Agronomy and Plant Genetics, University of Minnesota***

The mission of the Department of Agronomy and Plant Genetics at the University of Minnesota is to discover and share information and genetic materials that increase the efficiency, reliability, and profitability of crop production and utilization within Minnesota and around the world. We promote environmentally-sound practices that preserve the natural resource base upon which agriculture depends.

Our educational programs receive our highest priority and serve as the base from which our other programs are directed. Our research is designed to support our educational programs both within the university and in the larger community. We promote cooperation at all levels of our university and profession. We contribute personnel and resources to interdepartmental centers and working groups. We encourage service in professional societies, and on regional, national and international projects, as well as in setting national agricultural policy.

We are timely and assertive on new issues arising from within our profession that impact society. Issues which we plan to emphasize during the next five years include biocontrol of weeds, crop variety development, non-traditional education, cropping system diversity, sustainable agriculture, and value added products.