

**Environment and Natural Resources Trust Fund
2018 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 179-F

Preserving and Restoring Minnesota's Native Orchids – Phase 2

Category: F. Methods to Protect or Restore Land, Water, and Habitat

Total Project Budget: \$ 468,000

Proposed Project Time Period for the Funding Requested: 3 years, July 2018 to June 2021

Summary:

Minnesota's 48 native orchids are at risk. The Minnesota Landscape Arboretum will expand conservation of species through propagation and banking and begin restoration planting research in the program's second phase.

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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:

The visual shows a map of counties where populations have already been banked by the end of 2016. Locations of proposed restoration/common garden plantings are also indicated on the map. A list of Phase 1 and likely Phase 2 species is also provided, as are photographs of seedlings of two species already successfully propagated at MLA through this program.

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

PROJECT TITLE: Preserving and Restoring Minnesota’s Native Orchids – Phase 2

I. PROJECT STATEMENT

Expansion of Efforts to Preserve Minnesota Native Orchids

Ten of Minnesota’s 48 native orchid species are listed on Minnesota's List of Endangered, Threatened, and Special Concern Species and even the “common” species are likely to be the first plant species lost when a natural landscape is disturbed. Since 2015 under ENRTF M.L. 2015 funding, Phase 1 of the Minnesota Landscape Arboretum’s (MLA) Native Orchid Conservation Program has worked to preserve Minnesota's native orchid diversity by:

- 1) Collecting and preserving seed and/or live plants of 15 orchid species throughout Minnesota
- 2) Researching the propagation and cultivation of over half of all of Minnesota’s species.
- 3) Collecting, identifying and banking the fungal symbionts (necessary for many orchids’ survival) of Minnesota orchid species, in partnership with the Smithsonian Environmental Research Center (SERC), and with Dr. Jyotsna Sharma at Texas Tech University (TTU).

The ultimate goal of a genetic bank is restoration. The practice of terrestrial orchid restoration from seed is still in its infancy, but the Arboretum is in a unique position to advance the knowledge in this field given the strength of its orchid conservation program. Through a growing partnership with University of Minnesota’s experimental forests, the Cloquet Forestry Center (CFC) near Cloquet, MN and the Hubachek Wilderness Research Center (HWRC) near Ely, MN, the Arboretum will significantly advance experimental orchid restoration. The research centers’ knowledgeable staff will make it possible to develop orchid restoration techniques in protected landscapes and climate regimes that are not available at the Arboretum in Chanhassen, MN.

GOALS:

- 1) Expand collection efforts of 15 Phase 1 species to new locations to diversify banked.
- 2) Expand banking, propagation and display efforts by an additional 15 species to a total of **at least 30 species**.
- 3) Complete fungal symbiont species identification and banking for **38 non-listed orchid species, collecting from listed species when permitted**.
- 4) Begin to develop the knowledge and experience needed to place orchids back into landscapes.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Expand collection/preservation efforts to at least 30 species

Budget: \$259,000

The Arboretum will greatly increase the intensity and pace of these efforts with seed collection trips growing from 21 per field season to 65. This expansion will allow for collection in an increased geographic range across the state where there are both new populations of currently banked species and new species to bank. To continue to advance preservation goals, the Arboretum will increase banked species from 15 to 30 and will seek to complete initial acquisition of seed for propagation protocol development for all 48 species. The Arboretum also will complete collection of root samples for all non-listed orchid species. For all collection activities of both listed and non-listed species, the Arboretum obtains proper permits from all necessary sources.

Outcome	Completion Date
1. Begin collection for finalized list of 15 Phase 2 orchid species for seed bank.	December 2018
2. Complete collection of root samples from 38 non-listed orchid species, with listed species collected when permitted, samples sent to Texas Tech University (fungal identification) and The Smithsonian (propagation and banking).	December 2019
3. Complete seed bank collection goal of 3 populations for each of the 15 Phase 2 species.	December 2020
4. Complete seed propagation collection goal all 48 of Minnesota’s native orchids.	December 2020

Activity 2: Continue propagation and cultivation research

Budget: \$158,000

Propagation work will increase to include nearly all of Minnesota’s native orchid species. Additionally, the Arboretum will develop techniques for planting propagules of native species in different landscapes to develop planting and restoration protocols for each species. This work will be done in collaboration with researchers at Cloquet and Hubachek, which offer landscapes and climates that the Arboretum cannot duplicate.

Outcome	Completion Date
1. Species list for common garden and out-planting plots. Plant young orchids of up to 3 species in multiple gardens at the 3 sites, with mycorrhizal samples if available.	October 2018
2. Increased website presence of orchid conservation program on Arboretum website.	October 2018
3. Evaluation of developed propagation methods for orchid species from Phases 1 and 2. Prepare for publication.	December 2020
4. Produce pamphlet detailing program accomplishments and goals to site visitors and produce scientific publication.	Spring 2021

Activity 3: Establish and monitor restoration efforts at three sites

Budget: \$51,000

Staff at all three sites will establish and monitor multiple out-planting and common garden plots. Out-planting locations will be determined prior to the onset of funding, by matching potential sites to known site requirements of individual orchid species. Common garden location and construction plans will be developed prior to funding, as well, to create multiple identical beds at all three sites. Activity 2 and 3 restoration protocols will be used to develop a knowledge base for native orchid restoration, useful for both Minnesota and national restoration efforts. Visitors to the Arboretum will be able to see orchids at multiple locations as well as learn about how all sites participate in this project.

Outcome	Completion Date
1. Establish protocols and plots for out-planting and common garden monitoring work at all sites.	October 2018
2. Monitor planting plots during first growing season	September 2019
3. Monitor planting plots during second growing season	September 2020
4. Evaluation of field trials to determine if experiments should continue as designed or if different treatments need to be considered.	December 2020

III. PROJECT STRATEGY

A. Project Team/Partners

Partners receiving funding: Minnesota Landscape Arboretum; Cloquet Forestry Center; Hubachek Wilderness Research Center.

Partners not receiving funding from LCCMR funds: Dr. Jyotsna Sharma, Texas Tech University; Smithsonian Environmental Research Center.

B. Project Impact and Long-Term Strategy

Ultimately, the goal of this project is to create a bulwark against the loss of one of Minnesota’s most precious natural treasures. This project will continue and enhance the long-term orchid conservation model at MLA, established in Phase 1 of this funding, and will extend this successful model to expand the scope of the program to incorporate restoration activities. It will be exciting to move into a next phase of restoration with native orchid conservation, and partnering with CFC and HWRC will create an important long-term study examining both how to create populations of orchids in natural habitats and whether these new populations can persist over time in new/restored habitats.

C. Timeline Requirements

This proposal intends to complete work for Phase 2 within the three year time-frame as outlined above.

2018 Detailed Project Budget

Project Title: Preserving and Restoring Minnesota's Native Orchids - Phase 2

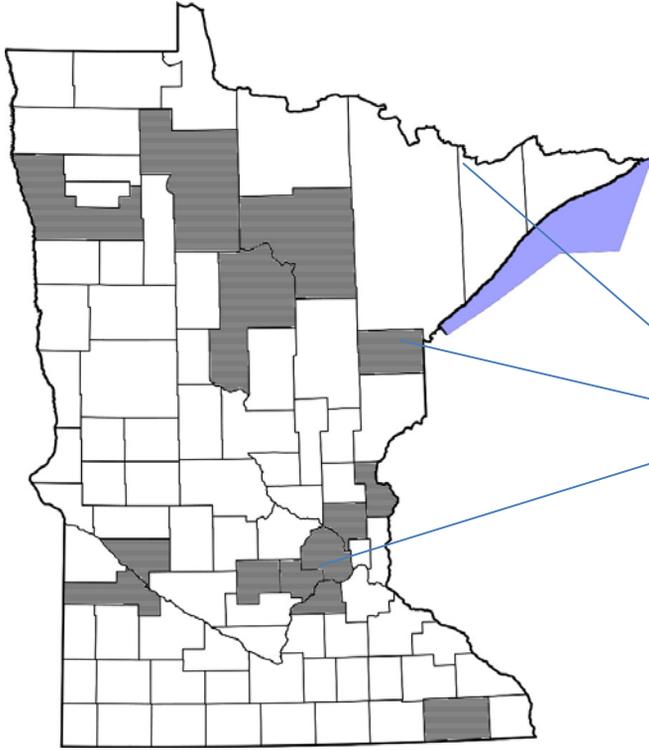
IV. TOTAL ENRTF REQUEST BUDGET 3 years

<u>BUDGET ITEM</u>	<u>AMOUNT</u>
Personnel (MLA):	
Curator of Endangered Plants David Remucal (MLA Program Manager, 0.5 FTE, Salary 76%, Benefits 24% for FY19, FY20 and FY21)	\$ 124,517
Conservation Program Associate Michael Monterusso (0.5 FTE, Salary 79%, Benefits 21% for FY19, FY20 and FY21)	\$ 101,214
Gardener Ricky Garza (Gardener, Orchid Program, 0.14 FTE, Salary 79%, Benefits 21% for FY19, FY20 and FY21)	\$ 25,186
Field Technician (seasonal 0.5 FTE, Salary 79%, Benefits 21% for FY19, FY20, and FY21)	\$ 63,657
Student intern (summer season, 10 weeks, Salary 93%, Benefits 7% for FY19, FY20 and FY21)	\$ 16,802
Communications Associate, Barb Kastens (0.02 FTE, Salary 79%, Benefits 21% for FY19, FY20 and FY21)	\$ 1,964
Personnel (CFC/HWRC):	
Associate Professor, CFC/HWRC, Andrew David (0.02 FTE, Salary 75%, Fringe 25% for FY19, FY20, FY21)	\$ 9,168
Forest Manager, Kyle Gill, CFC site locations, trial installation (0.04 FTE, Salary 75%, Fringe 25% for FY19, FY20, FY21)	\$ 8,703
Researcher, Beckie Prange, HWRC site locations, trial installation, weekly monitoring at HWRC (0.04 FTE, Salary 81%, Fringe 19% for FY19, FY20, FY21)	\$ 6,150
Student intern, TBD, summer season, 10 weeks (0.25 Position encumbrance, Salary 93%, Benefits 7%, for FY19, FY20 and FY21)	\$ 5,400
Professional/Technical/Service Contracts:	\$ 26,966
Contract, Jason Husveth (seed collection and population surveys in private and commercial lands difficult to gain access by MLA/state staff, 8 days per year @ contractor rate of \$1040/day plus travel for 5 trips/year @ 250 roundtrip miles and 0.535/mile reimbursement for FY19, FY20 and FY21)	
Equipment/Tools/Supplies:	
Lab supplies: Chemicals, glassware, growth media, greenhouse supplies, sterilization equipment. Includes external soil testing lab work and postage for sending samples to TTU and SERC	\$ 5,954
Greenhouse supplies: Including soil and lumber for garden bed maintenance, common garden construction, and shade structure construction, fertilizers, caging material	\$ 9,224
Water deionization system- Asymbiotic orchid propagation requires very precise control of nutrients and substrates. Distilled water must be used in most steps to ensure that known quantities of chemical compounds are being used. Often in propagation in this manner well or tap water is fatal to plants. Cost is for lease and maintenance of the system.	\$ 3,600
Travel:	
Food and lodging during seed and/or live plant collection trips in Greater Minnesota more than 200 miles round trip for 2 people - \$133/day x 40/days per yr x 3 years. Reimbursed based on University of Minnesota plan.	\$ 31,920
Mileage reimbursement for seed and/or live plant collection trips - .535 per mile x 250 miles per trip x 60 round trips per yr x 3 years. Reimbursed based on University of Minnesota plan.	\$ 24,075
Additional Budget Items:	\$ 3,500
Printing for brochure: 5 panel, folded, 2-sided, 4-color, 3K quantity	
LANDSCAPE ARBORETUM TOTAL ENRTF \$ REQUEST =	\$ 468,000

V. OTHER FUNDS

<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
Other Non-State \$ To Be Applied To Project During Project Period:	\$ -	NA
Other State \$ To Be Applied To Project During Project Period:	\$ -	NA
In-kind Services To Be Applied To Project During Project Period:		
MLA 0.05 FTE Development Officer; TTU collaborator salary, equipment and travel; SERC collaborator salary, equipment, infrastructure (all FY19, FY 20 and FY21)	\$ 65,000	Pending
Coordinator of CFC and HWRC field research efforts and summer intern, Kyle Gill (CFC Forest Manager and Research Coordinator, 0.08 FTE)	\$ 17,410	Pending
Past and Current ENRTF Appropriation: MLA has \$76,596 remaining from \$167,000 appropriation of M.L. 2015, Chp. 76, Sec.2 Subd. 08c "Preserving and Protecting Minnesota Native Orchid Species"	\$ 76,596	Unspent
Other Funding History:	\$ -	NA

Preserving and Restoring Minnesota's Native Orchids – Phase 2



2016 Banked Orchid Populations

Counties (shaded) from where orchid populations have been banked through the 2016 field season of Phase 1

HWRC	Locations of initial
CFC	restoration/outplanting plots for
MLA	Phase 2

Species banked by end of Phase 1

- Calopogon tuberosus* var. *tuberosus* (tuberous grass-pink)
- Corallorhiza odontorhiza* var. *odontorhiza* (autumn coral-root)
- Cypripedium acaule* (stemless lady's-slipper)
- **C. candidum* (small white lady's-slipper)*
- C. parviflorum* var. *makasin* (small yellow lady's-slipper)
- C. reginae* (showy lady's-slipper)
- Galearis spectabilis* (showy orchis)
- Goodyera pubescens* (downy rattlesnake-plantain)
- G. repens* (lesser rattlesnake-plantain)
- G. tessellata* (tesselated rattlesnake-plantain)
- Platanthera huronensis* (tall green bog-orchid)
- P. obtusata* ssp. *obtusata* (bluntleaved rein-orchid)
- P. psycodes* (lesser purple fringed orchid)
- Pogonia ophioglossoides* (rose pogonia)
- Spiranthes magnicamporum* (Great Plains ladies—tresses)

Proposed Phase 2 species

- Amerochis rotundifolia* (round-leaved orchid)
- Aplectrum hyemale* (putty-root)
- Arethusa bulbosa* (dragon's-mouth)
- Calypso bulbosa* var. *americana* (fairy-slipper)
- Coeloglossum viride* (long-bracted orchid)
- Corallorhiza trifida* (early coral-root)
- **Cypripedium arietinum* (ram's-head lady's-slipper)*
- C. parviflorum* var. *pubescens* (large yellow lady's-slipper)
- Liparis liliifolia* (lily-leaved twayblade)
- L. loeselii* (Loesel's twayblade)
- Listera cordata* (heart-leaved twayblade)
- **Malaxis monophyllos* var. *brachypoda* (white adder's-mouth)*
- M. unifolia* (green adder's-mouth)
- **Platanthera praeclara* (western prairie fringed orchid)*
- Spiranthes cernua* (nodding ladies'-tresses)



Tuberous grass-pink seedlings on sterile media at MLA (D. Hansen, photo)



Showy lady's-slipper seedlings on sterile media at MLA (D. Hansen, photo)

MLA Project Manager: David Remucal, PhD
2001 PhD – Environmental, Population and Organismic Biology, University of Colorado, Boulder, CO
1993 BA – Biology, Carleton College, Northfield, MN

Dr. Remucal is the Curator of Endangered Plants at the Minnesota Landscape Arboretum where he has developed and managed the Plant Conservation Program since its inception in 2013. He will provide overall project direction. As manager of the Plant Conservation Program, he has demonstrated the ability to manage and develop budgets, direct volunteers and staff, work with stakeholders, coordinate with remote and local partners, communicate program information and results to a variety of audiences, and expand the scope and influence of the MLA Conservation Program.

MLA Organization description

Organization History

In 1908, the University bought 78 acres of farmland west of Minneapolis in Chanhassen and formally established the Fruit Breeding Farm to develop fruits, vegetables, and later, landscape trees and shrubs that would thrive in Minnesota. The Arboretum was founded in 1958 on a site near the Fruit Breeding Farm. In 1976, the Fruit Breeding Farm was renamed the Horticultural Research Center to reflect the diversity of horticultural research, and in 1985 it merged with the Arboretum. The Minnesota Landscape Arboretum is one of the few institutions worldwide that identifies and develops cold-hardy fruit and landscape plants.

Programs, Strengths and Accomplishments

The Arboretum is a vital element of the cultural, educational, and economic fiber of the Twin Cities and larger community serving a broad audience with more than 450,000 visitors and 23,850 member households. Today, the Arboretum consists of 1,137 acres of unique public gardens, natural spaces and research areas with 32 display and specialty gardens, 48 generic plant collections, 5,000 species of plants, and 8 native and restored environments. It is a resource for horticultural and environmental information, a center for research and public education, and a place to inspire and offer models for visitors with quality plants in well-designed and maintained displays, collections, model landscapes and conservation areas.

CFC Project Manager: Dr. Andrew David
1996 - PhD Plant Breeding and Genetics – Forestry, Michigan State University
1983 – BA Biology, Kalamazoo College

Dr. David is an Associate Professor in the Department of Forest Resources, University of Minnesota and is the interim Director of the University of Minnesota's Cloquet Forestry Center and Hubachek Wilderness Research Center. His research interests are in population genetics of wild and domesticated populations of tree species, genetic conservation of Minnesota's ash species and the effect of temperature at seed development on the growth and survival of tree seedlings.

CFC / HWRC Organization description

The Cloquet Forestry Center was established in 1909 on 3,400 acres as the experimental forest of the University of Minnesota. The mission of the CFC is to conduct applied education, research, and outreach related to northern forests for the benefit of Minnesota. The Hubachek Wilderness Research Center was a gift to the University of Minnesota from the Hubachek family and comprises 360 acres between Fall and Browns Lakes adjacent to the Boundary Waters Canoe Area Wilderness. Together CFC and HWRC have a variety of forested and wetland ecosystems on which to establish new orchid populations. Both sites also offer lodging and dining facilities for researchers and on-site staff to assist with the project.