

**Environment and Natural Resources Trust Fund
2020 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 211-F

Preserving and Learning from Minnesota's Native Orchids

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

Sub-Category:

Total Project Budget: \$ 556,100

Proposed Project Time Period for the Funding Requested: June 30, 2023 (3 yrs)

Summary:

The Minnesota Landscape Arboretum will continue vital conservation of Minnesota's sensitive native orchid species and implement a science-based curriculum for Minnesota grade schools leveraging this program's research and infrastructure.

Name: David Remucal

Sponsoring Organization: U of MN

Job Title: Dr.

Department: Minnesota Landscape Arboretum

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Location:

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

The visual shows a map of the counties covered by banking efforts of the NOCP through 2018, with a chart showing species coverage over the phases of the program. Also included are photos of material and demonstration that can be used for education portion of the proposal.

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



Environment and Natural Resources Trust Fund (ENRTF)

2020 Main Proposal

PROJECT TITLE: Preserving and Learning from Minnesota's Native Orchids

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I. PROJECT STATEMENT

Minnesota has 48 species of native orchids. This third phase of the University of Minnesota Landscape Arboretum (MLA) project will continue conservation of these important and endangered species by:

1. **Expanding banking, propagation and display** efforts by 15 species to a total of at least **40 species**.
2. **Expanding collection efforts of 25 Phase 1 and 2 species** at new locations to continue to diversify banked genetics beyond the baseline 3 populations per species.
3. Implementing a pilot curriculum to **bring orchids to 10 classrooms across MN** – teaching students the scientific method and appreciation for Minnesota's natural world, and interacting with MLA scientists.

Ten orchid species are on the Minnesota's List of Endangered, Threatened, and Special Concern Species and the number of species on this List is likely to increase in the near future. The Native Orchid Conservation Program (NOCP) at MLA was established in 2015, in large part due to ENRTF M.L. 2015 funding. Phases 1 and 2 of this program have been laying the groundwork to protect these jewels of Minnesota's flora by (a) creating a genetically diverse bank of seed and/or live plants for 25 species of orchid from across Minnesota and (b) researching propagation and cultivation methods for nearly two-thirds of the 48 species. Our efforts have been increasingly recognized and we are leveraging that recognition to diversify our financial support and collaborations. We have refined and advanced protocols for almost half of our species and now are able to share our findings with other researchers. Fungal symbionts are necessary for orchid survival in the wild and we have identified, propagated and banked root-based symbionts for MN orchids in partnership with the North American Orchid Conservation Center (NAOCC) and Dr. Jyotsna Sharma at Texas Tech University (TTU).

NOCP research and developments have led to the establishment of a near-comprehensive orchid conservation program. Our goal is to create a program that is equipped to preserve all Minnesota-native orchid species and has infrastructure to assist groups with local protection and restoration. A seed bank is not only a genetic ark for rare plants but a tool for conservation, education and research. To that end, NOCP is partnering with MLA's Education Department and the Smithsonian Environmental Research Center to implement a pilot curriculum that would bring orchid propagation science to grade school classrooms for hands-on learning. We will use NOCP's success to bring exciting and applicable scientific research and education to classrooms state-wide. In an increasingly digital age, it is critical to offer children opportunities to develop critical thinking skills and an ethic of responsibility for their world. These in-class greenhouse experiments will connect students to a fascinating part of their natural heritage. This experience will encourage some students to become future scientists, and enable all to make clear-eyed choices about the environment and their relationship to it as they grow.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Expand banking/preservation efforts to at least 40 species

Budget \$209,681

MLA will expand banking efforts to 40 species, continuing on the past success of the program. Seeds are banked at the MLA long-term seedbank; roots are sent to TTU for fungal identification and NAOCC for fungal banking. Staff will travel to multiple sites throughout the growing season to collect data, seeds and root samples.

Outcome	Completion Date
1. Finalize list of 15 target species and sites for banking efforts	December 2020
2. Complete root sampling for fungal-associate banking for at least 40 orchid species.	June 2023
3. Complete seed bank collection from 3 populations for each of the 15 Phase 3 species.	June 2023
4. Increase range coverage for Phase 1 and 2 species, banking from edge-of-range.	June 2023



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Activity 2: Continue propagation and cultivation research

Budget \$181,098

Propagation lab and greenhouse work will increase to encompass all 48 of Minnesota's native orchid species. In addition, MLA staff will extract and propagate orchid root fungal species and will begin using these fungi for both propagation and establishment of orchids in pots/garden plots. As we refine techniques and propagation methods for each orchid species, we will also develop production-level protocols and infrastructure with the intention that for all species we will be able to produce sufficient material to be useful in reintroductions when requested by organizations such as MN DNR or The Nature Conservancy.

Outcome	Completion Date
1. Complete collection of seed from all 48 species for propagation purposes.	December 2020
2. Develop fungal extraction and inoculation techniques for 15 species of orchids.	June 2023
3. Develop and publish a propagation manual covering 20 of Minnesota's native orchids	June 2023

Activity 3: Develop educational research program for 7th grade science classrooms Budget \$165,321

To facilitate research-based science learning, we will place fluorescent light shelves with orchid seedlings in middle school classrooms. Trained teachers will oversee weekly data measurements taken by students - with programming on scientific method, plant anatomy, and critical thinking as well as introduce a conservation ethic, promoting interaction and appreciation of native plants, and fulfilling MN 7th Grade Life Science Standards related to Scientific Inquiry (7.1.1.1.2, 7.1.1.2.1, 7.1.1.2.2) and Natural Systems (7.4.2.1.3) in science curricula. Students from 23 classrooms over three years will interact with MLA scientists and other schools, including other schools around the country performing similar experiments, sharing and analyzing data together.

Outcome	Completion Date
1. Host a training session with Smithsonian staff for selected Twin Cities metro area participating teachers/schools. (3 schools)	Summer 2020
2. Establish programs in each school, providing equipment, supplies and orchids.	Fall 2020
3. Evaluate first year with participating schools and teachers.	Summer 2021
4. Introduce programs to 10 schools (including outstate MN) and follow for two years.	Fall 2021

III. PROJECT PARTNERS AND COLLABORATORS: Minnesota Landscape Arboretum*; Dr. Jyotsna Sharma, and Texas Tech University; Smithsonian; North American Orchid Conservation Center. * receiving LCCMR funds

IV. LONG-TERM IMPLEMENTATION AND FUNDING: MLA remains committed to both the Plant Conservation Program and the Native Orchid Conservation Program and is developing independent funding to support banking and conservation research, with several organizations providing increasing grant money to fund research or production of orchids for restoration. A conservation seed bank such as the orchid seed bank at MLA is a long-term commitment and needs both staff and infrastructure support and MLA continues to provide both. Education is a core mission of MLA as such, connecting our conservation research to Minnesota schools is a vital part of this mission. Increasing a sense of stewardship and appreciation for the natural world in Minnesota's future scientists and leaders will be important for responsible management of all of the state's natural resources.

V. SEE ADDITIONAL PROPOSAL COMPONENTS: A. Proposal Budget Spreadsheet, B. Visual Component or Map, F. Project Manager Qualifications and Organization Description

Attachment A: Project Budget Spreadsheet
 Environment and Natural Resources Trust Fund
 M.L. 2020 Budget Spreadsheet

Legal Citation:

Project Manager: David Remucal

Project Title: Preserving and Learning from Minnesota's Native Orchids

Organization: University of Minnesota Landscape Arboretum

Project Budget: \$556,100

Project Length and Completion Date: 3 Year; June 30, 2023

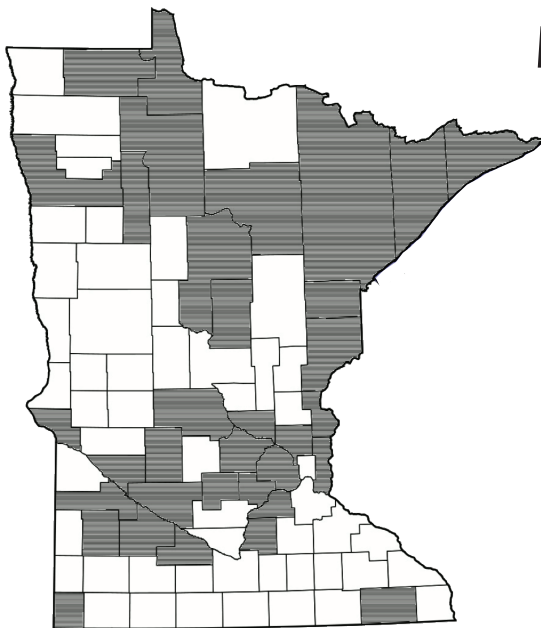
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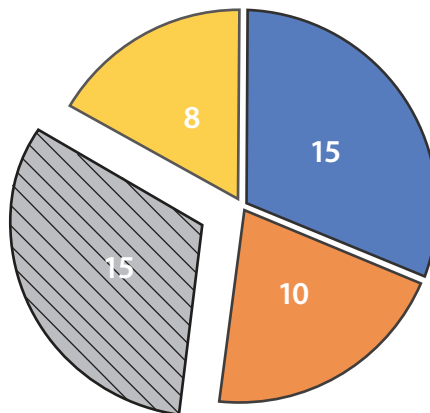
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET		Budget	Amount Spent	Balance
BUDGET ITEM				
Personnel (Wages and Benefits)		\$ 447,093	\$ -	\$ 447,093
Curator of Endangered Plants, Project Manager: \$215,389 (0.8 FTE and 36% fringe)				
Plant Conservation Program Associate: \$55,653 (0.3 FTE and 29.5% fringe)				
Field Technician: \$34,797 (0.26 FTE and 8.2% fringe) - knowledgeable regional naturalist for collection of seed from locations more generally remote				
Greenhouse/Plot Technician, Horticulture staff member: \$50,349 (0.31 FTE and 29.5% fringe)				
Student intern: \$20,255 (0.23 FTE and 8.2% fringe)				
School Orchid Research Project Evaluator, MLA Education Staff: \$10,044 (0.05 FTE and 29.5% fringe)				
School Orchid Research Project Coordinator, MLA Education Staff: \$60,606 (0.30 FTE and 29.5% fringe)				
Professional/Technical/Service Contracts				
Consultant: \$8,320 (8 days per year @ standard rate of \$1040/day) - Via UMN RFP bid process, hire environmental consultant with access to needed landscapes not easily accessed by MLA staff		\$ 8,320	\$ -	\$ 8,320
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 Texas Tech and NAOCC		\$ 5,000	\$ -	\$ 5,000
Greenhouse supplies: Including soil and lumber for garden bed maintenance, common garden construction, and shade structure construction, fertilizers, caging material		\$ 5,500	\$ -	\$ 5,500
Water deionization system - Purified water necessary for orchid propagation. Cost is for lease and maintenance of the system.		\$ 3,600	\$ -	\$ 3,600
Supplies for annual workshops for teachers		\$ 1,500	\$ -	\$ 1,500
Classroom propagation/research equipment (including shelving, lighting system, data collections equipment and safety equipment) - \$300 per classroom annually		\$ 6,900	\$ -	\$ 6,900
Capital Expenditures Over \$5,000				
Large capacity autoclave - we require a large-capacity autoclave to continue research and banking activities. This equipment will be used by the orchid program beyond the life of this granting period.		\$ 11,700	\$ -	\$ 11,700
Travel expenses in Minnesota				
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 UMN plan.		\$ 31,920	\$ -	\$ 31,920
Food and lodging for teachers that need to travel from outside of metro area to attend annual workshop - \$133/day X 6 days/year x 2 years. This assumes that 3 teachers on average per year will travel from far enough from the metro area to need to stay overnight prior to and after the workshop. Reimbursed based on University of Minnesota plan.		\$ 1,596		\$ 1,596
Mileage reimbursement for teachers traveling to attend annual workshop - .58 per mile x 250 miles per round trip at 3 round trips per yr x first year, then 10 round trips per year the final two years. Reimbursed based on UMN plan.		\$ 3,335	\$ -	\$ 3,335
Mileage reimbursement for seed and/or live plant collection trips - .58 per mile x 40 round trips per yr of 250 miles x 3 years. Reimbursed based on UMN plan.		\$ 17,400	\$ -	\$ 17,400
Mileage reimbursement for seed and/or live plant collection trips for consultant - .58 per mile x 5 round trips per yr of 250 miles x 1 year. Reimbursed based on UMN plan.		\$ 725	\$ -	\$ 725
Mileage reimbursement for Education staff to visit classrooms - 0.58 per mile FY21 - 3 local schools, 3 visits @ 50 miles/visit; FY22 and FY23 - 5 local schools, 3 visits @ 50 miles/visit and 5 Greater Minnesota schools, 3 visits @ 200 miles/visit		\$ 4,611	\$ -	\$ 4,611
Other				
Modest \$250 stipend for teachers to attend annual orchid research workshop with cohort of teachers. Teachers will be creating project schedules and lesson plans to fit their systems during the workshop and will be sharing these plans to further refine and improve the general curriculum.		\$ 6,900	\$ -	\$ 6,900
COLUMN TOTAL		\$ 556,100	\$ -	\$ 556,100
SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT				
	Status (secured or pending)	Budget	Spent	Balance
Non-State:		\$ 57,200		\$ 57,200
Several grant funding sources, including: Mid-American Orchid Congress, Stanley Smith Horticultural Trust, Jane Musser Fund, Taiwanese Orchid Growers Association		\$ 57,200		
State:		\$ -	\$ -	\$ -
In kind:		\$ 430,973	\$ -	\$ 430,973
Minnesota Landscape Arboretum 0.05 FTE Development Officer	Secured	\$ 24,000		
Minnesota Landscape Arboretum/UM Indirect Cost (at UM negotiated rate)	Secured	\$ 293,973		
Texas Tech University collaborator salary, equipment and travel	Pending	\$ 33,000		
North American Orchid Conservation Center collaborator salary, equipment, infrastructure	Pending	\$ 33,000		
MLA volunteer time contributing to project	Secured	\$ 47,000		
Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS				
	Amount legally obligated but not yet spent	Budget	Spent	Balance
M.L. 2015, Chp. 76, Sec.2 Subd. 08c "Preserving and Protecting Minnesota Native Orchid Species"		\$ 167,000	\$ 155,999	\$ 11,001
M.L. 2018, Chp. 214, Art. 4, Sec. 02, Subd. 08h "Preserving Minnesota's Native Orchids - Phase 2 "		\$ 208,540	\$ 259,000	\$ 50,460
			\$ 50,460	\$ 208,540

Preserving and Learning from Minnesota's Native Orchids

MLA Orchid Banking Progress



Counties (shaded) from which orchid populations have been banked through the 2018 field season of Phases 1 and 2



- Phase 1 species banked (2015-2018)
- Phase 2 species banked (2018-2020)
- Phase 3 species to be banked (2020-2023)
- Phase 4 species to be banked (2023-)

MLA Orchids in the Classroom



**Tuberous grass-pink
in flower**



**Tuberous grass-pink seedlings
fresh from the lab**



**Typical classroom
orchid set up**

**One of the orchids that will be used in orchid-centered
curriculum that includes classroom and laboratory exploration**

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.