# Environment and Natural Resources Trust Fund

2021 Request for Proposal

## General Information

**Proposal ID:** 2021-006

**Proposal Title:** Promoting Minnesota Conservation through Classroom Plant Science Research

## Project Manager Information

**Name:** David Remucal

**Organization:** U of MN - Landscape Arboretum

**Office Telephone:** (612) 301-1838

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## Project Basic Information

**Project Summary:** We will bring leading-edge biological conservation research into diverse grade school classrooms, allowing students to collect and analyze data, share results, and collaborate directly with professional researchers and other schools.

**Funds Requested:** $480,000

**Proposed Project Completion:** 2024-06-30

**LCCMR Funding Category:** Environmental Education (C)

## Project Location

**What is the best scale for describing where your work will take place?**

Statewide

**What is the best scale to describe the area impacted by your work?**

Statewide

**When will the work impact occur?**

During the Project and In the Future

## Narrative

**Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.**

An increasing number of plant and animal species are becoming endangered, and fewer people are pursuing botany and ecology degrees as well as careers in science, natural resources and environmental advocacy necessary to study and preserve these species. There is an urgent need to educate and develop citizens with a conservation ethic and direct hands-on experiences and knowledge from working with native plants and landscapes. Engaging a diversity of students across Minnesota's socioeconomic spectrum with authentic plant science experiences is an important strategy to address this problem. Grade school science experiments are not often considered true research; students are walked through experiments with known outcomes, often only inspiring those students who are already science-minded. To engage and inspire more students, we must have students perform innovative, authentic research – addressing questions with no known answers, where they interact with other student scientists doing similar work and can be mentored by established scientists working in their fields of study. We can expand the science-based conservation ethic of students and communities across Minnesota with authentic conservation research experiences, challenging student scientists to collect, analyze, share results, confront potentially inconclusive outcomes or opportunities for further study and propose future research questions.

**What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.**

The Native Orchid Conservation Program at the University of Minnesota Landscape Arboretum (UMLA) has a growing and nationally recognized program in native orchid research and conservation. In the pilot Project Orchid program, under the guidance of UMLA conservation researchers and education staff, students grow native orchids and collect data in their classrooms, seeking answers to real-time discovery research questions. Funding from LCCMR will support expansion of the program across the state, and allow students to interact with UMLA staff and other classrooms so they can compare their results and share ideas for future conservation research. They will also interact with students participating in similar programs based at the Smithsonian Environmental Research Center in Maryland and Fairchild Tropical Botanic Garden in Florida. Project Orchid will connect grade school students across Minnesota with vital botanical research being conducted in their state and region, highlighting important local environmental connections while inspiring students and positively impacting the wider natural world. This partnership is designed to 1) give students the confidence to implement scientific inquiry, 2) provide access to real-time research for local plant species, and 3) demonstrate how their work can make a difference in today's research and conservation of native plants.

**What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?**

1. Engage 24 classrooms by the end of the granting period. These classrooms will all be immersing students in research and curricula that will focus on protection, conservation and preservation of Minnesota's native flora.
2. Bring a scientifically-based conservation ethic to classrooms across the state, addressing schools in metro, suburban and rural locations, across the full spectrum of school resource availability. Specifically, classrooms reaching different economic and cultural backgrounds will be engaged (for example, diverse metro schools and tribal schools will be actively recruited).

## Activities and Milestones

### Activity 1: Implement Project Orchid in the classroom, bringing Minnesota conservation and cutting-edge research to 24 diverse classrooms across the state

**Activity Budget:** $212,000

**Activity Description:**
To facilitate research-based science learning, trained teachers, with assistance from UMLA research and education staff, will oversee the setup of classroom experiments, weekly data measurements taken by students, and results analysis. Students will engage in all aspects of this process, from setup and planting to final analyses and data sharing. Project Orchid offers a growing library of resources relating to conservation strategies, botany, ecology, and Minnesota habitats that will allow individual classrooms to customize and enhance their understanding of data collection, analyses, and processes for determining viability of results and future research pathways. Project Orchid classroom research will expose student scientists to authentic experiences in each of the four strands identified in the 2019 MN State Academic Standards for Science. This comprehensive research experience covers the experiment itself and the analysis and sharing of data as well as the students' communication of results to communities and other students. Expanding to 24 classrooms over 3 years, Project Orchid will reach 2,400 Minnesota students in both rural and metro area schools. Students will interact, in person and through technology, with UMLA research scientists and other schools around the state and country performing similar experiments, sharing and analyzing data together.

**Activity Milestones:**

| Description | Completion Date |
|---|---|
| Implement Project Orchid participation in 10 classrooms, providing equipment and training to teachers. | 2021-11-30 |
| Increase participation of classes to 18, again providing equipment and training to teachers at new locations. | 2022-11-30 |
| Increase participation of classes to 24, again providing equipment and training to teachers at new locations. | 2023-11-30 |

### Activity 2: Hold workshop for teacher training and annual evaluation of program and curriculum.

**Activity Budget:** $58,000

**Activity Description:**
Convene teachers at an annual workshop at UMLA to discuss further curricula refinement, classroom engagement improvements, and identify species and research questions to be further addressed. Teachers already engaged in the program will assist in leading discussions to onboard new teachers. All teachers will work with UMLA staff to learn about orchid biology, plant ecology and Minnesota landscapes. Experienced teachers and UMLA staff will lead evaluations and develop continued improvements to the Project Orchid curriculum, expanding its application to additional grade levels and school resource levels.

**Activity Milestones:**

| Description | Completion Date |
|---|---|
| Organize and host annual teacher workshop. | 2021-08-31 |
| Organize and host annual teacher workshop. | 2022-08-31 |
| Organize and host annual teacher workshop. | 2023-08-31 |

## Activity 3: Host annual student symposium to bring together diverse classrooms in a meaningful, professional-style scientific conference setting.

**Activity Budget:** $139,000

**Activity Description:**
Convene students at an annual student symposium at the end of each school year to present their results in a scientific conference and interact with each other and plant science professionals. Parents will be encouraged to attend to see the results of their children's work. Similar to a professional scientific conference, students will have the opportunity to participate in poster sessions or through presentations. There may also be opportunities to send students to a national orchid research conference hosted by UMLA, Smithsonian Environmental Research Center or Fairchild Tropical Botanic Garden.

**Activity Milestones:**

| Description | Completion Date |
|---|---|
| Organize gathering of students and teachers in a professional-style conference for school year 2021-2022. | 2022-06-30 |
| Organize gathering of students and teachers in a professional-style conference for school year 2022-2023. | 2023-06-30 |
| Organize gathering of students and teachers in a professional-style conference for school year 2023-2024. | 2024-06-30 |

## Activity 4: Collect and produce ecologically appropriate native orchids relevant to each classroom's geography

**Activity Budget:** $71,000

**Activity Description:**
Grow native orchids for classroom projects and expand curricula as well as the suite of species for additional regions of the state. Background research will be carried out to establish classroom research questions. Some travel will be required as the program grows, with efforts made to bring regionally appropriate plant materials to schools (i.e. for a Duluth school, seedlings will be brought to a classroom from seed collected within 20 miles of Duluth). This will allow each class to plant their orchids in local protected natural areas, parks, or botanic gardens at the end of each semester.

**Activity Milestones:**

| Description | Completion Date |
|---|---|
| Collect seed and begin propagation of plant material one year prior to classroom experiments. | 2021-09-30 |
| Collect seed and begin propagation of plant material one year prior to classroom experiments. | 2022-09-30 |
| Collect seed and begin propagation of plant material one year prior to classroom experiments. | 2023-09-30 |

## Project Partners and Collaborators

| Name | Organization | Role | Receiving Funds |
|---|---|---|---|
| Million Orchids Project | Fairchild Tropical Botanic Garden | Exchange and share parallel expansion of curricula. Support and exchange of ideas relating to program development of logistics and management. Coordination of their program's students/classrooms in interactions with Project Orchid students/classrooms. | No |
| Orchids in the Classroom | Smithsonian Environmental Research Center | Exchange and share parallel expansion of curricula. Support and exchange of ideas relating to program development of logistics and management. Coordination of their program's students/classrooms in interactions with Project Orchid students/classrooms. | No |

## Long-Term Implementation and Funding

**Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this be funded?**

UMLA is committed to the Project Orchid model and its expansion as it uniquely combines vital research with conservation and education programming. The experience and success of Project Orchid will continue to be leveraged for diversified funding and will continue as funding is available. It will be funded and supported similar to other UMLA programs – through a combination of volunteer work, fundraising, earned income, and endowment support. In other words, external funding sources (grants, individual giving, corporate support) will continue to be pursued to sustain and grow this program.

## Other ENRTF Appropriations Awarded in the Last Six Years

| Name | Appropriation | Amount Awarded |
|---|---|---|
| Preserving and Protecting Minnesota Native Orchid Species | M.L. 2015, Chp. 76, Sec. 2, Subd. 08c | $167,000 |
| Preserving Minnesota's Native Orchids - Phase 2 | M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 08h | $259,000 |

## Project Manager and Organization Qualifications

**Project Manager Name:** David Remucal

**Job Title:** Curator of Endangered Plants

**Provide description of the project manager's qualifications to manage the proposed project.**

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. A graduate of Carleton College, he received his PhD in plant reproductive ecology and evolution from the University of Colorado. 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. As part of outreach and education for the program, he teaches and presents to multiple groups every year and works to reach a broad audience around the state. The Plant Conservation Program strives to work with a broad coalition of partners for its work, engaging with regional NGOs, federal, state and local governmental agencies and researchers and groups nationally and internationally-based. Remucal and the Plant Conservation Program has parlayed two previous LCCMR grants into a nationally-recognized orchid research and conservation program.

**Organization:** U of MN - Landscape Arboretum

**Organization Description:**
The U of MN Landscape Arboretum, founded in 1958, is a 1,200-acre premier northern garden that includes 28 specialty gardens, 45 plant and tree collections, 18 model landscapes and natural areas, and an extensive collection of northern hardy plants. Located 35 minutes west of Minneapolis-St. Paul, the Arboretum's 12.5 miles of garden paths and hiking trails welcome 500,000 visitors each year who are inspired by their explorations of nature, the many seasonal displays and exhibits, and hands-on educational programming. The Arboretum's mission is to welcome, inform and inspire all through outstanding displays, protected natural areas, horticultural research and education. Its vision is to be the premier northern landscape arboretum, welcoming all to enjoy, learn from and connect with nature.

The U of MN Landscape Arboretum was born out of the University of Minnesota's Horticultural Research Center and is an established, nationally recognized research institution that includes a Plant Conservation Program focused on developing and implementing conservation strategies for imperiled native plants of the upper Midwest region.

## Budget Summary

| Category / Name | Subcategory or Type | Description | Purpose | Gen. Ineligible | % Benefits | # FTE | Classified Staff? | $ Amount |
|---|---|---|---|---|---|---|---|---|
| **Personnel** | | | | | | | | |
| Curator of Endangered Plants | | Principal Investigator and Project Coordinator - work with students, develop research question directions, manage plant material development and selection for classrooms, and collect necessary seeds | | | 26.7% | 0.6 | | $56,000 |
| Project Orchid Manager | | Central point person for Project Orchid - Manage and coordinate implementation and expansion of Project Orchid with classrooms and UMLA staff, assist in prep of classroom plant material, including collection of necessary seeds | | | 24.1% | 3 | | $190,000 |
| Plant Conservation Program Botanist | | Help refine curricula and work with individual classrooms and students, and collect necessary seeds for propagation material | | | 24.1% | 0.6 | | $43,500 |
| UMLA Greenhouse Technician | | Manage plant propagation and production for all Project Orchid classrooms, work with students as needed | | | 24.1% | 0.3 | | $15,000 |
| UMLA Education Staff | | Work with program manager and classrooms to ensure MN science standards are being addressed, assist in development of new program participants | | | 26.7% | 0.3 | | $36,000 |
| | | | | | | | **Sub Total** | **$340,500** |
| **Contracts and Services** | | | | | | | | |
| | | | | | | | **Sub Total** | **-** |
| **Equipment, Tools, and Supplies** | | | | | | | | |
| | Equipment | Classroom greenhouse setup - for 28 classrooms | Light shelf/greenhouse setups used by classrooms to perform Project Orchid research. Each setup includes growing material as well as equipment to collect data. 28 classroom setups are going to be provided in anticipation of losing a few classrooms over the course of the | | | | | $13,000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | granting period and recruiting replacement classrooms. | | | | | |
| | Tools and Supplies | Field, lab and greenhouse supplies to propagate classroom material | Supplies needed at UMLA for orchid seed collection and propagation in support of classroom experiments. | | | | | $6,000 |
| | | | | | | | **Sub Total** | **$19,000** |
| **Capital Expenditures** | | | | | | | | |
| | | | | | | | **Sub Total** | **-** |
| **Acquisitions and Stewardship** | | | | | | | | |
| | | | | | | | **Sub Total** | **-** |
| **Travel In Minnesota** | | | | | | | | |
| | Miles/ Meals/ Lodging | UMLA staff travel to classrooms. Mileage estimated based on 2020 UM mileage reimbursement rate of $0.575/mi. Assuming 5 trips to each classroom on average and travel to sites all around the state can be averaged to 150 miles roundtrip. | Regular travel for UMLA staff (Program Coordinator and Plant Conservation staff and Education staff) to classrooms to engage with students and teachers in person. | | | | | $22,500 |
| | Miles/ Meals/ Lodging | Bus transportation - and average of $850/roundtrip. For participation 10 schools in 2022, 18 schools in 2023 and 24 schools in 2024 | Travel for students for annual symposium at UMLA (or potential other location) | | | | | $45,000 |
| | Miles/ Meals/ Lodging | Mileage for one UMLA staff who will travel to collect locally appropriate seed material for propagation for each classroom, with remaining seed placed in UMLA long-term seedbank. Mileage estimated based on 2020 UM mileage reimbursement rate of $0.575/mi. Average of 150 miles roundtrip, and an estimated half of schools each year will need seed we can not already provide. | Travel is needed to collect seed for material for participating Project Orchid Classrooms. | | | | | $2,500 |
| | Miles/ Meals/ Lodging | Lodging and per diem for one UMLA staff who will travel to collect locally appropriate seed material for propagation for each classroom, with remaining seed placed in UMLA long-term seedbank. Estimated that about 1/3 of all trips each year will require overnight stay (3 in 2021, 6 in 2022 and 8 in 2023) | Travel is needed to collect seed for material for participating Project Orchid Classrooms. | | | | | $2,500 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | **Sub Total** | **$72,500** |
| **Travel Outside Minnesota** | | | | | | | | |
| | | | | | | | **Sub Total** | **-** |
| **Printing and Publication** | | | | | | | | |
| | | | | | | | **Sub Total** | **-** |
| **Other Expenses** | | | | | | | | |
| | | Stipend for teachers for annual workshop, the stipend will average $60 for each teacher. The expectation is that over the three years one teacher will represent each participating classroom for a total of 52 teachers over the 3 years. | Stipend is to help enable teachers to attend the annual workshop. Returning teachers can learn new skills, help review and enhance curricula, and share experiences with each other and with teachers new to Project Orchid. | | | | | $3,000 |
| | | Conference expenses for the annual student symposium, these include venue rental, food, scholarships for students to attend, and a stipend for potential chaperones if needed. The expectation is that over the three years 16 students will represent each participating classroom for a total of 832 students over the 3 years. | Conference expenses are necessary to host the annual symposium and to ensure that all students, regardless of their economic situation, would be able to attend. | | | | | $45,000 |
| | | | | | | | **Sub Total** | **$48,000** |
| | | | | | | | **Grand Total** | **$480,000** |

## Classified Staff or Generally Ineligible Expenses

| Category/Name | Subcategory or Type | Description | Justification Ineligible Expense or Classified Staff Request |
|---|---|---|---|

## Non ENRTF Funds

| Category | Specific Source | Use | Status | Amount |
|---|---|---|---|---|
| **State** | | | | |
| | | | **State Sub Total** | **-** |
| **Non-State** | | | | |
| Cash | MnDRIVE/NorthStar STEM Alliance Summer Research Internship Program | Research interns would assist in orchid research, especially in seed collection and fungal propagation. This would directly impact classroom material and research questions available for Project Orchid. | Potential | $12,000 |
| Cash | The Fred C. Gloeckner Foundation, Inc. | Would provide money for research specifically into fungal associates for orchids. This research will provide fungal material and many possible research questions for classrooms to tackle in Project Orchid. | Pending | $10,000 |
| Cash | U of MN Office of the Vice President for Research Bridge Funding | Provide funding for collection and propagation of orchid and fungi material, all of which can be used in Project Orchid classroom experiments. | Potential | $50,000 |
| Cash | Arboretum Foundation - Gala Fund-A-Need | Money would fund orchid propagation and seed banking operations and provide another vehicle as well as allow us to continue Project Orchid until LCCMR funding begins. | Pending | $120,000 |
| | | | **Non State Sub Total** | **$192,000** |
| | | | **Funds Total** | **$192,000** |

## Attachments

### Required Attachments

*Visual Component*

File: dfe65638-361.pdf

*Alternate Text for Visual Component*

Graphic depiction of four proposed activities, photographs of young orchids and Project Orchid students measuring and planting orchids in pots. Icon representations of classrooms learning about orchids and exchanging ideas and information between other Project Orchid classrooms, as well as teachers attending annual workshops and students attending annual symposium.

### Optional Attachments

*Support Letter or Other*

| Title | File |
|---|---|
| Letter of Support from the North American Orchid Conservation Center | 9cf8ea0a-09d.pdf |
| Letter of Support from Orchids in the Classroom/Smithsonian Environmental Research Center | 68075312-d6d.pdf |

## Administrative Use

**Does your project include restoration or acquisition of land rights?**

No

**Does your project have patent, royalties, or revenue potential?**

No

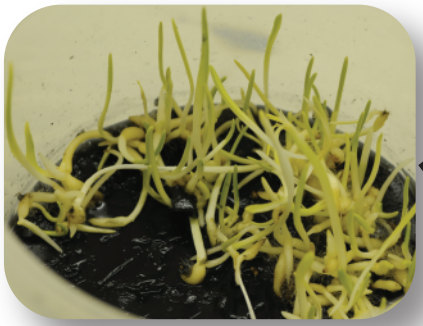
**Does your project include research?**

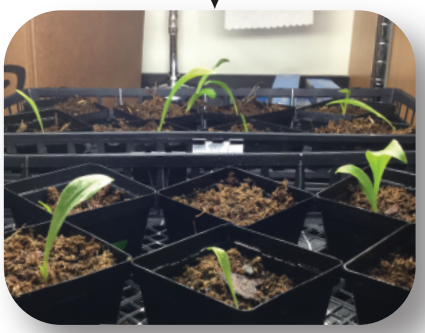
No

**Does the organization have a fiscal agent for this project?**

Yes, Sponsored Projects Administration

# Promoting Minnesota Conservation through Classroom Plant Science Research

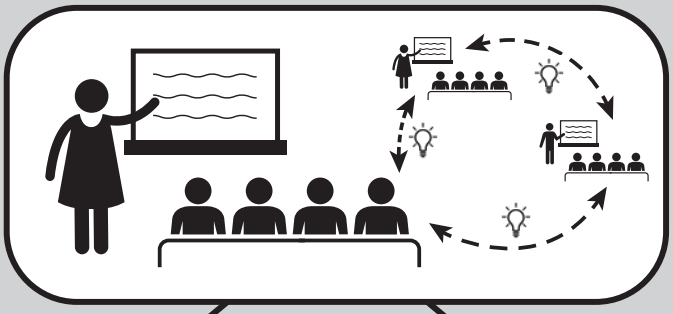




Photos by Kris Swartchick

Grow ecologically appropriate native orchids for each classroom

## *Project Orchid Classroom*

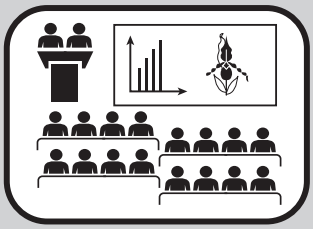


- Set up experiment in 24 diverse classrooms around the state
- Record, share and analyze data
- Prepare to communicate results

## *Teacher Workshop*

- Orchid conservation basics
- Project overview
- Materials, curriculum and timeline

## *Student Symposium*



- Share research findings with other student scientists
- Propose ideas for new/next research questions
- Share learning with community

PLANT CONSERVATION PROGRAM
AT THE MINNESOTA LANDSCAPE ARBORETUM

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