Environment and Natural Resources Trust Fund
2015 Request for Proposals (RFP)

Project Title: **ENRTF ID: 119-F**

Preserving and Protecting Minnesota's 48 Native Orchid Species

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

Total Project Budget: $ 167,700

Proposed Project Time Period for the Funding Requested: 3 years, July 2015 - June 2018

Summary:

Many of Minnesota's 48 native orchids are at risk. This new program's initial phase will contribute to the long-term conservation of 15 selected species in need of research and propagation.

Name: David Remucal

Sponsoring Organization: U of MN - Landscape Arboretum

Address: 3675 Arboretum Dr

Chaska MN 55318

Telephone Number: (952) 443-1418

Email lnitabac@umn.edu

Web Address www.arboretum.umn.edu

Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Listing of the 48 native orchid species found in wetlands, upland woodland, and prairies of Minnesota with photos representing an orchid from each ecosystem.

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

PROJECT TITLE: Preserving and Protecting Minnesota's 48 Native Orchid Species

I. PROJECT STATEMENT

There are roughly 200 species of orchids native to the continental United States and Minnesota has nearly a quarter of those species. With ten of Minnesota's 48 native orchid species already listed on Minnesota's List of Endangered, Threatened, and Special Concern Species, it is imperative to invest in the long-term preservation of this group of plants that can be found in every ecosystem type in the state including native forest, wetlands, and prairie. Orchids often have many specialized growing requirements, potentially making them vulnerable to changes in the local environment. Laboratory research on basic orchid biology and observation of introduced populations is essential to comprehending how they are likely to respond to environmental changes. With this understanding it could be possible to develop new ways to detect early declines in Minnesota's ecosystems.

The goal of this program is to preserve Minnesota's native orchid diversity. The Arboretum is deeply committed to preserving and protecting Minnesota's threatened and endangered plants and it currently houses a collection of seven native orchid species, some of which have been acquired through rescue efforts throughout the state. The initial phase of this new program will involve two main activities: 1) collect and preserve seed and/or live plants from orchids throughout Minnesota and 2) research the propagation and cultivation of each species.

This native orchid conservation program at the Arboretum will introduce 320,000 visitors to these elusive plants and their important role in forewarning threats to Minnesota's ecosystems. The Arboretum is committed to making its information and resources accessible to all Minnesotans, and it is in that spirit that the Arboretum waived its entrance fees for visitors during January 2014. In addition, admission is free on Thursdays from November – March and then from April – October admission is free the third Thursdays of the month after 4:30.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Collect and preserve seed and/or live plants from orchids throughout MN **Budget: $88,908**

The first phase of this new initiative will involve collecting seeds and/or live plants from a total of fifteen native orchid species, representing nearly a third of the 48 known species in Minnesota. Samples will be collected from as many individual specimens as possible to obtain a representation of several populations that span a large area of each species' range. Permits for collection of listed species will be obtained from the Minnesota Department of Natural Resources. Other permits for non-listed orchids will be properly obtained under Minnesota Statutes 2010, Chapter 18H.18. When live plants are collected, either an appropriate garden location at the Arboretum will be used to house them, or they will be grown in appropriately controlled environments. When populations or colonies are established on Arboretum grounds regular demographic monitoring will be performed in conjunction with monitoring of environmental factors such as soil moisture and temperature to analyze changes. As the program grows and species are brought to the Arboretum, it will be vital to engage the public –to educate them on the importance of native orchid conservation. Education efforts will happen in collaboration with the statewide Master Gardeners Program, which is now located at the Arboretum. Some of the current plant populations at the Arboretum come from rescue/salvage operations at construction sites. The Arboretum would be prepared for future opportunities permitted by the Minnesota Department of Natural Resources to rescue native orchid populations.

Outcome	Completion Date
1. Finalized list of phase one species, with collection begun from as many of these species as possible.	12/31/2015

2. Collection of samples from 7 species, with a goal of three populations per species	12/31/2016
3. Establish demographic database to manage data collected for populations within the Arboretum.	12/31/2016
4. Public will have access to labeled species and a printed and online version of a "Visitors Guide to Minnesota Orchids" on display at various locations on Arboretum grounds.	6/1/2017
5. Collection of remaining 8 species and populations to meet proposed goal of 15 species.	6/30/2018

Activity 2: Propagation and cultivation research **Budget: $78,792**

Develop an understanding of how to best grow each native orchid species. There are methods of growing orchids from seed that can be done in soils or laboratory environments that either include fungal associates or do not. It will be important to assess which methods produce the best, most reproducible results and which environmental factors are vital for seedlings and adults. There is research already underway for some of these native orchid species and building collaborations with other researchers to promote effective sharing of our results and to avoid duplication of effort.

Outcome	**Completion Date**
1. Evaluation of varied methods of orchid seed germination and cultivation for each species. These evaluations to include both laboratory and soil methods.	12/31/2017
2. Arboretum convenes meeting of researchers and other interested groups such as the Orchid Society of Minnesota in field to share emerging results and best practices	Spring 2018

III. PROJECT STRATEGY

A. Project Team/Partners

The project team will be lead by Dr. David Remucal the Arboretum's Curator for Endangered Plants who received his PhD in Environmental, Population and Organismic Biology from the University of Colorado and his B.A. in Biology from Carlton College. Dr. Remucal has worked as a scientist for the USDA Agricultural Research Service in Fort Collins, CO; as a vegetation ecologist for the Navajo Natural Heritage Program and as an instructor and interpretation specialist at the Denver Botanic Garden. At the Arboretum, Dr. Remucal will oversee the Arboretum's seed bank and the monitoring and propagation of imperiled native plants. Partner (not budgeted for E NRTF): Minnesota Department of Natural Resources.

B. Project Impact and Long-Term Strategy

This project will launch a long-term native orchid conservation program at the Minnesota Landscape Arboretum that is central to its larger efforts to monitor and protect all endangered plants in the Upper Midwest. The Arboretum has already established a collection of 13 plant species that are endangered, threatened or of special concern. Once established, this native orchid program will be a cornerstone of the Arboretum's larger Plant Conservation Program and will be a regional leader for native plant research and conservation. Given the rapid and continued modification of native landscapes in the region and the probable sensitivity of orchids to environmental change, a native orchid conservation program is a vital part of any effort to preserve Minnesota's native species, both plant and animal.

C. Timeline Requirements

This project will require three years or 36 months to implement as orchids grow very slowly. Conservation work will require the collection, storage, management, and propagation of a large diversity of seeds and genetic samples for each species as well as building the capacity and knowledge to potentially restore plants to appropriate locations across the state when requested in the future.

2015 Detailed Project Budget

Project Title: Preserving and Protecting Minnesota's 48 Native Orchid Species

IV. TOTAL ENRTF REQUEST BUDGET 3 years

BUDGET ITEM	AMOUNT	
Personnel:	$	118,115
1) Curator for Endangered Plants, David Remucal (.50 FTE): salary - $79,646, benefits - $11,349 over 3 yrs from 7/1/15 - 6/30/18. This role represents additional time not included in Dr. Remucal's current 14 hours a week. 2) Two Student interns (full time during 10 weeks of summer for 3 yrs @ $10/hr): salary - $24,000, benefits - $3,120		
Equipment/Tools/Supplies:	$	24,500
1) Incubator (Need an incubator that is to be used exclusively for orchid preservation because of specialized growing requirements. This incubator will come equipped with a programmable light and humidity control that is vital for orchid propagation work. Asymbiotic orchid propagation needs to be done in a controlled environment and can't be done in soil in a greenhouse) - $12,000 2) Lab supplies (includes supplies for growth media) - $3,500 3) Water distillation 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.) - $9,000		
Travel:	$	25,085
1) Food & lodging (for trips greater than 200 miles round trip): $133/day x 15 days per yr. x 3 yrs. X 3 people per trip - $17,955. For collection of native orchid seeds and plant material in Greater Minnesota. Reimbursed based on University of Minnesota Plan. 2) Mileage reimbursement: .56 per x 15 trips per yr. x 3 yrs. - $6,300 for collection of native orchid seeds and plant material. Reimbursed based on University of Minnesota Plan.		
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$	167,700

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ To Be Applied To Project During Project Period: *Arboretum personnel will be provided in-kind including: Director of Operations (.05 FTE) for supervision of Curator of Endangered Plants ($8,911), Arboretum Curator (100 hours) for production and placement of plant labels ($4,620). In addition the Arboretum is actively fundraising from private philanthropic sources to support this work.*	$ 13,531	*Secured*
Other State $ To Be Applied To Project During Project Period:	NA	
In-kind Services To Be Applied To Project During Project Period:	NA	
Funding History: Land Acquisition: M.L. 2013, Chp. 52, Sec. 2, Subd. 4(e), $2,000,000; M.L. 2005, Chp. 1, Sec. 11, Subd. 06(06p), $650,000; M.L. 2003, Chp. 128, Sec. 9, Subd. 06(06l), $350,000; M.L. 2001, Chp. 2, Sec. 14, Subd. 05(05h), $730,000; M.L. 1999, Chp. 231, Sec. 16, Subd. 13(13g), $700,000; M.L. 1997, Chp. 216, Sec. 15, Subd. 16(16b), $450,000; M.L. 1995, Chp. 220, Sec. 19, 20, and 21, Subd. 8(08h) $680,000.	$ 3,560,000	
Remaining $ From Current ENRTF Appropriation: *$615,000 for Pollinator Education Center at the Minnesota Landscape Arboretum. Still to be legally obligated, Peter Moe, Arboretum Director of Operations is the Project Manager.*	$ 615,000	*Pending appropriation by legislature*

Preserving and Protecting Minnesota's 48 Native Orchid Species

Wetlands

Amerochis rotundifolia (round-leaved orchid)
Arethusa bulbosa (dragon's-mouth)
Calopogon tuberosus var. *tuberosus* (tuberous grass-pink)
Calypso bulbosa var. *americana* (fairy-slipper)
Corallorhiza trifida (early coral-root)
Cypripedium acaule (stemless lady's-slipper) Arb
Cypripedium arietinum (ram's-head lady's-slipper) * *Arb*
Cypripedium parviflorum var. *makasin* (northern small yellow lady's-slipper) Arb
Cypripedium reginae (showy lady's-slipper) Arb

Goodyera repens (lesser rattlesnake-plantain)
Liparis loeselii (Loesel's twayblade)
Listera convallarioides (broad-leaved twayblade) *
Listera cordata (heart-leaved twayblade)
Malaxis monophyllos var. *brachypoda* (white adder's-mouth) *
Malaxis paludosa (bog adder's-mouth) *
Malaxis unifolia (green adder's-mouth)
Platanthera aquilonis (northern green bog-orchid)
Platanthera clavellata (small green bog-orchid) *
Platanthera dilatata var. *dilatata* (tall white bog-orchid)
Platanthera huronensis (tall green bog-orchid)
Platanthera lacera (ragged fringed orchid)
Platanthera obtusata ssp. *obtusata* (bluntleaved rein-orchid)
Platanthera orbiculata (lesser roundleaved orchid)
Platanthera psycodes (small purple fringed orchid) Arb
Pogonia ophioglossoides (rose pogonia)
Spiranthes cernua (nodding ladies'-tresses)
Spiranthes romanzoffiana (hooded ladies'-tresses)

Wetland species: *Cypripedium arietinum* (ram's-head lady's-slipper) * Arb. Image: Christopher Noll, Friends of the Eloise Butler Wildflower Garden

Upland woodland

Aplectrum hyemala (putty-root) Arb
Coeloglossum viride (long-bracted orchid)
Corallorhiza maculata var *maculata* (spotted coral-root)
Corallorhiza maculata var. *occidentalis* (western spotted coral-root)
Corallorhiza odontorhiza var *odontorhiza* (autumn coral-root)
Corallorhiza striata var. *striata* (striped coral-root)
Cypripedium parviflorum var. *pubescens* (large yellow lady's-slipper) Arb
Galearis spectabilis (showy orchis)
Goodyera pubescens (downy rattlesnake-plantain)
Goodyera tesselata (tesselated rattlesnake-plantain)
Liparis liliifolia (lily-leaved twayblade)
Listera auriculata (auricled twayblade) *
Platanthera hookeri (Hooker's orchid)
Spiranthes casei var. *casei* (Case's ladies'-tresses) *
Spiranthes lacera var. *lacera* (northern slender ladies'-tresses)

Upland Woodland species: *Cypripedium parviflorum var. pubescens* (large yellow lady's-slipper) Arb. Image: Thomas G. Barnes @ USDA-NRCS PLANTS Database

Prairie

Calopogon oklahomensis (Oklahoma grass-pink)
Cypripedium candidum (small white lady's-slipper) *
Platanthera flava var. *herbiola* (tubercled rein-orchid) *
Platanthera praeclara (western prairie fringed orchid) *
Spiranthes magnicamporum (Great Plains ladies'-tresses)
Spiranthes lacera var. *gracilis* (southern slender ladies'-tresses)

Prairie species: *Cypripedium candidum (small white lady's-slipper) *. Thomas G. Barnes @ USDA-NRCS PLANTS Database*

Notes: * refers to "a state-listed species"; Arb refers to "can be found at Minnesota Landscape Arboretum"

Project Manager Qualifications

David Remucal, Ph.D.
2001 PhD – Environmental, Population and Organismic Biology, University of Colorado, Boulder, CO
1993 BA – Biology, Carleton College, Northfield, MN

As the recently appointed Curator of Endangered Species with the Minnesota Landscape Arboretum, Dr. Remucal is developing the Minnesota Landscape Arboretum's Plant Conservation Program. The centerpiece of the program is its mission to manage a genetic long-term storage strategy for some of the species of the Center for Plant Conservation, a collaboration among about 40 of the United States' top botanic gardens and arboreta developed to conserve and protect the nations' most endangered plant species. In parallel with this storage responsibility is the need to perform research on the biology of these and other endangered plant species within a garden's regional area. Research on endangered species ranges from studying how best to grow plants; how long they last in storage; how a managed population differs from a wild population; how Arboretum populations compare to their source, wild populations; how native pollinators are important to each species; if populations are declining at Arboretum or in the wild; and how to maximize genetic diversity in storage and restoration projects. Of near equal importance to the research and conservation of these plants is the work to increase public education about endangered species. Prior work experience for Dr. Remucal includes ecological and botanical work for the Department of Agriculture's Agricultural Research Service, the Navajo Nation Natural Heritage Program and the Denver Botanic Garden. Dr. Remucal has been performing ecological research on plant reproduction and population dynamics for over twenty years in ecosystems ranging from tropical rainforest to arid canyon sand washes to alpine tundra and Minnesota wetlands.

Dr. Remucal will operate under the supervision of Peter Moe who has been the Director of Operations and Research at the Minnesota Landscape Arboretum since 1975.

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. It began as a research and education facility under the direction of Dr. Leon Snyder, head of the University of Minnesota's Department of Horticultural Science. 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 350,000 visitors and nearly 22,000 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.