

**Environment and Natural Resources Trust Fund**

# 2022 Request for Proposal

## **General Information**

**Proposal ID:** 2022-048

**Proposal Title:** Enhancing Natural Resource Conservation Through Species Distribution Modeling

## **Project Manager Information**

**Name:** Fred Harris

**Organization:** MN DNR - Ecological and Water Resources Division

**Office Telephone:** (507) 403-2834

**Email:** fred.harris@state.mn.us

## **Project Basic Information**

**Project Summary:** Create Species Distribution Models (SDMs) for rare species in Minnesota to provide new tools for natural areas conservation and rare species surveys.

**Funds Requested:** $200,000

**Proposed Project Completion:** June 30 2025

**LCCMR Funding Category:** Small Projects (H) **Secondary Category:** Foundational Natural Resource Data and Information (A)

## **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.**

To help conserve Minnesota’s native flora and fauna, conservation planners, environmental impact reviewers, land managers and landowners have to know where the plants and animals are—especially rare species that are in danger of vanishing from the state.

DNR biologists have been conducting field surveys to document where rare species remain in Minnesota. Yet, our information is incomplete. First, we cannot get to all potential locations for every species, and second, we do not have good information for many species on the extent of other unsearched locations where those species also likely reside. As a result:

1. For sites where rare species have not been surveyed, environmental review and conservation planners have no way of predicting the likelihood of a rare species being present, or of identifying other suitable habitat for a given rare species for mitigating environmental impacts.

2. Rare species field surveys can be hit-or-miss when surveyors are uncertain about how likely a species will occur in a given location – this makes surveys expensive and inefficient.

3. Public and private demand for DNR rare species data and expertise exceeds our staff capacities resulting in lost opportunities to protect biodiversity.

**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.**

This project will address the above issues by developing Species Distribution Models (SDMs) for Minnesota rare species. The project will use: (1) GIS modeling software to integrate known rare species locations with GIS data layers (e.g. LiDAR, climatology, soils, LandSat, and land-use data) to generate predictive habitat suitability maps for a given species, (2) test model predictions by conducting field surveys, and (3) refine the models’ predictive success by integrating the new field data back to the model. The final product will include a tested and refined process for modeling species distributions in Minnesota and data-driven maps that identify locations that have the highest likelihood of supporting a specific rare species in Minnesota. For projects undergoing environmental review that lack previous surveys, these maps will become one of the standard tools used for determining the likelihood of a rare species being present and for targeting field surveys.

**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?**

This project will:
1. Increase our ability to locate suitable habitat in decisions to require field surveys or mitigate environmental impacts in regulatory processes.
2. Increase precision in decisions, such as state listing decisions, by providing data-driven estimates of a species' viability, vulnerability and available suitable habitat.
3. Increase the sharing of knowledge about rare species distributions and habitats by synthesizing an immense amount of subject matter expertise that currently resides inside the heads of a few biologists.
4. Increase the effectiveness of rare species field surveys by identifying and ranking unsurveyed locations where rare species are likely to occur.

## **Activities and Milestones**

### **Activity 1: Develop Species Distribution Models**

**Activity Budget:** $50,000

**Activity Description:**Assemble and meet with a technical team of collaborators within and outside the DNR to develop model applications, data inputs and modeling protocols. Consult with other organizations that have experience with SDM, including NatureServe (an international network of conservation science organizations). Identify target species to model that have at least 10 known locations. Assemble SDM software and other tools. Assemble continuous coverage GIS data layers (LiDAR, climatology, soils, LandSat, land-use). Run SDM models on at least 100 rare plant species (and a similar number of rare animal species with federal funding for which these LCCMR dollars are a match). Convene the technical team to review model outputs. Refine and rerun models.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| A technical team identifies target species, model applications, needs, parameters and protocol | September 30 2022 |
| SDM models are completed for at least 100 species | February 28 2023 |
| SDM model outputs are reviewed by technical team and protocol adjustments identified | March 31 2023 |
| Models are refined and rerun based on technical team reviews. | April 30 2023 |

### **Activity 2: Test Model Predictions by Conducting Field Surveys**

**Activity Budget:** $120,000

**Activity Description:**Field surveys guided by SDM outputs are conducted in the 2023 and 2024 field seasons. For each field season, a minimum of 10 new SDM-generated locations will be surveyed for at least 10 species (i.e.>100 field survey locations). Results are compiled into the DNR's Natural Heritage Information System databases including the Observation Database and the Rare Features Database.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| At least 10 SDM-identified locations for at least 10 species are surveyed by field staff in 2023 field season | September 30 2023 |
| 2023 field season data are compiled into databases | December 31 2023 |
| At least 10 SDM-identified locations for at least 10 species are surveyed by field staff in 2024 field season | September 30 2024 |
| 2024 field season data are compiled into databases | December 31 2024 |

### **Activity 3: Refine Models by Integrating New Field Data**

**Activity Budget:** $30,000

**Activity Description:**Refine the models' predictive success by integrating new data back in the models and rerunning the models. Apply standard evaluation methods to assess model results. Incorporate validated models in DNR data delivery sites that are available for use by a wide range of people inside and outside the DNR, including environmental review biologists and contractors licensed to access rare species data.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| New data are incorporated into models and models are rerun | February 28 2025 |
| Technical team evaluates model results and identifies improvements | March 31 2025 |
| Outputs from validated models are made available for use | June 30 2025 |

## **Project Partners and Collaborators**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Organization** | **Role** | **Receiving Funds** |
| Regan Smyth | NatureServe | Guidance on tools and procedures developed for species distribution modeling. | 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?**Once built, tested and refined, SDMs will become one of the standard Natural Heritage Information System (NHIS) data delivery products that are provided by the Minnesota DNR through the same means as rare species data and information. The SDMs will be trained over time to improve their predictions through the input of new field survey data and advancements in the related datasets. Ongoing financial support for SDMs will be covered by program funding.

## **Project Manager and Organization Qualifications**

**Project Manager Name:** Fred Harris

**Job Title:** Plant Survey Supervisor (Acting) Minnesota Biological Survey

**Provide description of the project manager’s qualifications to manage the proposed project.**Fred Harris has worked as a plant ecologist, research scientist and supervisor for the DNR's Minnesota Biological Survey (MBS) for 26 years. As an ecologist he surveyed and mapped native plant communities and rare plant species populations in all or portions of 27 counties in Minnesota. As a Research Scientist at the DNR, and as Lead Ecologist at Great River Greening, Fred organized and coordinated numerous research and monitoring projects, including initial project design, budget management, personnel supervision and reporting. Since June 2020, he has supervised a staff of 12 plant ecologists and botanists who survey and monitor Minnesota's native plant communities and native plant populations.

Work Experience:
June 2020-present: Plant Survey Supervisor (Acting), Minnesota Biological Survey (MBS), DNR Division of Ecological and Water Resources
2011-2020 Research Scientist, MBS, DNR Division of Ecological and Water Resources
2006-2011 Plant Ecologist/Botanist, MBS, DNR Division of Ecological and Water Resources
2003-2006 Lead Ecologist, Great River Greening, St. Paul, MN
1992-2003 Plant Ecologist/Botanist, MCBS, DNR Division of Ecological and Water Resources
1991-1992 Preserve Ecologist, The Nature Conservancy, MN Chapter, Minneapolis
1980-1983 Peace Corps Volunteer and Trainer, U.S. Peace Corps, Kenya

Education:
1991 Ph.D. Botany, The University of Kansas
1980 B.A. Biology, Carleton College

**Organization:** MN DNR - Ecological and Water Resources Division

**Organization Description:**The DNR's Minnesota Biological Survey collects, interprets and delivers data on the distribution and ecology of native animals, plants, plant communities and native landscapes. Delivery of these data helps guide management, conservation and monitoring of critical habitat and ecological functions in Minnesota.

## **Budget Summary**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Category / Name** | **Subcategory or Type** | **Description** | **Purpose** | **Gen. Ineli gible** | **% Bene fits** | **# FTE** | **Class ified Staff?** | **$ Amount** |
| **Personnel** |  |  |  |  |  |  |  |  |
| Natural Resource Specialist/Intermediate - Plant Ecologist |  | Create and evaluate SDM models; field survey SDM-identified locations |  |  | 30% | 1.5 |  | $151,023 |
| Natural Resource Specialist SR - Plant Ecologist |  | Create and refine SDM models; conduct field surveys to SDM-identified locations |  |  | 30% | 0.2 |  | $25,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$176,023** |
| **Contracts and Services** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Equipment, Tools, and Supplies** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Capital Expenditures** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Acquisitions and Stewardship** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Travel In Minnesota** |  |  |  |  |  |  |  |  |
|  | Miles/ Meals/ Lodging | Fleet, lodging, meal expenses while in travel status for field surveys. | Fleet, lodging, meal expenses while in travel status for field surveys. |  |  |  |  | $10,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$10,000** |
| **Travel Outside Minnesota** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Printing and Publication** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Other Expenses** |  |  |  |  |  |  |  |  |
|  |  | DNR Direct & Necessary | DNR’s direct and necessary costs pay for activities that are directly related to and necessary for accomplishing appropriated projects. HR Support (~$2,829), Safety Support (~$438), Financial Support (~$2,371), Communication Support (~$1,311), IT Support (~$6,019), and Planning Support (~$1,008). |  |  |  |  | $13,977 |
|  |  |  |  |  |  |  | **Sub Total** | **$13,977** |
|  |  |  |  |  |  |  | **Grand Total** | **$200,000** |

### **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** |  |  |  |  |
| In-Kind | State Heritage Enhancement | In kind funds for 0.25 FTE (existing classified NR Specialist SR and Research Scientist 2) for 2 years; DNR GIS/IT professional services. | Pending | $65,000 |
| Cash | State mitigation dollars | Funds earmarked for SDM for goblin fern (Botrychium mormo). | Secured | $50,000 |
| In-Kind | General Fund | 0.1 FTE for Project management, supervision, administrative support | Pending | $20,000 |
|  |  |  | **State Sub Total** | **$135,000** |
| **Non-State** |  |  |  |  |
| In-Kind | Federal State Wildlife Grant | LCCMR dollars would be State match to Federal dollars; Federal dollars used for animal SDMs | Secured | $130,000 |
|  |  |  | **Non State Sub Total** | **$130,000** |
|  |  |  | **Funds Total** | **$265,000** |

## **Attachments**

### **Required Attachments**

#### ***Visual Component***

File: [2548c54d-ac0.pdf](https://lccmrprojectmgmt.leg.mn/media/map/2548c54d-ac0.pdf)

#### ***Alternate Text for Visual Component***

Graphic illustration of a species distribution model for blanket flower....

## **Administrative Use**

**Does your project include restoration or acquisition of land rights?**
 No

**Does your project have potential for royalties, copyrights, patents, or sale of products and assets?**
 No

**Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?**
 N/A

**Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?**
 N/A

**Does your project include original, hypothesis-driven research?**
 Yes

**Does the organization have a fiscal agent for this project?**
 No