



Native American/Native Hawaiian Museum Services Program

Sample Application MN-00-18-0014-18

Leech Lake Reservation Business Committee

Amount awarded by IMLS:	\$64,224
Amount of cost share:	\$27,986

Attached are the following components excerpted from the original application.

- Abstract
- Narrative
- Schedule of Completion

Please note that the instructions for preparing applications for the FY2019 Native American/Native Hawaiian Museum Services grant program differ from those that guided the preparation of FY2018 applications. Be sure to use the instructions in the FY2019 Notice of Funding Opportunity for the grant program and project category to which you are applying.

Abstract

The Leech Lake Reservation covers nearly 900,000 acres in north-central Minnesota including vast lakes, forests, and wetlands. These natural resources are critical to the cultural identity and wellbeing of the Leech Lake Band of Ojibwe, whose mission states that the Band is committed to the responsible operation of government, preservation of our heritage, promotion of our sovereignty, and the protection of natural resources for our elders and future generations, while enhancing the health, economic well-being, education, and our inherent right to live as Ojibwe People. Plant resources are intimately intertwined with Ojibwe heritage, sovereignty, health, and economic wellbeing. Thus the Leech Lake Herbarium, as part of the Leech Lake Division of Resource Management (DRM), is an important repository of cultural and natural history information for the Band. However, this important resource is at risk because data associated with the collection have never been digitized, and awareness of the collection's existence, let alone its scope or potential uses, are virtually unknown within the Leech Lake community. These issues were identified when a new botanist was hired by DRM, who had formerly worked as an instructor at Leech Lake Tribal College. As a former instructor who taught in the Forest Ecology program, including plant identification courses, she could immediately see the value in having a resource at DRM that would support not only resource management, but the broader Leech Lake community.

This project seeks to remedy the problems of limited data stewardship and access by achieving two primary goals: 1) enhancing digital stewardship of the collection through digitization and creating a searchable online database, and 2) increasing knowledge of community members, including students, teachers, and others with an interest in plants, of the herbarium and how its collection can be used. These goals will be achieved by first collecting images of all specimens, entering their label data, and uploading all images and data to a searchable online database that will be linked to a DRM website dedicated to the herbarium. In the second year of the grant, we will conduct outreach activities, including a workshop, designed to raise awareness of the online herbarium, what the collection includes, and how the collection can be used in various disciplines.

Specific outcomes that will be achieved through this project include: 1) collection images and data will be secured in online repositories, 2) relevant local community members, including educators, students, natural resource managers, and other interested individuals, as well as broader audiences, will be aware of what the herbarium is, how to access its collections, and how the collections can be used, 3) one intern will gain knowledge and experience in collections management, and 4) the collection will be used to help revive local plant knowledge.

Success in achieving intended outcomes will be assessed throughout each phase of the project. For digitization efforts, we will constantly monitor progress against our proposed timeline and adjust work as necessary. We will have successfully completed this step when all specimens are digitized. We will measure success in outreach by conducting before and after surveys to determine the effectiveness of workshops toward increasing knowledge about the herbarium, its uses, and plants in general.

The results of this project tie directly into the Band's mission and contribute to the public good of this community by strengthening museum services that preserve a collection of plants important to Ojibwe heritage, enhancing lifelong learning of community members, and promoting sovereignty and protection of natural resources by enhancing stewardship of and access to an important collection of plants. Beyond the reservation, this project will contribute to national and global efforts to digitize and make available biodiversity data that can be used by students, educators, and researchers around the world to examine pressing issues in plant biology that ultimately impact us all.

Leech Lake Band of Ojibwe - Narrative

Project Justification

Plant resources play important roles in ceremony, medicine, food security, art, and local economies of Ojibwe people, including the Leech Lake Band. The Leech Lake Herbarium was established in the early 1990s as a vital resource for documenting plants within the Leech Lake Reservation; however, **the value of this collection hinges on good stewardship of its data and how readily accessible data are to the local and broader community.** The herbarium currently houses approximately 2,000 specimens, and its collection focuses on species that are rare, that have some conservation concern surrounding them, or that are culturally important. Physical stewardship of the collection has maintained its core value over time, but due to limited time and funding, preservation of data associated with the specimens has languished. For example, all information associated with specimens is located on physical specimen labels and in handwritten notebooks. Because of this, the herbarium is virtually unknown as a resource within the community and the records are not easily available for community members, including educators, students, researchers, natural resource professionals, and others interested in plants to search and examine.

Several groups within the community would benefit from digitization and easy online access of these records. Many community members use a vast suite of plant species for traditional activities, and making these collections readily and freely available will provide them with a rich source of data for learning more about the flora of their reservation. Students and educators in the community, especially at the local tribal college, will benefit from having a large dataset on plant resources for developing and executing research projects and teaching and learning plant identification. Resources for enhancing learning of plant biology are especially important now, as “plant blindness,” the inability to recognize plants and their importance within our environment, has become pervasive in our society.¹ In particular, this project will provide opportunity for at least one student to gain training in collections management and outreach. Further, many of the species in the collection are important for the band’s Division of Resource Management (DRM) to document, because they allow assessment of how important resources change over time and can help to bolster the Band’s efforts to exercise treaty rights and promote their sovereignty. For example, when sensitive or culturally important species are present, the Band has more leverage to influence management activities conducted by the United States Forest Service on lands where reserved treaty rights apply. **Ultimately, the goals of this project are to 1) enhance digital stewardship of the collection, and 2) use the product of that digitization effort (a searchable online database) to teach the community about this resource and how they may use it to enhance knowledge of the flora of the reservation.**

To address these problems of collections stewardship and accessibility, our project proposes to undertake a digitization effort that will ultimately result in an online searchable database available to the community and broader public from the DRM website. We will use state of the art equipment to photograph each specimen, ensuring that a significant portion of the value of the physical specimens is preserved in perpetuity. Associated data will be entered into a database using an existing framework that is used by herbaria worldwide. Finally, this database will be made accessible in a searchable online format to the community. To ensure that improved access to the collection translates into increased knowledge of the herbarium and how its use can benefit community members, we will hold a workshop at the Leech Lake Tribal College (LLTC). The workshop will focus on giving faculty, students, and community members knowledge of what the herbarium is, the collections it contains, and how they may use it for teaching or research. In addition to digitizing the collection, a secondary, but important, goal of this project will be to utilize a local student as an intern to carry out much of

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the work. This will further enhance the reach of our project by training a local student in collections management and enhancing their knowledge of local plant resources.

The desired outcomes of this project include: 1) collection images and data will be secured in online repositories, 2) relevant local community members, including educators, students, natural resource managers, and other interested individuals, and broader audiences, will be aware of what the herbarium is, how to access its collections, and how the collections can be used, 3) one intern will gain knowledge and experience in collections management, and 4) the collection will be used to help revive local plant knowledge. In achieving these outcomes, this project will significantly strengthen the museum services of the Leech Lake Herbarium, which are currently virtually absent in terms of serving the public.

This project directly addresses the goals of the Native American/Native Hawaiian grant program. Digitizing the Leech Lake Herbarium's collection will help the Band sustain culture and knowledge through strengthening stewardship of this collection. In particular, the Herbarium's collection will be made more available to advance lifelong learning and cultural engagement surrounding the natural resources so critical to the identity, traditions, and lifeways of this community. In this way, our project will use technology to facilitate discovery of knowledge and cultural heritage for the Band, while enhancing stewardship of the Herbarium's collections.

Project Work Plan

Work to achieve the goals of this project will fall under two major categories 1) enhancing digital stewardship of the collection through digitization and 2) making relevant community members aware of the collection and how they can use it.

1) *Enhancing digital stewardship of the collection*: Due to recent initiatives by numerous organizations, including the National Science Foundation,² to digitize the nation's important biodiversity collections, there is a wealth of information on equipment and protocols for imaging, databasing, and making herbarium records available online. We will use the following "task clusters," which are recommended by existing protocols, to maximize efficiency in digitizing our collection.³

Prepare for digitization - During the first year of the grant (see timeline) we will procure equipment, including a camera, lighting equipment, external hard drive, and computer that are necessary to collect high quality specimen images and enter label data.⁴ During this period we will also set up the database and its online portal in collaboration with the Leech Lake Management Information System Division using freely available industry standard software for plant collections management (either Specify [<http://www.sustain.specifysoftware.org/>] or Symbiota [<http://symbiota.org/docs/>]). Imaging and data entry protocols will be developed, tested, and written by the project manager.

One local student intern will be hired to conduct the majority of the work digitizing specimens and entering label data. The first task of this student will be verifying plant nomenclature using The Plant List⁵ and annotating and reorganizing the collection as necessary.^{3,6} This process will also allow us to identify and address any issues within the collection, for example damaged specimens, so that image and data processing steps can be conducted as efficiently as possible. Specimens will also be given a barcode providing them a unique identifier within the database to eliminate potential errors including data duplication and associating specimen images with the wrong labels in the database.^{3,6}

Collect specimen images – We will use best practices to digitize the images and database all data associated with them.^{3,4,6,7} Digital images of specimens will be collected with a high quality digital camera and a lens with a 1:1 magnification ratio, so that the image projected on the sensor is the same size as the real-life specimens. A

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copy stand with professional lighting will be used according to iDigBio's equipment list for specimen image collection,⁴ to minimize shadows and produce professional quality photographs of specimens.

Enter label data into database – After all images have been collected, data for each label will be entered into the database, including the bar code associating the physical specimen and its image to the label data. Entered data will also be checked for quality control to ensure accuracy.

Upload data to online portal – All images and data will be uploaded to the online portal so that they are searchable. A separate page with instructions and a link to the search page will be set up from Leech Lake Division of Resource Management's webpage.⁸

Achievement of the first project goal, enhancing digital stewardship of the collection, will be evaluated at each step by the number of specimens that have been processed. Progress will be tracked by comparing which step of the project we are at with the proposed timeline. To assess whether we are meeting the goal of our intern gaining valuable collection experience, the student will keep a daily log of work done and completed, including number of specimens processed at each step. This will further allow us to continually evaluate whether we are adhering to our proposed schedule and make adjustments accordingly. For example, if digitization is proceeding more slowly than anticipated, the botanist or another DRM intern could conduct some of the digitization work. Overall success will be measured by the entire collection being digitized, processed, and made available electronically through the Web (with the exception of species or associated data that are too sensitive to publish publicly).

2) *Creating community awareness of collection and its uses*: The primary goal of this grant is to boost the museum services of the herbarium, and thus we feel that it is just as critical to share this project with the community as it is to complete the digitization process to preserve the collection and data associated with it. We will use a multi-faceted approach to build community awareness of this resource and how it can be used by educators, students, natural resource professionals, and other interested community members.

Create and execute a workshop at Leech Lake Tribal College – As major outcomes of this project, we intend for local educators and students to be aware that this collection exists and how they can use it effectively in teaching and research. Further, we want interested community members in general to know about the collection and how to access it to promote their lifelong learning related to the reservation's natural resources. To this end, we will create a workshop at the tribal college that will be open to all faculty, students, and other interested community members. The workshop will focus on the following topics 1) What is an herbarium? 2) Where is Leech Lake's herbarium and what comprises the collection? 3) How can the collection be accessed? 4) How are herbarium specimens used in teaching and research, including by individuals outside of academia? The workshop will be both lecture based and hands-on, with time for users to explore the online collection, view physical example specimens, and practice collecting and pressing specimens. Several specimens will be highlighted as examples of what can be learned from herbarium collections, with the intention of beginning to address the widening gap in understanding of plant science and plant identification.

The effectiveness of the workshop will be assessed by measuring the number of participants who develop an awareness of the herbarium as a data source and who see it as a resource that can be used in their classes or research efforts. This will be measured with a pre and post-workshop survey. After the workshop, we anticipate that 90% of participants would be confident in their knowledge of what the herbarium is and how to access its collection, at least 50% of participants would gain a better understanding of how the collection can be used in their teaching and research, and at least 50% of participants will have learned a new plant or something interesting about a plant they were already familiar with. Without knowing the demographics of the audience

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who will attend, since the workshop will be open to all, we are conservatively estimating a lower proportion of attendees who end up seeing the herbarium as useful to their field; however, our aim is to make the workshop as engaging and interdisciplinary as possible. For example, it is relatively clear how herbarium specimens could be used in science courses, but they may also be useful to the humanities when discussing historical or cultural importance and uses of plants, in art classes that utilize plants for projects like sweetgrass basket making, or in building trades courses when landscaping with native plants is taught.

Other outreach initiatives – In addition to a workshop, which will be the cornerstone of our outreach efforts, we will raise awareness of this resource in several other ways. We will collaborate with the Leech Lake Tribal College Library to train their librarian and staff on how to access and search for herbarium specimens. An article on digitization efforts with a link to DRM's herbarium website will be published in the local Debahjimon newspaper and we will discuss the collection on the local radio station's (KOJB 90.1 FM The Eagle) Environmental Voices program. Measurement of the outcome of these additional activities is difficult, since DRM personnel will not have direct access to the audience; however, we would anticipate that these activities will result in an increase in visits to the new DRM herbarium webpage. In addition to reaching out to the Leech Lake community with our results, we will also share them with the broader community, including botanists, relevant workers in other government agencies, and other local and regional herbaria.

Risks to the project include potential difficulty in finding a student intern at the tribal college that will be able to commit to the project. Our preference is to hire a student from LLTC, however the college is relatively small and there are often more opportunities for internships than students to fill them. If we are unable to recruit from LLTC, we are confident that we can recruit a student from either Bemidji State University, which is located approximately 15 miles away, or from the local high school, which is only one mile away.

Planning and project management will be done by the Leech Lake Director of Fish, Wildlife and Plant Resources and Botanist, Katie Zlonis. Both have significant experience with grant administration and project management. In addition, Mortensen has a degree in photography and years of experience photographing plants and Zlonis has experience creating and administering digital collections databases, especially through work as the project manager for Project Baseline (<https://baselineseedbank.org>). This project was a nation-wide, NSF sponsored initiative to create a seed collection for research on plant evolution. As part of Zlonis' work for this project, she created a database in collaboration with the University of Minnesota Duluth Information Technology Department, created a web application for data entry, and created web applications to make the data, photographs, and associated maps of collection locations publicly available via the project's website. In addition, both have teaching and outreach experience, and Zlonis has professional ties to the tribal college as a former instructor there, which will allow her to design and execute an effective workshop. This experience, coupled with existing robust protocols and open-source software for herbarium collections, will ensure success of this project.

Project Results

The problems this project addresses are a lack of digital stewardship for the Leech Lake Herbarium, a lack of community awareness and understanding regarding this resource, and a general trend of weakening plant knowledge. Our intended results address these issues by enhancing digital stewardship of the collection, and using outreach activities to increase community awareness and understanding of the collection, how it can be used, and plant resources in general. In addition, the project will provide a student with knowledge and skill in collections management through an internship.

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Data will be collected throughout the course of project execution to measure both progress and effectiveness in activities toward addressing identified needs and achieving intended results (Table 1). Methods for how data will be collected, and how success will be measured, are discussed in further detail under the project work plan.

Table 1. Summary of needs this project addresses, intended results or outcomes, data used for reporting with goal benchmarks, and product outputs.

Need	Intended Results	Outputs and Reporting
Digital stewardship of collection	Specimen images and label data will be secured in online repositories	<ul style="list-style-type: none"> • Number of specimens out of total collection (100%) that have been digitized and stored • Products: digitization protocols, images, database records, DRM herbarium website and links to searchable database
Herbarium access and community understanding of how collections can be used	Relevant local community members, and broader audiences, are aware of the Leech Lake herbarium and how to access and use it	<ul style="list-style-type: none"> • Number and percent of individuals attending a workshop who understand what the herbarium is (90%), how to access it (90%), and how it can be relevant to their work (50%); number of website visits • Products: workshop materials, including presentations, survey, and survey results
Community experience in collections management	One student will gain knowledge and experience in collections management	<ul style="list-style-type: none"> • Student effectively completed projects showing mastery of digital curation; proof will be number of specimens processed in each task cluster • Product: work log documenting progress and accomplishments of intern
Revive local plant knowledge	Community members will understand how specimens can be used to enhance plant knowledge	<ul style="list-style-type: none"> • At least 50% of workshop participants will have learned to identify, or learned something new, about at least one plant after workshop • Product: survey results (see above)

Overall, this project will increase organizational capacity to continue the valuable work of the Leech Lake Herbarium. In addition to equipment, a number of useful products will be developed as a result of this project that will pave the way for increasing the scope of the collection and continuing outreach (Table 1). For example, being able to summarize data from the database will help us to identify and fill gaps in the collection in the future. Strengthening the herbarium’s services through development of digital resources, digitization protocols, and outreach materials will allow DRM greater opportunity to engage the community in plant resource management and conservation. In addition, we will use this project as a platform for gaining additional funding to secure new collections in the future, focusing in particular on culturally important plants, many of which are common, that are currently underrepresented the collection, but that may be threatened by future land use and environmental change. We envision continued collaboration with educational institutions, particularly Leech Lake Tribal College, to further expand the collection and digitize all new specimens using the tools and protocols developed for this project. This will also allow us to continue to train students in collections management, with the hope that they will carry that knowledge on to curating other important collections and resources across the reservation. Beyond the reservation, these tools and protocols will allow the Leech Lake Herbarium to contribute to the global effort to digitally document biodiversity, which is increasingly important in an age of rapid environmental and social change.⁹

Schedule of Completion

	FY 2018											
Activity	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
Gather digitization equipment												
Develop, test, and write digitization protocols												
Set up database and portal												
Hire and train intern												
Verify nomenclature and address collection issues												
Attach barcode to specimens												
Collect specimen images												
Enter label data into database												

	FY 2019											
Activity	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August	Sept.
Enter label data into database												
Upload data to online portal												
Create DRM herbarium webpage and link to portal												
Develop workshop												
Conduct workshops and outreach activities												