Environment and Natural Resources Trust Fund

2021 Request for Proposal

General Information

Proposal ID: 2021-226

Proposal Title: Smart Lawns: Data-Driven Lawn Care Information for Homeowners

Project Manager Information

Name: Eric Watkins

Organization: U of MN - College of Food, Agricultural and Natural Resource Sciences

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Project Basic Information

Project Summary: We will develop, and make publicly available, an easy-to-use, data-driven web application to help guide Minnesotans when making lawn care decisions.

Funds Requested: $200,000

Proposed Project Completion: 2023-06-30

LCCMR Funding Category: Small Projects (H)
    Secondary 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?
    In the Future

Narrative

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

Most Minnesotans who have a lawn have found themselves, at some point, staring at a long shelf full of shiny, colorful, grass seed bags. These packages are covered with boasts that will never come to pass. "Sun or shade!" "No water needed!". A closer inspection of the bland, required-by-law seed tag reveals that the seed within will never live up to the claims plastered on the front of the bag. This troubling situation comes about because consumers have little knowledge of home lawn care, and they are specifically misinformed about grass seed. Lawns are ubiquitous in Minnesota, and can serve as an important green space in otherwise built environments. These lawns can easily be mismanaged: in some cases users apply too many inputs (i.e. fertilizer, water) resulting in harmful environmental effects such as contaminated groundwater and harm to pollinators; in other cases, lawns are under-managed, resulting in exposed soil that can flow to water bodies, resulting in higher phosphorus levels in our lakes and streams.

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.

Our group has led a multi-disciplinary effort to build a database of turfgrass seed data that can be used to help homeowners make informed, data-driven seed purchasing decisions. We have also built a mobile-friendly web application that has the potential to ease the entire seed selection process. The application aims to help homeowners navigate the aisles of the home improvement store to select the most appropriate grass seed for their home, using data from multiple databases, including growing/maintenance characteristics, weather information, soil classifications, and information about the amount of sun at a particular site. The application, its current form, is a far better option than an uninformed consumer making a seed purchasing decision based on the information found on the front of a glossy seed bag at a big box retailer. The app, however, needs more development in order for it to work well for a variety of users and landscapes (current testing has revealed a number of shortcomings that can only be overcome with significant improvements). We desire to optimize the application for users in Minnesota so that seed purchasing and other lawn management decisions can be made with data that is useful in our climate.

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?

We will help Minnesotans make wise, data-driven choices about grass selection and other lawn care practices in order to maximize the ecosystem services provided by lawns while reducing negative environmental impacts. We will do this by improving an existing web application that was funded by the USDA Specialty Crop Research Initiative (lowinputturf.umn.edu); the application uses data from the National Turfgrass Evaluation Program to provide homeowners with data to make better decisions. Minnesotans will be able to maximize enjoyment of their lawn by choosing grass seed that fits their expectations of maintenance and appearance.

Activities and Milestones

Activity 1: Develop mobile-friendly web application to support data-driven seed purchasing decisions

Activity Budget: $109,157

Activity Description:

Homeowners will use a computer or mobile device to make data-driven choices on which grass seed to purchase and plant. Minnesotans will be able to search for their home by typing in an address or using the location services of their mobile device by selecting characteristics of the lawn they want including: intended uses such as sports activities versus a lawn that makes the neighbors jealous; maintenance requirements such as mowing and watering frequency; and site characteristics including amount of shading, soil type and climate hardiness zones. The app will also provide a sustainability score based on local and national data, an indication of how choices in lawn seed impact the local environment. The app will be developed using Esri Web AppBuilder, with underlying data stored on ArcGIS Online (UMN has a site license to provide long term hosting of the app). No personal information will be collected by the app. We will consult with the UMN Usability Lab to get input on application design, as well as recruiting homeowners to participate in focus groups and/or task-based usability evaluations to inform application design (see attached letter).

Activity Milestones:

Description	Completion Date
Develop prototype application and data schema	2022-06-30
Hold focus groups and/or task-based usability evaluations with homeowners to give feedback on application	2022-10-31
Complete application development and integrate with outreach materials	2023-06-30

Activity 2: Identify knowledge gaps and execute new research projects

Activity Budget: $49,102

Activity Description:

As the mobile application is developed and tested, we will identify gaps in knowledge that are needed to improve the effectiveness of the application. For instance, we currently have access to solar maps that provide good estimates of lawn shading throughout Minnesota; however, the current National Turfgrass Evaluation Program database has very little data on shade tolerance of turfgrasses. Our team will work to identify new sources of data and when necessary, to conduct controlled environment and field research trials to obtain these data. The Smart Lawns web application will include a way for homeowners to report satisfaction with seed selection; these feedback will also allow us to identify where significant gaps exist. For instance, a survey might indicate that a consumer was dissatisfied with the outcome of a new seeding operation, but the reason was due to lack of knowledge about proper seedbed preparation, which is critical to a successful seeding. Our team could then design and implement a research project to identify easy-to-implement best practices for seed bed preparation.

Activity Milestones:

Description	Completion Date
Identify existing gaps in the National Turfgrass Evaluation Program (NTEP) database	2022-01-31
Design experiments to fill knowledge gaps	2022-04-30
Complete experiments and use results to improve database and mobile application	2023-06-30

Activity 3: Outreach: Create educational videos, develop a website to distribute the app, and publicize the our work

Activity Budget: $41,741

Activity Description:

We will produce two videos to be linked within the mobile application. Topics will include reading a seed label, the most important factor in purchasing seed, and the best steps homeowners can take to improve lawn sustainability. We will develop a website hosted at UMN for accessing the web application. The site will also include already-developed supporting educational materials for homeowners and landscape professionals, as well as for officials from city, county and state agencies. Our turfgrass research team and the soon-to-hired Turfgrass Extension Educator will use all our efforts to reach our audiences about the app and website. Specific channels we will target include workshops, conferences, social media, the Yard and Garden newsletter, articles for blogs and magazines, and our booth at the State Fair. We will also work with the communication professionals at University Relations to get the word out to the mass media. We anticipate great interest in this work as past homeowner-focused projects (over-irrigation of lawns is one example) have generated stories on local news broadcasts, public radio, the Star Tribune, as well as outstate media. We will track analytics for website and application usage.

Activity Milestones:

Description	Completion Date
Produce videos to be linked with the mobile-friendly web application	2022-09-30
Create website for app and other related educational materials	2023-03-31
Publicize final products to homeowner audience	2023-06-30

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Len Kne	University of Minnesota	Len is director of USpatial at the University of Minnesota. His group developed the first version of the web application we are proposing for this Smart Lawns project. His team will be charged with continued development of the application based on input from PI Watkins and his team.	Yes

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?

Successful deployment of this application will lead to increased economic opportunities for turfgrass seed sales companies. These companies will likely be interested in ensuring the continuation of this type of application through support dollars; these funds can be targeted to software enhancements and related IT improvement. We will also seek outside funding sources to continually improve the content of the application.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Bee Pollinator Habitat Enhancement - Phase II	M.L. 2016, Chp. 186, Sec. 2, Subd. 08a	$387,000

Project Manager and Organization Qualifications

Project Manager Name: Eric Watkins

Job Title: Professor

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

Professor Watkins leads the turfgrass science program at the University of Minnesota, where he has been on the faculty of Horticultural Science since 2004. Watkins received his undergraduate degree from the University of Minnesota in 1998 and his Ph.D. from Rutgers University in Plant Biology in 2004. His program conducts research related to turfgrass breeding, selection, and management, along with collaborations in social science, to increase the use of sustainable turfgrass species in multiple landscape types. He has led a number of large, multi-institutional projects on the improvement of low-input fine fescues. He has also worked with the Minnesota Department of Transportation on turfgrass selection and management for roadsides to reduce environmental impact and leads a project with the Met Council on reducing water use on lawns in the Twin Cities. He contributed significantly to recent LCCMR-funded projects focused on the development of "bee lawns". Dr. Watkins is active in outreach, giving presentations to multiple audiences ranging from homeowners to golf course superintendents. At the University, he teaches a number of courses on the topics of turfgrass management and plant breeding.

Organization: U of MN - College of Food, Agriculture and Natural Resource Sciences

Organization Description:

The College of Food, Agricultural, and Natural Resources Sciences, at the University of Minnesota, aims to inspire minds, nourish people, and enhance the natural environment. The college's vision is to advance Minnesota as a global leader in food, agriculture, and natural resources through extraordinary education, science-based solutions, and dynamic public engagement that nourishes people and enhances the environment in which we live. The college has 13 academic departments, including Horticultural Science, home of the turfgrass science program. The turfgrass science program has

the field, laboratory, growth chamber, and greenhouse facilities needed for innovative research to serve the needs of Minnesota stakeholders.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Faculty - Eric Watkins		Principal Investigator who will coordinate the grant and oversee all project activities			36.5%	0.04		$7,531
Geospatial Analyst - Peter Wiringa		Homeowner application development			36.5%	0.2		$20,131
Graduate Student in U-Spatial - TBD		Assist in developing the homeowner app and consult with the UMN Usuablity Lab			40.35%	0.76		$86,516
Researcher 5 - Kristine Moncada		Develop video content, set up materials on our website, and coordinate outreach efforts			31.8%	0.36		$29,922
Researcher 3 - TBD		Conduct field research to supply data to support the homeowner app			31.8%	0.7		$46,591
							Sub Total	**$190,691**
Contracts and Services								
TBD - media company	Professional or Technical Service Contract	Media company services for video production to include shooting at two sites, interviews with two people, project coordination, camera work, editing, and video footage storage				0.06		$9,309
							Sub Total	**$9,309**
Equipment, Tools, and Supplies								
							Sub Total	-
Capital Expenditures								
							Sub Total	-

Acquisitions and Stewardship								
-							**Sub Total**	-
Travel In Minnesota								
-							**Sub Total**	-
Travel Outside Minnesota								
-							**Sub Total**	-
Printing and Publication								
-							**Sub Total**	-
Other Expenses								
-							**Sub Total**	-
							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				
-			State Sub Total	-
Non-State				
-			Non State Sub Total	-
-			Funds Total	-

Attachments

Required Attachments
Visual Component
File: [1d2afa57-bea.pdf](1d2afa57-bea.pdf)

Alternate Text for Visual Component
The graphic shows people using lawns in a number of ways including for leisure and sports. Some think lawns are bad for the environment; however, when lawns are managed properly, this is not the case. Homeowners desire a sustainable lawn, but do not have the knowledge they need. The Smart Lawns mobile web application allows users to find data-driven recommendations based on their home address. Our team will utilize the application to communicate sustainable lawn care information to Minnesota residents.

Optional Attachments
Support Letter or Other

Title	File
Letter of Support for Application Usability Testing at UMN	[811ba37c-8a4.pdf](811ba37c-8a4.pdf)

Administrative Use

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

Does your project have patent, royalties, or revenue potential?
> Yes,
>> • Patent, Copyright, or Royalty Potential

Does your project include research?
> Yes

Does the organization have a fiscal agent for this project?
> Yes, Sponsored Projects Administration

Smart Lawns: Data-Driven Lawn Care Information for Homeowners

Eric Watkins, UMN Department of Horticultural Science
Len Kne, UMN U-Spatial

Lawns are an essential part of Minnesotans' active outdoors lifestyle.

But aren't lawns bad for the environment?
No, not if they're managed better!

Based on our experiences, homeowners do want sustainable lawns, but they need help.

Our project will address this problem with three activities:
1. Designing a user-friendly web application for homeowners to choose which grass seed to purchase and plant
2. Conducting research targeting homeowner needs in lawn management
3. Creating supplementary educational materials and publicizing our work to homeowners

The app will be smart phone friendly.

Our team will communicate our work to homeowners.

The application will deliver recommendations based on the user's location.

We will conduct research that will address homeowner needs such as low-input turf.