Environment and Natural Resources Trust Fund
2018 Request for Proposals (RFP)

Project Title: **ENRTF ID: 024-A**

Wetland-Biodiversity Vulnerabilities to Changes in Land-Use and Climate

Category: A. Foundational Natural Resource Data and Information

Total Project Budget: $ 481,705

Proposed Project Time Period for the Funding Requested: 2 years, July 2018 to June 2020

Summary:

We will model satellite and geospatial data to map relative threats land-use and climate changes pose to habitat quality and connectivity, wetlands, and biodiversity on state-owned lands throughout Minnesota.

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Sponsoring Organization: U.S. Geological Survey

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Location

Region: Statewide

County Name: Statewide

City / Township: All with state lands

Alternate Text for Visual:

Map of MN state lands, aerial photo of a wildlife management area, example of results from modeling habitat quality/connectivity, map of distribution of Le Contes sparrow in MN, graph of historical precipitation data for MN climate-division 1, example of Landsat scenes showing wetland surface-water extent in drier and wetter years

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

PROJECT TITLE: An assessment of the relative threats future changes in land use and climate pose to habitat quality and connectivity, wetlands, and biodiversity on state-owned lands throughout Minnesota

I. PROJECT STATEMENT: Landscapes on Minnesota's state-owned lands typically consist of wetlands that are linked physically and ecologically to adjacent uplands. These landscapes provide essential ecosystem services. They sustain resident and migratory wildlife, reduce flooding, mitigate impacts of droughts, provide food and recreation, and filter air and waterborne pollutants, among other services. Wetlands and uplands have been drained and degraded extensively on private lands in Minnesota, especially in certain regions. As a result, state-owned lands often equate to isolated, variously sized patches of relatively intact landscapes embedded within broader, more altered landscapes. Thus, state lands are differentially susceptible to hydrologic and biological impacts from changes in surrounding land use and climate across the state. Such impacts include reduced quality and connectivity of wildlife habitat and altered wetland surface-water availability that could cause declines of wildlife populations and species diversity. Few data are available regarding these relative threats and vulnerabilities for Minnesota's state lands, thereby limiting effective adaptive management of these lands for conservation in the face of global change. We propose to address this information need by assessing the relative risks potential future land use and climate pose to habitat, wetland surface-water availability, and biodiversity on state-owned lands across the state. We will do so via a combination of recently developed computer algorithms and various established and new ground-based and/or satellite sensor-derived data sets to 1) model recent and projected future habitat quality and connectivity (HQC) in contiguous landscape blocks throughout the state to identify state lands most vulnerable to current conditions and future changes, 2) analyze historic climate dynamics dating back to 1896 for each of the state's nine climate divisions to compare with future climate projections, 3) work to describe wetland surface-water extent under different climate conditions dating back to 1985 on select lands and then model potential future extents in relation to climate projections, and 4) characterize the potential for projected changes in HQC, climate, and wetland surface-water extent on populations of amphibians and wetland-dependent bird species for each state-owned parcel. Collectively, the vulnerability maps and associated data layers we produce will considerably strengthen the ability of resource managers to plan and act adaptively to manage state-owned landscapes in Minnesota. They also will provide similar, but more limited, information for private and other public lands across the state.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Assemble and vet all requisite climate, land-cover, and biodiversity data sets and layers. Refine, then use an algorithm we developed for Iowa on data from the 2011 National Land Cover Data set to model recent HQC within ecologically relevant 4-km^2 contiguous blocks across the entire state of Minnesota. Use the same algorithm and recently produced USGS data sets that describe future land cover to model HQC within the same blocks. Assess potential future changes in HQC within buffers around each polygon of state-owned land.

Budget: $120,000

Outcome	Completion Date
1. Maps and data layers of modeled recent and future HQC within landscape blocks throughout the state.	*4.30.2019*

Activity 2: Describe and assess temperature and precipitation dynamics dating back to 1895 for each of Minnesota's nine climate divisions and compare with future climate projections (resulting from the most current and scientifically accepted climate-change models available during 2018).

Budget: $65,000

Outcome	Completion Date
1. Maps, graphs, and data layers of historical climate dynamics relative to potential future changes.	*6.30.2019*

Activity 3: Apply an algorithm developed recently by USGS and university partners to survey archived Landsat scenes (1985 to the present) of landscapes on a subset of state-owned lands and characterize changes in seasonal surface-water extent for select wetlands (target ≥ 30 across different areas, but will depend upon the efficiency of the process) relative to air temperature and precipitation. Model potential future changes based upon climate projections described earlier. **Budget: $130,000**

Outcome	Completion Date
1. Maps, graphs, and data layers of recent and potential future changes in wetland surface-water extent relative to air temperature and precipitation.	*12.1.2019*

Activity 4: Assess the vulnerabilities of amphibians and wetland-dependent bird species on state-owned lands relative to potential changes in HQC, climate, and wetland surface-water availability. **Budget: $65,000**

Outcome	Completion Date
1. Maps and data layers describing relative species vulnerability across state-owned lands.	*3.1.2020*

Activity 5: Produce final data products and write final report and manuscripts. **Budget: $101,705**

Outcome	Completion Date
1. Maps, data layers, and final report completed.	*6.30.2020*
2. Manuscripts submitted to scientific journals.	*2020, 2021*

III. PROJECT STRATEGY

A. Project Team/Partners

Dr. Walt Sadinski, a research ecologist at USGS's Upper Midwest Environmental Sciences Center (UMESC), will be the overall lead for and manage this project. Dr. Alisa Gallant, a research physical scientist at USGS's Earth Resources Observation and Science Center, will provide primary guidance and oversight on geospatial analyses and modeling. A postdoctoral researcher and a UMESC geospatial analyst (names TBD) will conduct most of the work. A UMESC biologist also will contribute limited assistance.

B. Project Impact and Long-Term Strategy

Maps, data layers, the final report, and scientific publications from this project will provide the first comprehensive assessment of the effects of projected changes in land use and climate on resources related to Minnesota's state-owned lands, enabling managers to more effectively manage these lands adaptively over the course of time. They also will facilitate additional scientific research on a range of current and projected global-change impacts across Minnesota. We will be leveraging considerable USGS resources to accomplish this work, which also will provide training for, and advance the career development of, a recent Ph.D. graduate.

C. Timeline Requirements

We need two years to complete all the tasks associated with this project, including producing the final maps, data layers, and report. We will produce journal manuscripts after 6.30.2020 at no cost to the ENRTF.

2018 Detailed Project Budget

Project Title: *"An assessment of the relative threats future changes in land use and climate pose to habitat quality and connectivity, wetlands, and biodiversity on state-owned lands throughout Minnesota "*

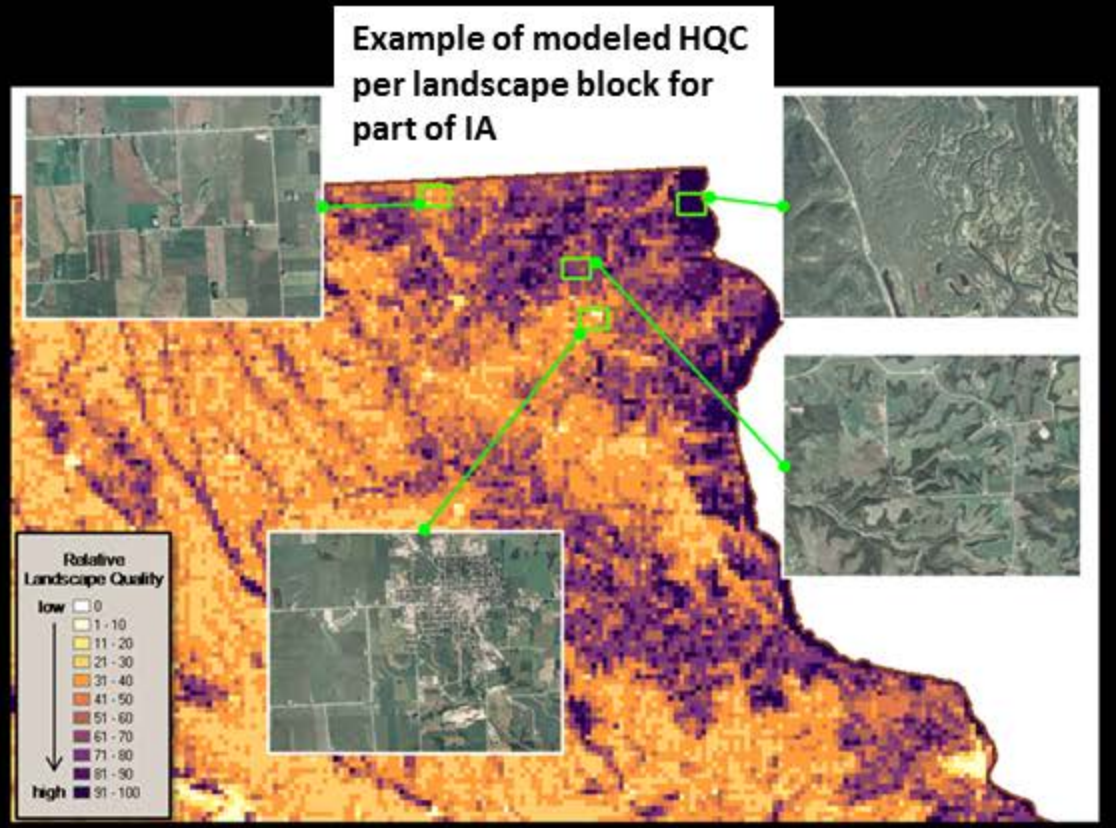
IV. TOTAL ENRTF REQUEST BUDGET 2 years

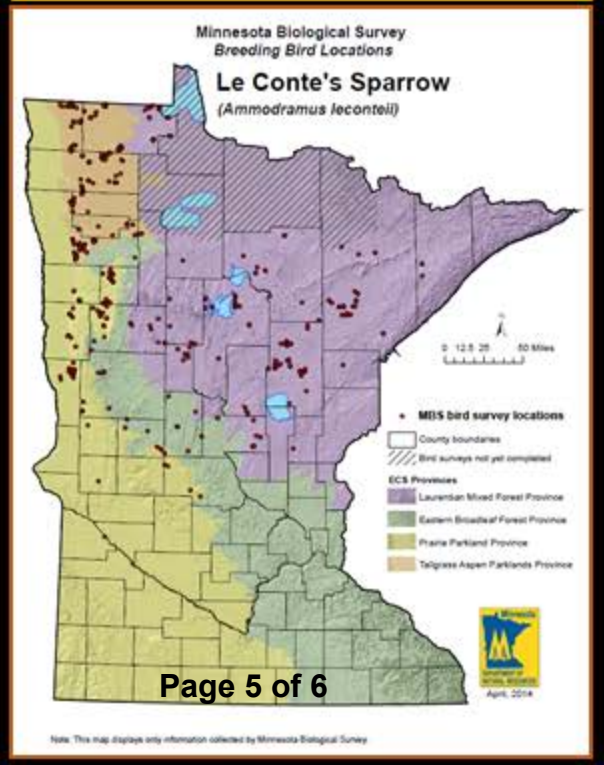
BUDGET ITEM	AMOUNT
Personnel	
GS-9 Postdoctoral Researcher (7.1.2018 through 6.30.2020 = 52 pay periods) 70% salary, 30% benefits	$ 221,991
GS-9 Geospatial-data analyst (7.1.2018 through 6.30. 2020 = 52 pay periods) 70% salary, 30% benefits	$ 251,016
GS-13 Research Ecologist - one pay period in Year 2 for project management and production of data products and final report. 70% salary, 30% benefits	$ 8,698
Professional/Technical/Service Contracts	N/A
Equipment/Tools/Supplies	N/A
Acquisition (Fee Title or Permanent Easements)	N/A
Travel	
Additional Budget Items	N/A
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$ 481,705

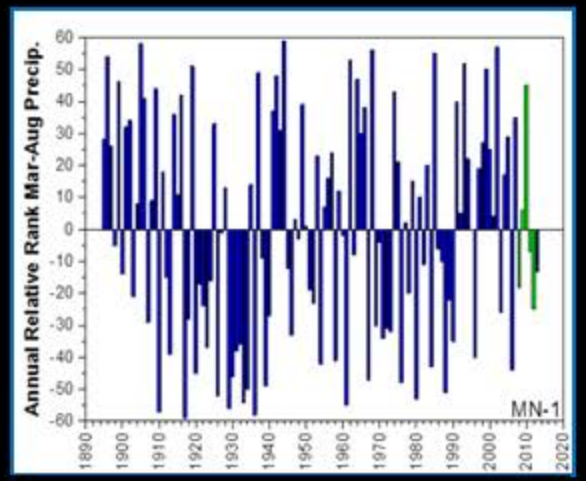
V. OTHER FUNDS *(This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not applicable.)*

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ To Be Applied To Project During Project Period	N/A	N/A
Other State $ To Be Applied To Project During Project Period	N/A	N/A
In-kind Services To Be Applied To Project During Project Period		
GS-14 Research Physical Scientist - five pay periods per year for two years for project guidance and training. 70% salary, 30% benefits	$ 97,804	Secured
GS-13 Research Ecologist - five pay periods per year for two years for project management, guidance, and training. 70% salary, 30% benefits	$ 86,976	Secured
GS-9 Biologist - three pay periods per year for two years for project assistance. 70% salary, 30% benefits	$ 30,476	Secured
Requisite software for conducting project analyses	$ 6,220	Secured
External hard drives for storing project's climate and geospatial data	$ 3,110	Secured
Travel for one person to attend one conference per year to present project results	$ 6,531	Secured
Fees for publishing results in scientific journals (two manuscripts)	$ 9,330	Secured
Funding History	N/A	N/A
Remaining $ From Current ENRTF Appropriation	N/A	N/A

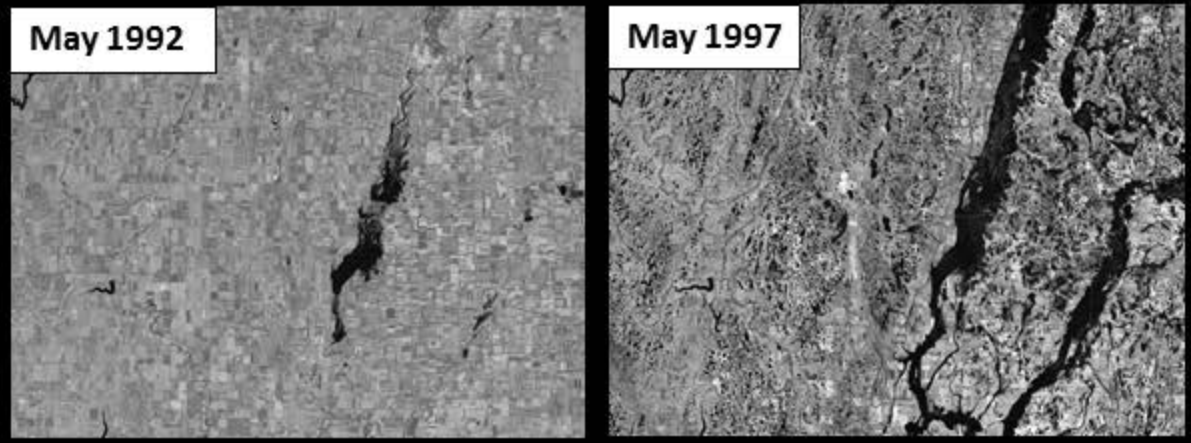
Linked wetlands and uplands at Folden Woods State Wildlife Management Area near Almora, MN (Credit Google Earth)







Example of historical precipitation data for MN climate-division 1



Landsat images of the same location in the Prairie Pothole Region showing differences in wetland surface-water extent between drier and wetter years

Project Manager Qualifications

Dr. Walt Sadinski has been a research ecologist for the U.S. Geological Survey (USGS) at the Upper Midwest Environmental Sciences Center (http://www.umesc.usgs.gov/) since 2002. He also has been the principal investigator for the USGS's Amphibian Research and Monitoring Initiative (http://armi.usgs.gov/) for the Midwest Region throughout that time. For several years, he has been the overall lead in developing and implementing an integrated network of partners and research sites to study the long-term impacts of climate change and other global-change factors on ecological conditions in wetland-upland landscapes, including in study areas in Minnesota. He will work closely with Dr. Gallant, with whom he has collaborated for many years, while overseeing the execution of this work.

Organization Description

"The USGS is a science organization that provides impartial information on the health of our ecosystems and environment, the natural hazards that threaten us, the natural resources we rely on, the impacts of climate and land-use change, and the core science systems that help us provide timely, relevant, and useable information." (http://www.usgs.gov/aboutusgs/)