Environment and Natural Resources Trust Fund

2022 Request for Proposal

General Information

Proposal ID: 2022-275

Proposal Title: Beavers, Trees and Climate- Increasing Floodplain Forest Resilience

Project Manager Information

Name: Nancy Duncan

Organization: National Park Service - Mississippi National River and Recreation Area

Office Telephone: (651) 293-8434

Email: nancy_duncan@nps.gov

Project Basic Information

Project Summary: Climate change, beaver herbivory and Emerald Ash Borer are significant threats to upper Mississippi floodplain forests. Our extensive partnership is identifying solutions to save floodplain wildlife habitat before it disappears.

Funds Requested: $430,000

Proposed Project Completion: June 30 2025

LCCMR Funding Category: Foundational Natural Resource Data and Information (A)

Project Location

What is the best scale for describing where your work will take place?

Region(s): Metro

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.

This 72-mile stretch of the Mississippi River is home to 60+ nesting bald eagle pairs, is the flyway for nearly ⅓ of North American migratory birds and contains habitat for federally endangered species. However, herbivory, climate change, and emerald ash borer (EAB), are causing wide-spread mortality in the overstory and a lack of natural regeneration of native seedlings. How to manage these issues and promote a healthy forest is an ongoing concern among natural resource managers along the river.

Interrelated impacts of increased beaver herbivory, climate change, and forest pests like EAB result in loss of important forest canopy species, including cottonwood. This impacts bald eagle nesting as 80% of eagles nesting along this stretch nest in cottonwood. Lack of regeneration also leads to invasion by reed canary grass and buckthorn, increasing future restoration costs. This proposal brings together multiple public agencies, land managers, foresters, researchers, and volunteers working to improve floodplain forest restoration and protection outcomes. We've seen that targeted planting and protection of naturally germinating seedlings from herbivory can increase regeneration, but need more data to create a set of best management practices for effective and efficient floodplain forest restoration.

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.

Working together, we can improve survival of naturally regenerating and planted trees along the Mississippi River. We must act quickly to prevent undesirable species filling gaps created by Emerald Ash Borer (EAB) devastation. Natural regeneration is critical to floodplain canopy restoration, and targeted tree planting can reestablish canopy in areas lost to EAB and invasive species. This proposal will create best management practices (BMPs) for successful floodplain forest canopy restoration and wildlife habitat enhancement.

Grant funding will identify beaver locations in MNRRA and determine where beavers provide beneficial aquatic and terrestrial wildlife habitat and where they negatively impact naturally regenerating seedlings and mature, seed producing trees. Funding will support data collection of seedling survival, growth, and long-term success of planted climate-adapted native seedlings (funded through Wildlife Conservation Society grant match). This proposal will create best management practices (BMPs) for successful floodplain forest canopy restoration and wildlife habitat enhancement.

This project will improve restoration outcomes in 25 cities, 5 counties, 2 state-wide and several federal agencies by increasing knowledge about: 1) beaver herbivory impacts on natural regeneration and 2) adaptive forest management for climate change in plantings. A successful project will evaluate land management options that impact wildlife habitat and water quality in the Mississippi - a drinking water source for over 1.3 million Minnesota residents.

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?

Outcome 1: Determine best management practices to promote successful floodplain forest canopy restoration for wildlife habitat through natural regeneration and manual plantings.

Products include:

A beaver assessment, population estimates and monitoring plan, including a map of areas where beavers are improving habitat within the MNRRA corridor.

A vegetation assessment of floodplain forest areas at risk of beaver herbivory, with a particular eye to cottonwood, a preferred nesting tree for bald eagles.

A climate-adaptive tree species assessment, tailored to meet site-specific management objectives in the 54,000 acres of MNRRA.

Outcome 2: Disseminate BMPs with stakeholders, including 40+ Minnesota land managers.

Activities and Milestones

Activity 1: Beaver population assessment and impact map along the MNRRA corridor.

Activity Budget: $106,500

Activity Description:
No beaver population monitoring assessment currently exists along this stretch of the Mississippi nor is there data on beaver abundance. We will determine beaver abundance by identifying active beaver colonies throughout the MNRRA corridor via aerial photograph review, aerial observations and field observations determined each fall via cache (winter food storage) surveys conducted by watercraft and/or fixed-wing aircrafts. Camera traps will be placed around a number of colonies to investigate possible predation and what other species utilize structures (lodges/dams) which could impact beaver dispersal and population growth.

Information gathered during this activity will indicate areas of the park where encouraging beaver will improve overall habitat and water quality. Pairing this activity with Activity 2 will also indicate which areas of the park will need exclosure protection to increase natural regeneration.

A thorough understanding of beaver populations and their impacts on riparian trees throughout MNRRA will provide critical information for future conservation and restoration efforts.

Activity Milestones:

Description	Completion Date
Identify locations of active beaver colonies	August 31 2022
Map lodge/bank den location and digitize impounded areas	November 30 2022
Set ~100 camera traps and 5 Hancock Traps for tagging at lodges. Document findings.	June 30 2023
Estimate beaver population via aerial flight census	June 30 2025
Monitoring plan will be developed and incorporated into MNRRA Resource Management protocol.	June 30 2025

Activity 2: Create vegetation assessment of floodplain areas at risk of beaver herbivory, targeting cottonwood, a preferred nesting tree for bald eagles

Activity Budget: $74,000

Activity Description:
We will document beaver herbivory impact on cottonwood and other riparian tree species. This will determine where beavers play a significant role in limiting recruitment and growth of mature trees. A vegetation assessment will indicate where the overabundance of beaver herbivory is damaging floodplain forest health at scale.
Beaver herbivory appears to be limiting recruitment and growth of key floodplain tree species within the corridor. Though numerous land managing partners working along the Mississippi River have anecdotally reported the issue, it's extent is unmeasured. To determine the impact of beaver herbivory, vegetation surveys will be conducted on the regenerating layer (seedlings and saplings – most vulnerable to herbivory) and the overstory (most important for bald eagle nesting). Surveys will be conducted by establishing a minimum of 20 transects at least 100 meters long utilizing 1 meter square quadrats spaced 10 meters apart to quantify density, percent cover, and herbivory impact of seedlings and saplings. A minimum of 25 fixed radius circular plots will be used to quantify overstory density of tree species. Within the fixed radius plots, species, status (live or dead), height, diameter, crown ratio, and impacts of herbivory or other forest health concerns will be documented.

Activity Milestones:

Description	Completion Date
Inventory forage species along a minimum of 3 transects around representative number of beaver ponds.	November 30 2022
Quantify beaver impact on cottonwood regeneration vs. other beaver forage species.	June 30 2023
Map beaver habitat use.	June 30 2025
Create management assessment indicating where herbivory is significantly limiting recruitment and growth of mature trees.	June 30 2025

Activity 3: Develop best management practices for climate-adapted management of floodplain trees.

Activity Budget: $213,500

Activity Description:

After mortality from EAB, public land managers are worried about establishment of non-native invasives like European buckthorn in natural areas. Creating an adaptive management assessment with consideration for climate change and herbivory will give managers data to inform decisions for tree planting in floodplain forests.

We will monitor 1,200 saplings planted in 18 1/10th acre plots in Saint Paul in 2020 with the goal of quantifying differences in growth, survival, physiology (how saplings respond to shade), and phenology (timing of plant development) of eighteen different native tree species across four different treatments - resistance, resilience, transition, and control (no-treatment). The range of treatments provides critical information on planting and restoration in the face of shifting conditions related to climate and flooding.

Annual measurements will include height, diameter at the base (basal diameter), dbh (diameter at breast height), percent canopy cover, and an overall health rating. Measuring soil moisture will determine how saplings respond to annual flooding. On a subset of saplings (400 saplings), we will measure phenology to quantify the timing of growth and development. On a further subset of these saplings (200), we will measure photosynthesis to quantify responses to varying light and moisture levels.

Activity Milestones:

Description	Completion Date
Quantify 5-year survival, growth, overall health of 18 different tree species in four treatment types.	June 30 2025
Measure the phenology (timing of leafout, flowering and leaf fall) on 400 saplings	June 30 2025
Measure photosynthetic rates of 200 saplings at least 3 times throughout the growing season	June 30 2025

Activity 4: Share information with forest and natural area managers for management application and the general public.

Activity Budget: $36,000

Activity Description:

Data on beaver and adaptive management will be shared with local and state partners to contribute to the knowledge base of specific local partners and statewide natural resources managers. MPC and NPS will host an annual land managers meeting to bring 30+ public agencies and nonprofits that manage land within the MNRRA corridor to discuss data and assessments.

Collaborations with the US Forest Service as well as the University of Minnesota will bring this work statewide to other floodplain forests across the state. Assessments will be made available for public use on the National Park Service's website.

Volunteers will be engaged in all aspects of this work and co-managed by the National Park Service and Mississippi Park Connection. LCCMR will receive recognition of support at volunteer events as well as through E-Newsletter publications, the NPS/MPC social media sites, and our annual print newsletter.

Activity Milestones:

Description	Completion Date
Share data- publications, NPS/MPC webpages, social media, enews, partnership meetings (30 land agencies).	June 30 2025
Increase successful reforestation efforts occurring in urban riparian forests nationwide through conferences and publications.	June 30 2025
Add an adaptive management chapter to MNRRA's forest management assessment used by many cities/counties.	June 30 2025
Include volunteers and University students to increase public understanding/realize project goals - in kind support.	June 30 2025

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
PhD Student	Univ of MN Dept of Fisheries, Wildlife and Conservation Biology	With assistance from NPS and U of MN faculty, design and implement beaver project, conduct field work, collect and analyze data, write up findings, conclusions and recommendations. Write up findings for peer-reviewed publication. Present work at conferences and other venues.	Yes
Research Assistant	U of MN Dept of Forest Resources	Graduate student (M.S.). With assistance from U of MN and MPC, this person will conduct field work, collect vegetation data and write up results and conclusions from vegetation portion of the study.	Yes
Environmental Stewardship and Volunteer Manager	Mississippi Park Connection (MPC)	Project coordination including staff, volunteers, and field work; for vegetation piece of study (floodplain forest/tree regeneration success work).	Yes
Dr Marcella Windmuller-Campione, PhD, Assistant Professor of Silviculture	University of Minnesota Department of Forest Resources	Project co-coordinator and provides oversight and technical assistance for forestry/tree portion of study.	Yes
Dr. Steve Windels, Wildlife Biologist,	National Park Service, Voyageurs National Park	Training and technical assistance for beaver portion of study; loan of beaver supplies as available/needed.	No
Dr. Joseph Bump, Associate Professor	University of Minnesota, Dept. of Fisheries, Wildlife and Conservation Biology	Work with PhD student providing technical assistance on beaver portion of the study.	No
Adam Robbins, Natural Resources Supervisor	Saint Paul Parks and Recreation - Natural Resources	Provide technical assistance on project including beaver locations/locations of damaged trees and damaged floodplain regeneration along the Mississippi within St. Paul, MN	No
Leslie Brandt, Climate Change Specialist	U.S. Forest Service/Northern Institute of Applied Climate Science (NIACS)	Technical assistance on vegetation portion of project.	No
Scott Hagen, Natural Resources Specialist	Dakota County Parks	Technical assistance with project; provide locations of beaver colonies and beaver damaged trees within the Mississippi floodplain in Dakota County.	No
Jody Yungers, Director, Recreation and Parks Department	City of Brooklyn Park	Provide project support including locations of beaver damaged trees along the Mississippi River in the City of Brooklyn Park.	No
Robert Fashingbauer, Area Wildlife Manager	MN Dept. of Natural Resources	Technical assistance, providing known beaver and beaver damaged tree locations along the Mississippi River, river backwater areas and the Vermillion River in the southern end of the study corridor.	No

Thomas Parr, Network Program Manager	National Park Service, Great Lakes Network Inventory and Monitoring	Provide general technical assistance with study design, data analysis and NPS report writing and publication, as needed.	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?
Periodic beaver monitoring will be incorporated into MNRRA management plans to provide information on changes in beaver populations and geographic distribution. These data, paired with trends in herbivory species, will inform resource managers on the state of floodplain tree recruitment and need for protection and/or restoration efforts for floodplain forest species in the Mississippi corridor. This creates successful management of the riparian forest-climate-beaver ecosystem.

Monitoring of the climate-adapted plantings will provide a blueprint for floodplain restoration in a changing climate – something natural resource managers up and down the river need, and which will be applicable across the state.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Develop Sonar Data Mapping on Three Rivers to Assess Suitability for Native Mussel Habitat	M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 03j	$200,000

Project Manager and Organization Qualifications

Project Manager Name: Nancy Duncan

Job Title: Natural Resource Program Manager

Provide description of the project manager's qualifications to manage the proposed project.
Nancy Duncan has been the Natural Resource Program Manager with the National Park Service, Mississippi National River and Recreation Area (MNRRA) for over 20 years. She coordinates corridor research within the MNRRA, reviews projects, writes and administers grants, sits on numerous Technical Advisory Committees, hires and supervises summer seasonal biological technicians, approves research permits, facilitates natural resource project coordination between the 26 communities within the corridor, and does occasional planning work. Recent efforts included developing an overarching natural resource forest management assessment for the entire 72-mile stretch of the MNRRA and the lower 4 miles of the Minnesota River that fall within the MNRRA boundary.

Work Experience:

1992 - present Natural Resource Program Manager, National Park Service, MNRRA
1987 - 1992 Cartographic Technician (GIS), National Park Service, Denver Service Center

Education:

1985 - 1992 PhD Candidate, Forest Ecology/Soils Minor, University of MN

1984 - M.S. Degree - Forest Resources, University of MN
1980 - B.S. Degree - Horticulture/Landscape Architecture, University of Missouri - Columbia

Project Manager Responsibilities:

As the Project Manager, Nancy will provide overall project direction, project reporting, budget management, supervision of field efforts, and provide review prior to dissemination of all data products. As the Natural Resource Program Manager, Nancy has demonstrated her ability to manage budgets, direct staff, coordinate with partners, and efficiently and effectively deliver project outcomes.

Organization: National Park Service - Mississippi National River and Recreation Area

Organization Description:
The Mission of the National Park Service, which celebrated its 100th Anniversary in 2016, is "to preserve unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations." The Mississippi National River and Recreation Area (MNRRA) was established in 1988 to preserve the history and natural resources of the Mississippi River as it runs through the Minneapolis/St. Paul area, particularly the river itself, the floodplain forest habitat and the migratory flyway. The National Park Service also has a strong mission to promote the use of the National Parks as natural laboratories to better understand the natural world.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
							Sub Total	**-**
Contracts and Services								
Mississippi Park Connection	Sub award	Mississippi Park Connection will be providing on-the-ground coordination and technical consulting for this project.				1.5		$100,000
Conservation Corps of MN and IA	Professional or Technical Service Contract	Support from a Conservation Corps Crew will support herbivory surveys, monitoring, and establishment management for tree planted at Crosby Farm Regional Park.				3		$63,000
University of Minnesota	Sub award	This would support a full-time PhD student for 3 years and a part-time graduate student for 1 year. It would also support technical consulting with a Professor in the UMN Forestry Department.				4.2		$227,000
Aerial Flight Surveys	Professional or Technical Service Contract	We will seek a contract for aerial flight surveys that will identify beaver populations.				0.03		$10,000
							Sub Total	**$400,000**
Equipment, Tools, and Supplies								
	Equipment	Remote Wildlife Cameras	Camera traps will be placed around a number of colonies to investigate possible predation and what other species utilize structures (lodges/dams) which could impact beaver dispersal and population growth.					$20,000
	Equipment	5 Hancock traps	These live capture traps will allow us to tag and monitor beaver.					$2,500
	Tools and Supplies	Supplies (flagging, tape, gloves for volunteers and other misc supplies)	These items will facilitate volunteer groups.					$1,500

	Tools and Supplies	Exclosure Supplies	Tree tubes or fencing will be used to exclose trees from herbivory.					$3,000
							Sub Total	**$27,000**
Capital Expenditures								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
							Sub Total	**-**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	Publication	Publication Fees	Publishing fees ($1,000/year) for the results and findings.					$3,000
							Sub Total	**$3,000**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$430,000**

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				
In-Kind	National Park Service Voyageurs National Park: GS-12 Wildlife Biologist salary/benefits	Will consult on beaver monitoring assessment, data planning, etc. Will support the PhD student in project design and implementation.	Secured	$18,000
In-Kind	National Park Service - Mississippi National River and Recreation Area: GS-11 Natural Resource Program Manager salary/benefits	Working together with the wildlife biologist for Voyageurs and the Forestry Professor at the University of Minnesota, Nancy Duncan will be the project manager for this proposal.	Secured	$102,000
In-Kind	National Park Service - Mississippi National River and Recreation Area: GS-05 seasonal Biotechnician salary/benefits	This seasonal staff at the National Park Service will support field work, vegetation monitoring, and mapping data.	Secured	$75,000
Cash	National Park Service - Mississippi National River and Recreation Area: Rental car, gas	The National Park Service will rent a car for the biotechs, PhD and graduate student to use for field work related to this project each year.	Secured	$9,000
Cash	Mississippi Park Connection - Federal Service Call Grant and Cooperative Agreement	Mississippi Park Connection will support the project by matching time through the Conservation Corps of MN and IA crew with a 50-50 match. This will double the amount of time that they work on the project.	Secured	$63,000
In-Kind	Mississippi Park Connection volunteers - 600 hours/year@ $25.43/hour	Volunteers will be involved in this project every step of the way. From vegetation surveys to tree monitoring to supporting the beaver assessment, volunteers will support.	Secured	$45,000
Cash	Graduate Student through a U.S. Forest Service Grant	The U.S. Forest Service has supported the graduate student position named in this proposal with funding for years two and three as well as tuition. This provides a 2-1 match for this LCCMR request.	Secured	$75,000
In-Kind	Northern Institute for Applied Climate Science (U.S. Forest Service).	Leslie Brandt, PhD is a project collaborator on this project.	Secured	$16,500
			Non State Sub Total	**$403,500**
			Funds Total	**$403,500**

Attachments

Required Attachments

Visual Component

File: cca8e270-fcf.pdf

Alternate Text for Visual Component

This visual shows a stand of 50 cottonwood planted 7 years ago that was completely cut down by beaver earlier this year. It also has a photo depicting measuring floodplain tree regeneration, a photo of a beaver swimming carrying a stick, and a photo of an eagle in flight. It describes how Mississippi River floodplain forest is being lost to emerald ash borer, climate change, and beaver herbivory, the lack of data on beaver, as well as the lack of data on how to successfully achieve floodpla...

Optional Attachments

Support Letter or Other

Title	File
Support Letter - Dakota County	cc944a79-acb.pdf
Support Letter - U.S.. Forest Service - Northern Institute of Applied Climate Science	6a022a6e-149.pdf
Support Letter - Brooklyn Park	b6161b4b-18d.pdf
Support Letter - Department of Natural Resources	c9c24047-49a.pdf
Support Letter - Saint Paul Parks and Recreation	81dea924-7a8.pdf

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




Beavers, Trees and Climate – Increasing Floodplain Forest Resilience

The Mississippi River floodplain forest is at risk of losing critically important trees that are home to 60+ nesting bald eagle pairs, is the flyway for nearly ⅓ of North American migratory birds and contains habitat for federally endangered species. Beaver herbivory, climate change, and forest pests like EAB are contributing to habitat loss. No data is available on how extensive beaver damage is or how to restore the forest under these new pressures. This project will provide vital best management practices to land managers to protect and restore this habitat before it is lost forever.

Activities:

1. Estimate beaver population and distribution.
2. Create vegetation assessment of floodplain areas at risk of beaver herbivory, targeting cottonwood, a preferred nesting tree for bald eagles.
3. Develop best management practices for climate-adapted management of floodplain trees.
4. Share information with forest and natural area managers for management application and the general public.

Outcome 1: Determine best management practices to promote successful floodplain forest canopy restoration for wildlife habitat through natural regeneration and manual plantings.

Outcome 2: Disseminate BMPs with stakeholders, including 40+ Minnesota land managers.

NATIONAL PARK SERVICE · Department of Forest Resources · MISSISSIPPI PARK CONNECTION *Discover your river* · Dakota County forever wild PARKS · NIACS Northern Institute of Applied Climate Science · SAINT PAUL NATURAL RESOURCES