

**Environment and Natural Resources Trust Fund
2017 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 125-D

A Native Biocontrol for Invasive Hybrid Cattails

Category: D. Aquatic and Terrestrial Invasive Species

Total Project Budget: \$ 306,728

Proposed Project Time Period for the Funding Requested: 3 years, July 2017 - June 2020

Summary:

Our project will quantify the impact of invasive hybrid cattails on MN wetlands and investigate the effectiveness of reintroduced muskrat populations as a potential native biocontrol.

Name: Adam Ahlers

Sponsoring Organization: Kansas State University

Address: 1712 Claflin Rd
Manhattan KS 66503

Telephone Number: (785) 532-0875

Email aahlers2@ksu.edu

Web Address _____

Location

Region: Northeast

County Name: Koochiching, St. Louis

City / Township:

Alternate Text for Visual:

Flow chart representing the impact of invasive hybrid cattails in MN and how muskrats may be a native biocontrol.

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



Environment and Natural Resources Trust Fund (ENRTF)

2017 Main Proposal

Project Title: A native biocontrol for invasive hybrid cattails

PROJECT TITLE: A native biocontrol for invasive hybrid cattails

I. PROJECT STATEMENT

An invasive hybrid cattail species, *T. x glauca*, is rapidly expanding and negatively affecting biodiversity in wetland ecosystems across Minnesota (MN), from the prairie potholes to the Border Lakes region. Dense stands of *hybrid cattail* are reducing open-water habitats and likely impacting the native wildlife and plant communities. To better inform restoration and management of invaded wetlands in MN, a clearer understanding of how expanding *hybrid cattail* populations affect native MN species is needed. Additionally, because mechanical and chemical removal of invasive cattails is costly and relatively destructive, the use of a *native biocontrol* technique is preferred. We will test the effectiveness of muskrats, herbivores that have the ability to control and reduce cattails and other wetland vegetation, as a *native biocontrol* of invasive cattail expansions in MN.

Goal 1: Quantify how invasive hybrid cattail expansions impact native biodiversity in wetland ecosystems.

Because of they grow in dense stands, expanding *hybrid cattail* populations are assumed to negatively affect wildlife and plant communities in MN. However, these assumptions have not been rigorously tested and this lack of information is impeding future management efforts. We propose to quantify how the presence and density of *hybrid cattail* stands impact native wildlife (e.g., crayfish, amphibians, muskrats, waterfowl) and plant (e.g., wild rice, bulrush) communities in Voyageurs National Park (VNP; See attached infographic), one of the most pristine native ecosystems in MN. This information will be used to guide future wetland and wildlife management efforts across all wetland ecosystems in MN.

How does invasive hybrid cattail affect habitat quality for waterfowl, amphibians, wild rice, and other native species Minnesotans love?

Goal 2: Assess the effectiveness of muskrats as a native biocontrol of invasive hybrid cattail expansions.

Expanding *hybrid cattail* populations across MN require proactive and immediate wetland management efforts. Currently, removal of *hybrid cattail* involves highly invasive mechanical or chemical techniques, and the usefulness of a native biocontrol has not yet been evaluated. Muskrat populations have the documented ability to reduce and control densities of wetland vegetation, and may be a viable management alternative for expanding cattail populations. Our project will experimentally assess the effectiveness of reintroducing and enhancing muskrat populations to serve as a *native biocontrol* for expanding hybrid cattails in MN.

Can native muskrat population abundances be enhanced to naturally control invasive hybrid cattails?

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Effects of invasive *hybrid cattail* on native wetland biodiversity

Budget: \$135,079

We will identify and establish transects at wetland sites within VNP with varying levels of *hybrid cattail* abundance. Mechanical wetland-restoration efforts are already being planned at VNP and our sampling will be stratified across “restored” and “unrestored” sites. Estimates of *hybrid cattail* density will be measured along each transect and correlated with measurements of native plant, vertebrate, and invertebrate abundance and diversity. Thus, our study will provide a clear understanding of the benefits of wetland restoration practices by comparing biodiversity measurements from pre- and post-restoration sites. This approach will also provide a mechanistic insight into how wetland ecosystems are impacted by expanding hybrid cattail populations in MN. Preliminary data will be collected during the summer of 2016 (1-year prior to this proposed projects initiation) and used to guide and refine our sampling techniques and hypotheses.



Outcome	Completion Date
1. Biodiversity measures across all pre- and post-restoration transects	9/31/2019
2. Provide wetland-management recommendations to MN land managers	6/30/2020

Activity 2: Determine the effectiveness of muskrats as a *native biocontrol* for invasive cattail expansions Budget: \$171,650

We will identify wetland sites within VNP that are heavily invaded with *hybrid cattail* and experimentally manipulate muskrat densities within each wetland. Because muskrat populations have declined in VNP over the last 30+ years, we will translocate additional muskrats into these wetlands (at various treatment densities) from nearby areas (<250km away). A subset of muskrats will be fitted with radio transmitters to assess their survival and movements within each treatment wetland. We will also investigate food preferences of native muskrats on invasive hybrid cattail versus other native plant species. The effectiveness of our *native biocontrol* efforts will be evaluated by the quantifying the extent of *hybrid cattail* reduction in each wetland relative to control wetlands (no muskrats). Additionally, we will assess the economic and environmental feasibility of this native biocontrol compared to ongoing mechanical control techniques.

Outcome	Completion Date
1. Measure the effects of translocated muskrat populations on expanding invasive hybrid cattail	05/31/2020
2. Report summarizing the impact of native muskrat reintroductions on invasive hybrid cattail expansions	9/31/2020
3. Management recommendations for dealing with effects of expanding hybrid cattail in MN	6/30/2020

III. PROJECT STRATEGY

A. Project Team/Partners

Dr. Adam Ahlers is a wetland and wildlife ecology expert at Kansas State University and will oversee the project and contribute to Activities 1 and 2. Dr. Ahlers will mentor two graduate students that are Minnesota residents. Dr. Steve Windels is a wetland and wildlife ecology expert, adjunct faculty at University of Minnesota-Duluth, and Wildlife Biologist with the National Park Service at VNP. Dr. Windels will supervise data collection in VNP and contribute to Activities 1 and 2.

B. Project Impact and Long-Term Strategy

Our study will identify how invasive cattail expansions affect wetland biodiversity in MN and determine if reintroducing native muskrats into heavily invaded wetlands is an effective biocontrol strategy. Land managers from VNP, MN Department of Natural Resources, and other agencies will use this information to move forward with immediate removal of invasive hybrid cattails and subsequent long-term restoration efforts.

C. Timeline Requirements

Our project will be completed in 3 years (01 July 2017 – 30 June 2020). We will begin site selection and data collection in July 2017 and continue with field work until the spring of 2020.

2017 Detailed Project Budget

Project Title: A native biocontrol for invasive hybrid cattails

IV. TOTAL ENRTF REQUEST BUDGET 3 years

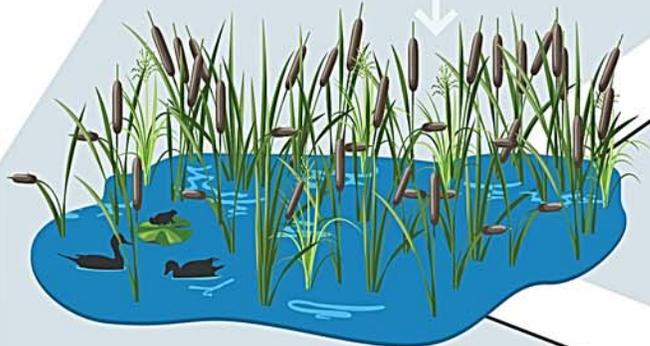
<u>BUDGET ITEM</u>	<u>AMOUNT</u>
Personnel:	
Ahlers; project management; 10% fte; 68% salary/32% fringe; 3 years	\$ 31,284
GRA (x2; Minnesota residents): Data collection, analysis, writing; 50% fte; 94.5% salary/	\$ 139,260
GRA (x2; Minnesota residents): Tuition and fees	\$ 34,254
Undergrad RA (x2): 50% fte; 99% salary/1% fringe; 3 summers	\$ 36,360
Equipment/Tools/Supplies:	
100 live traps @\$35.80 apiece	\$ 3,580
60 VHF transmitters @\$200 apiece	\$ 12,000
2 radiotelemetry receivers @ \$825 apiece	\$ 1,650
4 radiotelemetry antennae @ \$160 apiece	\$ 640
Surgical transmitter implants @\$120 apiece	\$ 7,200
Construction materials for trap platforms (e.g, wood, pvc pipe, screws, rope)	\$ 3,500
Travel:	
Travel mileage between study sites in MN, vehicle rental, summer lodging for 2 graduate students and 2 technicians, 3 years	\$ 27,000
Additional Budget Items:	
Flight time for aerial muskrat and vegetation surveys (\$100/hr for 80 hours)	\$ 8,000
Publication fees (4 publications@ \$500 apiece)	\$ 2,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 306,728

V. OTHER FUNDS

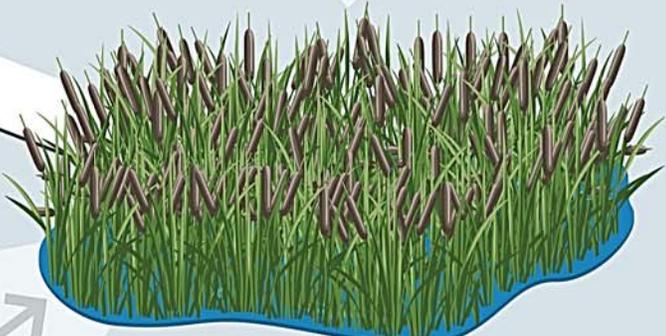
<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
Other Non-State \$ To Be Applied To Project During Project Period:	NA	NA
Other State \$ To Be Applied To Project During Project Period:	NA	NA
In-kind Services To Be Applied To Project During Project Period:		
Kansas State University will provide indirect costs (50%) as in-kind match	\$ 136,239	Secured
Funding History:		
VNP: Inventory of known stands of invasive hybrid cattail, wild rice, and muskrat abundance in 2015 (\$15,000); restoration project to test new mechanical methods of cattail removal and wetland revegetation in 2015-2016 (\$250,000); VNP study of muskrat abundance and survival in 2004-2005 (\$40,000); USGS/NPS project to characterize genetics of invasive hybrid cattail stands (\$70,000)	\$ 375,000	Secured
Remaining \$ From Current ENRTF Appropriation:	NA	NA



INVASIVE HYBRID CATTAILS are negatively affecting native wildlife, vegetation, and recreational opportunities in Minnesota.



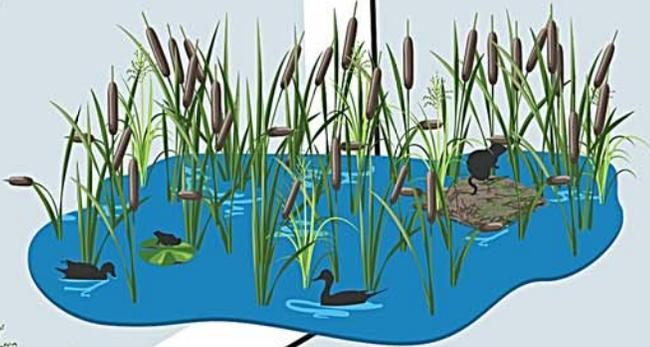
Unmanaged wetlands have dense stands of **INVASIVE HYBRID CATTAILS** that displace native vegetation (e.g., bulrush and wild rice) and wildlife.



MUSKRATS MAY BE A NATIVE BIOCONTROL FOR INVASIVE HYBRID CATTAILS

05/07/2016

We will translocate muskrat populations into invaded wetlands to investigate their effectiveness as a **NATIVE BIOCONTROL FOR INVASIVE HYBRID CATTAILS**.



Muskrats may act as a **NATIVE BIOCONTROL FOR INVASIVE HYBRID CATTAILS** and restore native biodiversity and recreational opportunities for Minnesotans.



ENRTHID: 125-D

I. Qualifications

Dr. Adam A. Ahlers is an Assistant Professor at Kansas State University that specializes in wetland and wildlife research. Many of his published studies have investigated the effects of environmental change on native wildlife populations that occur in wetland ecosystems.

Education/Certification

Ph.D., Natural Resources and Environmental Sciences, University of Illinois, 2015

M.S., Natural Resources and Environmental Sciences, University of Illinois, 2010

B.S., Biological Sciences, Eastern Illinois University, 2007

A.A., Liberal Arts, Northeast Community College, 1997

Certificate in Business Administration, University of Illinois, 2010

Associate Wildlife Biologist®, The Wildlife Society

Selected Peer-Reviewed Publications

Ahlers AA, Heske EJ, and Schooley RL. 2016 (In Press). Prey distribution, potential landscape supplementation, and urbanization affect occupancy dynamics of American mink in streams. *Landscape Ecology*. DOI: 10.1007/x10980-016-0350-5.

Ahlers AA, Cotner LA, Wolff PJ, Mitchell MA, Heske EJ, and Schooley RL. 2015. Summer precipitation predicts the spatial distribution of semiaquatic mammals. *PLoS ONE*. DOI: 10.1371/journal.pone.0135036.

Fischer JD, Schneider SH, **Ahlers AA**, and Miller JR. 2015. Categorizing wildlife responses to urbanization and conservation implications of terminology. *Conservation Biology* 29: 1246-1248.

Ahlers AA, Mitchell MA, Dubey JP, Schooley RL, and Heske EJ. 2015. Risk factors for *Toxoplasma gondii* exposure in semiaquatic mammals in a freshwater ecosystem. *Journal of Wildlife Diseases* 51: 488-492.

Schooley RL, Cotner LA, **Ahlers AA**, Heske EJ, and Levensgood JM. 2012. Monitoring site occupancy for American mink in its native range. *Journal of Wildlife Management* 76: 824-831.

Ahlers AA, Mitchell MA, Schooley RL, Heske EJ, and Levensgood JM. 2011. Hematologic and blood chemistry reference values for free-ranging riparian muskrats (*Ondatra zibethicus*). *Journal of Wildlife Diseases* 47: 685-689.

Ahlers AA, Heske EJ, Schooley RL, and Mitchell MA. 2010. Home ranges and space use of muskrats *Ondatra zibethicus* in restricted linear habitats. *Wildlife Biology* 16: 400-408.

Ahlers AA, Schooley RL, Heske EJ, and Mitchell MA. 2010. Effects of flooding and riparian buffers on survival of muskrats (*Ondatra zibethicus*) across a flashiness gradient. *Canadian Journal of Zoology* 88: 1011-1020.

II. Responsibilities

Dr. Ahlers will manage all aspects of the above described project. He will mentor two M.S. students (who will be Minnesota residents) and supervise two summer technicians for the duration of the project. Additionally, Dr. Ahlers will coordinate study design, data collection, and analysis of data and provide subsequent reports to the LCCMR, VNP, and Minnesota DNR.

III. Organization Description

Kansas State University is an 1863 Land Grant Institution that has a strong record of conducting applied wildlife research. This proposed research will also be in collaboration with the National Park Service (Voyageurs National Park - Minnesota's only national park) whose mission 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."