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

Project Title: **ENRTF ID: 017-A**

Effects of Wolves on Beavers, Moose, and Deer

Category: A. Foundational Natural Resource Data and Information

Total Project Budget: $ 293,000

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

Summary:

Project will assess wolf hunting behavior on beavers, moose, and deer in the Border Lakes region to understand how availability of beavers can influence wolf predation on moose and deer.

Name: Steve Windels

Sponsoring Organization: Voyageurs National Park

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Web Address

Location

Region: Northeast

County Name: Koochiching, St. Louis

City / Township:

Alternate Text for Visual:

Wolves prey on moose, deer, and beavers. Does the availability of beavers, an easy food source, reduce predation pressure on moose and deer? GPS collars on wolves can point to locations where wolves have killed prey. Species, sex, and age of prey items can be identified to understand wolf predation under high and low beaver densities.

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

PROJECT TITLE: Effects of Wolves on Beavers, Moose, and Deer in the Border Lakes Region

I. PROJECT STATEMENT

We propose to examine gray wolf hunting behavior in an area with abundant beavers to better understand how the availability of vulnerable beaver prey may affect wolf predation on moose and deer. Gray wolves are widely known to prey on adults and fawns/calves of deer and moose. Beavers also make up a large portion of the diet in areas where beavers are plentiful. Recent studies in Voyageurs National Park (VNP) and surrounding area, where beaver densities are very high, demonstrated that up to 38% of the summer diet is beavers. In other areas of the state beavers are much less a part of wolf diet, generally <5-15%. Moose persist in VNP at low numbers, despite a healthy gray wolf population. Does the high abundance of beavers, a more easily killed prey item than moose, result in lower predation on moose? Likewise, how does the availability of beaver prey affect wolf predation on adult and fawn deer in summer and fall?

Beavers are 2-10x more abundant in VNP than elsewhere in the state because trapping has not been permitted within federally-owned lands in VNP since park establishment in 1975. High beaver densities are generally not tolerated elsewhere in Minnesota because of conflicts they cause from flooding of roads, cutting valuable timber or trees on waterfront property, or stream fisheries. However, a trade-off of lowered beaver densities may be increased predation on moose and deer by wolves.

Voyageurs National Park offers the perfect natural laboratory in Minnesota to learn about wolf hunting behavior in an area where beaver densities can be very high.

The proposed project would build on past and current monitoring and research in VNP related to wolf, beaver, moose, and deer interactions by focusing resources on examining kill sites of GPS-collared wolves in VNP for a 3-year study period. Specifically, our project goals are to:

1) Determine wolf predation rates on beavers, adult and calf moose, and adult and fawn deer for each of the 6-8 wolf packs that overlap VNP;
2) Census beaver populations within each wolf pack in VNP annually; and
3) Evaluate the relationship between beaver abundance and wolf predation rates on other prey species such as moose and deer.

Although the proposed research would occur within the boundaries of a U.S. National Park, the results will be applicable anywhere in MN where wolves, beavers, moose, and deer overlap. Project results will also add to the information generated by several other LCCMR-funded projects investigating the cause of moose declines in Minnesota.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Determine predation rates on moose, deer, and beavers **Budget: $233,000**

Within each of the 6-8 wolf packs (the number varies each year) whose territory overlaps VNP, we will capture and GPS-collar at least 2 wolves/pack. Potential wolf kill sites will be identified from GPS-collar locations (uploaded daily by satellite) and ground crews will examine sites for evidence of species (moose, deer, beaver, other), sex, and age (from teeth and other bones).

Outcome	Completion Date
1. Capture and GPS-collar ≥12 wolves.	November 2018

2. Estimate wolf predation rates on moose, deer, and beaver.	November 2019
3. Final report and activity results submitted.	June 2020

Activity 2: Census beaver populations within each wolf pack in VNP Budget: $20,000
Annual fall beaver cache surveys will be completed using fixed-wing aircraft. Each active beaver lodge will be identified and mapped using real-time GIS software. Beaver abundance data gathered for this project can be related to other beaver population work done in VNP from the 1950s-present.

Outcome	Completion Date
1. Annual estimates of beaver abundance in each wolf pack	November 2019
2. Final report and activity results submitted.	June 2020

Activity 3: Evaluate relationship between beaver abundance and wolf predation on moose and deer Budget: $45,000
Beaver abundance varies across the VNP landscape and therefore varies between wolf packs. We will evaluate how differences in the abundance of beavers can affect wolf predation rates on moose and deer of different sex and age classes (fawn/calves, yearlings, prime adults, old adults).

Outcome	Completion Date
1. Modeling/analysis of predation rates and prey abundance.	November 2019
2. Final report and management recommendations detailing linkages between beaver abundance and wolf predation rates on moose and deer.	June 2020

III. PROJECT STRATEGY

A. Project Team/Partners
The project will be lead by Dr. Steve Windels, Research Wildlife Biologist at Voyageurs National Park. Tom Gable, M.S. (June 2016), is currently a wildlife biologist at VNP who specializes in wolf capture, kill site analysis, and wolf-beaver interactions. Dr. Ron Moen (Univ. of Minnesota-Duluth) and other species experts in Minnesota may also be collaborating on the project.

B. Project Impact and Long-Term Strategy
If clear linkages can be found between beaver abundance and wolf predation rates on moose and deer, *potential management options exist where beaver populations could be manipulated to alleviate predation on moose and deer*. Options include reduced beaver harvest or incentives to encourage beavers in low density areas. This project would also contribute to continued understanding of the ecology of wolves and their prey in a natural setting in northern Minnesota.

C. Timeline Requirements
Our project will be completed in 3 years (01 July 2017 – 30 June 2020). We will begin wolf capture and collaring in July 2017 and continue with kill site examination until the spring of 2020. Final analysis and reporting will take place within the final year.

2017 Detailed Project Budget

Project Title: *Effects of Wolves on Beavers, Moose, and Deer in the Border Lakes Region*

IV. TOTAL ENRTF REQUEST BUDGET: *3* years

BUDGET ITEM	AMOUNT
Personnel:	
Thomas Gable, Lead Biologist (71% salary, 29% benefits); 75% FTE for Year 1-3; will coordinate all field work and data collection and assist with analysis and report writing.	$ 112,000
2 Wildlife Technicians (93% salary, 7% benefits); 50% FTE for Year 3; for wolf capture and kill site visitation.	$ 38,000
4 Wildlife Interns (100% stipend @ $150/mo); 20% FTE for Years 1-3; to assist with wolf capture and kill site visitation.	$ 6,500
Professional/Technical/Service Contracts:	
GPS-satellite collar data acquisition contract; $2000/yr/collar	$ 72,000
Equipment/Tools/Supplies:	
GPS-satellite wolf collars; $1500/collar for 24 collars to maintain 2 collars/pack for 3 years	$ 36,000
Pharmaceuticals for wolf capture	$ 3,000
Hand-held GPSs (4)	$ 2,500
Acquisition (Fee Title or Permanent Easements):	
Travel:	$ -
Mileage and boat gas for field work	$ 8,000
Additional Budget Items:	$ -
Flight time for annual beaver census ($100/hr) for Year 1-3	$ 15,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND $ REQUEST =	$ 293,000

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State $ To Be Applied To Project During Project Period: National Park Service grant for wolf monitoring in 2017-2018 will pay for 2 Wildlife Technicians in Years 1 and 2 for wolf capture and kill site visitation.	$ 70,000	*Secured*
Other State $ To Be Applied To Project During Project Period:		
In-kind Services To Be Applied To Project During Project Period: Voyageurs National Park: 20%FTE salary/benefits for 3 Years for Project Lead S. Windels ($67,000); wolf capture equipment and supplies ($12,000); housing for interns ($6,000); 2.5%FTE salary/benefits for VNP pilot S. Mazur ($8,400); 5% FTE salary/benefits for GIS support by VNP biologist ($12,000); use of boats and motors	$ 106,000	*Secured*
Funding History:	N/A	
Remaining $ From Current ENRTF Appropriation:	N/A	

Effects of Wolves on Beavers, Moose and Deer in Border Lakes Region

Wolves prey on moose, deer, and beavers. Does the availability of beavers, an easy food source, reduce predation pressure on moose and deer?

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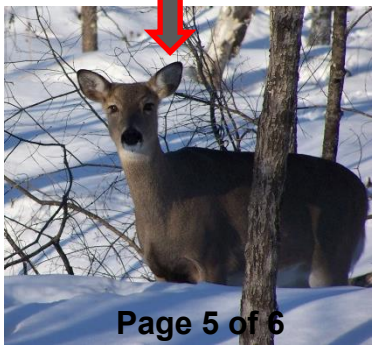

GPS collars on wolves can point to locations where wolves have killed prey. Species, sex, and age of prey items can be identified to understand wolf predation under high and low beaver densities.

Examples of wolf kill sites

Wolf-Killed Beaver

Wolf-Killed Moose

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2016 LCCMR Project Manager Qualifications and Organization Description

I. QUALIFICATIONS

Dr. Steve K. Windels has been a Research Wildlife Biologist at Voyageurs National Park, MN from 2003-present. He currently oversees research and monitoring projects on wolves, beavers, moose, and other wildlife species. Most relevant to the proposed project, he and his staff have captured and collared 36 wolves in VNP since 2012. He recently won the prestigious National Park Service Director's Award for Natural Resource Research in 2014.

Education/Certification

Ph.D. in Wildlife Ecology, Michigan Technological University
M.S. in Range and Wildlife Management, Texas A&M University – Kingsville
B.S. in Fisheries and Wildlife Management, University of Minnesota
Certified Wildlife Biologist® by The Wildlife Society.

Selected Publications

Windels, S.K., and J.L Belant. 2016. Performance of tail-mounted transmitters on American beavers *Castor canadensis* in a northern climate. Wildlife Biology (in press).

Smith, J.B., S.K. Windels, T. Wolf, R. Klaver, and J.L. Belant. 2016. Do transmitters affect fitness indices of American beavers (Castor canadensis)? Wildlife Biology (in press).

Johnston, C.L., and S.K. Windels. 2015. Using beaver works to estimate colony activity in boreal landscapes. Journal of Wildlife Management 79:1072-1080.

Cyr, T., S.K. Windels, R.A. Moen, and J.W. Warmbold. 2014. Diversity and abundance of terrestrial gastropods in Voyageurs National Park, MN: implications for risk of moose to *P. tenuis* infection. Alces 50: 121-132.

Olson, B.T., S.K. Windels, M. Fulton, and R.A. Moen. 2014. Fine-scale temperature patterns in the southern boreal forest: implications for the cold-adapted moose. Alces 50: 105-121.

VanderWaal, K.L., S.K. Windels, B.T. Olson, T. Vannatta, and R.A. Moen. 2014. Spatial epidemiology of liver fluke and meningeal worm in white-tailed deer in northern Minnesota, USA. Parasitology: 1-13.

Severud, W.J., J.L. Belant, S.K. Windels, and J.G. Bruggink. 2013. Seasonal variation in assimilated diets of American beavers. American Midland Naturalist 169:30-42.

Severud, W.J., S.K. Windels, J.L. Belant, and J.G. Bruggink. 2013. The role of forage availability on diet choice and body condition in American beavers (Castor canadensis). Mammalian Biology 78: 87-93.

Windels, S.K. 2013. Ear tag loss rates in American beavers. Wildlife Society Bulletin 38:122-126.

II. RESPONSIBILITIES

Dr. Windels will coordinate and manage the overall project, and directly supervise Lead Biologist Gable, who will coordinate the field work components of the project. Dr. Windels will also oversee all aspects of study design, analysis, and final reporting.

III. ORGANIZATION DESCRIPTION

The mission of the National Park Service, celebrating 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." Voyageurs National Park, Minnesota's only National Park, was established in 1975 to preserve the history and natural resources of the Border Lakes Region. The National Park Service also has a strong mission to promote the use of National Parks as natural laboratories to better understand the natural world.