

**Environment and Natural Resources Trust Fund
2012-2013 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 004-A

Moose Habitat Restoration in Northeastern Minnesota

Topic Area: A. Fisheries & Wildlife Research

Total Project Budget: \$ 219,734

Proposed Project Time Period for the Funding Requested: 3 yrs, July 2013 - June 2016

Other Non-State Funds: \$ 0

Summary:

We will develop best practices guidelines for creating moose foraging habitat efficiently and cost-effectively that will allow limited funds to be directed to projects providing most benefit to moose.

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Sponsoring Organization: U of MN - Duluth NRR

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Location

Region: NE

County Name: Cook, Koochiching, Lake, St. Louis

City / Township:

<input type="checkbox"/> Funding Priorities	<input type="checkbox"/> Multiple Benefits	<input type="checkbox"/> Outcomes	<input type="checkbox"/> Knowledge Base
<input type="checkbox"/> Extent of Impact	<input type="checkbox"/> Innovation	<input type="checkbox"/> Scientific/Tech Basis	<input type="checkbox"/> Urgency
<input type="checkbox"/> Capacity Readiness	<input type="checkbox"/> Leverage	<input type="checkbox"/> Employment	<input type="checkbox"/> TOTAL <input type="checkbox"/> %



Environment and Natural Resources Trust Fund (ENRTF) 2012-2013 Main Proposal

PROJECT TITLE: Moose Habitat Restoration Techniques in Northeastern Minnesota

I. PROJECT STATEMENT

Research is needed to halt the decline and increase the moose population in Minnesota. The focus in **Identifying Critical Habitats for Moose in Northeastern Minnesota** (ML 2010, Chap. 362, Sec. 2, Subd. 3(k)) was on thermal habitat. With some of the hottest summers on record in Minnesota in recent years, thermal habitat needed to be identified and managed.

In the **Identifying Critical Habitats project** satellite GPS collars on moose collected GPS locations every 20 minutes, providing a track of where each moose went over an entire year (Fig. 1). In addition to identifying areas used by moose when the temperature was 90° in summer, these GPS collars enabled us to find moose feeding areas and led to this proposed project. Consumption by moose was unexpectedly high in most moose feeding areas (Fig. 2).

Identifying characteristics of feeding areas would make it possible to manage for the best possible moose foraging habitat. Initial funding from the EPA Great Lakes Restoration Initiative was obtained to restore moose habitat in Lake County and monitor moose use. A \$976K project to restore additional moose habitat in Lake, Cook, and St. Louis counties submitted by MDHA was recommended for Lessard-Sams OHF funding from 2012 to 2015.

Thus, 2012 marks the start of what could be a decade of intensive moose habitat management. General techniques and guidelines for creating moose habitat are known, but at present it is not known which habitat restoration methods are most cost-effective and best for moose.

Goal 1: Evaluate techniques for moose habitat restoration and develop best practices guidelines for creating moose foraging habitat efficiently and cost-effectively using satellite GPS collar data from moose.

Moose foraging habitat can also be created after forest fires and wind storms. Over the last 15 years forest fires and wind storms have hit almost half of the land in and near the BWCA (Fig. 3). The Ham Lake, Cavity Lake, and Pagami Creek fires all created moose foraging habitat, and provide a unique opportunity to measure moose response to fires, monitor browse production, and determine year-round use by moose on the ground.

Goal 2: Determine habitat quality, current moose use, and predict future moose use of recent forest fires and the blowdown in and near the BWCA.

Results from Goal 2 also apply to Goal 1, because prescribed fire is one technique to create moose foraging habitat. Current GPS radiocollar research projects provide a great opportunity to determine best habitat management practices that should not be missed. Outcomes of this proposal will directly benefit current and future moose habitat restoration projects.

This proposal is focused on foraging habitat, with other research projects addressing different critical needs of moose. Dr. Erika Butler (DNR) leads a study funded by the ENRTF to identify causes of mortality in adult moose. Dr. Glenn DeGiudice (DNR) leads a calf mortality project funded by the DNR. Some combination of managing bears, wolves, parasites, diseases, deer, humans, and habitat will be required to stabilize or reverse the moose decline.

Goal 3: Continue to involve the public, biologists, and organizations in a coordinated effort to slow or prevent a continuing decline of the NE MN moose population

Goal 3 is important because of the combined research effort among biologists, agencies, and organizations. Concern about moose in Minnesota is real, and is evident in the way moose research transcends agency jurisdiction and even the international boundary.

Collectively, the research projects will provide a biological basis for management decisions.

II. DESCRIPTION OF PROJECT ACTIVITIES

Activity 1: Foraging habitat restoration techniques for moose in Minnesota **Budget:** \$180,000

We will measure browse production and browse consumption from different moose habitat restoration techniques and identify techniques that are of most benefit to moose. 8 moose will be collared for targeted measuring of moose response to specific habitat restoration techniques. Spatial distribution and presence of habitat types (including thermal cover) will also be incorporated to guide identification of specific sites for enhancement, protection, or acquisition.

Outcome	Completion Date
1. Measurement of browse production in shear, burn, and harvest areas	1/1/2016
2. Deploy GPS collars for fine-scale foraging data on 8 moose	1/1/2016
3. Throughout this activity work with LS-OHF habitat restoration project	6/1/2016
4. Report and recommendations on moose habitat restoration techniques	6/1/2016

Activity 2: Moose use of wildfires and prescribed burns in and near the BWCA **Budget:** \$39,734

Analysis of moose habitat quality and moose use (bites, pellet counts) in and near recent forest fires (Pagami Creek, Cavity Lake, Ham Lake), prescribed burns, and the blowdown area. Products would inform the moose habitat restoration process (prescribed burn, slash) and be used for long-term planning (future browse response).

Outcome	Completion Date
1. Measurement of browse production in forest fires and blowdown area	1/1/2016
2. Report on current and future moose habitat in BWCA and adjacent forest	1/1/2016

III. PROJECT STRATEGY

A. Project Team/Partners – Project Partners will not receive ENRTF funding

Dr. Ron Moen, NRRI-UMD is project manager.

The NE MN Moose Habitat Collaborative created the LS-OHF proposal that is recommended for funding. Collaborative members include MDHA (fiscal agent), Cook, Lake, and St. Louis County Forestry, Superior National Forest, Tribal representatives, and The Nature Conservancy.

MN DNR. Project will be coordinated with the DNR (Primary contact Dr. Glenn DelGiudice).

The Minnesota Zoo is continuing its involvement with moose. Outreach and education will be coordinated with zoo staff.

The overall moose GPS collar projects includes cooperators from Voyageurs National Park (Dr. Steve Windels), Grand Portage Indian Reservation (Dr. Seth Moore), 1854 Treaty Authority (Andrew Edwards), and Quetico Provincial Park in Ontario (Lisa Solomon).

B. Timeline Requirements

The urgency of the moose issue has led to a flurry of research activities, some funded by ENRTF, other parts funded by external funds. Outcomes of this proposal could be used immediately in habitat restoration projects and improve LS-OHF expenditures in the future.

C. Long-Term Strategy and Future Funding Needs

Collaboration among scientists and managers in NE MN to increase the moose population will continue. There may be some smaller scale moose research needs in the future, but the current collaborative and complementary research and habitat projects should answer many of the immediate questions and allow limited funds to be directed to projects that will provide most benefit to moose. In the next 3 to 5 years we should have answers on what is needed to keep moose in Minnesota.

2012-2013 Detailed Project Budget

Moose habitat restoration techniques in northeastern Minnesota

IV. TOTAL ENRTF REQUEST BUDGET 3 years

BUDGET ITEM	AMOUNT
Personnel (All personnel at NRRI-UMD):	
R. Moen, Manager, 36 mos @ 25%=\$74,340; \$54,663 Salary, \$19,677 Fringe (36%)	\$ 74,340
Grad Res Asst, 6 months @ 50%=\$12,947; \$10,269 Salary, \$2,679 Fringe (26.1%)	\$ 12,947
UG RA, 27 mos @ 35%, 9 mo @ 25%=\$22,488; \$22,165 Sal, \$323 Frng (7.61% - 9 mo)	\$ 22,488
Adv Status GRA, 7 mos @ 50%=\$15,646; \$12,217 Sal, \$2,427 Frng (6 mo @26.1%, 1 mo @ 50%)	\$ 14,644
Adv Status GRA - Tuition Only	\$ 1,002
Field/lab tech, 36 mos @ 25%=\$22,438; \$20,493 Salary, \$1,945 Fringe (9.5%)	\$ 22,438
Contracts:	
DNR, Spotter plane for captures, calves, and mortalities (30 hrs @ \$250/hr)	\$ 7,500
TBD, Helicopter for moose capture (8 moose @ ~\$1,100/moose estimate)	\$ 8,800
TBD, Plant chemistry analysis (~480 samples @ \$25/sample)	\$ 12,000
Iridium satellite services for downloading data from moose collars	\$ 9,000
Lotek Wireless, Inc. Collar refurbishment (8 collars @ \$1,875 / collar)	\$ 15,000
Equipment/Tools/Supplies:	
Batteries, field sampling tools and supplies (Twig cutters, bags, ziplocks, bug dope)	\$ 1,500
Moose capture supplies (drugs, sample kits, bags, snowmobile gas)	\$ 3,000
Travel: 6 people * 40 days * \$10/day food = \$2,400/yr food * 3 years, 4,135 miles x \$0.555 per mile on vehicle = \$2,295/yr * 3 years, \$10/day vehicle rental charge (departmental vehicle) * 33 days/yr = \$330/yr * 3 years	\$ 15,075
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 219,734

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ Being Applied to Project During Project Period:		
One National Science Foundation pending application will complement LCCMR project activity. Total application \$155,000. Federal grants cannot be committed as match, A-21 Circular.		Pending
Other State \$ Being Applied to Project During Project Period:		
Base support from NRRI-UMD to R. Moen	\$ 8,485	Secured
Base support from NRRI-UMD to R. Moen	\$ 16,970	Pending
In-kind Services During Project Period:		
Voyageurs National Park biologist/technician	\$ 8,500	Secured
Remaining \$ from Current ENRTF Appropriation (if applicable): "Identifying Critical Habitats for Moose in Northeastern Minnesota" (ML 2010, Chap. 362, Sec. 2, Subd. 3(k)) is in progress. Project funds will be spent over the next 15 months as specified in the work plan and expended by June 30, 2013. Data on moose locations collected on the existing ENRTF appropriation will be used in this habitat restoration project.	\$ 190,000	Unspent but project in progress
Funding History: Lessard-Sams OHF funding to MDHA for moose habitat restoration is recommended for funding for 2012 at ~\$976K. This project is directly relevant because some of areas restored will be manipulated, and advice on moose habitat restoration techniques will be provided to the LS-OHF project. Voyageurs National Park (~\$300K), Grand Portage (~\$200K), and Quetico Provincial Park (~\$100K) are awarded funding but A-21 Circular of the Federal Government does not allow us to list dollar amounts as match (all Fed. Funds are Secured). The moose collared in these projects are also providing data for this project. In addition, \$192K was obtained for moose habitat restoration from the EPA Great Lakes Restoration Initiative (Secured).	\$ 976,000	Pending

Moose Habitat Restoration Techniques in Northeastern Minnesota

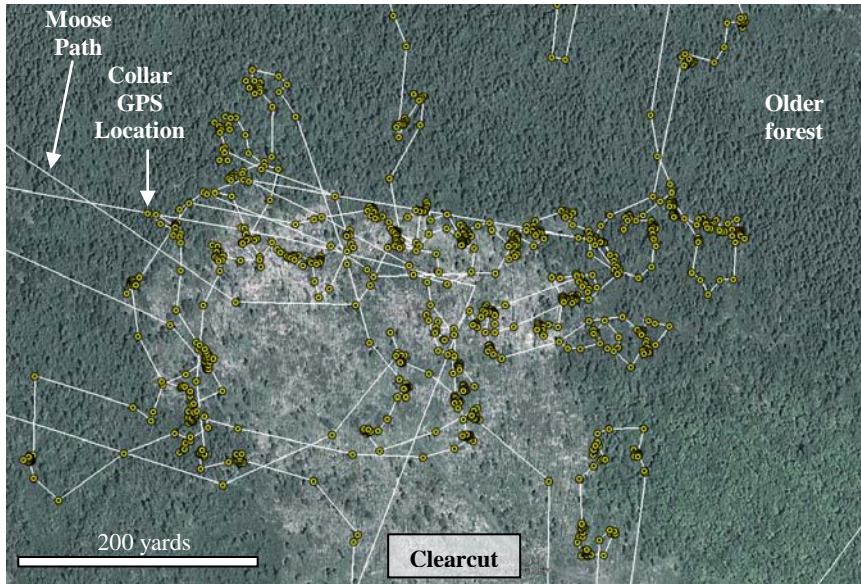


Figure 1. Foraging path of moose in clearcut area and in forest. This is about two days of foraging for one moose. Overall there are over 30,000 feeding bouts that can be analyzed from data collected in the habitat project (ML 2010, Chap. 362, Sec. 2, Subd. 3(k)).



Figure 2. All twigs on this red osier dogwood stem were browsed. We followed movements paths of many collared moose. Feeding stations in many areas look like this.

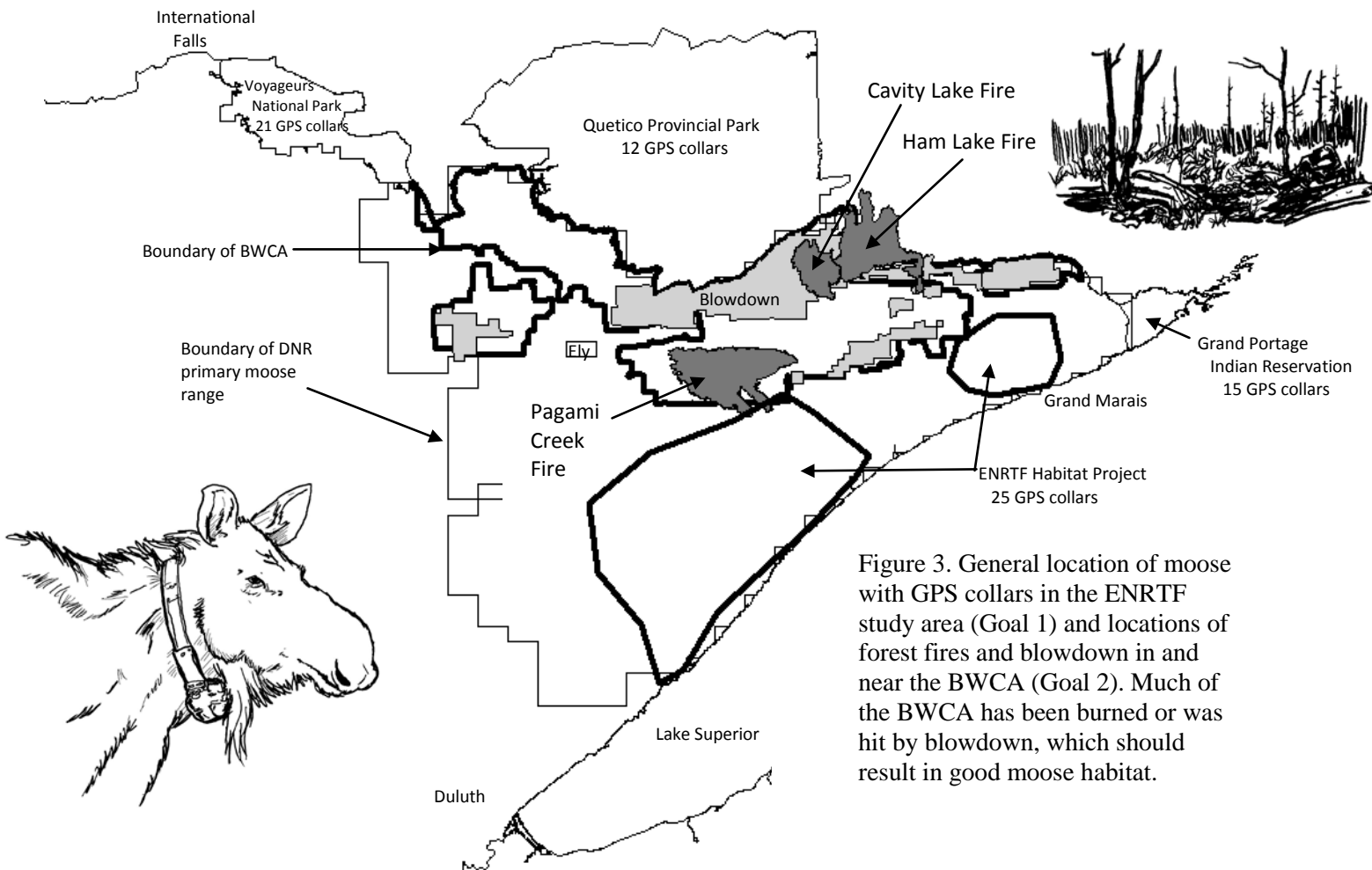


Figure 3. General location of moose with GPS collars in the ENRTF study area (Goal 1) and locations of forest fires and blowdown in and near the BWCA (Goal 2). Much of the BWCA has been burned or was hit by blowdown, which should result in good moose habitat.

Moose Habitat Restoration Techniques in Northeastern Minnesota

2012 LCCMR Project Manager Qualifications and Organization Description

Ronald A. Moen, Natural Resources Research Institute, University of Minnesota Duluth

Key Qualifications

Dr. Moen is a research associate at the Natural Resources Research Institute, non-tenure track assistant professor in the Department of Biology at the University of Minnesota Duluth, and holds appointments in the graduate programs of Integrated Biological Science (Duluth campus) and Conservation Biology (Twin Cities campus).

Education

University of Minnesota, Wildlife Conservation, Ph.D. 1995

University of Minnesota, Wildlife, M.S. 1988

Cornell University, Biological Sciences, B.S. 1984

Selected Grants

- 2010. Environmental Protection Agency Great Lakes Restoration Initiative. Restoring moose foraging habitat in Lake Superior Uplands. R. Moen. \$198,000.
- 2010. Legislative Citizen Committee on Minnesota Resources. Identifying critical habitats for moose in northeastern Minnesota. R. Moen, M. Lenarz, M. Schrage, A. Edwards, and M. Johnson. \$510,000.
- 2009. U.S. Fish and Wildlife Service. Seth Moore, Andrew Edwards, and R.A. Moen. Mooz (Moose) habitat use in a changing climate. \$199,999.
- 2009. U.S. Geological Survey. Steve Windels, Michael E. Nelson, and R.A. Moen. Investigate effects of climate change and other factors on population viability of moose in Voyageurs National Park. \$307,700.

Selected Publications

- McGraw, A.M., R.A. Moen, and L. Overland. 2012. Effective temperature of cover types found in moose home ranges in northeast Minnesota. *Alces* 48: *In press*.
- Moen, R.A., M.E. Nelson, and A. Edwards. 2011. Radiotelemetry locations, home ranges, and aerial surveys in Minnesota. *Alces* 47:101-112.
- McGraw, A.M., R.A. Moen, and M. Schrage. 2011. Characteristics of post-parturition areas of moose in northeast Minnesota. *Alces* 47:113-124.
- Burdett, C.L., R.A. Moen, G.J. Niemi, and L.D. Mech. 2007. Defining Canada lynx space use and movements with GPS telemetry. *Journal of Mammalogy* 88:457-467.
- Moen, R.A., J. Pastor, and Y. Cohen. 1997. Accuracy of GPS telemetry collar locations with differential correction. *Journal of Wildlife Management* 61:530-539.

The **Natural Resources Research Institute** is a part of the University of Minnesota Duluth. NRRI's mission is to promote private sector employment based on natural resources in an environmentally sensitive manner. NRRI scientists have extensive experience in applied ecological research on terrestrial and aquatic systems.