



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2011 Work Plan

Date of Status Update:

Date of Next Status Update: 1/1/2012

Date of Work Plan Approval: 8/11/2011

Project Completion Date: 6/30/2015

Is this an amendment request? _____

Project Title: Determining Causes of Mortality in Moose Populations

Project Manager: Erika Butler

Affiliation: MN DNR

Address: 5463C W Broadway

City: Forest Lake **State:** MN **Zipcode:** 55025

Telephone Number: (651) 296-2662

Email Address: erika.butler@state.mn.us

Web Address:

Location:

Counties Impacted: Cook, Lake, St. Louis

Ecological Section Impacted: Northern Superior Uplands (212L)

Total ENRTF Project Budget:	ENRTF Appropriation \$:	600,000
	Amount Spent \$:	<u>0</u>
	Balance \$:	600,000

Legal Citation: M.L. 2011, First Special Session, Chp. 2, Art.3, Sec. 2, Subd. 03f

Appropriation Language:

\$300,000 the first year and \$300,000 the second year are from the trust fund to the commissioner of natural resources to determine specific causes of moose mortality and population decline in Minnesota and to develop specific management actions to prevent further population decline. This appropriation is available until June 30, 2015, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Determining causes of death in declining moose population

II. PROJECT SUMMARY: Minnesota's moose are dying at rates much higher than elsewhere in North America. Moose numbers in northwestern (NW) MN have plummeted from over 4,000 to fewer than 100 animals in just the past 2 decades and recent studies of moose in the northeast (NE) suggest this population is also declining, albeit at a less precipitous rate. A recent study of the NE moose herd reported non-hunting mortality rates of 15-26% per year, which was significantly higher than for other northern moose populations (8–12% per year) outside of MN. The specific causes of non-hunting mortality remain unknown as this information has not been identified as a research priority in past or ongoing research. This study will determine cause-specific mortality by deploying communication satellite-linked GPS collars on 100 moose in NE Minnesota and by preparing an extensive network of responders highly trained in conducting field necropsies. Moose mortalities will be thoroughly investigated within 24 hours of death to identify the proximate cause of mortality and to examine the influence of potential contributing factors. Specifically, the influence of nutrition on moose survival and cause-specific mortality is unclear and will be evaluated via indicators of nutritional stress (i.e., urine chemistries and ultrasonic measurements of rump fat). Once causes of death and major influential factors are identified, appropriate management actions may be taken to address the population decline.

III. PROJECT STATUS UPDATES:

Project Status as of December 2011:

Project Status as of June 2012:

Project Status as of December 2012:

Project Status as of June 2013:

Project Status as of December 2013:

Project Status as of June 2014:

Project Status as of December 2014:

Project Status as of June 2015:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Purchase and thoroughly field test 100 communication satellite-linked Global Positioning System (GPS) collars

Description: One hundred GPS collars utilizing the Iridium communication satellite technology will be purchased in spring of 2012. The collars will notify the research team when a moose has died by way of a motion-sensitive switch in the collar and subsequently sending a text message with the moose's location. This technology will be thoroughly field tested in a variety of habitat types and weather conditions prior to deployment on moose. Prototypes of the collars will be requested from the various manufacturers for more rigorous testing in the winter of 2011-2012.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 250,000
Amount Spent: \$ 0
Balance: \$250,000

Activity Completion Date:

Outcome	Completion Date	Budget
1. Field test prototype collars provided by vendors.	3/31/2012	\$0
2. Purchase 100 GPS collars	5/30/2012	\$ 250,000
3. Thoroughly field test collars and their mortality notification function	11/30/2012	\$0

Activity Status as of December 2011:**Activity Status as of June 2012:****Activity Status as of December 2012:****Activity Status as of June 2013:****Activity Status as of December 2013:****Activity Status as of June 2014:****Activity Status as of December 2014:****Activity Status as of June 2015:****Final Report Summary: August 2015****ACTIVITY 2: Determine specific causes of mortality of moose in NE MN**

Description: Global Positioning System (GPS) collars will initially be deployed on 100 adult moose (approximately 75 females and 25 males) in January-February of 2013. The collars will notify the research team when a moose has died by way of a motion-sensitive switch in the collar and a subsequent text message. A network of strategically stationed responders will reach moose within the critical 24-hours after death, ensuring the carcass and tissue samples are suitable for diagnostics. When possible, carcasses will be transported intact to a nationally certified laboratory in Minnesota for a full diagnostic workup. Otherwise, a trained biologist or veterinarian will perform a thorough field examination (necropsy). Diagnostic screening for more than 30 diseases, toxicities and deficiencies will occur by Board-certified veterinary pathologists.

Summary Budget Information for Activity 2:

ENRTF Budget: \$ 323,240
Amount Spent: \$ 0
Balance: \$323,240

Activity Completion Date:

Outcome	Completion Date	Budget
1. Determine specific causes of death of moose that die during the study period.	6/30/2015	\$ 291,240
2. Quantifying rate of exposure to diseases and toxicity and deficiency levels	6/30/2015	\$ 32,000
3. Preliminary data analyses and final LCCMR report	6/30/2015	\$ 0
4. Descriptive reports/articles in peer-reviewed publications addressing findings	6/30/2016	\$ 0

Activity Status as of December 2011:

Activity Status as of June 2012:

Activity Status as of December 2012:

Activity Status as of June 2013:

Activity Status as of December 2013:

Activity Status as of June 2014:

Activity Status as of December 2014:

Activity Status as of June 2015:

Final Report Summary: August 2015

ACTIVITY 3: Determine the influence of nutritional stress as a contributing factor to the specific causes of deaths.

Description:

Biological samples (blood, feces, and urine) will be collected from all moose at capture and fat measurements will be made by ultrasound. Baseline (early winter) data from blood and urine specimens and fat measurements will be used to assess body condition, nutritional status, and overall health of moose. Snow-urine samples will be collected each winter throughout the study area, and then chemically analyzed to determine the degree of winter nutritional stress experienced by the broader moose population. Value of this latter technique has been demonstrated with moose on Isle Royale and with elk and bison in Yellowstone National Park.

Summary Budget Information for Activity 3:

ENRTF Budget: \$ 26,760
Amount Spent: \$ 0
Balance: \$ 26,760

Activity Completion Date:

Outcome	Completion Date	Budget
1. Assess the nutritional condition, health, and overall well-being of moose at the start of winter.	6/30/2015	\$ 15,000
2. Determine how progressive winter nutritional stress and poor condition of moose contributed to specific causes of death.	6/30/2015	\$ 11,760
3. Preliminary data analyses and final LCCMR report	6/30/2015	\$ 0

Activity Status as of December 2011:

Activity Status as of June 2012:

Activity Status as of December 2012:

Activity Status as of June 2013:

Activity Status as of December 2013:

Activity Status as of June 2014:

Activity Status as of December 2014:

Activity Status as of June 2015:

Final Report Summary: August 2015

V. DISSEMINATION:

Description: Annual research summaries addressing accomplishments to date will be written and available on the MNDNR website. Descriptive reports/articles will be written and submitted for publication in peer-reviewed publications.

Activity Status as of December 2011:

Activity Status as of June 2012:

Activity Status as of December 2012:

Activity Status as of June 2013:

Activity Status as of December 2013:

Activity Status as of June 2014:

Activity Status as of December 2014:

Activity Status as of June 2015:

Final Report Summary: August 2015

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget:

Budget Category	\$ Amount	Explanation
Personnel:	\$ 54,200	1 Wildlife Technician (unclassified), 50% effort , field data collection and analysis, field necropsies, and outreach; 2 seasonal volunteers, 100% effort, field data collections (room and board only)
Professional/Technical Contracts:	\$ 32,000	Nationally certified laboratory in Minnesota (to be determined), disease and health screening for dead moose (screening for over 30 diseases, various toxicities, and nutritional deficiencies)
Service Contracts	\$ 185,640	Helicopter for wildlife capture (to be determined),

		Year 2: initial moose capture and handling, Year 3: additional moose capture to maintain sample size; Iridium satellite data acquisition (company undetermined), downloading location data and location fixes
Equipment/Tools/Supplies:	\$ 282,660	GPS collars (120) will provide notification and location of death; capture drugs for chemical immobilization of moose; supplies for necropsy kits used to collect samples from dead moose; field equipment (GPS units, camera, etc) used for mortality investigation
Travel Expenses in MN:	\$ 21,500	Mileage to/from study area by project managers and technician and volunteers
Other:	\$ 24,000	DNR spotter plane to be used during capture/recapture events
TOTAL ENRTF BUDGET: \$ 600,000		

Explanation of Use of Classified Staff: Funds will not be used to pay for classified staff.

Explanation of Capital Expenditures Greater Than \$3,500: NA

Number of Full-time Equivalent (FTE) funded with this ENRTF appropriation: 0.5 FTE

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
Minnesota Deer Hunter's Association	\$ 5,000	\$0	Transport of carcasses
State			
Other DNR funds (general funds, game and fish funds, etc)	\$ 221,500	\$0	Shared services, fish and wildlife division support, project management, field necropsies, snow urine analysis, habitat analysis and mapping, data analysis, writing, and outreach
TOTAL OTHER FUNDS:	\$ 226,500	\$0	

VII. PROJECT STRATEGY:

A. Project Partners:

Dr. Erika Butler, MN DNR, project leader
 Dr. Michelle Carstensen, MN DNR, co-investigator
 Dr. Glenn DelGiudice, MN DNR, co-investigator
 Dr. Ulrike Munderloh, University of MN Dept. of Entomology, collaborator
 Dr. Ron Moen, NRRI-UMD, collaborator;
 Mark Johnson, MDHA, collaborator
 Mike Schrage, Fond du Lac Resource Management Division, collaborator
 Dr. Arno Wuenschmann, Veterinary Diagnostic Laboratory, collaborator
 Dr. Anibal Armien, Veterinary Diagnostic Laboratory, collaborator

B. Project Impact and Long-term Strategy:

The results of serological screening for diseases; serum analyses for pregnancy testing, chemistry profiles, and metabolic hormones; and complete and differential blood cell counts will quantify rates of

exposure to diseases, pregnancy rates, and assist with assessment of overall health and physiological status of moose. Seasonal and annual survival and cause-specific mortality rates will be assessed.

Specific causes of death of collared moose that die during the study period will be determined, contributing to our understanding of the role health-related mortalities are playing in the overall decline of the NE MN moose population. Once the specific causes of mortality and major influential factors (i.e., nutritional condition, seasonal weather conditions) are identified, appropriate management actions may be taken to address the population’s decline.

Nutritional status and overall health of collared animals and the moose population at large will be assessed as winters progress. Conclusions will be formulated about the nutritional condition, health, and overall well-being of moose at the start of winter, as well as how progressive winter nutritional stress and poor condition of moose may be contributing to specific causes of death. If nutritional status is identified as a contributing factor to moose mortality and population decline, then management efforts can be focused on enhancing forage quantity and quality.

C. Spending History:

Funding Source	M.L. 2005 or FY 2006-07	M.L. 2007 or FY 2008	M.L. 2008 or FY 2009	M.L. 2009 or FY 2010	M.L. 2010 or FY 2011
Not applicable, see Budget Detail for more information.					

VIII. ACQUISITION/RESTORATION LIST: N/A

IX. MAP(S): N/A

X. RESEARCH ADDENDUM: See Research Addendum

XI. REPORTING REQUIREMENTS:

Periodic Work Plan status update reports will be submitted not later than January 2012, July 2012, January 2013, July 2013, January 2014, July 2014, January 2015, and July 2015. A final report and associated products will be submitted between June 30 and August 1, 2015 as requested by the LCCMR.

Attachment A: Budget Detail for M.L. 2011 (FY 2012-13) Environment and Natural Resources Trust Fund Projects											
Project Title: Determining causes of death in declining moose populations											
Legal Citation: To be determined											
Project Manager: Erika Butler											
M.L. 2011 (FY 2012-13) ENRTF Appropriation: \$ \$300,000 the first year and \$300,000 the second year are from the trust fund to the commissioner of natural resources to determine specific causes of moose mortality and population decline in Minnesota and to develop specific management actions to prevent further population decline. This appropriation is available until June 30, 2015, by which time the project must be completed and final products delivered.											
Project Length and Completion Date: June 30, 2015											
Date of Update: <i>Fill in the date of report submission</i>											
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Balance	Activity 2 Budget	Amount Spent	Balance	Activity 3 Budget	Amount Spent	Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	<i>Purchase and thoroughly field test 100 Global positioning system collars</i>			<i>Determine specific causes of moratlity of moose in NE MN</i>			<i>Determine the influence of nutritinal stress as a contributing factor to the specific causes of death</i>				
Personnel (Wages and Benefits)											
Wildlife Technician: 1- 50% FTE (80% salary, 20% benefits), field data collection and analysis, field necropsies, and outreach (Sept 2013 June 2015)				29,540		29,540	12,660		12,660	42,200	42,200
Seasonal Volunteers: 2- 100% effort (room and board only), field data collections (January- April 2013-2014)							12,000		12,000	12,000	12,000
Professional/Technical Contracts											
Nationally Certified Laboratory in Minnesota (yet undetermined) ; disease and health screening for dead moose (screening for over 30 diseases, various toxicities, and nutritional deficiencies)				32,000		32,000				32,000	32,000
Service contracts											
Helicopter for moose capture (yet undetermined): 2013: Initial moose capture and handling; 2014: Additional moose capture to maintain sample size				120,000		120,000				120,000	120,000
Iridium satellite data acquisition (company undetermined): dowloading of location data and costs for location fixes.				65,640		65,640				65,640	65,640
Equipment/Tools/Supplies											
GPS collars: provide notification and location of death	250,000		250,000							250,000	250,000
Capture drugs (\$228/moose)				27,360		27,360				27,360	27,360
Medical and laboratory supplies and field necropsy kits				3,300		3,300				3,300	3,300
Field equipment (handheld GPS, camera, antennae, etc)				2,000		2,000				2,000	2,000
Travel expenses in Minnesota											
Travel to study area by project management staff (fleet @ \$0.55/mi, 20,000 miles)				11,000		11,000				11,000	11,000
Travel to study area by technician and seasonals (fleet @ \$0.55/mi, 20,000 miles)				8,400		8,400	2,100		2,100	10,500	10,500
Other											
Spotter plane during capture/recapture efforts (120 hours @\$200/hour)				24,000		24,000				24,000	24,000
COLUMN TOTAL	\$250,000		\$250,000	\$323,240		\$323,240	\$26,760		\$26,760	\$600,000	\$600,000