

April 11, 2017

Ms. Susan Thornton
Director, LCCMR
Room 65 State Office Building
100 Rev. Dr. Martin Luther King Jr. Blvd
St. Paul, Minnesota 55155

Dear Susan:

Thank you for working with my research staff to assist us in obtaining critical funding from the emerging issues account to examine possible prion transmission pathways for chronic wasting disease (CWD) in white-tailed deer. We are very interested in pursuing this project and believe it meets the intent of the emerging issues account. With the recent discovery of CWD in southeastern Minnesota, the Department of Natural Resources (DNR) has responded swiftly and aggressively to minimize the opportunity for the disease to become established. Equally important, however, is elucidating the risk of prion transmission on the landscape due to such things as deer movement and interactions among individuals. The emerging issues account provides an excellent opportunity to examine these relationships from the perspective of disease transmission.

At the Minnesota DNR, we have staff expertise and experience, field equipment, and staff support to achieve the project objectives. Specifically, Drs. Jenelle, Norton, Carstensen, and Cornicelli all have extensive experience in research design, white-tailed deer biology, and disease ecology. I would offer their time as in-kind support for the duration of the project.

As you can see from the proposal, staff are asking for \$350,000 from the emerging issues account and the rest of the project will be submitted as a regular LCCMR project. Certainly, if more funds are available from emerging issues, we can reframe the budget.

Thank you for the time you and your staff have spent on this proposal and for consideration of this request. If you have any questions, please contact Dr. Lou Cornicelli, Wildlife Research Manager at 651-259-5202 or lou.cornicelli@state.mn.us.

Sincerely,



Tom Landwehr
Commissioner

c: Sarah Strommen, Assistant Commissioner
Jason Tidemann, Grants Specialist
Jim Leach, Director, Fish and Wildlife
Lou Cornicelli, PhD, Wildlife Research Manager
Chris Jennelle, PhD, Wildlife Research Scientist

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

**DRAFT
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Project Title:

Deer movement related to potential CWD prion transmissio

Category: A. Foundational Natural Resource Data and Information

Total Project Budget: \$ 902,456

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

Summary:

Movement ecology of white-tailed deer in southeastern Minnesota as related to chronic wasting disease prion transmission. DNR will radiocollar deer to evaluate deer movements and disease transmission potential.

Name: Chris Jennelle

Sponsoring Organization: Minnesota Department of Natural Resources

Address: 5463 Broadway Ave N.
Forest Lake MN 55025

Telephone Number: 651-539-3310

Email chris.jennelle@state.mn.us

Web Address

Location

Region: Southeast

County Name: Fillmore, Houston, Olmsted, Winona

City / Township:

Alternate Text for Visual:

Map of the southeastern Minnesota showing the disease management area (dark gray) and study area (cross-hatched area)

MP: 0517-2-131-proposa

Budget: 0517-2-131-bud

Qual: 0517-2-131-qualifi

Map: 0517-2-131-map-C

Resolution:

List:

	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 (ENTRF)

Emerging Issues Account and FY 18 Project Proposal

Project Title: Deer movement related to potential CWD prion transmission

PROJECT TITLE: Deer movement related to potential CWD prion transmission

I. PROJECT STATEMENT

We are requesting emerging issues funding to begin this research project. That funding will allow DNR to acquire supplies, radio collars, and start the contracting process for capture beginning January 2018. Big game are most efficiently captured during winter, as compared to other seasons. Additional funding will be requested through the annual ENTRF process to complete this 3-year project (through June 2020).

In November 2016, MNDNR discovered chronic wasting disease (CWD) in wild white-tailed deer of southeastern Minnesota. In total, 11 positives were found close together, which provides an opportunity to conduct research to 1) understand potential pathways of CWD landscape spread, and 2) increase our likelihood of managing the outbreak in this and other areas. We propose to study the deer movement ecology as it relates to potential prion transmission in southeastern Minnesota. This early stage of the outbreak offers the only chance of management success, because once the disease becomes established, it will impact long-term deer numbers.

As infected and non-infected deer interact and move across the landscape, they transmit infectious prions directly through direct contact or indirectly through environmental deposition. Limited information exists about deer contact rates and their relationship to transmission rates, especially in areas recently infected. The presumed main driver of spatial spread among wild deer is movement. Currently, there is no research that demonstrates the extent to which potentially infected deer move across the landscape and interact with each other in southeastern Minnesota.

Deer behavior and movements vary by biological and environmental conditions, along with deer population demographics and social structure. Two types of movement likely facilitate disease spread across the landscape, recurrent seasonal movements and one-time dispersal or foray events. The most substantial long-distance movements involve dispersal from birth to adult ranges, most likely to occur in 1-year-old deer. Because deer densities can be altered by management actions, a better understanding of both deer density and movement tendencies related to density will enhance our ability to effectively manage disease risk in the Minnesota deer population. This research is also particularly important due to the increased risk of disease spread from Wisconsin and Iowa as the findings will help the MNDNR understand those risk factors as well.

Project goals:

1) Document dispersal patterns and estimate movements of yearling (1.5 year old) males and females, and adult males (>2 year old)

Deer will be fitted with Global Positioning System (GPS) collars to obtain multiple locations on a daily basis. We will determine movement patterns and home ranges of deer during biologically critical time periods of the year; namely spring, fall, and winter. We will focus on yearling deer because they are the most likely to disperse to new areas and adult males because they are three times more likely to be infected than other sex or age classes.



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2) CWD spatial pathways mapping and cause-specific mortality rates

We will use GPS location data to evaluate how movement propensities of deer are correlated with landscape characteristics and deer densities in the study area. This will be used to create a predictive deer movement map, which will inform future surveillance and probable pathways of spatial CWD spread. Using this technology, we will also estimate cause-specific mortality rates and incorporate those data into population models to improve accuracy and understanding of population dynamics.

3) Estimate deer-to-deer contact rates

We will use special camera collars on select deer as a pilot to quantify deer contact rates. We will also incorporate a camera trap array on the study area to augment contact information from camera collars, and create a spatio-temporally explicit index of deer contact. This will greatly inform our understanding of infectious contact risk for different age-sex cohorts, in both space and time.

Outcomes:

The outcomes of this research are to,

1. Develop predictive models to ascertain the likely spatial pathways of CWD prion infection spread.
2. Design management programs that limit the opportunity for disease spread.
3. Provide auxiliary information useful for population modeling and demographic parameter estimation.

Having the knowledge to assess risk factors prior to disease emergence and then focusing surveillance efforts based on the best available data will allow MNDNR to focus resources in the most critical areas. For CWD, identifying locations with deer populations or juxtapositions of suitable habitats located in close proximity to infected deer herds can be an effective first step for identifying priority areas for surveillance and control programs. Predictive models become increasingly important as Agency funding decreases and work is prioritized. In addition, defensible, science-based management strategies (e.g., reducing deer densities, targeted age-sex specific harvest) that minimize risk factors related to disease spread can be implemented.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Emerging Issues - Dispersal patterns and movements of GPS-collared deer

Budget: \$350,000

Two age classes of deer will be captured and fitted with GPS collars. We will set GPS collars to collect multiple daily locations of deer for up to 4 years. We will estimate annual home ranges, seasonal home ranges, and movement patterns of deer. Collar technology is advanced enough so that collars can be reprogrammed seasonally to definitively identify precise movements from natal range and emigrations to new ranges.

Outcomes of Activity 1	Completion Date
1. Capture and GPS-collar 100 male white-tailed deer (70 yearling/30 adult) and 25 yearling female white-tailed deer.	03/31/2018
2. Capture and GPS-collar deer to retain sample size of 100. Capture and radiocollar 25 female yearling deer.	03/31/2019
3. Analyze location data to determine movements and home ranges.	06/30/2019
4. Report findings in research summaries and peer-reviewed publications.	06/30/2020



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Activity 2: CWD spatial pathways mapping and cause-specific mortality rates

Budget: \$532,456

We will quantify GIS land cover data, temporal covariates, and deer density and demographic information for southeastern Minnesota in order to temporally relate deer resource use and movement tendencies with landscape features and population demographics. We will produce a deer movement propensity map stratified by age and sex cohort, which will be used in directing future CWD surveillance and management efforts.

Outcomes of Activity 2	Completion Date
1. Collect and characterize relevant GIS files	12/31/2017
2. Collect and characterize GIS files and temporal data used to model mortality rates	03/31/2018
3. Construct and refine movement models using deer location data	06/30/2019
4. Construct CWD spatial pathway map and estimate cause-specific mortality rates	06/30/2020
5. Report findings in research summaries and peer-reviewed publications	06/30/2020

Activity 3: Estimate deer-to-deer contact rates

Budget: \$20,000

We will fit two yearling males, two adult males, and two yearling females with collar cameras to estimate deer-to-deer seasonal contact rates. We will place twenty remote camera traps within the study area stratified by land cover type in order to augment information on specific deer contact rates. Together these data will be used to estimate an index to infectious deer contact rate, critical to inform infectious disease models, for predicting CWD risk to deer cohorts in space and time.

Outcomes of Activity 3	Completion Date
1. Place remote camera traps on landscape	03/31/2018
2. Outfit GPS collars with specialized cameras and apply to randomly selected captured deer	12/30/2017
3. Estimate contact rate index	06/30/2019
4. Report findings in research summaries and peer-reviewed publications	06/30/2020

III. PROJECT STRATEGY

A. Project Team/Partners

- Chris Jennelle, PhD, MNDNR Wildlife Health Research Scientist - project manager, co-investigator. Providing study design, oversight of overall project, statistical analysis, and report/manuscript writing
- Andrew Norton, PhD, MNDNR Ungulate Research Scientist – co-investigator. Providing study design, radiocollar and other technology evaluation and equipment purchasing, statistical analysis, and report/manuscript writing
- Michelle Carstensen, PhD, MNDNR Wildlife Health Program Supervisor – collaborator. Providing technical guidance, overall study design, and other in-kind support
- Lou Cornicelli, PhD, MNDNR Wildlife Research Manager – collaborator. Providing logistical support, contract administration, and other in-kind support

B. Project Impact and Long-Term Strategy

This study will provide critical information on movements related to CWD prion transmission to new areas. These data will inform future surveillance management strategies related to white-tailed deer; a \$500,000,000



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annual resource in Minnesota. In addition, we will collect survival information used to inform population models.

The products of this research will have national and international significance for agencies tasked with managing CWD in cervids and preparing surveillance activities to maximize early detection effectiveness, and provide critical survival information for modeling North American white-tailed deer populations.

	2017		2018				2019				2020	
Research Task	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun
Funding provided, project planning begins												
Locate suitable capture locations, secure permission from private landowners												
Capture and fit deer with GPS collars												
Collection and analysis of locations to determine movements and home ranges												
Collection and analysis of survival information to inform population model parameters												
Complete data analyses and preparation of final report												
Report findings and make recommendations												

C. Timeline Requirements

The LCCMR study will require 3 years from planning to final reporting of results. Emerging issues account funding is requested for the first year, including project startup. Additional funding will be pursued through an FY18 ENTRF project request. Project planning, including a more detailed research proposal (and literature review) and the bid process for acquisition of equipment (e.g., GPS collars, trapping supplies) will begin immediately. Capture of deer is weather dependent and will occur starting in January 2018. Deer capture will occur in subsequent years to maintain a sample size of 150 GPS collared animals. Data collection via GPS collars will be on-going for the length of the project. Final data analysis and reporting will be completed by June 2020.



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IV. TOTAL ENTRF REQUEST BUDGET – 3 Years - \$902,456 (1 year emerging issues account: \$350,000)

2018 Detailed Project Budget (portion 2017 Emerging Issues)		
Project Title: Movement ecology of white-tailed deer and potential prion transmission related to a new chronic wasting disease outbreak		
IV. TOTAL ENTRF REQUEST BUDGET - 3 years (first year Emerging Issues - \$350,000)		
BUDGET ITEM	AMOUNT	
Personnel:	\$	150,000
TBD, PhD graduate student in wildlife ecology and research assistant, 50% FTE for 3 years OR Unclassified DNR project lead (MS level)	\$	150,000
Professional/Technical/Service Contracts:	\$	336,250
RFP - Wildlife helicopter capture company (to be determined): Deer capture and handling (200 deer @ 800/deer)	\$	160,000
Iridium satellite deer data acquisition: transmission of locations and mortality messages (\$500/year/deer for 3 years)	\$	156,250
Technology support for programming collars, GPS, and GIS work	\$	20,000
Equipment/Tools/Supplies/Test Fees	\$	350,000
RFP - GPS deer collars (200 @ \$1,500/each); collect location data and mortality notifications	\$	300,000.00
RFP - GPS deer collars with camera to estimate contact rates (4 @5,000 each)	\$	20,000.00
Capture and monitoring supplies (GPS units, trail cameras for array)	\$	30,000.00
Travel:	\$	35,000
Seasonal vehicle leases through DNR, travel to study area by deer project management staff and graduate student (fleet @\$0.55/mi, estimated 30,000 miles)	\$	25,000.00
Meals and per diem for deer project management staff, graduate student, and project assistants	\$	10,000.00
Additional Budget Items:	\$	31,206
Spotter plane to be used during capture efforts (40 hours @\$250/hr)	\$	10,000.00
*Direct and Necessary expenses: HR Support (~\$2,227), Safety Support (~\$512), Financial Support (~\$11,514), Communication Support (~\$1,271), IT Support (~\$4,611), and Planning Support (~\$1,072) necessary to accomplish funded programs/projects.	\$	21,206.00
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$	902,456
*Direct and Necessary expenses include Department Support Services (Human Resources, IT Support, Safety, Financial Support, Communications Support, and Planning Support). Department Support Services are described in the agency Service Level Agreement and billed internally to divisions based on rate that have been developed for each area of service. These services are directly related to and necessary for the appropriation. Department leadership services (Commissioner's Office and Regional Directors) are not assessed. Those elements of individual projects that put little or no demand on support services such as large single-source contracts, large land acquisitions, and funds that are passed through to other entities are not assessed Direct and Necessary costs for those activities.		
SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ To Be Applied To Project During Project Period:		N/A
Other State \$ To Be Applied To Project During Project Period:		N/A
In-kind Services To Be Applied To Project During Project Period: MNDNR Wildlife Health Group, Farmland Populations and Research Group: multiple employees; project management, field work, data analyses, reporting of results; 36 months, 20% effort	\$114,000	Secured
Funding History:		N/A
Remaining \$ From Current ENTRF Appropriation:	\$ -	N/A

2018 Detailed Project Budget (portion 2017 Emerging Issues)

Project Title: Movement ecology of white-tailed deer and potential prion transmission related to a new chronic wasting disease outbreak

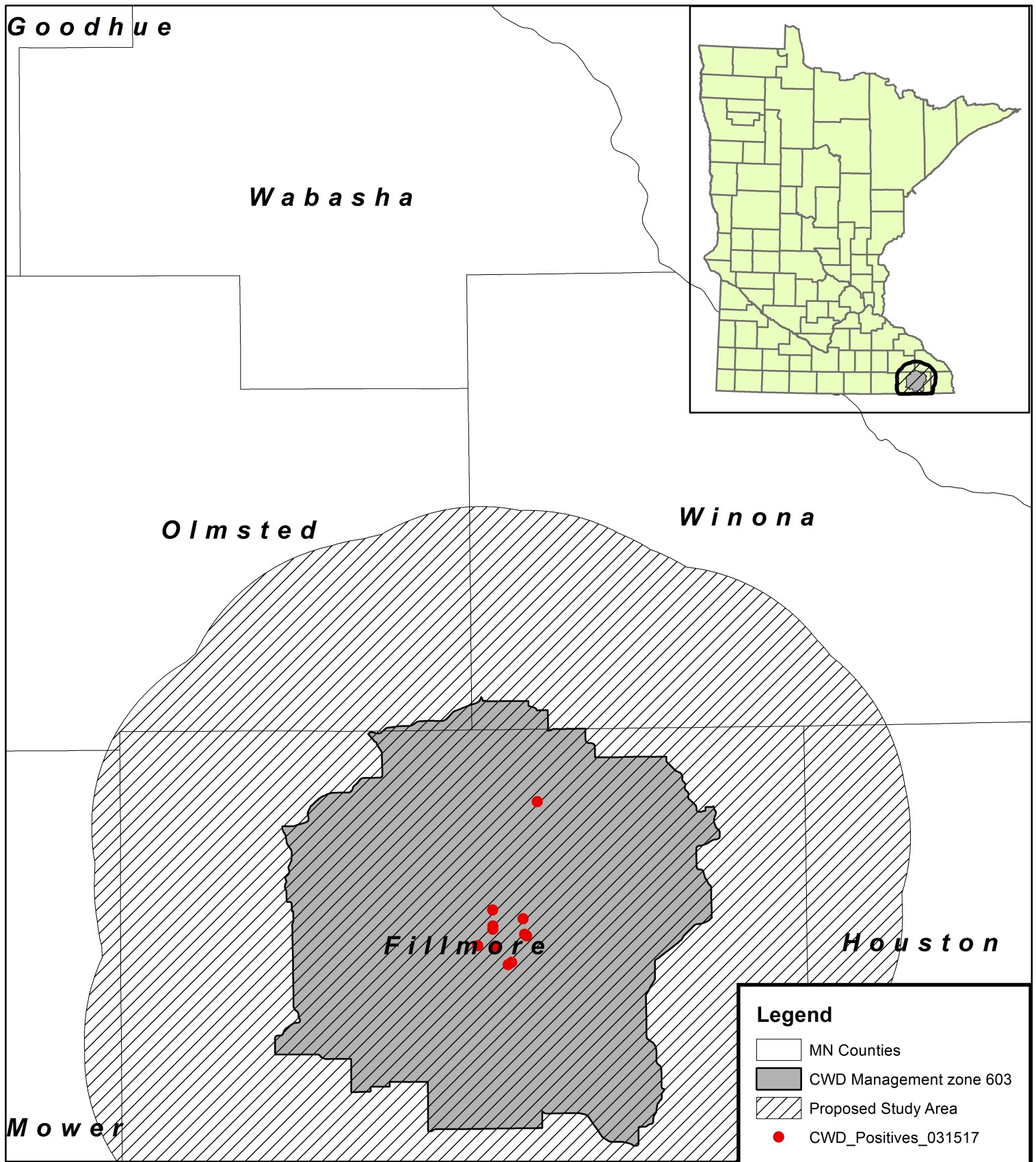
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TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST	\$ 902,456

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Funding History:		N/A
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Study Area



0 2 4 8 12 16 Miles





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Chris Jennelle, PhD, Project manager, co-investigator, is a wildlife disease expert and Research Scientist with the Minnesota Department of Natural Resources. He has a Ph.D. from Cornell University in wildlife disease ecology and has investigated chronic wasting disease transmission dynamics and advanced surveillance methodology for 10 years. He has a strong quantitative background (disease modeling, parameter estimation, study design, survey methodology) and a proven scientific track record with 18 peer-reviewed publications. He is a co-designer of the proposed research project, and will contribute to data management, analysis, and publication of scientific results.

Andrew Norton, PhD, co-investigator, is an Ungulate Research Scientist with the Farmland Wildlife Populations and Research Group at the Minnesota Department of Natural Resources. He has a Ph.D. from the University of Wisconsin-Madison in wildlife and quantitative ecology. His background is related to the collection of field data and development of analytical techniques used to estimate and evaluate wildlife population parameters related to cause-specific mortality, reproduction, movement, and abundance. Specifically, his research interests relate to understanding sensitivity and robustness of both population models and population dynamics of game species used to inform science-based management decisions.

Michelle Carstensen, PhD, collaborator, is a wildlife disease expert and Wildlife Health Program Supervisor with the Minnesota Department of Natural Resources. She has a Ph.D. from the University of Minnesota in white-tailed deer ecology and has designed and implemented chronic wasting disease surveillance efforts in Minnesota for 13 years. She has extensive experience with GPS collar technology, capture of large ungulates, and study design. She is a co-designer of the proposed research project, and will contribute to data management, analysis, and publication of scientific results.

Lou Cornicelli, PhD, collaborator, is the Wildlife Research Manager for the Minnesota Department of Natural Resources. He has a Ph.D. from the University of Minnesota in Natural Resources Science and Management. His background has mostly involved researching and managing large ungulates, particularly white-tailed deer, elk, and moose. His research interests are ungulate population ecology, wildlife disease ecology, and the sociological aspects of managing wildlife populations for the public benefit.

The Minnesota Department of Natural Resources (DNR) is the state agency charged with managing the state's wildlife resources for the benefit of the public. Research provides foundational information that allows Agency staff to make sound science-based decisions. The mission of the Minnesota DNR is to work with citizens to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life.