



Environment and Natural Resources Trust Fund

2022 Request for Proposal

General Information

Proposal ID: 2022-217

Proposal Title: Establishing a Center for Prion Research and Outreach

Project Manager Information

Name: Peter Larsen

Organization: U of MN - College of Veterinary Medicine

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Project Basic Information

Project Summary: Responding to the immediate need for cohesive research efforts focused on a prion disease that is spreading across Minnesota through the formation of an innovative and multidisciplinary research center.

Funds Requested: \$4,356,000

Proposed Project Completion: July 31 2025

LCCMR Funding Category: Foundational Natural Resource Data and Information (A)

Project Location

What is the best scale for describing where your work will take place?

Statewide

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

During the Project and In the Future

Narrative

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

Chronic wasting disease (CWD) is an immediate threat to Minnesota's moose, elk and white-tailed deer. The disease is 100% fatal and spreads via direct (animal to animal) and indirect (environment to animal) routes. CWD prions remain infectious within the environment for years and have been identified in soil, plants, and waterways. Thus, CWD is a multi-billion dollar, perpetual threat to the state's economy through reduction in hunting activities and sales, decreased property values, and limited trade of agricultural commodities from positive areas. First identified in Minnesota in 2002, CWD has steadily spread to 13 counties, becoming established in the southeast and moving northward to the southern metro. A strategic research effort focused on CWD detection, prevention, and therapeutics is lacking. Given the diversity of biological and ecological systems impacted, the long-term economic risk of CWD, and concerns of spread to wildlife, livestock, and humans, we urgently recommend the formation of a multidisciplinary center aimed at confronting CWD and related prion diseases. The Minnesota Center for Prion Research and Outreach (MNPRO) unites researchers across the neurodegenerative disease spectra, thus serving as an incubator for profound research advances and optimally situating the center to address CWD and all prion-related diseases.

What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.

Minnesota has taken a strong approach to CWD management of wild deer populations and plays a leading role across the nation in advancing cervid-related research. However, the challenges posed by CWD are far-reaching and can only be met through strategic and multidisciplinary efforts. Thus, MNPRO was established as a 'grassroots movement' in 2019 to join the state's efforts in CWD research and control by advancing diagnostic methods and elevating the issue among all stakeholders through outreach and education. MNPRO's early successes in diagnostic technology R&D and engagement with the public and diverse hunting communities through collaborative research and outreach demonstrate the value of a multidisciplinary center in addressing the challenges of CWD. These efforts have revealed critical needs within the state that require a center-level approach aimed at effectively confronting the multifaceted health and economic issues presented by CWD. This proposal builds on these early successes by 1) advancing the novel diagnostics developed by MNPRO for CWD surveillance of wild and captive deer, 2) cultivating new, multidisciplinary research to enhance the understanding of environmental CWD transmission, spread and persistence, and 3) supporting ongoing CWD research and outreach efforts through the formalization of MNPRO as a collaborative center.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

Initial outcomes include: real-time CWD diagnostics, infectivity assessments of CWD prions within environmental samples (soil, water, plants), state-wide assessment of cervid CWD prion strain diversity and genetic susceptibility, risk assessment maps based on environment and cervid demography, and vector-potential assessment of non-cervid species (scavengers). Long-term outcomes include environmental remediation strategies, cervid-focused therapeutics, and a curated biorepository of animal and environmental samples (currently over 2,000 samples) that will facilitate many future research projects for all Minnesota research partners. These steps will help mitigate CWD-related impacts to deer health, state economics, and the associated livelihoods and cultures of Minnesotans.

Activities and Milestones

Activity 1: Prion detection methods research and development

Activity Budget: \$1,973,389

Activity Description:

MNPRO’s research, supported by previous ENRTF funding, has resulted in new diagnostic tools available for cutting-edge CWD research in Minnesota. These tools include a newly developed assay capable of on-site detection of CWD prions using tissues harvested from white-tailed deer and a laboratory-based assay (real-time quaking-induced conversion; RT-QuIC) capable of screening both biological (blood, urine, feces, tissues, etc.) and environmental (soil, plants, water, etc.) samples for CWD prions. Research continues on several other novel prion detection methods. These promising avenues can be combined and compliment each other for future laboratory and field testing of prion diseases. Further diagnostic research and development to improve surveillance includes: additional diagnostic tool development, validation and optimization of sampling and diagnostic protocols and tests, epidemiological assessment and validation of test performance, high-throughput expansion of current assays, and a mobile research center featuring MNPRO’s CWD outreach, the newly developed on-site assay, and future advancements. Validated tests and protocols will directly facilitate research performed by MNPRO affiliates (see Activity 2) and will lead to advancements in regulatory testing of farmed and wild cervids and testing available to the public.

Activity Milestones:

Description	Completion Date
CWD tests experimentally validated and optimized; protocols expanded for environmental surveillance of CWD-causing prions	June 30 2023
Laboratory assays expanded for high-throughput testing and genotyping; mobile research center launched	June 30 2024
Novel prion diagnostics validated; tissue- and environment-based CWD diagnostics epidemiologically assessed and validated	June 30 2025

Activity 2: Research to understand chronic wasting disease spread and persistence in the Minnesota environment

Activity Budget: \$675,000

Activity Description:

While deer are critical to the transmission of CWD, recent studies reveal that environmental biotic (scavengers, plant uptake) and abiotic (soil, water) factors play a role in CWD transport and persistence. For example, the past decade of research demonstrates that prions bind to different soil types, in some cases making them more infectious to deer, they can be transported in water runoff from positive areas, taken up through plant tissues, and detected in scavenger feces. How these various findings translate to CWD persistence and spread through Minnesota is unknown and there is a clear need for environmental research on CWD throughout Minnesota. To that end, MNPRO will provide competitive grants for research projects (one to two years in duration) that address topics including, but not limited to: sampling/collection methods for various environmental sample types; factors in the transmission, transport and persistence of CWD prions and ecological impacts; effective biosurveillance at landscape and farm levels; and environmental remediation. The MNPRO wetlab will provide prion testing services as needed for successfully funded projects and will facilitate outreach for the transfer of knowledge generated from the projects to state and tribal management agencies and other stakeholders (see Activities 1 and 3).

Activity Milestones:

Description	Completion Date
Launch of 3-6 selected competitive projects assessing environmental factors of CWD (1 and 2 year proposals)	July 31 2024
1 year competitive projects completed	July 31 2024
2 year competitive projects completed	July 31 2025

Activity 3: Essential MNPRO Center functions to support prion disease research and outreach

Activity Budget: \$1,707,611

Activity Description:

Minnesota’s efforts to control CWD will be fortified by a long-term, coordinated response facilitated by a multidisciplinary prion research center. MNPRO’s work focuses on the need to solve prion disease challenges through innovative collaborations of multidisciplinary teams. Central to this work are the connections made within Minnesota and regionally to control CWD in cervid populations. MNPRO has already achieved exciting successes over the past two years of collaborative work with experts across UMN colleges, Minnesota agencies, and community partners. Activity 3 will take the existing efforts of MNPRO visionaries further and will directly support the formalization of MNPRO as a University of Minnesota center. Operational funds will support the following:

- Strategic planning to formalize MNPRO leadership and mission, research needs assessment and prioritization, recruitment, communication, outreach, establishment of external and technical advisory boards, creating official commitments with state partners
- Building infrastructure, equipment and staff capacity, including dedicated lab, communication and outreach staff to meet research and outreach needs
- Administering and managing competitive grants for state-wide collaborative prion research and outreach
- Providing research services: rodent colony for prion infectivity studies, recombinant prion protein substrate, analytical services, and biorepository of cervid tissues to support diverse projects for cervid health research

Activity Milestones:

Description	Completion Date
MNPRO staff recruited and on-boarded; partner commitments confirmed	December 31 2022
Technical advisory board established, research needs assessment performed, RFPs issued and funds awarded	July 31 2023
External advisory board established and a strategic plan developed; Research services infrastructure procured	December 31 2023
Broad-scale MNPRO-led research and outreach performed; results reported	July 31 2025

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Tiffany Wolf	University of Minnesota	Co-Lead. Dr. Wolf is Co-Director of MNPRO and will assist with the development, oversight, and execution of all center-related research and outreach activities.	Yes
Marc Schwabenlander	University of Minnesota	Co-Lead. Mr. Schwabenlander is Associate Director and Outreach Specialist of MNPRO. He will coordinate center-level research and outreach projects, facilitate stakeholder connections, and connect MNPRO research activities to the public.	Yes

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this be funded?

MNPRO-led research efforts are already making an impact with local, regional and national partners and have resulted in collaborative publications, provisional patent applications, and industry partnerships. Effective CWD research and outreach efforts in collaboration with state agencies and community partners have taken shape through the use of previous ENRTF funding. This progress has facilitated financial support from the University of Minnesota and external partners. This newly requested ENRTF funding would greatly expand these activities through 2026 and help secure additional state, industry, and federal funding which will drive MNPRO's activities for the greater good of Minnesota's natural resources.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
MITPPC - Phase III - Understanding the Benefits and Limitations of Using Goats for Invasive Plant Control	M.L. 2016, Chp. 186, Sec. 2, Subd. 06a-02	\$0
Emerging Issues Account	M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 10	\$439,000
Understanding Brainworm Transmission to Find Solutions for Minnesota Moose Decline	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03f	\$400,000
Diagnostic Test for Chronic Wasting Disease	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03t	\$1,804,000

Project Manager and Organization Qualifications

Project Manager Name: Peter Larsen

Job Title: Assistant Professor

Provide description of the project manager's qualifications to manage the proposed project.

Dr. Peter Larsen is an Assistant Professor in the College of Veterinary Medicine at the University of Minnesota and is Co-Director of MNPRO with Dr. Tiffany Wolf. He leads a diverse One Health-oriented research program focused on the discovery of wildlife sources of emerging zoonoses, field-based molecular diagnostics for bacterial, viral, and prion diseases, and the origins of neurodegenerative disease. Dr. Larsen has over 19 years of research experience in wildlife biology, molecular biology and genomics and his UMN laboratory currently includes 14 individuals (undergraduate and graduate students, and research staff) who conduct research on a wide variety of wildlife-focused projects. In response to critical needs identified by the Minnesota State Legislature and the UMN in 2018, Dr. Larsen has focused his recent efforts on the development of new diagnostic tools capable of detecting pathogenic CWD prions in biological and

environmental samples (supported by ENTREF, MN Experiment Station). To accomplish this goal he has personally led a multi-disciplinary research team that includes experts in nanotechnology engineering, epidemiology, and biology. Together with MNPRO leadership, Dr. Larsen has forged collaborative relationships throughout the University of Minnesota, Winona State University, and multiple MN state agencies including the DNR, BAH, MDA, and MPCA. He has testified frequently before the MN State Legislature (8 hearings) and two Federal hearings specifically on CWD. To date, the CWD diagnostic research effort has resulted in four invention disclosures (transitioning to provisional patents in 2021), two peer-reviewed manuscripts (currently in review), and the successful field-deployment of a portable 24-hour CWD diagnostic test (March 2021). Beyond research, Dr. Larsen has led numerous outreach events aimed at informing Minnesotans about the science surrounding CWD and related diseases. This effort has resulted with ~6,000 members of the Minnesota public being reached through seminars and museum exhibits in the past two years.

Organization: U of MN - College of Veterinary Medicine

Organization Description:

The Minnesota Center for Prion Research and Outreach (MNPRO) is a multi-disciplinary center at the University of Minnesota focusing on the biology, ecology and epidemiology of neurodegenerative human and animal prion diseases and related protein-misfolding disorders. MNPRO collaborates with an incredibly diverse range of University of Minnesota faculty and external team members to conduct research with a broad impact on prion diseases including CWD, scrapie, bovine spongiform encephalopathy, and Creutzfeldt-Jakob Disease. These prion-focused research efforts naturally extend to multiple protein-misfolding disorders such as Alzheimer's disease, Parkinson's disease, and ALS and therefore MNPRO faculty are pioneering cross-disciplinary research on these important human diseases. MNPRO's strategic vision is to make rapid advancements in neurodegenerative research by: utilizing comparative medicine and biology to maximize research impacts, creating a think-tank environment for cutting edge science, developing strategic research priorities in the areas of diagnostics and risk assessment, and collaborating through targeted outreach to become a worldwide hub for combating neurodegenerative disease.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Peter Larsen		Project Manager / MNPRO Co-Director			36.5%	0.8		\$153,538
Tiffany Wolf		Co-Lead / MNPRO Co-Director			36.5%	0.8		\$127,312
Marc Schwabenlander		Co-Lead / MNPRO Associate Director and Outreach Specialist			36.5%	4		\$523,888
Communications Specialist		Develop and maintain platforms for internal and external MNPRO communications			31.8%	4		\$369,040
Research Scientists		Two scientists to lead MNPRO wetlab and epidemiology projects and staff			36.5%	8		\$764,400
Laboratory Technicians		Two staff to perform dedicated research and development for prion detection in biological and environmental samples			31.8%	4		\$453,392
Co-PIs / MNPRO RFPs		See Activity 2. Perform research on CWD spread and persistence in MN environment. Reviewed externally and funded through MNPRO RFPs			31.8%	0.5		\$40,000
Post-doctoral Researchers		See Activity 2: Two postdocs to perform research on CWD spread and persistence in MN environment. Reviewed externally and funded through MNPRO RFPs			25.4%	4		\$260,000
Graduate Students		See Activity 2: Two graduate students to perform research on CWD spread and persistence in the MN environment. Externally reviewed and funded through MNPRO RFPs			87.9%	4		\$200,000
MNPRO Graduate Students		Two graduate students to perform research in the MNPRO lab on prion diagnostic R&D, conduct lab and field-work, and perform research on CWD spread and persistence in the MN environment			87.9%	4		\$200,000
Undergraduate Students		See Activity 2: two undergraduate students to perform research on CWD spread and persistence in the MN environment. Externally reviewed and funded through MNPRO RFPs			0%	1		\$20,000
MNPRO Undergraduate Students		Two undergraduate students to perform research within the main MNPRO laboratory and to assist with field-work			0%	1		\$20,000
							Sub Total	\$3,131,570

4/7/2021

Contracts and Services								
Private contractors	Professional or Technical Service Contract	Equipment repairs, communication services and fees				-		\$60,000
Private contractors	Professional or Technical Service Contract	Strategic planning				-		\$20,000
University of Minnesota	Internal services or fees (uncommon)	UMN research services (e.g. protein production, supercomputing)				-		\$150,000
							Sub Total	\$230,000
Equipment, Tools, and Supplies								
	Equipment	Prion detection/research equipment	Equipment for MNPRO lab R/D and analytical services					\$80,000
	Tools and Supplies	Lab supplies for MNPRO	Lab and field work supplies for research, development and outreach; mobile research center fuel, maintenance, etc.					\$250,000
	Equipment	Field/lab equipment	Equipment for field and lab research of successful RFPs					\$60,000
	Tools and Supplies	Field/lab tools and supplies	Supplies for field and lab research of successful RFPs					\$60,000
							Sub Total	\$450,000
Capital Expenditures								
		Microplate readers for RT-QuIC	Microplate readers are the workhorse for prion detection in the RT-QuIC assay					\$150,000
		Mobile research center	A mobile research center (vehicle or trailer) will be outfitted with laboratory equipment for the purpose of conducting CWD research and					\$275,000

			testing in field settings throughout the state.					
							Sub Total	\$425,000
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	Travel for MNPRO staff and researchers	Conduct research, meet with stakeholders/partners, public outreach					\$40,000
	Conference Registration Miles/ Meals/ Lodging	Travel for MNPRO staff and researchers	Present research findings					\$10,000
							Sub Total	\$50,000
Travel Outside Minnesota								
	Conference Registration Miles/ Meals/ Lodging	Travel for MNPRO staff and researchers	Present research findings and connect with research partners outside of Minnesota	X				\$30,000
							Sub Total	\$30,000
Printing and Publication								
	Printing	Outreach materials, surveys, reports	Educating public and disseminating research results					\$19,430
	Publication	Fees for peer-reviewed publication of research results	Funds for successful RFPs and MNPRO research and development to publish in peer-reviewed journals.					\$20,000
							Sub Total	\$39,430
Other Expenses								
							Sub Total	-
							Grand Total	\$4,356,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Travel Outside Minnesota	Conference Registration Miles/Meals/Lodging	Travel for MNPRO staff and researchers	It is essential for MNPRO associates to share research findings with collaborators at regional and national conferences to advance the field of prion research and management. This benefits Minnesota by bringing new ideas to the work within the state as well as helping neighboring states with similar issues that are faced in Minnesota.

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	-
Non-State				
			Non State Sub Total	-
			Funds Total	-

Attachments

Required Attachments

Optional Attachments

Support Letter or Other

Title	File
Dr. Jonathan Gilbert letter of support	e89e1b19-e99.pdf
Schwabenlander et al. preprint - MNDNR collaborative research	d721a4ea-c5e.pdf
Dr. Beth Thompson letter of support	c6416ba3-18e.pdf
Dr. Nicole Neeser letter of support	7b46e2ef-61b.pdf
Dr. Joseph Bump letter of support	d2b99ad8-ba1.pdf
Dr. Jason Bartz letter of support	dc136ca7-c7f.pdf
Dr. Christopher Cramer letter of support	c64dad3b-af5.pdf
MNPRO visual component	65ecc233-ae7.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Does your project have potential for royalties, copyrights, patents, or sale of products and assets?

Yes

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

Yes

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

No

Does your project include original, hypothesis-driven research?

Yes

Does the organization have a fiscal agent for this project?

Yes, Sponsored Projects Administration



Establishing the Minnesota Center for Prion Research and Outreach

The Minnesota Center for Prion Research and Outreach (MNPRO) began as a 'grassroots movement' in 2019 to join the state's efforts in CWD research and control. MNPRO's early successes in diagnostic technology research and development, as well as engagement with the public and diverse hunting communities demonstrate the value of a multidisciplinary center in addressing the challenges of CWD. MNPRO's broader efforts include prion and protein-misfolding diseases (e.g. Alzheimer's). This center-level approach is aimed at effectively confronting the statewide, multifaceted health and economic issues presented by prion diseases, now and into the future.

MNPRO in action: *research and outreach efforts 2019-21*

CWD is a multibillion dollar threat to Minnesota's economy.

Critical research needs

- Investigate the extent of CWD prion environmental contamination
- Improve the sensitivity and capability of CWD diagnostics

Critical outreach needs

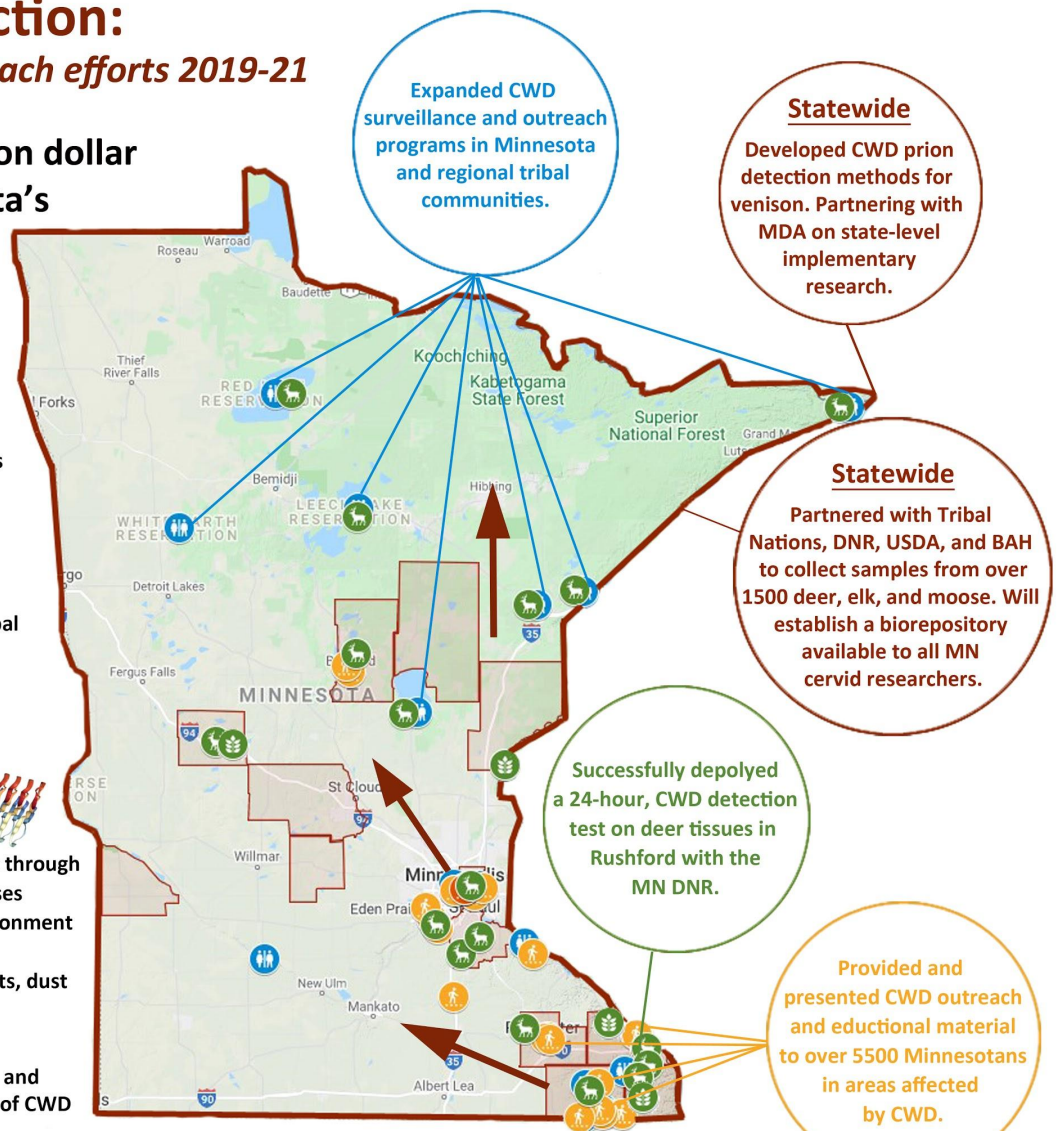
- Engage the needs of under-represented communities
- Assist state agencies and Tribal Nations with CWD education
- Inform MN hunters on CWD biology and best practices

CWD prions



- Deposited in the environment through feces, urine, saliva and carcasses
- Remain infectious in the environment for many years
- Detectable in soil, water, plants, dust

Arrows indicate current and potential future spread of CWD



Partners and collaborators



Animal samples



Public outreach events



Environmental samples

