

# Emerging environmental threat of chronic wasting disease

The Minnesota Center for Prion Research and Outreach (MNPRO) is ready to launch a novel, multi-disciplinary initiative aimed at characterizing, forecasting, and remediating prion contamination of Minnesota waterways, soils, and plants.

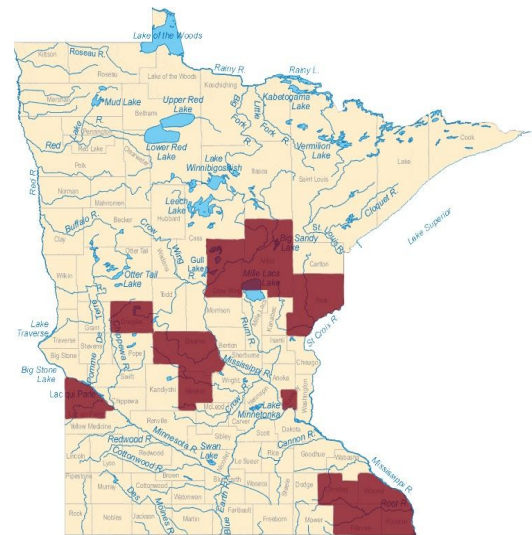


## Leveraging the use of developed tools

MNPRO scientists have come together in an effort to develop new chronic wasting disease (CWD) detection tools. We have established a relatively new protein-amplification method called RT-QuIC and have launched multiple independent lines of research that are designed to improve CWD detection methods capable of testing live animal, hunter-harvested and environmental samples. This has been made possible through the bipartisan supported funding during the 2019 session. Our team is working closely with the MN DNR and Board of Animal Health to secure valuable tissues and environmental samples that will aid in our efforts to further develop these new tools.

A CWD positive deer sheds prions into the environment, predominantly through feces and urine for up to 2 years. Additionally, natural decomposition of the animal upon death further deposits CWD prions. These elements create hotspots of nearly indestructible CWD prions in natural and agricultural environments. Further, a prion's durability facilitates their spread in the surrounding environment through many avenues.

Based on evidence from previous research, advanced investigation into CWD prion dissemination from water runoff and infiltration through the ground is warranted. Ascertaining water's part in the spread of CWD is essential to securing the health of Minnesota's deer and also, the success of a wide variety of economic sectors across the state. Therefore, it is essential to utilize the developed tools for environmental-based investigations in Minnesota.



*Counties in which chronic wasting disease has been found since 2003, on a map of Minnesota waterways*

# MINNESOTA CENTER FOR PRION RESEARCH AND OUTREACH

## Hydrology of CWD in Minnesota

*Understanding water's central role in Minnesota is vital to combating the environmental spread of CWD.*

Water can determine how far and how fast prions are transported from CWD positive regions, but to what extent does water carry infectious prions from the landscape to and through the waterways of Minnesota? Like other water quality concerns such as phosphorus and E. coli, CWD prions can move through the environment attached to soil and clay particles. Therefore, it is important to understand water runoff, erosion, and soil movement across the diverse landscapes in Minnesota where the CWD prion has been found. Different regions have different landscapes and the prion is likely to be more mobile in areas where fields are closely connected with streams and rivers.

## MNPRO: CWD Ecosystem and Environmental Research

CWD is an emerging environmental threat and requires immediate research attention. Although transmission of CWD to humans has not been documented, there is growing concern that some CWD prion strains could infect humans as has been demonstrated with similar prion diseases. Beyond health concerns, the environmental contamination of CWD prions also represents a threat to the Minnesota agricultural economy as plants can potentially take up and express the CWD-causing prions. For this reason, in 2018, Norway banned the importation of hay and straw from CWD positive regions.

MNPRO has assembled a multi-disciplinary research team with expertise in hydrology, soils, epidemiology, plant biology, and molecular biology. We are poised to collaborate with Minnesota watershed districts, affected and interested citizens, and other valued partners.

Our mission is to conduct cutting-edge research on the complex ecosystems across Minnesota affected by CWD. Despite the ecological variability, water is core to each ecosystem and key to deciphering the environmental persistence and spread of CWD.

To accomplish our research objectives, MNPRO plans an integrated series of critical experimental, computational modeling, and field-based studies focused on the binding and bio-accumulation of CWD prions to micronutrients and soil/clay particles and transport through water.

### MNPRO environmental research objectives

- Elucidating mechanisms for the persistence and spread of CWD through waterways, soils, and plants
- Characterizing the abundance of CWD prion in Minnesota waterways, soils, and plants
- Forecasting CWD contamination and spread based upon heterogeneity in landscape and hydrology
- Educating and involving Minnesota landowners in environmental sampling, risk assessment, and remediation
- Developing and evaluating remediation strategies for prion contaminated waterways, soils, and plants



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## Budget

Item	Average annual cost	Quantity (years)	Estimate cost
UMN Personnel			
Key PIs (n=6)	\$66,515	5	\$332,577
Support staff and students (n=8; lab, sample collection, modeling)	\$409,781	5	\$2,048,905
Direct costs			
Equipment	\$67,000	1	\$67,000
Sample collection (travel)	\$3,000	4	\$12,000
Experiment supplies and materials	\$53,000	5	\$265,000
Publications	\$3,000	4	\$12,000
<b>Total</b>			<b>\$2,737,482</b>



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