

# The Emerging Environmental Threat of Chronic Wasting Disease

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**Driven to Discover®**



# Outline

What is Chronic Wasting Disease and how does it relate to water?





# CWD is a progressive and fatal neurodegenerative disease of cervids



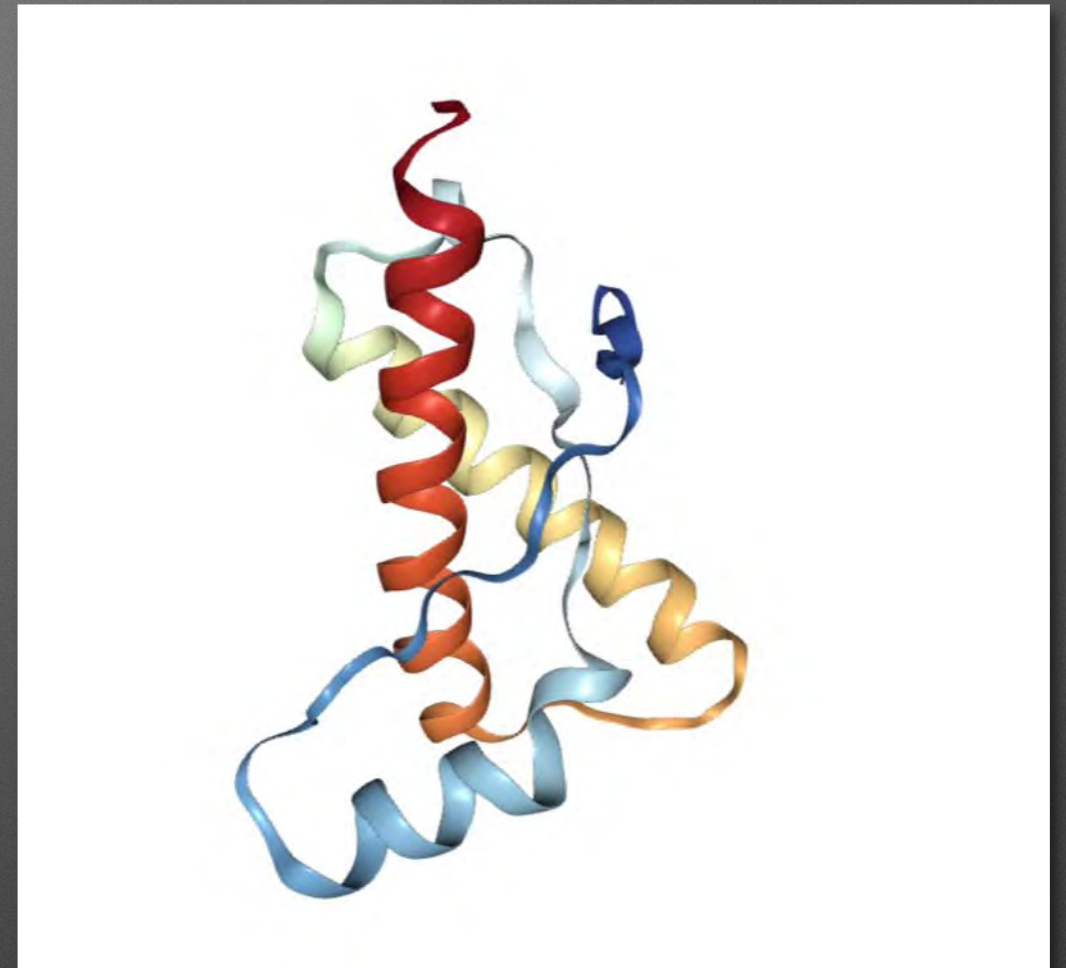
- Impacts all cervids (caribou, elk, mule deer, white-tailed deer, moose, etc.)
- Not caused by a virus or a bacteria. Caused by misfolded prion protein
- First identified in Colorado in 1960's





# What is a prion?

- All mammals have prion proteins
- Normal cellular function
  - Copper and metal processing
- Important functional roles in nerve cells

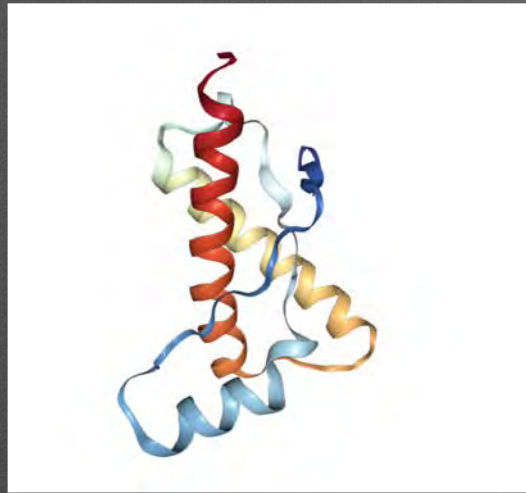


Normal Prion

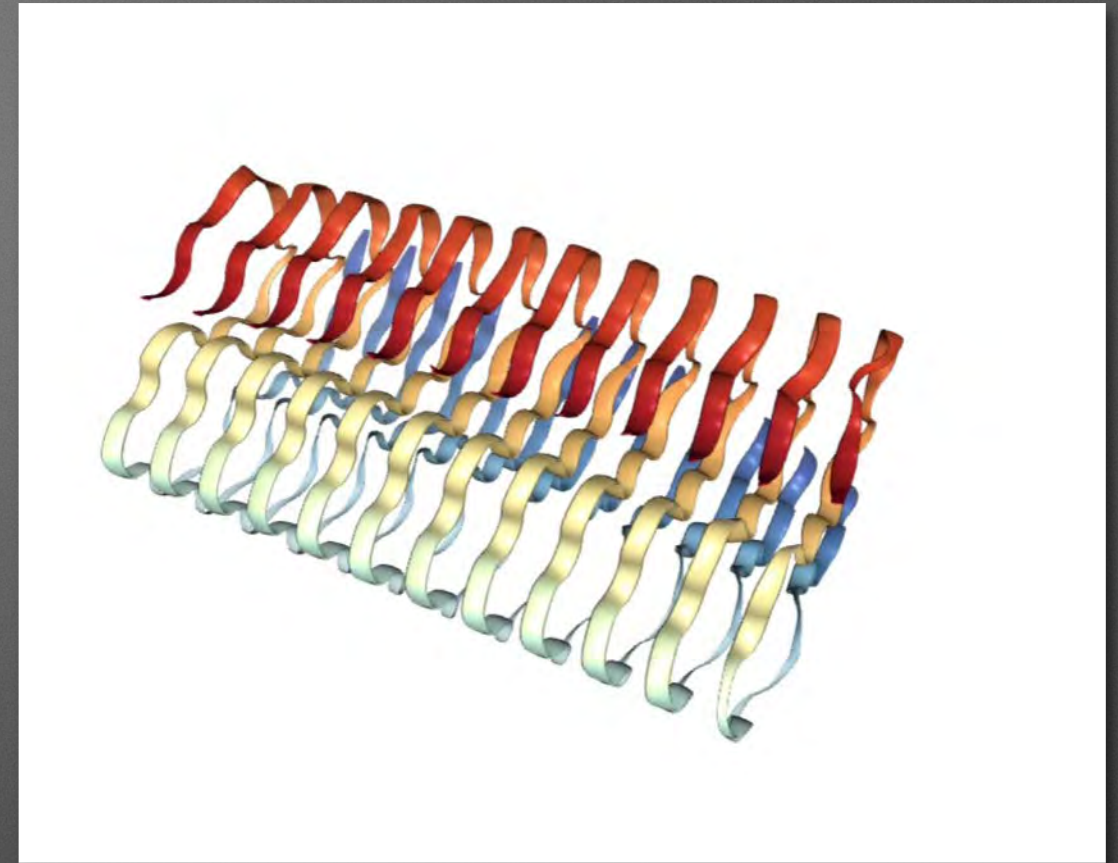




# CWD Prions

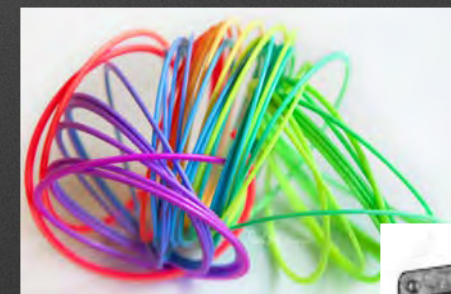


Normal Prion



CWD Prions

- CWD prions are misfolded
- Stick together to form tangles
- Misfolded form is almost indestructible and can remain infectious in the environment





# The Chaos Engine of CWD

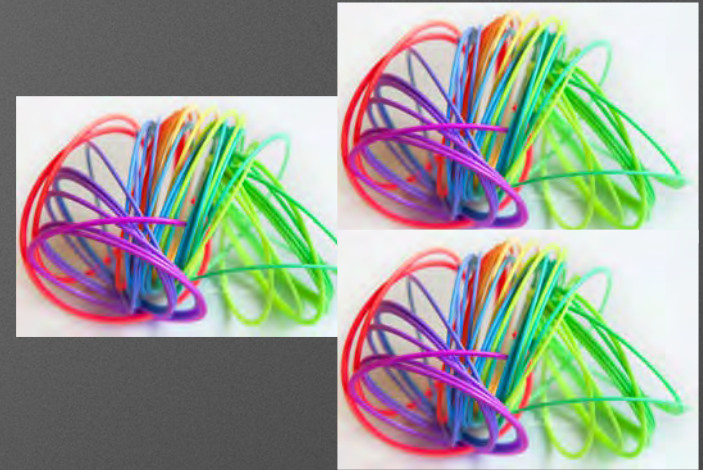
CWD-prions cause normal prions to misfold. The reaction spreads through the animal, colonizes the brain, and begins to kill neurons.





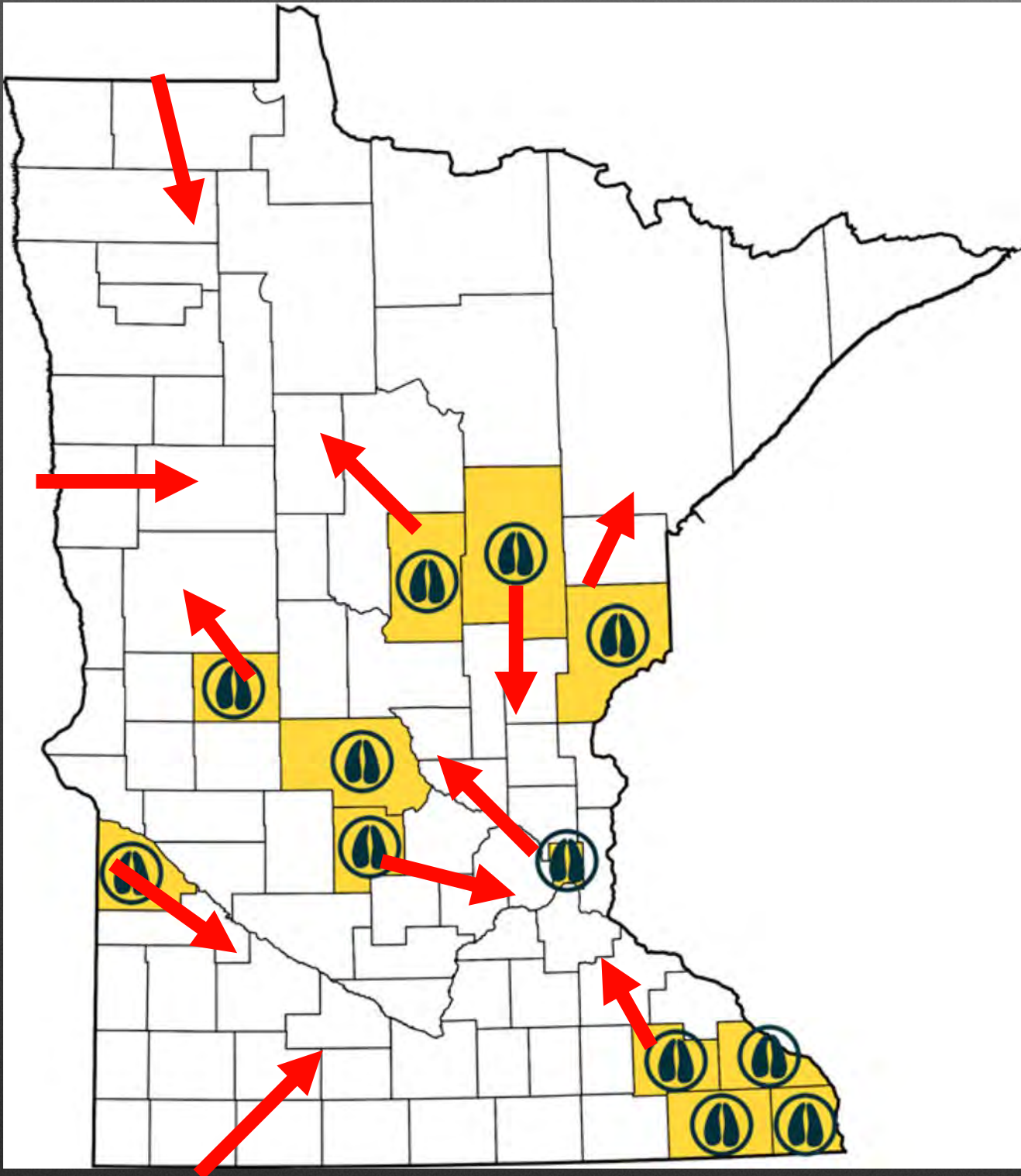
# How is CWD Transmitted?

- Misfolded prions in saliva, semen, blood, urine, feces, carcass
- Remain infectious in soil for years. Transported by water runoff from CWD positive areas.
- Plants can uptake the CWD prions and deposit them in their leaves





# Where is CWD in Minnesota?



- Spread of CWD
- Flow along riparian zones and where deer congregate
- CWD+ areas are potential point sources for new infections
- Must conduct research on the ecology of CWD in MN



# Hydrology of CWD

Research Paper

## Detection of protease-resistant cervid prion protein in water from a CWD-endemic area

T.A. Nichols, Bruce Pulford, A. Christy

Pages 171-183 | Received 20 Mar 2009, Accepted

## Survival of infectious prions in water

SYREETA L. MILES, KAZUE TAKIZAWA, CHARLES P. GERBA and IAN L. PEPPER

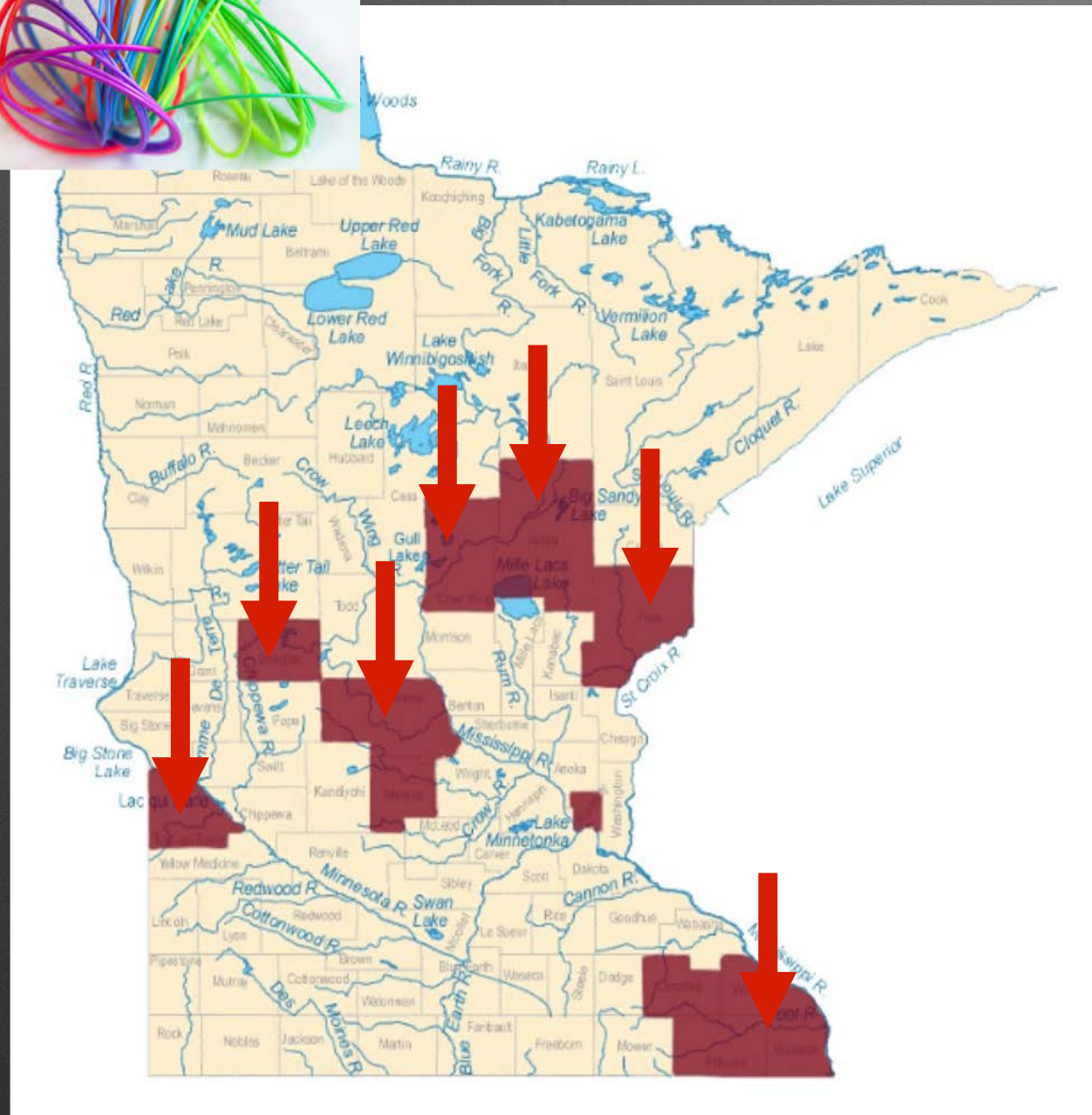
*Soil, Water, and Environmental Science Department, University of Arizona, Tucson, Arizona*

- CWD prions detected in snowpack melt runoff and at a water treatment facility downstream of CWD endemic area
- The more organic material in water the longer the prions remain infectious





# Hydrology of CWD in Minnesota?



- Zero data exist on the hydrology of CWD in Minnesota
- Distance that prions are transported from CWD+ regions?
- Are water-transported prions infectious?
- Are prions ending up in wells or water treatment facilities?





# Environmental Contamination Concerns and the Hydrology of CWD in Minnesota



Diana Karwan  
PhD



Tiffany Wolf  
DVM, PhD



Elizabeth Boyer  
PhD



Eric Seabloom  
PhD



Marc  
Schwabenlander  
MPH



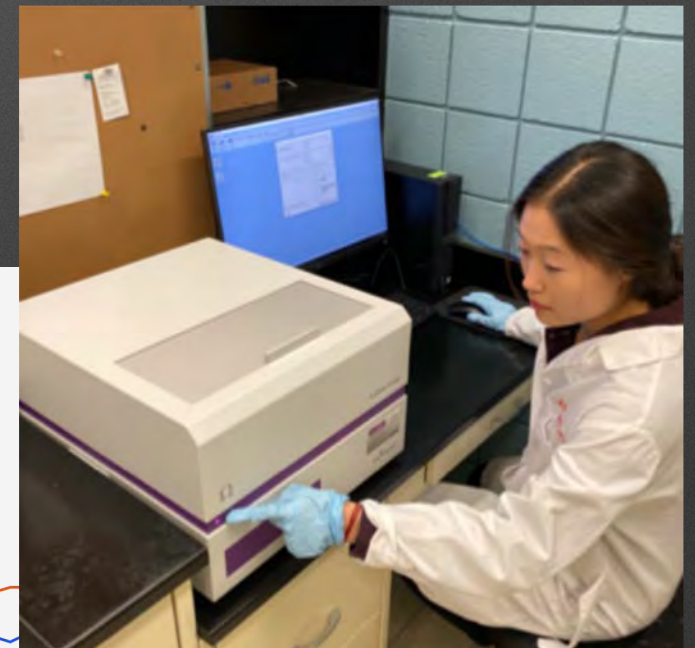
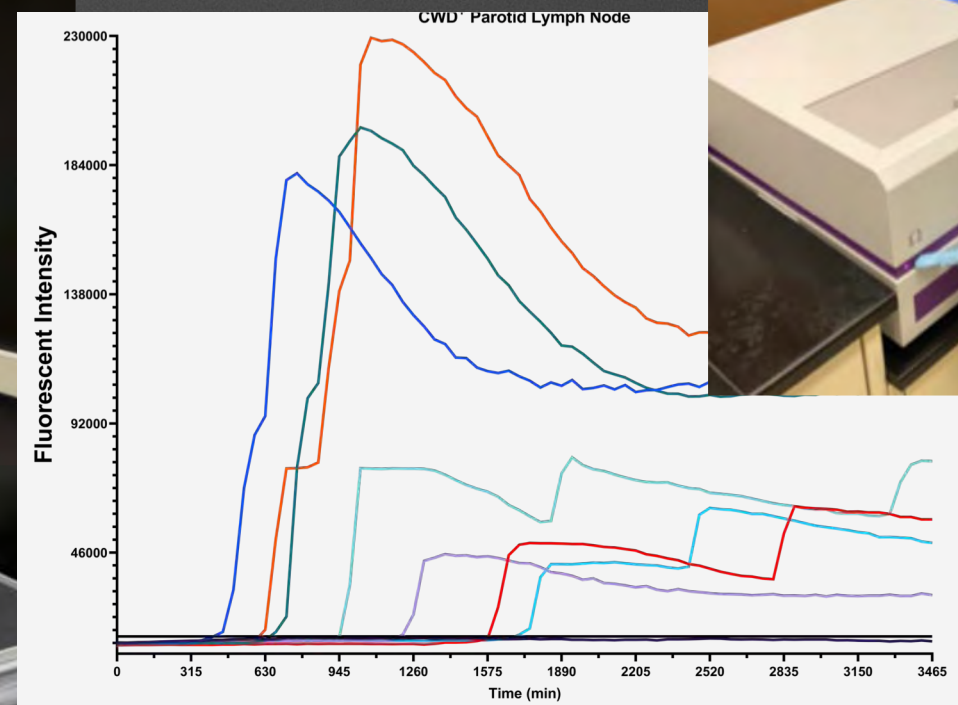
Davis Seelig  
DVM





# Minnesota Center for Prion Research and Outreach (MNPRO)

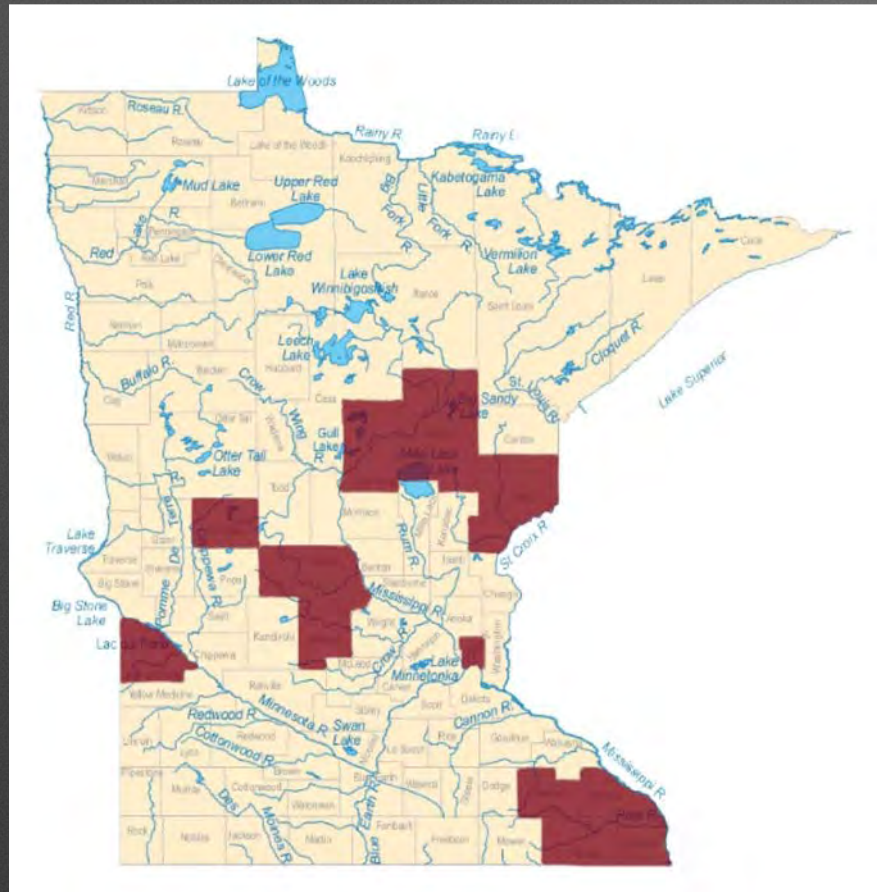
- How to detect prions in environmental samples?
- New MNPRO prion research lab with advanced CWD diagnostics (RT-QuIC technology)
- Facilitates environmental research and infectivity studies





# Hydrology of CWD in Minnesota

## 5 Year Research Project (HF 3591)



### Key Research Areas

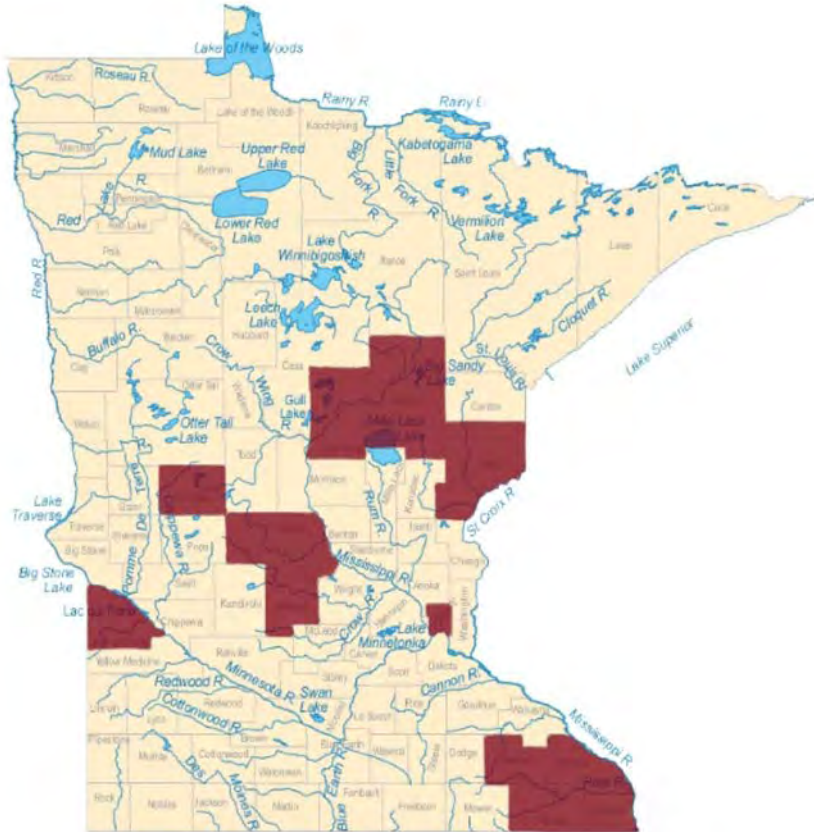
- Identify mechanisms for environmental spread of CWD
- Quantify prion abundance on and downstream of CWD point sources
- Forecast CWD contamination and spread
- Develop remediation strategies





# Hydrology of CWD in Minnesota

## 5 Year Research Project (HF 3591)



### 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>





**Thank you!**

