

Chronic Wasting Disease Surveillance in Minnesota's Southeastern Wild Deer Herd

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SUMMARY OF FINDINGS

In fall 2014, the Minnesota Department of Natural Resources (MNDNR) sampled 411 hunter-harvested white-tailed deer (*Odocoileus virginianus*) for chronic wasting disease (CWD) in southeastern Minnesota. The surveillance effort focused on testing deer within deer permit areas (DPA) 348 and 349, in response to the first detection of CWD in a free-ranging deer by the Iowa Department of Natural Resources in Allamakee County. All deer were negative for the disease. MNDNR also submitted samples from 69 deer from within DPA's 236 and part of 601 (north metro surveillance area) where a captive European red deer (*Cervus elaphus*) farm was found positive for CWD in summer 2012. These deer were collected through vehicle kills, special hunts, and depredation permits; all deer were negative for CWD. In addition, MNDNR submitted samples from 18 cervids through targeted surveillance, which included sick animals, escaped captive cervids, and vehicle-kills; these were also all negative for CWD. Currently, MNDNR has suspended efforts to test for CWD through hunter-harvested surveillance in the state, but will continue with targeted surveillance efforts.

INTRODUCTION

Chronic wasting disease is a transmissible spongiform encephalopathy (TSE) that affects elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), white-tailed deer, and moose (*Alces alces*). TSEs are infectious diseases that alter the morphology of the central nervous system, resulting in a "sponge-like" appearance of this tissue. The etiological agent of CWD is an infectious protein, called a prion. Incubation time of the disease can range from 1.5 to nearly 3 years, although infected animals have been shown to shed prions in their feces up to a year before showing signs of illness (Tamguney et al. 2009, Haley et al. 2011). Clinical signs are non-specific and may include a loss of body condition and weight, excessive salivation, ataxia, and behavioral changes. There is no known treatment or vaccine for the disease and it is always fatal. Experimental and circumstantial evidence suggest that transmission of the disease is primarily through direct contact with infected animals or their infective saliva or excrement (Mathiason et al. 2006, Safar et al. 2008). However, persistence of prions in the environment and resulting indirect transmission has been shown to occur (Miller et al. 2004, Johnson et al. 2007, and Maluquer de Motes et al. 2008).

The Center for Disease Control (CDC) and other public health agencies have concluded there is no known link between CWD and any neurological disease in humans (MaWhinney et al. 2006, Sandberg et al. 2010). However, both the CDC and the World Health Organization (WHO) recommend that no part of a known positive animal should be consumed by humans. Additionally, there is no evidence that CWD can be naturally transmitted to species other than deer, elk, or moose.

To date, CWD has been diagnosed in 3 captive elk (*Cervus canadensis*) herds, 1 captive white-tailed deer herd, and 1 captive European red deer (*Cervus elaphus*) herd in Minnesota. Two of the elk herds (Stearns and Aitkin counties) were discovered in 2002 and depopulated; no additional CWD-positive animals were found. In 2006, a captive white-tailed deer from a mixed deer/elk herd in Lac Qui Parle County was infected with CWD and depopulated without additional infection being detected. In 2009, another captive elk herd (Olmsted County) was found infected with CWD and, following depopulation of >600 animals, a total of 4 elk were confirmed with the disease. The United States Department of Agriculture's (USDA) indemnification document noted there was an apparent longstanding infection within this captive elk facility. In 2012, a captive European red deer was found infected with CWD in a herd of approximately 400 animals in North Oaks, MN. This marked the first time CWD was discovered in this species. This red deer herd was depopulated in 2014; no additional infected

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animals were found. According to the indemnity agreement, perimeter fences must remain intact at this property until 2019, in an effort to keep wild deer from entering the property to reduce disease transmission risks.

Currently, Minnesota has approximately 500 captive cervid facilities. As the current statewide population estimate of wild deer approaches one million, there is an element of inherent disease transmission risk between captive and wild cervids. Overall, risk is difficult to quantify because deer populations are unevenly distributed over the landscape ranging in densities from < 1-15 deer/km² (i.e., 1–40 deer/mi²), facility fences vary in construction quality, and direct/indirect contact rates between captive and wild cervids are unknown. In addition, captive cervid facilities are sporadically distributed on the landscape and are independent of wild deer densities.

In November 2010, MNDNR sampled 564 hunter-harvested deer focused on a 32.2-km (20-mi) radius around a CWD-positive captive elk facility near Pine Island (Olmstead county), discovered in 2009. One free-ranging deer tested positive for CWD, marking the first detection of the disease in Minnesota's wild deer population. In response to this disease detection, MNDNR conducted a fixed-wing aerial deer survey in a 16.0-km (10-mi) radius of the index case in late January 2011 and estimated 6,200 deer (7.3 deer/km² or 19 deer/mi²). A supplemental surveillance effort was conducted in February–March 2011; 752 adult deer were sampled and all tested negative. To prevent further disease spread, MNDNR banned recreational feeding of deer in a 4-county area in southeastern Minnesota and created a CWD Management Zone DPA 602. From 2011–2013, a total of 4,050 ($n = 1,125, 1,195, \text{ and } 978$ for 2011, 2012, and 2013, respectively) deer were sampled for CWD within DPA 602 with no further infection detected.

These data, in combination with historical data from 2002-2009 indicated >99% probability that disease prevalence was no greater than 0.5% assuming independence between years and animals within year. These results provide strong evidence that Minnesota was on the front end of a CWD outbreak in wild deer. Our inability to detect any additional infected deer in the immediate vicinity of the index case or in surrounding DPA's or in DPA's bordering neighboring infected counties is encouraging. The data suggests CWD was recently introduced on the southeastern MN landscape, with a high likelihood that widespread wild cervid exposure has been minimal.

METHODS

Hunter-harvested surveillance during 2014 was conducted at deer registration stations during the first two weekends of the regular firearm hunting season in southeastern Minnesota. Selected stations were staffed with MNDNR personnel and students (veterinary medicine and natural resources) trained in lymph node collection. Stations were selected based on deer volume and distribution throughout the surveillance zone to meet a sampling goal of 450 between DPAs 348 and 349 combined. Hunters were asked to voluntarily submit medial retropharyngeal lymph node samples from deer ≥ 1.5 years of age to be tested for CWD, and a front incisor was extracted from all deer visually assessed to be ≥ 2.5 years old for aging by cementum annuli. To obtain access to deer from the north metro surveillance area MNDNR worked with local contractors and the Wildlife Science Center to collect vehicle-killed deer within a 10-mile radius of the CWD-infected red deer farm in North Oaks. Additional deer were obtained through special hunts in Ramsey and Anoka counties, as well as both private and city depredation permits. All deer samples were inventoried, entered into a database, and sent to Colorado State University (Fort Collins, CO) for enzyme-linked immunosorbent assay (ELISA) testing. Any presumptive positive deer from ELISA testing would be confirmed using immunohistochemistry (IHC) testing at the National Veterinary Services Laboratory in Ames, Iowa.

At the time when deer were sampled, hunter information was recorded, including the hunter's name, a telephone number, MNDNR number, and location of harvest. Maps were provided to assist the hunters in identifying the location (Township, Range, and Section) of the harvest site. Cooperating hunters were given a cooperators patch.

Across MN, MNDNR consistently samples any cervid exhibiting clinical symptoms of CWD infection (targeted surveillance). We have disseminated information to wildlife staff

regarding clinical signs of infection for symptomatic deer. We also provided staff with the necessary equipment and training for lymph node removal and data recording. The number of samples expected through targeted statewide surveillance is estimated to be less than 100 animals annually, as few reports of deer with clinical signs are received.

RESULTS AND DISCUSSION

MNDNR collected a total of 411 samples in southeastern Minnesota from hunter-harvested deer during fall 2014 (Figure 1). All samples were negative for CWD. The sampling goal was 450 samples between DPA's 348 and 349 combined, and we achieved 91% of our surveillance goal in southeastern MN.

From July 2014 to June 2015, MNDNR collected a total of 18 samples from targeted surveillance efforts. This included samples from 2 escaped captive deer, and 16 free-ranging deer with clinical signs; all samples were negative for CWD.

In the north metro surveillance area, 69 deer were tested in fall 2014. From 2012 – 2014, a total of 350 (160, 121, and 69, respectively) deer were tested for CWD through vehicle-kills ($n=48$), special hunts ($n=163$), and from a city-contracted sharpshooting effort within the city of North Oaks ($n=139$), with no detection of the disease (Figure 2).

Hunter-harvested deer was and remains the primary source for obtaining adequate samples for continued monitoring and management of this disease since the first discovery of CWD in MN in 2002. MNDNR remains concerned about CWD spread in wild cervids, and has increased surveillance focus in southeastern Minnesota with evidence of increasing CWD detections in wild deer in southwestern Wisconsin and northeastern Iowa.

Future Surveillance Plans

Given there have been no CWD detections in hunter-harvested wild deer since 2010, and no detections via targeted surveillance efforts, MNDNR will not conduct hunter-harvest surveillance in 2015. Targeted CWD surveillance of deer exhibiting clinical signs of illness will continue statewide.

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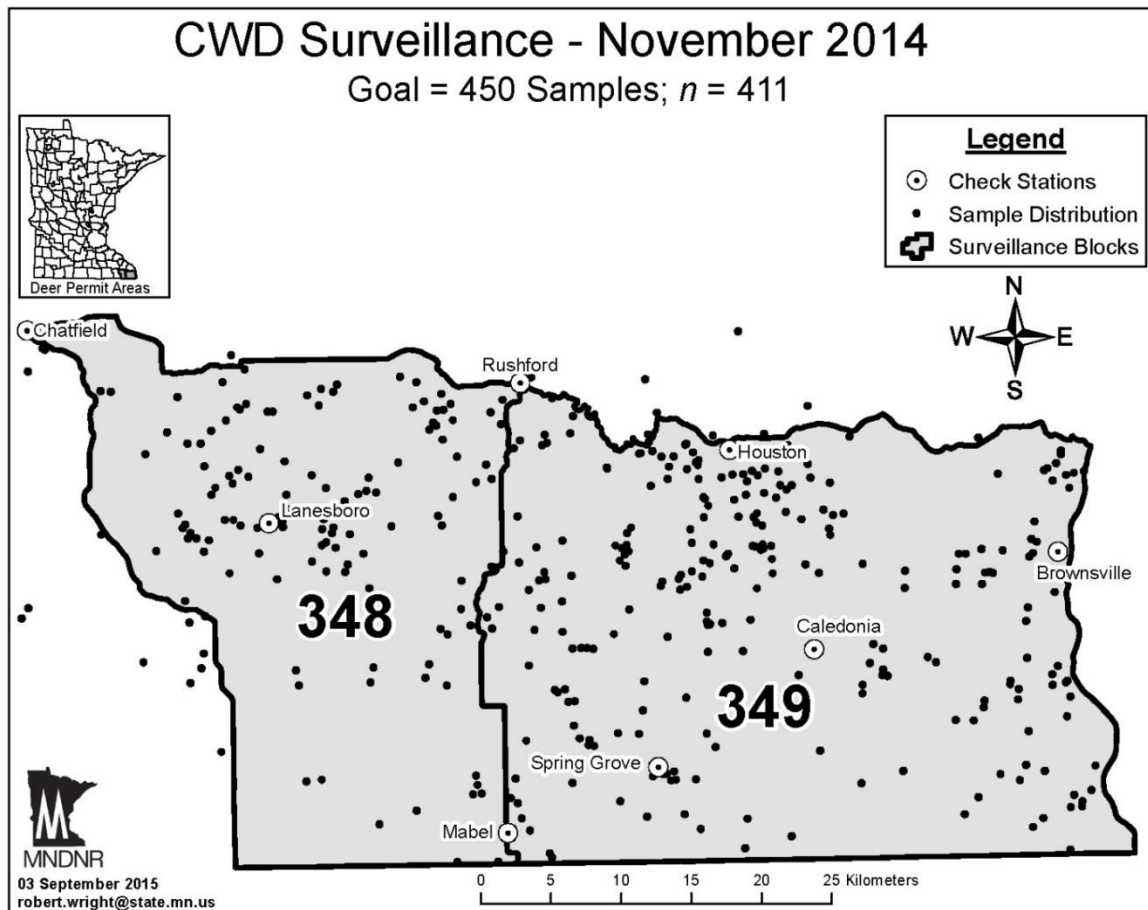


Figure 1. Samples collected from deer ($n=411$) for chronic wasting disease (CWD) testing in southeastern Minnesota during fall 2014.

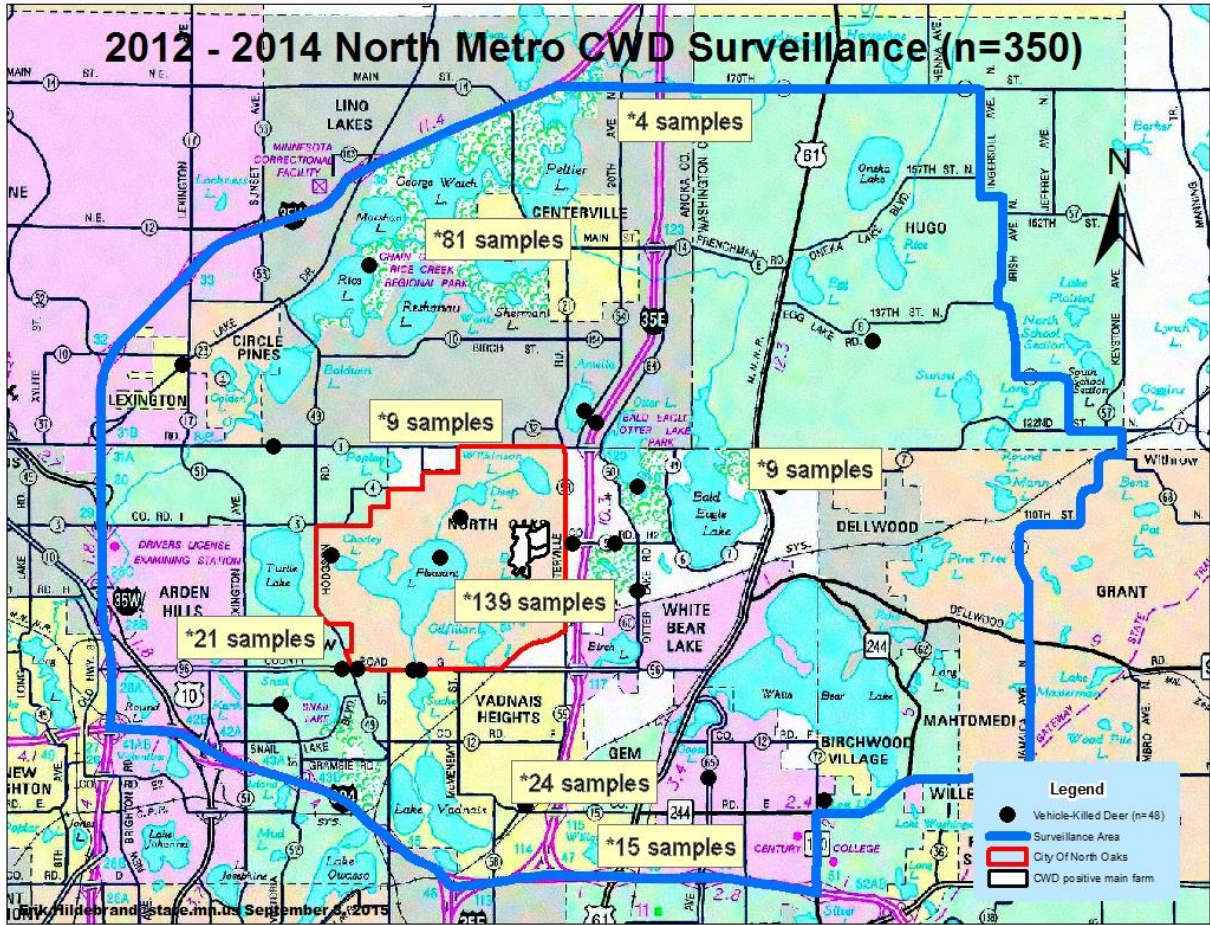


Figure 2. Samples collected from deer ($n=350$) for chronic wasting disease (CWD) testing in the north metro surveillance area, in relation to the location of CWD-positive European red deer farm, 2012 through fall 2014.