



Ontario Chronic Wasting Disease Surveillance Program

2017 Program Update

Wildlife Research and Monitoring Section

2017

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Wildlife Research and Monitoring Section
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Summary

During 2017, as part of Ontario's chronic wasting disease (CWD) surveillance program, a total of **512** white-tailed deer (*Odocoileus virginianus*) samples and **1** moose (*Alces alces*) sample from Eastern Ontario were collected and tested. This sample size was above the target sample size of 460 and is likely sufficient to detect if CWD was present in 1% or more (99% confidence level) of the population within the surveillance zone. CWD was not detected in any of the samples. Since the CWD surveillance program began in 2002, 11,710 samples have been analyzed. To date, no cases of CWD have been detected in wild deer populations in Ontario.

Introduction

CWD is a fatal disease that infects members of the cervid family. The disease is caused by abnormally folded proteins called prions, which cause brain lesions leading to death. The disease is not known to naturally infect species other than those in the cervid family. CWD has been identified in 23 U.S. states and two western Canadian provinces (Alberta and Saskatchewan), and is now considered endemic in several states in the western United States (i.e., Colorado and Wyoming). Since 2003 it has also become established in several eastern U.S. states (e.g., Wisconsin, Illinois, Pennsylvania, Maryland, West Virginia). Currently, CWD is not known to exist in Ontario but has been discovered in all five bordering states: Minnesota (2002), New York (2005), Michigan (2008 in captive animals, 2015 in free-ranging animals), Pennsylvania (2012), and Ohio (2014). In the primary infection area of the western U.S., white-tailed deer (*Odocoileus virginianus*), elk (*Cervus canadensis*), and mule deer (*Odocoileus hemionus*) have been shown to be very susceptible to CWD and several moose (*Alces alces*) have also tested positive for CWD.

Ontario surveillance program background

Due to increasing concern about diseases in Ontario's white-tailed deer and restored elk populations, a surveillance pilot project was initiated in 2002 to determine whether CWD was present in Ontario's wild cervid populations. The *Ontario Chronic Wasting Disease Surveillance* program became operational in 2003.

Each year, surveillance samples are collected from hunters during the fall. Small crews of Ministry of Natural Resources and Forestry (MNRF) staff roam patrol areas in the predetermined surveillance area, asking hunters for permission to remove a brain and lymph node sample from their harvested deer. Hunters also have the option of dropping off deer heads at depots within the surveillance area.

Initially in 2003, the province was divided into 14 CWD surveillance zones prioritized by CWD risk factors, with one zone surveyed per year. To expedite surveillance of the province, the number of CWD zones surveyed per year was increased from one to three zones per year between 2005 and 2010. In 2010, when surveillance of all 14 CWD zones was complete, several factors (new research findings, financial pressure, and maturation of the program) led to the development and use of a dynamic risk-based surveillance program, and a decrease in the number of surveillance zones monitored each year. Instead of following a pre-determined schedule of zones to be tested each

year (as in initial years), a dynamic model was developed to predict highest risk areas of the province annually (Figure 1). Risk inputs used in the current model are (in order of importance): estimated cervid farm density, estimated wild deer density, proximity of neighbouring CWD outbreaks, years since last surveillance, presence of restored elk population, deer wintering concentrations, and clay content. Each year, new data are input to determine the areas with the highest risk, which informs the choice of surveillance area for that year.

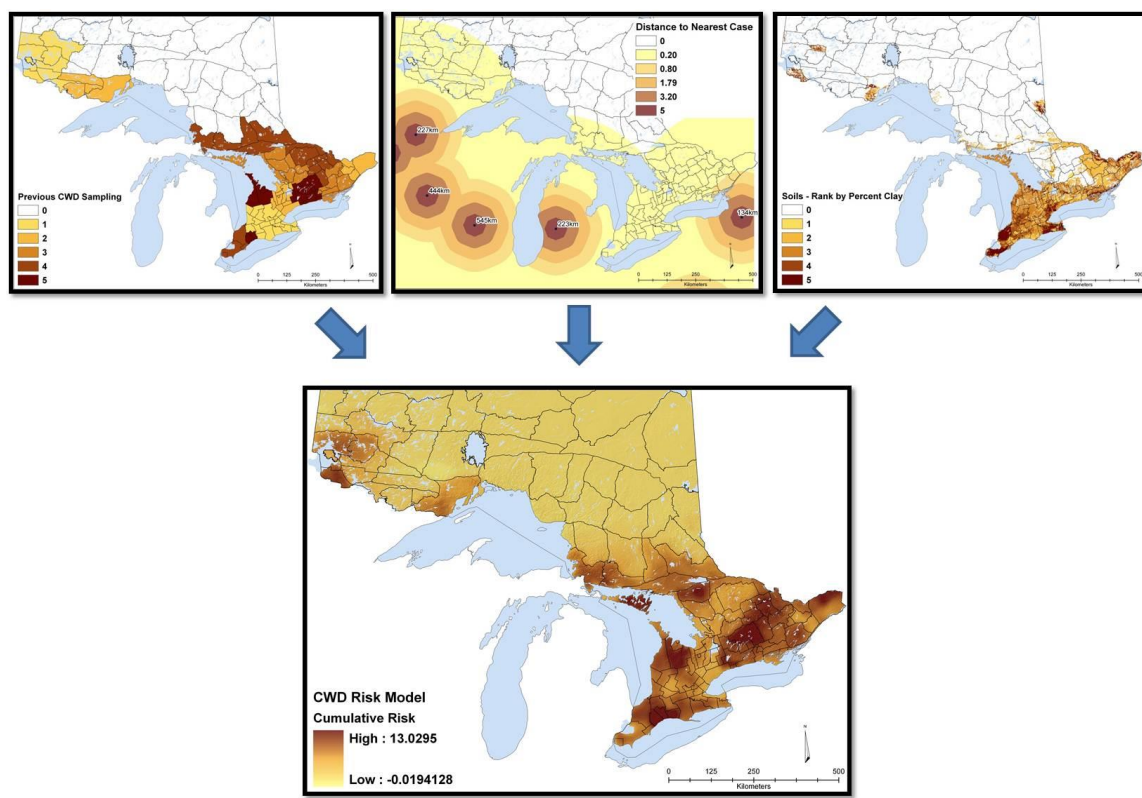


Figure 1. Example of risk layers compiled to produce a spatially quantified risk assessment for chronic wasting disease in cervids to help inform choice of surveillance areas in Ontario.

2017 Results

Using the Ontario CWD risk model, MNRF identified a conglomerated area in eastern Ontario from Kingston to the Quebec border as having the highest risk of CWD in 2017 (Figure 2). Accordingly, CWD surveillance was conducted in eastern Ontario, which included [Wildlife Management Units](#) (WMU) 64A, 64B, 65, 66A, 66B, 67, 69-A2, 69A-3 and 69B (Figure 3). Freezer depots were established at seven locations throughout the sampling area. Depots were opened in early October for the archery hunters and remained open throughout the entire gun hunt so hunters could drop off their deer heads. Most of the samples (89%) were collected by MNRF roving crews. The remaining samples (11%) were collected from the depots. All retropharyngeal lymph nodes were screened for CWD at the Animal Health Lab in Guelph, Ontario, using enzyme-linked immunosorbent assay (ELISA) tests. In total, 513 wild cervids were sampled and screened for CWD; all tested negative. This sample size was above the target sample size of 460 and is therefore likely sufficient to detect if CWD was present in 1% or more (99% confidence level) of the population within the surveillance zone. [Individual test results are posted on the Internet.](#)

For the second year in a row, MNRF assisted Dr. Aaron Shafer and grad student Spencer Anderson from Trent University in collecting deer genetic samples from the CWD surveillance zone. The project aims to use genome sequencing to identify the genes controlling important traits in deer, such as antler characteristics or body size. The ultimate goal of this work is to inform current management strategies with the key contribution being quantifying the biological factors that influence body size and antler characteristics of deer.

MNRF also collaborated with Dr. Nicole Nemeth and grad student Dr. Samantha Allen from the University of Guelph in collecting blood samples from harvested deer from the CWD surveillance zone. The project aims to identify whether bluetongue and/or epizootic hemorrhagic disease viruses are present in Ontario's domestic and wild ruminant populations, and to analyze this data in relation to landscape and climatic data. The ultimate goal of this work is to help develop any future emergency management preparedness strategies to ensure the continued health of Ontario's domestic and wild ruminant populations.

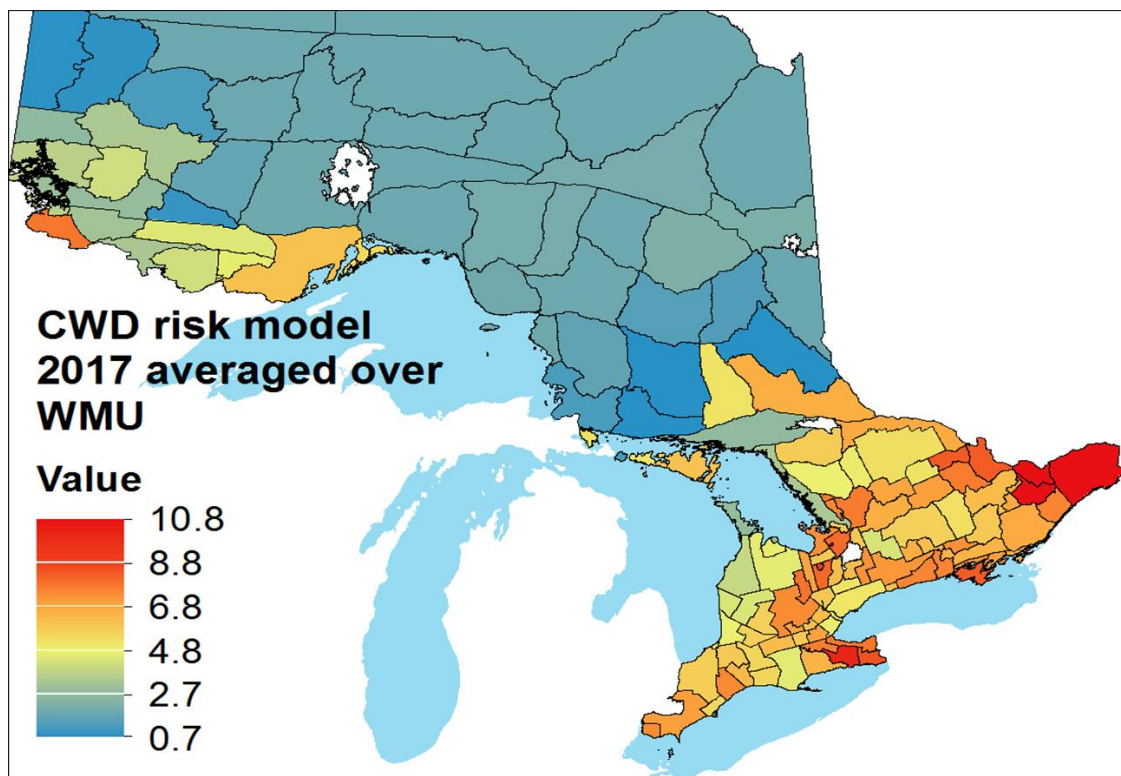


Figure 2. Modelled risk of chronic wasting disease in Ontario for 2017.

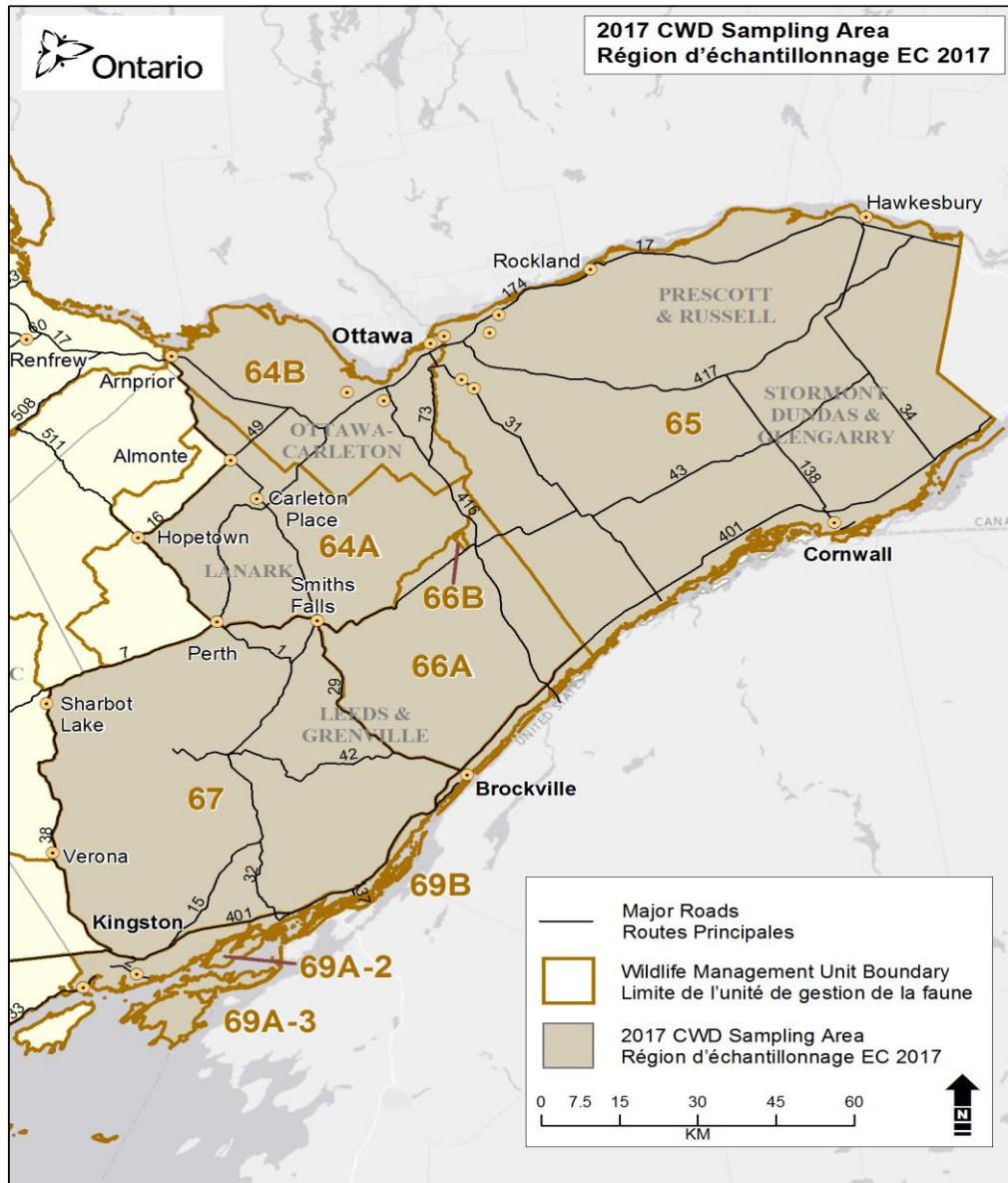


Figure 3. Area of 2017 chronic wasting disease (CWD) surveillance in eastern Ontario.

Other sampling

In addition to MNRF's annual systematic surveillance, the ministry also opportunistically tests samples from deer that display CWD-like symptoms, as reported by the public or MNRF offices throughout the year and across the province. In 2017, nineteen white-tailed deer with abnormal behaviour or appearance were tested from across the province. One elk (Madoc) and one moose (Petawawa) were also tested. Reported symptoms included abnormal appearance or behaviour, emaciation, and disorientation. Post-mortems on these animals were performed by the Canadian Wildlife Health Cooperative (CWHC) in Guelph, Ontario. All animals tested negative for CWD. Since 2009, 60 cervids displaying abnormal, CWD-like behaviour have been necropsied and tested for CWD (Figure 4); all tested negative for CWD. In 2017, thanks to increased cooperation from MNRF district offices and members of the public, MNRF tested the largest number (21) of suspicious cervids in one year since sampling began in 2009.

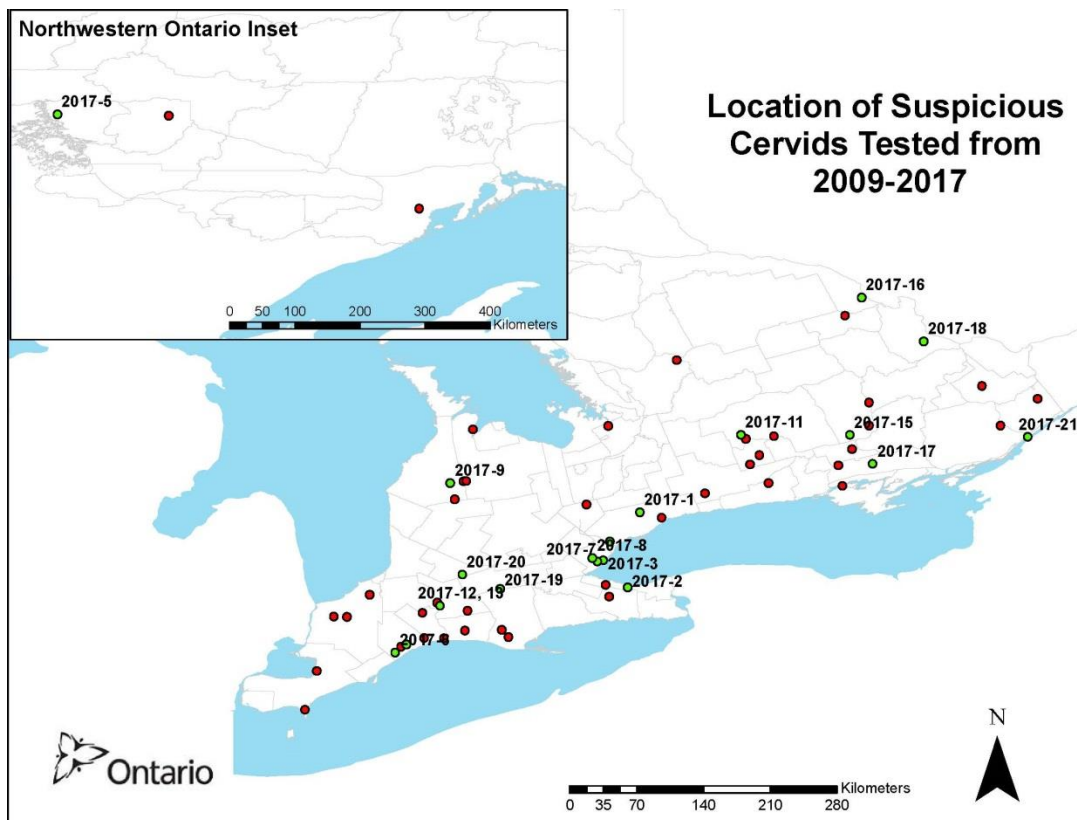


Figure 4. Locations of cervids displaying abnormal or CWD-like symptoms tested in Ontario since 2009. Green markers indicated 2017 samples.

Program results to date

This was the 15th operational year of the CWD surveillance program. All areas of the province with significant deer populations have been surveyed at least once, and many of the highest priority areas have been surveyed two or three times. To date, **11,710** wild cervids (11,696 white-tailed deer, 13 elk and 1 moose) have been tested for CWD during regular surveillance (Table 1).

Table 1. Numbers of surveillance samples collected per year in Ontario.

Year	Surveillance area	Wildlife Management Units	Deer tested
2002	Owen Sound-Hanover	82, 84 (pilot year)	183
2003	Ottawa-Cornwall	64, 65, 66	471
2004	Toronto-Barrie	76, 77, 78B-E, 81	427
2005 ¹	Guelph-Goderich	79C, 80, 85, 86, 87A, 87C	269
2005 ¹	London-Niagara Falls	79D, 87B, 87D-E, 88, 89, 90, 91, 92	467
2005 ¹	Kingston-Brockville	62, 66A, 67, 68B, 69	500
2006 ²	Kenora-Fort Frances	5, 6, 7, 8, 9, 10, 11A	491
2006 ²	Lindsay-Peterborough	60, 71, 72, 73, 74, 75, 78A	520
2006 ²	Owen Sound-Hanover	82, 83, 84	371
2007	Pembroke-Bancroft	48, 51, 55, 57, 58, 61	393
2007	Windsor-Sarnia	93, 94	249
2007	Sault Ste. Marie-Sudbury	36, 37, 38, 39, 45	239
2008	Kingston-Lanark	59, 62, 63, 67, 68, 69, 70	487
2008	Manitoulin	43, 44	480
2008	Parry Sound-North Bay	42, 46, 47, 49, 50, 53, 54, 56	521
2009	Thunder Bay-Ignace	11B, 11C, 12, 13, 14, 28	110
2009	Ottawa-Cornwall	64, 65, 66	349
2009	Toronto-Barrie	76, 77, 78B-E, 81	298
2010	Guelph-Goderich	79C, 80, 85, 86, 87A, 87C, 92A	518
2010	London-Niagara Falls	79D, 87B, 87D-E, 88, 89, 90, 91, 92D	513
2010	Kenora-Fort Frances	5, 6, 7, 8, 9, 10, 11A	362
2011 ³	Peterborough-Bancroft	57, 60, 74, 75	495
2012	London-Sarnia	90B, 92, 93	488
2013	Pembroke-Mattawa	48, 55, 58, 59, 63	495
2014	Owen Sound-Goderich	82, 83, 84, 85	496
2015	Parry Sound-North Bay	42, 46, 47, 49, 50	305
2016	Manitoulin - north shore	36, 37, 43A, 43B, 44, 45	475
2017 ⁴	Kingston - Cornwall	64A, 64B, 65, 66A, 66B, 67, 69A-2, 69A-3, 69B	513
Total			11,710^{1,2}

¹An additional 175 samples were collected in 2005, but zones not recorded.

²An additional 50 samples were collected in 2006, but zones not recorded.

³Twelve of the 2011 samples were wild elk harvested from the 2011 elk hunt.

⁴One of the 2017 samples was a harvested moose.

Sampling in Ontario is confined to areas with medium to high deer population densities. Much of northern Ontario either contains very low or no deer populations. Sampling is therefore confined to southern, central, and northwestern Ontario. In southern Ontario, the sampling has been relatively evenly distributed (Figure 5), but with high concentrations in southeastern and southwestern Ontario where some WMUs have been sampled three times. Areas such as Windsor may appear to have had little or no sampling, but this is an artifact of differences in location data (townships vs. bird breeding squares) resulting in sample locations not being displayed on the map. The only areas of southern Ontario that have not received adequate sampling are the Greater Toronto Area (GTA) and Algonquin Provincial Park. This is due to lack of deer hunting in the former and hunting restrictions in the latter. In northwestern Ontario, sample distribution is a function of suitable deer habitat and is focused around the Thunder Bay, Fort Frances, Dryden, and Kenora areas.

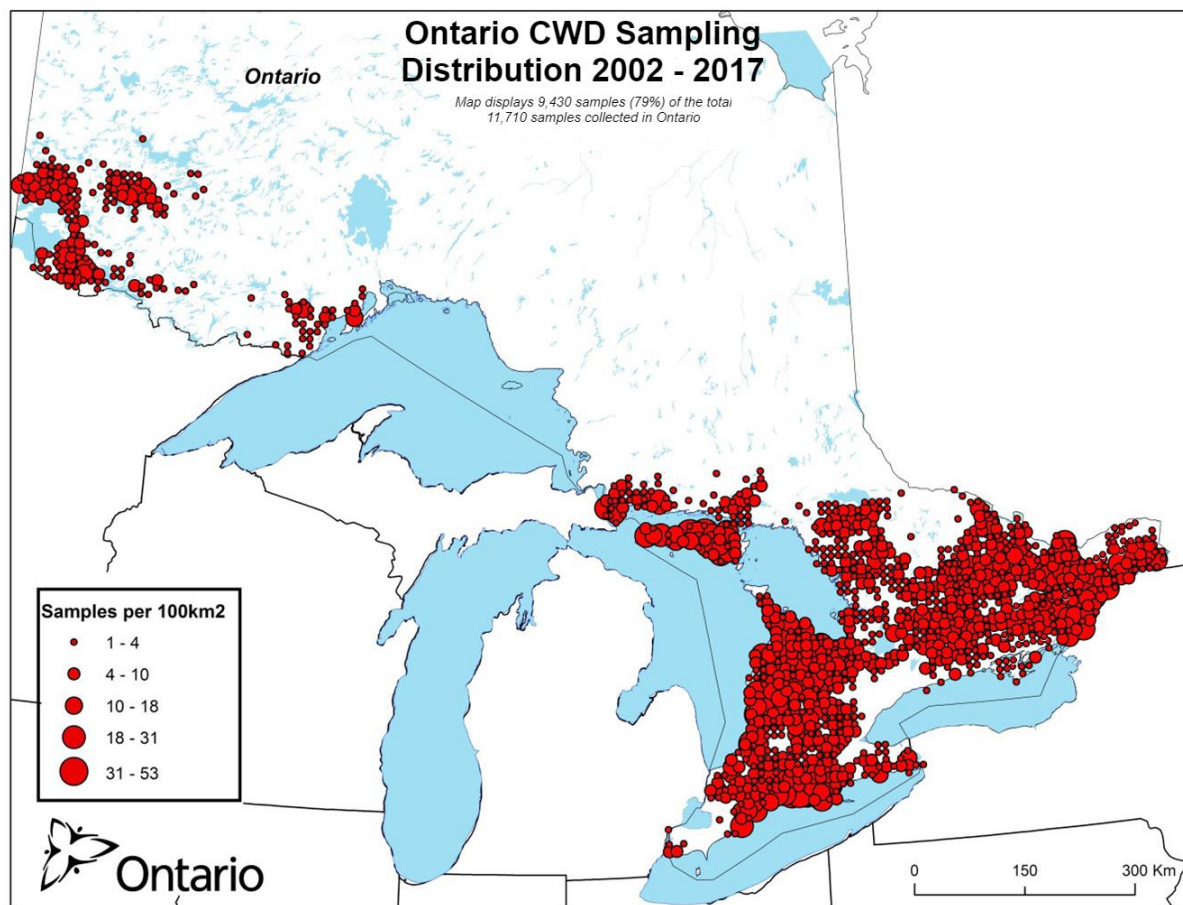


Figure 5. CWD sample collection locations in southern and northwestern Ontario between 2002 and 2017. (Note: Reflects 79% of the total samples collected and tested.)

Neighbouring jurisdictions

CWD has been detected in all five U.S. states that share a border with Ontario (Figure 6). No further cases have been discovered in New York State since the initial seven cases detected in 2005 (five cases on a cervid farm and two cases in wild white-tailed deer) near Syracuse (130 km south of the Ontario border near Kingston). After extensive testing over six years turned up no new cases of CWD, in 2010 the containment area restrictions were lifted.

In Minnesota, the first case of CWD was discovered in 2010 in a wild deer in the southeast part of the state, which initiated the implementation of a CWD management zone in a seven mile radius of the case. In mid-2012, a captive European red deer (*Cervus elaphus*) was found infected with CWD in a herd from North Oaks. In late 2016, CWD was discovered in two farmed deer herds in Crow Wing and Meeker Counties, and eleven harvested white-tailed deer tested positive for CWD in southeastern Minnesota. In 2017, six deer harvested in the southeastern tip of the state, and a captive white-tailed buck from Winona County tested positive for CWD. Given no deer with CWD were found in north-central and central Minnesota, the DNR will narrow surveillance next fall to areas closer to the farms where CWD was detected. A fourth precautionary surveillance area will be added in fall 2018 in Winona County.

In Michigan, a case of CWD was diagnosed in 2008 on a game farm near the city of Grand Rapids (220 km west of the Ontario border at Windsor). A containment area was established in the townships around the game farm, and extensive testing did not discover any further cases. In May 2015, presumably independently, a free-ranging deer near Lansing was Michigan's first confirmed case of CWD in a wild deer. It was located about 100 km east of the previous case and about 120 km west of Windsor. In early 2017, two female deer from a private cervid farm in Mecosta County (~300km west of the Ontario border) tested positive for CWD. Since May 2015 when the first CWD deer was found, the DNR has tested over 30,000 deer. As of mid-January 2018, there are nearly 60 free-ranging deer that have tested positive in Michigan. Positives were found in Clinton, Ingham, Ionia, Kent and Montcalm counties. CWD has not been found in the Upper Peninsula; however, it has been discovered approximately 40 miles from the western Upper Peninsula border in Wisconsin.

In Pennsylvania, the first cases of CWD were discovered in 2012 in two locations within the state. Several cases were detected on game farms in the southeast part of the state (near Harrisburg) and three cases were detected in wild deer shot during the 2012 hunt in the south-central part of the state (120 km east of Pittsburgh). In 2013, another case was discovered in a hunted wild deer from the south-central outbreak area of the state. In September 2014, an adult white-tailed deer died on a game farm 120 km northeast of Pittsburgh. This case was located about 200 km south of the Ontario border at Fort Erie, and is considered to be the source of the recent CWD case on an Ohio game farm. In 2015, 12 additional white-tailed deer with CWD were detected in southcentral Pennsylvania (~400 km south of the Ontario border), more than doubling the cases from 2012 to 2014 cases. During late 2016 and early 2017, CWD was identified on three captive deer farms in the southcentral part of the state in Bedford, Fulton, and Franklin counties. In late 2017, three white-tailed deer on a hunting preserve in Franklin County and one on a Fulton County hunting preserve tested positive for CWD. The disease was also confirmed in one white-tailed deer on a hunting preserve in Bedford County

and one at a Lancaster County breeding operation in early 2018. Over 1,000 cervid game farms are operating in the state of Pennsylvania. Since the disease was discovered in Pennsylvania in 2012, 46 deer have been confirmed to have CWD in the state. The latest CWD-positive case is a concern because of its proximity to Pennsylvania's elk range. More than 100 elk are tested for CWD each year and, thus far, the disease has not been detected among the state's elk.

In October 2014, Ohio announced their first cases of CWD in the state with 19 positive cases on a game farm located in the northeast part of the state (100 km south of Cleveland). The farm had been under quarantine since April 2014 after an investigation determined that the farm had a known connection with a game farm in Pennsylvania with animals that tested positive for CWD. In early 2018, a single buck on a hunting preserve in Guernsey County tested positive for CWD as part of Ohio's CWD monitoring program for captive white-tailed deer operations.

Two large outbreaks of CWD exist in eastern North America. A very large outbreak in the southern Wisconsin-northern Illinois border area has persisted and grown since 2002, with more than 4,100 cases detected. Approximately 30-40% of adult male deer in the core area of the southwestern outbreak are infected with CWD. The prevalence continues to increase in affected deer populations in Wisconsin. This outbreak area is approximately 550 km west of the Ontario border at Windsor. In Wisconsin, 45 of 72 counties are now considered "CWD-affected". The second, more recent, outbreak area is in the West Virginia-Virginia-Maryland-Pennsylvania area. It is a smaller area with lower prevalence rates of CWD but the disease is probably spreading. This outbreak area is centred approximately 400 km southeast of the Ontario border at Niagara Falls.

Ontario's Canadian neighbours (Quebec and Manitoba) remain CWD free and have ongoing surveillance programs.

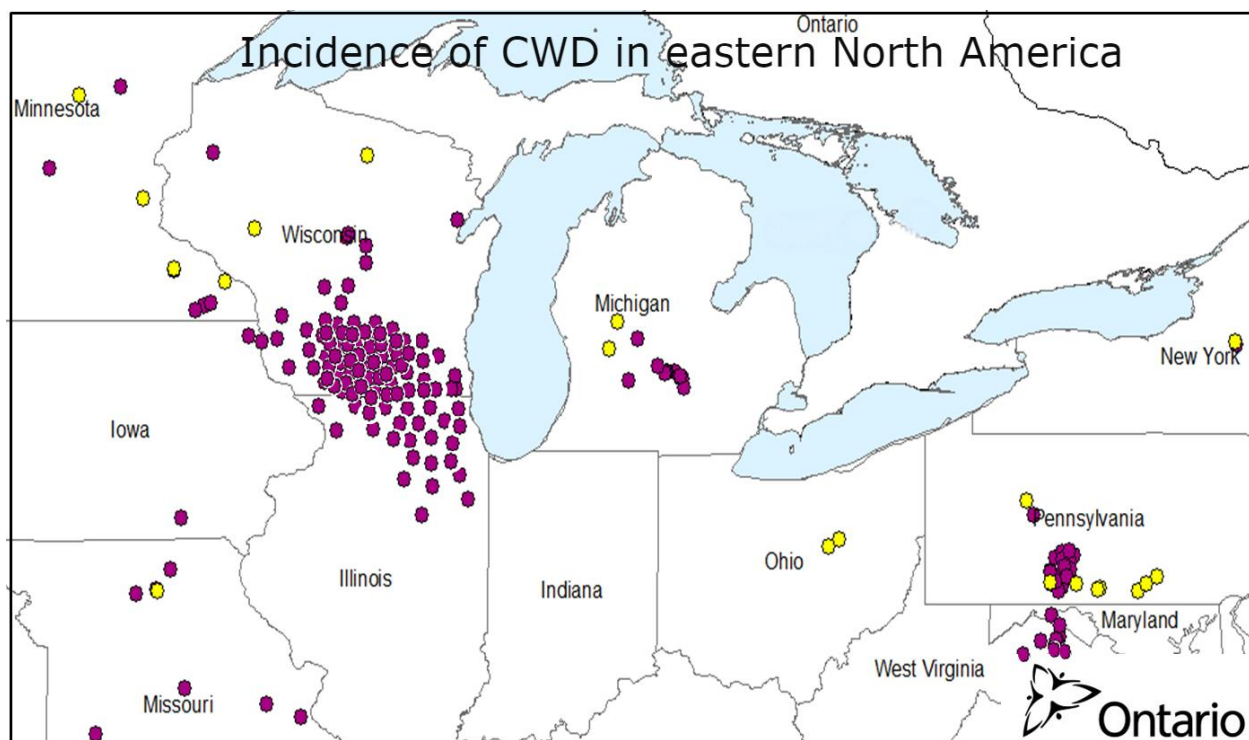


Figure 6. Incidence of chronic wasting disease (CWD) in eastern North America from 2012 to January 1, 2018. Purple markers indicate cases of CWD found in wild white-tailed deer, yellow markers indicate cases detected on game farms. All locations are approximations based on best available data.

In 2016, the first detection of CWD in Europe occurred in a female free-ranging reindeer (*Rangifer tarandus tarandus*) in South-Norway. This is the first detection of natural CWD infection in reindeer worldwide. Additional cases of CWD were detected in 18 reindeer (in Nordfjella), and 3 moose, 1 red deer (in Selbu in the north) in Norway later in 2016. The infected moose and red deer were older animals, suggesting that these were cases of spontaneous disease, which are less likely to be infectious especially considering the more solitary nature of moose. However, the reindeer all lived in the same herd in Nordfjella, a rocky region in the middle of the country. The government quickly implemented a cull the herd of roughly 2000 reindeer, or nearly 6% of the country's wild population, to stop the spread of the disease. The deer's habitat will be quarantined for at least 5 years to prevent reinfection. Plans are also underway to develop more information on CWD prevalence in reindeer and moose in Norway and to evaluate any potential changes in cervid populations.

In early 2018, the first case of CWD was detected in Finland in a 15 year old European elk (*Alces alces*) found in Kuhmo, eastern Finland. Finland has been monitoring for the disease since 2003, testing 2500 samples, which have all been negative up until this point. Monitoring of the disease will be intensified in the Kuhmo and Kainuu region.

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from Species Conservation Policy Branch developed and maintained MNRF's CWD policies and CWD response plan document. MNRF regional biologists Brad Allison, Mike Gatt, and Peter Davis provided regional expertise and advice. Zaur Aliyev of Communication Services Branch assisted with posting test results online.

MNRF Wildlife Research and Monitoring Section staff Erica Newton, Kelly Milne, and Val von Zuben created maps for the program. Kevin Middel was an integral developer of the Ontario CWD risk model; the model is now updated annually by Erica Newton. Beverly Stevenson assisted with advertising campaigns, and internal communications and approvals. Communications Services Branch assisted with advertising campaigns and designed this year's commemorative crest. Rachel Gagnon ensured accessibility of this document. Mark Gibson led the surveillance crews and managed depot locations, sample logistics, and supply management. Tore Buchanan and Peter Carter reviewed this report.

Crew leader: Mark Gibson

Crew staff: Steve Bennett, Will Bennett, Hower Blair, Laura Dougherty, James Groenwold, Alison Hanes, Morgan Hawkins, Travis McGee, Phil McLaren, Larissa Nituch, Derek Potter, Natalie Pulham, Matt Sweeting, and Katrina Wisniewski

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