



SURVEILLANCE AND MANAGEMENT OF CHRONIC WASTING DISEASE IN MINNESOTA

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SUMMARY OF FINDINGS

In fall 2018, mandatory surveillance for chronic wasting disease (CWD) in hunter-harvested white-tailed deer (*Odocoileus virginianus*) continued across 3 surveillance areas in the state. In the north-central and central surveillance areas, sampling occurred over the opening weekend of firearm season for a second consecutive year, in response to positive cervid farms discovered in Crow Wing and Meeker counties. We collected 888 and 462 samples from hunter-harvested deer in the north-central and central surveillance areas, respectively; no CWD was detected. In southeast Minnesota, 3,122 samples were collected during opening weekends of the firearms seasons in deer permit areas (DPAs) outside the CWD Management Zone (DPA 603); 3 new CWD-positive cases were detected. This marked the first time CWD was detected outside of the CWD Management Zone, which was established in 2016. In DPA 603, we tested 1,250 hunter-harvested deer and detected 9 positive cases. Additionally, two deer that were found dead by hunters also had CWD. Disease prevalence in DPA 603 had doubled from the previous fall, from 0.46% to 0.84%. In response to both the increased in CWD prevalence and spread into new areas, the Minnesota Department of Natural Resources (MNDNR) implemented additional management actions post-season to curb the spread of disease, including special late hunts, landowner shooting permits (LSP), and agency culling. Late hunts accounted for another 1,004 deer harvested and 4 new cases of CWD; 3 in DPA 603 and 1 in DPA 346. Shooting permits were mailed to 3,559 landowners in Fillmore county; however, only 245 permits were utilized to harvest a total of 409 deer. Shooting permits were also mailed to 235 landowners in Winona and Houston counties, resulting in only 33 additional deer taken. Agency culling removed 493 deer in DPA 603 (12 were CWD-positive) and 47 in DPA 346 (2 were CWD-positive). Thus, post-season efforts in the southeast resulted in a total of 1,986 additional samples with 19 new positives. In February 2019, an adult doe that was found dead less than a half mile from a CWD-infected cervid farm in Crow Wing county was confirmed with the disease, marking the first occurrence of CWD in a wild deer in northern Minnesota. Through a combination of landowner shooting permits, agency culling, and opportunistic sampling, 115 deer were tested from February-April in the area immediately surrounding the infected farm and no CWD was detected. To date, 52 wild deer have been confirmed CWD positive in Minnesota since surveillance efforts began in 2002.

INTRODUCTION

Chronic Wasting Disease (CWD) belongs to a family of infectious diseases known as transmissible spongiform encephalopathies, or prion diseases. Members of the cervid family are susceptible and infection always results in death, with no vaccine or treatment available (Williams 2005). While a link between CWD and neurological illnesses in humans has not been detected (MaWhinney et al. 2006, Sandberg et al. 2010), the Center for Disease Control

recommends testing deer or elk intended for human consumption and abstaining from eating known CWD positive meat ([cdc.gov/prions/cwd/prevention.html](https://www.cdc.gov/prions/cwd/prevention.html)).

Since 2002, Minnesota Department of Natural Resources (MNDNR) has tested over 71,000 wild white-tailed deer (*Odocoileus virginianus*), elk (*Cervus canadensis*) and moose (*Alces alces*) across the state. From 2002-2004, Minnesota completed a statewide surveillance effort, sampled 28,000 deer, and detected no CWD cases. In 2005, MNDNR adopted risk-based surveillance for 1) any suspect deer displaying neurological symptoms consistent with CWD (opportunistic deer), 2) new infections found near neighboring states' borders, and 3) surveillance of hunter-harvested deer as a response to CWD-positive cervid farms. Through risk-based surveillance, 43,000 wild deer were sampled from 2005 to present. To continue mitigating disease spread, in 2016 MNDNR expanded the carcass importation ban to disallow the movement of whole cervid carcasses into Minnesota from anywhere outside its borders.

Using risk-based surveillance, the first case of CWD in a wild deer occurred in 2010 while conducting hunter harvested surveillance near an infected farmed elk facility in Pine Island. From 2011–2013, MNDNR implemented the 2011 CWD Response Plan (MNDNR 2011) to manage the discovery of the disease. After sampling 4,000 deer between 2011 to 2013, no new cases of the disease were found and the disease management zone boundary was dissolved (Hildebrand et al. 2013). For the next 6 years, no further CWD was found in Minnesota's wild herd. In 2016, MNDNR conducted risk-based surveillance using hunter-harvested deer in the southeast as a response to CWD found across state borders in Iowa and Wisconsin; 3 positive wild deer were found near Preston, MN. Over the winter, MNDNR created a disease management zone, called Deer Permit Area (DPA) 603, established carcass movement restrictions, implemented a recreational feeding ban, and liberalized hunting opportunities. In addition, a special late hunt, landowner shooting permits, and targeted agency culling were conducted and yielded 8 additional CWD-positive wild deer. In fall 2017, 6 more CWD-positive deer were detected within DPA 603 during fall harvest (Hildebrand et al. 2018).

The Minnesota Board of Animal Health (BAH) currently manages 371 captive cervid farms that contain approximately 10,000 animals, primarily white-tailed deer and elk (L. Glaser, BAH Assistant Director, personal communication, 27 June 2018). In Minnesota, farmed cervids are classified as livestock and are subject to certain regulations including mandatory CWD testing of all deceased adult animals (<https://www.bah.state.mn.us/deer-elk/#chronic-wasting-disease>). Since 2002, CWD has been detected on 8 captive cervid farms. The most recent detections occurred in Crow Wing county in 2016, and Meeker and Winona counties in 2017 (the Meeker county farm traced-out from the Crow Wing county farm). As part of the CWD Response Plan, MNDNR began conducting precautionary surveillance around the Crow Wing and Meeker county farms in 2017, in addition to implementing a ban on recreational feeding in all adjacent counties. Precautionary surveillance of wild deer began in fall 2018 for the area surrounding the CWD-infected Winona county farm.

The cervid farms in Meeker and Winona counties were depopulated after discovering the disease, but the Crow Wing county farm elected to remain in business. Additional positive cases were found on that farm in 2018, and the United States Department of Agriculture (USDA) indemnified and depopulated the remaining animals in April 2019; 9 additional deer tested positive for CWD. In February 2019 an emaciated wild deer was discovered dead less than a half-mile from the CWD-infected farm and confirmed positive for CWD. A necropsy revealed this deer died from CWD and MNDNR immediately enacted its CWD Response Plan to try to contain the disease.

METHODS

Fall Hunter-Harvested Surveillance

MNDNR staff and students from 5 universities conducted mandatory sampling of hunter-harvested deer in fall 2018 to monitor changes in CWD prevalence and spread. Staff and students collected medial retropharyngeal lymph nodes for CWD testing and additional samples (e.g., muscle sample, front incisor) were collected in DPA 603, where there was a greater chance for detecting an individual with the disease. Hunter contact information, harvest location, and age/sex of the deer were also recorded. Lymph node samples were sent to Colorado State University (CSU) for testing using enzyme-linked immunosorbent assay (ELISA), and all suspect cases were confirmed with immunohistochemistry (IHC). Test turnaround times were typically 3-4 business days for samples taken within the disease management zone.

We also worked with 27 taxidermists across the 3 surveillance areas to collect samples from animals that had a higher probability of incubating CWD: older, mature bucks. MNDNR also developed tracking forms to allow hunters who harvested trophy bucks to have their deer tested at a later time. In addition, the dual deer feeding and attractant use ban grew to 6 counties in the southeast and remained at 11 counties for north-central and central (attractants excluded) surveillance areas.

Southeast

In southeast Minnesota, the CWD surveillance zone consisted of 10 DPAs, including 341, 342, 343, 344, 345, 346, 347, 348, 349, and 255 (Figure 1). Sampling occurred on opening weekends of both A and B firearms seasons (3-4 and 17-18 November 2018) at 23 sampling stations. Due to increased concerns from hunters and landowners around the CWD-positive Winona county cervid farm, self-service sampling stations were placed in DPA 346 during the remaining firearms season (outside of mandatory testing weekends) to allow hunters to submit voluntary samples.

In DPA 603, liberalized hunting opportunities in the fall were available through elimination of antler point restrictions and providing unlimited disease management tags for antlerless deer. Mandatory testing was required for adult deer throughout all hunting seasons. Five self-service sampling stations were available during archery and muzzleloader seasons and 3 sampling stations were continually staffed during the two 9-day firearm seasons. Carcass movement restrictions remained in place for adult deer, while fawns could leave the zone after age was confirmed by staff during firearm season. MNDNR and Bluffland Whitetails Association provided a dumpster, tripod, and shed at the Preston Forestry Office to provide hunters a place to quarter their deer and comply with carcass movement restrictions. A self-service refrigerated semi-trailer was provided by MNDNR for hunters to store carcasses while awaiting test results during the firearm season.

Central and North Central

For fall 2018, MNDNR reduced the size of the surveillance zones from fall 2017 to approximately a 15-mile radius surrounding each CWD-positive cervid farm in Crow Wing and Meeker counties. Surveillance occurred over opening weekend of firearm season (3-4 November 2018). For the north-central surveillance area, the 2 DPAs included 242 and 247 and utilized 5 sampling stations (Figure 2). For the central surveillance area, the surveillance zone had 4 sampling stations and included portions of DPAs 277 and 283 east of State Highway 4, DPA 219 south of State Highway 55, and DPA 285 north of State Highway 7 (Figure 2).

Winter CWD Surveillance and Management Efforts

Due to increased incidence of CWD during fall hunter-harvest surveillance efforts, MNDNR implemented its 2011 CWD Response Plan and created more opportunities to harvest deer post-season, including special late-season hunts, landowner shooting permits (LSP), and agency culling. To address these opportunities with the community, public meetings were held in Chatfield on 18 December 2019, Winona on 15 January 2019, and Brainerd on 4 March 2019.

Special hunts were designed to increase harvest through liberalized regulations, and included options such as unlimited disease management tags (\$2.50) for either-sex deer, elimination of antler point restrictions, permission to cross-tag bucks, no bag limits, and the ability to use any unfilled deer license from earlier in the 2018 deer seasons. The first special hunt occurred over two weekends (21-23 & 28-30 December 2018) in an extended hunt boundary surrounding DPA 603 and consisted of DPAs 603, 347, 348, and portions of 343 and 345 south of Interstate 90. A second special hunt occurred in DPA 346 over two weekends (25-27 January & 1-3 February 2019).

Landowner shooting permits allowed a landowner to apply for a permit and designate shooters to take an unlimited number of deer off their property. The first LSP phase occurred within the extended hunt boundary which included DPAs 603, 347, 348, and parts of 343 and 345 (1-3 January 2019). The second LSP phase occurred within two miles of the first positive deer found in DPA 346, hereafter called Looney Valley (12-20 Jan 2019). The third LSP phase took place within two miles of the positive deer found during the special hunt which was adjacent to the CWD-infected cervid farm in DPA 346, hereafter called Cedar Valley (23 February to 10 March 2019). Following the discovery of the CWD-positive wild deer in Crow Wing, a final LSP phase permitted landowners within two miles of the positive deer and adjacent CWD-infected cervid farm to take additional deer from their properties (2-24 March 2019).

MNDNR contracted with USDA-Wildlife Services (WS) to conduct agency culling directed at areas with known CWD-positive deer near Preston, Winona, and Brainerd, MN (22 January to 29 March 2019). Priority areas were determined as sections with a high number of positives, positive female deer (considered to be disease anchors), or areas with high deer densities in close proximity to known positives. In the southeast, agency culling efforts were expected to last for at least 2 months with several hundred deer culled. Carcass movement restrictions meant few options were available for meat processing within DPA 603. MNDNR staff collected samples and processed agency culled deer via gutless-quartering. Deer were skinned and chest cavities, with the viscera intact, were disposed of into a gasket-sealed, 20-yard dumpster and brought to a lined landfill. Deer quarters were stored in food-grade, wax lined boxes labeled with sample identification, and held in the refrigerated semi-trailer until test results were returned. MNDNR collaborated with a local sportsman's group, Bluffland Whitetails Association, to pioneer Share the Harvest Program – a venison donation program that distributed meat to the public. Additional tissue samples (submandibular lymph nodes, parotid lymph nodes, tonsils, feces, blood, and muscle) were taken in partnership with the University of Minnesota to aid in the development of a rapid diagnostic test procedure to identify CWD prions. Due to the late-winter discovery of the CWD-positive wild deer in Crow Wing County, USDA-WS efforts in that area were only anticipated to last for a couple weeks. Eviscerated carcasses were brought to a local meat processor in Emily, MN for processing and venison was distributed to special interest groups and the public via the Share the Harvest Program in collaboration with Turn-in-Poachers.

RESULTS

From 1 July 2018 – 30 June 2019, 8,040 deer were tested and 34 new positive cases were discovered (Table 1). During fall 2018, MNDNR tested a total of 5,722 total deer, including 378 samples from participating taxidermists. In the southeast, 3,122 deer were tested outside of DPA 603 and 3 new CWD detections occurred for the first time outside the CWD Management Zone; hunter compliance was 86% for the first weekend and 88% for the second weekend, a marked improvement from the previous year. In DPA 603, 1,250 deer were tested and 9 positive cases were discovered (Figure 1). In the north-central surveillance area, 888 deer were tested with no CWD detections; hunter compliance rate was 92% (Figure 2). In the central surveillance area, 462 deer were tested with no CWD detections; hunter compliance rate was incalculable, as the surveillance area included portions of 4 separate DPAs (Figure 2). Throughout the year and especially in areas of concern, routine monitoring of opportunistic deer displaying CWD symptoms was conducted. In DPA 603, 25 opportunistic deer were tested in the fall and 2 deer found dead by landowners tested positive for CWD. The apparent prevalence of CWD within DPA 603 using hunter-harvested and special late hunt samples is 0.84%, up from 0.46% in 2017.

Combined across the southeast, MNDNR sampled an additional 1,986 deer through special hunts, landowner shooting permits, and targeted agency culling. These efforts led to the removal of another 18 CWD-positive deer off the landscape (Figure 3). During the first special hunts, 644 deer were tested and 3 new positives were discovered. For the special hunts in DPA 346, 360 deer were tested and one new positive was discovered 2.5 miles from the Winona county CWD-positive cervid farm. During the LSP phase in the extended boundary around DPA 603, 3,559 permits were mailed or written; of those, 245 permits were utilized and 409 deer were sampled with no new disease detections. Note, during this LSP timeframe, a deer was found dead within DPA 603 and tested positive. During the second phase of LSPs in Looney Valley, 80 permits were issued and 18 deer were sampled with no new disease detections. For the third phase of LSPs in Cedar Valley, 155 permits were issued and 15 deer were sampled with no new disease detections. In the Preston area, 49 landowners granted USDA-WS access to their property (about 9,600 acres of private land and 7,000 acres of public land). In Winona county, 10 landowners allowed USDA-WS to access their property to remove deer (about 1,500 acres of private property). Targeted agency culling around Preston resulted in 493 culled deer with 12 new CWD-positives while Winona county resulted in 47 culled deer and 2 new positive cases.

In the north central area, MNDNR sampled 80 additional deer through LSP and targeted agency culling phases; no additional CWD positives were detected (Figure 4). During LSP, MNDNR issued permits for 139 landowners and 14 deer were sampled with no new positives. In Crow Wing county, 15 landowners allowed USDA-WS access to their property, (about 900 acres of private land); 66 deer were culled with no new positives. During winter 2019, area staff tested 41 opportunistic deer in the Crow Wing county area, which included the CWD-positive found dead deer that initiated the winter surveillance efforts.

The first year for the Share the Harvest Program was a great success. During the 2018-2019 season, 705 people signed up to receive venison, 553 deer were distributed from all efforts, and about 280 individuals received deer.

Between 1 July 2018 and 30 June 2019, MNDNR collected 252 opportunistic samples statewide across 53 different DPAs. Of those, 92 were found dead, 77 were vehicle-killed, 46 were reported sick, and the remainder fell into miscellaneous categories. Four found dead deer were positive: two in DPA 603 during fall 2018, and one each in DPAs 603 and 247 in January 2019.

DISCUSSION

For 2018, the statewide carcass importation ban remained in place to prevent movement of potentially infected carcass remains into Minnesota and further spread of the disease. Recreational deer feeding and attractant bans were expanded in some areas of the state based on risk factors. Increased communication efforts included new quartering and capping videos for social media posting, an increased outreach effort at the Minnesota State Fair, creation of 2 informative pamphlets about CWD, an informational website overhaul, and a new widget on the website that allowed every hunter who submitted a sample to check their results online. In addition, mandatory testing requirements and sampling station locations were printed in the 2018 Minnesota Hunting & Trapping Regulations booklet and posted online.

Total expenditures for 2018 and 2019 CWD surveillance efforts came to \$1,524,906. During fall 2018, CWD surveillance occurred at 35 sampling stations in 3 areas of the state. In total, \$482,179 was spent planning, collecting, and testing 5,722 samples during the fall (Aug. 1-Nov. 30, 2018), roughly \$84.27/sample. However, all winter management efforts, including special late hunts, landowner shooting permits, and USDA-WS agency culling, resulted in 2,318 samples at a cost of \$1,003,135, or \$432.76/sample. Between fall and winter surveillance, wildlife staff worked 259 shifts and students filled 180 shifts.

An aerial survey was conducted from 13-15 February 2019 in DPA 603 to estimate deer density. Fixed-wing aerial surveys were also conducted in Winona and Crow Wing counties following the discovery of positives in those areas in winter 2019.

Future Surveillance Plans

MNDNR drafted an updated CWD Response Plan (MNDNR 2019), as the original plan had not laid out decision metrics to determine if CWD became endemic in an area of the state. The new plan outlined management actions for 3 stages of infection: 1) initial detection, 2) persistent infection, and 3) endemic disease. The plan lays out goals and options for handling the disease at each stage of infection as well as transition points between stages. MNDNR utilized public engagement with legislative, tribal, agency, and stakeholder group leaders as well as public meetings to explain the plan and collect input.

Following the discovery of CWD outside of DPA 603, new disease management zone boundaries were drawn in the southeast and north central. Using information collected from the Southeast Deer Movement study (Jennelle et al., 2018), new disease management boundaries were drawn 15-miles around each positive wild deer. In the southeast, CWD positive deer across the border in Vernon county (WI) and apparent spread within Minnesota meant portions of 8 different DPAs were affected by the 15-mile boundaries. DPAs affected by that buffer were converted to a 600-series delimiter. DPA 603 was dissolved and the following DPAs were adopted: 643, 645, 646, 647, 648, 649, and 655. Within the disease management zone, mandatory testing is required for adult deer and carcass movement restrictions affects all deer, including fawns for the first time. Additionally, a novel CWD Control Zone was established to surround the disease management zone; DPAs 255, 343, and 344 will have carcass movement restrictions on all deer, including fawns, as well as mandatory testing for all adult deer harvested over opening weekends of firearms A and B seasons. This control zone allows carcasses to move into management zone, but whole carcasses cannot leave the management zone without "not detected" test results (Figure 5).

In the north central area, MNDNR created a new disease management zone, DPA 604, to enforce mandatory testing of all adult deer as well as carcass movement restrictions for all deer, including fawns (Figure 5). DPA 604 was established using a 15-mile buffer around the positive cervid farm and found dead wild deer with boundary lines imposed by enforceable roads.

In fall 2019, self-service sampling stations will be available in the disease control and management zones during archery and muzzleloader season and the stations will be staffed during the firearms seasons. Mandatory surveillance will occur in the central surveillance area over opening weekend for at least one more year and that area will be dissolved if no CWD positive deer are found. The recreational deer feeding and attract ban will be expanded to include 24 counties.

During the 2019 Minnesota legislative session, \$1.87 million was awarded from the state's general tax fund to help monitor and manage CWD. In addition, a dumpster program was initiated by state legislators to mandate a partnership between MNDNR, Department of Health, Pollution Control Agency, waste haulers/disposal sites, taxidermists, and meat processors to create guidelines for proper carcass disposal. Within both disease management and control zones, dumpsters and quartering stations will be available to hunters to process their deer and abide by carcass movement restrictions.

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Table 1. MN wild white-tailed deer samples submitted for testing and resulting positive CWD cases detected by operational phase between 1 July 2018 and 30 June 2019.

Dates	Operational phase	Number of landowners who received a Landowner Shooting Permit	Number of deer sampled	Resulting positives
Nov. 3-4, Nov. 17-18	Fall - Southeast		3,122	3
Nov. 3-4	Fall - North central		888	0
Nov. 3-4	Fall - Central		462	0
Sept. 15 – Dec. 31	Fall – DPA 603		1,250	9
Dec. 21-23, Dec. 28-30	Special late hunts – extended boundary DPA 603		644	3
Jan. 1 -13	Landowner Shooting Phase - extended boundary DPA 603	3,559	409	0
Jan. 12-20	Houston county LSP – Looney Valley	80	18	0
Jan. 25-27, Feb. 1-3	346 Special late hunt		360	1
Feb. 23 - Mar. 10	Winona county LSP - Cedar Valley	155	15	0
Jan. 22 - Mar. 29	USDA-WS Preston		493	12
Mar. 7-29	USDA-WS Winona		47	2
Mar. 2 -24	Crow Wing LSP	139	14	0
Mar. 17-29	USDA-WS Crow Wing		66	0
July 1-June 30	Opportunistic statewide		252	4
Totals			8,040	34

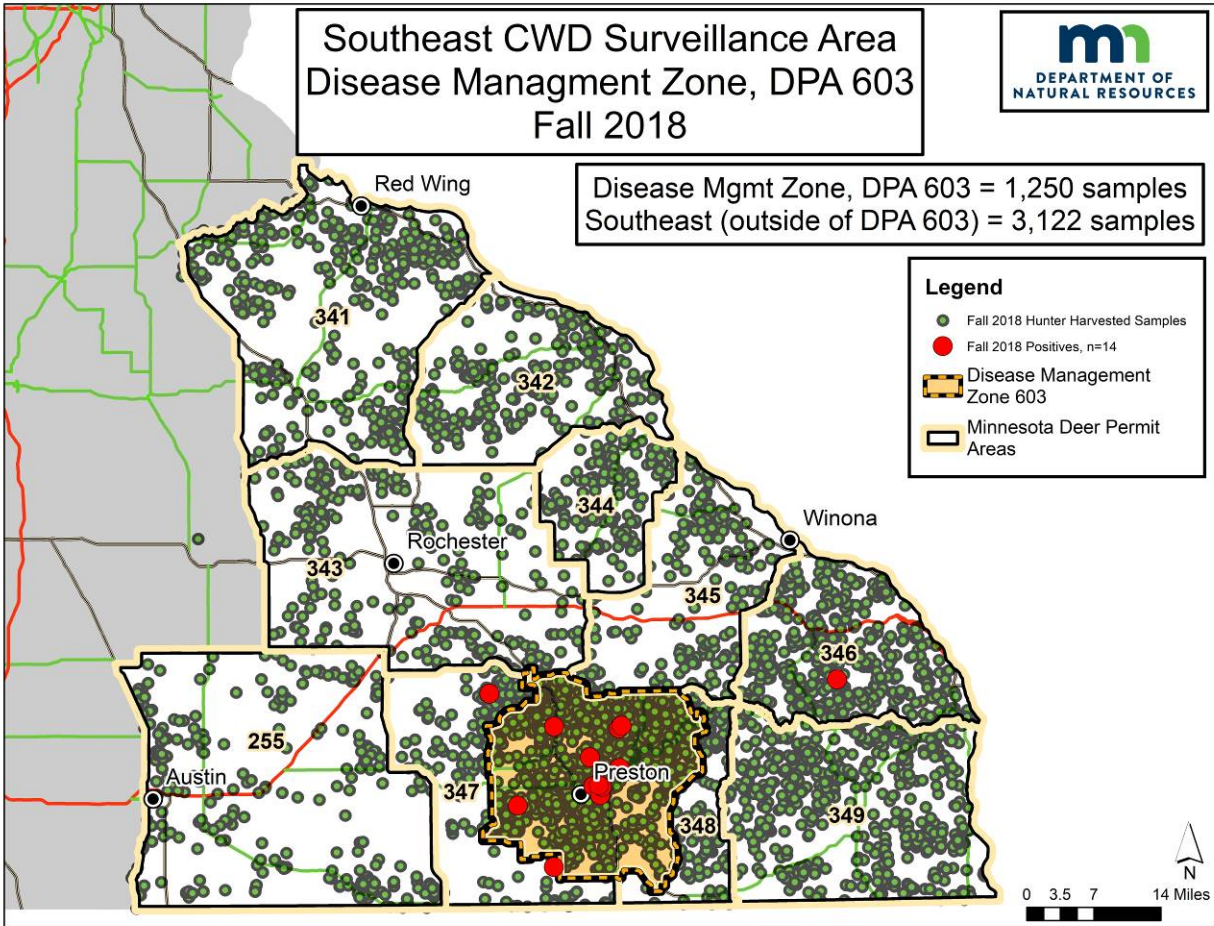


Figure 1. Fall 2018 sampling results of hunter harvested white-tailed deer for the southeast and DPA 603. DPAs for the southeast surveillance area included 341, 342, 343, 344, 345, 346, 347, 348, 349, and 255. Outside of DPA 603, 3,122 samples were collected and 3 new positives were found; 2 in DPA 347 and 1 in DPA 346. Within DPA 603, 1,250 samples were collected and 9 positive hunter harvested deer and 2 found dead deer were found.

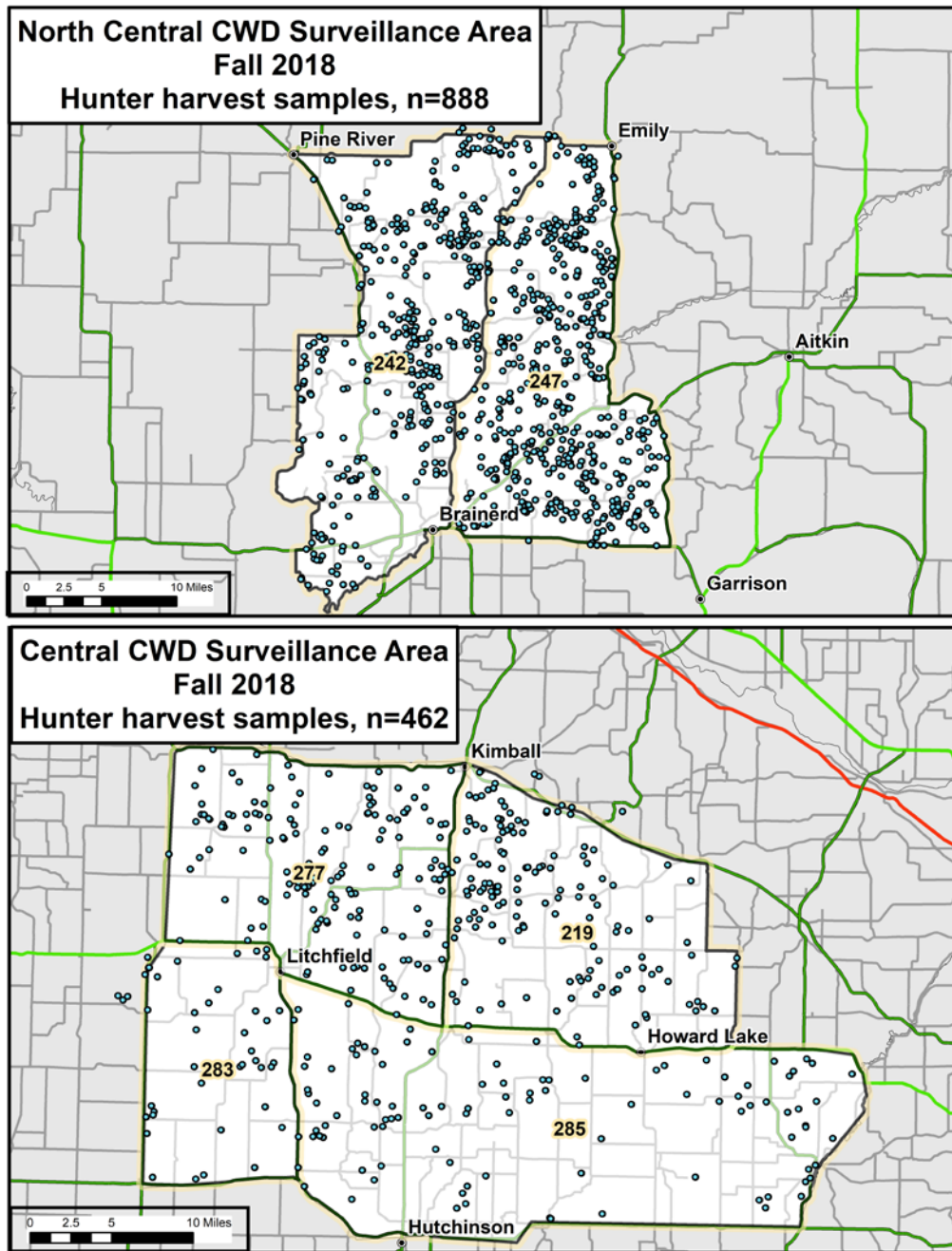


Figure 2. Fall sampling results of hunter harvested white-tailed deer from north central and central surveillance on 3-4 November 2018. North central surveillance included DPAs 242 and 247; 888 samples were taken and no new positives were detected. Central surveillance area included portions of DPAs 277 and 283 east of State Highway 4, DPA 219 south of State Highway 55, and DPA 285 north of State Highway 7; 462 samples were collected and no new positives were found.

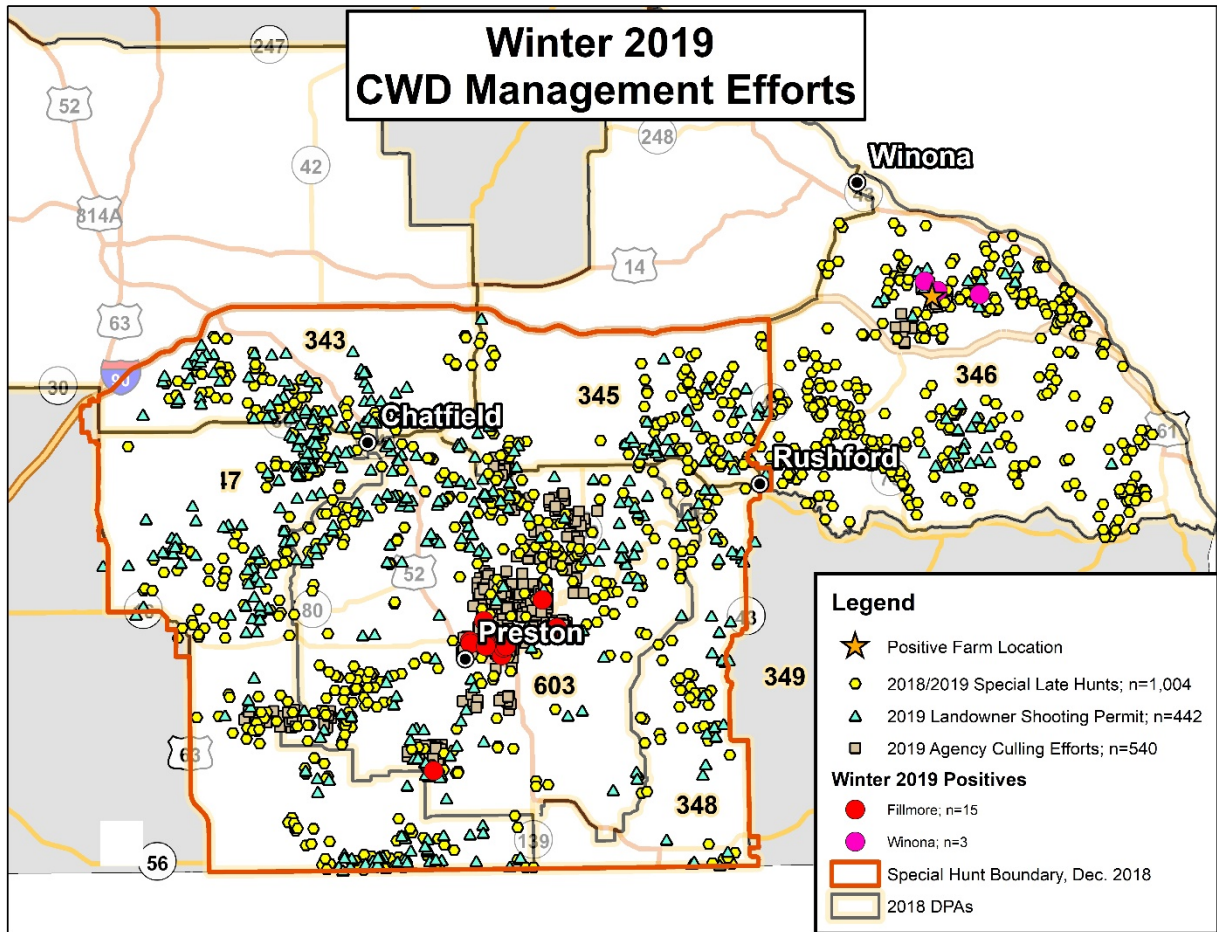


Figure 3. During winter 2019, MNDNR sampled an additional 1,986 white-tailed deer through special hunts, landowner shooting permits, and targeted agency culling. These efforts led to the removal of another 18 CWD-positive deer off the landscape. During the special hunts, 1,004 deer were tested and 4 new positives were discovered. During the three LSP phases in this area, 442 deer were harvested and 1 found dead deer tested positive. Agency culling removed 493 deer in DPA 603 with 12 positives and 47 deer in DPA 346 with 2 positives.

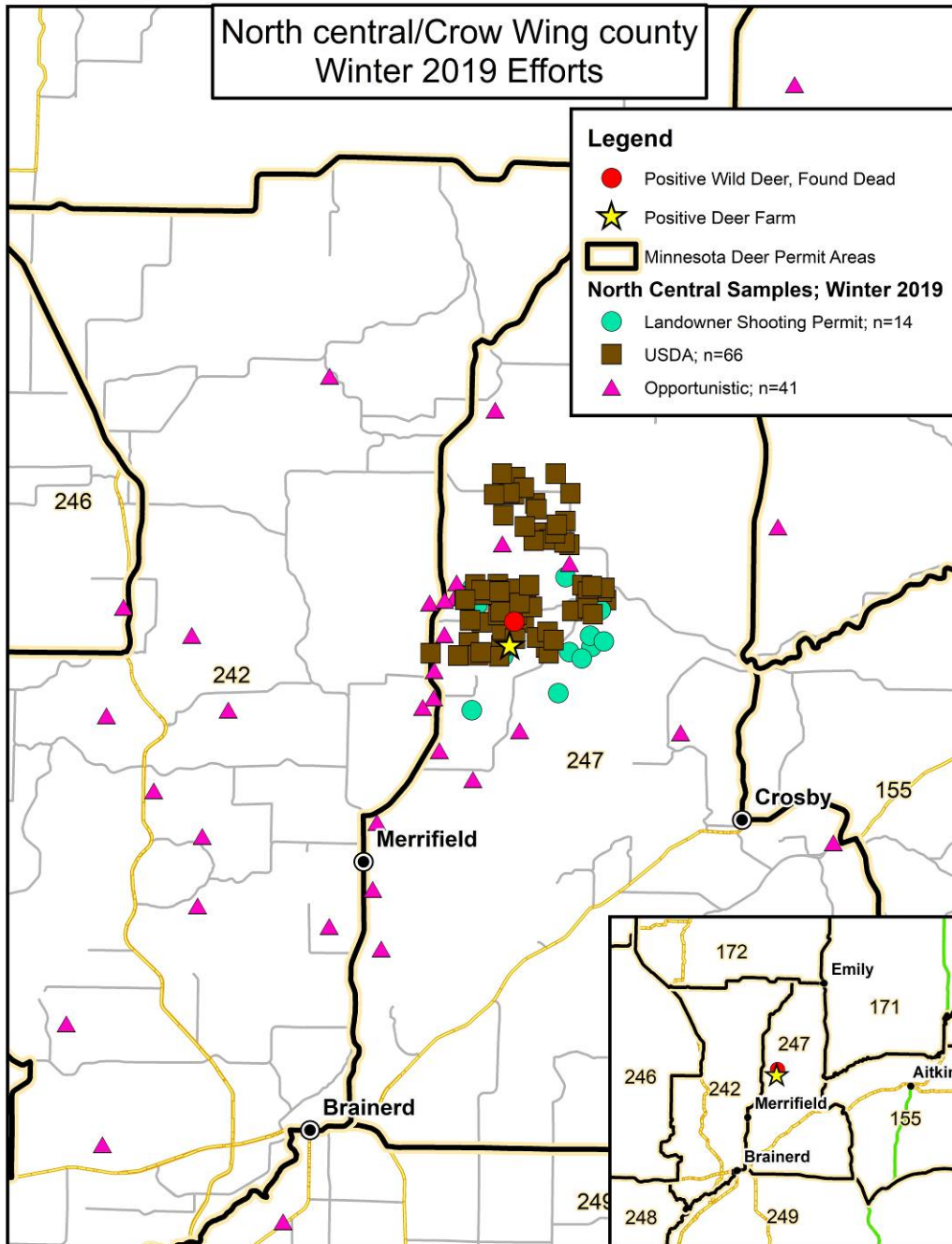


Figure 4. Following the discovery of the positive deer found dead in Crow Wing county, landowner shooting permits were issued to 138 landowners and 14 deer were tested. Immediately following, USDA-WS culled 66 deer from private and public properties surrounding the farm and positive deer. Throughout all of winter 2019, area wildlife staff tested 41 opportunistic deer in the surrounding area. No additional positives were discovered from these efforts.

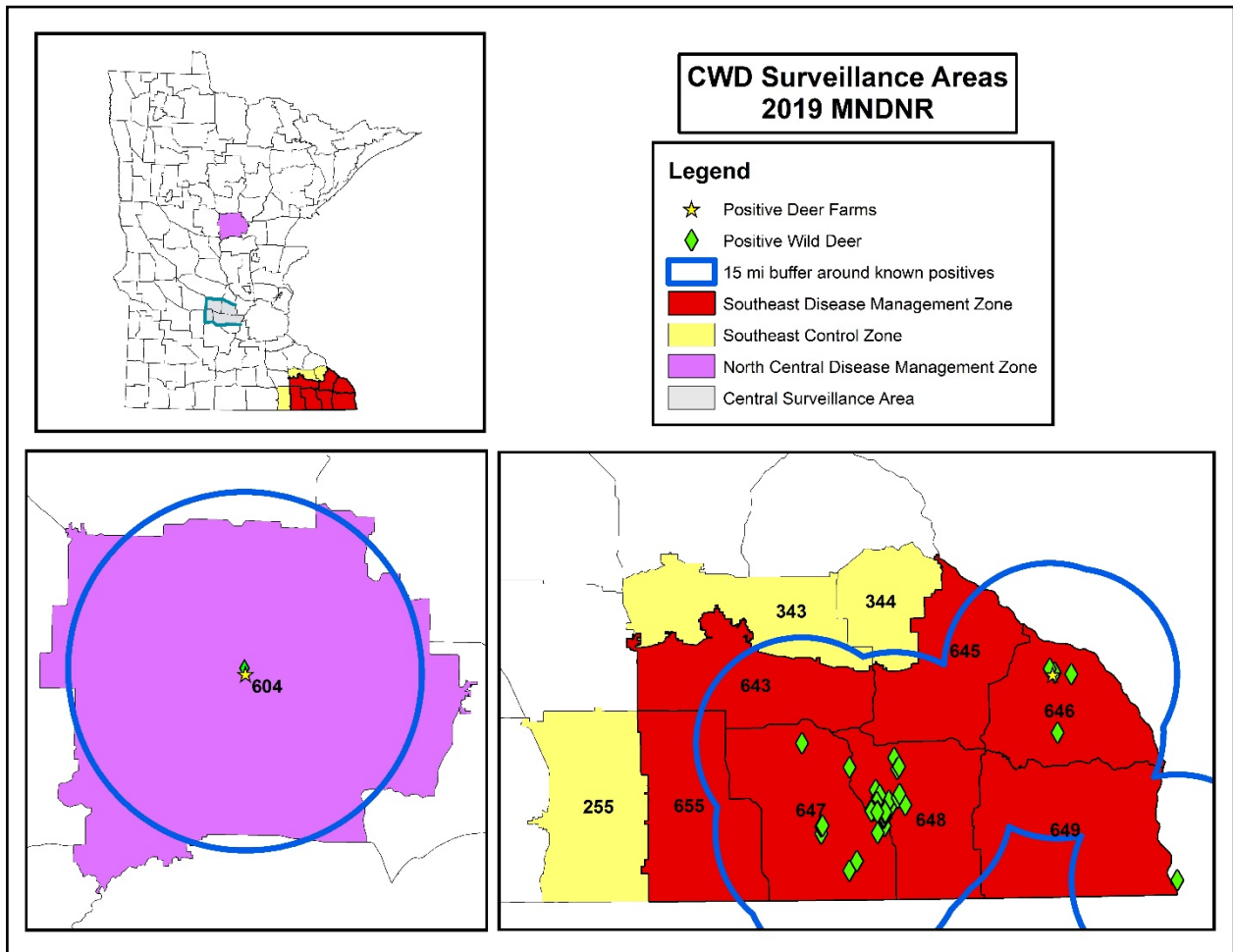


Figure 5. For fall 2019, new disease zone boundaries were drawn 15-miles around each positive wild deer. The southeast management zone consists of DPAs 643, 645, 646, 647, 648, 649, and 655. Additionally, a CWD Control Zone was established for the DPAs surrounding the new 600-series; DPAs 255, 343, and 344. This control zone allows carcasses to move into the 600-series, but whole carcasses cannot leave the 600-series without “not detected” test results. In the north central area MNDNR created a new disease management zone, DPA 604.