



**Montana Fish,
Wildlife & Parks**

Montana Chronic Wasting Disease Surveillance Plan March 2017

Background

CWD is a fatal neurologic disease of deer, elk and moose. Although CWD has not yet been detected in free-ranging wildlife in Montana, it was detected in 1999 at a depopulated captive game farm outside of Phillipsburg, Montana, and it has been detected in wild mule deer, white-tailed deer, elk and moose near Montana's border with North Dakota, South Dakota, Wyoming, Alberta and Saskatchewan. To date, CWD has been detected in captive or free-ranging wildlife populations in 24 states (Colorado, Wyoming, Montana, Utah, New Mexico, Texas, Kansas, Nebraska, Oklahoma, North Dakota, South Dakota, Minnesota, Iowa, Missouri, Arkansas, Wisconsin, Illinois, Michigan, Ohio, Pennsylvania, West Virginia, Virginia, Maryland, and New York) and the Canadian provinces of Alberta and Saskatchewan, and continues to expand its range, annually. It is unknown how CWD will affect Montana's cervid populations once it arrives, however, several field studies (Miller et al., 2008; Monello et al., 2014; Geremia et al., 2015; Edmunds et al., 2016; DeVivo 2015; Samuel & Storm, 2016) and computer models (Gross & Miller, 2001; Wasserberg et al., 2009; Almberg et al., 2011) suggest that populations could be substantially reduced over time.

Montana Fish, Wildlife and Parks (MFWP) conducted active surveillance for CWD from 1998 through 2011, and since that time has conducted more limited, opportunistic surveillance across the state. In 2014, MFWP modified its CWD Management Plan for Free Ranging Wildlife in Montana (MFWP, 2013; MFWP, 2014) to include a renewed surveillance effort in high risk areas (based on geographic proximity to CWD cases in neighboring states/provinces and high deer densities) utilizing a weighted surveillance strategy (Walsh 2012) and at minimum, alternating efforts among areas annually. Early detection of CWD is critical in facilitating the widest range of management options, opportunities, and public outreach. To this end, the Management Plan states that surveillance should be at a level sufficient to be 95% confident of detecting at least one positive animal if CWD is present in the area at a 1% prevalence. Here, we outline a proposal for renewed active CWD surveillance and an associated annual operating budget.

Proposed Strategy

We propose to (1) continue to test any symptomatic animal statewide and (2) to employ a weighted surveillance strategy (Walsh 2012) with a target detection threshold of 1% prevalence with 95% confidence, which rotates among all currently identified high-priority CWD surveillance areas, as defined and updated from Russell et. al (2015) (Figure 1). Weighted surveillance allows one to incorporate previous estimates of the relative risk of various demographic groups (age, sex, or cause of death categories) to economize sampling efforts. We would prioritize the sampling of mule deer, but would also include elk, white-tailed deer, and moose on an opportunistic basis. Samples would be collected from symptomatic animals, animals necropsied from research projects, hunter harvested animals and road-killed animals. This effort would require (1) the hiring of five temporary technicians (one Band 5 technician for 32 weeks, and four Band 4 technicians for 16 weeks, roughly starting Sept 1) to assist with sample collection and processing, (2) increased educational outreach during hunting seasons, (3) possible incentives to hunters to contribute samples, and (4) an increase in overall testing costs to accommodate the extra volume of samples. Montana Fish, Wildlife & Parks Wildlife Health Program staff and the technicians (supervised by the Disease Ecologist) would be primarily responsible for implementing the surveillance program with additional support from regional staff.

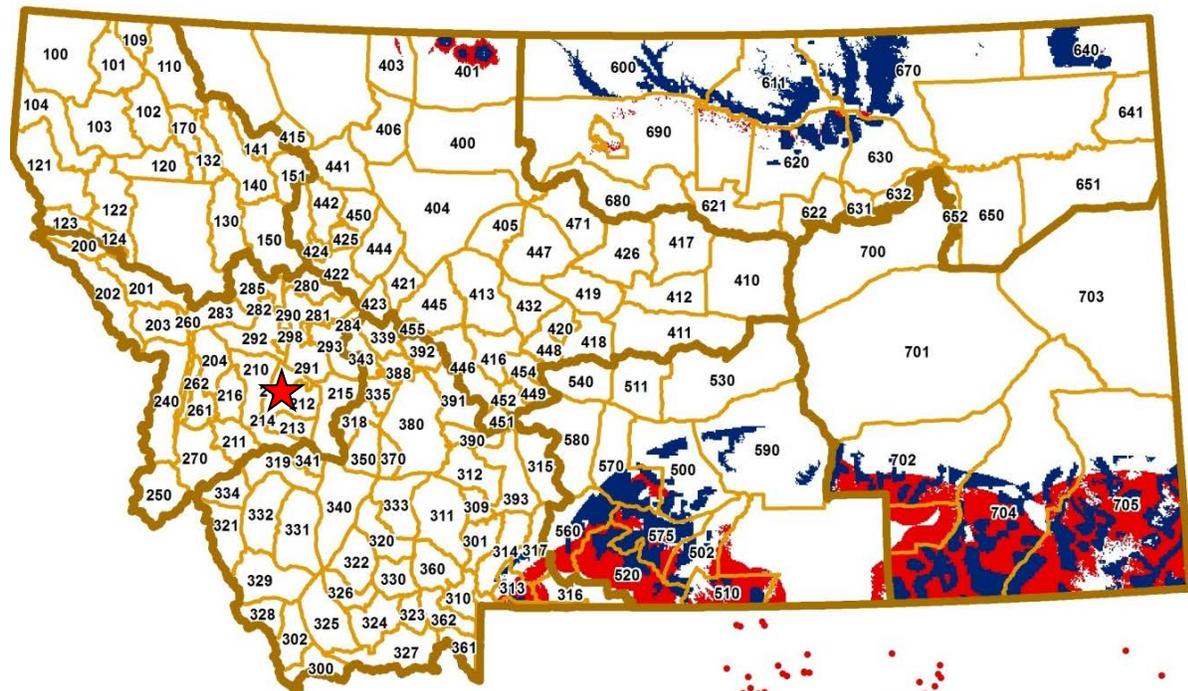


Figure 1. Winter (blue) and summer (red) chronic wasting disease (CWD) priority surveillance areas for mule deer in Montana. Priority surveillance areas were identified based on proximity to known CWD cases in neighboring states/provinces and high relative mule deer densities. The red star in Region 2 marks the approximate location of the captive elk facility that tested positive for CWD in 1999. Mule deer hunt districts are displayed. Red dots are known CWD cases in wild cervids from neighboring states/provinces. Map updated in 2016 based upon Russell et al. 2015.

Minimum sampling units, distribution, and rotation schedule

Montana Fish, Wildlife, and Parks will employ a weighted surveillance strategy with a target detection threshold of 1% prevalence with 95% confidence (Walsh 2012), which rotates among all currently identified high-priority CWD surveillance areas, as defined and updated from Russel et al (2015) (Figure 1). The minimum spatial unit on which surveillance will be focused will include aggregations or sections of hunt districts with a total estimated mule deer population size of $\leq 16,000$ (mean = 8,600, median = 9,250) (Table 1). Thus, if surveying a hunt district with 16,000 deer, and assuming the population was well-mixed with infections spread randomly throughout, we could expect to detect at least one positive, with 95% confidence, if there were ≥ 160 deer infected with CWD. Surveying populations of smaller size would decrease the number of infected deer needed before we would expect a detection. Assumptions about the population being well-mixed, and infections being distributed randomly throughout, will be violated; in many cases, deer are diffusely spread across the landscape, and we know CWD infections are highly localized when they do occur (Conner and Miller, 2004; Miller & Conner, 2005; Farnsworth et al., 2006; Joly et al., 2006; Osnas et al., 2009; Heisey et al., 2010). Thus, every effort must be made to broadly distribute the sampling effort across the HD to maximize our ability to detect an infection (Walsh 2012).

We propose surveying up to four of these minimum sampling units per year, grouped by geographic proximity to facilitate logistics (Table 1, "Suggested grouping of minimum surveillance units to be visited per year"). We would rotate to a new group of minimum surveillance units each year. Outside of these high-priority surveillance areas, we propose to (1) continue to collect and test all symptomatic deer, regardless of the location within the state, and (2) visit at least two new non-priority areas for surveillance within the three-year rotation described above (Table 1). The location and boundaries of these non-priority area would be determined by input from regional managers and biologists and would be restricted to a population size of less than or equal to approximately 15,000 deer.

Should CWD be detected within a surveillance unit, the CWD management plan calls for increased surveillance within an "initial CWD response zone" to determine distribution and prevalence. While we hope to have a separate budget in place for the initial surveillance effort post-detection, this area may be visited more frequently in future surveillance rotations to track changes in distribution and prevalence over time and in response to management actions.

Table 1. Table of proposed minimum CWD surveillance units (aggregations or portions of mule deer hunt districts), their estimated population size, and suggested groupings of units to be visited within the same year.

Minimum CWD surveillance units for mule deer populations (aggregations or portions of hunt districts)	Estimated mule deer population size	Suggested grouping of minimum surveillance units to be visited per year
313, 316, 317	3000	A
520, 560, 575	11,500	A
510, 502	5500	A
570, 500, 590	13,000	A
210, 212, 217	2000	B
401,403	3000	B
Rotating surveillance area (e.g. Region 1)	-	B
Rotating surveillance area (e.g. Region 1)	-	B
600, 611, 670, 640, 620, 630	16000	C
702*	7000	C
704*	12000	C
705*	13000	C

*Only the southern half of the deer in these hunt districts would be targeted for surveillance.

Weighted surveillance

Weighted surveillance allows one to incorporate previous estimates of the relative risk of various demographic groups (age, sex, or cause of death categories) to economize sampling efforts (Walsh 2012). Our surveillance efforts will focus on mule deer since they are the species with highest observed prevalences and are believed to be most susceptible to CWD within our state (Miller et al., 2000). While we will opportunistically sample elk, white-tailed deer, and moose within our surveillance units, these samples do not count towards meeting sample size objectives in mule deer for that region. Previous research on CWD in mule deer suggests that symptomatic individuals, mortalities other than those associated with hunter-harvest (e.g. road-kill, predation, other unexplained mortalities in adults and yearlings), and adult hunter-harvested males have the highest probabilities of being infected with CWD (Walsh 2012). Thus, the weighted surveillance strategy ascribes weights or “points” for samples collected from each demographic group (Table 2). To detect at least one positive with 95% confidence if CWD were present at 1% prevalence, we would need approximately 300 sample points (or 332, assuming test sensitivity is 0.9) per minimum surveillance unit. Sample size requirements are relatively invariant to population size if trying to detect the disease at a specified prevalence (Walsh 2012).

As an example, if we were able to test 22 suspect female mule deer widely distributed across our sampling unit, we would meet our 300 point goal (e.g. $22 \times 13.6 = 299.2$). Understanding these relative weights will allow us to maximize the value of our effort and money. This information also makes it clear that it is not worth collecting fawns or harvested yearling males because they are so unlikely to be positive.

Table 2. The relative weights and associated number of samples needed to achieve 95% confidence that a surveillance unit is free from CWD if the prevalence is less than or equal to 1% for mule deer. These estimates are based on data from mule deer in chronic wasting disease-positive areas in Colorado during 2003–2006 (Reproduced from Walsh & Otis, 2012).

Group	Weight	Number of samples needed
Suspect female	13.6	22
Suspect male	11.5	26
Other mortalities (road-kill, predation, other unexplained in adults and yearlings)	1.9	158
Harvest-adult males	1	300
Harvest-adult females	0.56	536
Harvest-yearling females	0.33	909
Harvest-yearling males	0.19	1579
Harvest-fawns	0.001	300000

In the event that we are unable to meet sample size requirements within a surveillance year, we may continue to collect a limited number of samples the following year to achieve a total 300-sample point goal within a two year period. This will likely entail the support of biologists and wardens in continuing to sample symptomatic animals, road-killed animals, or a limited number of hunter-harvested animals.

Sample collection, storage, testing and reporting schedule

For each cervid sampled as part of the CWD surveillance program, field and laboratory staff will collect both retropharyngeal lymph nodes (or an obex sample if the lymph nodes are not available), an incisor tooth for aging, and a small genetic sample (muscle tissue), where possible. In addition, field staff will work with hunters to gather precise location information on where the animal was harvested/found, species, age, and sex. Lymph nodes from deer and elk will be frozen for subsequent enzyme-linked immunosorbent assay (ELISA) testing, whereas all obex samples as well as lymph nodes from moose will be fixed in 10% buffered formalin for immunohistochemistry (IHC) testing. Samples collected during the general season will be

submitted to a National Animal Health Laboratory Network-accredited diagnostic laboratory (Montana Fish, Wildlife and Parks currently uses Colorado State Veterinary Diagnostic Laboratory) as soon as possible, with an expected return time for results of 1-2 weeks. If a harvested animal tests positive for CWD, Montana Fish, Wildlife and Parks will notify the associated hunter. An annual surveillance report will be published by March 1st, following the end of the previous hunting season. Press releases will be issued as soon as all test results have been received.

Deliverables

An annual surveillance report will be published by March 1st, following the end of the previous hunting season. Press releases will be issued as soon as all test results have been received.

Estimated Budget

Supplies	\$10,500
Travel	\$24,360
Shipping	\$3,675
Testing Costs	\$40,624
Print Costs (flyers, brochures)	\$5,775
Personnel (1 Band 5 Conservation Tech (32 weeks), and 4 Band 4 Conservation Techs (16 weeks))	\$115,728
Total	\$200,662

Personnel

Dr. Emily Almberg	Disease Ecologist	994-6358	ealmberg@mt.gov
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* Area code 406

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