



Montana Fish, Wildlife & Parks' 2024 Chronic Wasting Disease Surveillance and Monitoring Report

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Executive Summary

Montana Fish, Wildlife, and Parks (FWP) has been conducting surveillance for chronic wasting disease (CWD) since 1998, and first detected CWD in wild deer in 2017. In 2024, FWP prioritized sampling in southwestern, central, and central-eastern Montana. FWP offered free statewide testing. Hunters could submit samples via mail, at CWD sampling stations, and at all FWP regional offices in 2024. For CWD management within CWD Management Zones, FWP continued agency trapping and removal of white-tailed deer within the urban area in and around the town of Libby, MT (Libby Surveillance Area or LSA) and continued to implement liberal white-tailed deer harvest regulations within the Libby CWD Management Zone (LMZ). FWP did not hold the Southwestern Montana CWD Management Hunt for CWD management in southwest Montana.

During the 2024-2025 season, FWP tested 9504 samples from mule deer (n=3131), white-tailed deer (n=4927), elk (n=1399), and moose (n=47). Of these, 356 animals tested positive for CWD, including 128 mule deer, 222 white-tailed deer, and 6 elk. CWD has now been detected in 30% of Montana hunting districts. In 2024, CWD was detected in 7 new hunting districts: 170, 403, 404, 406, 515, 525, 620. Additionally, two hunting districts (323 and 324) became positive for CWD as a result of newly drawn hunting district boundaries in 2024. Among CWD-positive hunting districts across the state and including data from CWD Management Zones, three-year prevalence estimated from hunter-harvested and agency-trapped adult animals sampled from 2022-2024 ranged from <1% - 23% in mule deer and <1% - 39% in white-tailed deer. Within white-tailed deer, CWD prevalence was highest in hunting districts 322 (39%, 95%CI: 35-43%, N = 532), 340 (22%, 95%CI: 17-29%, N = 209) and 705 (15%, 95%CI: 10-23%). Based on a small sample size, hunting district 555 (18%, 95%CI: 5%-48%, N = 11) had a high CWD prevalence in white-tailed deer but also had a wide confidence interval. Within mule deer in hunting districts that are well-sampled, CWD prevalence was highest in hunting districts 600 (23%, 95%CI: 17-29%, N = 199), 640 (20%, 95%CI: 16-25%, N = 295), and 670 (17%, 95%CI: 14-21%, N = 370). Notably, hunting district 322 (18%, 95%CI: 12-28%, N=92) also had among the highest CWD prevalences in mule deer but had a moderately broad confidence interval due to a moderate sample size. In the Libby Surveillance Area, 16% (95%CI: 11-23%, N = 160) of hunter-harvested or trapped adult white-tailed deer were positive for CWD in 2022 -2024, whereas only 6% (95%CI: 4-8%. N = 651) were positive outside the urban areas of the town of Libby within the Libby Management Zone. In the Southwestern Montana CWD Management Hunt Area, the three-year CWD prevalence among hunter-harvested adult white-tailed deer was 59% (95%CI: 53-65%, N = 259) for 2022-2024.

An analysis of all data collected between 2017-2024 from deer harvested by hunters or removed during management efforts in CWD-positive hunting districts (n= 32,030) suggested several statewide patterns of infection across species, sex, age class, location, and time. We found evidence that the probability of an animal testing positive for CWD was associated with deer species, sex, a species by sex interaction, age class, whether the deer was harvested or removed inside the Libby Management Zone, the Southwestern Montana Management Zone, or outside of the two management areas (a categorical variable referred to as "MGZN2"), time, a time by MGZN2 interaction, and whether a deer was harvested before or during/after the peak rut (November 15th). Outside of the Libby and Southwestern Montana Management Zones, we found no significant statewide difference in prevalence among adult male white-tailed deer and adult male mule deer. By contrast, the relative risk of CWD in adult female mule deer was significantly lower than in adult female white-tailed deer (adult female mule deer had 0.3 times the relative risk as adult female white-tailed deer, 95%CI: 0.2-0.6; average prevalence across positive hunting districts was 1% (95%CI: 1-2%) in female mule deer and 3% (95%CI: 2-4%) in female white-tailed deer). Outside of the CWD Management Zones, we found that males of both species were generally at higher risk of infection than females—adult male mule deer had 3.1

times the risk of infection of adult females (95%CI: 2.3-4). Model-estimated average adult male mule deer CWD prevalence across positive hunting districts was 3% (95%CI: 2-4%) versus 1% (95%CI: 1-2%) among adult females. Adult male mule deer had 3.1 times the risk of infection of adult females (95%CI: 2.3-4). Adult male white-tailed deer had 1.5 times the relative risk of females (95%CI: 1.3-1.7; adult white-tailed deer female prevalence = 3% (95%CI: 2-4%), adult white-tailed deer male prevalence = 4% (95%CI: 3-6%)). Within age classes for both species, the risk of infection was greatest in adults, followed by yearlings and young of the year. Deer harvested after the average start date for rut (November 15th) had 1.2 times the relative risk of testing positive for CWD than those harvested before that date (95%CI: 1.1-1.3; adult male mule deer CWD prevalence outside of the CWD Management Zones prior to November 15th = 2% (95%CI: 1-4%) versus after = 3% (95%CI: 2-5%)). Species-specific versions of our full model indicate white-tailed deer have an estimated maximum annual CWD growth rate (the maximum growth potential during the early exponential phase of an epidemic) of 38% (se = 0.05) versus 46% in mule deer (se = 0.08). Our model supported distinct white-tailed deer CWD hotspots in the Libby and SW Montana Management Zones, although white-tailed deer CWD prevalence was only significantly higher within the SW Montana Management Zone as compared to estimates from elsewhere around the state. We found that the Libby Management Zone had a significantly slower maximum annual growth rate in prevalence between 2017-2024, estimated at 5% (se = 0.14), when compared to CWD-positive hunting districts and the SW Montana Management Zone. The annual growth in CWD prevalence in the SW Montana Management Zone (31%, se = 0.14) was not statistically different from that of other CWD-positive hunting districts, although, as prevalence has reached 67% and 75% in adult female and male white-tailed deer, the realized annual change is slowing, suggesting that the epidemic in this area is no longer in the exponential growth phase.

FWP continues to plan for long-term CWD management in positive areas. In 2025, FWP will continue to enforce proper carcass disposal requirements and provide educational materials and programs. FWP will continue to advertise CWD sampling station locations and hours of operation as well as distribute information for hunters who wish to collect and submit their own samples throughout the hunting season. Harvest management aimed at minimizing the spread and population effects of CWD is ongoing in various regions of the state. CWD management hunts will continue in the Libby Management Zone and be considered in Southwestern Montana Management Zone. Trap and removal efforts in the Libby Surveillance Area will also continue to be used to manage CWD prevalence and spread within the area. In 2025, FWP will prioritize sampling effort in hunting districts in central-western, eastern and portions of north-central Montana. Surveillance and monitoring efforts will continue to be used to improve understanding of CWD presence and prevalence in these hunting districts.

Background

Chronic Wasting Disease is a fatal neurologic disease of cervids (deer, elk, moose, and caribou) for which there is no known cure. CWD is caused by an infectious, mis-folded prion protein which is shed by infected individuals for much of their approximately 2-year course of infection (Williams et al. 2002, Williams 2005). The CWD-associated prion is transmitted via direct animal-to-animal contact and indirectly, likely through naso-oral contact with and ingestion of contaminated materials in the environment. Some research suggests the inhalation of aerosolized respiratory droplets may play a role in transmission as well (Denkers et al. 2013). Since CWD was discovered in Colorado in 1967, it has been documented in captive or free-ranging cervid populations in 36 US states, six Canadian Provinces, Norway, Sweden, Finland, and South Korea (USGS, 2025). CWD is generally considered a slow-moving disease, and if left unmanaged, may take decades to reach prevalences of 20-30%. Significant herd-level declines are predicted at such high prevalences (Gross and Miller 2001, Wasserberg et al. 2009, Almberg et al. 2011) and have been documented among mule deer and white-tailed deer in Wyoming (DeVivo 2015, Edmunds et al. 2016) and in mule deer in Colorado (Miller et al. 2008). Surveillance programs aimed at early detection of CWD are essential to providing the best options for managing the spread and prevalence of the disease. While CWD is not known to infect humans, public health authorities advise against consuming meat from a CWD-positive animal and recommend hunters have their deer, elk, or moose tested if it was harvested within a CWD-endemic area (CDC, 2021).

Introduction

Surveillance programs for CWD are essential for early detection of the disease in wild cervid populations. Detection of CWD while prevalence is still low is thought to be critical to the success of managing the disease. Nationally, surveillance efforts for CWD have varied over time and have fluctuated in response to changes in funding and public interest. This has been true for Montana as well. More recently, renewed concerns over the potential risk to human health (Czub et al. 2017), the discovery of CWD in wild cervids in several new states and renewed national legislative discussion on CWD have fueled interests to increase surveillance once again. With additional surveillance and concerted efforts at managing the disease, such as those outlined in the Western Association of Fish and Wildlife Agencies' 2017 "Recommendations for Adaptive Management of CWD in the West," our goal is to effectively manage the disease in wild populations and stave off the worst of the predicted population declines.

Montana Fish, Wildlife, and Parks (FWP) has been conducting surveillance for CWD since 1998, with varying levels of intensity. In 2017, FWP renewed its CWD surveillance and management plan with the help of an internal CWD Action Team and a CWD Citizen's Advisory Panel. FWP's plan outlines a strategy to maximize our ability to detect CWD in high-priority areas where it is not known to exist. This entails 1) continuing to test any symptomatic deer, elk, or moose statewide, 2) focusing surveillance on mule deer and white-tailed deer, and 3) employing a weighted surveillance strategy aimed at detecting 1% CWD prevalence with 95% confidence (Walsh 2012) that rotates among high-priority CWD surveillance areas. In 2020, these surveillance and management techniques were built upon, refined, and published in the Montana Chronic Wasting Disease Management Plan. In this plan, high priority surveillance areas are defined as those hunting districts that intersect a 40-mile buffer on known CWD positive cases inside or adjacent to Montana where CWD has not yet been detected. Once an area is determined to be positive for CWD, FWP shifts focus in that area to monitoring prevalences and may set up special CWD hunts or use hunter-harvest samples from the general season to monitor the distribution and prevalence of the disease.

In the fall of 2024, FWP prioritized CWD surveillance and monitoring in southwestern, central, and central-

eastern Montana (Figure 1). FWP did not conduct an annual special CWD management hunt in southwestern Montana in 2024. FWP conducted CWD Management in the Libby Management Zone with liberalized white-tailed deer harvest and continued to trap and euthanize white-tailed deer within the Libby Surveillance Area as part of an effort to reduce deer densities and help control CWD within the surrounding Libby Management Zone. FWP continued to provide free, statewide CWD testing of hunter-harvested and salvaged road-killed animals in 2024. Below, we report on the results and lessons learned from the 2024 CWD surveillance and monitoring efforts.

2024 - 2025 CWD Priority Sampling Areas

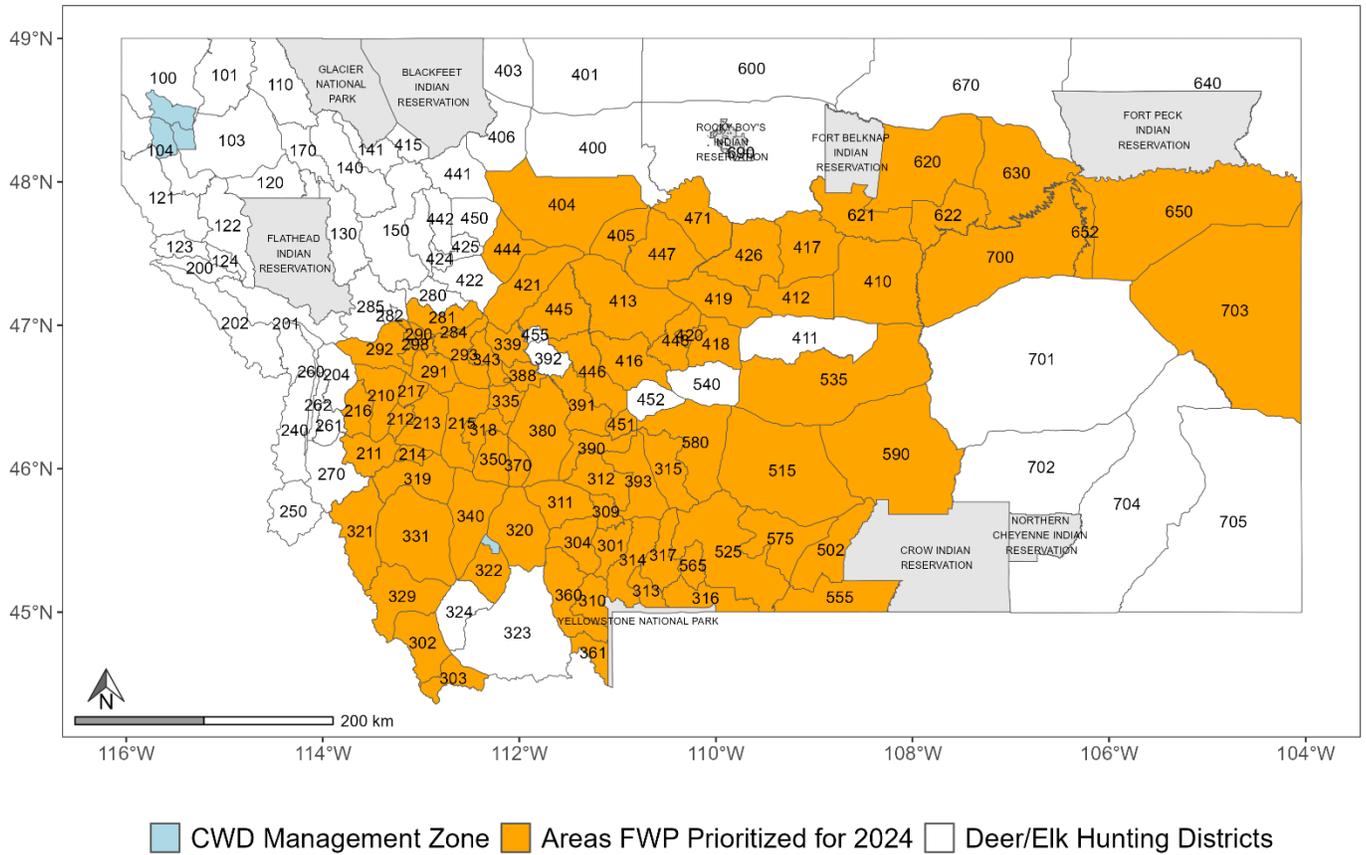


Figure 1. CWD priority sampling areas in Montana, 2024. CWD surveillance and monitoring areas included southwestern, central-central, and central-eastern Montana, shown in orange. Boundaries of the CWD Libby Management Area and the Southwestern Montana CWD Management Hunt Area (located in hunt district 322) are displayed in light blue. Note that hereafter the Libby Management Area includes animals harvested and trapped within the urban areas in and around the town of Libby (Libby Surveillance Area) unless otherwise stated.

Methods

Surveillance

In 2024, FWP increased sampling effort in hunting districts with historically small sample sizes that intersect a 40-mile buffer of known positives. FWP focused surveillance and monitoring in districts in southwestern, central-central, and central-eastern Montana to improve understanding of CWD presence and prevalence in

these hunting districts. Priority sampling areas are broken into priority surveillance areas (PSAs), where CWD has not yet been detected, and priority monitoring areas (PMAs), where CWD has been detected previously. Priority sampling areas have been previously comprised of minimum surveillance units (MSUs) that sometimes included one or more hunting districts. In 2024, MSUs were the same as hunting districts within priority sampling areas and will be referred to as hunting districts here forward. Within each hunting district, we employed a weighted surveillance strategy aimed at detecting 1% CWD prevalence with 95% confidence (Walsh 2012). Under the weighted surveillance framework, different demographic groups (age, sex, or cause of death categories) of a species are assigned different point-values based on their relative risk of being infected (Table 1). A total of 300 points, spatially distributed across each hunting district, were necessary to meet our detection goals in each hunting district. Sample size goals were specific to a single species within a hunting district, and our efforts prioritized the sampling of deer since they have the highest prevalences among the different cervid species where they overlap (Miller et al. 2000). Elk and moose were sampled opportunistically.

Table 1. Relative weights or “points” associated with each demographic group of deer and elk that count towards meeting a sample size goal using a weighted surveillance strategy based on data from mule deer and elk in CWD-positive areas in Colorado (Walsh and Otis 2012) and white-tailed deer in Wisconsin’s CWD management zone (Jennelle et al. 2018).

Demographic Group	Weight/Points		
	Mule Deer	White-tailed Deer	Elk
Symptomatic female	13.6	9.09	18.75
Symptomatic male	11.5	9.09	8.57
Road-killed males/females	1.9	0.22	0.41
Other mortalities (predation, other unexplained in adults and yearlings)	1.9	7.32	0.41
Harvest-adult males	1	3.23	1.16
Harvest-adult females	0.56	1.30	1.00
Harvest-yearling females	0.33	0.85	0.23
Harvest-yearling males	0.19	1	NA
Harvest-fawns/calves	0.001	0.001	NA

FWP staff collected samples between July 1, 2024 – March 25, 2025, from mule deer, white-tailed deer, elk, and moose that were either hunter-harvested, road-killed, symptomatic and euthanized, or found dead. An animal was considered symptomatic if it appeared extremely sick and/or displayed symptoms consistent with CWD (emaciation, lack of coordination, drooping head/ears, excessive salivation, etc.). To obtain samples, FWP collaborated with several groups, including hunters, meat processors, taxidermists, outfitters, landowners, Montana Department of Transportation, local city law enforcement, and tribes. FWP employed a variety of tools to obtain samples, such as having FWP personnel available to collect samples at FWP regional offices and field sampling stations and providing resources to hunters and other groups about how to collect and submit samples via mail. FWP staff collected retropharyngeal lymph nodes (Hibler et al. 2003) or an obex sample if lymph nodes were not available (both lymph nodes and obex were collected from moose), an incisor tooth for aging, and a small genetic sample (muscle tissue) from each cervid sampled as part of the CWD surveillance program. Field staff worked with hunters to gather precise location information on where the animal was harvested/found, as well as species, age, and sex information for each sampled animal. Lymph nodes and obex from deer and elk were frozen for subsequent enzyme-linked immunosorbent assay (ELISA) testing, whereas lymph nodes and obex from moose were fixed in 10% buffered formalin for immunohistochemistry (IHC) testing. Samples were submitted to Montana Veterinary Diagnostic Laboratory

for ELISA testing. Samples requiring an IHC test (e.g., moose samples and confirmations of ELISA positives) were sent to Utah Veterinary Diagnostic Laboratory or Colorado State University Veterinary Diagnostic Laboratory. In previous years, samples have also been sent to the National Veterinary Services Laboratory. Testing costs were \$15/sample for the ELISA, and \$37.00 - 5.00/sample for IHC, depending on the lab. Results from hunter-harvested animals were posted on FWP's website as soon as results were received from the lab and the submitting hunter was notified of their available online results via email. Differing from previous years, in both 2023 and 2024, FWP only contacted hunters via phone upon a harvested animal testing positive for CWD on the ELISA (labeled a "suspect") if 1) the hunter did not list an email address, 2) the positive sample was harvested in a hunting district that had no previous positive samples, or 3) the hunter indicated the positive animal would be processed at a commercial meat processor or donated to a foodbank. IHC confirmations were typically available 2-4 weeks later, so FWP did not require hunters to wait for that result before legally disposing of the carcass and, when applicable, obtaining a replacement license.

In addition to the focused sampling efforts in the 2024 priority sampling areas, FWP collected or received samples from symptomatic, road-killed, or hunter-harvested animals statewide. Hunters that harvested an animal outside of the priority sampling areas and wanted to have their animal tested either brought their animal to a CWD sampling station or a regional headquarters/area office or were instructed how to collect and mail in their samples. Testing costs were paid by FWP. The video instructing hunters how to collect their own CWD sample can be found at fwp.mt.gov/conservation/chronic-wasting-disease under "Hunter Info."

Monitoring of prevalence and distribution within CWD Positive Areas

In 2024, FWP prioritized sample collection for monitoring of known positive areas in southwestern, central-central, and central-eastern Montana, in hunting districts where sampling has been historically low and continued to test any hunter-submitted samples from other hunting districts around the state. In 2024, FWP did not hold a Special CWD Management Hunt in southwestern Montana but continued to have liberalized white-tailed deer harvest within the Libby CWD Management Zone and continued to trap and euthanize white-tailed deer in the Libby Surveillance Area to further reduce deer densities for CWD management. In 2024, the Montana Fish and Wildlife Commission approved required testing of all deer harvested using the either-sex Deer B License: 199-20, which is only valid within the Libby Management Zone and issued for CWD management, and Mule Deer Permit: 103-50, which is limited in number and allows for harvest of an antlered mule deer in an area adjacent to the Libby Management Zone. Mandatory testing was implemented for the 103-50 deer permit in an effort to obtain more samples and increase CWD surveillance in this mule deer herd. Otherwise, throughout the state, CWD testing was not required but was encouraged to improve our estimates of CWD prevalence and distribution in Priority Sampling Areas (Figure 1). To reflect recent and current estimates, observed prevalence estimates in this report were calculated using only data from hunter-harvested or agency-trapped and euthanized adult animals (i.e., Libby Surveillance Area) from 2022-2024. Beginning with the 2023 CWD Annual Report and continuing in this report, some annual model-estimated prevalences were also provided. The increased robustness of the data set allowed the incorporation of a year effect and yielded better fitting models for our analysis of trends. (See Results and Discussion.)

Data summaries and analyses

For surveillance, weighted surveillance points were calculated separately for mule deer, white-tailed deer, and elk (relative risk of infection data currently does not exist for moose) using data collected from 2022-2024. For each species, we tallied the number of samples collected within each of the age/sex/cause of death categories outlined in Table 1, multiplied this by their assigned point value, and summed all points within a hunting

district. We then modified the equation for the sample size (n) needed to establish freedom from disease at a specified prevalence level (P ; proportion of the population that is positive), with a desired level of statistical confidence (α),

$$n = \frac{-\ln(1 - \alpha)}{P}$$

to calculate the threshold prevalence above which we would expect to detect at least one positive given our weighted surveillance points (n) and assuming 95% statistical confidence:

$$P = \frac{-\ln(1 - \alpha)}{n}$$

All analyses were carried out in Program R (R Core Team 2024). For CWD monitoring following detection and to be consistent with previous CWD Annual Reports, we reported three-year observed prevalences using CWD samples from hunter-harvested and agency trapped adult animals from 2022-2024. Three-year prevalence estimates were calculated using the proportion of positive tests and the Wilson method to calculate confidence intervals. In the 2023 CWD Annual Report, three-year observed prevalences included animals of all age classes, in this report and moving forward, three-year observed prevalences are calculated only using adult animals (excluding young of year and yearlings). When evaluating trends in observed prevalence and through models, we used samples for which all auxiliary data (harvest location, species, sex, age class, and lab result) was known. We explored patterns of infection among hunter-harvested and management-removal deer in CWD-positive hunting districts and management zones using a logistic, generalized linear mixed model (Package `glmmTMB`, Brooks et al. 2017). We evaluated the probability of CWD infection as a function of fixed-effects including species, sex, age class, whether the animal was harvested in the Libby CWD Management Zone (including the Libby Surveillance Area), the Southwestern Montana CWD Management Hunt Area (i.e. SW Montana Management Zone), or outside of these areas (a categorical variable “MGZN2”), time (Year), and whether the sample was collected prior to or after the average start date of deer rut (November 15th, based on biologists’ expert opinion) (Rut). A random intercept for hunting district or management zone (HDmz) was included as well as a random slope adjustment for species and year (e.g. $(1 + \text{Species} + \text{Year} | \text{HDmz})$).

$\text{logit}(\text{Pr}(\text{Infected})) \sim 1 + \text{Year} + \text{Species} + \text{Sex} + \text{Species} * \text{Sex} + \text{AgeClass} + \text{MGZN2} + \text{MGZN2} * \text{Year} + \text{Rut} + (1 + \text{Species} + \text{Year} | \text{HDmz})$

We report the estimated covariate effects from the full model. Odds ratios (exponentiated logistic coefficients) were converted to estimates of relative risk to facilitate interpretation (relative risk = odds ratio / (1 - p_0 + (p_0 * odds ratio))), where p_0 is the prevalence within the baseline group (Grant 2014); it can also be calculated as the ratio of the estimated prevalences of the two groups being compared). We report prevalence at the scale of hunting districts, and the Libby Management Zone or Southwestern Montana CWD Management Hunt Area (also referred to as SW Montana Management Zone). We calculated 95% binomial confidence intervals using the Wilson method.

Results

Between July 1, 2024 – March 25, 2025, FWP submitted 9504 samples that were suitable for testing, which was a 27% increase from the number of samples collected and tested in 2023 ($n=7494$) and a 31% increase compared to the number of samples collected in 2022 ($n=7244$) (Table 2). Most of these samples were analyzed at Montana Veterinary Diagnostic Laboratory, with most confirmatory IHC tests for ELISA positive

samples conducted at Utah Veterinary Diagnostic Laboratory. Of these samples, 3131 were collected from mule deer, 4927 from white-tailed deer, 1399 from elk, and 47 from moose. Fifty-one percent (n = 4814) of testable samples were collected from outside our priority sampling areas. Hunters collected and submitted 1167 of their own samples in 2024 and, of those samples, 1164 (99.7%) were suitable for testing (Table 3). Hunter submitted testable samples made up 13% of all submitted testable samples in 2024. Table 3 includes summaries of hunter submitted samples for 2024 and other years. A breakdown of all submitted samples from each of the seven FWP administrative regions can be seen Figure 2. Since FWP’s renewed surveillance efforts in 2017, we have tested 51,488 samples statewide for which all animal auxiliary data is known. FWP detected 356 CWD positive cervids during the 2024 sampling season, which included 128 mule deer, 222 white-tailed deer, and 6 elk. Of the 356 samples that tested positive on ELISA, eight could not be tested through the confirmatory IHC test due to insufficient or unsuitable remaining tissue. Of the remaining samples, 4% tested positive for CWD with ELISA but were found as not detected during the confirmatory IHC test. In the 2024 sampling season, we detected CWD in seven new hunting districts (170, 403, 404, 406, 515, 525, 620). Additionally, two hunting districts (323 and 324) became positive for CWD as a result of newly drawn hunting district boundaries in 2024 (Figure 3). In 2024, six elk tested positive for CWD (four, one, and one in hunting districts 322, 323, and 704, respectively), bringing the total number of elk samples that have tested positive for CWD across the state among all years to nine.

Table 2: Testable CWD Samples submitted by year, including samples for which auxiliary data is unknown.

Year	Total Testable Samples
2017	1980
2018	2009
2019	6927
2020	7611
2021	8736
2022	7244
2023	7494
2024	9504

Table 3: Hunter-submitted CWD samples by year from animals for which all auxiliary data is known, except age class.

Year	Hunter-Submitted Samples	Testable Hunter-Submitted Samples	Proportion Testable	Proportion of All Hunter-Harvested Samples
2017	5	5	1.00	0.003
2018	10	10	1.00	0.005
2019	1126	1087	0.965	0.166
2020	1156	1136	0.983	0.158
2021	1035	1023	0.988	0.123
2022	618	615	0.995	0.092
2023	947	943	0.996	0.139
2024	1167	1164	0.997	0.134

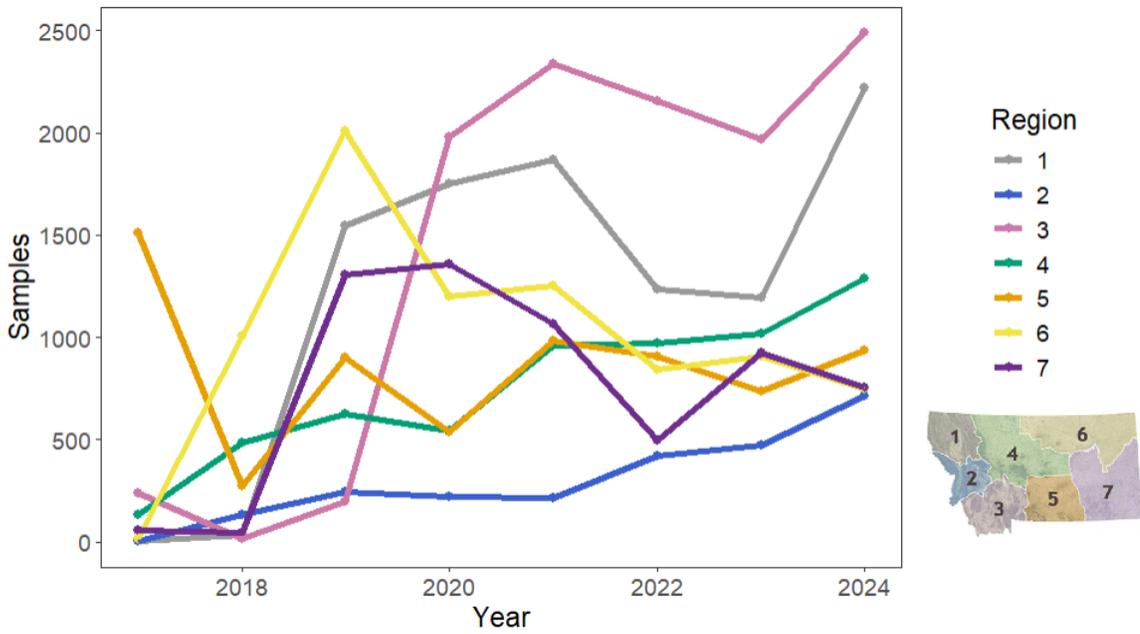


Figure 2. Number of samples submitted from each FWP administrative region in Montana over time. Samples include those lacking auxiliary data.

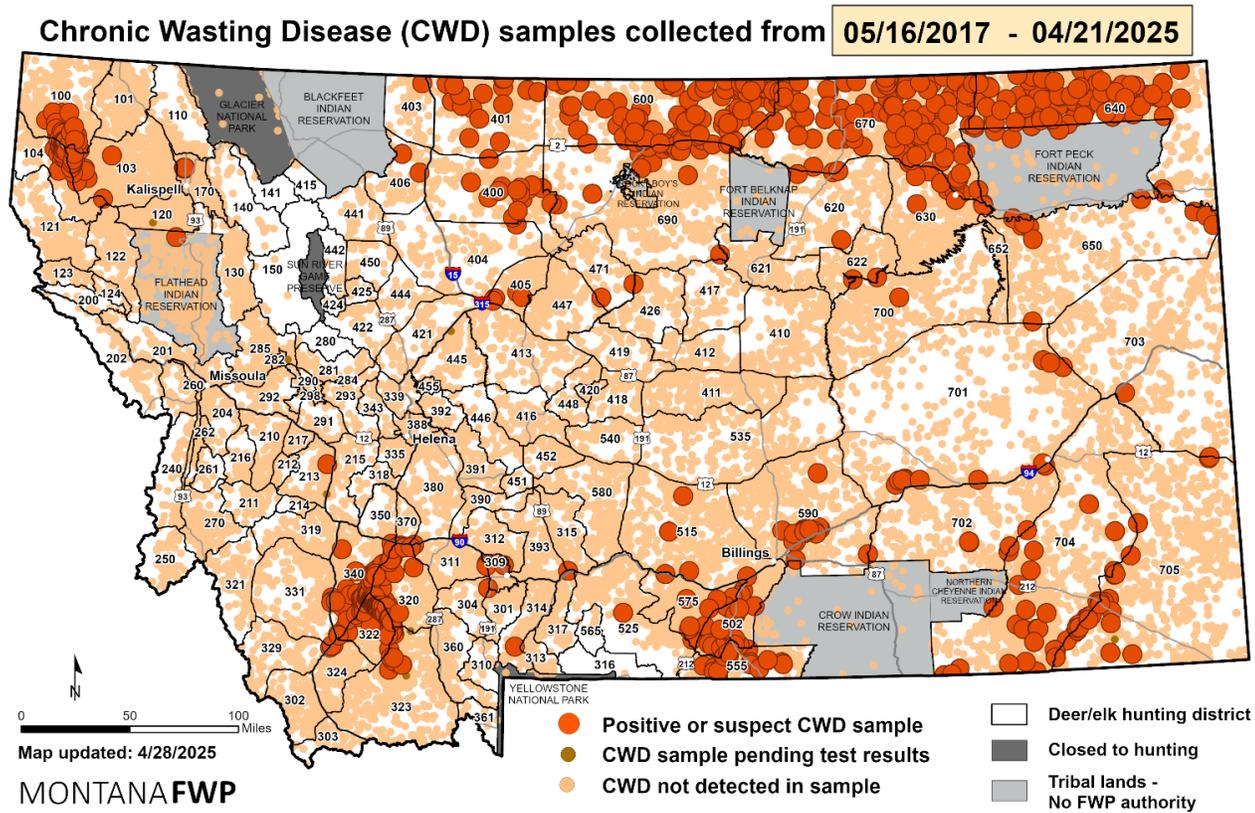


Figure 3. Map of sampling locations and CWD positives among deer, elk, and moose from 2017-2025.

Priority sampling areas are broken into priority surveillance areas (PSAs), where CWD has not yet been detected, and priority monitoring areas (PMAs), where CWD has been previously detected. In PSAs, FWP's goal as outlined in the 2020 CWD Management Plan is to achieve 300 weighted sampling points over no more than a 3-year period to determine if CWD is present at >1% prevalence with 95% confidence. Within PSAs, we only met our goal of 300 weighted surveillance points in hunting districts 312 and 525 with samples from white-tailed deer. In all other 2024 PSAs in southwestern, central-central, and central-eastern Montana (i.e., hunting districts 210, 211, 212, 214, 215, 216, 217, 281, 284, 290, 291, 292, 293, 298, 301, 302, 303, 310, 312, 313, 315, 316, 318, 319, 321, 329, 331, 335, 339, 343, 350, 360, 361, 370, 380, 388, 390, 391, 393, 410, 412, 413, 416, 417, 418, 419, 420, 421, 426, 444, 445, 446, 447, 448, 451, 535, 565, 580, 621, 652), we failed to meet our target surveillance points within each hunting district (Appendix I, Figure A1). Falling short of the 300-point goal suggests that we cannot rule out the presence of CWD at <1% prevalence with 95% confidence in these hunting districts. Additional sampling is warranted among these hunting districts to achieve the necessary surveillance goals. During the 2024 hunting season, CWD was found to be present in priority surveillance hunting districts 404, 515, 525, and 620 (Figure 3). Though we only met the 300 points for surveillance goal in white-tailed deer in hunting district 525, future sampling effort in hunting districts 404, 515, 525, and 620 will be focused on monitoring prevalence due to the new detections.

Estimates of prevalence in most 2024 PMAs in southwestern, central-central, and central-eastern Montana (i.e., hunting districts 213, 304, 309, 311, 314, 317, 320, 322, 340, 405, 471, 502, 555, 575, 590, 620, 622, 630, 650, 700, and 703) were improved by another year of sampling (Figures 4 and 5 and Appendix I, Figure A2). Specifically, in hunting districts that are CWD positive for any species, we reached the targeted range of precision (+/- 3% margin of error; i.e. a 95% confidence interval no wider than 0.06) for white-tailed deer CWD prevalence estimates in hunting districts 309, 311, 317, 320, and 575 and for mule deer CWD prevalence estimates in hunting districts 314, 405, 575, 650, 700, and 703. Additionally, we met target range of precision for white-tailed deer in hunting district 525 and for mule deer in hunting district 515, which had first time CWD detections this year, and therefore were not yet PMAs. Appendix I, Figure A2 shows 2022-2024 sampling numbers for PMAs.

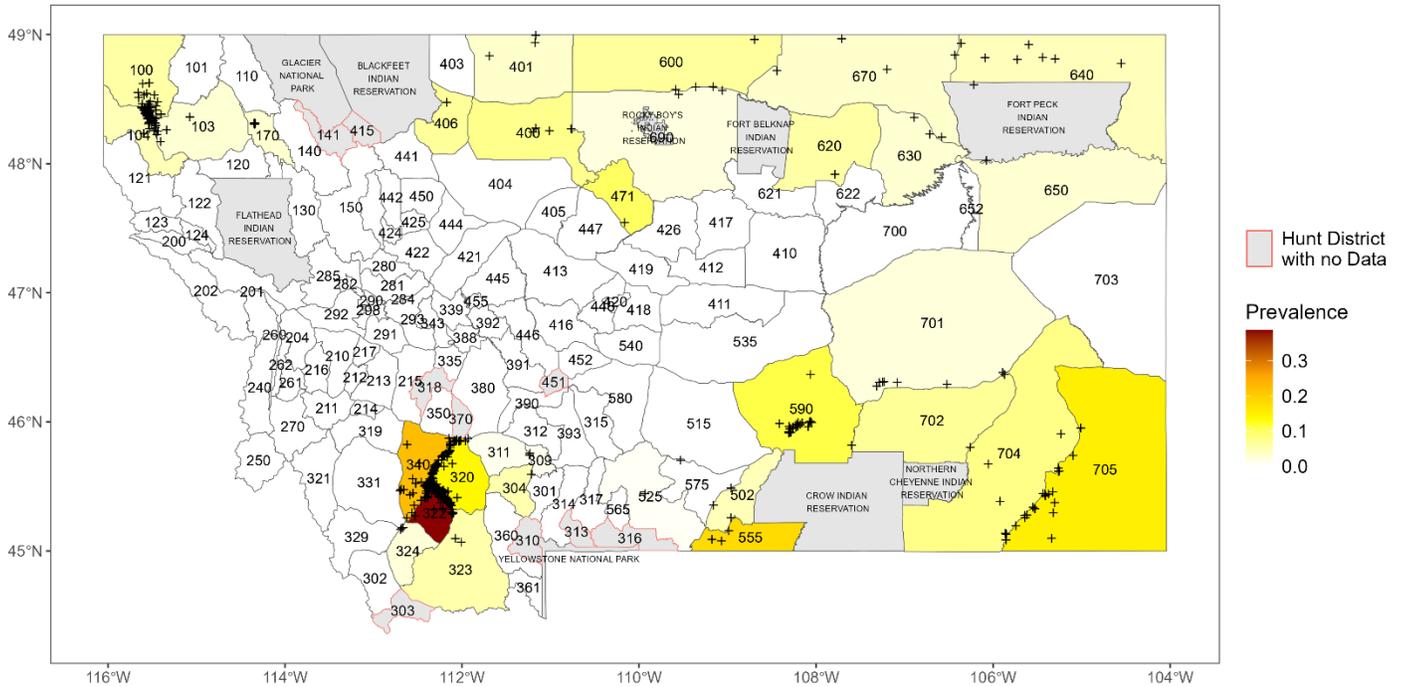
To date, CWD has been detected in elk in five hunting districts in Montana (322, 323, 502, 622, and 704). Generally, FWP does not report elk prevalences due to prohibitively small sample sizes within all hunting districts, but high numbers of elk samples collected and tested between 2022-2024 have allowed CWD prevalence in elk to be reported within target certainty in hunting districts 322 (2%, 95%CI: 1-7%, N = 129) and 323 (<1%, 95%CI: 0-3%, N = 166).

Using the proportion of positive tests (observed prevalence) and the Wilson method to calculate confidence intervals, we calculated three-year observed prevalences for management areas and hunting districts (see Appendix II for a table of three-year observed prevalences for all hunting districts). Among all CWD-positive hunting districts, three-year prevalence estimated from hunter-harvested and agency-trapped adult animals tested from 2022-2024 ranged from <1% - 23% in mule deer and <1% - 39% in white-tailed deer (Figure 4 and 5; see Appendix II for prevalence estimates by hunting district), with 95% confidence intervals of varying widths. Between 2022-2024 statewide, including CWD Management Areas, observed CWD prevalence among white-tailed deer was highest in hunting districts 322 (39%, 95%CI: 35-43%, N = 532), 340 (22%, 95%CI: 17-29%, N = 209) and 705 (15%, 95%CI: 10-23%). Based on a small sample size, hunting district 555 (18%, 95%CI: 10%-48%, N = 11) also had a very high CWD prevalence in white-tailed deer but also had a wide confidence interval (Figure 4). In districts that were well-sampled for mule deer, observed CWD prevalence was highest in hunting districts 600 (23%, 95%CI: 17-20%, N = 198), 640 (20%, 95%CI: 16-25%, N = 295), and 670 (17%, 95%CI:

14-21%, N = 370). Notably, hunting district 322 (18%, 95%CI: 12-28%, N=92) had high CWD prevalence in mule deer, but the small number of tested samples resulted in low certainty in the prevalence estimate (Figure 5). Between 2022-2024 in the urban areas in and around the town of Libby, known as the Libby Surveillance Area, 16% (95%CI: 11-23%, N = 160) of hunter-harvested or trapped adult white-tailed deer were positive for CWD, whereas only 6% (95%CI: 4-8%, N = 651) were positive outside the town but otherwise within the Libby Management Zone. Between 2022-2024 in the SW Montana Management Zone 59% (95%CI: 53-65%, N = 259) of hunter-harvested white-tailed deer were positive for CWD. Within an 8-mi buffer of the SW Montana Management Zone, but not including the SW Montana Management Zone, 25% (95%CI: 21-29%, N = 418) of hunter-harvest deer tested positive. A comparison of prevalences in these two management zones over time can be seen in Figure 7. A further breakdown of CWD prevalence by distance from the SW Montana Management Zone can be seen in Figure 12.

Estimated Prevalence of CWD in White-tailed Deer by Hunt District

Prevalence Data and Positive Sample Collection Points (+)
from seasons 22-23, 23-24, and 24-25



Confidence Interval (CI) Ranges for Estimated Prevalence of CWD in White-tailed Deer by Hunt District

Prevalence Data from seasons 22-23, 23-24, and 24-25

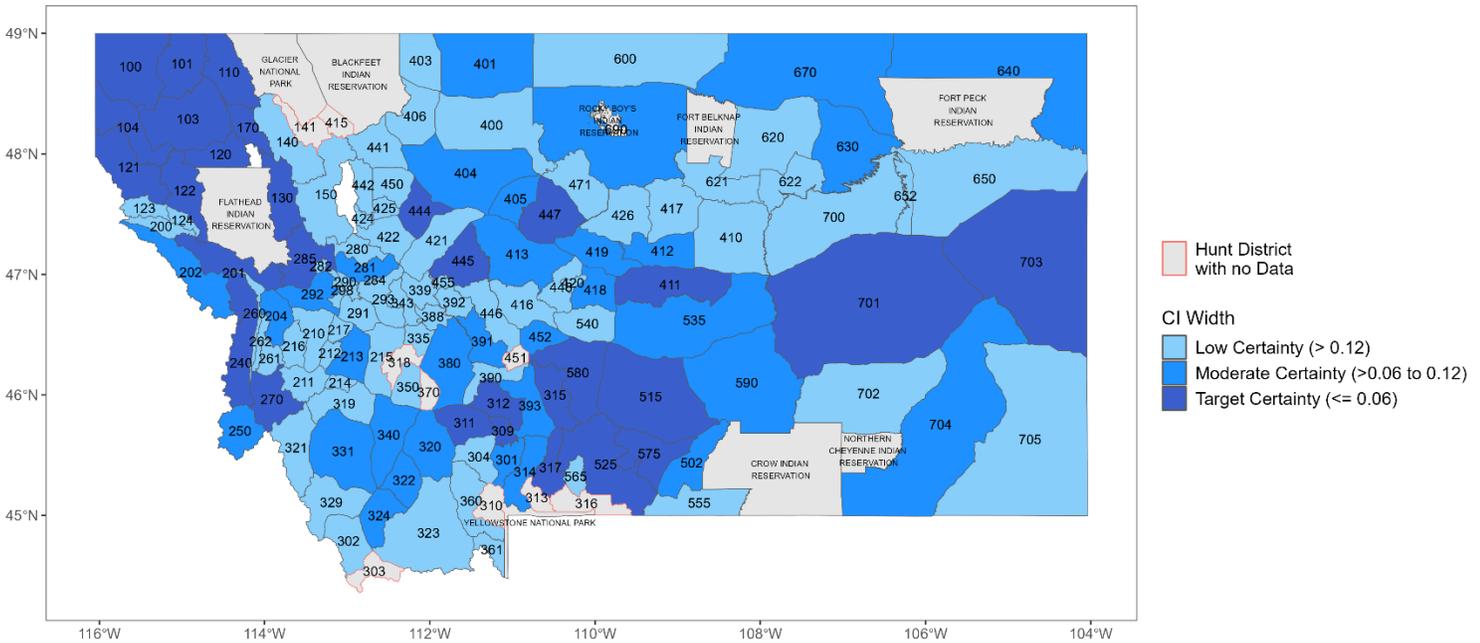
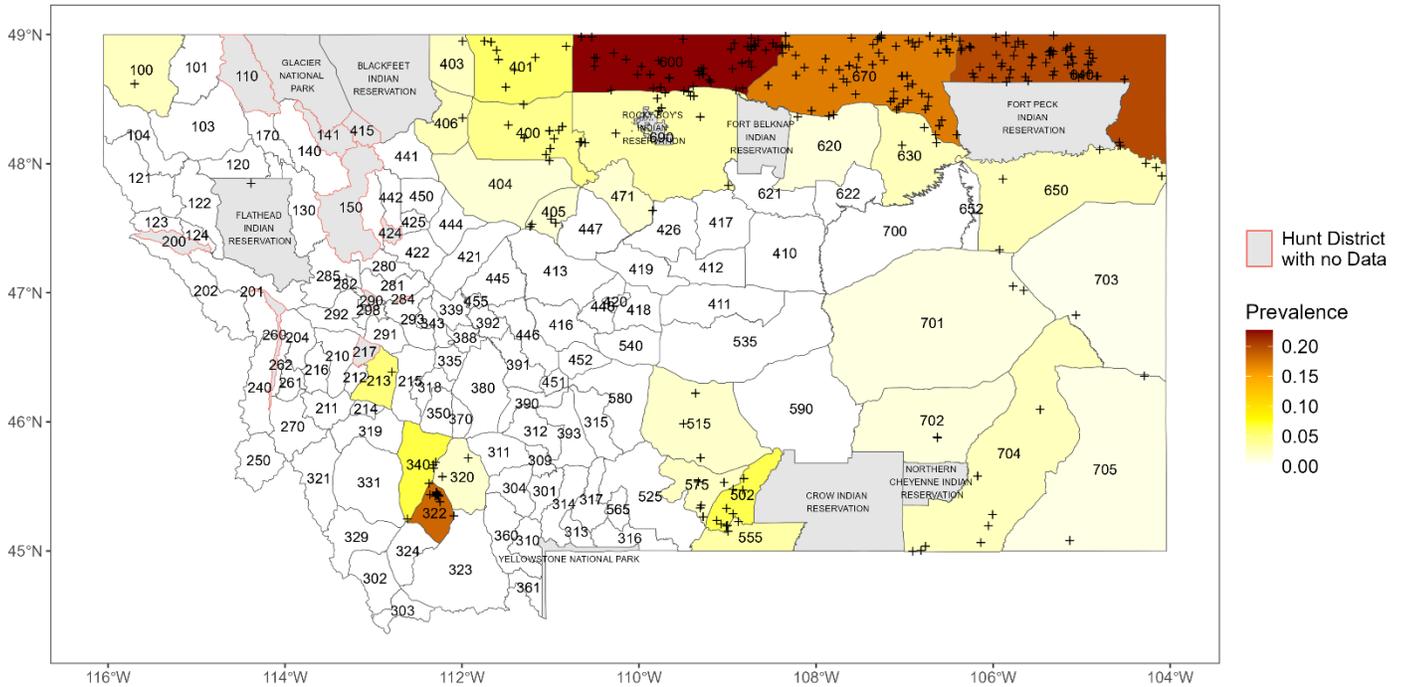


Figure 4. Estimated CWD prevalence in white-tailed deer (top map) by hunting district from 2022-2024. Prevalence is calculated by dividing the number of test-positives by the total number of animals sampled. Only data from hunter-harvested or agency removed adult animals were used to calculate prevalence. The corresponding confidence interval ranges (CI) are displayed in the bottom map. The numbers represented in the legend (CI Width) show the range the prevalence estimate has within a 95% CI. Where CWD has not been detected (prevalence = 0 in top map), additional sampling may be necessary to declare the area free of CWD, or below 0.01 prevalence, with 95% confidence. CWD has previously been detected in white-tailed deer in hunting districts 317 and 575, but not within the three-year period.

Estimated Prevalence of CWD in Mule Deer by Hunt District

Prevalence Data and Positive Sample Collection Points (+)
from seasons 22-23, 23-24, 24-25



Confidence Interval (CI) Ranges for Estimated Prevalence of CWD in Mule Deer by Hunt District

Prevalence Data from seasons 22-23, 23-24, and 24-25

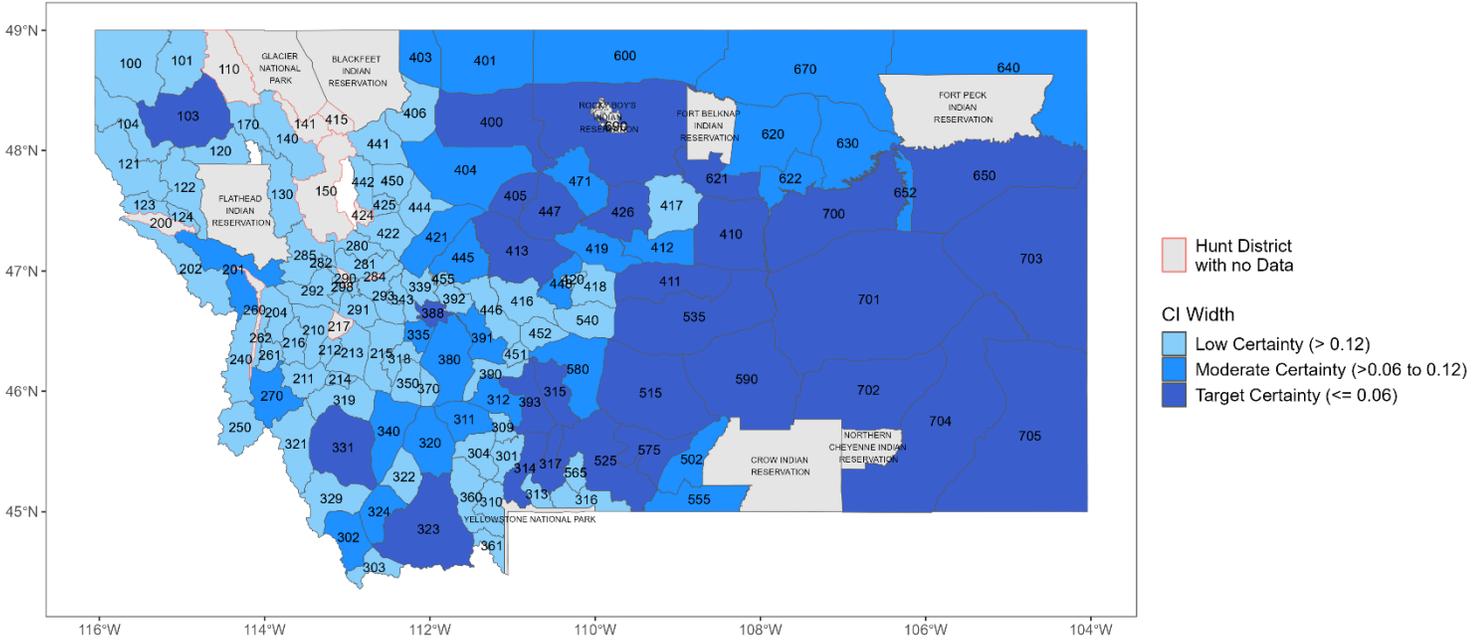


Figure 5. Estimated CWD prevalence in mule deer (top map) by hunting district from 2022-2024. Prevalence is calculated by dividing the number of test-positives by the total number of animals sampled. Only data from hunter-harvested or agency removed adult animals were used to calculate prevalence. The corresponding confidence interval ranges (CIs) are displayed in the bottom map. The numbers represented in the legend (CI Width) show the range the prevalence estimate has within a 95% CI. Where CWD has not been detected (prevalence = 0 in top map), additional sampling may be necessary to declare the area free of CWD, or below 0.01 prevalence, with 95% confidence. CWD has previously been detected in mule deer in hunting districts 314, 622 and 700, but not within the three-year period.

An analysis of all data collected between 2017-2024 from deer harvested by hunters or removed during management efforts in CWD-positive hunting districts (n= 32,030) suggested several state-wide patterns of infection across species, sex, age class, location, and time. We found evidence that the probability of an animal testing positive for CWD was associated with deer species, sex, a species by sex interaction, age class, whether the deer was harvested or removed inside the Libby Management Zone, the SW Montana Management Zone, or outside of the two management areas (a categorical variable referred to as “MGZN2”), time, a time by MGZN2 interaction and whether a deer was harvested before or during/after the peak rut (November 15th). Our model was specified to allow starting prevalences of CWD, as well as the estimated effect of species and time, to vary by hunting district or Management Zone (i.e. random intercept and slope model; Figures 6 & 7).

Our model supported distinct white-tailed deer CWD hotspots in the Libby and SW Montana Management Zones, although white-tailed deer CWD prevalence was only significantly higher within the SW Montana Management Zone as compared to estimates from elsewhere around the state. CWD Management in the Libby area includes trap and removal efforts in the urban areas in and around the town of Libby (Libby Surveillance Area) as well as harvest management in the designated area surrounding the Libby Surveillance Area (Libby Management Zone). For this analysis with our models, we refer to the Libby Management Zone (Figure 1) as including all data within the Libby Surveillance Area and Libby Management Zone, unless otherwise stated. In 2024, adult male and female white-tailed deer in the Libby Management Zone both had 1.5 times the risk of infection (Male 95%CI: 0.2-9.1; Female 95%CI: 0.2-10.2) of adult male and female white-tailed deer from elsewhere in the state. In 2024 in the SW Montana Management Zone, adult male and female white-tailed deer had 18.8 (95%CI: 6.6-24) and 24.9 (95%CI: 7.2-35.2) times the risk of infection, respectively, compared to adult male and female white-tailed deer from elsewhere in the state. In 2024, the model-estimated adult white-tailed deer CWD prevalence inside the Libby Management Zone was 10% (95%CI: 8-13%) among males and 7% (95%CI: 5-9%) among females (Figure 7); in the SW Montana Management Zone, it was 76% (95%CI: 69-82%) among males and 67% (95%CI: 59-75%) among females (Figure 7). Outside of these management zones, the average model-estimated prevalence across hunting districts was 4% (95%CI: 3-6%) among males and 3% (95%CI: 2-4%) among females, respectively (Figure 6). Inside the Libby Management Zone, male white-tailed deer had 1.5 times the relative risk of CWD of females (95%CI: 1.3-1.7); inside the SW Montana Management Zone, male white-tailed deer had 1.1 times the relative risk of CWD of females (95%CI: 1.1-1.2).

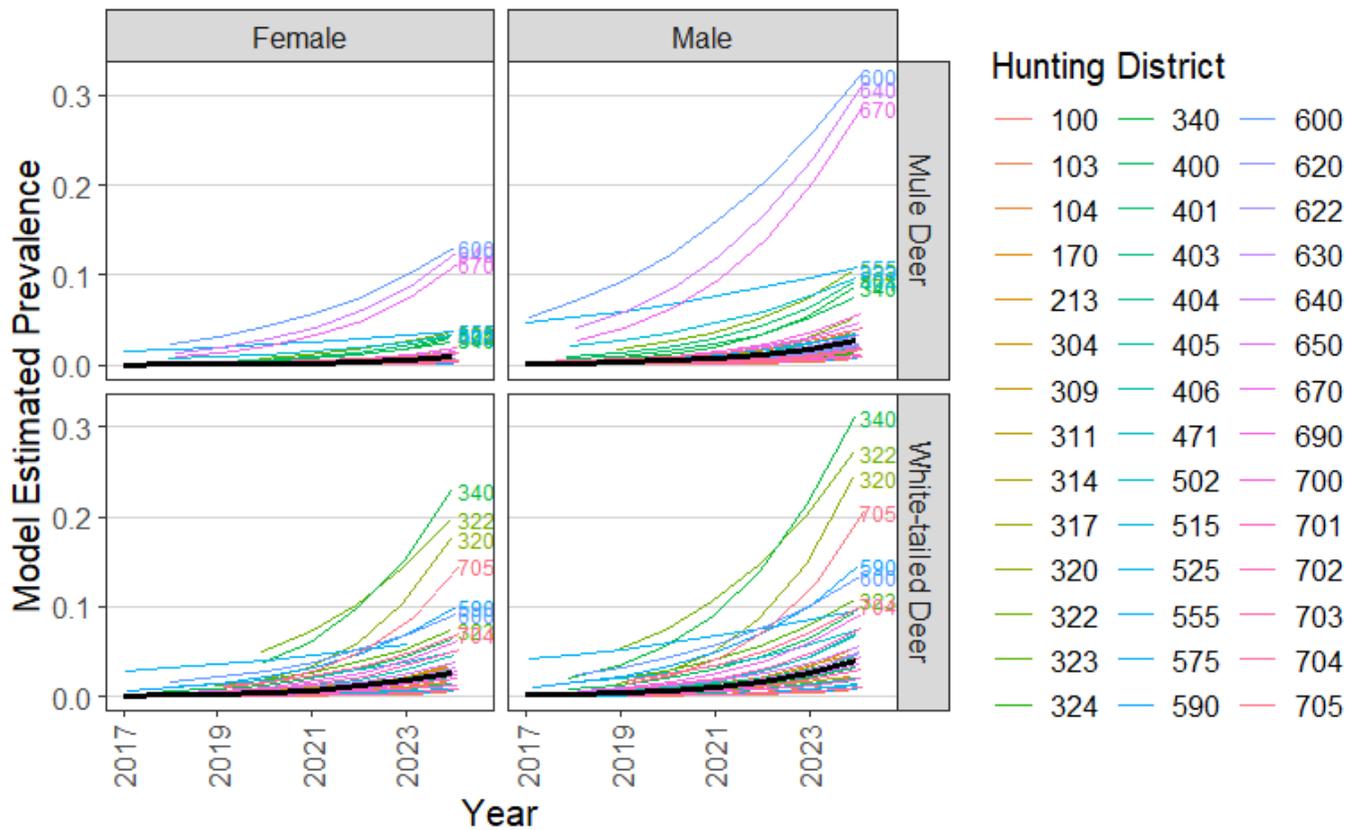


Figure 6. Model-estimated prevalence from 2017-2024, based on our full model, for CWD-positive hunting districts. The bold black lines indicate the average prevalence over time across CWD-positive hunting districts. The top 8 highest prevalence districts in 2024 are labeled for reference (in mule deer: 600, 640, 670, 555, 322, 502, 401, 340; in white-tailed deer: 340, 322, 320, 705, 590, 600, 323, 704). Prevalence estimates for hunting districts 100, 103, 104, and 322 exclude data from the Libby and SW Montana Management Zones.

Observed and model-estimated CWD prevalence among adult deer inside the Management Zones

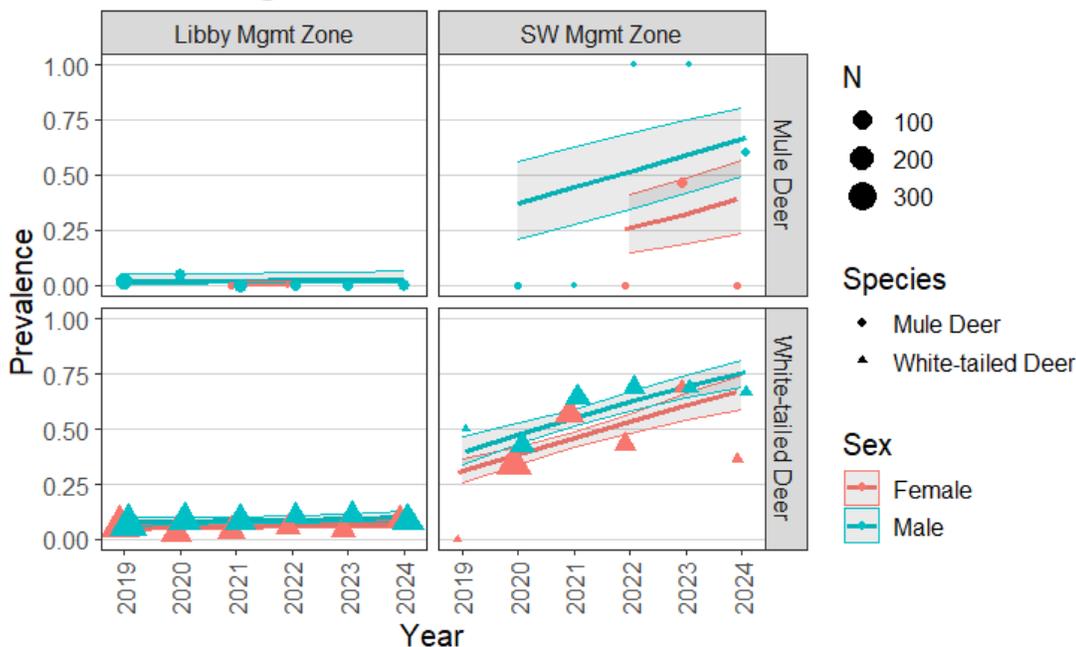


Figure 7. Observed (points) and model-estimated (bold lines) CWD prevalence among adult mule deer and white-tailed deer from 2019-2024 within the Libby and SW Montana Management Zones. Female and male data are denoted in red and blue, respectively. Sample sizes (N) are denoted by point size. The grey ribbon represents the 95% confidence interval around the model-estimated prevalence.

Outside of the Libby and SW Montana Management Zones, we found no significant statewide difference in prevalence among adult male white-tailed deer and adult male mule deer (adult male mule deer have 0.7 times the relative risk of adult male white-tailed deer, 95%CI: 0.4-1.2; average prevalence across positive hunting districts is 4% in male white-tailed deer versus 3% in male mule deer). By contrast, the relative risk of CWD in adult female mule deer was significantly lower than in adult female white-tailed deer (adult female mule deer had 0.3 times the relative risk as adult female white-tailed deer, 95%CI: 0.2-0.6; average prevalence across positive hunting districts was 1% (95%CI: 1-2%) in female mule deer and 3% (95%CI: 2-4%) in female white-tailed deer). In both cases, there was substantial variation among hunting districts and management zones as to whether white-tailed deer or mule deer were more likely to be positive (Figure 8).

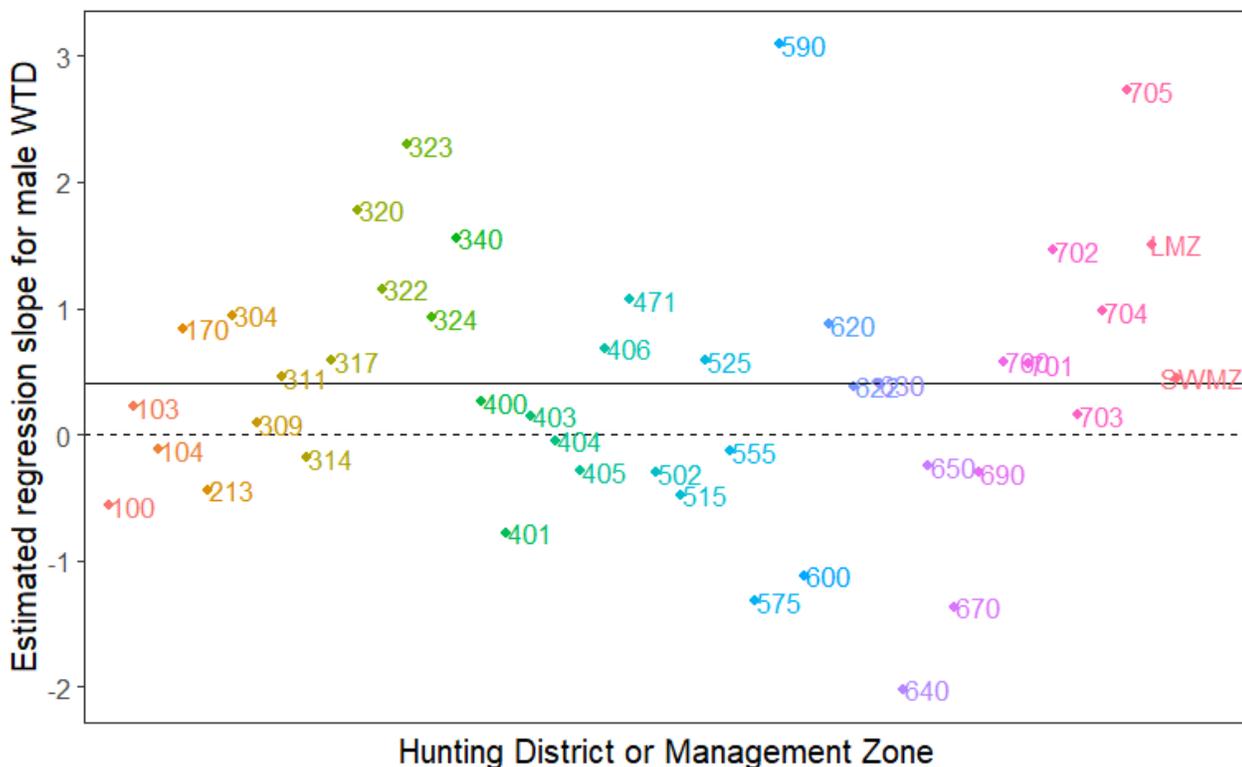


Figure 8. Hunting district or Management Zone-specific slope estimates for male white-tailed deer (WTD) as compared to male mule deer. The horizontal black line indicates the average slope estimate, across hunting districts and Management Zones, indicating a slight bias, on average, towards higher prevalences among male white-tailed deer versus male mule deer. A slope of 0, denoted by the dashed line, indicates no difference between species in the probability of testing positive for CWD. Points that fall above the solid horizontal line indicate districts or management zones where male white-tailed deer are more likely than average to test positive for CWD than male mule deer; points that fall below the dashed line where the estimated species slope is 0, indicate districts or management zones where male mule deer are

more likely to test positive than male white-tailed deer.

In 2024 outside of the CWD Management Zones, adult male mule deer had 3.1 times the risk of infection of adult females (95%CI: 2.3-4), and model-estimated average adult male mule deer CWD prevalence across positive hunting districts was 3% (95%CI: 2-4%) versus 1% (95%CI: 1-2%) among adult females (Figure 6). Outside of the CWD Management Zones, adult male white-tailed deer had 1.5 times the relative risk of females (95%CI: 1.3-1.7; adult white-tailed deer female prevalence = 3% (95%CI: 2-4%), adult white-tailed deer male prevalence = 4% (95%CI: 3-6%)). Across deer species in CWD-positive hunting districts, young of the year and yearlings had 0.1 times (95%CI: 0.1 – 0.2) and 0.5 times (95%CI: 0.4 – 0.6) the risk of infection of adults, respectively. Lastly, deer harvested after the average start date for rut (November 15th) had 1.2 times the relative risk of testing positive for CWD than those harvested before that date (95%CI: 1.1-1.3; adult male mule deer CWD prevalence outside of the CWD Management Zones prior to November 15th = 2% (95%CI: 1-4%) versus after = 3% (95%CI: 2-5%)).

Outside of the two CWD Management Zones, the maximum annual CWD growth rate in prevalence (the maximum growth potential during the early exponential phase of an epidemic) was 43% across mule deer and white-tailed deer between 2017-2024 (the estimated coefficient on Year is: $\beta = 0.43$ (se = 0.05); Figure 9). When estimated from species-specific versions of our model in which we use all the same covariates except species, white-tailed deer have an estimated maximum annual CWD growth rate of 38% (se = 0.05) versus 46% in mule deer (se = 0.08). We found that the Libby Management Zone had a significantly slower maximum annual growth rate in prevalence between 2017-2024, estimated at 5% (se = 0.14) (Figure 9), when compared to CWD-positive hunting districts and the SW Montana Management Zone (Figures 6, 7 & 9). The annual growth in CWD prevalence in the SW Montana Management Zone (31%, se = 0.14; Figure 9) was not statistically different from that of other CWD-positive hunting districts, although, as prevalence has reached 67% and 75% in adult female and male white-tailed deer, the realized annual change is slowing (e.g. the annual relative risk from 2023-2024 in male white-tailed deer was 1.07 (95%CI: 1.01-1.12)), suggesting that the epidemic in this area is no longer in the exponential growth phase. General trends in annual CWD prevalence in adult male and female mule deer and white-tailed deer can be seen in Figures 10 and 11, respectively.

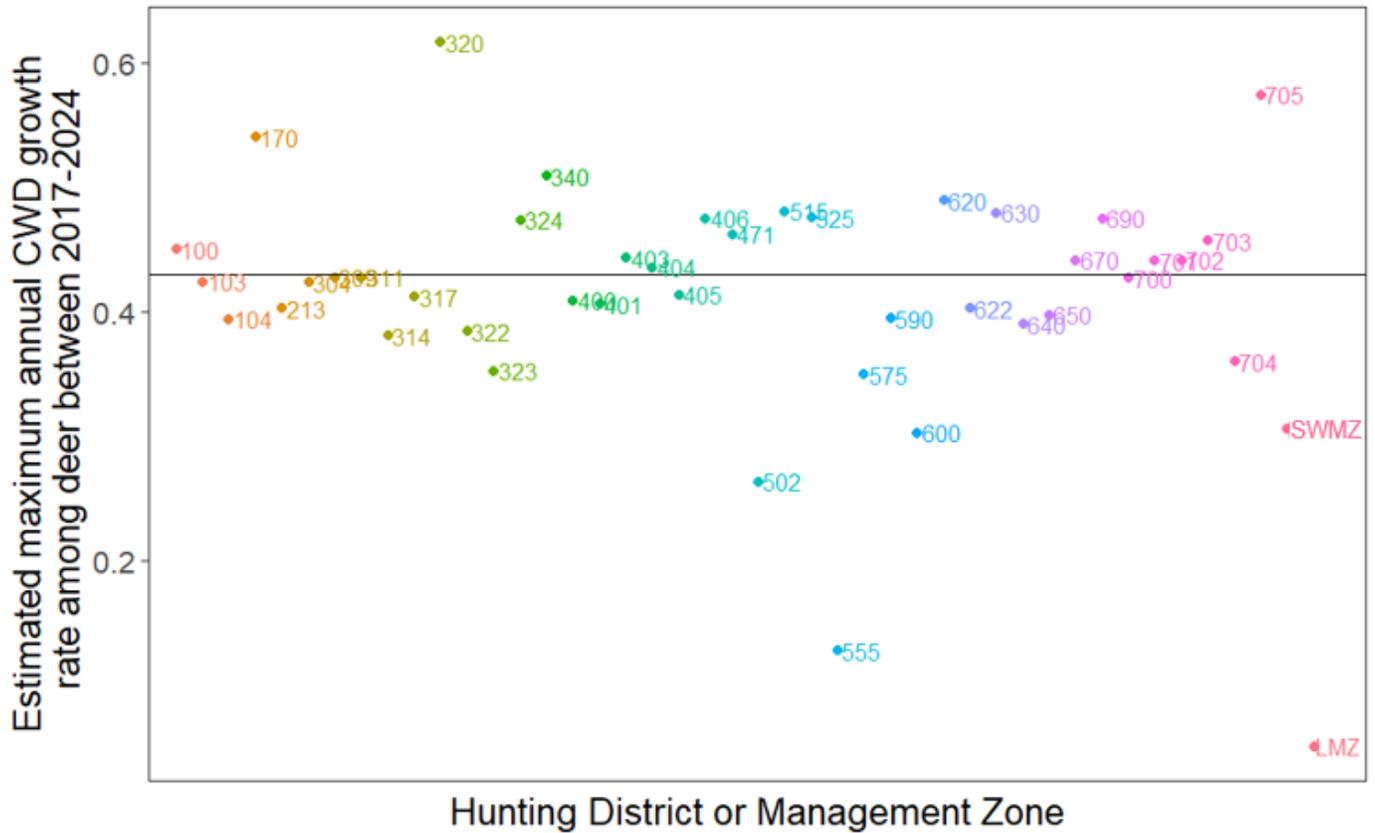


Figure 9. Hunting district or Management Zone-specific maximum annual (intrinsic) prevalence growth rates of CWD across white-tailed deer and mule deer between 2017-2024. The horizontal black line indicates the average maximum annual prevalence growth rate among hunting districts outside of the Management Zones (43%; the estimated coefficient on Year is: $\beta = 0.43$ (se = 0.05)). Points that fall above the solid horizontal line indicate districts with higher prevalence growth rates than average; points that fall below the line indicate districts or management zones with lower prevalence growth rates than average.

Observed and model-estimated CWD prevalence in adult mule deer

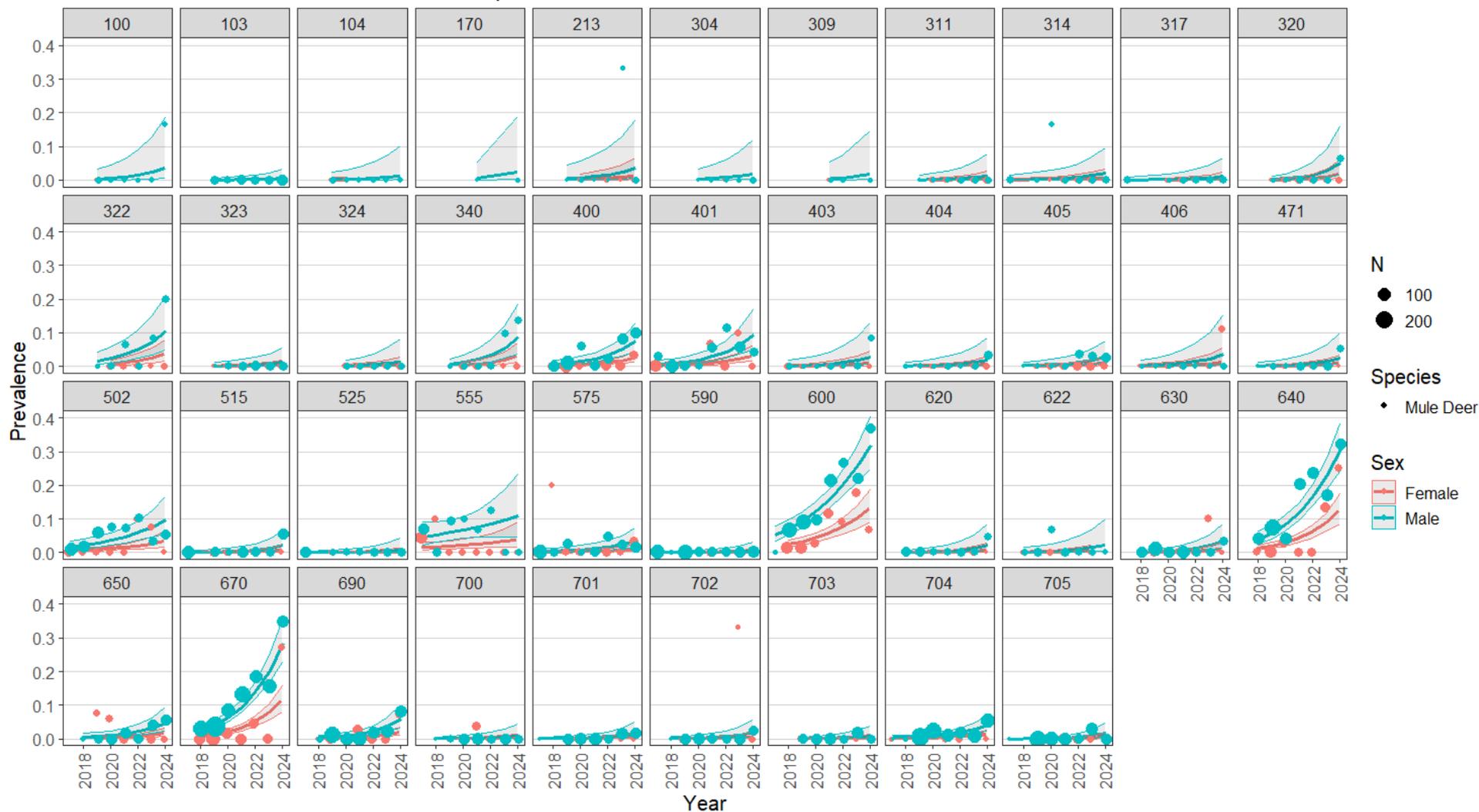


Figure 10. Observed (points) and model-estimated (bold lines) CWD prevalence among adult mule deer from 2017-2024 within CWD-positive hunting districts. Female and male data are denoted in red and blue, respectively. Sample sizes (N) are denoted by point size. The grey ribbon represents the 95% confidence interval around the model-estimated prevalence. Prevalence estimates for hunting districts 100, 103, 104, and 322 exclude data from the Libby Management Zone and SW Montana Management Zone.

Observed and model-estimated CWD prevalence in adult white-tailed deer



Figure 11. Observed (points) and model-estimated (bold lines) CWD prevalence among adult white-tailed deer from 2017-2024 within CWD-positive hunting districts. Female and male data are denoted in red and blue, respectively. Sample sizes (N) are denoted by point size. The grey ribbon represents the 95% confidence interval around the model-estimated prevalence. Prevalence estimates for hunting districts 100, 103, 104, and 322 exclude data from the Libby Management Zone and SW Montana Management Zone.

CWD Management Hunts:

Southwestern Montana CWD Management Hunt

FWP did not run the Southwestern Montana CWD Management Hunt in 2024. In response to CWD detection in the Ruby Valley in 2019, FWP ran the Southwestern Montana CWD Management Hunt in a portion of hunting district 322 (Figure 2) with a high prevalence of CWD after every general hunting season during the 2020-2023 hunting seasons (four consecutive years). During the initial two years, the hunt area was broad, and the primary objective was to improve our understanding of the prevalence and distribution of CWD among white-tailed deer. In 2022, the CWD management hunt area was reduced in size to focus hunter harvest within an area of known high CWD prevalence among white-tailed deer. The primary objective of the hunt became reducing that localized population of white-tailed deer to the lowest extent possible through hunter harvest of all sex and age classes. In 2023, the management hunt was implemented across the same focused area as in 2022. Mule deer were included in the 2023 hunt in response to testing results that showed high CWD prevalence among a population of mule deer within the hunt area. In 2024, FWP did not run the annual Southwestern Montana CWD Management Hunt because the white-tailed deer population in the focused management area had been reduced by approximately 90% likely through hunting pressure, CWD mortality, and low fawn recruitment. This was evaluated, in part, by the substantially lower hunter harvest rates throughout the archery and general rifle season in 2024. Given the lower deer abundance, harvest that results from established hunting seasons and continued CWD mortality is expected to maintain low deer abundance, but FWP is continuing to evaluate CWD in the Ruby Valley and surrounding area and may host CWD management hunts in the future.

Changes in yearly prevalence with the SW Montana Management Zone are difficult to estimate due to small sample sizes, but the data reflects a general trend of increasing prevalences and spatial extent in areas surrounding the SW Montana Management Zone, with overlapping 95% confidence intervals (Figure 12). Fluctuations in observed annual prevalence within the SW Montana Management Zone make trends in observed annual prevalence difficult to assess. Our models suggest that the prevalence growth rate within the SW Montana Management Zone has slowed and may no longer be in the exponential growth phase.

Libby

In late 2021, Libby's City Council passed Resolution 1979, which articulates the city's commitment to collaborate with FWP to manage deer within the city limits. The goals of Resolution 1979 include: 1) eliminating sickly and aggressive deer, 2) reducing deer damage to private property, 3) preventing illegal feeding of deer, 4) educating the public about safe disposal of deer carcasses, and 5) cooperating with FWP on their CWD management goals. Resolution 1979 allows FWP to continue to cooperatively manage deer inside city limits with the goal of reducing CWD prevalence to <5%. In 2024, the Montana Fish and Wildlife Commission approved required testing of all deer harvested using the either-sex Deer B License: 199-20, which is only valid within the Libby Management Zone and issued for CWD management, and Mule Deer Permit: 103-50, which is limited in number and allows for harvest of an antlered mule deer in an area adjacent to the Libby Management Zone. From January 21, 2025 through March 4, 2025 FWP trapped, euthanized, and tested an additional 43 white-tailed deer within the Libby Surveillance Area (LSA, i.e., urban areas in and around the town of Libby), of which 12 were positive or suspect. Using data from hunter-harvested and trapped and euthanized adult white-tailed deer during the 2024 sampling season, the Libby Surveillance Area had an observed prevalence of 21% (95%CI: 12-32%, N = 63) in white-tailed deer, whereas the remaining outer ring of the Libby Management Zone had a prevalence of 6% (95%CI: 4-9%, N = 300) in white-tailed deer. While the prevalence for the outer ring of the Libby Management Zone for 2024 was very similar to 2023, there was

an increase in CWD prevalence among white-tailed deer in the Libby Surveillance Area from 2023, 17% (95%CI: 9-30%, N = 52), to 2024 (Appendix I, Figure A5). In 2024, trapping efforts in the Libby Surveillance Area were concentrated in a different geographic area within the Libby Surveillance Area than the previous year. This geographic shift in samples from trapping efforts may have introduced bias in the estimates of prevalence within the Libby Surveillance Area, and changes in CWD prevalence may have resulted from this sampling bias. Within the Libby Management Zone for the 2024 sampling season, only 26 mule deer, 7 elk, and 1 moose were harvested and CWD sampled, and CWD was not detected in any of these samples.

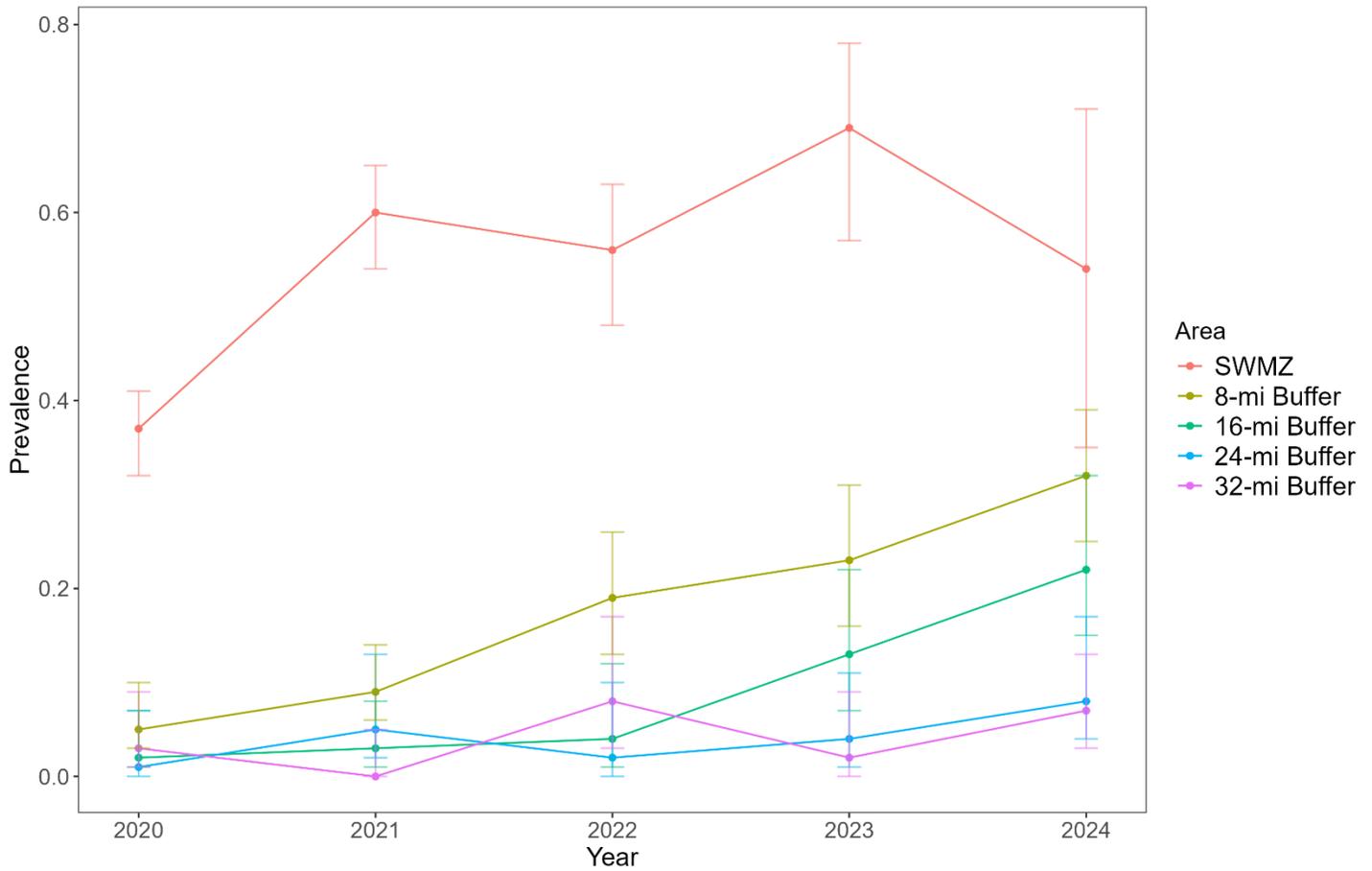


Figure 12. Observed annual prevalence among adult white-tailed deer by year in the SW Montana Management Zone (SWMZ) and within concentric 8-mile buffers (8 mi, 16 mi, 24 mi, 32 mi buffers), which do not include data from buffers inside each buffer. Data includes hunter-harvested animals from 2020 – 2024 seasons. 95% confidence intervals (CIs) are represented by the vertical lines at each yearly datum point. Note the trend of increasing observed prevalence over time across concentric buffers around the core SW Montana Management Zone, consistent with the spatial spread and expansion of CWD from the core management zone. Within the SW Montana Management Zone, the trend over time is less clear, with fluctuations that may reflect slowing epidemic growth.

Testing and reporting turn-around time

On average, it took 7 calendar days (sd = 3 days) from the day a sample was collected to the day the ELISA test result was posted online during the 2024 season. This was similar to 2023, when the average turnaround time was 7 days (sd = 4 days) and to 2021, when our average turnaround time was 8 days. Of this time, it took on average 2 days (sd = 18 days) from the time the sample was received by FWP until shipment to Montana Veterinary Diagnostic Laboratory, and an average of 5 days (sd = 18 days) from the day of shipment until results were received by FWP, which includes 1-2 days of transit time. FWP received test results from IHC testing of moose samples an average of 21 days (sd = 5) after samples were mailed to Colorado State University Veterinary Diagnostic Laboratory.

When a suspect CWD test result was received, FWP staff called hunters if 1) the hunter did not list an email address, 2) the animal was harvested in a hunting district that had no previous positive samples, 3) the positive sample was from a new species that had no previous positive samples in that hunting district, or 4) the hunter indicated the animal would be processed at a commercial meat processor or donated to a foodbank. If FWP was told that meat from a positive animal had gone to a processor, FWP staff notified the Department of Public Health and Human Services, who then contacted county health departments for follow up with the processor or any hunters who may have received meat that was batch-processed with the positive animal. Most hunters who harvested positive animals had either waited for their test result prior to processing or processed their animal at home.

Discussion

Through dedicated CWD surveillance and monitoring efforts, we now know that CWD is found in at least 42 of Montana's 138 2024-2025 hunting districts (30%) and is geographically distributed across much of Montana. Statewide testing that is offered free-of-charge to hunters, while requiring a significant amount of time and resources, continues to be successful at detecting positive animals in new areas. We plan to continue offering free statewide testing to allow hunters to make informed decisions about meat consumption, improve our understanding of CWD distribution in the state through surveillance, inform prevalence estimates in positive hunting districts through monitoring, and determine and inform future CWD management in Montana.

In 2024, FWP primarily targeted hunting districts with historically low sampling. Predictably, we did not meet our 300-sample surveillance goal in many priority surveillance areas, as these areas had been identified as historically falling well below sampling goals or the target precision of three-year prevalence, but we did see increased sampling within these districts. In 2024, statewide, FWP collected the largest number of samples of any sampling year to date (Table 2), representing a 27% increase in total number of tested samples from 2023. Dividing the number of samples among the seven FWP administrative regions where each animal was harvested, we see that sampling trends vary among regions (Figure 2). The increased sampling among most FWP regions likely resulted from a combination of increasing public awareness (both statewide and nationally), renewed FWP outreach efforts encouraging sampling, and testing requirements for animals harvested under some licenses and permits allocated for CWD management in Region 1. Decreased sampling in Regions 6 and 7 may have been the result of large portions of these Regions falling outside of our priority sampling areas or may be indicative of waning public interest and decreasing mule deer populations resulting in reduced availability of B-licenses (See Region 6 & 7 management updates section). CWD test results data is vital to FWP's ability to provide accurate CWD prevalences, evaluate best potential management tools, and assess the effectiveness of previously implemented management actions. FWP surveillance efforts in 2025 will focus, in part, on increasing sampling in Regions 6 and 7.

During the 2024 season, CWD was detected in seven new hunting districts, increasing the number of hunting districts that should be targeted for surveillance to include 86% of Montana's hunting districts in 2024. This large proportion of hunting districts necessitates further prioritization of hunting districts beyond those within the 40-mile buffer of known positives. Priority sampling areas in 2025 incorporate districts in need of additional samples, especially related to new detections in 2024 and hunting districts that have been outside the priority sampling areas for multiple years. In 2025, FWP rotated away from some hunting districts that have still not met target levels of sampling despite having been included in priority sampling areas for multiple years.

The geographic distribution of CWD continues to expand and prevalences continue to increase statewide. CWD was detected in seven new hunting districts and in new species in some hunting districts where CWD was previously known to occur in 2024. Additionally, the number of elk that have tested positive in the state increased three-fold; though, most of the new positive tests in elk were collected from one area (Ruby Valley). While the high number of detections in new hunting districts in 2024 is likely partially due to higher sample numbers, it is also indicative of expanding CWD distribution. Between 2017-2024, we estimated that CWD has had a maximum annual prevalence growth rate of 43% among white-tailed deer and mule deer combined in Montana. For the average adult male prevalence estimated across hunting districts in 2024 (3% in MD, 4% in WTD), that annual prevalence growth rate translates to an expected increase of 1 -2 percentage points in prevalence next year. Many districts have lower prevalences, translating to even smaller observed differences in prevalence between years. However, for those districts and management zones that currently have high prevalences, including hunting districts 600, 640, 670, and 555 for mule deer and hunting districts 340, 322, 320, and 705 for white-tailed deer, that annual prevalence growth rate could translate to more significant jumps in prevalence in the coming year.

Our statistical model identified the Libby and SW Montana Management Zones as white-tailed deer CWD hotspots; the SW Management Zone may be becoming a hotspot for CWD in mule deer as well (Figure 7), although more data is needed to evaluate this. While we don't have experimental controls that allow us to conclusively measure the impacts of CWD management efforts within these two zones, we used the Year*MGZN2 interaction to explore the hypothesis that our management zones might have different annual prevalence growth rates compared to less-intensively managed positive hunting districts. The Libby Management Zone has experienced a significantly lower rate of annual growth in prevalence than we would expect based on trends elsewhere around the state (Figure 9), particularly in the core Libby Surveillance Area where white-tailed deer are trapped and euthanized (Appendix I, Figure A5). The annual prevalence growth rate in the SW Montana Management Zone appears to be statistically similar to those outside the zone, suggesting that it's likely more difficult to impact the trajectory of an epidemic through trapping and removal when prevalences are very high at the time of first detection. There appears to be an increase in CWD prevalence among adults in 2024 in the Libby Surveillance Area, but the majority of samples were collected from a different geographic area within the Libby Surveillance Area during the 2024 season. The shifting foci of trapping efforts in 2024 may introduce bias in the estimates of prevalence within the Libby Surveillance Area.

Hunting districts vary in terms of CWD prevalence at the time of first detection, their prevalence growth rates, and which species exhibit higher prevalences. Some districts, including 590, 705, 323, and 320 have higher prevalences among white-tailed deer than mule deer. Other districts have higher prevalences in mule deer, including 640, 670, 575, 600, and 401. These differences may be due to variation in the dominant species present within a hunting district or the relative timing of when a species first became infected within the hunting district. Furthermore, by examining our model-estimated hunting district-specific prevalence growth

rates, we found that in addition to the Libby Management Zone, hunting districts 555 and 502 exhibited lower annual growth rates than average, whereas 320, 705, 170, and 340 exhibited higher than average prevalence growth rates (Figure 9). Among these districts, the Libby Management Zone, and hunting districts 555 and 502 all have experienced some level of CWD management. Ongoing work is aimed at understanding some of the factors influencing different growth rates among districts. Hunting districts 320 and 340 encompass the growing epidemic outside of the SW Montana Management Zone. In hunting district 705, the majority of CWD positive white-tailed deer were harvested near the Powder River. FWP will include hunting district 705 in the 2025 priority sampling areas in an effort to better understand CWD geographic distribution and prevalence in this hunting district. The estimated annual growth rate for hunting district 170 was likely inflated due to a concentrated removal of positive deer around a newly detected hotspot.

Statistical modelling showed patterns of CWD prevalence related to sex. Male mule deer have been found to have higher prevalences than females in other western states and provinces (Miller et al. 2000, DeVivo 2017, Nobert et al. 2016), and reported patterns among the sexes in white-tailed deer have been more variable, including evidence for a female bias (Edmunds et al. 2016), a male bias (Gear et al. 2006, Nobert et al. 2016), and no detectable differences in prevalence between the sexes (Miller et al. 2000). In Montana, using data from 2017-2024, males still have higher prevalences than females for both mule deer and white-tailed deer. The magnitude of difference between the sexes in white-tailed deer are the same for Libby and the other positive hunting districts (males have 1.5 times the relative risk of females), whereas within the SW Montana Management Zone, male and female white-tailed deer CWD prevalences are more similar (male:female relative risk is just 1.1). This may indicate a shift in the relative bias of sex at the advanced stages of an epidemic and may be the result of either an increasing shift toward environmental transmission or a reflection of higher contact rates within and between the sexes in high-density areas like the SW Montana Management Zone.

Conner et al. (2000) found that the risk of harvesting CWD positive mule deer, particularly mule deer bucks, increased over the harvest season. Furthermore, Conner et al. (2021) found that focusing harvest closer to the mule deer breeding season was associated with modest reductions in epidemic growth. One hypothesis is that older-aged animals, which are more likely to be positive, are more susceptible to harvest during the rut, which could bias the estimate of prevalence upwards in late vs. early season. Another hypothesis is that CWD-infected deer may be less aware or responsive to hunters, particularly when they are already distracted by the rut. Hunts occurring later in the season may therefore be selectively removing positive animals at slightly higher rates and may, in combination with the intensity of harvest, be used to further reduce CWD prevalence. We found support for a general pattern where hunters were more likely to harvest a CWD-positive mule deer and white-tailed deer later in the rut (after November 15th) than earlier.

FWP continues to target the Libby Management Zone and SW Montana Management Zone for focused CWD management efforts and monitoring. Within the Libby Management Zone prevalence has stayed lower than expected, suggesting management actions of FWP and the City of Libby may be effective in slowing CWD spread. In the SW Montana Management Zone, we are, so far, unable to detect an obvious management effect when comparing CWD prevalence to other positive hunting districts with varying levels of CWD management. This may not be surprising given how advanced the epidemic is in this area. Some models indicate that environmental transmission plays a larger role in CWD spread as the epidemic progresses, likely causing management through hunting and culling to become less effective (Almberg et al, 2011). Despite significant reductions in deer density in the SW Montana Management Zone, transmission from the environment and vertical transmission are likely contributing to CWD spread. While continued management may not reduce prevalence in the SW Montana Management Zone, it may help reduce outward spread and

slow increases in prevalence in surrounding areas.

With the CWD testing dataset for Montana becoming larger and more robust for each species and demographic group, the development of Montana-specific estimates of weighted surveillance point values (Table 1) has begun. Next year, we anticipate incorporating Montana-specific weighted surveillance points into surveillance efforts and results reporting.

In 2025, we will conduct targeted surveillance and monitoring in hunting districts in Region 2, Region 6, and Region 7, as well as in hunting districts 403 and 406 (Figure 13). These priority sampling areas are located in central-western, north-central, and eastern Montana and have been targeted, because they include hunting districts that have been outside of priority sampling areas for multiple years, have low sampling numbers, or had new detections in 2024 and have low certainty for target precision in prevalence. Having greater sample numbers in these priority sampling areas will allow FWP to better understand if CWD exists at or above a 1% prevalence in hunting districts where CWD has not been detected, provide more accurate prevalences in positive hunting districts, evaluate existing management strategies, and provide better informed management recommendations.

2025 - 2026 CWD Priority Sampling Areas and Postive HDs outside of Priority Sampling Areas

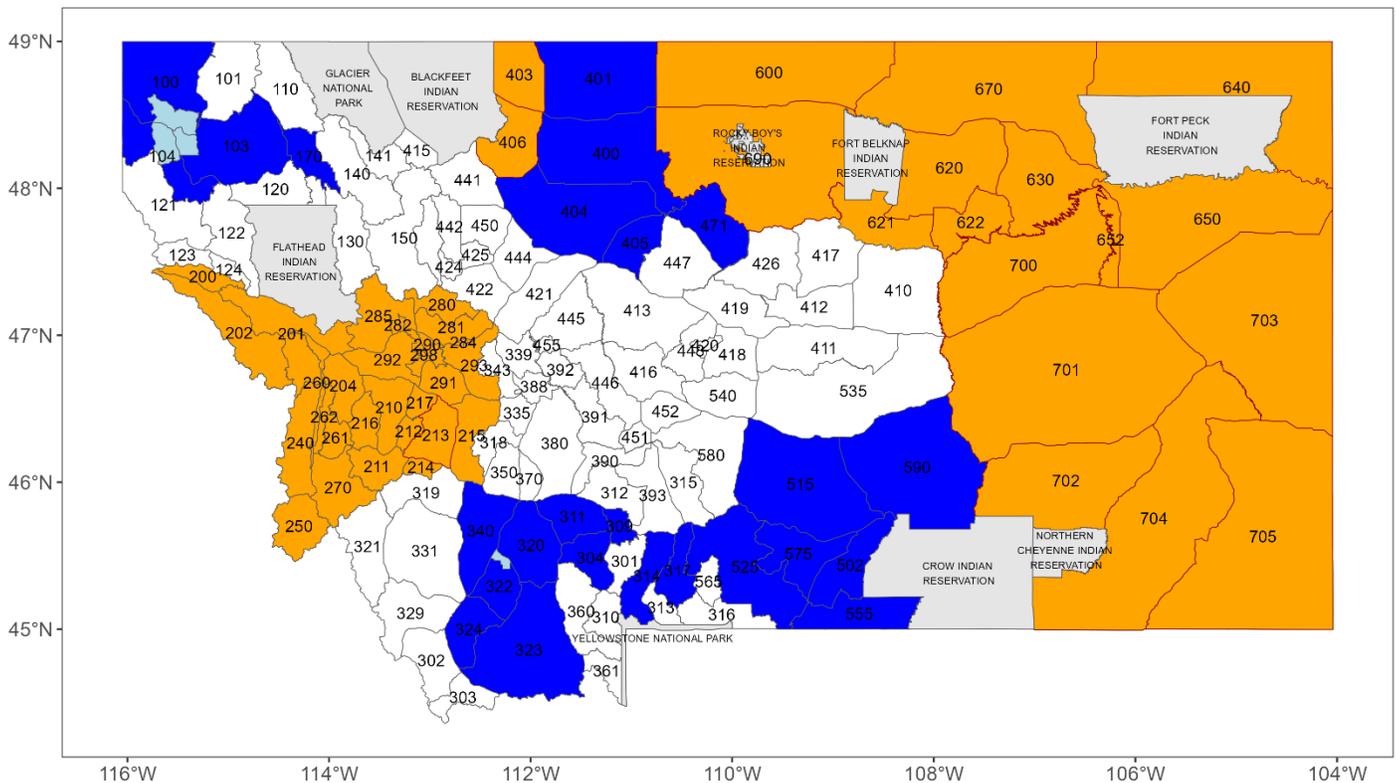


Figure 13. Map of 2025 CWD priority sampling areas (orange) and CWD-positive hunting districts (blue) not selected in the 2024 priority sampling areas. Priority sampling areas outlined in dark red are also positive hunt districts, excluding hunting district 652. The light blue shapes represent areas with annual CWD management hunts or controlled removal for CWD management.

Management updates

FWP committed to managing CWD to minimize its spread and to keep prevalences below 5% in the 2020 Montana Chronic Wasting Disease Management Plan. Management has changed in response to CWD in the following areas:

- **Region 1:** Following the detection of CWD in Libby in 2019, the region focused on increasing the accuracy and precision of prevalence estimates. Efforts were made to increase signage and/or public messaging throughout the Libby CWD Management Zone about 1) not feeding/aggregating deer, 2) discouraging carcass dumping, and 3) informing hunters of proper carcass disposal. FWP worked with the Libby City Council to write an Urban Deer Management Plan, which was completed in 2021 and calls for the annual trapping and euthanasia of white-tailed deer in an effort to manage CWD prevalence at $\leq 5\%$. Also in response, the Fish & Wildlife Commission approved an either-sex B-license with a quota of 2,000 valid within the Libby Management Zone. In December 2023, the Fish and Wildlife Commission approved a change to the 2,000 either-sex B-license (199-20) making CWD testing mandatory. This mandatory testing also applied to the limited mule deer buck permits in hunting district 103 (HD103-50 permits). In 2024, FWP continued CWD management in the Libby Management Zone with the Libby Management Hunt for the 6th consecutive year. In October 2024, CWD was detected for the first time in hunting district 170. A symptomatic, male white-tailed deer was found and euthanized within the Flathead County Landfill and tested positive for CWD. FWP worked with Flathead County Landfill staff and local law enforcement to lethally remove and test additional white-tailed deer located within the landfill. Between October 2024 and March 2025, a total of 96 white-tailed deer (not including the initial symptomatic animal) were removed and tested, of which 16 tested positive for CWD. FWP is continuing to collaborate with the Flathead County Landfill to find methods to exclude live cervids from the property. FWP is also creating a CWD Management Zone around the Flathead County Landfill and utilizing additional white-tailed deer licenses to evaluate CWD prevalence in the area.
- **Region 2:** CWD was first detected in Region 2 during the 2023-2024 season in a sample from hunting district 213 (mule deer). In response, FWP offered a special impromptu check station to collect CWD samples near Deer Lodge, MT on the last weekend of general rifle season in 2023-2024. In 2024, FWP placed a CWD sampling station in Deer Lodge, MT to collect additional samples from hunting district 213 and surrounding hunting districts, and these hunting districts were included in the 2024 CWD Priority Surveillance Areas. No additional CWD samples have tested positive from Region 2 to date. CWD management in Region 2 has been largely geared toward preventing human-mediated introduction of CWD into the region. FWP has offered 7 strategically placed carcass disposal dumpster stations in Region 2 during the hunting season to facilitate FWP's carcass disposal policy aimed at reducing spread of CWD to new areas of the state via movement of carcasses.
- **Region 3:** In response to CWD detection in the Ruby Valley in 2019, FWP held the Southwestern Montana CWD Management Hunt in a portion of hunting district 322 (Figure 2) with a high prevalence of CWD after each general hunting season during the 2020-2023 hunting seasons. The goals of the hunt were to: continue ongoing priority CWD surveillance; reduce the number of CWD-positive animals; slow the spread of CWD among white-tailed deer populations and to neighboring populations of mule deer, elk, and moose; and measurably reduce white-tailed deer populations to a level that could be more effectively managed through general hunting season harvest. In 2024, FWP did not hold

the annual Southwestern Montana CWD Management Hunt because the white-tailed deer population in the focused management area had been reduced by approximately 90% likely through a combination of factors including hunting pressure, CWD mortality, and low fawn recruitment. This was evaluated, in part, by the substantially lower hunter harvest rates throughout the archery and general rifle season in 2024. Given the lower deer abundance, harvest that results from established hunting seasons and continued CWD mortality is expected to maintain low deer abundance. FWP is continuing to evaluate CWD in the Ruby Valley and surrounding area and may hold CWD management hunts in the future. In November 2023 and September 2024, CWD was detected near the Gallatin River on the western side of hunting district 309 and on the eastern side of 311, which is predominantly private land with limited hunting access. In response, FWP mobilized an effort to increase surveillance in this area through letters to landowners, encouraging testing of harvested and road-killed deer, and through regular collection and testing of road-killed deer by FWP staff. FWP is maintaining liberal harvest regulations for white-tailed deer in these areas (up to 5 area-specific antlerless deer B-licenses, 1 regional antlerless deer B-licenses, and the general deer license) and allowing antlerless white-tailed deer hunting until January 15th in hunting district 309. Of the 34 additional roadkill samples collected in eastern hunting district 311 and across hunting district 309, no additional samples tested positive.

- Region 4: Based on CWD surveillance findings in 2019, FWP Region 4 managers proposed a change from a 3-week general deer season to a 5-week general deer season in hunting districts 400, 401, 403, and 406. Due to significant public resistance and direction from the Fish & Wildlife Commission, the Department proposed an alternative of limited species-specific antlered buck permits valid for 2 weeks after the 3-week general season in these 4 hunting districts. This change was approved by the Fish & Wildlife Commission on February 13, 2020 and is still in effect. CWD was found in hunting district 405 in January 2023. Hunting district 405 has maintained an either-sex mule deer season type, along with liberal numbers of mule deer B-licenses to maintain and/or reduce the deer population. This season type continues to date. In 2024, CWD was detected for the first time in hunting districts 403 (mule deer), 404 (mule deer), and 406 (mule deer and white-tailed deer). In response to the new detections in 403 and 406, FWP is increasing surveillance effort near these hunting districts to better understand prevalence and geographic distribution of CWD in deer populations and assess potential management responses.
- Region 5: In 2019, Region 5 implemented CWD-related season changes in south-central Montana (previously hunting districts 510, 502, 520, and 575) designed to liberalize both mule deer and white-tailed deer harvest, particularly of bucks. Restructuring of hunting district boundaries in 2022 changed these to hunting districts 555, 502, 525, and 575. From the 2021 hunting season to the 2022 hunting season, hunting in hunting districts 502 and 555 shifted from buck-heavy harvest to either-sex. Hunting district 525 had an antlered buck mule deer season, with additional antlerless mule deer B-licenses available. The antlered buck mule deer season type was maintained in HD 575, but the number of antlerless B-licenses issued was doubled compared to 2018. In the 2023 season, changes in Region 5 hunting district mule deer regulations included either-sex mule deer opportunity being removed from the general deer license, when applicable, and only allowing antlered mule deer buck harvest on the general deer license. These changes were put in place to both shift harvest to mule deer bucks in CWD management hunting districts and to decrease harvest pressure on the antlerless portion of the mule deer population in hunt districts with decreasing mule deer numbers. Region 5 hunting districts that had not been restricted to antlered buck mule deer harvest on the general deer license were changed during the December 2023 commission meeting. In 2024, hunting districts 515, 565 and 590 had antlered mule deer buck harvest with a general deer license. Hunting districts 502, 525, 540, 555, 575,

580 had either-sex mule deer youth opportunity with a general deer license, in addition to antlered mule deer buck with a general deer license. All Region 5 hunting districts had either-sex white-tail deer opportunity with a general deer license.

- Region 6: FWP has issued higher numbers of mule deer B-licenses than would have been prescribed in the absence of CWD but has restricted B-license availability as populations have trended downward. In 2024, 2,825 mule deer antlerless B-licenses were issued region-wide, with 2,000 (71%) of those issued in hunting districts with CWD prevalence above 5%. These hunting districts include 600, 640, and 670 where CWD prevalence ranged from 17-23% in mule deer based on the 2022-2024 estimates. In 2024, the general mule deer season structure remained either-sex for the majority of Region 6, and hunter participation was high throughout the Region. Antlerless white-tailed deer B-licenses remained unlimited with a maximum of 3 licenses per hunter, despite below average white-tailed deer populations in most areas of the region following epizootic hemorrhagic disease events in recent years. The number of buck permits issued in the Region's sole limited buck-permit hunting district, 652, was reduced from 125 to 100 in response to lower deer numbers. CWD has not been detected in hunting district 652. Additionally, one carcass disposal dumpster was placed in Region 6 for the 2024 sampling season to facilitate FWP's carcass disposal policy aimed at reducing the human-assisted spread of CWD to new areas of the state. Following "hot spot" analysis conducted by FWP, FWP held public meetings in April 2025 in Turner, Opheim, and Scobey, MT, inviting local landowners via mailed letters. The goal of the sessions was to provide local landowners with information about CWD management techniques and what is known about their effectiveness and to hear feedback from the landowners about future implementation. FWP plans to continue to work with local landowners as they consider the best management practices to implement in the region.
- Region 7: Management in 2023 and 2024 was a little more restrictive than previous years. Recently, management of cervid species in Region 7 has been generally motivated by population declines but are relevant to CWD management and progression of the epidemic. Population declines related to prolonged drought conditions and to a lesser extent disease (i.e., bluetongue, epizootic hemorrhage disease viruses) resulted in fewer antlerless deer B-licenses available regionally. In 2024, the region-wide mule deer B-license quota was set at 1,000, which was the same as the 1,000 in 2023, down from 5,500 in 2022, and also reduced from 2021 when 11,000 were offered. The region-wide white-tailed deer B-license quota was set at 6,000, which was down from the 8,500 quota offered in 2023 and 2022. In 2024, CWD was detected in elk for the first time in Region 7 (hunting district 704).

Acknowledgements

CWD surveillance required significant involvement from FWP regional enforcement staff, biologists, communication and education staff, administrative staff, the Wildlife Health Program, and hired technicians. A special thank you to all the coordinators and technicians that worked sampling stations and regional offices during the general season. We greatly appreciate their help for making this effort a success. We would like to extend a special thank you to the staff at the Montana Veterinary Diagnostic Laboratory, Colorado State University's Veterinary Diagnostic Laboratory, National Veterinary Services Laboratory, and Utah Veterinary Diagnostic Laboratory for analyzing all our samples as quickly as possible. We would also like to thank hunters, landowners, supportive residents and communities, vigilant wildlife watchers, and State, Federal and Tribal agency partners. Funding for this project has come from deer and elk auction license sales, a Pittman-Robertson Management Grant to Montana Fish, Wildlife and Parks, a USDA APHIS CWD Grant, and generous

donations from the Rocky Mountain Elk Foundation and the Mule Deer Foundation.

Appendix I. Additional Figures

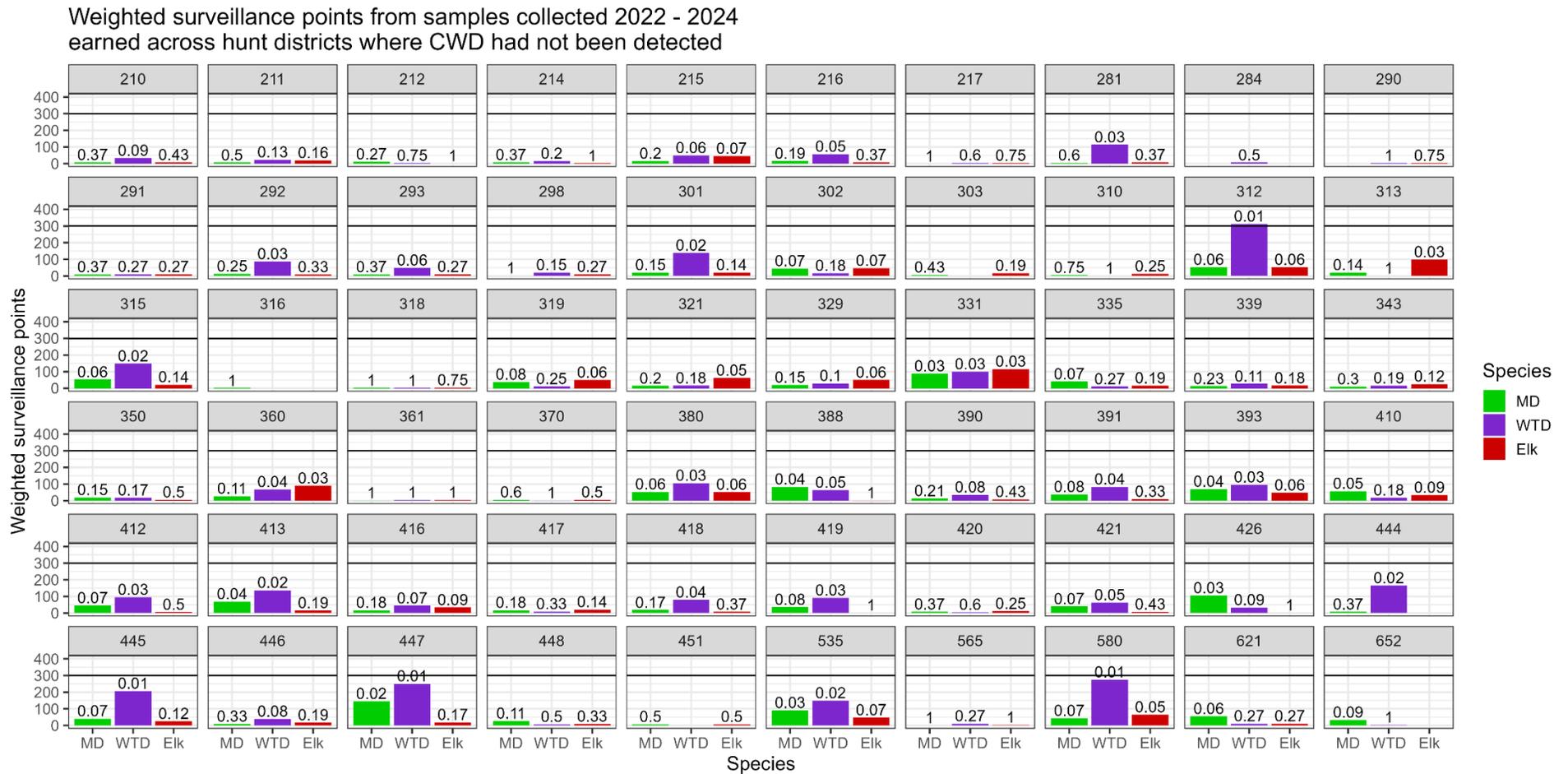


Figure A1. Weighted surveillance points earned for mule deer (MD), white-tailed deer (WTD), and elk within the 2024 hunt districts in Montana, using data collected from the 2022-2024 hunting seasons. Under the weighted surveillance framework, different demographic groups (age, sex, or cause of death categories) of a species are assigned different point-values based on their relative risk of being infected and summed to a total point value. Our goal was to reach 300 weighted surveillance points in mule deer and/or white-tailed deer to detect $\geq 1\%$ prevalence with 95% confidence. Above each bar, we have displayed the threshold prevalence, above which we would expect to detect at least 1 positive if the disease were present, given the number of surveillance points earned. Only hunting districts in the 2024 priority surveillance areas are included in this figure.

Samples Collected 2022-2024 within
Positive Hunting Districts in Priority Monitoring Areas

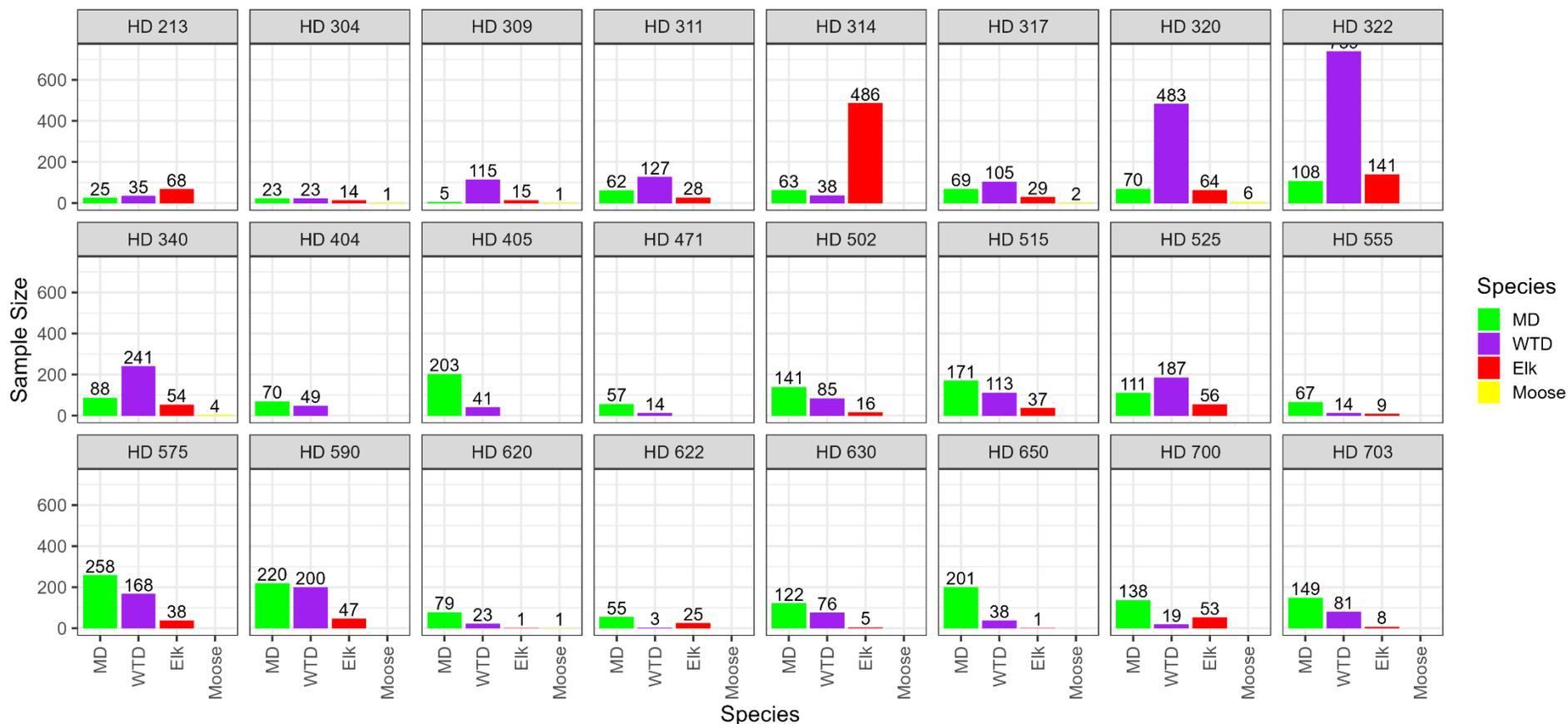


Figure A2. Samples collected from mule deer (MD), white-tailed deer (WTD), elk, and moose within the 2024 priority monitoring areas in Montana, using data collected from the 2022-2024 hunting seasons. We are typically aiming for at least 200 samples distributed across the population, to achieve a prevalence estimate with a margin of error $\leq 3\%$. Above each bar, we have displayed the total number of individuals sampled.

Samples Collected 2022-2024 within
Positive Hunting Districts outside of Priority Monitoring Areas

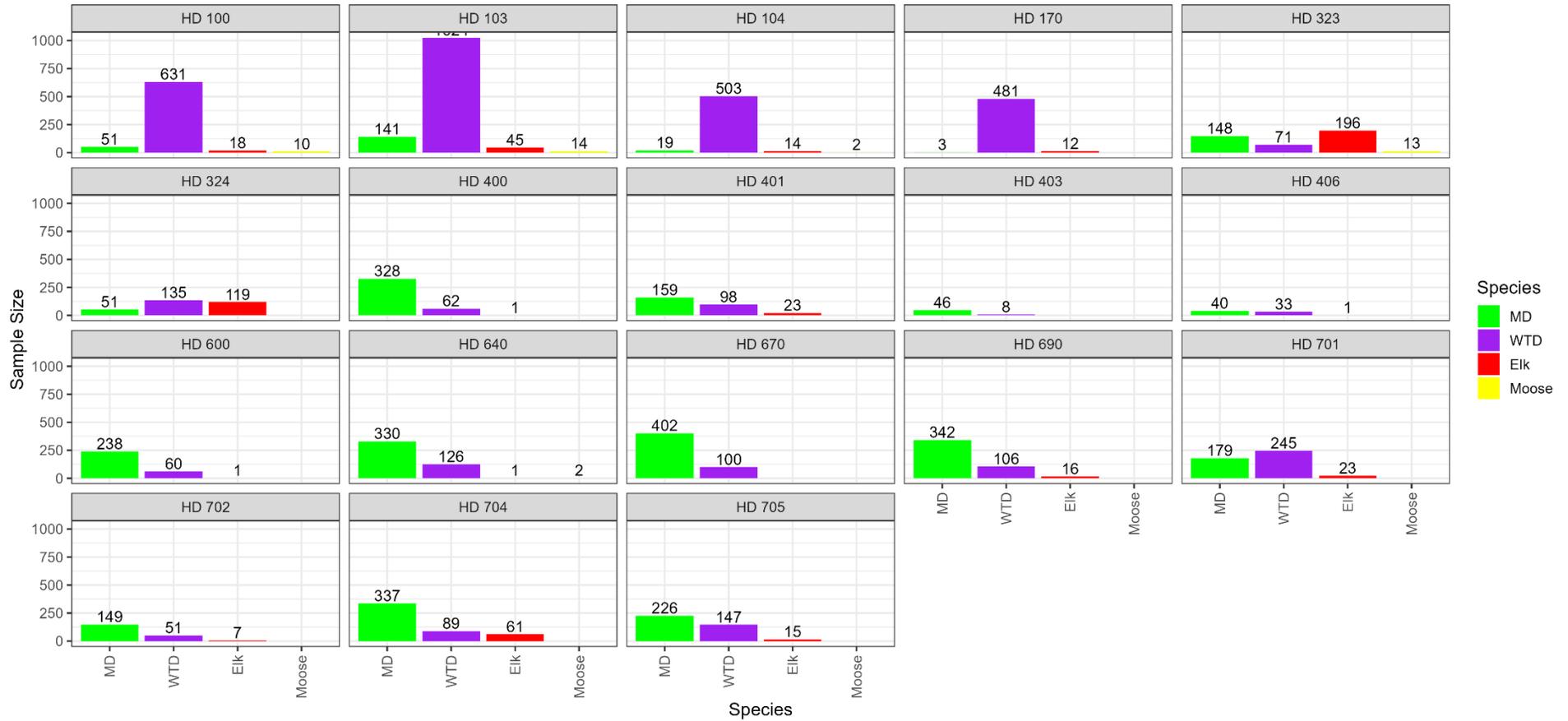


Figure A3. Samples collected from mule deer (MD), white-tailed deer (WTD), elk, and moose in positive hunt districts outside of the 2024 priority monitoring areas in Montana, using data collected from the 2022-2024 hunting seasons. Though these were not 2024 priority monitoring areas, we are looking at how close they fall within the goal for at least 200 samples distributed across the population to achieve a prevalence estimate with a margin of error $\leq 3\%$. Above each bar, we have displayed the total number of individuals sampled.

Number of Samples Collected by Sampling Location (7/01/2024 - 03/25/2025)

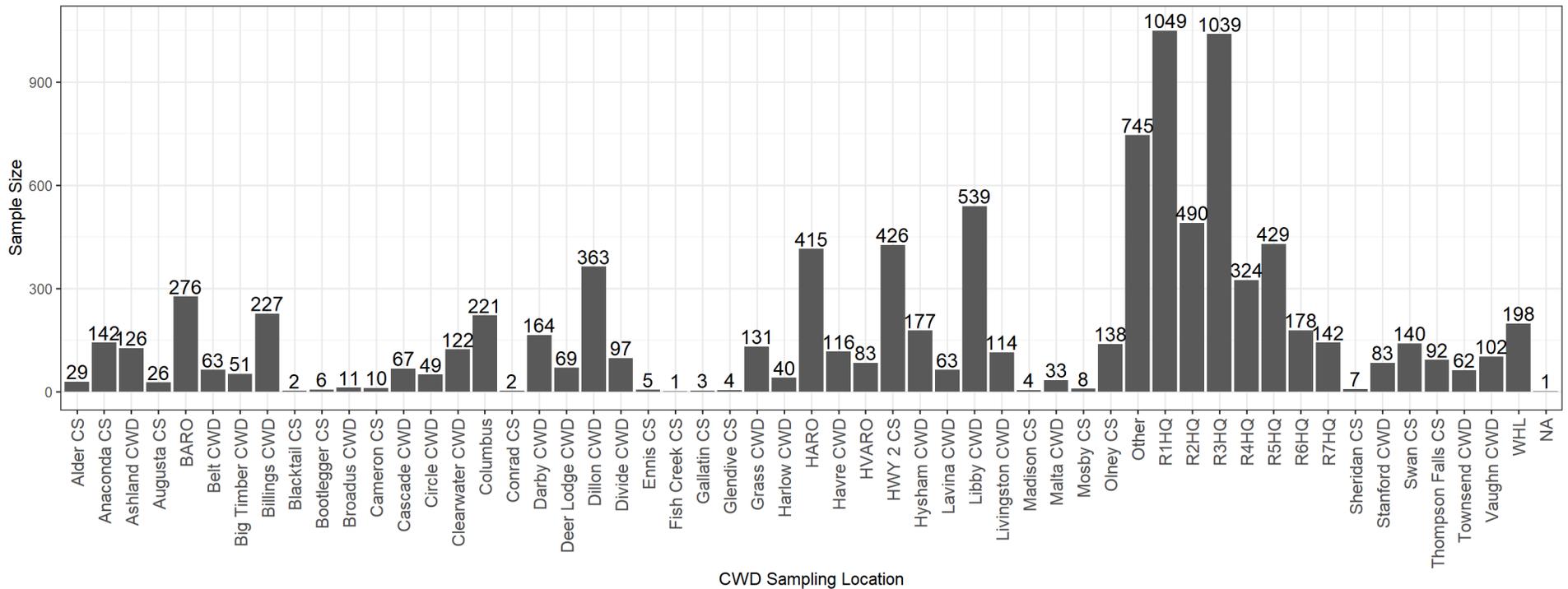


Figure A4. Number of samples collected at various CWD sampling locations around the state during the 2024 hunting season. “HQ” stands for headquarters and “WHL” stands for the Wildlife Health Lab. “HVARO”, “HARO”, and “BARO” stand for Havre Area Resource Office, Helena Area Resource Office, and Butte Area Resource Office, respectively. “CWD” signifies a CWD specific sampling station and “CS” signifies a hunting check station. “Other” includes all the additional locations that samples were collected (e.g. private property, trailheads, BMA, etc.,).

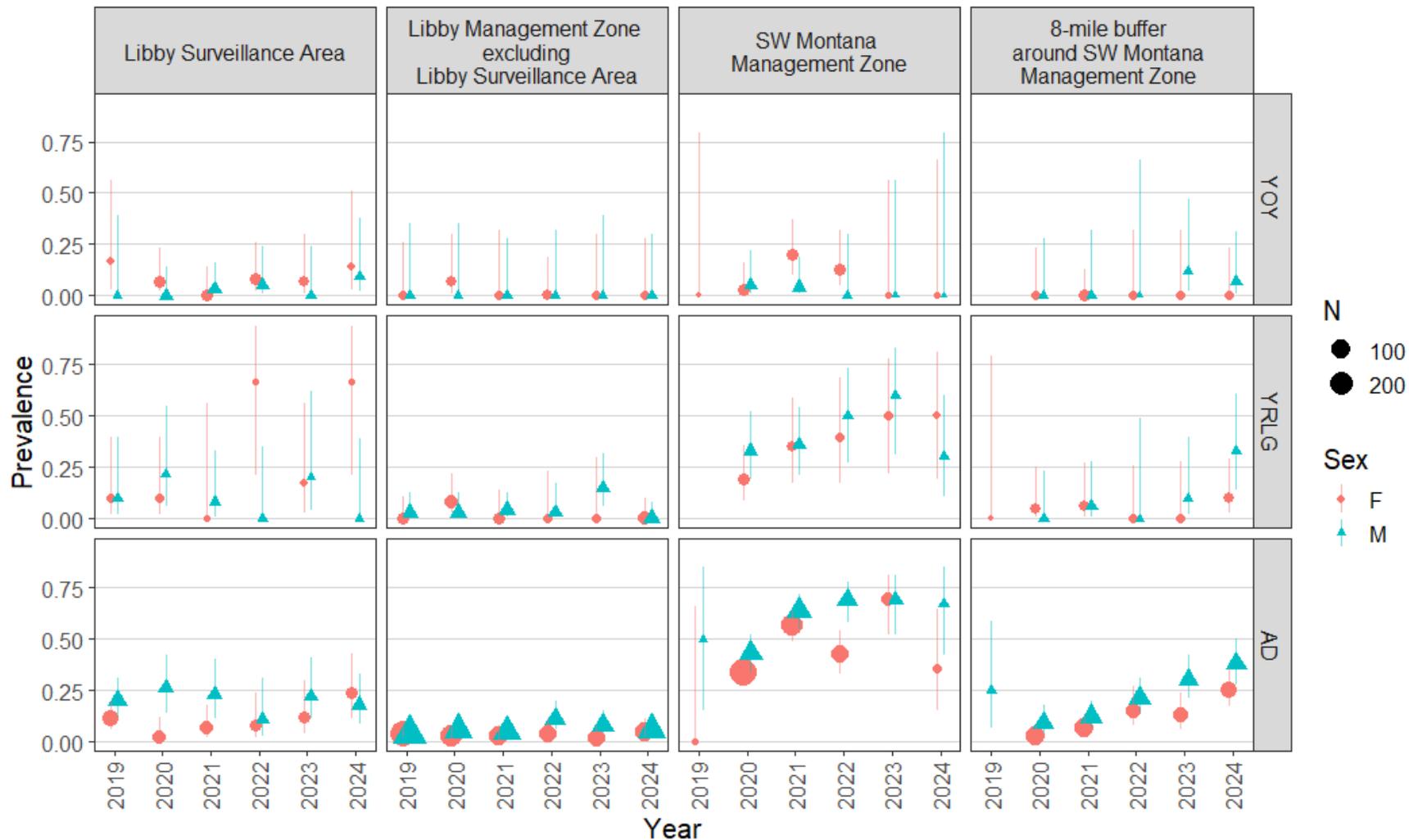


Figure A5. CWD prevalence estimates among white-tailed deer from 2019 -2024 for the Libby Surveillance Area, Libby Management Zone excluding the Libby Surveillance Area, SW Montana Management Zone and an 8-mile buffer around the SW Montana Management Zone. Estimates are shown for young of year (YOY), yearlings (YRLG), and adults (AD). Error bars seen for each point (F = female, M = male) represent the 95% binomial confidence intervals.

Appendix II. Three-year CWD Observed Prevalence

Table A1. CWD prevalence by hunting district (HD) and species among adult deer and by sex, using data from 2022-2024 sampling from hunter-harvested or agency removed (i.e. in Libby) adult animals. Within parentheses, N = number of samples tested, CI = 95% confidence interval. There is no data from 2022-2024 available for hunting districts 141 and 415. While CWD has previously been detected in mule deer in hunting districts 314, 622, and 700 and in white-tailed deer in hunting districts 317 and 575, no positive CWD samples were collected within the three-year period. Blank entries in the rows below represent groups for which we have no data for this period.

HD	Species	Total Prev (N;CI)	Female Prev (N;CI)	Male Prev (N;CI)
100	MD	0.03 (40; 0-0.13)	0 (1; 0-0.79)	0.03 (39; 0-0.13)
100	WTD	0.06 (472; 0.04-0.08)	0.05 (180; 0.03-0.09)	0.07 (292; 0.04-0.1)
101	MD	0 (18; 0-0.18)		0 (18; 0-0.18)
101	WTD	0 (240; 0-0.02)	0 (82; 0-0.04)	0 (158; 0-0.02)
103	MD	0 (126; 0-0.03)		0 (126; 0-0.03)
103	WTD	0.03 (804; 0.02-0.04)	0.03 (227; 0.02-0.06)	0.03 (577; 0.02-0.04)
104	MD	0 (19; 0-0.17)		0 (19; 0-0.17)
104	WTD	0.05 (381; 0.03-0.07)	0.05 (145; 0.02-0.1)	0.05 (236; 0.03-0.08)
110	WTD	0 (68; 0-0.05)	0 (10; 0-0.28)	0 (58; 0-0.06)
120	MD	0 (7; 0-0.35)		0 (7; 0-0.35)
120	WTD	0 (281; 0-0.01)	0 (57; 0-0.06)	0 (224; 0-0.02)
121	MD	0 (15; 0-0.2)		0 (15; 0-0.2)
121	WTD	0 (100; 0-0.04)	0 (18; 0-0.18)	0 (82; 0-0.04)
122	MD	0 (23; 0-0.14)		0 (23; 0-0.14)
122	WTD	0 (126; 0-0.03)	0 (26; 0-0.13)	0 (100; 0-0.04)
123	MD	0 (17; 0-0.18)		0 (17; 0-0.18)
123	WTD	0 (16; 0-0.19)	0 (6; 0-0.39)	0 (10; 0-0.28)
124	MD	0 (3; 0-0.56)		0 (3; 0-0.56)
124	WTD	0 (17; 0-0.18)	0 (4; 0-0.49)	0 (13; 0-0.23)
130	MD	0 (5; 0-0.43)		0 (5; 0-0.43)
130	WTD	0 (203; 0-0.02)	0 (45; 0-0.08)	0 (158; 0-0.02)
140	MD	0 (5; 0-0.43)		0 (5; 0-0.43)

HD	Species	Total Prev (N;CI)	Female Prev (N;CI)	Male Prev (N;CI)
140	WTD	0 (23; 0-0.14)	0 (5; 0-0.43)	0 (18; 0-0.18)
150	WTD	0 (2; 0-0.66)	0 (1; 0-0.79)	0 (1; 0-0.79)
170	MD	0 (2; 0-0.66)		0 (2; 0-0.66)
170	WTD	0.03 (348; 0.02-0.06)	0.04 (177; 0.02-0.08)	0.02 (171; 0.01-0.06)
200	WTD	0 (4; 0-0.49)	0 (2; 0-0.66)	0 (2; 0-0.66)
201	MD	0 (29; 0-0.12)	0 (1; 0-0.79)	0 (28; 0-0.12)
201	WTD	0 (74; 0-0.05)	0 (15; 0-0.2)	0 (59; 0-0.06)
202	MD	0 (5; 0-0.43)	0 (1; 0-0.79)	0 (4; 0-0.49)
202	WTD	0 (41; 0-0.09)	0 (8; 0-0.32)	0 (33; 0-0.1)
204	MD	0 (5; 0-0.43)		0 (5; 0-0.43)
204	WTD	0 (42; 0-0.08)	0 (22; 0-0.15)	0 (20; 0-0.16)
210	MD	0 (5; 0-0.43)	0 (1; 0-0.79)	0 (4; 0-0.49)
210	WTD	0 (14; 0-0.22)	0 (7; 0-0.35)	0 (7; 0-0.35)
211	MD	0 (4; 0-0.49)		0 (4; 0-0.49)
211	WTD	0 (8; 0-0.32)	0 (3; 0-0.56)	0 (5; 0-0.43)
212	MD	0 (11; 0-0.26)	0 (1; 0-0.79)	0 (10; 0-0.28)
212	WTD	0 (2; 0-0.66)	0 (2; 0-0.66)	
213	MD	0.05 (20; 0.01-0.24)	0 (5; 0-0.43)	0.07 (15; 0.01-0.3)
213	WTD	0 (27; 0-0.12)	0 (11; 0-0.26)	0 (16; 0-0.19)
214	MD	0 (6; 0-0.39)		0 (6; 0-0.39)
214	WTD	0 (5; 0-0.43)	0 (2; 0-0.66)	0 (3; 0-0.56)
215	MD	0 (13; 0-0.23)	0 (1; 0-0.79)	0 (12; 0-0.24)
215	WTD	0 (17; 0-0.18)	0 (5; 0-0.43)	0 (12; 0-0.24)
216	MD	0 (16; 0-0.19)		0 (16; 0-0.19)
216	WTD	0 (20; 0-0.16)	0 (6; 0-0.39)	0 (14; 0-0.22)
217	WTD	0 (1; 0-0.79)		0 (1; 0-0.79)
240	MD	0 (10; 0-0.28)	0 (1; 0-0.79)	0 (9; 0-0.3)
240	WTD	0 (59; 0-0.06)	0 (9; 0-0.3)	0 (50; 0-0.07)
250	MD	0 (12; 0-0.24)		0 (12; 0-0.24)

HD	Species	Total Prev (N;CI)	Female Prev (N;CI)	Male Prev (N;CI)
250	WTD	0 (38; 0-0.09)	0 (4; 0-0.49)	0 (34; 0-0.1)
260	WTD	0 (14; 0-0.22)	0 (3; 0-0.56)	0 (11; 0-0.26)
261	MD	0 (2; 0-0.66)		0 (2; 0-0.66)
261	WTD	0 (6; 0-0.39)	0 (1; 0-0.79)	0 (5; 0-0.43)
262	MD	0 (2; 0-0.66)	0 (2; 0-0.66)	
262	WTD	0 (18; 0-0.18)	0 (5; 0-0.43)	0 (13; 0-0.23)
270	MD	0 (49; 0-0.07)	0 (14; 0-0.22)	0 (35; 0-0.1)
270	WTD	0 (75; 0-0.05)	0 (12; 0-0.24)	0 (63; 0-0.06)
280	MD	0 (1; 0-0.79)		0 (1; 0-0.79)
280	WTD	0 (2; 0-0.66)	0 (1; 0-0.79)	0 (1; 0-0.79)
281	MD	0 (5; 0-0.43)		0 (5; 0-0.43)
281	WTD	0 (36; 0-0.1)	0 (6; 0-0.39)	0 (30; 0-0.11)
282	MD	0 (2; 0-0.66)		0 (2; 0-0.66)
282	WTD	0 (5; 0-0.43)	0 (3; 0-0.56)	0 (2; 0-0.66)
284	WTD	0 (2; 0-0.66)		0 (2; 0-0.66)
285	MD	0 (14; 0-0.22)		0 (14; 0-0.22)
285	WTD	0 (108; 0-0.03)	0 (24; 0-0.14)	0 (84; 0-0.04)
290	WTD	0 (1; 0-0.79)		0 (1; 0-0.79)
291	MD	0 (8; 0-0.32)		0 (8; 0-0.32)
291	WTD	0 (4; 0-0.49)	0 (1; 0-0.79)	0 (3; 0-0.56)
292	MD	0 (12; 0-0.24)	0 (1; 0-0.79)	0 (11; 0-0.26)
292	WTD	0 (29; 0-0.12)	0 (7; 0-0.35)	0 (22; 0-0.15)
293	MD	0 (9; 0-0.3)	0 (2; 0-0.66)	0 (7; 0-0.35)
293	WTD	0 (16; 0-0.19)	0 (3; 0-0.56)	0 (13; 0-0.23)
298	MD	0 (3; 0-0.56)		0 (3; 0-0.56)
298	WTD	0 (6; 0-0.39)		0 (6; 0-0.39)
301	MD	0 (18; 0-0.18)	0 (1; 0-0.79)	0 (17; 0-0.18)
301	WTD	0 (46; 0-0.08)	0 (13; 0-0.23)	0 (33; 0-0.1)
302	MD	0 (51; 0-0.07)	0 (15; 0-0.2)	0 (36; 0-0.1)

HD	Species	Total Prev (N;CI)	Female Prev (N;CI)	Male Prev (N;CI)
302	WTD	0 (6; 0-0.39)	0 (2; 0-0.66)	0 (4; 0-0.49)
303	MD	0 (6; 0-0.39)	0 (3; 0-0.56)	0 (3; 0-0.56)
304	MD	0 (19; 0-0.17)	0 (1; 0-0.79)	0 (18; 0-0.18)
304	WTD	0.05 (19; 0.01-0.25)	0 (7; 0-0.35)	0.08 (12; 0.01-0.35)
309	MD	0 (5; 0-0.43)		0 (5; 0-0.43)
309	WTD	0.01 (95; 0-0.06)	0.03 (39; 0-0.13)	0 (56; 0-0.06)
310	MD	0 (4; 0-0.49)		0 (4; 0-0.49)
311	MD	0 (48; 0-0.07)	0 (19; 0-0.17)	0 (29; 0-0.12)
311	WTD	0.01 (89; 0-0.06)	0 (31; 0-0.11)	0.02 (58; 0-0.09)
312	MD	0 (28; 0-0.12)	0 (9; 0-0.3)	0 (19; 0-0.17)
312	WTD	0 (111; 0-0.03)	0 (43; 0-0.08)	0 (68; 0-0.05)
313	MD	0 (22; 0-0.15)	0 (9; 0-0.3)	0 (13; 0-0.23)
314	MD	0 (59; 0-0.06)	0 (17; 0-0.18)	0 (42; 0-0.08)
314	WTD	0 (34; 0-0.1)	0 (16; 0-0.19)	0 (18; 0-0.18)
315	MD	0 (59; 0-0.06)	0 (20; 0-0.16)	0 (39; 0-0.09)
315	WTD	0 (63; 0-0.06)	0 (35; 0-0.1)	0 (28; 0-0.12)
316	MD	0 (1; 0-0.79)		0 (1; 0-0.79)
317	MD	0 (62; 0-0.06)	0 (16; 0-0.19)	0 (46; 0-0.08)
317	WTD	0 (91; 0-0.04)	0 (39; 0-0.09)	0 (52; 0-0.07)
318	MD	0 (3; 0-0.56)		0 (3; 0-0.56)
319	MD	0 (24; 0-0.14)	0 (5; 0-0.43)	0 (19; 0-0.17)
319	WTD	0 (6; 0-0.39)	0 (4; 0-0.49)	0 (2; 0-0.66)
320	MD	0.02 (52; 0-0.1)	0 (15; 0-0.2)	0.03 (37; 0-0.14)
320	WTD	0.14 (373; 0.11-0.18)	0.14 (186; 0.1-0.2)	0.14 (187; 0.1-0.2)
321	MD	0 (15; 0-0.2)	0 (2; 0-0.66)	0 (13; 0-0.23)
321	WTD	0 (8; 0-0.32)	0 (6; 0-0.39)	0 (2; 0-0.66)
322	MD	0.18 (92; 0.12-0.28)	0.17 (42; 0.08-0.31)	0.2 (50; 0.11-0.33)
322	WTD	0.39 (532; 0.35-0.43)	0.3 (267; 0.25-0.36)	0.47 (265; 0.41-0.53)
323	MD	0 (130; 0-0.03)	0 (34; 0-0.1)	0 (96; 0-0.04)

HD	Species	Total Prev (N;CI)	Female Prev (N;CI)	Male Prev (N;CI)
323	WTD	0.06 (54; 0.02-0.15)	0 (22; 0-0.15)	0.09 (32; 0.03-0.24)
324	MD	0 (44; 0-0.08)	0 (18; 0-0.18)	0 (26; 0-0.13)
324	WTD	0.03 (115; 0.01-0.07)	0.02 (50; 0-0.1)	0.03 (65; 0.01-0.11)
329	MD	0 (21; 0-0.15)	0 (3; 0-0.56)	0 (18; 0-0.18)
329	WTD	0 (9; 0-0.3)	0 (2; 0-0.66)	0 (7; 0-0.35)
331	MD	0 (91; 0-0.04)	0 (26; 0-0.13)	0 (65; 0-0.06)
331	WTD	0 (35; 0-0.1)	0 (11; 0-0.26)	0 (24; 0-0.14)
335	MD	0 (40; 0-0.09)	0 (5; 0-0.43)	0 (35; 0-0.1)
335	WTD	0 (4; 0-0.49)	0 (1; 0-0.79)	0 (3; 0-0.56)
339	MD	0 (13; 0-0.23)	0 (2; 0-0.66)	0 (11; 0-0.26)
339	WTD	0 (10; 0-0.28)	0 (3; 0-0.56)	0 (7; 0-0.35)
340	MD	0.07 (75; 0.03-0.15)	0 (18; 0-0.18)	0.09 (57; 0.04-0.19)
340	WTD	0.22 (209; 0.17-0.29)	0.17 (75; 0.1-0.27)	0.25 (134; 0.19-0.33)
343	MD	0 (10; 0-0.28)	0 (1; 0-0.79)	0 (9; 0-0.3)
343	WTD	0 (6; 0-0.39)	0 (2; 0-0.66)	0 (4; 0-0.49)
350	MD	0 (18; 0-0.18)	0 (1; 0-0.79)	0 (17; 0-0.18)
350	WTD	0 (7; 0-0.35)	0 (5; 0-0.43)	0 (2; 0-0.66)
360	MD	0 (22; 0-0.15)	0 (1; 0-0.79)	0 (21; 0-0.15)
360	WTD	0 (26; 0-0.13)	0 (12; 0-0.24)	0 (14; 0-0.22)
361	MD	0 (1; 0-0.79)		0 (1; 0-0.79)
361	WTD	0 (1; 0-0.79)		0 (1; 0-0.79)
370	MD	0 (5; 0-0.43)	0 (1; 0-0.79)	0 (4; 0-0.49)
380	MD	0 (54; 0-0.07)	0 (13; 0-0.23)	0 (41; 0-0.09)
380	WTD	0 (36; 0-0.1)	0 (10; 0-0.28)	0 (26; 0-0.13)
388	MD	0 (71; 0-0.05)	0 (50; 0-0.07)	0 (21; 0-0.15)
388	WTD	0 (19; 0-0.17)	0 (8; 0-0.32)	0 (11; 0-0.26)
390	MD	0 (14; 0-0.22)	0 (1; 0-0.79)	0 (13; 0-0.23)
390	WTD	0 (13; 0-0.23)	0 (4; 0-0.49)	0 (9; 0-0.3)
391	MD	0 (38; 0-0.09)	0 (6; 0-0.39)	0 (32; 0-0.11)

HD	Species	Total Prev (N;CI)	Female Prev (N;CI)	Male Prev (N;CI)
391	WTD	0 (30; 0-0.11)	0 (8; 0-0.32)	0 (22; 0-0.15)
392	MD	0 (15; 0-0.2)	0 (1; 0-0.79)	0 (14; 0-0.22)
392	WTD	0 (1; 0-0.79)	0 (1; 0-0.79)	
393	MD	0 (67; 0-0.05)	0 (7; 0-0.35)	0 (60; 0-0.06)
393	WTD	0 (31; 0-0.11)	0 (6; 0-0.39)	0 (25; 0-0.13)
400	MD	0.04 (272; 0.03-0.08)	0.01 (118; 0-0.05)	0.07 (154; 0.04-0.12)
400	WTD	0.08 (53; 0.03-0.18)	0 (11; 0-0.26)	0.1 (42; 0.04-0.22)
401	MD	0.06 (143; 0.03-0.11)	0.02 (42; 0-0.12)	0.07 (101; 0.03-0.14)
401	WTD	0.03 (86; 0.01-0.1)	0.07 (27; 0.02-0.23)	0.02 (59; 0-0.09)
403	MD	0.02 (42; 0-0.12)	0 (9; 0-0.3)	0.03 (33; 0.01-0.15)
403	WTD	0 (7; 0-0.35)	0 (2; 0-0.66)	0 (5; 0-0.43)
404	MD	0.02 (60; 0-0.09)	0 (15; 0-0.2)	0.02 (45; 0-0.12)
404	WTD	0 (43; 0-0.08)	0 (21; 0-0.15)	0 (22; 0-0.15)
405	MD	0.02 (176; 0.01-0.05)	0 (76; 0-0.05)	0.03 (100; 0.01-0.08)
405	WTD	0 (37; 0-0.09)	0 (7; 0-0.35)	0 (30; 0-0.11)
406	MD	0.03 (37; 0-0.14)	0.07 (14; 0.01-0.31)	0 (23; 0-0.14)
406	WTD	0.07 (30; 0.02-0.21)	0 (10; 0-0.28)	0.1 (20; 0.03-0.3)
410	MD	0 (61; 0-0.06)	0 (9; 0-0.3)	0 (52; 0-0.07)
410	WTD	0 (5; 0-0.43)	0 (1; 0-0.79)	0 (4; 0-0.49)
411	MD	0 (77; 0-0.05)	0 (12; 0-0.24)	0 (65; 0-0.06)
411	WTD	0 (94; 0-0.04)	0 (10; 0-0.28)	0 (84; 0-0.04)
412	MD	0 (49; 0-0.07)	0 (9; 0-0.3)	0 (40; 0-0.09)
412	WTD	0 (35; 0-0.1)	0 (12; 0-0.24)	0 (23; 0-0.14)
413	MD	0 (60; 0-0.06)	0 (5; 0-0.43)	0 (55; 0-0.07)
413	WTD	0 (55; 0-0.07)	0 (24; 0-0.14)	0 (31; 0-0.11)
416	MD	0 (16; 0-0.19)	0 (1; 0-0.79)	0 (15; 0-0.2)
416	WTD	0 (17; 0-0.18)	0 (6; 0-0.39)	0 (11; 0-0.26)
417	MD	0 (16; 0-0.19)		0 (16; 0-0.19)
417	WTD	0 (4; 0-0.49)	0 (2; 0-0.66)	0 (2; 0-0.66)

HD	Species	Total Prev (N;CI)	Female Prev (N;CI)	Male Prev (N;CI)
418	MD	0 (18; 0-0.18)	0 (1; 0-0.79)	0 (17; 0-0.18)
418	WTD	0 (31; 0-0.11)	0 (12; 0-0.24)	0 (19; 0-0.17)
419	MD	0 (39; 0-0.09)	0 (9; 0-0.3)	0 (30; 0-0.11)
419	WTD	0 (29; 0-0.12)	0 (5; 0-0.43)	0 (24; 0-0.14)
420	MD	0 (8; 0-0.32)		0 (8; 0-0.32)
420	WTD	0 (2; 0-0.66)	0 (1; 0-0.79)	0 (1; 0-0.79)
421	MD	0 (42; 0-0.08)	0 (9; 0-0.3)	0 (33; 0-0.1)
421	WTD	0 (20; 0-0.16)	0 (6; 0-0.39)	0 (14; 0-0.22)
422	MD	0 (7; 0-0.35)		0 (7; 0-0.35)
422	WTD	0 (11; 0-0.26)	0 (4; 0-0.49)	0 (7; 0-0.35)
424	WTD	0 (2; 0-0.66)	0 (1; 0-0.79)	0 (1; 0-0.79)
425	MD	0 (10; 0-0.28)	0 (6; 0-0.39)	0 (4; 0-0.49)
425	WTD	0 (7; 0-0.35)	0 (5; 0-0.43)	0 (2; 0-0.66)
426	MD	0 (109; 0-0.03)	0 (8; 0-0.32)	0 (101; 0-0.04)
426	WTD	0 (12; 0-0.24)	0 (3; 0-0.56)	0 (9; 0-0.3)
441	MD	0 (10; 0-0.28)	0 (2; 0-0.66)	0 (8; 0-0.32)
441	WTD	0 (24; 0-0.14)	0 (9; 0-0.3)	0 (15; 0-0.2)
442	MD	0 (2; 0-0.66)		0 (2; 0-0.66)
442	WTD	0 (4; 0-0.49)	0 (1; 0-0.79)	0 (3; 0-0.56)
444	MD	0 (10; 0-0.28)	0 (6; 0-0.39)	0 (4; 0-0.49)
444	WTD	0 (60; 0-0.06)	0 (28; 0-0.12)	0 (32; 0-0.11)
445	MD	0 (43; 0-0.08)	0 (6; 0-0.39)	0 (37; 0-0.09)
445	WTD	0 (79; 0-0.05)	0 (37; 0-0.09)	0 (42; 0-0.08)
446	MD	0 (9; 0-0.3)	0 (1; 0-0.79)	0 (8; 0-0.32)
446	WTD	0 (13; 0-0.23)	0 (7; 0-0.35)	0 (6; 0-0.39)
447	MD	0 (148; 0-0.03)	0 (13; 0-0.23)	0 (135; 0-0.03)
447	WTD	0 (95; 0-0.04)	0 (36; 0-0.1)	0 (59; 0-0.06)
448	MD	0 (27; 0-0.12)	0 (4; 0-0.49)	0 (23; 0-0.14)
448	WTD	0 (3; 0-0.56)	0 (2; 0-0.66)	0 (1; 0-0.79)

HD	Species	Total Prev (N;CI)	Female Prev (N;CI)	Male Prev (N;CI)
450	MD	0 (17; 0-0.18)	0 (2; 0-0.66)	0 (15; 0-0.2)
450	WTD	0 (14; 0-0.22)	0 (7; 0-0.35)	0 (7; 0-0.35)
451	MD	0 (6; 0-0.39)		0 (6; 0-0.39)
452	MD	0 (21; 0-0.15)		0 (21; 0-0.15)
452	WTD	0 (32; 0-0.11)	0 (20; 0-0.16)	0 (12; 0-0.24)
455	MD	0 (1; 0-0.79)		0 (1; 0-0.79)
455	WTD	0 (2; 0-0.66)		0 (2; 0-0.66)
471	MD	0.02 (56; 0-0.09)	0 (4; 0-0.49)	0.02 (52; 0-0.1)
471	WTD	0.1 (10; 0.02-0.4)	0 (2; 0-0.66)	0.12 (8; 0.02-0.47)
502	MD	0.06 (125; 0.03-0.12)	0.07 (30; 0.02-0.21)	0.06 (95; 0.03-0.13)
502	WTD	0.05 (64; 0.02-0.13)	0.03 (31; 0.01-0.16)	0.06 (33; 0.02-0.2)
515	MD	0.02 (150; 0.01-0.06)	0 (34; 0-0.1)	0.03 (116; 0.01-0.07)
515	WTD	0 (80; 0-0.05)	0 (31; 0-0.11)	0 (49; 0-0.07)
525	MD	0 (93; 0-0.04)	0 (8; 0-0.32)	0 (85; 0-0.04)
525	WTD	0.01 (145; 0-0.04)	0 (59; 0-0.06)	0.01 (86; 0-0.06)
535	MD	0 (100; 0-0.04)	0 (26; 0-0.13)	0 (74; 0-0.05)
535	WTD	0 (48; 0-0.07)	0 (8; 0-0.32)	0 (40; 0-0.09)
540	MD	0 (11; 0-0.26)		0 (11; 0-0.26)
540	WTD	0 (22; 0-0.15)	0 (14; 0-0.22)	0 (8; 0-0.32)
555	MD	0.03 (58; 0.01-0.12)	0 (20; 0-0.16)	0.05 (38; 0.01-0.17)
555	WTD	0.18 (11; 0.05-0.48)	0 (3; 0-0.56)	0.25 (8; 0.07-0.59)
565	MD	0 (1; 0-0.79)		0 (1; 0-0.79)
565	WTD	0 (4; 0-0.49)	0 (2; 0-0.66)	0 (2; 0-0.66)
575	MD	0.02 (217; 0.01-0.05)	0.01 (72; 0-0.07)	0.03 (145; 0.01-0.07)
575	WTD	0 (126; 0-0.03)	0 (54; 0-0.07)	0 (72; 0-0.05)
580	MD	0 (42; 0-0.08)	0 (4; 0-0.49)	0 (38; 0-0.09)
580	WTD	0 (110; 0-0.03)	0 (48; 0-0.07)	0 (62; 0-0.06)
590	MD	0 (197; 0-0.02)	0 (24; 0-0.14)	0 (173; 0-0.02)
590	WTD	0.11 (178; 0.07-0.17)	0.09 (58; 0.04-0.19)	0.12 (120; 0.08-0.2)

HD	Species	Total Prev (N;CI)	Female Prev (N;CI)	Male Prev (N;CI)
600	MD	0.23 (198; 0.17-0.29)	0.12 (65; 0.06-0.22)	0.28 (133; 0.21-0.36)
600	WTD	0.07 (46; 0.02-0.18)	0 (12; 0-0.24)	0.09 (34; 0.03-0.23)
620	MD	0.01 (72; 0-0.07)	0 (14; 0-0.22)	0.02 (58; 0-0.09)
620	WTD	0.06 (17; 0.01-0.27)	0 (5; 0-0.43)	0.08 (12; 0.01-0.35)
621	MD	0 (56; 0-0.06)	0 (7; 0-0.35)	0 (49; 0-0.07)
621	WTD	0 (4; 0-0.49)	0 (1; 0-0.79)	0 (3; 0-0.56)
622	MD	0 (49; 0-0.07)	0 (9; 0-0.3)	0 (40; 0-0.09)
622	WTD	0 (3; 0-0.56)	0 (3; 0-0.56)	
630	MD	0.03 (112; 0.01-0.08)	0.06 (32; 0.02-0.2)	0.01 (80; 0-0.07)
630	WTD	0.03 (66; 0.01-0.1)	0 (19; 0-0.17)	0.04 (47; 0.01-0.14)
640	MD	0.2 (295; 0.16-0.25)	0.12 (94; 0.07-0.2)	0.24 (201; 0.19-0.3)
640	WTD	0.05 (110; 0.02-0.1)	0.03 (29; 0.01-0.17)	0.05 (81; 0.02-0.12)
650	MD	0.03 (186; 0.01-0.06)	0 (44; 0-0.08)	0.04 (142; 0.02-0.08)
650	WTD	0.03 (33; 0.01-0.15)	0.09 (11; 0.02-0.38)	0 (22; 0-0.15)
652	MD	0 (31; 0-0.11)	0 (3; 0-0.56)	0 (28; 0-0.12)
652	WTD	0 (1; 0-0.79)		0 (1; 0-0.79)
670	MD	0.17 (370; 0.14-0.21)	0.05 (102; 0.02-0.11)	0.22 (268; 0.17-0.27)
670	WTD	0.03 (88; 0.01-0.1)	0.07 (15; 0.01-0.3)	0.03 (73; 0.01-0.09)
690	MD	0.03 (308; 0.02-0.06)	0.01 (79; 0-0.07)	0.04 (229; 0.02-0.07)
690	WTD	0.02 (93; 0.01-0.08)	0.03 (32; 0.01-0.16)	0.02 (61; 0-0.09)
700	MD	0 (132; 0-0.03)	0 (17; 0-0.18)	0 (115; 0-0.03)
700	WTD	0 (15; 0-0.2)	0 (3; 0-0.56)	0 (12; 0-0.24)
701	MD	0.01 (168; 0-0.04)	0 (12; 0-0.24)	0.01 (156; 0-0.05)
701	WTD	0.02 (212; 0.01-0.05)	0 (41; 0-0.09)	0.03 (171; 0.01-0.07)
702	MD	0.01 (145; 0-0.05)	0.08 (13; 0.01-0.33)	0.01 (132; 0-0.04)
702	WTD	0.07 (44; 0.02-0.18)	0 (7; 0-0.35)	0.08 (37; 0.03-0.21)
703	MD	0.01 (142; 0-0.04)	0 (16; 0-0.19)	0.01 (126; 0-0.04)
703	WTD	0 (69; 0-0.05)	0 (22; 0-0.15)	0 (47; 0-0.08)
704	MD	0.03 (312; 0.01-0.05)	0 (26; 0-0.13)	0.03 (286; 0.01-0.05)

HD	Species	Total Prev (N;CI)	Female Prev (N;CI)	Male Prev (N;CI)
704	WTD	0.08 (77; 0.04-0.16)	0.04 (26; 0.01-0.19)	0.1 (51; 0.04-0.21)
705	MD	0.01 (206; 0-0.03)	0 (40; 0-0.09)	0.01 (166; 0-0.04)
705	WTD	0.15 (118; 0.1-0.23)	0.09 (43; 0.04-0.22)	0.19 (75; 0.11-0.29)

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