



Wyoming Game and Fish Department 2023 Brucellosis Surveillance in Non-Feedground Elk Herds February 2024



Overview:

Each year the Wyoming Game and Fish Department (WGFD) monitors the distribution and prevalence of brucellosis (*Brucella abortus*) within the state's elk populations with blood samples collected mostly by hunters and occasionally by department personnel. Between 8,000 and 9,000 blood collection kits are mailed to elk hunters successful in acquiring limited quota licenses within targeted surveillance areas. Annual surveillance is conducted in herds that surround the Brucellosis Designated Surveillance Area (DSA) and in herds that do not use state or federal feedgrounds (Figure 1). Additional surveillance occurs in a quarter of the hunt areas located outside of the DSA, providing coverage of the entire brucellosis non-endemic area every 4-5 years. Approximately 22,800 elk blood samples have been analyzed since this programs inception in 1991.

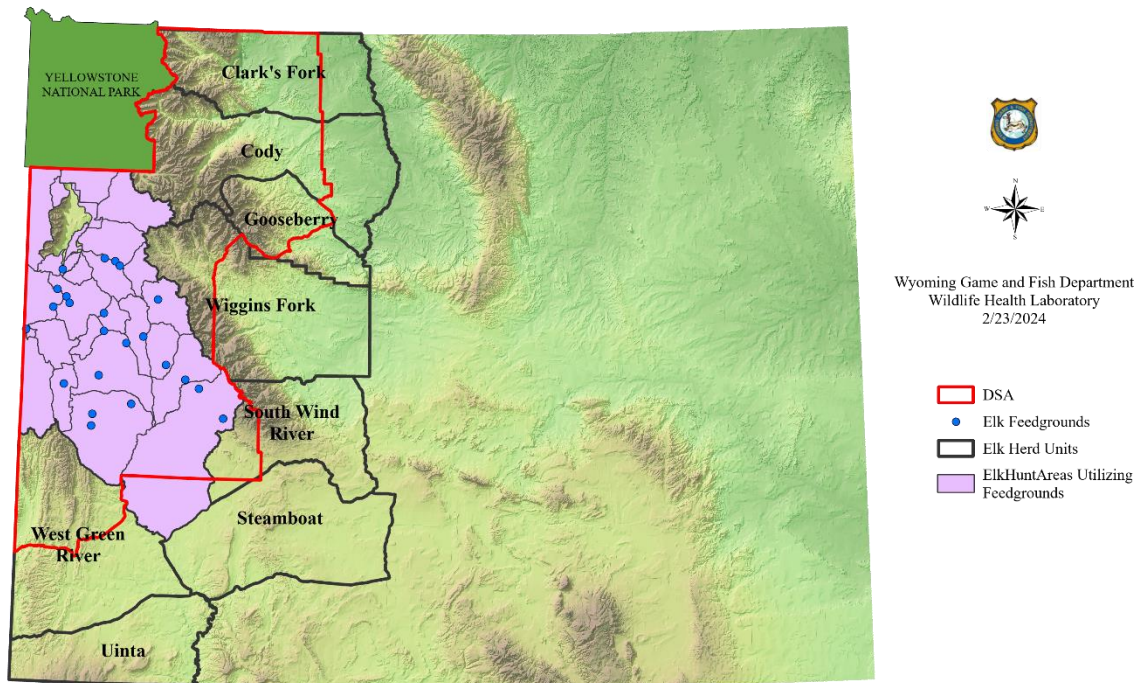


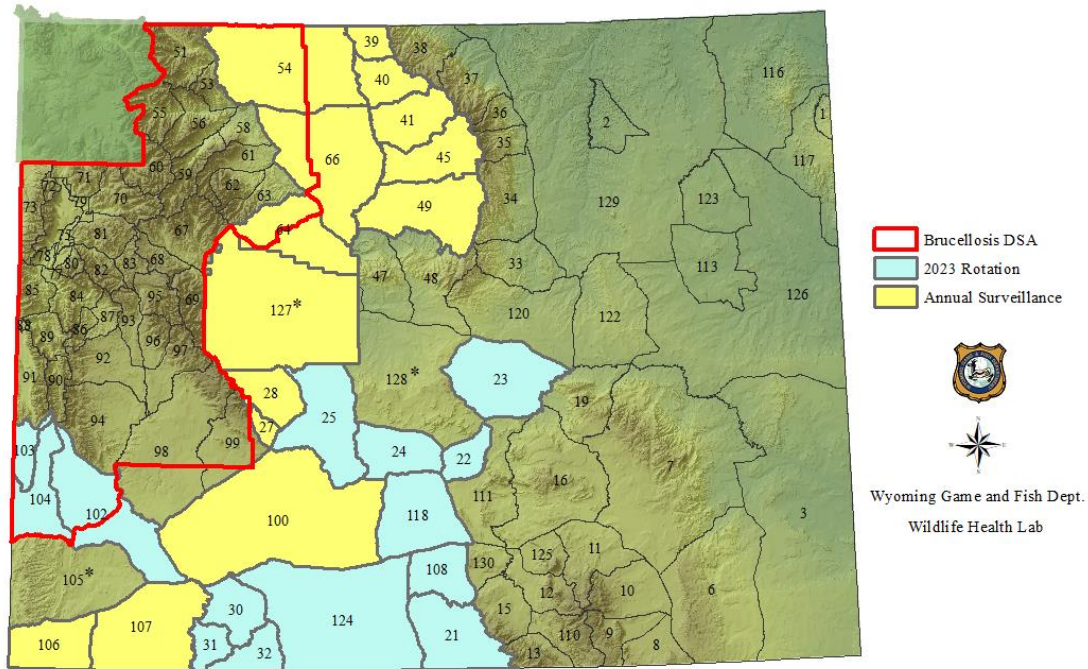
Figure 1. Locations of Wyoming feedgrounds (blue dots), surrounding non-feedground elk herd units (bolded black line), and the Designated Surveillance Area (DSA) (red line).

2023 Surveillance:

Methods:

In 2023, ~9000 blood collection kits were mailed or directly handed out to elk hunters in targeted hunt areas. Surveillance included the western Bighorn Mountains, the eastern border of the DSA,

and down to the southwestern corner of the state (Figure 2). The blood collection kits consisted of a 15 ml sterile polypropylene conical tube, a paper towel, an instruction/data sheet, and a prepaid mailing label for return shipping. Samples were also obtained opportunistically in association with various research efforts.



* Elk hunt areas with only general licenses available. Hunt area 127 surveillance completed with help from USFWS and the Wind River Indian Reservation.

Figure 2. Annual and rotating brucellosis surveillance in Wyoming non-feedground Elk

All useable samples were analyzed at the WGFD Wildlife Health Laboratory (WHL). Serologic assays for exposure to *B. abortus* were conducted and interpreted using current assay kit protocols for the fluorescence polarization assay (FPA) plate tests and National Veterinary Services Laboratories (NVSL) protocols for FPA tube tests. The FPA plate test was used to screen all samples, and all positive or suspect reactions on the plate assay were confirmed with the FPA tube test. Any samples outside of the endemic or exposure region (Figure 3) testing positive were sent to NVSL for confirmation. Seroprevalence of elk within the known endemic or exposure areas are based on yearling and adult females; males and juveniles are included in surveillance data outside of the known endemic or exposure areas. Including serologic data from males and juveniles offers improved detection of brucellosis in areas where this disease is not known to occur.

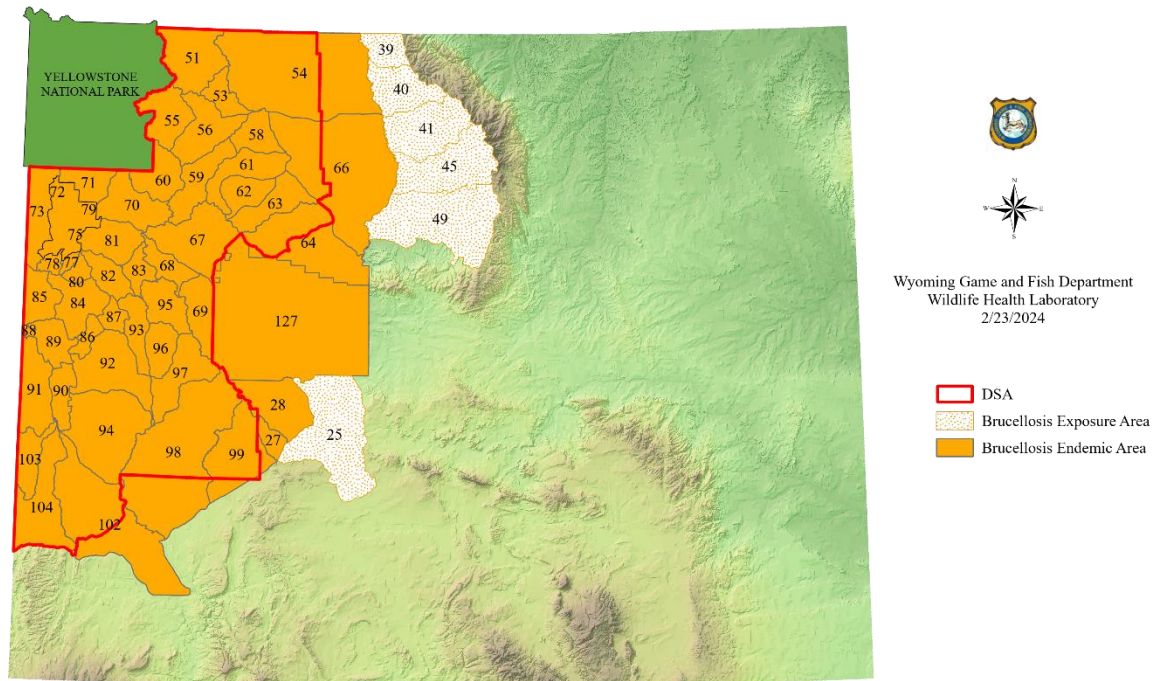


Figure 3. Wyoming elk hunt areas with brucellosis status; brucellosis endemic areas (orange), brucellosis exposure areas (white with orange dots), and DSA (red line).

Serologic tests have improved and become less subjective and most hemolyzed serum samples have become suitable for testing and can contribute to the areas sample size (Jennings-Gaines et al., 2021). Hemolyzed serum samples received from within the DSA are discarded.

The number of hunt areas surveyed and the number of blood collection kits mailed to hunters was based on the priorities of the WGFD and the Wyoming Livestock Board, while balancing the capacity of the WHL. Enhanced surveillance efforts were conducted in the Green River region where two brucellosis technicians were hired to assist in sample acquisition focusing primarily on elk areas 102, 103, 104, 105, 106 and 107. The 2023 surveillance effort was supported by WGFD, and by a cooperative agreement with USDA/APHIS.

Results and Discussion:

In 2023, 1,415 elk blood samples were received by the WHL; from ~9,000 kits mailed or handed out. Of those, 1,400 were suitable for testing. This year's testable numbers are higher than the average returns seen in previous years, with an average testable rate of 1,057 from 2019-2022.

From the 1,400 blood samples tested for *B. abortus* specific antibodies, 36 were seropositive, with two being from hunt areas completely outside of the DSA. One from hunt area 45, on the western slope of the Bighorn Mountains, and the other from hunt area 25, on the southern tip of the Wind River Range.

Bighorn Mountains Brucellosis Surveillance:

Since 2014, 5,100 samples have been tested from the Bighorn Mountains (Figure 4). The first seropositive samples were detected in 2012 from two harvested elk (bull and cow; hunt area 40). From 2013-2016 there were nine seropositive elk samples, from four hunt areas in this region (3 bulls and 6 cows; 39, 40, 41, and 49). From 2017-2021, there were no additional detections.

Due to the lack of seropositive samples, in 2021, it was decided to only focus on the western slope of the Bighorn Mountains (hunt areas 39, 40, 41, 45 and 49). In 2022, there was one seropositive sample (bull; hunt area 45), and in 2023 there was one seropositive sample (cow; hunt area 45).

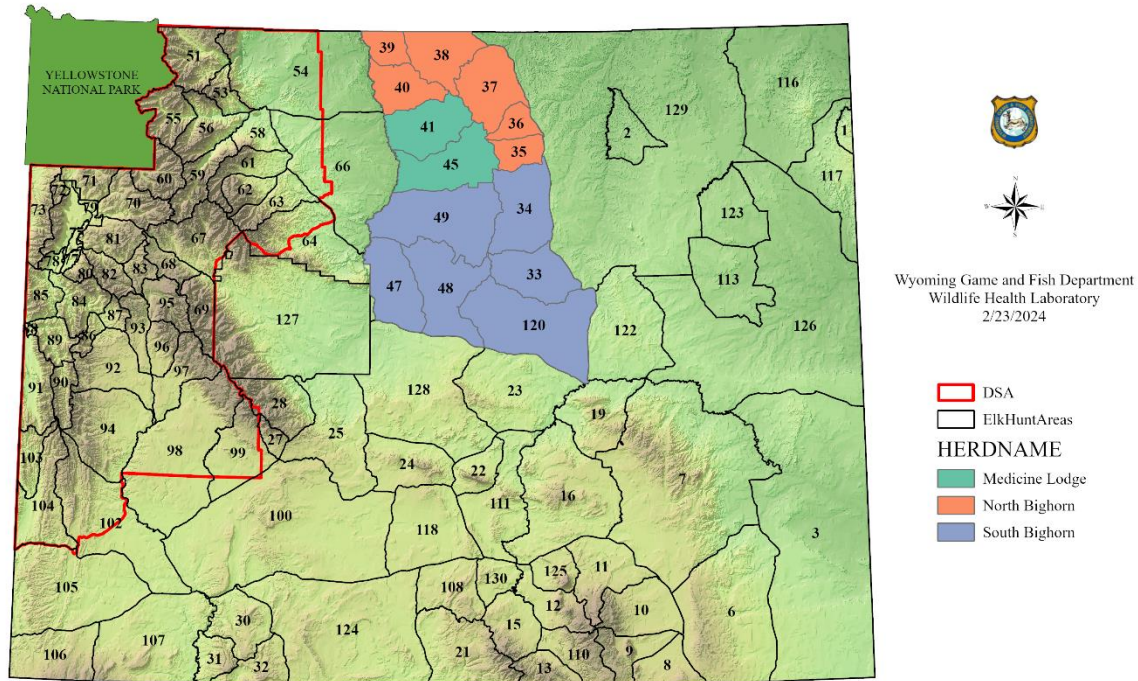


Figure 4. Herd Units and Hunt Areas within the Bighorn Mountains region of Wyoming; Medicine Lodge (aqua), North Bighorn (coral), South Bighorn (purple).

Northern DSA Surveillance:

Brucellosis surveillance in the combined northern herd units (Clark’s Fork, Cody, Gooseberry, and Wiggins Fork) of the DSA reported an increase in seroprevalence over the past five years (17.3%; 95% CIs: 14.7% - 20.2%; n=773) compared to the 2014-2018 five-year average (13.6%; 95% CIs: 11.4% - 15.9%; n=848).

The five-year average seroprevalence varied between the four northern herd units (Figure 5). It is important to note that sample sizes are generally low and affect the accuracy of prevalence estimates for the individual herd units. Therefore, prevalence figures are combined into five-year totals to improve sample size and allow for statistical analysis.

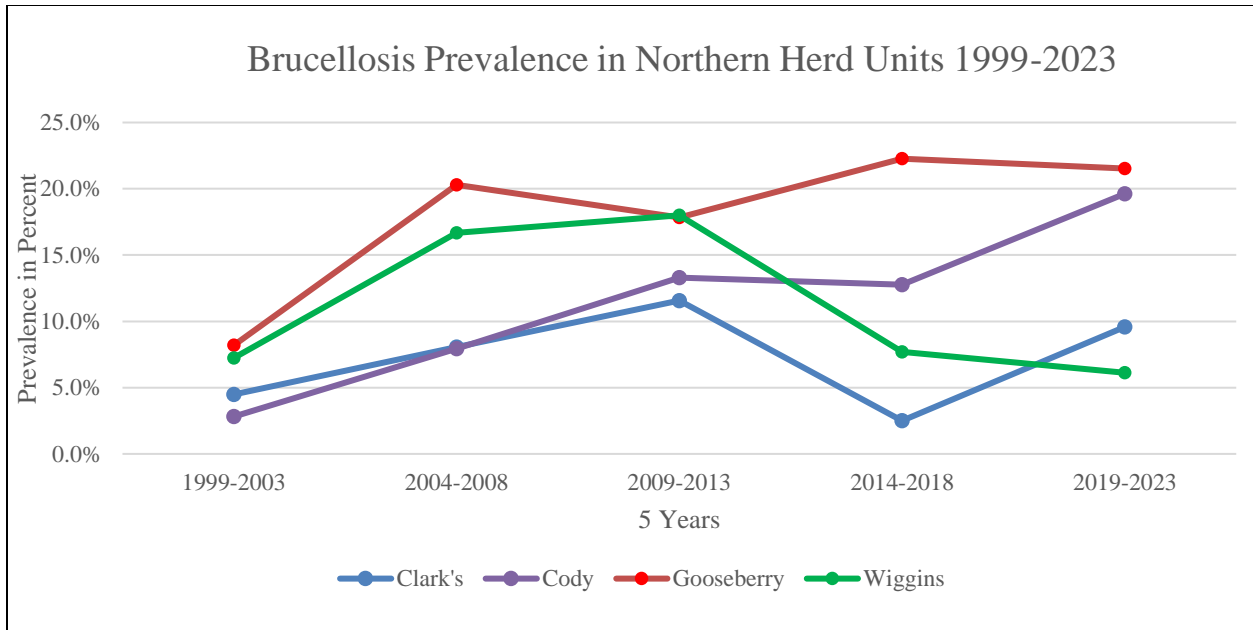


Figure 5. Seroprevalence over time in cow elk from the Northern HUs.

Southern DSA Surveillance:

The brucellosis seroprevalence of yearling and adult cow elk of the southern DSA herd units (South Wind River and West Green River) was 0.6 % (95% CIs: 0.1% - 2.1%; n = 482) from 2019-2023; the previous five-year average (2014-2018) was 0.0%; 95% CIs: 0.0% - 0.7%; n=286).

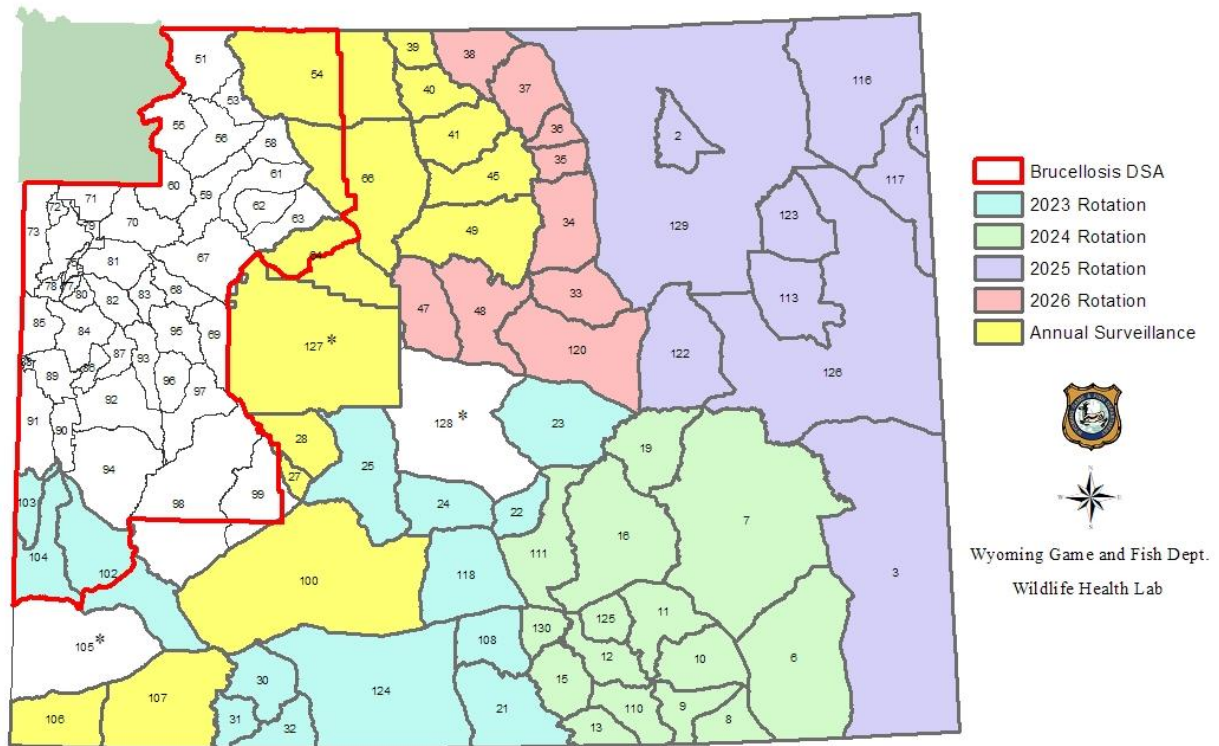
Enhanced surveillance efforts were initiated, in 2018, in the southern herd units bordering the DSA. In 2019, there were two seropositive samples (bull, cow; hunt areas 25 and 27), then in 2022, there was one seropositive case (cow; hunt area 28). A combined 204 samples (male and female; all ages) were tested from the South Wind River and the West Green River herd units in 2023 with one seropositive sample (bull; hunt area 25).

Rotating Statewide Surveillance:

From the statewide rotating surveillance program target areas in 2023 (21, 22, 23, 24, 25, 30, 31, 32, 102, 103, 104, 108, 118 and 124), 514 useable samples were submitted. One sample from the rotating surveillance tested positive for exposure to *B. abortus*. In the past 10 years, 6,880 samples from non-endemic areas statewide have been tested with 10 positive detections in that time. It is important to continue this rotating surveillance in non-endemic areas to catch detections early as this disease is difficult to manage in free-ranging populations and can have significant economic impacts statewide.

2024 Surveillance:

In 2024, the rotating surveillance area will focus on the southeastern portion of the state (not including the eastern most edge). This encompasses elk hunt areas 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 19, 21, 110, 111 and 125. Efforts to survey around the eastern and southern border of the DSA will continue as well as the western slope of the Bighorn Mountains (Figure 6).



* Elk hunt areas with only general licenses available. Hunt area 127 surveillance completed with help from USFWS and the Wind River Indian Reservation.

Figure 6. Proposed 4-year rotation schedule of elk hunt areas to target for brucellosis surveillance.

Literature cited:

Jennings-Gaines, J. E., W. H. Edwards, and T. J. Robinson. 2021. Determining antibody retention in hemolyzed, bacterially contaminated, and nobuto filter paper-derived serum utilizing two *Brucella abortus* fluorescence polarization assays. *Journal of Wildlife Diseases* 57(2).