Wyoming Game and Fish Department
2015 Brucellosis Surveillance in Hunter-Killed Elk
February 2016

Overview:
Each year the Wyoming Game and Fish Department (WGFD) monitors the distribution and prevalence of brucellosis within the state's elk populations by requesting hunters to collect blood samples from their harvested animal. Surveillance is generally concentrated in elk herds that surround the Brucellosis Designated Surveillance Area (DSA), and do not use state or federal elk feedgrounds (see Figure 1). Nearly a quarter of the state is surveyed each year, resulting in coverage over the entire state in a 4-5 year timeframe. Approximately 10,000 blood collection kits are assembled and mailed to elk hunters successful in acquiring limited quota elk licenses within target surveillance areas. In general, hunters return between 1,000 and 1,500 blood samples to the laboratory, of which approximately 60% are suitable for testing (samples often freeze in the return mailing, rendering them untestable).

Since 1991 over 13,300 elk blood samples have been analyzed for brucellosis. To date, surveillance has documented this disease in only the western half of Wyoming, with prevalence levels between 0-4% in the southern herd units (South Wind River, West Green River) surrounding feedgrounds, and between 1-23% in the corresponding northern herd units (Clarks Fork, Gooseberry, Cody, and Wiggins Fork). The northern herd units have been opportunistically monitored for the past several years, when for unknown reasons prevalence dramatically increased in early 2000.

In 2012, two sero-positive elk were discovered in Elk Hunt Area (HA) 40 on the northwest side of the Bighorn Mountains; two additional positives were found in the same HA in 2013. In 2014, two seropositive bull elk were identified from two new HAs on the west side of the Bighorn Mountains as well; one in HA 39, and another in HA 41. This was in addition to a seropositive cow elk also identified in HA 40 (see Figure 3).

The documentation of seropositive elk outside of the Greater Yellowstone Area (GYA) is alarming to both livestock and wildlife managers, and has become the focus for brucellosis surveillance in the State of Wyoming.

2015 Surveillance:
The 2015 surveillance program concentrated on the Bighorn Mountains; especially HA 39, 40, and 41. The total number of HAs surveyed and the total number of blood collection kits to be mailed to hunters was based on the priorities of the WGFD and the Wyoming Livestock Board, while balanacing the capacity of the WGFD Wildlife Health Laboratory.

Surveillance inclued those HAs surrounding the DSA to continue monitoring of the endemic/nonendemic border. Surveillance also continued in the southwestern corner of the DSA due to limited historical serological data of those herd units. Surveillance outside of the western

half of the state occurred on the eastern slope of the Snowy Range and the Sierra Madre Mountains (see Figure 2).

The 2015 surveillance effort was supported by the WGFD using general funds, and by a cooperative agreement with the Animal and Plant Health Inspection Service. Funding was used for additional laboratory personnel for kit assembly, field technicians to maximize usable sample collection and submission, as well as numerous other costs associated with this large scale surveillance project.

Methods:

In 2015, over 10,500 blood collection kits were mailed or directly handed to elk hunters successful in limited quota elk license drawings in the select (target) HAs. Kits consist of a 15 ml sterile polypropylene conical tube, a paper towel, an instruction/data sheet, as well as a prepaid mailing label for return shipping. Samples were also obtained opportunistically in association with various research efforts where animals were captured and bled for disease testing.

All useable serum samples were analyzed at the Wildlife Health Laboratory. Serologic assays for exposure to *B. abortus* were conducted and interpreted using current National Veterinary Services Laboratories protocols for the rapid automated presumptive (RAP) and fluorescence polarization assay (FPA) in microplates and tubes. Serological profiles were categorized using the United States Department of Agriculture's brucellosis eradication uniform methods and rules for Cervidae (US Department of Agriculture-APHIS 91-45-16, 2003). The RAP and FPA plate test were used to screen all samples. Positive reactions on either assay were confirmed with the FPA tube. Serologic data (prevalence levels) on elk within the known endemic area is based on yearling and adult females, but males are included in surveillance data outside of the known endemic area. Including serologic data from males offers improved detection of brucellosis outside of the known endemic area.

Results:

Statewide surveillance yielded 1,158 elk blood samples that were received by the laboratory with 798 (69%) of those being suitable for testing. The majority of the statewide samples were collected from the Bighorn Mountains where 482 useable samples were collected. Table 1 outlines the number of samples analyzed per HA as well as the associated herd unit (HU) within the Bighorn Mountains. The 95% confidence interval is also listed for each HA and HU in Table 1. This value is calculated from the total samples collected from 2012 to 2015. This interval provides 95% certainty the prevalence of brucellosis within that HA/HU falls within the specified range (see 95% confidence lower and upper columns), not the given prevalence determined for a particular year.

Table 1. Total useable blood samples tested from elk harvested in the Bighorn Mountains along with the 95% Confidence Interval of seroprevalence based on total samples 2012 to 2015

		2015			Total Samples 2012-2015			95% Confidence (2012-15)	
Elk Hunt Area / Herd Unit (HU)	**Age/Sex**	**Samples**	**Positive**	**Prevalence**	**Samples**	**Positive**	**Prevalence**	**Lower**	**Upper**
33	All	21	0	0.0%	64	0	0.0%	0.0%	5.6%
34	All	25	0	0.0%	85	0	0.0%	0.0%	4.2%
47	All	5	0	0.0%	32	0	0.0%	0.0%	10.9%
48	All	25	0	0.0%	64	0	0.0%	0.0%	5.6%
49	All	24	0	0.0%	124	0	0.0%	0.0%	2.9%
120	All	29	0	0.0%	62	0	0.0%	0.0%	5.8%
Total South Bighorn HU	All	129	0	0.0%	431	0	0.0%	0.0%	0.9%
35	All	14	0	0.0%	93	0	0.0%	0.0%	3.9%
36	All	11	0	0.0%	40	0	0.0%	0.0%	8.8%
37	All	22	0	0.0%	66	0	0.0%	0.0%	5.4%
38	All	84	0	0.0%	332	0	0.0%	0.0%	1.1%
39	All	37	0	0.0%	119	1	0.8%	0.0%	4.6%
	Cows	24	0	0.0%	67	0	0.0%	0.0%	5.4%
40	All	66	0	0.0%	225	5	2.2%	0.7%	5.1%
	Cows	44	0	0.0%	137	4	2.9%	0.8%	7.3%
Total North Bighorn HU	All	234	0	0.0%	875	6	0.7%	0.3%	1.5%
	Cows	68	0	0.0%	204	4	2.0%	0.5%	4.9%
41	All	55	0	0.0%	272	1	0.4%	0.0%	2.0%
	Cows	27	0	0.0%	154	0	0.0%	0.0%	2.4%
45	All	64	0	0.0%	212	0	0.0%	0.0%	1.7%
Total Medicine Lodge HU	All	119	0	0.0%	484	1	0.2%	0.0%	1.1%
	Cows	27	0	0.0%	154	0	0.0%	0.0%	2.4%
Total Bighorns	All	482	0	0.0%	1,790	7	0.4%	0.2%	0.8%
	Cows	95	0	0.0%	358	4	1.1%	0.3%	2.8%

In the combined northern herd units of the DSA, seroprevalence decreased from 16.6% in 2014 to 9.2% in 2015 (see Figure 4). Seroprevalence in the targeted areas for long-term monitoring (HA 61, 62, and 63) also decreased from 2014. Last year's levels were 20.1% in cows (22 positives/109 samples), but decreased to 14.3% in 2015 (5 positives/35 samples).
In the southern herd units, 12 suitable samples were received from cows harvested from either the South Wind River or the West Green River herd units. Although the sample size is small, no seropositive animals were identified from these herd units.

A total of 344 useable samples were collected over the past four years of surveillance in the southeastern corner of the state. All samples tested negative for exposure to *B. abortus* on serological tests. In the past 24 years, 4,010 samples from the nonendemic area have been analyzed. To date, this disease has not been documented outside of western half of the state (see Figure 5).

Figure 1: Locations of Wyoming Feedgrounds with Surrounding Non-Feedground Elk Herd Units and the Designated Surveillance Area (DSA)

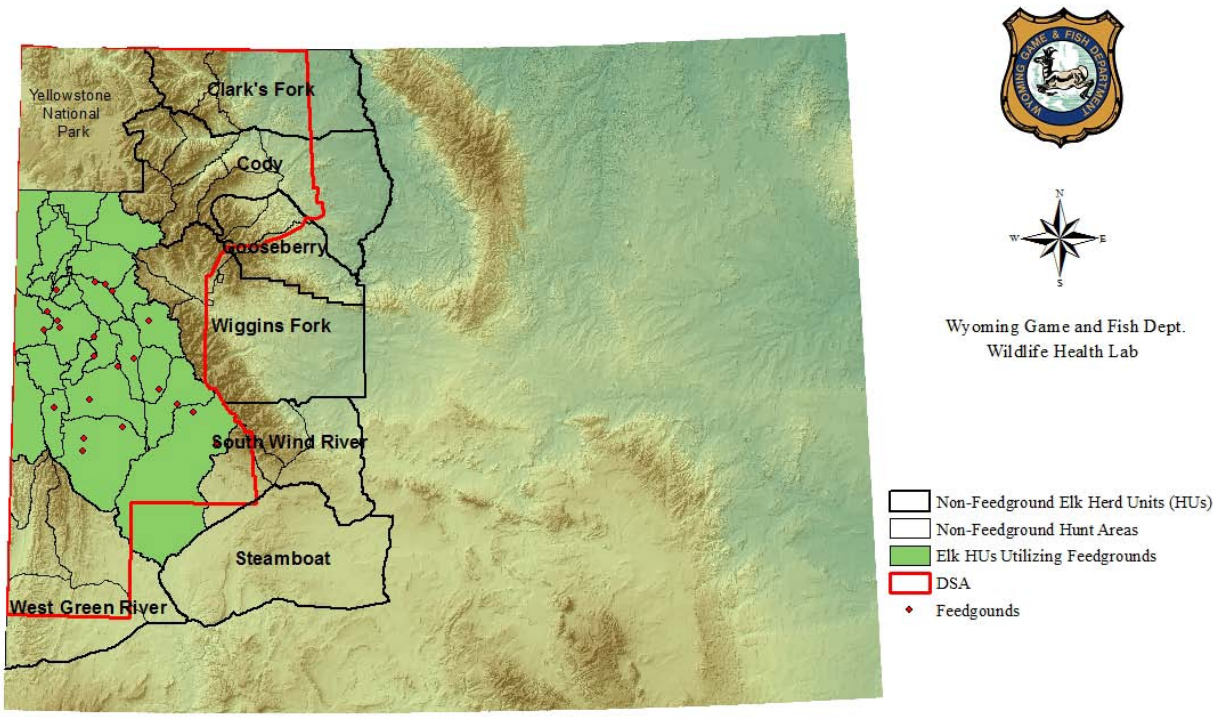

Figure 2: Elk Hunt Areas Surveyed in 2015 for Brucellosis in Hunter-Killed Elk

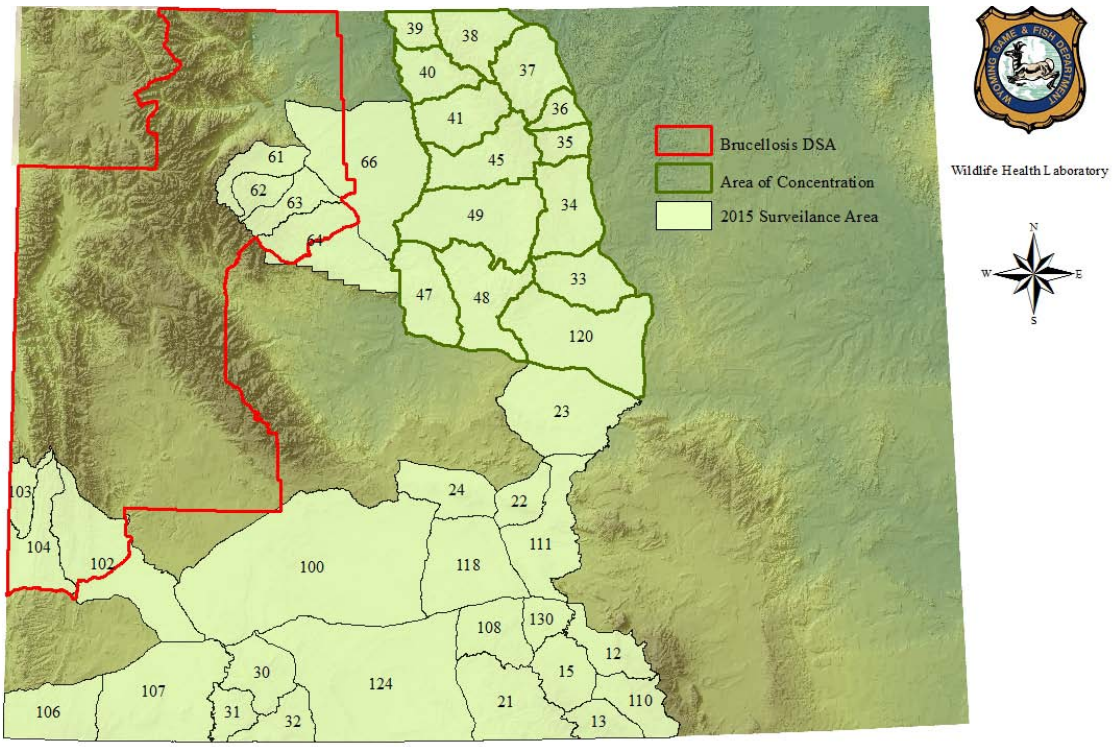

Figure 3: Locations of Seropositive Elk in the Bighorn Mountains 2012-2015

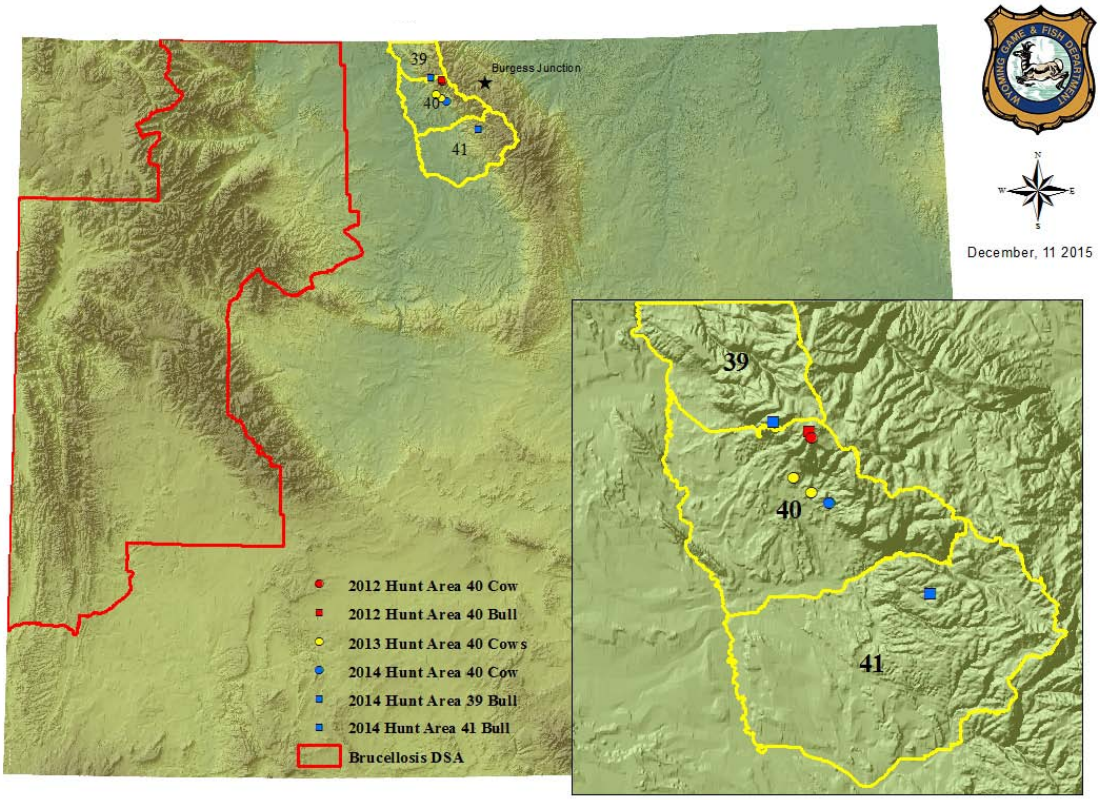

Figure 4: Seroprevalence Through Time in Cody and Gooseberry Elk Herd Units (Cows only)

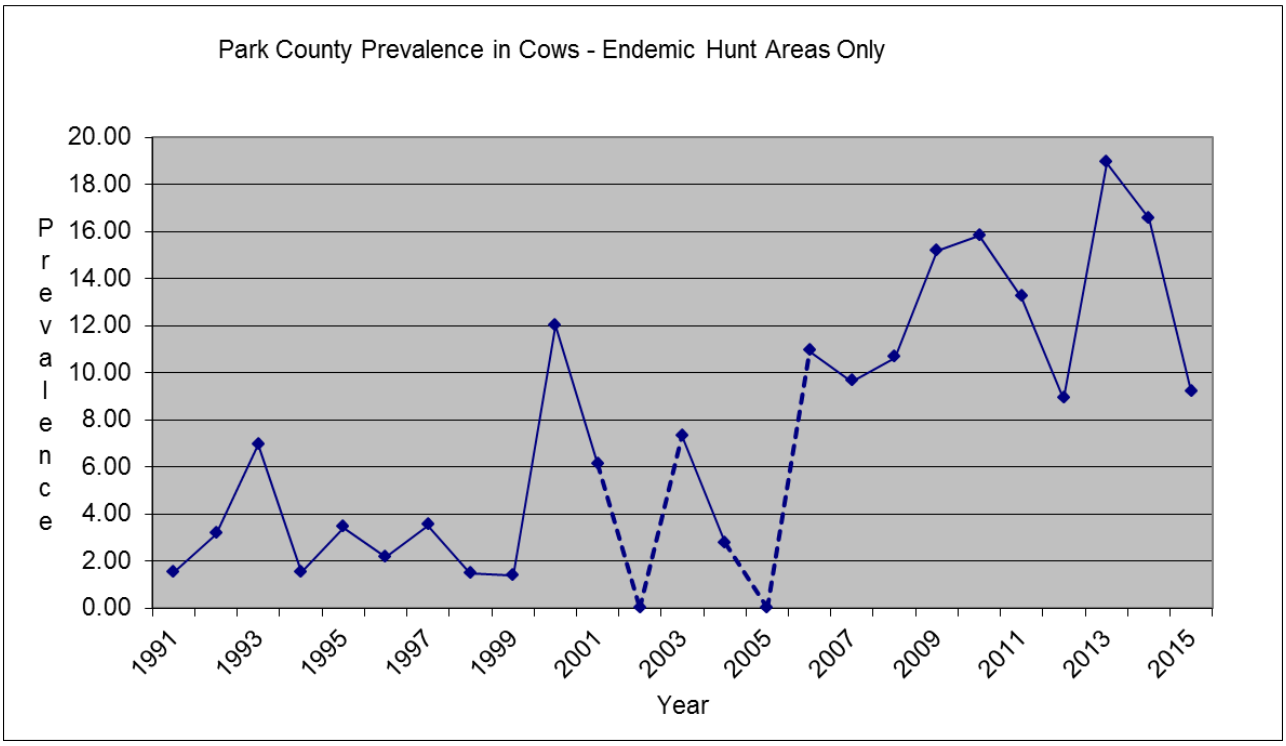

Figure 5: Brucellosis Endemic Elk Hunt Areas in Wyoming