

Introduction

The Cody elk herd (CEH) unit is located along the eastern and southern borders of Yellowstone National Park (YNP) and includes a variety of habitat types, ranging from alpine to irrigated farmland. The CEH is comprised of 7 Hunt Areas (Areas); 55, 56, 58-61, and 66 (Figure 1). Both migratory and non-migratory elk populations are found within the CEH, with areas 58 and 61 containing some (~ 30%) non-migratory (i.e., resident/year round) segments, while smaller non-migratory segments are found within Areas 55, 56, and 59. Resident elk found in Areas 58 and 61 live there year round, while migratory elk that winter in Areas 58 and 61 spend summer months in the backcountry (Thorofare and YNP.) Each fall, Area 58 and 61 migratory elk move to the east slope of Carter Mountain near Meeteetse to spend winter in mostly open sagebrush grassland habitat. Migratory elk that live in Areas 55, 56, and 59 also spend the summer months in the backcountry (Thorofare and YNP), as well. Historically, resident non-migratory populations were not as large, and hunting season success relied on storm events to move migratory elk from the backcountry summer range to the front country transition and winter range to get desired harvest. Rudd (1982) found that 80% of elk wintering in Areas 55 and 56 were migratory, with many moving into Area 60 (Thorofare) and YNP to summer. A similar degree of movement is believed to occur for elk wintering in Area 59, although resident elk numbers and harvest are good in this area. Area 60 contains large numbers of elk in the summer and fall, but accumulating snow depths force most elk out to winter ranges on Carter Mountain in Area 61 (Hurley 1996), along the North and South Fork of the Shoshone River, and the Upper Wind River drainage. Until recently, Area 66 (east of Wyoming State Highway 120) contained no elk and did not have an open hunting season. However, within the last 6-8 years, elk have become established within portions of Area 66 along the Greybull River, presumably from non-migratory populations in Areas 58 and 61. Current elk seasons in Area 66 are designed to increase elk harvest and prevent further population expansion into private agricultural lands along the lower Greybull River.

The trend in brucellosis seropositives in elk in the CEH has been predominantly low and steady between 1991 and about 2004, with a range of 0% to about 4% (Chart 1). After 2004, brucellosis seropositive elk increased to about 9% for 3 years and then peaked at 17% in 2009. In 2010, after an extensive sampling effort, seropositive elk dropped to about 11%, and then slightly increased to about 13% in 2011. The number of elk blood samples collected by hunters has been variable since 1991, with noticeable peaks in 1994, with 157 samples, and again in 2010 with 174 samples. Obtaining enough useable elk blood

samples has been a problem since it is entirely voluntary, and blood sample viability is sensitive to temperature extremes. During the 2010 and 2011 elk season, we also sampled tissue from harvested elk for culture in Area 61, and found 5 of 11 seropositive elk samples tested positive for the *B. abortus* bacteria (Table 1) (1 of the 12 seropositive elk listed in table 1 did not have tissue collected).

We are unclear as to the cause of the recent increase in seropositive elk after many years of variable, but low prevalence rates. One potential cause is the large wintering elk groups that approximate densities seen on feedgrounds in western Wyoming (Cross et al. 2010). These large groups potentially could be influenced by winter range conditions, effect of wolves on elk distribution and movement (Gude et al. 2006), forage and/or security (from hunters or predation) on private land, or other unidentified factors that congregate elk. Other potential reasons for changes in elk seroprevalence rates could be due to changes in weather patterns affecting where elk spend winter and spring, changes in land use (development, subdivisions, etc.), and/or changes in winter use areas due to differing elk movement to and from summer and winter habitats. Future monitoring and research could help uncover other potential factors that affect elk seroprevalence rates. Some wildlife and livestock managers have observed changes in elk habitat and seasonal range use in some areas in the CEH over the last 10–15 years, supporting the need for continued evaluation of disease exposure or transmission risk mitigation between elk and livestock.

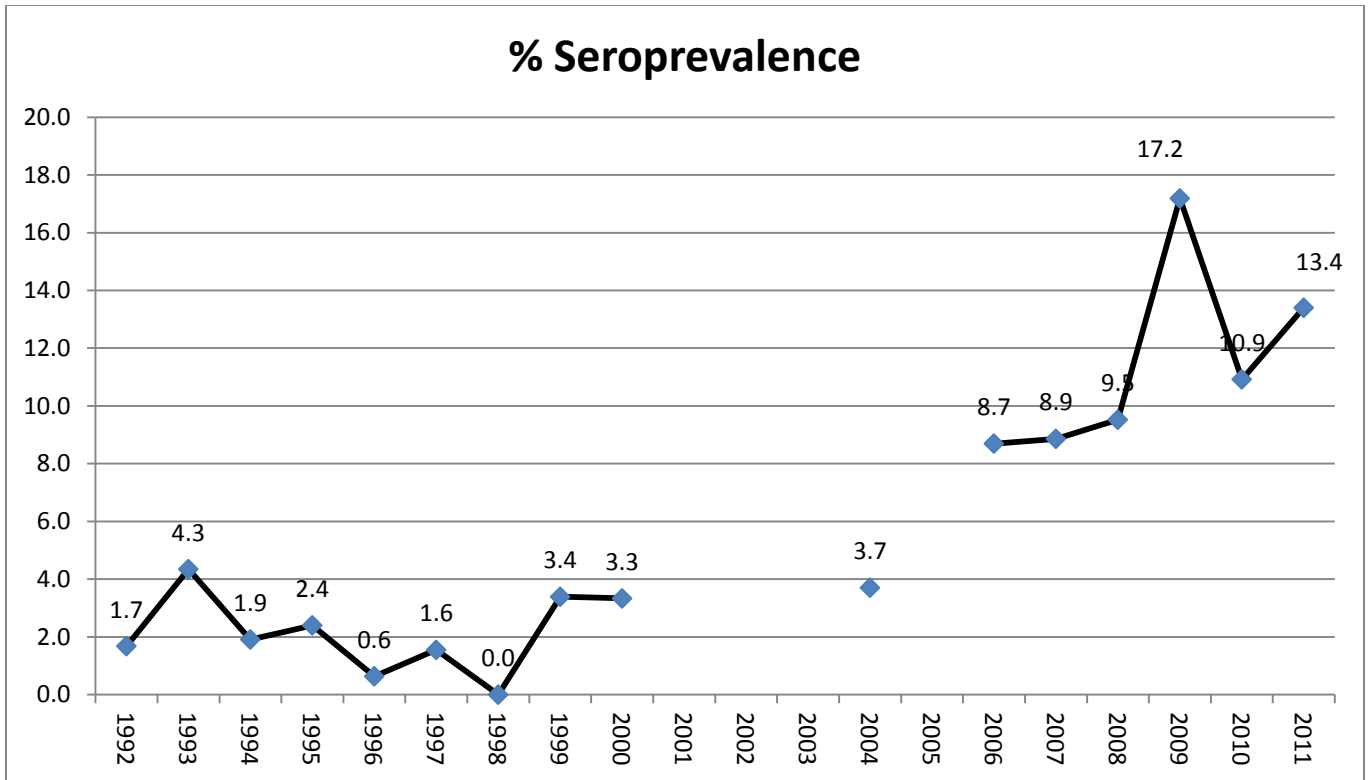


Chart 1. Brucellosis prevalence (males and females tested) in the CEH from 1991 to 2011.

Target Hunt Areas Only							
Culture				Serology			
Hunt Area	# Elk Sampled	# Adult Females	# Suspect B.abortus	# Blood Samples	# Suitable Samples	# Seropositives	Seroprevalence
61	74 (147)	57 (111)	5 (5)	86	60	12	20%
62	45 (93)	36 (80)	1 (unk)	61	40	9	22.50%
63	14 (28)	11 (22)	1 (1)	39	28	9	32.10%
67	12 (16)	9 (12)	1 (1)	25	15	4	26.70%
Total	145 (284)	113 (225)	8 (7)	211	143	34	23.80%
	()=total tissues	()=total tissues	()=# adult females		()=% suitable		
* Individual serological results cannot be linked to individual culture positive animals. (For example, a seropositive cow elk may not have had tissue cultured, and a tissue culture positive elk may not have had blood tested for seroprevalence)							

Table 1. Serology and culture results for targeted hunt areas in and near the CEH during 2010-2011 hunting season (with January extension.)

Cody (E216) Elk Herd Unit

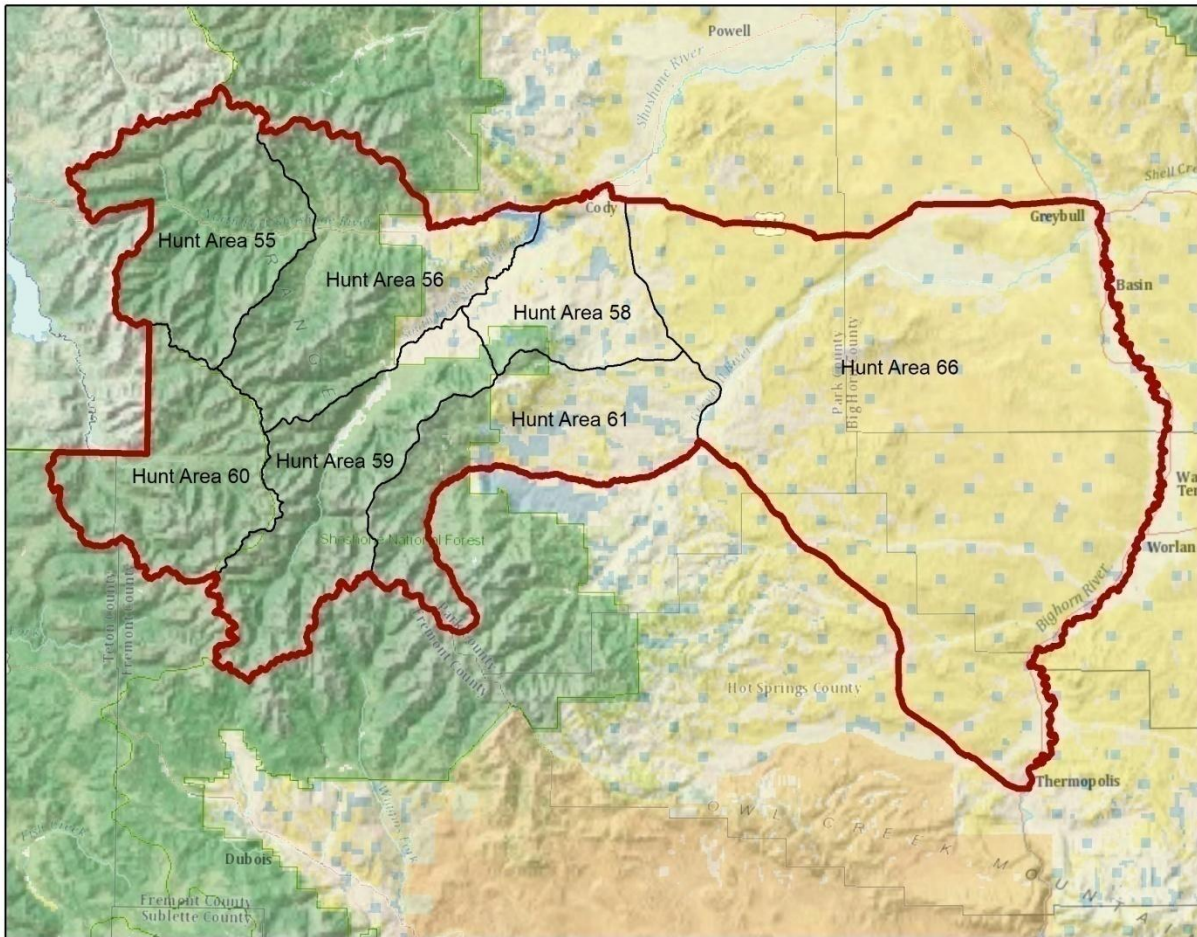


Figure 1. Cody elk herd unit location, boundaries and hunt areas.

Goal & Objectives

In February 2004, Wyoming lost its brucellosis class-free status when 31 reactor cattle were detected in a Sublette County herd (Wyoming Brucellosis Coordination Team [WBCT] 2005). Infection of these cattle likely originated from elk on the nearby Muddy Creek feed ground. Following this loss of class-free status, increased surveillance of Wyoming cattle revealed a series of herds with brucellosis in the Greater Yellowstone Ecosystem ([GYE];WBCT 2005).

To develop management strategies regarding brucellosis in the GYE of western Wyoming and regain brucellosis class-free status, the WBCT identified the Brucellosis Management Action Plan (BMAP) process as their highest priority recommendation (WBCT 2005). BMAPs have already been finalized for each of the 7 elk herds in the Jackson-Pinedale Regions containing winter elk feedgrounds, and the Jackson Bison Herd and the Absaroka Bison Management Area

The objectives of this BMAP are to: 1) document available data regarding brucellosis in the CEH, 2) use data to develop management actions to reduce risk of brucellosis transmission among elk and from elk to cattle, and 3) select appropriate management actions for implementation in the CEH.

This plan, combined with its appendices, include data and information relevant to understanding, formulating, and implementing management actions. We will review this plan every 5 years unless new information or research will make significant improvements in management. Our periodic review of this plan will incorporate new brucellosis research results, management protocols, and agency (state, federal, private) recommendations.

Public Involvement in this BMAP

Between 2005 and 2007, BMAPs were developed for each of 7 elk herds associated with feedgrounds in the Jackson and Pinedale Regions. The Wyoming Game and Fish Department (WGFD) followed the WBCT recommendations to coordinate with cattle producers, land management agencies, and livestock disease regulatory agencies through public meetings and personal contacts with landowners, and sportsman. Opportunity for public feedback on BMAPs was given at past WBCT meetings, and a public presentation was made when each was completed.

Brucellosis Management Options

This section lists potential options that could be used to reduce *B. abortus* seroprevalence; however, is not necessarily selected as a management action in this BMAP. The CEH unit differs from other elk herd units near Jackson and Pinedale because there are no elk feedgrounds. Cody typically has milder winters with less snow, and native winter range habitat is more available to wintering elk than near Jackson or Pinedale. Strategies to help reduce transmission risks between elk and cattle require a different approach than in elk herd units with feedgrounds. We propose to reduce comingling of elk and cattle, and to use harvest to manage elk at predetermined population objectives. Management options are listed as follows:

1. Elk Population Management

- a) Continue to work with the public and landowners to manage elk populations at the currently defined objective.
- b) Set season structure to maximize antlerless harvest when the population is above objective.
- c) Work with landowners to improve or sustain hunter access in areas that need increased harvest, and in areas where comingling is a major concern during high risk periods (February-May).
- d) Use Hunt Management Coordinators to increase and manage antlerless elk harvest on private and adjacent public lands in some areas. This may help prevent comingling due to reducing elk densities on private land.

2. Prevent or mitigate elk-cattle comingling (see page 8, #2 for protocol).

3. Increase brucellosis surveillance in elk.

4. Habitat enhancements where feasible.

Coordination Meetings

Producer and Public Meeting- the WGFD held a producer meeting on 29 August 2011 and a public meeting on 30 August 2011 to gather input and present our draft plan. A second producer meeting was held on the 26th of January 2012 by request of some area producers, to provide additional comment in the final draft of the plan. We incorporated some comments from those meetings into this plan. The WGFD will review this plan in 5-year intervals or when new significant findings

would improve managing brucella in elk (e.g., when research helps identify new information or techniques.)

Proposed Management Actions

1. Elk Population Management.

- a. Continue to work with landowners and the public to manage elk populations to objective. Through our current positive landowner relationships, we anticipate we can maintain access for hunters to meet harvest objectives in most hunt areas. Success will require positive relationships with local landowners, and ensuring complaints are handled quickly and effectively. In many cases, this effort requires understanding by the public of the need to reduce elk densities in areas where transmission risk is high, and coordination among field personnel and landowners to help design seasons to accommodate landowner needs and harvest objectives.
- b. By reducing or disbursing large groups of elk adjacent to and on private lands, we may be able to decrease seroprevalence rates and reduce transmission risks to cattle. Elk that are hunted repeatedly will move to less accessible areas and potentially away from private land and cattle herds. This requires access to many areas to prevent refuges.
- c. Modify season structure to maximize harvest. This will mostly be a balance between number of licenses and season length. In some cases, we will issue more licenses in an area to ensure any hunter who wants to hunt an elk has the opportunity to purchase a license. This will increase the number of hunters in the field, but will not make license acquisition a hindrance. In other cases, we may set license numbers at a lower level, but will provide longer seasons to increase success.
- d. Work with landowners to improve or sustain hunter access. Using the WGFD's Private Land Public Wildlife program could facilitate this by allowing a small incentive to let hunters access private ground. The landowner could also take advantage of the Hunter Assistance Program where the landowner's name is put on the WGFD website informing hunters of an area where there is some private land access to hunt. This program lists how many hunters are needed for each private landowner, so they are not overwhelmed with hunters.

- e. Use Hunt Management Coordinators (HMC) to increase harvest in some areas. We are using these positions to help improve access on private land in portions of the CEH. This is a pilot project intended to increase antlerless harvest and landowner assistance during elk hunting seasons by using the HMC as a liaison among WGFD, hunters, and landowners. HMCs will also collect biological samples (blood and tissues) for disease testing and help monitor success during open hunting seasons.
2. Prevention of elk and cattle comingling when the risk of transmission between elk and cattle is high (February-May).
 - a. Requires communication between producers, public, and WGFD.
 - b. Producer should contact WGFD of situations where elk are close to cattle during the high risk period (Feb-June) so WGFD can respond and move elk.
 - c. The WGFD will respond and move elk away from cattle and keep in contact with producer to make sure the elk do not return.
 - d. If elk return on successive days and cannot be kept away, the WGFD will initiate steps to lethally remove elk. This has worked in the other elk herds where brucella infection is a risk.
 - e. Elk carcasses will be donated up to 15 February; after that date carcasses will not be donated, and will be disposed of due to potential brucella infection risk.
 - f. Blood, teeth, and tissues of lethally removed elk will be used for aging, brucella testing, and Chronic Wasting Disease (CWD) testing.
 - g. The WGFD will in stay in contact with the producer to make sure the elk do not return.
 3. Increase blood and tissue monitoring efforts. With the season extension during the winter of 2010-2011, we successfully increased our sampling efforts and resulting sample sizes to better understanding brucellosis prevalence in the CEH. We continue to target our sampling efforts for elk herds in the Bighorn Basin, with emphasis in the Cody, Gooseberry, and Clark's Fork herds. Increased sampling intensity will allow the WGFD and producers to better understand the distribution of brucellosis and identify trends in prevalence. Better information will provide the

WGFD and producer with more management options (modify hunting seasons to target higher prevalence areas, producers may voluntarily change grazing management and area of use to avoid higher prevalence areas during high risk periods, etc.).

4. Develop and implement research in the CEH. Designing, funding, and completing studies that help us understand where and how elk use the habitats in the herd unit will provide valuable information to affected interests. Currently, an elk movement study is being planned to define temporal and spatial characteristics of elk abortions, the primary means of brucellosis transmission in the CEH. In addition, elk movement information can help us better understand their migration and timing during key periods. Research will also help us evaluate programs like our HMAP, blood and tissue collection methods, etc. and test potential new methods to reduce transmission and seroprevalence.

Additional Actions

Information and Education. WGFD Brucellosis Feed ground and Habitat Section (BFH) personnel and other personnel regularly inform and educate various public factions about wildlife diseases, including brucellosis. Educational outreach has included group presentations, news releases, interpretive signs at feedgrounds and crucial winter ranges, and various brochures and publications. The importance of quality wildlife habitat and substantial role that disturbance (e.g., fire) plays in natural ecosystems are also stressed during public forums. Wyoming Game and Fish Department BFH personnel and other field staff make numerous private landowner contacts regarding habitat improvement projects, wildlife-friendly management techniques, or ways to prevent commingling of elk and livestock. Additional efforts are focused on area school groups and events such as the WGFD's annual Hunting and Fishing EXPO to inform children and their parents on brucellosis. These efforts should be continued to inform the public of the WGFD's role in brucellosis research and management and relay consequences of the disease to the State's economy. Additionally, should any of the aforementioned options be officially adopted, I&E efforts should focus on why the option(s) was (were) pursued and what benefits may be realized. The public should be made aware of any proactive management embarked upon by the WGFD, and their interests in the actions should be heard.

Literature Cited

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- Rudd, W. J. 1982. Elk migrations and movements in relation to weather and hunting in the Absaroka Mountains, Wyoming. M.S. thesis. University of Wyoming, Laramie, Wyoming.
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Table 1. Brucellosis seroprevalence sampling results from 1991 to 1996 in the CEH.

Hunt Area		1991			1992			1993			1994			1995			1996		
Herd Unit		Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev
55	All	4	0	0.00	13	0	0.00	0	0		40	1	2.50	12	0	0.00	11	0	0.00
	Cow	2	0	0.00	10	0	0.00	0	0		31	1	3.23	11	0	0.00	8	0	0.00
56	All	41	1	2.44	41	1	2.44	17	1	5.88	43	2	4.65	57	2	3.51	49	0	0.00
	Cow	32	1	3.12	36	1	2.78	15	1	6.67	38	2	5.26	45	2	4.44	41	0	0.00
58	All	13	0	0.00	28	1	3.57	3	0	0.00	4	0	0.00	7	0	0.00	14	0	0.00
	Cow	11	0	0.00	24	1	4.17	3	0	0.00	4	0	0.00	7	0	0.00	13	0	0.00
59	All	0	0		0	0		17	1	5.88	33	0	0.00	32	1	3.13	33	0	0.00
	Cow	0	0		0	0		15	1	6.67	28	0	0.00	27	1	3.70	24	0	0.00
60	All	0	0		0	0		0	0		0	0		0	0		0	0	
	Cow	0	0		0	0		0	0		0	0		0	0		0	0	
61	All	11	0	0.00	37	0	0.00	9	0	0.00	37	0	0.00	17	0	0.00	50	1	2.00
	Cow	10	0	0.00	23	0	0.00	8	0	0.00	33	0	0.00	12	0	0.00	34	1	2.94
66	All	0	0		0	0		0	0		0	0		0	0		0	0	
	Cow	0	0		0	0		0	0		0	0		0	0		0	0	
Total	All	69	1	1.45	119	2	1.68	46	2	4.35	157	3	1.91	125	3	2.40	157	1	0.64

Table 1. Brucellosis seroprevalence sampling results from 1997 to 2002 in the CEH.

Hunt Area		1997			1998			1999			2000			2001			2002		
Herd Unit		Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev
55	All	17	1	5.88	24	0	0.00	5	0	0.00	7	0	0.00	0	0		0	0	
	Cow	14	1	7.14	18	0	0.00	3	0	0.00	5	0	0.00	0	0		0	0	
56	All	30	0	0.00	41	0	0.00	22	0	0.00	8	0	0.00	0	0		0	0	
	Cow	23	0	0.00	30	0	0.00	19	0	0.00	7	0	0.00	0	0		0	0	
58	All	7	0	0.00	3	0	0.00	7	0	0.00	2	0	0.00	0	0		0	0	
	Cow	7	0	0.00	3	0	0.00	6	0	0.00	1	0	0.00	0	0		0	0	
59	All	27	0	0.00	24	0	0.00	11	1	9.09	3	0	0.00	0	0		0	0	
	Cow	24	0	0.00	17	0	0.00	8	1	12.50	3	0	0.00	0	0		0	0	
60	All	2	0	0.00	0	0		0	0		0	0		0	0		0	0	
	Cow	1	0	0.00	0	0		0	0		0	0		0	0		0	0	
61	All	46	1	2.17	10	0	0.00	14	1	7.14	10	1	10.00	0	0		0	0	
	Cow	30	1	3.33	8	0	0.00	12	1	8.33	7	0	0.00	0	0		0	0	
66	All	0	0		0	0		0	0		0	0		0	0		0	0	
	Cow	0	0		0	0		0	0		0	0		0	0		0	0	
Total	All	129	2	1.55	102	0	0.00	59	2	3.39	30	1	3.33	0	0		0	0	

Table 1. Brucellosis seroprevalence sampling results from 2003 to 2008 in the CEH.

Hunt Area		2003			2004			2005			2006			2007			2008		
Herd Unit		Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev
55	All	0	0		5	0	0.00	0	0		9	1	11.11	3	0	0.00	8	0	0.00
	Cow	0	0		5	0	0.00	0	0		8	1	12.50	1	0	0.00	7	0	0.00
56	All	0	0		17	0	0.00	0	0		8	0	0.00	30	1	3.33	19	2	10.53
	Cow	0	0		13	0	0.00	0	0		6	0	0.00	26	1	3.85	16	2	12.50
58	All	0	0		9	0	0.00	0	0		11	1	9.09	12	2	16.67	14	2	14.29
	Cow	0	0		3	0	0.00	0	0		10	1	10.00	9	2	22.22	7	1	14.29
59	All	0	0		11	1	9.09	0	0		12	2	16.67	24	3	12.50	16	2	12.50
	Cow	0	0		11	1	9.09	0	0		9	1	11.11	18	3	16.67	14	2	14.29
60	All	0	0		0	0		0	0		0	0		0	0		0	0	
	Cow	0	0		0	0		0	0		0	0		0	0		0	0	
61	All	0	0		12	1	8.33	0	0		6	0	0.00	10	1	10.00	26	2	7.69
	Cow	0	0		4	0	0.00	0	0		4	0	0.00	2	0	0.00	15	0	0.00
66	All	0	0		0	0		0	0		0	0		0	0		1	0	0.00
	Cow	0	0		0	0		0	0		0	0		0	0		1	0	0.00
Total	All	0	0		54	2	3.70	0	0		46	4	8.70	79	7	8.86	84	8	9.52

Table 1. Brucellosis seroprevalence sampling results from 2009 to 2011 in the CEH.

Hunt Area		2009			2010			2011			Total			95% Confidence		
Herd Unit		Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev	Tested	# Pos	prev	Ratio	Lower	Upper
55	All	6	1	16.67	7	0	0.00	0	0	0	171	4	2.34	0.0234	-12.5%	17.2%
	Cow	4	0	0.00	7	0	0.00	0	0	0	134	3	2.24	0.0224	-14.5%	19.0%
56	All	19	3	15.79	26	0	0.00	1	1	100	469	13	2.78	0.0278	-6.2%	11.7%
	Cow	19	3	15.79	22	0	0.00	0	0	0	388	13	3.35	0.0335	-6.4%	13.1%
58	All	12	0	0.00	17	2	11.76	8	3	37.50	171	11	4.43	0.0491	-8.1%	20.9%
	Cow	9	0	0.00	14	2	14.29	6	2	33.33	137	9	6.57	0.0534	-9.6%	22.8%
59	All	12	5	41.67	36	5	13.89	11	1	9.09	302	22	7.28	0.0690	-3.6%	18.1%
	Cow	11	5	45.45	35	5	14.29	10	1	10.00	254	21	8.27	0.0782	-3.5%	20.0%
60	All	0	0		0	0		4	0	0	6	0	0.00	0.0000		
	Cow	0	0		0	0		0	0	0	1	0	0.00	0.0000		
61	All	15	2	13.33	85	13	15.29	125	15	12	520	38	7.31	0.0582	-1.0%	15.6%
	Cow	10	1	10.00	60	12	20.00	93	11	11.83	365	27	7.40	0.0588	-2.5%	17.3%
66	All	0	0		4	0	0.00	0	0	0	5	0	0.00	0.0000		
	Cow	0	0		4	0	0.00	0	0	0	5	0	0.00	0.0000		
Total	All	64	11	17.19	174	19	10.92	149	20	13.42	1494	68	4.55	0.0455	0.4%	11.0%