

2016 - JCR Evaluation Form

SPECIES: EIk

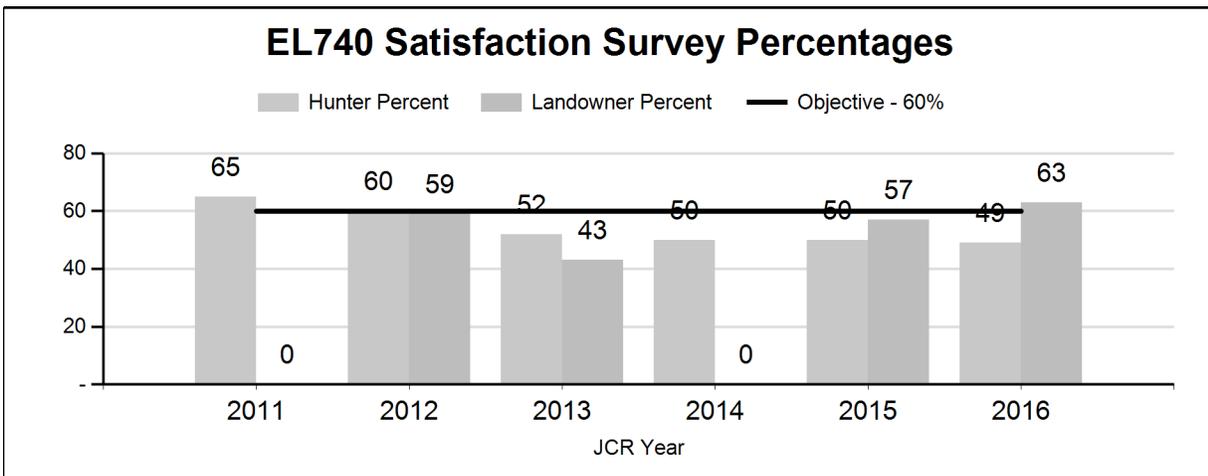
PERIOD: 6/1/2016 - 5/31/2017

HERD: EL740 - BLACK HILLS

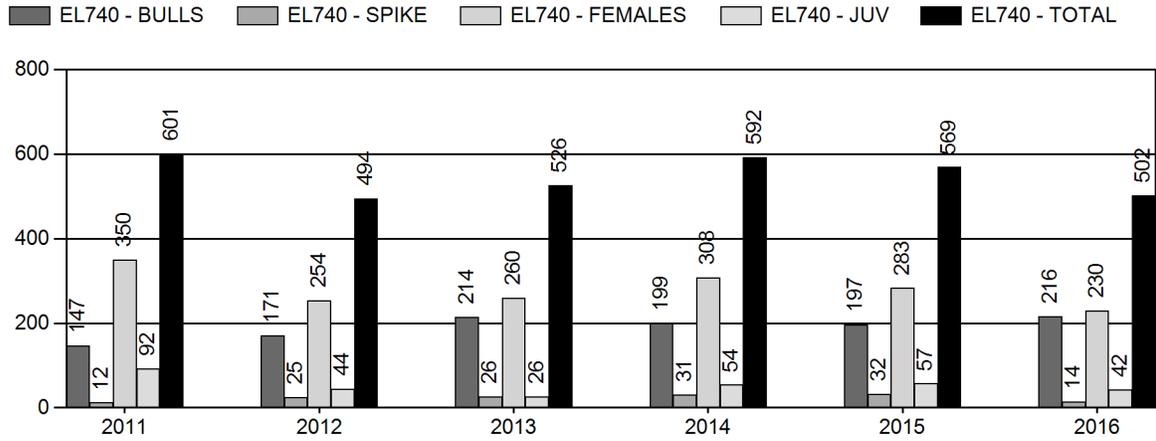
HUNT AREAS: 1, 116-117

PREPARED BY: JOE SANDRINI

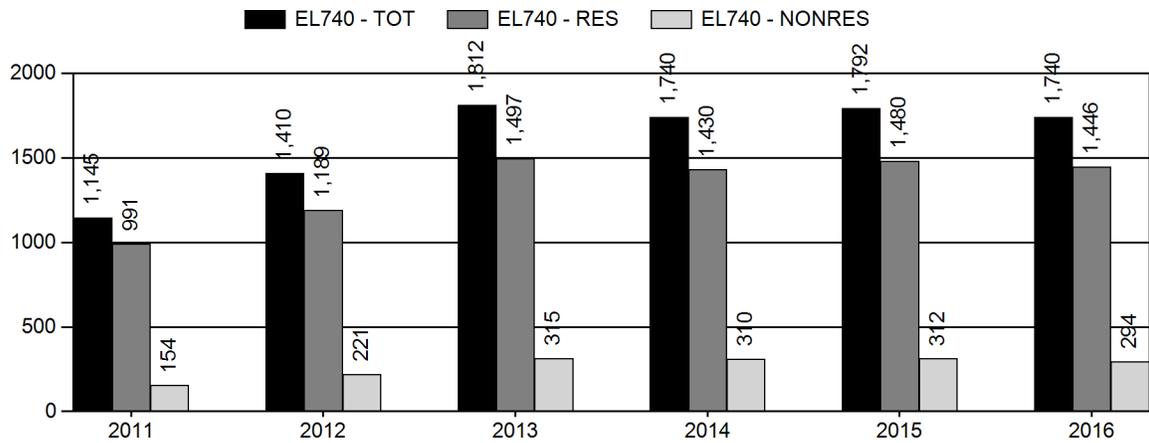
	<u>2011 - 2015 Average</u>	<u>2016</u>	<u>2017 Proposed</u>
Hunter Satisfaction Percent	54%	49%	50%
Landowner Satisfaction Percent	55%	63%	60%
Harvest:	556	502	580
Hunters:	1,580	1,740	1,850
Hunter Success:	35%	29%	31%
Active Licenses:	1,665	1,816	1,900
Active License Success:	33%	28%	31%
Recreation Days:	17,423	18,351	19,000
Days Per Animal:	31.3	36.6	32.8
Males per 100 Females:	29	0	
Juveniles per 100 Females	33	0	
Satisfaction Based Objective			60%
Management Strategy:			Private Land
Percent population is above (+) or (-) objective:			-4%
Number of years population has been + or - objective in recent trend:			4



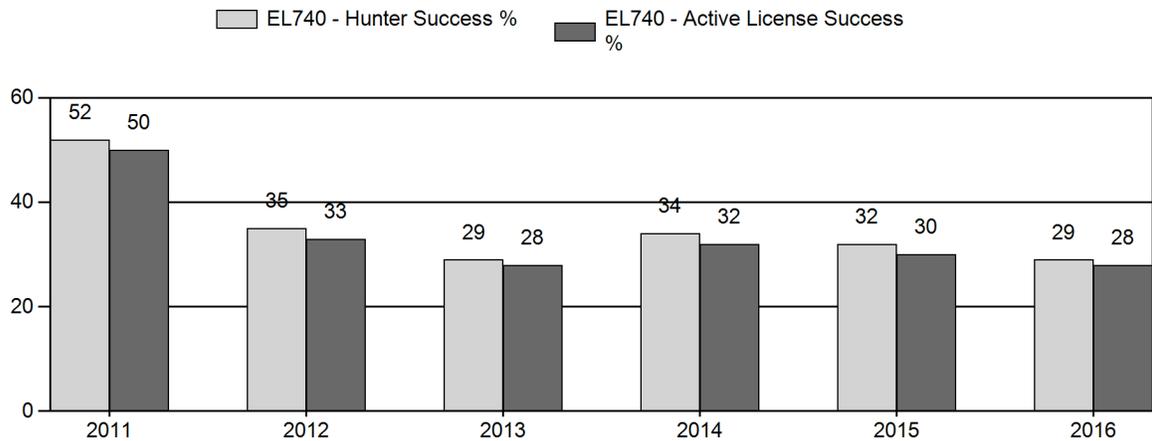
Harvest



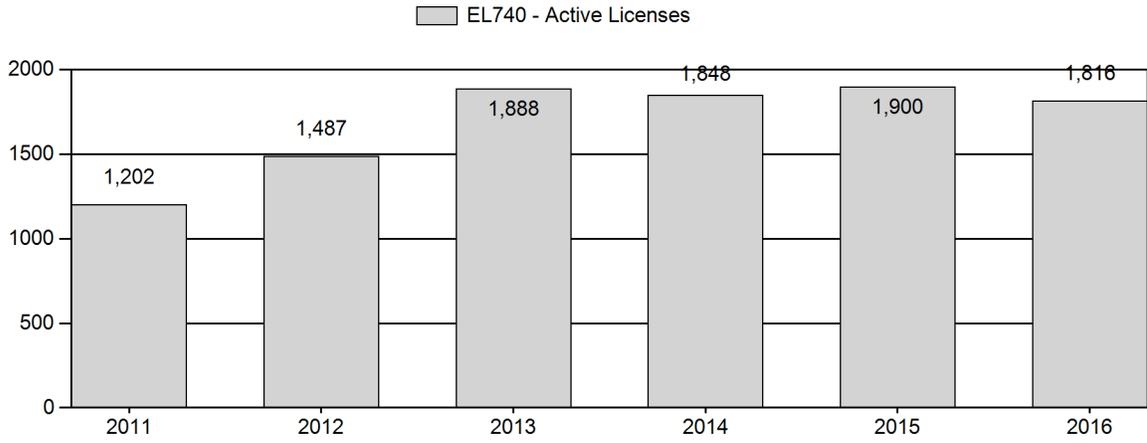
Number of Hunters



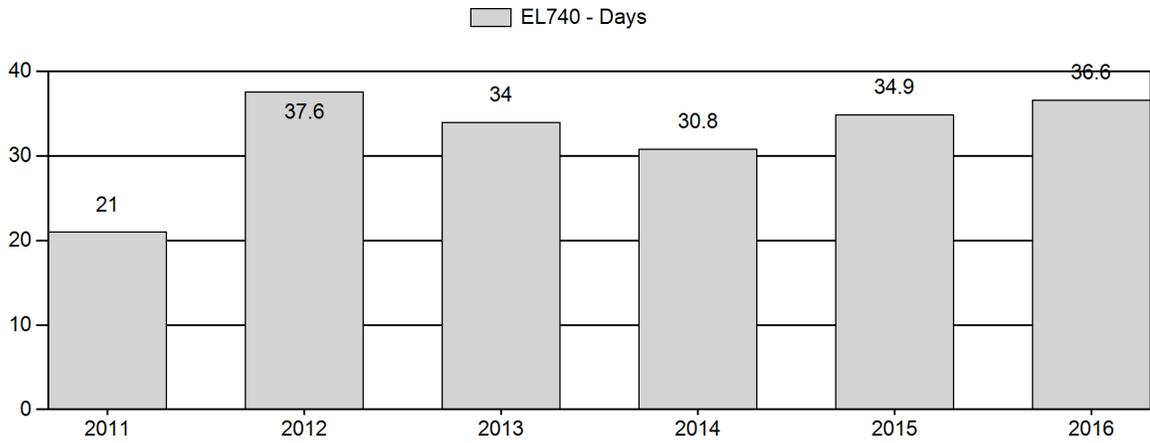
Harvest Success



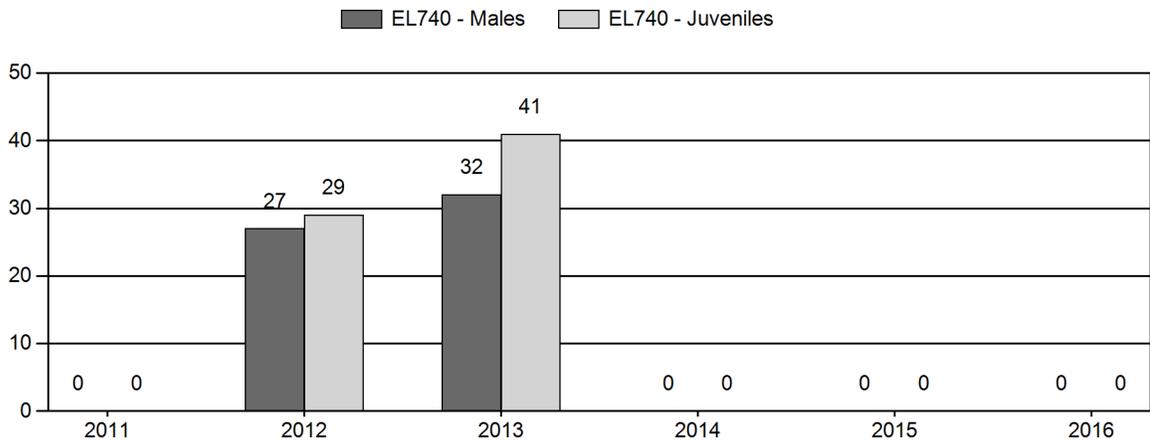
Active Licenses



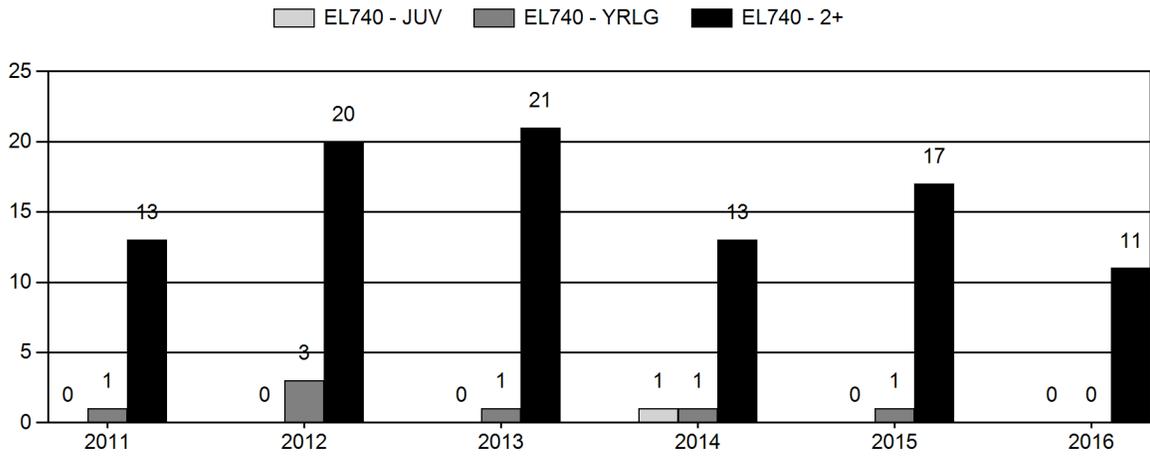
Days per Animal Harvested



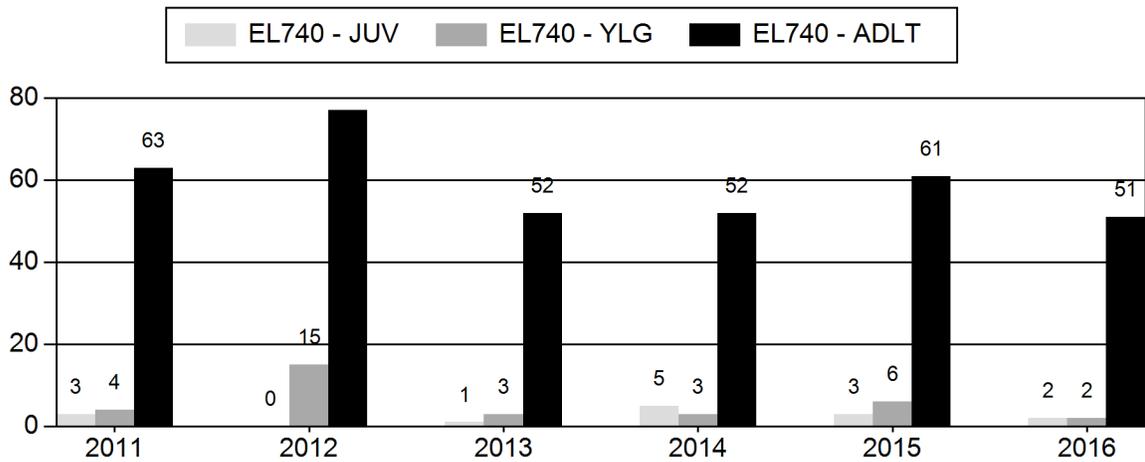
Postseason Animals per 100 Females



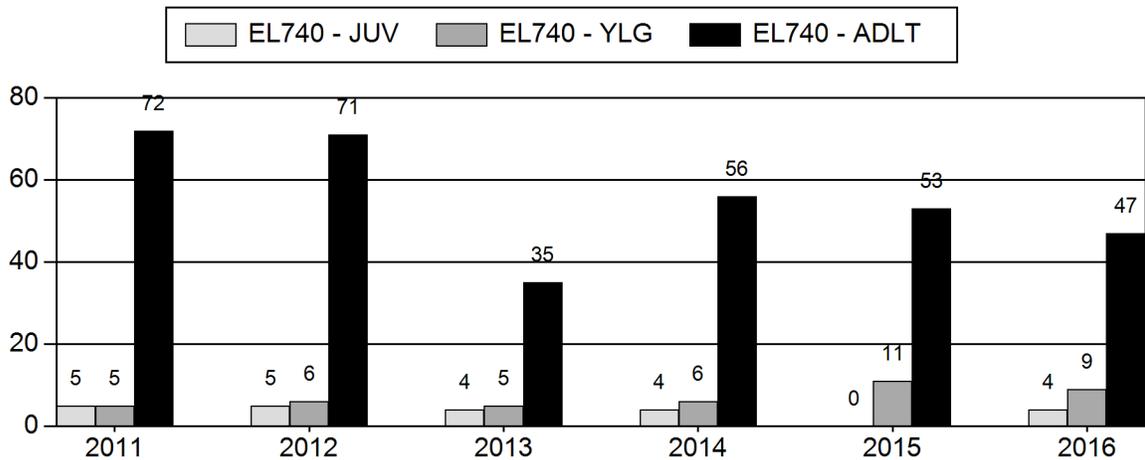
Age Structure of Field Checked Males



Age Structure Data (Field and Laboratory) - Male



Age Structure Data (Field and Laboratory) - Female



2011 - 2016 Postseason Classification Summary

for Elk Herd EL740 - BLACK HILLS

Year	Post Pop	MALES				FEMALES		JUVENILES		Tot CIs	Cls Obj	Males to 100 Females				Young to		
		Ylg	Adult	Total	%	Total	%	Total	%			Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2011	0	0	0	0	0%	0	0%	0	0%	0	0	0	0	0	±0	0	±0	0
2012	0	32	32	64	17%	239	64%	69	19%	372	0	13	13	27	±0	29	±0	23
2013	0	19	24	43	19%	133	58%	54	23%	230	0	14	18	32	±0	41	±0	31
2014	0	0	0	0	0%	0	0%	0	0%	0	0	0	0	0	±0	0	±0	0
2015	0	0	0	0	0%	0	0%	0	0%	0	0	0	0	0	±0	0	±0	0
2016	0	0	0	0	0%	0	0%	0	0%	0	0	0	0	0	±0	0	±0	0

**2017 HUNTING SEASONS
BLACK HILLS ELK HERD (EL740)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
1	1	Oct. 15	Nov. 30	100	Limited quota	Any elk
1	4	Oct. 15	Nov. 30	75	Limited quota	Antlerless elk
116		Oct. 15	Nov. 10		General	Any elk
116		Nov. 11	Nov. 30		General	Antlerless elk
116	6	Oct. 15	Jan. 31	250	Limited quota	Cow or calf
116	8	Aug. 15	Oct. 14	50	Limited quota	Cow or calf valid off national forest
117	1	Oct. 15	Nov. 30	275	Limited quota	Any elk
117	1	Dec. 1	Jan. 31			Antlerless elk
117	4	Oct. 15	Jan. 31	250	Limited quota	Antlerless elk
117	6	Oct. 15	Jan. 31	250	Limited quota	Cow or calf
117	7	Aug. 15	Sept. 15	50	Limited quota	Cow or calf valid south of the Green Mountain Road (Weston County Road 11), east of the Skull Creek Road (Weston County Road 14), and west of the Oil Creek Road (Weston County Road 10)
117	7	Dec. 1	Jan. 31			Cow or calf valid south of the Green Mountain Road (Weston County Road 11), east of the Skull Creek Road (Weston County Road 14), and west of the Oil Creek Road (Weston County Road 10)
117	8	Aug. 15	Oct. 14	75	Limited quota	Cow or calf valid off national forest

Special Archery Season Hunt Areas	Season Dates	
	Opens	Closes
1, 116, 117	Sep. 1	Sep. 30

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	Type	Change from 2016
Herd Unit Totals	1	none
	4	none
	6	none
	7	+50
	8	+25

Management Evaluation

Current Hunter/Landowner Satisfaction Management Objective: 60% landowner & hunter

Management Strategy: Private Land

Secondary Management Strategy: Age distribution of harvested bulls

2016 Hunter Satisfaction Estimate: 49%

2016 Landowner Satisfaction Estimate: 63%

Most Recent 3-year Running Average Hunter Satisfaction Estimate: 50%

Most Recent 3-year Running Average Landowner Satisfaction Estimate¹: 61%

2016 Postseason Population Estimate: ~ 2,700 (*Field Estimate*)

2017 Proposed Postseason Population Estimate: ~ 2,700 (*Field Estimate*)

HERD UNIT ISSUES: The Black Hills Elk Herd Unit is managed for 60% or greater landowner and hunter satisfaction. The management strategy is private land, with a secondary management objective seeking an annual bull harvest (based upon tooth age data) comprised of 20% aged ≤ 2 years old; 60% aged 3 to 5 years old; and 20% aged 6 years old, or older (*± 5% in all categories*). These management objectives and strategies were adopted in 2013. Field personnel anecdotally estimated Wyoming’s Black Hills elk population to have numbered about 2,700 at the close of the 2016 hunting season.

We can neither construct a population model, nor generate a population estimate for this herd as the Department has never been able to collect adequate classification data. Additionally, radio collar data show substantial numbers of elk regularly cross the Wyoming / South Dakota Stateline violating the closed population assumption of models. Consequently, no attempts have been made to model this population since 1996. As a result, the aforementioned non-numerical management objectives were adopted in 2013.

The Black Hills Elk Herd Unit is comprised of Hunt Areas (HA’s) 1, 116, & 117. It is located in the northeast corner of Wyoming and encompasses approximately 3,270 mi², of which 1,920 mi² are considered occupied habitat. Elk are not ubiquitous across occupied habitat either in time or

¹ Includes only data for bio-years 2015 & 2016 (data not collected for bio-year 2014 due to survey changes).

space. Rather, they tend to move about depending upon range conditions, snow depth and human activity, with some areas seeing regular elk use and others very infrequent use. Approximately 73% of the occupied habitat is private land, with the single largest block of public land being found on the Black Hills National Forest (BHNF), which contributes 14% of the occupied habitat. HA 1 is 95% public land, and represents the largest contiguous block of public land extensively inhabited by elk. Elk do occur on other portions of the Black Hills National Forest and dispersed sections of State and other federally owned lands. However, elk use and harvest in those areas are not nearly as consistent.

The adopted management framework for this herd states all landowners receiving landowner elk licenses and other landowners whose property see regular elk use, or have expressed an interest in elk management will receive a mail survey with prepaid response envelopes every three years; and annual, documented one on one visits (or an annual meeting with “key” landowners) will be conducted on non-survey years.² In recent years, we have been conducting the former in lieu of the latter based upon administration direction. Landowner satisfaction with elk numbers was first quantified for bio-year 2012 with the proposal to move to a non-numerical objective. At that time, 167 Black Hills landowners were mailed a short survey to gauge their satisfaction with elk numbers and quantify support for a non-numerical objective. 71 landowners responded, and slightly more than 60% of these noted they were satisfied, very satisfied, or neutral with respect to elk numbers. During bio-year 2013, thirty large landowners who regularly harbor elk, allow some level of hunting and often experience conflict with elk were individually contacted. 48% of these landowners reported being satisfied or very satisfied; one landowner reported “no opinion,” and neutral responses were not solicited.

The criteria used to gauge landowner satisfaction were formalized in bio-year 2014 by Wildlife Division Administration when it was deemed landowners reporting elk numbers to be “at, or about at” desired levels were to be considered satisfied, while those reporting numbers to be above or below desired levels characterized as unsatisfied. As such, survey results for bio-years 2012 and 2013 were reanalyzed using these criteria where they could be teased from the responses collected. Consequently, the recorded satisfaction values were changed to 59% and 43% for bio-years 2012 and 2013, respectively. Unfortunately, due to the timing of survey efforts and administrative direction regarding satisfaction measurement criteria, no landowner satisfaction survey data meeting the revised standards were collected during bio-year 2014.

In January 2016, a mail survey was sent to 167 landowners. Subtracting for undelivered surveys, the response rate was 50%. Of the responding landowners, 18% reported elk numbers were below, 57% at, and 25% above desired levels. However, when specifically asked about satisfaction, 44% reported being satisfied or very satisfied, 19% neutral, and 37% dissatisfied or very dissatisfied. The reasons for dissatisfaction were: 44% felt elk numbers were “too low;” 22% thought elk numbers were “too high;” another 22% indicated elk causing damage (or a combination of damage and too many elk); and 11% indicated “other” reasons for dissatisfaction, such as not qualifying for landowner licenses. The majority of neutral respondents (57%) stated they had no strong feelings about elk numbers, and 36% were “happy the way things are,” while the remaining 7% were “unsure.” In summary, 63% of survey respondents were not specifically

² See “Final Black Hills Herd Unit and Population Review” adopted by the Dept. and Commission in 2013.

dissatisfied with elk numbers or management, versus 57% reporting elk numbers were “at or about at” desired levels.

In January 2017, a similar survey was sent to 174 landowners. Excluding undeliverable surveys, the response rate was 48%. Of the responding landowners, 13% reported elk numbers were below, 64% at, and 21% above desired levels. When specifically asked about satisfaction, 43% reported being satisfied or very satisfied, 28% neutral, and 29% dissatisfied or very dissatisfied. The reasons for dissatisfaction were: 14% felt elk numbers were “too low;” 27% thought elk numbers were “too high;” another 50% indicated elk causing damage (or a combination of damage and too many elk); and 9% indicated “other” reasons for dissatisfaction. The majority of neutral respondents (76%) stated they had no strong feelings about elk numbers or were “happy the way things are.” In summary, 71% of survey respondents were not specifically dissatisfied with elk numbers or management, versus 64% reporting elk were “at or about at desired level.”

The survey data collected in 2016 & 2017 demonstrate how difficult it is to broadly quantify landowner satisfaction in the Black Hills. Most of the properties are relatively small by typical Wyoming ranch standards, and many are not dependent on agriculture for profit. A significant portion of these of landowners enjoy having elk around and would like to see more, as would other non-traditional landowners who have purchased property for hunting. On the other hand, there are traditional ranching landowners negatively impacted by elk and frustrated with the damage they cause along with the lack of hunting on adjoining or nearby properties, with 50% of the reported dissatisfaction being due to damage. As such, these two contingents are diametrically opposed in what they desire in the way of elk numbers. The end result is conflict between the disparate positions, with both contributing to quantified dissatisfaction.

In the normal course of duties, Department field personnel contact landowners on an almost daily basis. Complaints about elk numbers are regularly received from some landowners, especially those experiencing damage to fences and growing or stored hay. However, no elk damage claims were made in the Sundance or Moorcroft game warden districts this past year; while three claims were submitted in the Newcastle district. Those claims totaled approximately \$2,900.00, and compensated elk depredation to growing hay crops and damage to fences. Overall, field personnel report ambivalence among landowners regarding elk management, with some noting conflicts and dissatisfaction, and others expressing real satisfaction or a desire for more elk. Given landownership patterns and disparate attitudes towards allowing hunting, damage claims will likely persist.

WEATHER: For the most part, winter weather and growing season conditions over most of the past decade in the Black Hills have been neither specifically detrimental, nor abundantly beneficial for elk; but did result in some late summer and winter depredation complaints. More recently, severe drought plagued the Black Hills in 2012, and a class III drought beset the majority of the herd unit during the primary growing season of 2016. Both of these transient droughts resulted in very poor forage production and the led to several large wildfires. However, the inter-drought period provided growing seasons with temperatures and rainfall generally above average. This resulted in good to excellent forage growth from 2013 through 2015. Fall and winter weather over that same timeframe was characterized by normal to above average temperatures and average to below normal precipitation. However, coming on the heels of the

2016 drought, more normal to severe winter weather was again experienced. See <http://www.ncdc.noaa.gov/cag/> for detailed weather information.

Based upon weather and habitat conditions observed over the past ten years, elk have likely entered most winters in good condition, except perhaps following the summer droughts of 2012 and 2016. Overall, weather patterns have been generally favorable for elk. However, fluctuations in weather patterns such as the 2012 and 2016 droughts, along with a few significant snow events and persistent deep snow at times have likely impacted herd demographics and exacerbated damage.

HABITAT: The Black Hills is the western most extension of many eastern plant species. These species are often found mixed with more typical western plants providing a large variety of habitats used by elk. Ponderosa pine (*Pinus ponderosa*) is the predominant overstory species. There are scattered patches of quaking aspen (*Populus tremuloides*), paper birch (*Betula papyrifera*), bur oak (*Quercus macrocarpa*), and mountain mahogany (*Cercocarpus montanus*). Many of these stands are in late successional stages. Important shrubs include Saskatoon serviceberry (*Amelanchier alnifolia*), Oregon grape (*Berberis repens*), common chokecherry (*Prunus virginiana*), and wild spiraea (*Spiraea betulifolia*). Since 2000, wildfires in both Wyoming and South Dakota have burned well over 10% of the BHNF and significant amounts of private land in this ecosystem. These fires have been beneficial for elk by creating early succession plant communities and increasing available forage. However, there are no habitat evaluation or vegetation surveys located within this herd unit related to elk forage or cover.

Elk habitat quantity and quality are thought to be good, but security areas may be impacted or lacking in areas due to high road densities. These road densities, along with vast tracts of commercially thinned ponderosa pine stands, do not provide what is usually considered classic, good elk habitat. Despite the lack of cover in areas and numerous roads, the elk population significantly expanded through the 1990's and into the early years of the next decade. Several factors benefited this population. First, herbaceous forage is abundant, and wildfires have increased available forage. Second, despite high road densities, much of the land inhabited by elk is privately owned. This private land has lower road densities and experiences limited human activity. Many of these same private land areas provide elk refuge from hunting pressure during the fall. Also benefiting the situation, in 2010 USFS increased the number of road closures on the Black Hills National Forest when they adopted a new travel management plan.

FIELD DATA: Collection of classification data were suspended in 1996, and only occasionally are limited classification data garnered during other field activities. The limited data that have been collected over the years have generally reflected larger samples collected in the Black Hills of South Dakota by SDGF&P. SDGF&P collects preseason classification data on elk every year, and since 2003 these data consistently yielded calf:cow ratios near 50:100, but more variable bull:cow ratios, which have averaged near 30:100 (South Dakota Department of Game, Fish and Parks, 2015). In 2015 & 2016, no specific efforts were made by the WGFD to classify elk. However, the WGFD did partially fund SDGF&P's 2015 helicopter-based late winter elk survey. This funding was used to pay for SDGF&P's survey efforts across much of the occupied habitat south of Interstate Highway 90 (I-90) in Wyoming HA's 1 & 117. That effort detected a total of 923 elk in the portion of Wyoming surveyed. Of the elk observed, SDGF&P personnel were

able to classify 516 (262 cows, 52 calves, and 202 bulls). The 407 unclassified elk were primarily large groups of cows and calves. It is hoped the data collected can eventually be used in light of SDGF&P's past studies to estimate elk numbers in that portion of Wyoming south of I-90 harboring wintering elk; or act as the basis for a winter trend count.

While classification data are lacking, tooth age data have been collected from harvested elk most years since 1987.³ Tooth age data can estimate annual recruitment via the percentage of yearlings in the female segment of the harvest (Figure 1). Since 1987, this figure has averaged 16.2% (std. dev. 7.7%)⁴ suggesting most years 8 to 24 yearling cows (and about the same number of yearling bulls) are added per 100 adult cows into this population. However, as noted in previous reports (2015 EL740 JCR) recruitment of yearling elk has been lower since 2000. Because of this and significantly increased license issuance with extended hunting seasons, there had been an increase in the percentage of harvested female elk over age 5 and a decline in the percentage of young (≤ 2 years old) females taken, while the relative percentage of mid-aged cows has remained fairly stable (Figure 2). However, this trend has reversed itself the past two years as the percentage of yearling cows in the female harvest increased and the relative percentage of older cows dropped. Similarly, the yearling buck:doe ratios in sympatric deer herds increased significantly as well in 2015 & 2016, suggesting strong production and recruitment since 2014 amongst Black Hills ungulates.

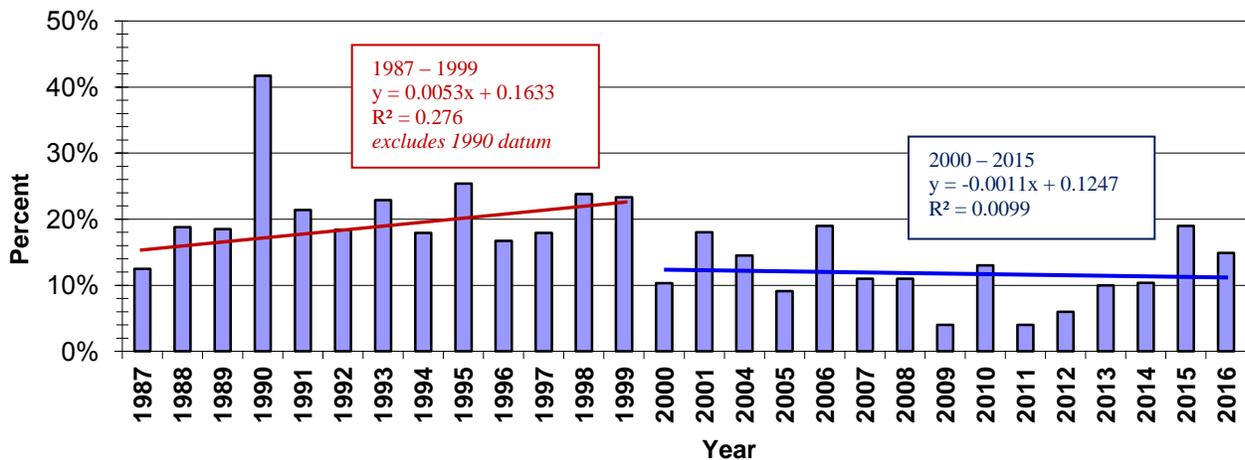


Figure 1. Percentage of yearlings in the female segment of the elk harvest (1987 – 2016).

Of course there is greater hunter selectivity when it comes to take of bulls. Between 2000 and about 2009, tooth age data suggest a slight decline in the relative percentages of both middle-aged (3-5 year old) and young (≤ 2 years old) bulls in the harvest, and a slight increase in the percentage of bulls 6⁺ years old harvested (Figure 3). However, since 2010 this trend may have reversed itself, as it appears a greater proportion of younger bulls (≤ 5 years old) have been harvested more recently - although this trend was contraindicated in 2016. However, 33% of the tooth aged bull harvest consisted of 3 year old elk. Considered in light of the larger relative increases in antlerless license versus any elk license issuance, it is reasonable to assume we have impacted the antlerless segment of the herd. This is reflected in the increasing percentage of

³ Budgetary constraints prevented tooth age data collection in 2002 & 2003.

⁴ Omitting 1990 data reduces this average to 15.2% with a std. dev. 6.0%.

female elk in the total harvest and, if this population has stabilized or is declining, one would expect to see an increase in the percentage of younger aged bulls harvested, as availability of older bulls declines with decreased production and recruitment in the face of sustained antlerless harvest and consistent bull take. It does appear we may be shifting harvest pressure on to younger-aged bulls (Figure 3 & Table 1), and if these recent trends continue, our ability to meet our secondary objective of age distribution of harvested bulls may become difficult without reductions in Type 1 license issuance.

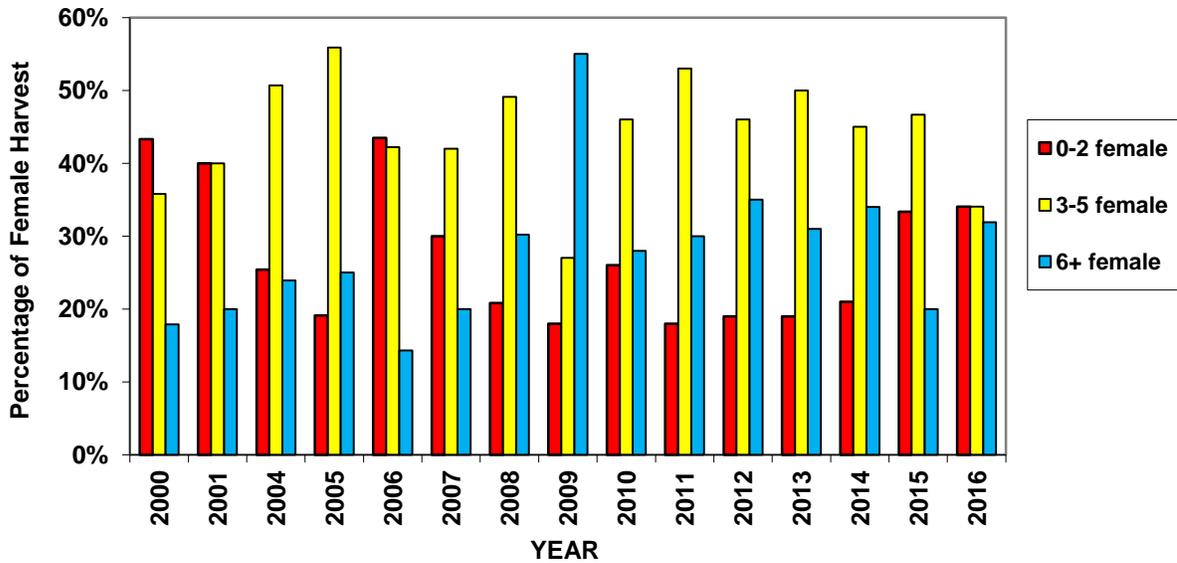


Figure 2. Relative percentages of various age classes of female elk harvested (2000 – 2016).

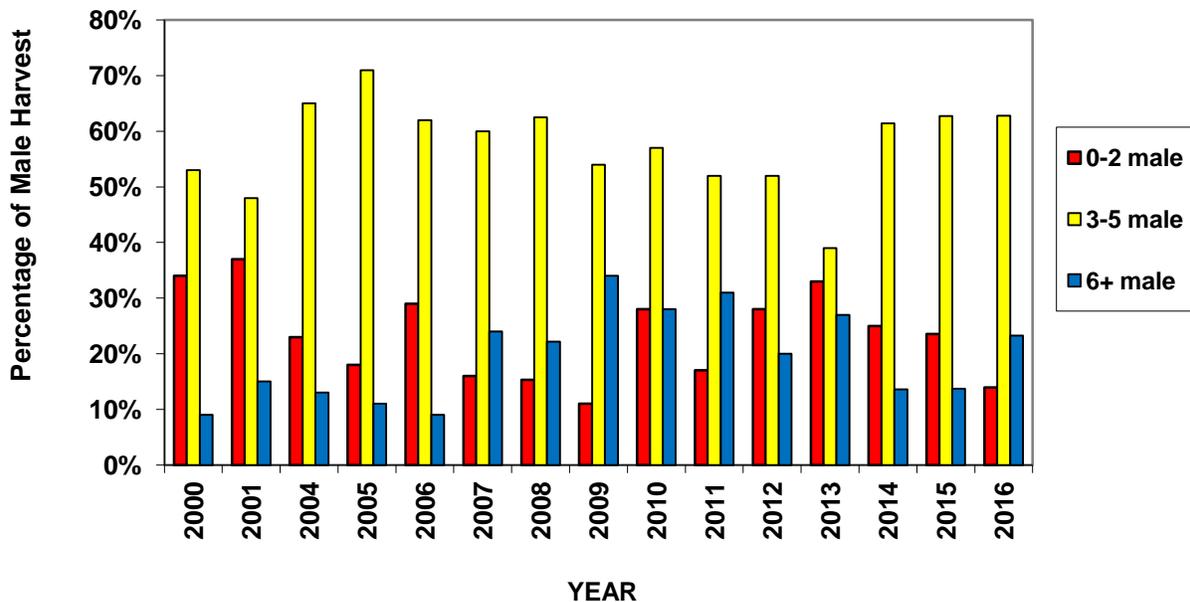


Figure 3. Relative percentages of various age classes of male elk harvested (2000 – 2016).

Segment of Bull Harvest	Objective	2014	2015	2016
Bulls 0-2 yrs. old	20%	25%	25%	14%
		3 yr. mean		21%
Bulls 3-5 yrs. old	60%	61%	62%	63%
		3 yr. mean		62%
Bulls 6+ yrs. old	20%	14%	13%	23%
		3 yr. mean		17%

Table 1. Secondary management objective, relative distribution of ages of harvested bulls

HARVEST: The low percentage of yearling females present in the harvest between 2000 and 2014 suggests reduced recruitment, as does the fact elk have not been pioneering into unoccupied habitats as they once were. However, over the years the bulk of tooth age data have been returned from HA 1 and 117 and therefore any decrease in recruitment should only be ascribed to that segment of the herd. It does seem harvest rates adequate to manage elk numbers may be achieved some years south of I-90, but poor success by hunters pursuing female elk in HA 116 is likely allowing that portion of the herd to grow. Conservative elk management at times in South Dakota and interstate elk movement further confound our ability to make herd-wide judgments relative to current harvest level’s capacity to manage elk numbers.

Elk harvest bounced back to predicted levels in 2014, as weather conditions allowed hunters easier access to elk compared to 2013 when their travels were severely hindered by winter storm “Atlas.” In 2015, with the same hunting season structure in place as the previous two years, total harvest fell midway between that experienced in 2013 and 2014. Field personnel also reported that hunters seemed to struggle a bit more to find and harvest elk in 2015. The same scenario played out in 2016 with fewer total elk being harvested compared to 2015 with the same season structure in place – although there was an increase in the total bull harvest, while antlerless harvest declined 15%.

Across Wyoming, at the herd unit level, elk hunter success is highly correlated with reported hunter satisfaction (close to 90% in years examined). Beginning in 2013, HA 116 moved from limited quota license hunting to a liberal general license season combined with a significant number of reduced priced cow/calf licenses. Due to very limited access to elk hunting on private land, this has resulted in a large number of license holders hunting the BHNF north of Sundance where few elk reside. Consequently, since 2013 hunter success on general licenses has been low, averaging less than 15%, while success on cow/calf licenses has averaged only 28% and that of total active licenses was 18%. These poor success rates are reflected in low hunter satisfaction in HA 116, where satisfaction has averaged just over 40% during this same timeframe. That figure biases the herd unit hunter satisfaction numbers low, since an average of 55% of the hunters at the herd unit level are sampled each year from HA 116. In contrast, since 2013, hunter satisfaction in HA 1 and HA 117 has averaged close to 60% each year.

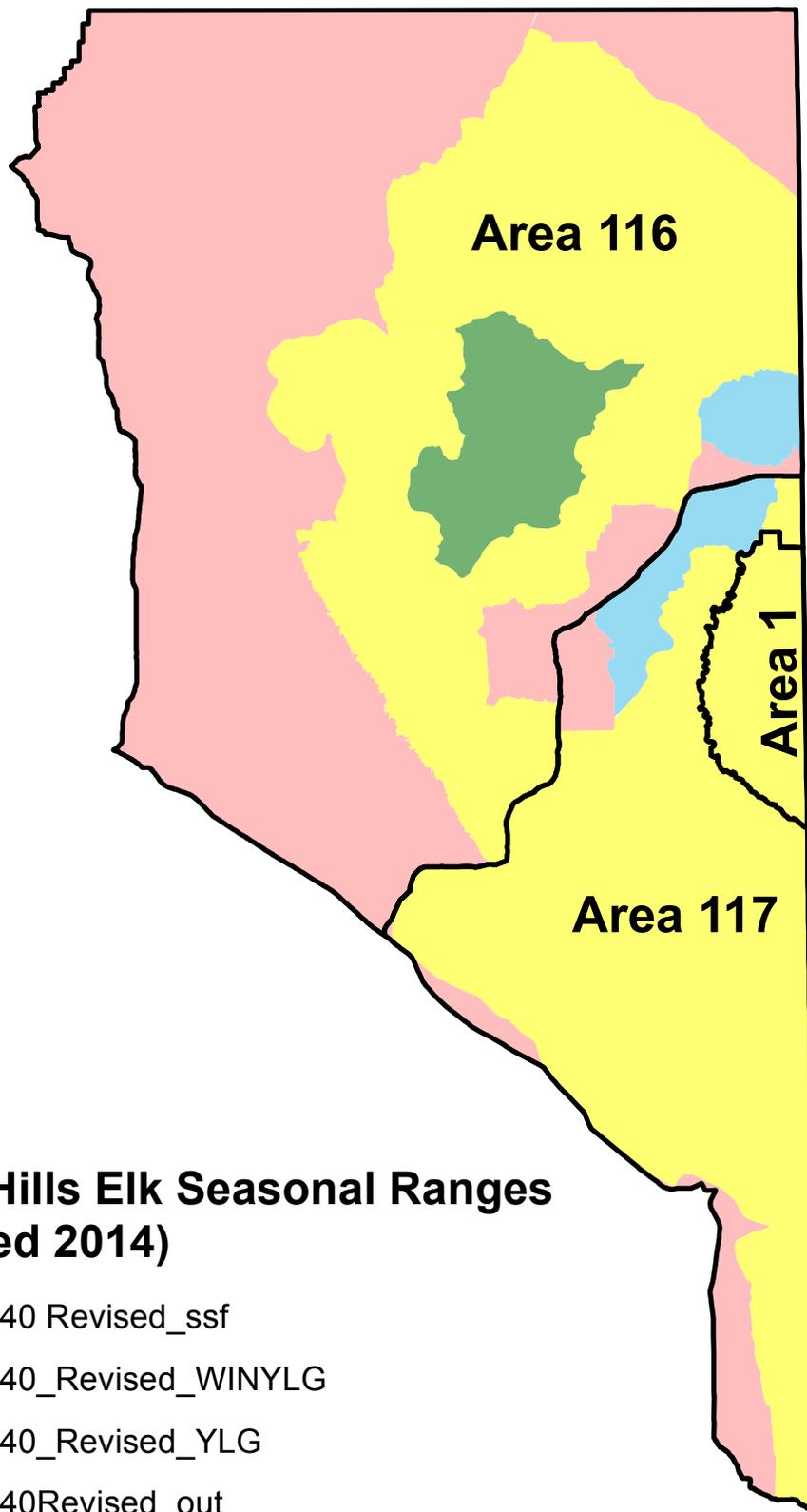
Given an average annual recruitment of 30 yearling elk per 100 cows (based upon 15% yearling cows in total cow elk harvest) and assuming a pre-season herd composition of 40 bulls per 100 cows and 47 calves per 100 cows, the 2016 estimated harvest of 498 adult elk would have removed the annual recruitment of yearlings from a total population of about 3,100 elk. Thus, (based upon our anecdotal population estimate of 2,700) the 2016 harvest should have about kept this elk herd in check or reduced it some. However, several hundred elk (perhaps nearly 1,000 head) regularly cross the Stateline and winter in South Dakota making it difficult to determine the real effect harvest is having on our post-season population; and most of the tooth age data and harvest come from HA's 1 & 117.

POPULATION: Despite the lack of a population estimate, indications are elk numbers increased quite a bit between 1990 and 2010 as elk significantly expanded their distribution. Silvicultural practices and wildfires throughout the region have also created habitat favorable for elk. Although habitat changes have continued to favor elk in recent years, elk have not continued to pioneer into previously unoccupied areas. Harvest statistics and tooth age data suggest population growth may have been curbed recently, at least south of I-90. But, it is likely robust reproduction and survival since 2014 has allowed this sub-population to once again grow. Given the high quality habitat in the region, limited access to hunt elk on private land, and sustained high harvest rates of mountain lions, this herd will likely continue to exhibit growth potential in many areas due to limited private land access for hunting.

MANAGEMENT SUMMARY: Changes implemented in 2013 expanded HA 116 and put it under a general license hunting season framework augmented with Type 6 and 8 cow/calf licenses. This was done to liberalize harvest opportunity as much as the Department felt could be done and retain some level of public support. This resulted in a hunt area with very low hunter success rates and satisfaction compared to the rest of Wyoming. However, it is also important to note that while only 48% of the landowners surveyed in 2014 were satisfied with elk numbers, a whopping 82% did not want a change in license numbers and several expressed dissatisfaction with the long hunting season. In the 2016 landowner survey the following question was added, "If you think elk numbers are too high, how can we work together to substantially reduce the herd size through public hunting?" Unfortunately, no viable or positive answers were returned. These facts bears out that while some traditional landowners complain about elk numbers, few are willing to allow hunting at the levels needed to significantly reduce this population. However, a group of landowners in the Skull Creek drainage of HA 117 desire to participate in a Hunter Management Assistance Program (HMAP) to address a sub-herd of about 300 head. To accommodate and facilitate this request, a type 7 license valid in this portion of the area has been added with 50 tags available, and HA 117 Type 8 license issuance has been increased by 25. Overall, management tactics the past 5 years seems to be reducing or holding elk numbers in check where there is adequate access for hunting, but allowing sub-herds to grow in areas without adequate hunter access.

Given mean hunter participation and success rates over the past decade and a half, the 2016 harvest should result in about 580 total elk taken. This harvest estimate is predicated on a similar number of elk being harvested from HA 116 on general licenses, continued average success rates in other hunt areas, and includes take of 55 calves. However, the long season for antlerless elk hunting in HA's 116 and 117 (five and a half months), plus the addition of the HMAP could

increase antlerless harvest above predicted values if access to elk improves. If projected harvest levels are reached, elk numbers could stabilize or decline south of I-90, while elk numbers north of the Interstate will likely continue to increase. Based upon an estimated preseason herd composition of 47:100:40 (calf:cow:bull) and a recruitment rate of 30 yearling elk per 100 cows, a harvest of 525 adult elk would remove the annual yearling recruitment from a herd of ~3,250 elk (all age classes), a number below what field personnel believe to be present at this time.



**Black Hills Elk Seasonal Ranges
(Revised 2014)**

- E740 Revised_ssf
- E740 Revised_WINYLG
- E740 Revised_YLG
- E740 Revised_out

2016 - JCR Evaluation Form

SPECIES: Elk

PERIOD: 6/1/2016 - 5/31/2017

HERD: EL741 - LARAMIE PEAK/MUDDY MOUNTAIN

HUNT AREAS: 7, 19

PREPARED BY: HEATHER O'BRIEN

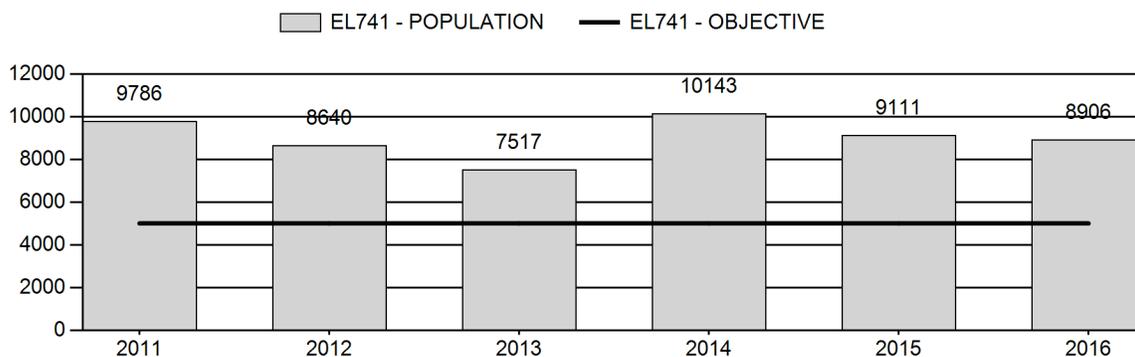
	<u>2011 - 2015 Average</u>	<u>2016</u>	<u>2017 Proposed</u>
Population:	9,039	8,906	7,575
Harvest:	2,397	2,435	2,225
Hunters:	4,741	4,887	5,000
Hunter Success:	51%	50%	44%
Active Licenses:	4,832	4,945	5,000
Active License Success:	50%	49%	44%
Recreation Days:	36,663	39,372	37,000
Days Per Animal:	15.3	16.2	16.6
Males per 100 Females	30	36	
Juveniles per 100 Females	37	29	

Population Objective (± 20%) :	5000 (4000 - 6000)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	78%
Number of years population has been + or - objective in recent trend:	16
Model Date:	03/02/2017

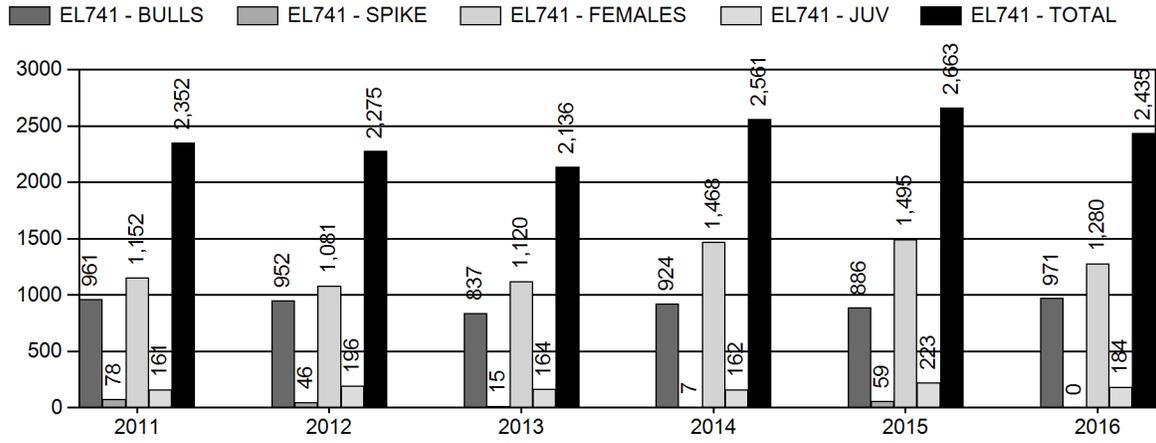
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	24.9%	21.3%
Males ≥ 1 year old:	36.5%	37.0%
Total:	30.1%	23.8%
Proposed change in post-season population:	-12.5%	-15.5%

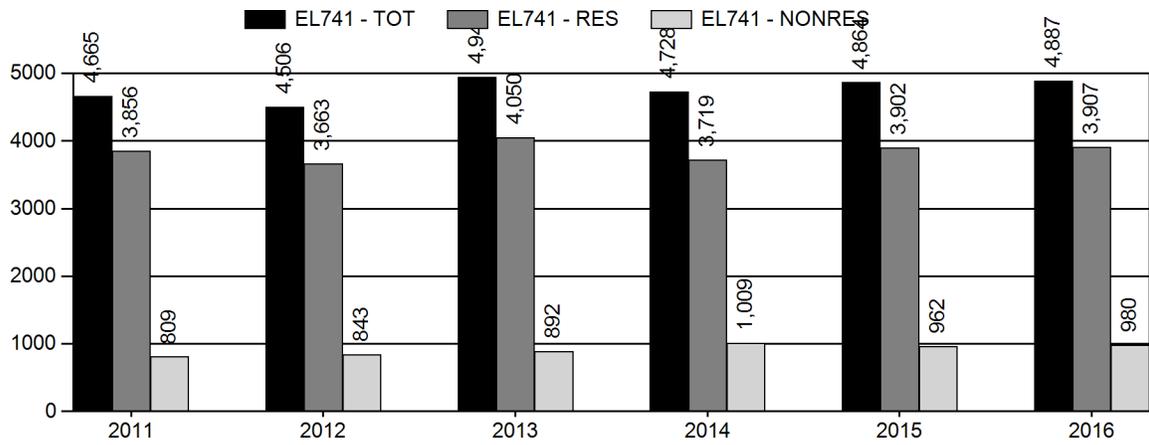
Population Size - Postseason



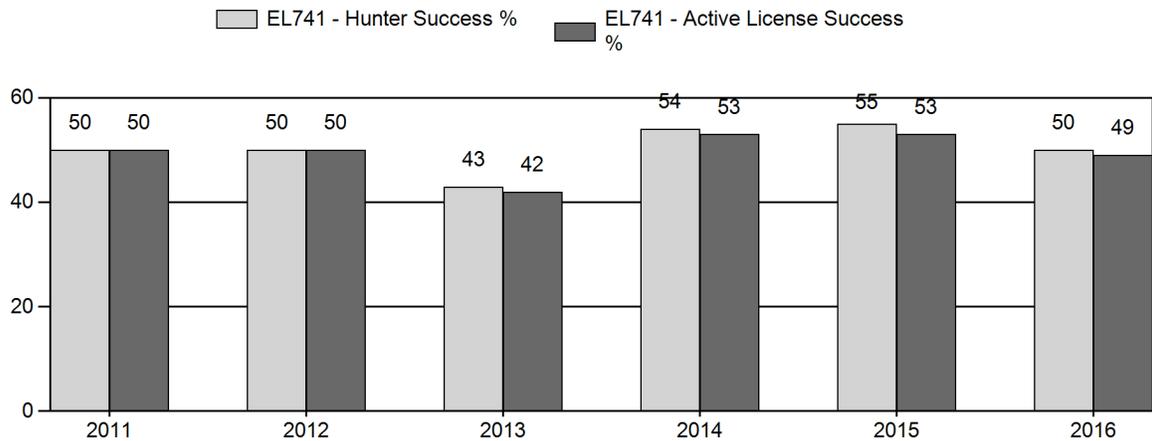
Harvest



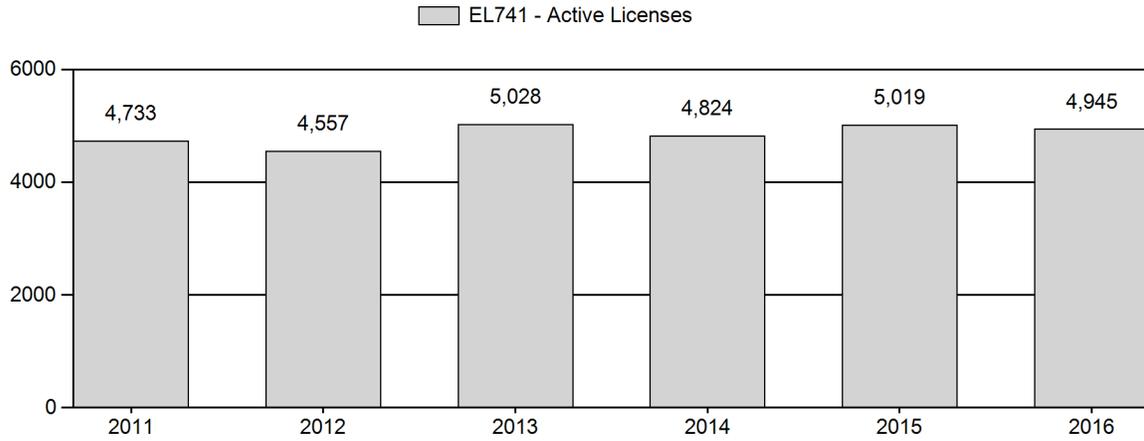
Number of Hunters



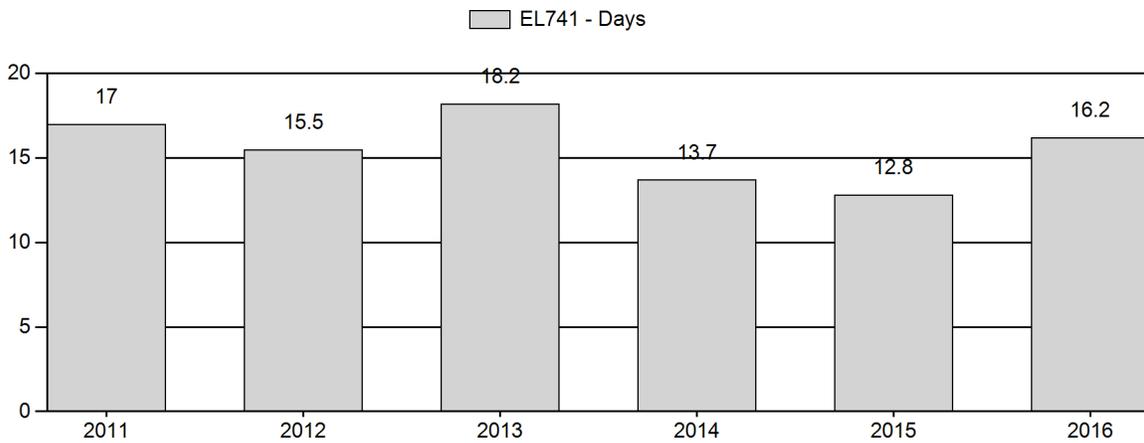
Harvest Success



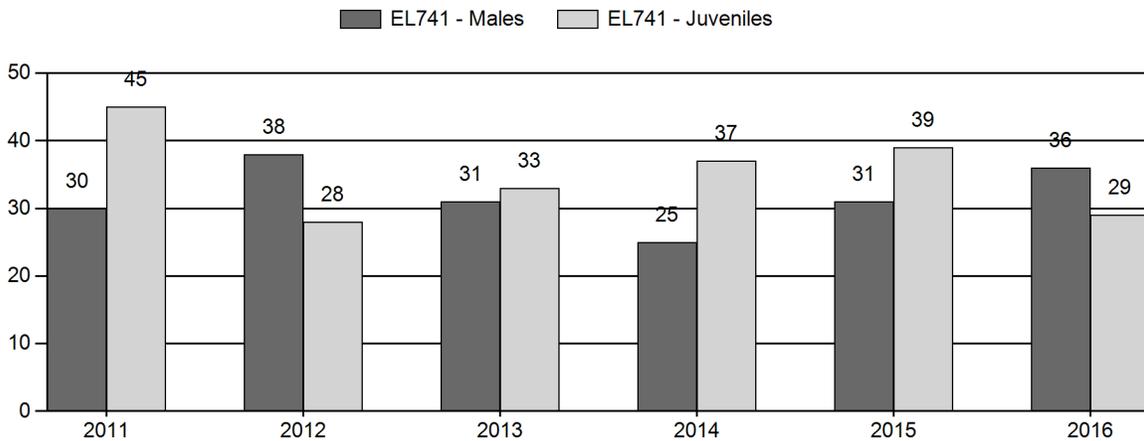
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2011 - 2016 Postseason Classification Summary

for Elk Herd EL741 - LARAMIE PEAK/MUDDY MOUNTAIN

Year	Post Pop	MALES				FEMALES		JUVENILES		Tot CIs	Cls Obj	Males to 100 Females				Young to		
		Ylg	Adult	Total	%	Total	%	Total	%			Ylg	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2011	9,786	324	548	872	17%	2,890	57%	1,298	26%	5,060	539	11	19	30	± 1	45	± 1	35
2012	8,640	143	362	505	23%	1,334	60%	379	17%	2,218	617	11	27	38	± 2	28	± 2	21
2013	7,517	328	487	815	19%	2,605	61%	869	20%	4,289	535	13	19	31	± 1	33	± 1	25
2014	10,143	383	468	851	15%	3,454	62%	1,270	23%	5,575	592	11	14	25	± 1	37	± 1	30
2015	9,111	404	485	889	18%	2,882	59%	1,116	23%	4,887	504	14	17	31	± 1	39	± 1	30
2016	8,906	383	581	964	21%	2,803	61%	806	18%	4,573	495	14	21	34	± 1	29	± 1	21

2017 HUNTING SEASONS
LARAMIE PEAK MUDDY MOUNTAIN ELK (EL741)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
7	1	Oct. 15	Nov. 20	1,500	Limited quota	Any elk
		Nov. 21	Dec. 31			Antlerless elk
	4	Oct. 15	Dec. 31	1,200	Limited quota	Antlerless elk
		6	Aug. 15			Oct. 14
	Oct. 15		Dec. 31	Cow or calf valid in the entire area		
	7	Jan. 1	Jan. 31	500	Limited quota	Cow or calf
	19	1	Oct. 1	Oct. 14	150	Limited quota
Nov. 21			Jan. 31	Antlerless elk		
2		Nov. 1	Nov. 20	150	Limited quota	Any elk
		Nov. 21	Jan. 31			Antlerless elk
4		Oct. 1	Oct. 14	125	Limited quota	Antlerless elk
		Nov. 21	Jan. 31			Antlerless elk
5		Nov. 1	Jan. 31	125	Limited quota	Antlerless elk
6		Oct. 1	Oct. 14	225	Limited quota	Cow or calf
		Nov. 1	Jan. 31			Cow or calf
Archery			Sep. 1	Sep. 30		

Hunt Area	Type	Quota change from 2016
7, 19	All	No change

Management Evaluation

Current Postseason Population Management Objective: 5,000

Management Strategy: Special

2016 Postseason Population Estimate: 8,906

2017 Proposed Postseason Population Estimate: 7,523

2016 Hunter Satisfaction: 67% Satisfied, 17% Neutral, 16% Dissatisfied

The Laramie Peak / Muddy Mountain Elk Herd Unit has a postseason population management objective of 5,000 elk. The herd is managed using the special management strategy, with a goal of maintaining postseason bull ratios between 30-40 bulls per 100 cows and a high percentage of branch-antlered bulls in the male harvest segment. The objective and management strategy were last reviewed in 2013, when managers and landowners agreed to maintain both the population objective and the special management strategy for bulls.

Herd Unit Issues

Hunting access within the herd unit is variable, with a mix of national forest, state lands, and private lands. The addition of Walk-In Areas and Hunter Management Areas greatly expands hunting opportunity within the herd unit as well. Landowners offer varying levels of access to hunting. While most landowners offer some form of access – whether it be free or fee hunting – there are a few ranches that offer little access. These areas tend to harbor high numbers of elk that are inaccessible during hunting seasons. The main land use within the herd unit is traditional ranching and grazing of livestock; however several properties in the herd unit have become “non-traditional” in that they are owned by individuals who do not make a living by ranching their lands. Industrial-scale developments are minimal within this herd unit, though there is potential for the expansion of wind energy development. Chronic Wasting Disease is present in this herd at low prevalence (typically 6-8% of hunter-harvested elk).

Weather & Habitat

The summer of 2012 was the driest on record since 1904 in much of Wyoming. Extensive wildfires displaced and redistributed elk, especially in the east-central portion of the herd unit. The severe drought and resulting wildfires likely impacted calf survival, as post-season ratios were low at 28 calves per 100 cows. The winter of 2012 was mild with below average snow

accumulation, while spring of 2013 was wet with significant precipitation. In early October 2013, winter storm “Atlas” blanketed the area with 12-36” of wet snow, with greater depths at higher elevations. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 was one of the best growing seasons the region had seen in years. Winter 2014-2015 was generally mild, and the 2015 growing season was just above average for the region. Fall of 2015 was relatively dry, and much of the herd unit remained accessible for hunting for the majority of the hunting season. 2016 was mild at first with a wet spring, but then became quite dry for the majority of the summer and fall. The fall of 2016 was dry with above average temperatures. Hunting was difficult, as elk activity was more limited to early morning and late evening when temperatures were cooler. Late fall precipitation provided green forage and a nutritional boost for elk prior winter. While there were several notable snow storms and cold snaps during the winter of 2016-2017, there were also periods of warm weather and high winds that melted and drifted snow to expose forage. Thus, managers expect good calf survival for the winter of 2016-2017. For detailed weather data see <http://www.ncdc.noaa.gov/gac/time-series/us>.

Field Data

Calf ratios are typically in the 40s per 100 cows for the Laramie Peak / Muddy Mountain Elk Herd. While calf survival can vary from year to year, adult elk in this herd are thought to have rather high rates of survival as predation pressure is relatively low and there is little mortality from disease and winter weather. Prior to 2005, antlerless license issuance was not adequate to keep up with the production of this herd. Since then, antlerless license issuance has increased substantially, and the population has stabilized or begun to decrease as harvest pressure on cows has greatly intensified. In 2012, the calf ratio reached a historic low of 28 calves per 100 cows. Calf production increased slowly from 2013-2015, but was low again in 2016 with 29 calves per 100 cows observed. Calf ratios over the previous 5 years (average = 36) have been much lower than the long-term average of 43 (1991-2015). This may be due to a number of factors including stress on pregnant cows from January hunting seasons, changes in habitat quality, or increased competition due to higher elk densities. Cow harvest continues to remain high, and late-season access to hunt was good in the herd unit for 2016. While lower calf production/survival from 2012-2016 may slow population growth, continued high license issuance and harvest of cows is still necessary to reduce this herd toward objective.

Bull ratios for the Laramie Peak / Muddy Mountain Herd historically average in the mid-30s per 100 cows, though there have been years where the ratio has dropped below special management limits into the 20s. Prior to 2016, the accuracy of bull ratios was questionable from year to year in this herd. While post-season classification samples are well distributed within this herd unit, changes in distribution of elk, ability to locate large cow/calf groups, and concealment of bulls in timber during January can influence results from year to year. In 2016 a new survey method was

developed, using stratified random selection of sample units delineated from previous elk location data. This survey method should eliminate surveyor bias and provide a more consistent and accurate estimate of bull ratios within the herd. The 2016 observed bull ratio for the herd unit was 34 per 100 cows. Consistent use of the new survey method should also improve the accuracy of the population model, as the model relies strongly on observed male ratios for alignment and predict population size.

From 2010-present, Type 1 licenses have fluctuated between 1,500 and 1,750 licenses in Area 7, depending upon hunter, landowner, and manager perceptions of bull quality. While annual tooth-age data illustrate hunters are consistently harvesting prime age-class bulls over the past four years, antler-class data show a decrease in the percentage of Class-II antlered bulls (Appendix A). Hunters have more frequently communicated concern about declines in trophy quality within this herd in recent years as well. While consistent harvest pressure on trophy-class bulls may be one contributing factor, other influences including competition for key resources may also be influencing antler quality in this herd. Managers regularly observed 800-1,100 bulls during postseason helicopter surveys from 2007-2016. While a higher number of bulls implies more hunting opportunity, it also signifies a higher potential for competition for forage and other resources. It should also be noted that expectations of hunters for increasingly larger bulls in a prized hunt area may also be influencing perceptions of bull quality. Regardless, hunters, landowners, and managers seem to be satisfied with current bull ratios and the opportunity is still readily available for a quality hunt in this herd unit. Consequently, any-elk license issuance will be maintained in Areas 7 and 19 at 1,800 licenses, which is considered conservative for this herd unit.

Harvest Data

License success in this herd unit is typically in the 50th percentile. It should also be noted that days per animal can be high in this herd unit compared to others, as hunters have high expectations regarding bull quality and will exert more effort in finding a mature bull. Archery hunting has also become more popular in the herd unit, as hunters want to maximize their time in the field to harvest a mature bull. Days per animal was 16.2 in 2016, which is higher than the 10-year average of 14.4 days per animal. Weather and access conditions were both excellent during much of the 2016 hunting season, though temperatures were well above normal in November, making it difficult to locate elk. Overall harvest success in 2016 (50%) was on par with the ten-year average (52%). Total harvest (2,435) was higher than the ten year average, but similar to total harvests for 2014 & 2015. Bull harvest (971) was the highest it has been since 2012, and cow harvest (1,280) remained higher than the 10-year average (1,139). Total harvest of cows and calves was exceptional in both hunt areas for 2016. In Area 19, an estimated 178 cows and calves were harvested, while in Area 7 over 1,286 were harvested. Both totals

represent very high cow/calf harvests for each hunt area, and may be attributed to favorable weather, prolonged hunting seasons, and good access to elk in 2016.

Population

The 2016 postseason population estimate was approximately 8,900 and managers believe the herd is either stable or slowly trending downward. A sightability survey was conducted in conjunction with January 2017 classification surveys, and will be available to further align the model for 2018. It is difficult for managers to have confidence in the model for this herd, which consistently predicts a declining or even crashing population. Between 2,000 and 2,700 elk have been harvested annually since 2007, and harvest success has remained above 50% in all but one year (when weather conditions greatly restricted hunting access). During classification flights in 2010, nearly 6,500 elk were observed with excellent survey conditions. During classification flights in 2016, over 6,200 elk were observed under similar conditions. Though the model illustrates a declining population, this herd continues to support a high level of harvest without declines in harvest success. Tooth age data have shown that prime-age bulls and cows have consistently been harvested from the herd in recent years. All these data, combined with the ability to reliably observe large numbers of elk during annual surveys, suggest the herd is more likely stable than declining. A rudimentary population model suggests this herd must contain 13,700 elk in order to sustain current levels of harvest. However, managers do not feel that over 7,000 elk were undetected during surveys. On the contrary, all major wintering complexes with large congregations of elk were surveyed intensively. Field personnel agree that it is highly unlikely that less than fifty percent of elk were observed during January 2017 flights. Thus, managers have low confidence in the validity of the population model. Population, harvest, and tooth data combined with observations from field personnel, hunters, and landowners all indicate this herd is likely either stable or slowly declining.

The “Time-Specific Juvenile Survival, Constant Adult Survival,” (TSJ,CA) spreadsheet model was selected to represent the Laramie Peak / Muddy Mountain Herd Unit for 2016. In previous years the TSJ,CA,MSC, TSJ,CA and CJ,CA models have each been used. Shifting to a new TSJ,CA model in 2016 will result in inconsistent data between previous years and 2016. However, the TSJ,CA model is currently the only model that seems representative of the herd in current years without additional unwarranted manipulation. The CJ,CA and SCJ,SCA models predict precipitous declines and/or population crashes that are improbable and/or impossible for the herd given field observations and harvest data. Both models also predict unrealistically high harvest segments for bulls in recent years that range from 45 to 60%. The TSJ,CA,MSC model predicts a higher than expected population size for the herd, and also assumes that adult males have a lower annual survival rate than females. This assumption is unreasonable for the herd, as females receive a high level of harvest pressure during early and late cow seasons when bulls receive no harvest pressure. In addition, this herd does not have a high level of natural predation

that would create a lower survival rate for bulls. The TSJ,CA model predicts a more reasonable population size, though it selects the upper constraint for adult survival and frequently hits both upper and lower constraints for calf survival across years.

Managers have low confidence in any of the models for the Laramie Peak / Muddy Mountain Herd Unit with the data currently available. The addition of a sightability coefficient (to be calculated in 2017) should improve alignment of the model. The new stratified random classification survey method should also help enhance model quality. This survey methodology, once refined and used over multiple years, will improve model quality by contributing age and sex ratios that are more accurate for this herd. Until additional years of improved data can be added to the model, it is considered of poor quality.

Management Summary

Season dates for this herd have changed from year to year, and in general have been liberalized over time to maximize cow harvest and reduce damage on agricultural fields. Meetings with landowners continue to be held to discuss ideas to maximize female harvest and maintain bull quality, and the majority of landowners have expressed their satisfaction with the current season structure. Thus, season dates and limitations will remain unchanged for 2017 in both hunt areas. Area 7 Type 6 licenses will remain valid early from August 15th through October 14th to address damage on hay fields in Albany and Converse Counties. Area 7 Type 7 licenses will provide further opportunity to harvest a cow or calf in January, while unused Area 19 licenses will continue to be valid for antlerless elk through January as well. Currently, access is predicted to be similar in 2017 compared to previous years. If additional access is secured in Area 19, increased license issuance will be considered by managers for future seasons. Goals for 2017 are to continue reduction of the herd toward objective, maintain bull ratios within special management limits, maintain good harvest success, and reduce elk damage to agricultural fields.

If we attain the projected harvest of 2,225 elk with average calf ratios, this herd will decline further toward objective. The predicted 2017 postseason population size of the Laramie Peak / Muddy Mountain Elk Herd is approximately 7,600 animals, which is 50% above objective.

APPENDIX A:

Tooth-Age and Antler Class Data for Laramie Peak / Muddy Mountain Elk

The Laramie Peak / Muddy Mountain Elk Herd Unit (Wyoming Hunt Areas 7 & 19) has historically built a reputation for superior hunting in terms of high bull ratios, bull quality, and good hunter success. Bull ratios are managed under the special management criteria, with the goal of maintaining 30-40 per 100 cows. Bull quality is monitored annually using cementum annuli tooth aging from a sample of hunter-harvested elk and categorical postseason classifications based on antler size.

Tooth age data from the Laramie Peak / Muddy Mountain herd have been collected in nearly all years from 1997-2016. Tooth samples are solicited from both bull and cow elk hunters, as female age data is more representative of a random sample across age classes, while bull age data is potentially biased towards hunter preferences for more mature age classes. Sample size has varied from year to year depending upon hunter response rates. In 2016, a total of 800 “any-elk” hunters and 775 antlerless elk hunters in the herd unit were solicited for tooth samples. Of those solicited, 132 returned teeth from bulls and 90 returned teeth from cows. Samples received from calf elk were removed from resulting totals so as not to skew statistics on adult age classes.

Average tooth age of harvested adult males slowly increased from 1999-2015, and decreased slightly in 2016 (Table 1). Average tooth age of harvested female elk has been more variable over time, but has steadily increased since 2011 and was the highest on record in 2016 (Table 2). Median age of males decreased from 6.5 to 5.5 years old in 2016, while median age of females held constant at 4.5 years old. This slight divergence between harvested bull and cow ages suggests that hunter selectivity is for larger, older age class bulls; while the younger age class of harvested cows is likely to represent the most abundant age class in this herd. Hunters who harvest a 1.5 year old bull are also less likely to submit teeth for aging, as they are usually aware of the age of their “spike” elk in the field. Hunters who harvest a 1.5 year old cow have no certain way to age their elk in the field, and thus are more likely to submit teeth.

The percentage of harvested bulls aged 6-10 gradually increased from 2001-2016, indicating that older age-class bulls may be increasingly available for harvest. This contradicts some years of observed antler class data during the same time period that shows a decline of Class II (6 points on a side or better) bulls in the herd (Table 3). This disparity may be due to increased selectivity of hunters for older age-class bulls, compared to the more random sample of bulls surveyed during postseason classification flights. In addition, hunters submitting teeth may be biased towards older age class bulls, as hunters who are pleased with the quality of their animals may be more likely to submit samples.

The increasingly high percentage of older age-class bull elk is a surprising trend, considering that managers believe this herd has been stable or decreasing since 2009. License issuance has remained high, and one would expect it to become increasingly difficult to find and harvest older age-class bulls. At the same time, average age of sampled cows has slowly increased, while license issuance and season length have been liberalized, and this herd has either stabilized or begun to decrease. These data are somewhat confounding as they suggest that females are increasingly reaching older age classes in the herd before they are harvested and/or there are relatively fewer younger age class cows available for harvest. However, calf ratios have also declined in recent years, meaning lower calf recruitment may have suppressed the distribution of elk in younger age classes.

Trends in antler class of classified bull elk are more difficult to interpret on their own. Class I bulls are mature bulls that have < 6 points on both antlers, while Class II bulls have ≥ 6 points on either antler. The percentage of Class II bulls declined from 2008-2011, but then increased and seems to have stabilized from 2012-2016. During the same time period, average tooth-age of harvested bulls increased from 5.01 to 6.40, with a slight decline to 6.20 in 2016. The lack of symmetry between the two data sets suggests antler quality is not always correlated positively with bull age for this herd. Factors such as nutrition and genetics may also be contributing to antler quality. Studies of the tooth-age dataset certainly temper any assumptions made regarding changes in the antler class dataset and aid in making sound management decisions for this herd. Collectively, these data indicate this herd can continue to support the current number of any-elk licenses for the 2017 season without compromising bull ratios or bull quality. Managers must continue to scrutinize harvest data and hunter feedback, and perhaps begin to reduce issuance of any-elk licenses if the percentage of Class II bulls observed during classification surveys continues to decline. Managers may also consider incentivizing the submission of tooth samples from hunters as a means to improve and maintain adequate sample sizes, as hunter participation appears to have dropped in recent years.

Table 1. Tooth-age data analysis for adult bull elk harvested within the Laramie Peak/Muddy Mountain Herd Unit, 1997 - 2016.

Year	Number of Adult Males per Age Class (Tooth Sampling)																						
	1+	2+	3+	4+	5+	6+	7+	8+	9+	10+	11+	12+	13+	14+	15+	16+	17+	18+	19+	20+	21+	22+	
1997	7	13	5	5	6	2	2	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
1998	1	16	19	10	10	4	3	2	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0
1999	20	26	39	24	16	9	8	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0
2000	22	36	41	28	24	13	6	1	3	1	1	0	0	0	1	0	0	0	0	0	0	0	0
2001	15	22	27	29	14	10	3	3	1	0	2	2	0	0	0	0	0	0	0	0	0	0	0
2004	7	8	16	19	6	10	5	3	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
2005	6	3	27	16	10	11	6	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0
2007	1	11	24	18	12	12	8	3	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0
2008	4	2	19	24	22	17	12	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
2010	4	3	16	27	32	27	13	2	1	2	5	1	0	0	0	0	0	0	0	0	0	0	0
2011	7	9	11	19	25	24	7	4	6	3	3	0	0	0	0	0	0	0	0	0	0	0	0
2012	2	9	9	22	22	20	9	3	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0
2013	3	3	11	33	22	40	11	9	7	4	1	0	2	0	0	0	0	0	0	0	0	0	0
2014	3	4	19	27	35	31	17	13	7	5	2	0	0	1	0	0	0	0	0	0	0	0	0
2015	4	6	10	17	18	29	27	11	9	5	2	0	1	0	0	0	0	0	0	0	0	0	0
2016	1	4	13	20	31	21	18	12	5	2	3	2	0	0	0	0	0	0	0	0	0	0	0

Year	1	2-5	6-10	11-12	13+	N	Avg Age
1997	7	29	9	1	0	46	4.41
1998	1	55	12	1	0	69	4.12
1999	20	105	20	1	0	146	3.91
2000	22	129	24	1	1	177	3.99
2001	15	92	17	4	0	128	4.17
2004	7	49	19	1	0	76	4.48
2005	6	56	20	1	0	83	4.51
2007	1	65	23	2	1	92	4.58
2008	4	67	35	1	0	107	5.01
2010	4	78	45	6	0	133	5.33
2011	7	64	44	3	0	118	5.35
2012	2	62	36	1	0	101	5.44
2013	3	69	71	1	2	146	6.07
2014	3	85	73	2	1	164	6.02
2015	4	51	81	2	1	139	6.40
2016	1	63	63	5	0	132	6.20

Year	Percentages						
	1	2-5	6-10	11-12	13+		
1997	15%	63%	20%	2%	0%		
1998	1%	80%	17%	1%	0%		
1999	14%	72%	14%	1%	0%		
2000	12%	73%	14%	1%	1%		
2001	12%	72%	13%	3%	0%		
2004	9%	64%	25%	1%	0%		
2005	7%	67%	24%	1%	0%		
2007	1%	71%	25%	2%	1%		
2008	4%	63%	33%	1%	0%		
2010	3%	59%	34%	5%	0%		
2011	6%	54%	37%	3%	0%		
2012	2%	61%	36%	1%	0%		
2013	2%	47%	49%	0%	1%		
2014	2%	52%	45%	1%	1%		
2015	3%	37%	58%	1%	1%		
2016	<1%	48%	48%	4%	0%		

Table 2. Tooth-age data analysis for adult female elk harvested within the Laramie Peak/Muddy Mountain Herd Unit, 1997 - 2016.

Year	Number of Adult Females per Age Class (Tooth Sampling)																						
	1+	2+	3+	4+	5+	6+	7+	8+	9+	10+	11+	12+	13+	14+	15+	16+	17+	18+	19+	20+	21+	22+	
1997	8	3	5	9	5	1	1	2	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0
1998	3	14	6	10	6	7	5	2	1	2	1	1	1	0	0	0	1	0	0	0	0	0	0
1999	14	22	16	20	8	8	6	7	3	1	8	3	3	1	0	0	0	0	0	0	0	0	1
2000	19	26	21	17	13	11	6	4	6	0	4	3	0	1	2	1	0	0	0	0	0	1	0
2001	11	15	24	11	15	9	10	5	4	4	3	3	0	0	0	1	0	0	0	0	0	0	0
2004	8	4	13	8	8	6	3	2	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0
2005	26	14	39	34	21	14	16	15	4	6	5	0	4	4	0	0	0	1	0	0	0	0	0
2007	4	7	19	24	7	6	8	5	11	4	5	2	2	1	0	2	1	0	0	0	0	0	0
2008	8	11	14	14	17	8	11	5	3	2	1	2	3	1	0	2	1	0	0	1	0	0	0
2010	5	7	14	9	13	9	3	5	3	5	1	1	2	0	1	1	0	0	0	0	0	0	0
2011	4	4	11	10	14	6	7	6	2	1	0	0	0	0	1	2	0	0	0	0	0	0	0
2012	10	9	15	8	7	5	4	6	2	1	4	1	1	0	0	0	0	0	0	0	0	0	0
2013	5	1	11	20	14	8	4	3	3	2	1	4	0	0	0	0	0	0	0	0	0	0	0
2014	9	11	19	25	18	11	13	11	6	4	2	3	0	3	1	1	0	0	0	0	0	0	0
2015	16	9	12	16	10	3	9	7	3	1	5	4	3	1	2	0	1	0	0	0	0	0	0
2016	7	12	15	13	7	6	7	5	6	1	2	3	2	1	0	0	3	0	0	0	0	0	0

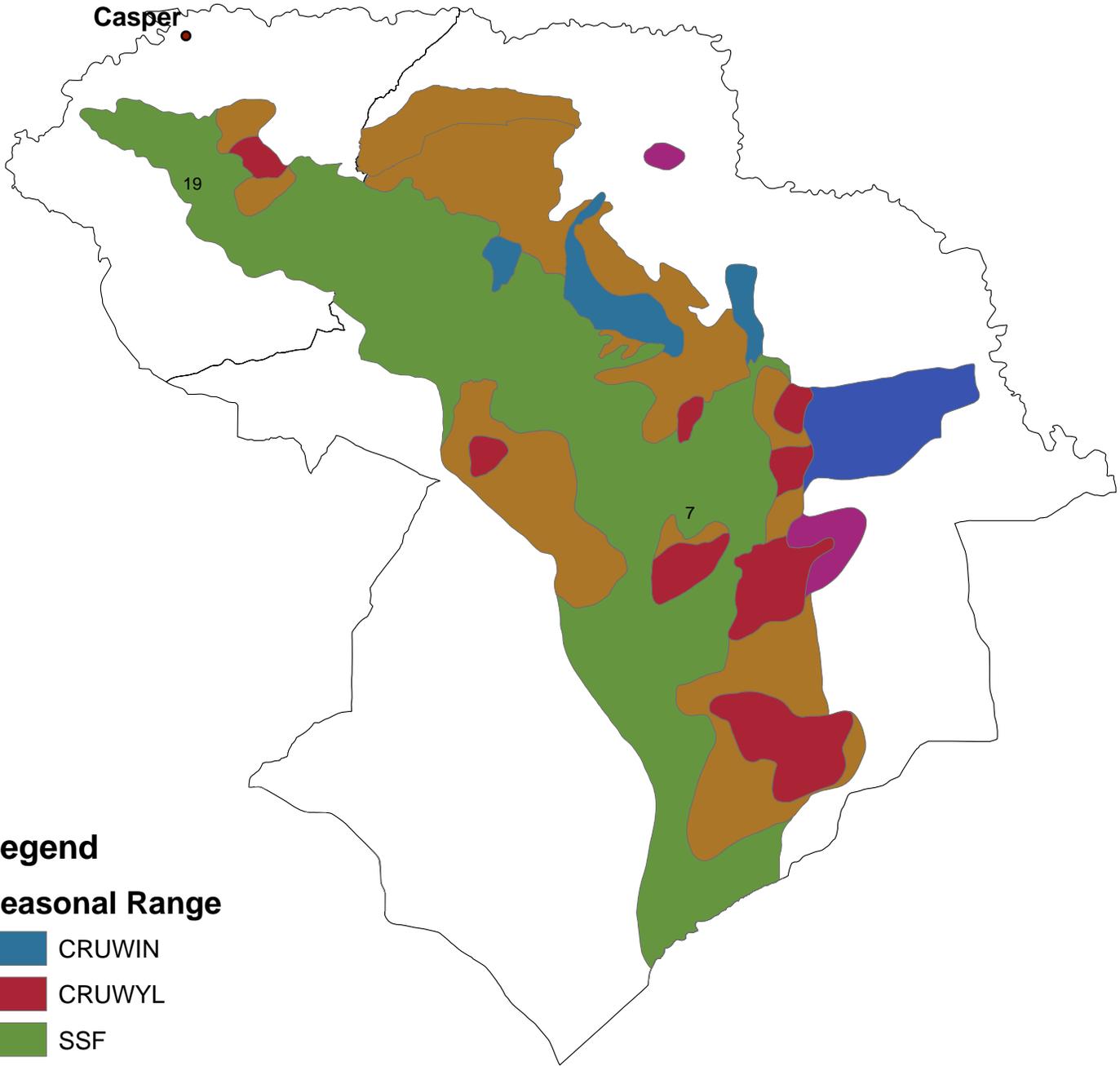
Year	Percentages						
	1	2-5	6-10	11-12	13+		
1997	21%	56%	15%	8%	0%		
1998	5%	60%	28%	3%	3%		
1999	12%	55%	21%	9%	4%		
2000	14%	57%	20%	5%	4%		
2001	10%	57%	28%	5%	1%		
2004	14%	59%	25%	2%	0%		
2005	13%	52%	26%	5%	4%		
2007	4%	53%	31%	6%	6%		
2008	8%	53%	28%	3%	9%		
2010	6%	54%	32%	3%	5%		
2011	6%	57%	32%	0%	4%		
2012	14%	53%	25%	7%	1%		
2013	7%	61%	26%	7%	0%		
2014	7%	53%	33%	4%	4%		
2015	16%	46%	23%	9%	7%		
2016	8%	52%	28%	5%	7%		

Year	1	2-5	6-10	11-12	13+	N	Avg Age
1997	8	22	6	3	0	39	4.38
1998	3	36	17	2	2	60	4.90
1999	14	66	25	11	5	121	5.02
2000	19	77	27	7	5	135	4.61
2001	11	65	32	6	1	115	4.84
2004	8	33	14	1	0	56	4.27
2005	26	108	55	10	9	208	5.16
2007	4	57	34	7	6	108	5.97
2008	8	56	29	3	9	105	5.71
2010	5	43	25	2	4	79	5.49
2011	4	39	22	0	3	68	5.34
2012	10	39	18	5	1	73	5.20
2013	5	46	20	5	0	76	5.70
2014	9	73	45	5	5	137	5.88
2015	16	47	23	9	7	102	6.05
2016	7	47	25	5	6	90	6.07

Table 3. Antler classification of bull elk from the Laramie Peak/Muddy Mountain Herd Unit, 2008-2016.

Mature Bull Antler Classification									
Bio- Year	Area 7 (N / %)			Area 19 (N / %)			EL 741 (N / %)		
	Class I	Class II	Total	Class I	Class II	Total	Class I	Class II	Total
2008	82 (23%)	270 (77%)	352	41 (26%)	119 (74%)	160	123 (24%)	389 (76%)	512
2009	211 (49%)	219 (51%)	430	58 (41%)	84 (59%)	142	269 (47%)	303 (53%)	572
2010	246 (47%)	280 (53%)	526	61 (54%)	52 (46%)	113	307 (48%)	332 (52%)	639
2011	278 (69%)	128 (31%)	406	104 (73%)	38 (27%)	142	382 (70%)	166 (30%)	548
2012	76 (56%)	60 (44%)	136	160 (71%)	66 (29%)	226	236 (65%)	126 (35%)	362
2013	213 (56%)	169 (44%)	382	57 (54%)	48 (46%)	105	270 (55%)	217 (45%)	487
2014	165 (64%)	93 (36%)	258	106 (57%)	79 (43%)	185	271 (61%)	172 (39%)	443
2015	212 (74%)	74 (26%)	286	93 (47%)	106 (53%)	199	305 (63%)	180 (37%)	485
2016	318 (70%)	137 (30%)	455	111 (57%)	85 (43%)	196	429 (66%)	222 (34%)	651

**Laramie Peak/Muddy Mountain Elk Herd Unit
(EL741)
Revised May 18, 2010
Hunt Areas 7 & 19**



Legend

Seasonal Range

-  CRUWIN
-  CRUWYL
-  SSF
-  WIN
-  WYL
-  YRL

2016 - JCR Evaluation Form

SPECIES: Elk

PERIOD: 6/1/2016 - 5/31/2017

HERD: EL742 - RATTLESNAKE

HUNT AREAS: 23

PREPARED BY: HEATHER O'BRIEN

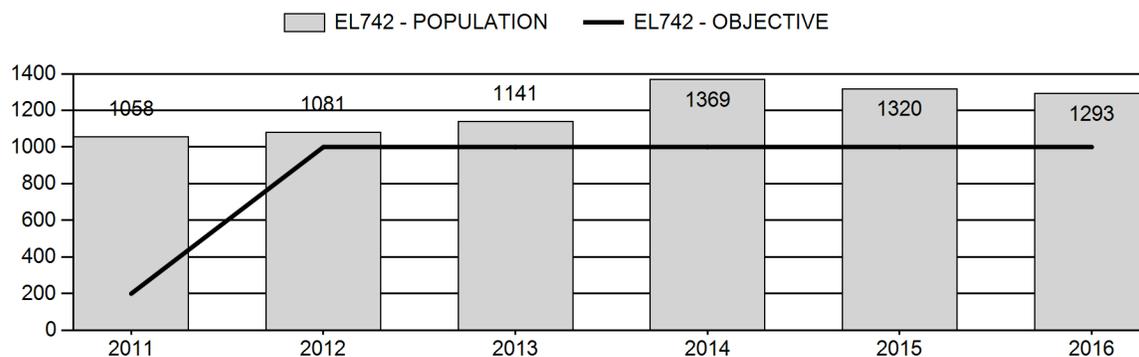
	<u>2011 - 2015 Average</u>	<u>2016</u>	<u>2017 Proposed</u>
Population:	1,194	1,293	1,289
Harvest:	171	206	230
Hunters:	380	380	390
Hunter Success:	45%	54%	59%
Active Licenses:	401	402	420
Active License Success:	43%	51%	55 %
Recreation Days:	3,423	3,611	3,500
Days Per Animal:	20.0	17.5	15.2
Males per 100 Females	59	27	
Juveniles per 100 Females	37	24	

Population Objective (± 20%) :	1000 (800 - 1200)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	29%
Number of years population has been + or - objective in recent trend:	25
Model Date:	3/01/2017

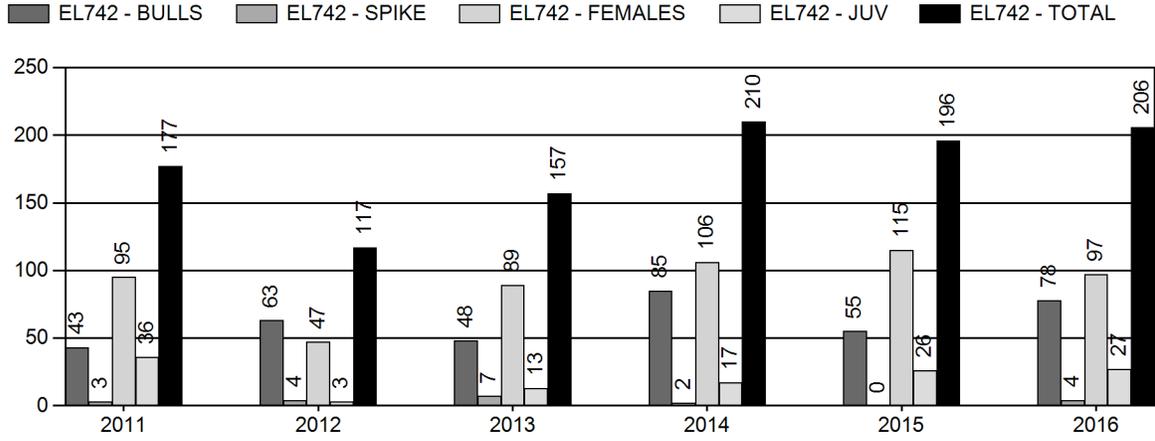
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	16.2%	13.1%
Males ≥ 1 year old:	18.5%	21.0%
Total:	14.0%	15.0%
Proposed change in post-season population:	-10.6%	0%

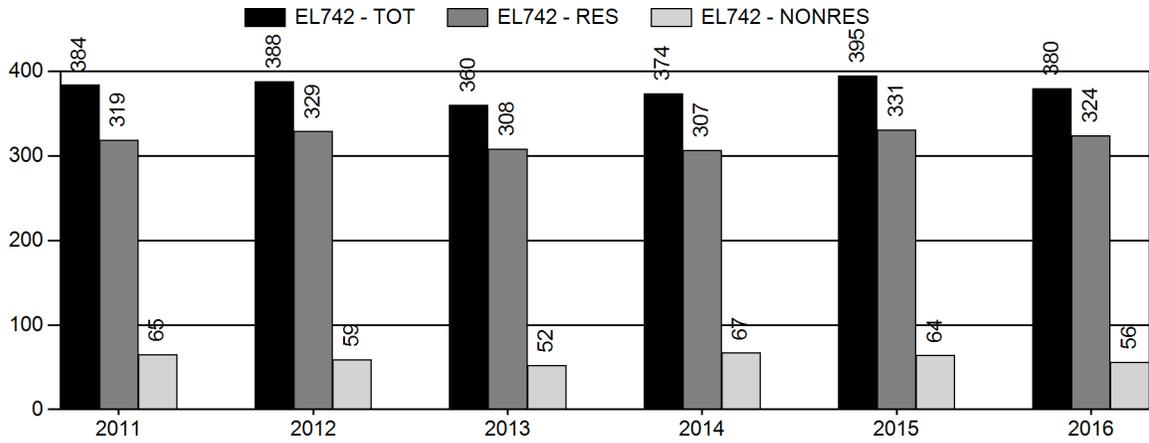
Population Size - Postseason



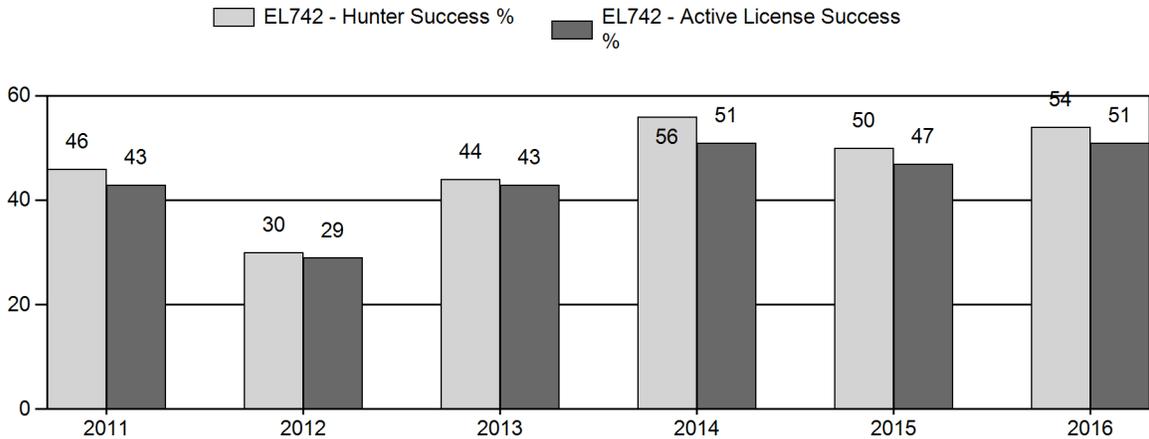
Harvest



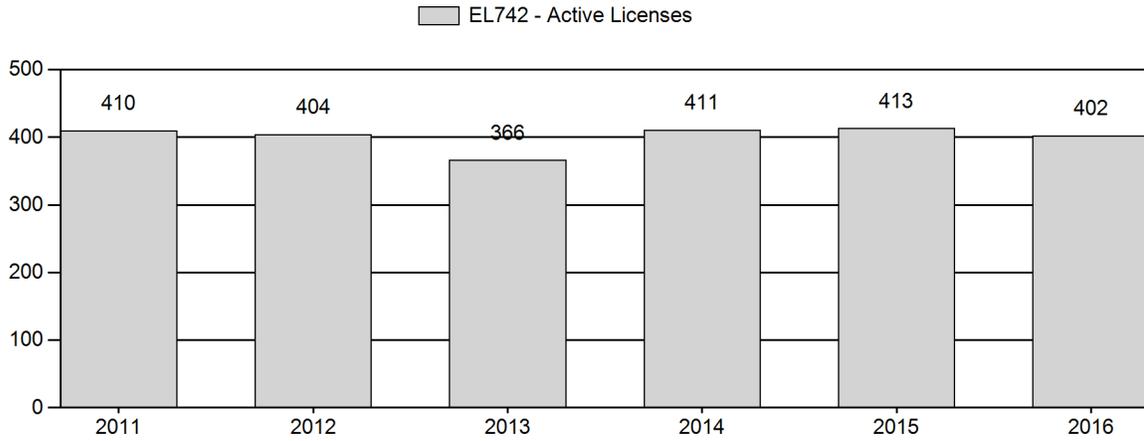
Number of Hunters



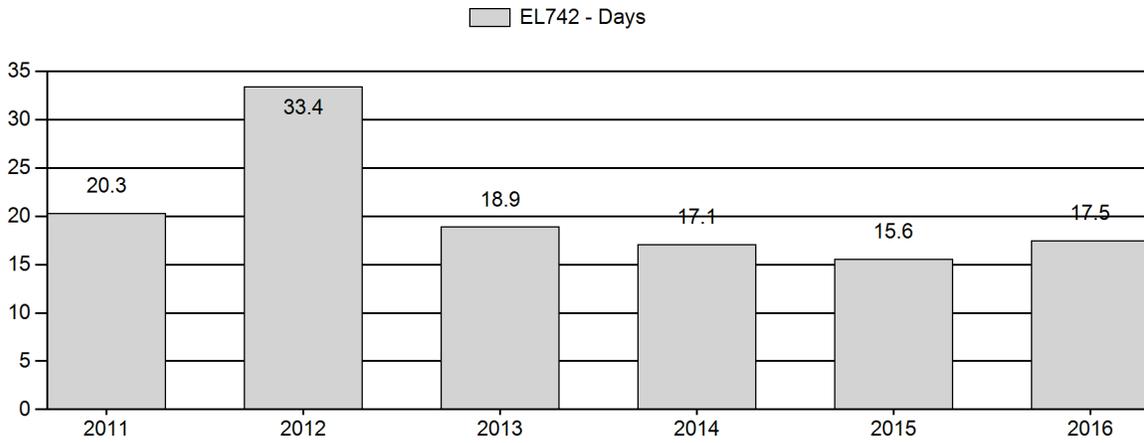
Harvest Success



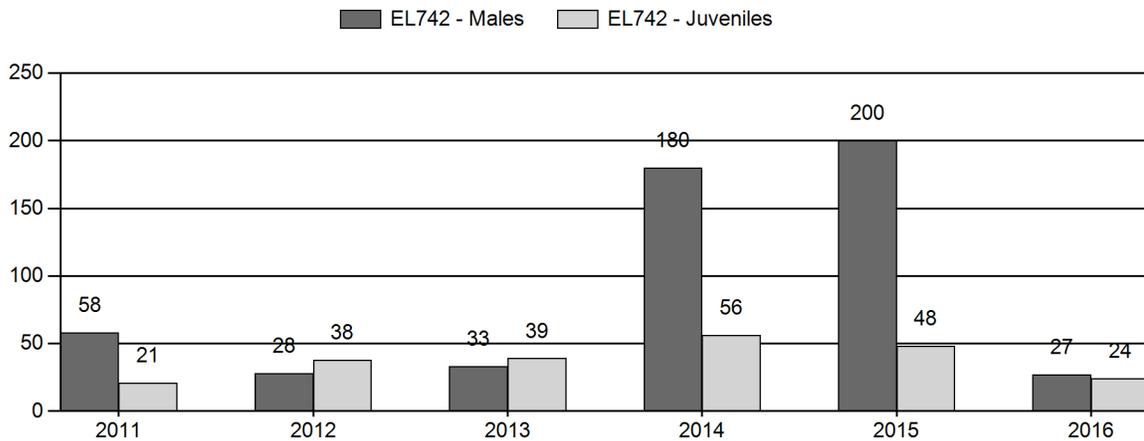
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2011 - 2016 Postseason Classification Summary

for Elk Herd EL742 - RATTLESNAKE

Year	Post Pop	MALES				FEMALES		JUVENILES		Tot CIs	Cls Obj	Males to 100 Females				Young to		
		Ylg	Adult	Total	%	Total	%	Total	%			Ylg	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2011	1,058	17	90	107	32%	185	56%	38	12%	330	443	9	49	58	± 7	21	± 4	13
2012	1,081	26	32	58	17%	204	60%	77	23%	339	384	13	16	28	± 4	38	± 5	29
2013	1,141	26	102	128	19%	390	58%	153	23%	671	479	7	26	33	± 3	39	± 3	30
2014	1,369	35	113	148	54%	82	30%	46	17%	276	406	43	138	180	± 28	56	± 12	20
2015	1,320	10	86	96	57%	48	29%	23	14%	167	390	21	179	200	± 42	48	± 15	16
2016	1,293	53	77	130	18%	478	66%	114	16%	722	395	11	16	27	± 2	24	± 2	19

**2017 HUNTING SEASONS
RATTLESNAKE ELK (EL742)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
23	1	Oct. 1	Oct. 31	150	Limited quota	Any elk
		Nov. 15	Dec. 15			Any elk
	4	Oct. 1	Oct. 31	125	Limited quota	Antlerless elk
		Nov. 15	Dec. 15			Antlerless elk, also valid in Area 128
	6	Oct. 1	Oct. 31	200	Limited quota	Cow or calf
		Nov. 15	Dec. 15			Cow or calf, also valid in Area 128
	7	Nov. 15	Dec. 15	50	Limited quota	Cow or calf, also valid in Area 128
Archery						Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2016
23	1	+25
	4	No changes
	6	+25
	7	No changes

Management Evaluation

Current Postseason Population Management Objective: 1,000

Management Strategy: Recreational

2016 Postseason Population Estimate: 1,300

2017 Proposed Postseason Population Estimate: 1,300

2016 Hunter Satisfaction: 56% Satisfied, 17% Neutral, 27% Dissatisfied

The Rattlesnake Elk Herd Unit has a postseason population management objective of 1,000 elk. The herd is managed using the recreational management strategy, with a goal of maintaining

postseason bull ratios of 15-29 bulls per 100 cows. The objective and management strategy were revised in 2012.

Herd Unit Issues

Hunting access within the herd unit is variable. The majority of occupied elk habitat is accessible for hunting via public land and Hunter Management Area access. However, there is one ranch within the central part of occupied habitat that does not allow any access for hunting and harbors the vast majority of elk within the herd unit. Hunters have expressed frustration when elk take refuge in this area, as they tend to remain there due to low hunter pressure and good forage conditions. The main land use within the herd unit is traditional ranching and grazing of livestock, with isolated areas of oil and gas development. There is the potential for future mining of precious metals and rare earth minerals in the hunt area, but current levels of activity are low. Disease outbreaks are not a current concern in this herd unit.

Weather

The severe winter of 2010-2011 and subsequent drought of 2012 may have caused higher mortality of elk in the Rattlesnake Herd Unit, particularly calves. From 2013 to the present, weather trends have been more favorable, and elk have fared well within the herd. Range conditions were particularly good from 2013 to 2015, when spring and summer moisture improved and winters were mild. The winter of 2015 was fairly average, though some areas experienced prolonged periods of persistent snow. The spring of 2016 was very wet, resulting in rapid plant growth and green-up of rangelands. However, the majority of the summer and fall were extremely dry, causing much of the available forage to cure. Fortunately, precipitation in October resulted in a late surge of plant growth, which may have provided elk with a boost in nutrition prior to the winter of 2016-2017. While there were several notable snow storms and cold snaps during the winter of 2016-2017, there were also periods of warm weather and high winds that melted and drifted snow to expose forage. Thus, managers expect good calf survival for the winter of 2016-2017. For detailed weather data see <http://www.ncdc.noaa.gov/gac/time-series/us>.

Habitat

This herd unit has no established habitat transects that measure production and/or utilization on vegetation preferred by elk. Anecdotal observations and discussions with landowners in the region indicate late summer forage production may have been poor, but fall forage availability

for elk improved in 2016. Harvested elk, elk observed during November aerial surveys, and elk observed during February 2017 ground surveys appeared to be in good body condition.

Field Data

Observed calf ratios are highly erratic in this herd unit due to varying classification survey conditions and levels of effort across years. Thus it is difficult to correlate changes in population size or make decisions regarding license issuance based on observed calf ratios. Even with excellent survey conditions during 2016 classification flights, it was difficult to accurately classify individuals within very large cow/calf groups recorded on digital video. Instead of focusing on changes in observed calf ratios, managers continue to focus on maximizing cow harvest without over-saturating public lands with hunter pressure. Increases in cow license issuance are not warranted unless access improves and there are no large areas where elk can take refuge from harvest pressure.

Observed bull ratios are also highly erratic as a result of variable survey conditions and levels of effort from year to year. Since 2001, observed bull ratios have ranged from 13 to 58 per 100 cows during favorable survey years. Years with low observed bull ratios were followed by years with much higher observed ratios; indicating bulls were likely missed during classification surveys in some years, and/or elk are immigrating/emigrating to and from adjacent hunt areas. In years when large cow/calf groups are missed during aerial surveys, resulting bull ratios appear to be artificially high. While real survey data in these years are reported in classification results; long-term averages are applied in the population model to represent more realistic bull ratios. Coverage during 2016 classification surveys was considered excellent, with good flight and observation conditions. Managers therefore believe the resulting bull ratio of 27 per 100 cows is likely an accurate representation of real bull ratios within this herd. While license issuance and season structure changes in this herd are not typically made based on observed classification ratios, current harvest pressure on bulls seems to be well tolerated. Future season structure should persist in maximizing cow harvest while maintaining relatively good license success without overcrowding hunters.

Harvest Data

License success in this herd unit is typically in the 40th percentile and is fairly consistent given license issuance and hunter opportunity has remained relatively similar across years. Hunter days per animal fluctuate from year to year, but this may be a function of changes in access due to weather and road conditions. The persistence of unattainable elk in the aforementioned private land refugia most certainly contributes to increased hunter days and low harvest success in most

years. In 2016, weather conditions were mostly favorable and access to public hunting areas was good. Overall harvest success improved to 55%, compared to the 25-year average of 48%. The longer, split season in 2013-2016 also facilitated movement of elk off of private refugia. Elk have moved into accessible hunting areas during the November 1-14th closure in all four years. Late-season licenses were also valid in the adjacent Hunt Area 128, where portions of the herd sometimes migrate during the fall and winter months. Field personnel continue to receive positive comments from hunters and landowners who are pleased with this hunting season structure. In 2016, the late season was extended from two to four weeks in length to further maximize female harvest. Success on late season cow licenses improved immensely – from 15% in 2015 to 59% in 2016 – and hunters commented that they were pleased to have more hunting opportunity. Overall, harvest was the second highest on record, and hunter satisfaction improved in 2016.

Population

The 2016 postseason population estimate was approximately 1,300 elk. Managers believe this herd is slightly larger than the model predicts, since 1,225 elk were observed during 2016 postseason classification surveys. No sightability or other population estimate data are currently available to further align the model in conjunction with classification and harvest data. There have been few complaints from landowners in recent years with regard to elk numbers. Harvest pressure and success have increased with longer seasons since 2013, but may also be improving if this elk herd is growing slightly. It is difficult to determine how many elk may emigrate from the herd unit into adjacent areas, but managers believe this population to be relatively stable.

The “Time-Specific Juvenile – Constant Adult Survival – Male Survival Coefficient ” (TSJ,CA, MSC) spreadsheet model was selected for the postseason population estimate of this herd. This population is difficult to model as it is small in size and appears to have consistent interchange with an adjacent herd, thus violating the closed population assumption of the model. High variability in observed bull and calf ratios also render this herd challenging to model. Long-term classification averages are used in years when adequate sample sizes are not reached during postseason surveys to avoid inaccuracies from high variability in the model. Trend count data are also included in the model to document higher numbers of elk that have been seen in some years but could not be classified. The TSJ,CA and CJ,CA models were discarded, as they predict population sizes that are lower than observed survey totals. When juvenile survival was increased in years known to have mild winter conditions, the SCJ,CA model predicted a reasonable population size. However, the model applied the extreme lower survival constraint for juveniles and the upper survival constraint for adults, indicating poor model performance and quality. While the TSJ,CA,MSC model appears to be the best choice to represent the herd, it should be noted that this model frequently selected for the upper and lower juvenile survival

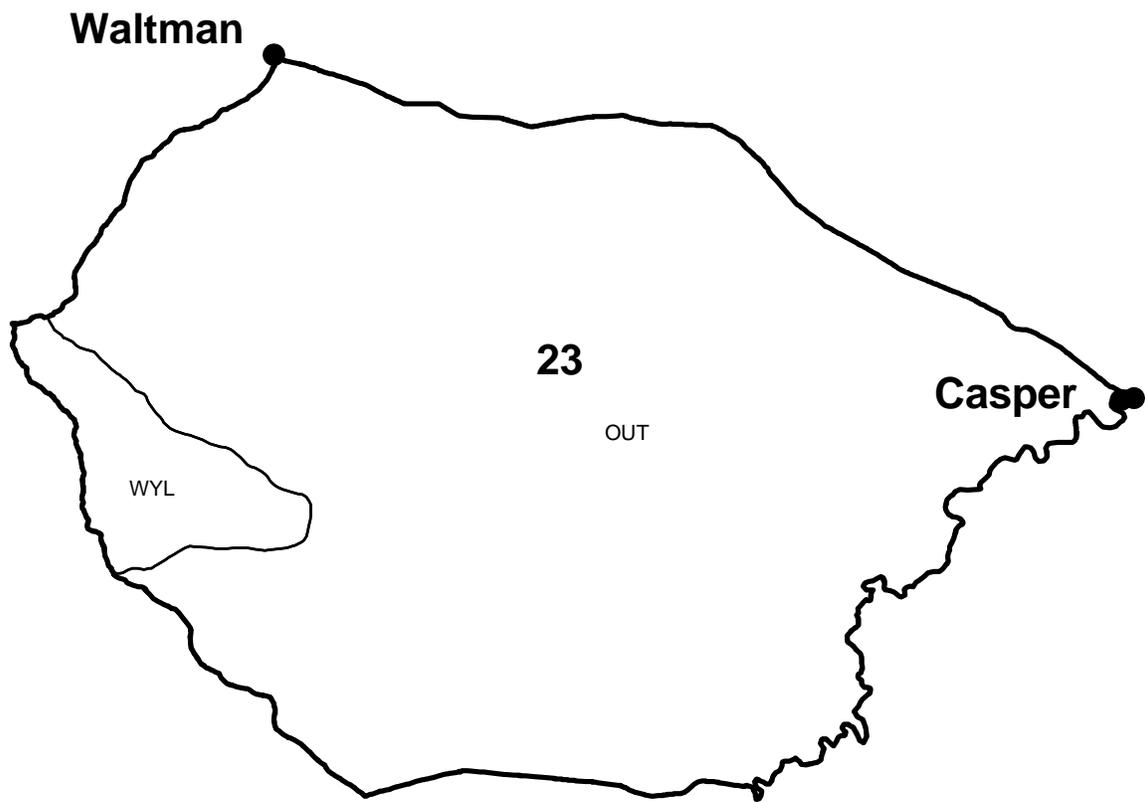
constrains and selected the highest adult survival constraint, indicating that it is of poor quality. If the model continues to be troublesome and inaccurate in reflecting trends and known numbers of elk, managers may consider changing to trend-count based management for this herd.

Management Summary

Opening day of hunting season in this herd is traditionally October 1st, and closing dates have differed with changing harvest prescriptions from year to year. Season structure has also changed to include a split season in recent years to maximize cow harvest. Longer split season dates with a closure from November 1 – 14 have been well-received the last four years by hunters, and have resulted in record high harvest success and harvest totals. Since this has worked well, the same season structure is being implemented for 2017. The addition of 25 Type 1 and 25 Type 6 licenses in 2017 is justified by the very high number of elk observed during classification surveys. If the addition of these licenses causes noticeable hunter crowding or reduced harvest success, license reductions will be considered for 2018. The 4-week late cow season will be continued as a means to provide extended opportunity for those license holders. Goals for 2017 are to continue high harvest pressure on cows, maintain extended opportunity to hunt bulls, and maintain or improve overall harvest success.

If we attain the projected harvest of approximately 203 elk and assuming average calf production/survival, this herd should remain relatively stable. The predicted 2017 postseason population estimate for the Rattlesnake Elk Herd is approximately 1,300 animals, or 30% above objective.

Elk - Rattlesnake
Hunt Area 23
Casper Region
Revised 8/94

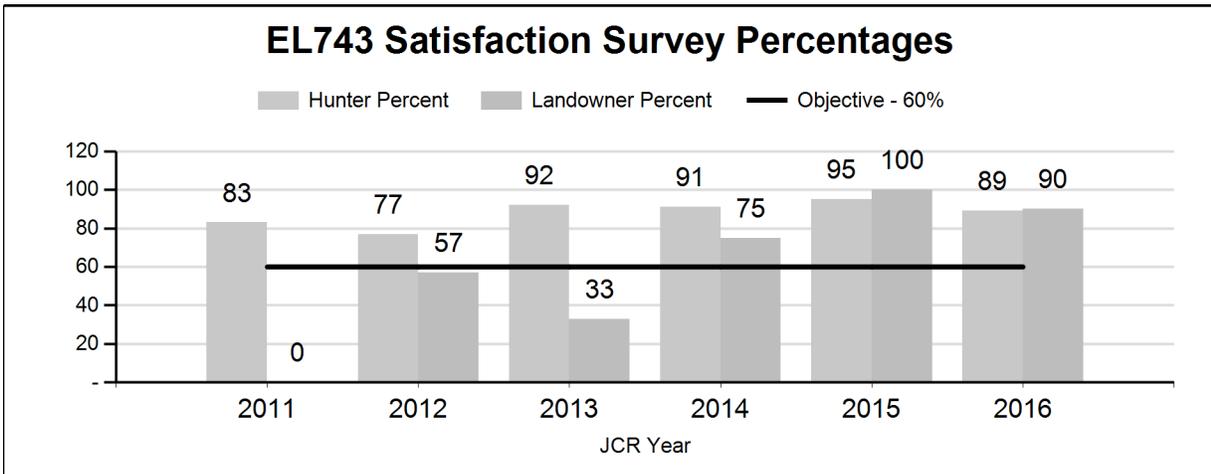


2016 - JCR Evaluation Form

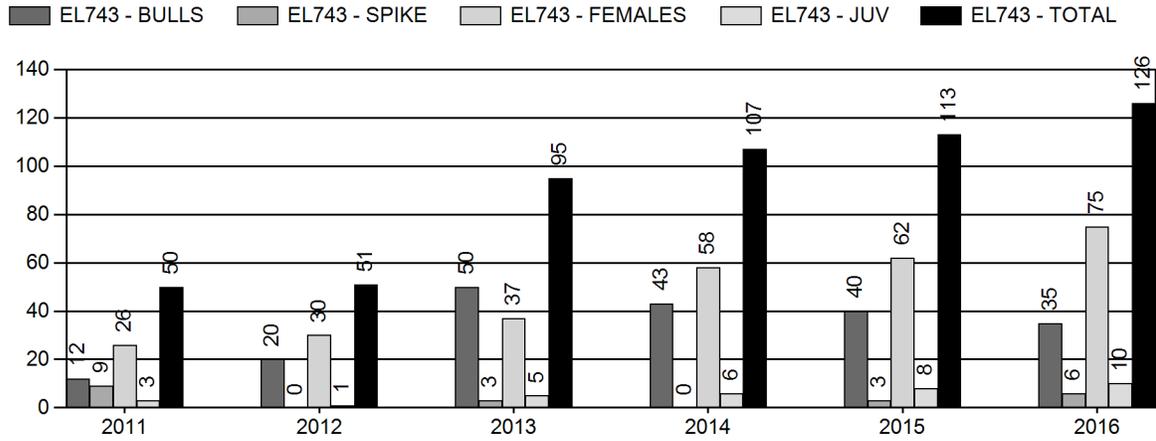
SPECIES: Elk
 HERD: EL743 - PINE RIDGE
 HUNT AREAS: 122

PERIOD: 6/1/2016 - 5/31/2017
 PREPARED BY: WILLOW STEEN

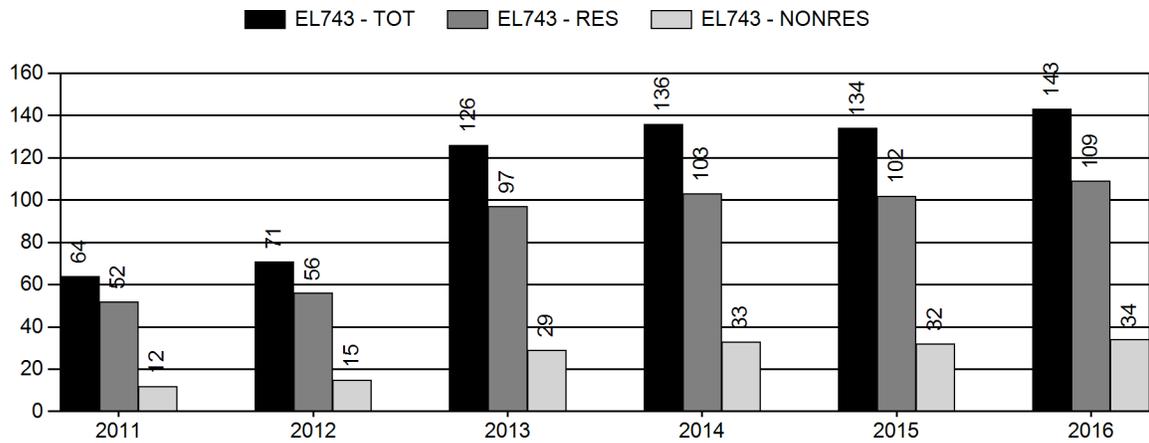
	<u>2011 - 2015 Average</u>	<u>2016</u>	<u>2017 Proposed</u>
Hunter Satisfaction Percent	89%	89%	90%
Landowner Satisfaction Percent	68%	90%	90%
Harvest:	83	126	130
Hunters:	106	143	145
Hunter Success:	78%	88%	90 %
Active Licenses:	113	155	158
Active License Success:	73%	81%	82 %
Recreation Days:	466	525	530
Days Per Animal:	5.6	4.2	4.1
Males per 100 Females:	0	0	
Juveniles per 100 Females	0	0	
Satisfaction Based Objective			60%
Management Strategy:			Private Land
Percent population is above (+) or (-) objective:			30%
Number of years population has been + or - objective in recent trend:			3



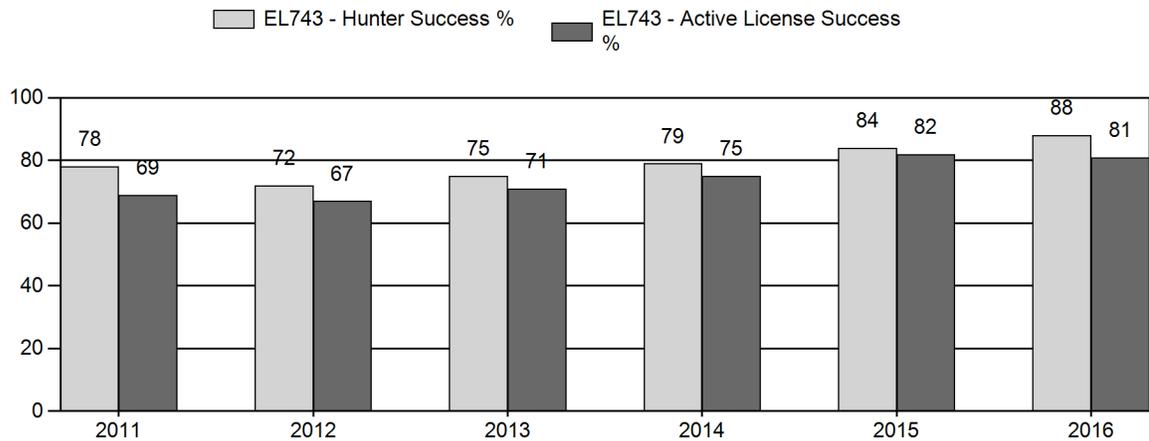
Harvest



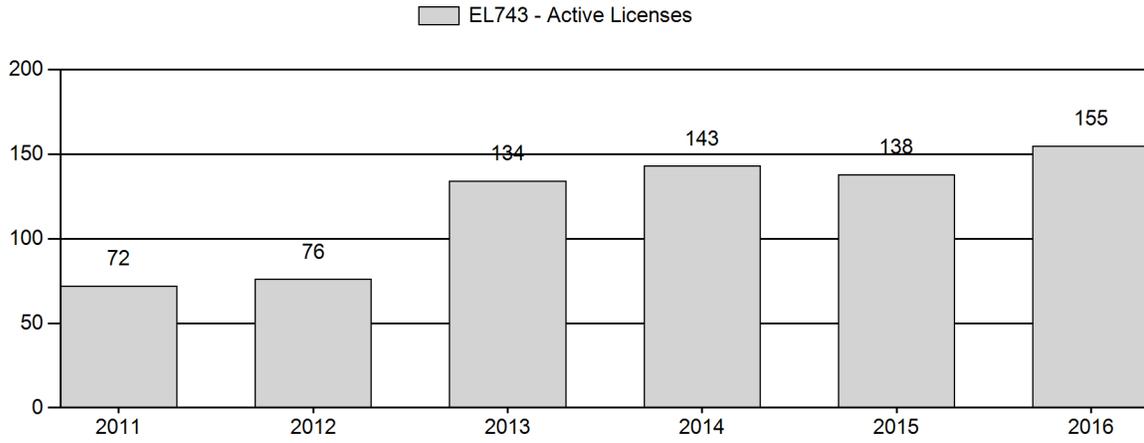
Number of Hunters



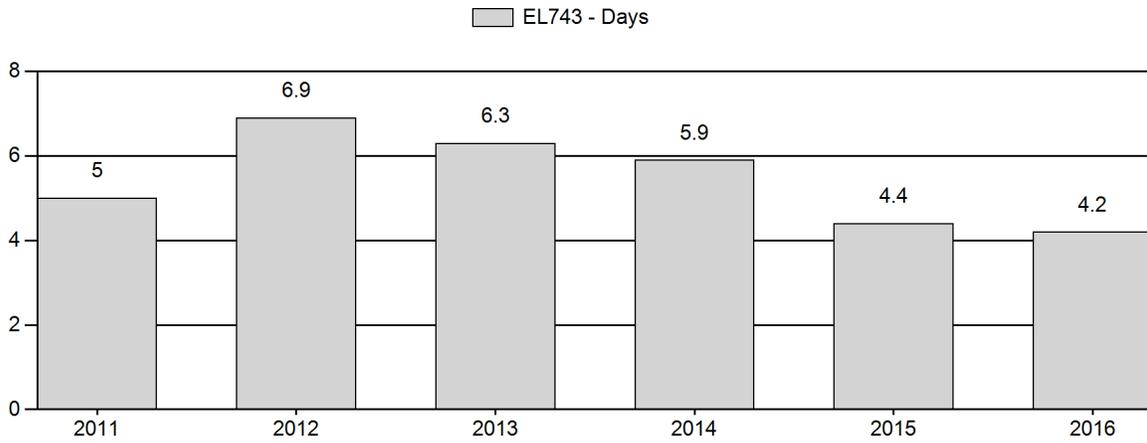
Harvest Success



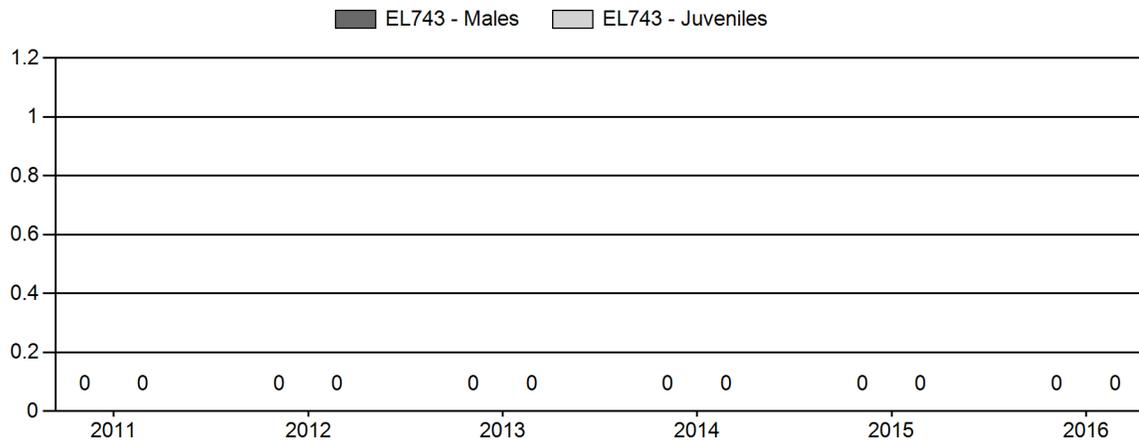
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



**2017 HUNTING SEASONS
PINE RIDGE ELK HERD (EL743)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
122	1	Oct. 15	Nov. 30	75	Limited quota	Any elk
		Dec. 1	Dec. 31			Antlerless elk
	6	Oct. 15	Dec. 31	150	Limited quota	Cow or calf
Archery		Sep. 1	Sep. 30			Refer to license and type limitations in Section 2

Management Evaluation

Current Hunter/Landowner Satisfaction Management Objective: 60% hunter/landowner satisfaction; bull quality

Management Strategy: Private Land

2016 Hunter Satisfaction Estimate: 89%

2016 Landowner Satisfaction Estimate: 90%

Most Recent 3-year Running Average Hunter Satisfaction Estimate: 92%

Most Recent 3-year Running Average Landowner Satisfaction Estimate: 88%

2016 Postseason Population Estimate: ~ 900 (*Field Estimate*)

2017 Proposed Postseason Population Estimate: ~ 900 (*Field Estimate*)

The Pine Ridge Elk Herd Unit has a management objective based on 60% or higher landowner and hunter satisfaction. As a secondary objective, managers strive to maintain a bull harvest consisting of 60% mature, branch-antlered bulls. This objective was revised in 2012. An objective based upon postseason population estimates was not feasible for this herd unit.

Herd Unit Issues

Nearly all elk in this herd reside in and along the timbered Pine Ridge escarpment in the north central portion of the herd unit. Land use consists of traditional ranching and livestock grazing mixed with areas of intensive oil and gas, wind, and uranium development. Access to hunting is tightly controlled by private landowners, and achieving adequate harvest to manage growth of this herd can be difficult, although it has been significantly improved in recent years. Given the

private-land nature of this elk herd, the Department gives serious deference to landowner desires. In past years, landowners have expressed dissatisfaction with growing elk numbers. However, the majority of landowners are now expressing satisfaction with current season structure, level of harvest, and elk numbers. Recently liberalized season structure, as well as increased commitment from landowners to harvest cow elk, have resulted in continually increasing harvest rates, which appear to be maintaining elk numbers.

Weather & Habitat

The Pine Ridge Elk Herd resides in relatively low-elevation habitat, and weather typically has minimal influence on elk productivity, survival and movements. In addition, there are no habitat or classification data collected in this herd unit given the Department's minimal management influence and budgetary constraints. Thus no meaningful analysis of weather and habitat data will be presented.

Field Data

Fixed-wing winter trend counts are conducted in this herd unit as budget and weather conditions allow. Past trend counts of this herd typically found between 150 and 350 elk. In 2013, a winter trend count conducted under optimum conditions found a total of 840 elk, indicating this herd was larger than previously believed. A trend count conducted in February 2014 found a total of 454 elk; however snow conditions were not ideal and elk were difficult to see bedded amongst exposed rocks and shrubs. In February 2015, a trend count yielded only 276 elk despite good survey conditions and thorough coverage. In November of 2015, field personnel attempted to conduct the trend count during deer helicopter classification flights, but were only able to locate 49 elk. In 2016, elk were counted during deer flights in November (total of 271 elk) as well as a trend count in February under ideal conditions (566 elk). Based on past observations and landowner input, managers still estimate this herd likely numbers 900-1,000 elk.

Current information on this herd is somewhat limited given budget constraints and the private land nature of this herd. Despite these limitations, field managers and many landowners feel that the population is stagnant. However, given typical calf ratios found in other Central Wyoming herds (in the 40s), if the population is indeed at about 900 elk, the average level of harvest in this herd (5-year average of 58 cow/ calves; 98 total elk), is not sufficient to curtail population growth. Managers therefore assume that there may be population emigration occurring in this herd. There are few major geographical or anthropogenic barriers to elk movement in this area. Managers and landowners observe small groups of elk, particularly bulls, moving east from Pine Ridge, often crossing Highway 59. The population may violate the herd definition of less than 10% interchange. However, lack of specific information regarding these elk movements precludes re-defining the herd.

Landowner and hunter satisfaction surveys are used to gauge management of the Pine Ridge Elk Herd. Annual survey results must show that at least 60% of hunters were either “satisfied” or “very satisfied” with the previous year’s hunting season. In addition, landowner surveys must show that at least 60% or more respondents are satisfied with elk numbers in their area. Should these satisfaction thresholds not be met, changes in management should be prescribed to address reasons for dissatisfaction. A secondary objective is also used in the Pine Ridge Elk Herd Unit to anchor the results of satisfaction surveys to a population parameter. In this case, age class targets are determined from the harvest survey and used as a measure of bull quality. The percentage of mature branch-antlered bulls in the male portion of the annual harvest is used, with a 3-year trend average of 60% minimum being the threshold for management action.

Pine Ridge landowners continue to express their preference for the Department to hold an in-person meeting every year as opposed to conducting a mailer survey. Due to poor road conditions, landowners did not attend the scheduled in-person meeting this year. Landowners were therefore contacted via phone and asked for their input regarding the elk herd. For the 2016 season, 90% of landowners (N=10) were satisfied, while 89% of hunters who returned surveys were “satisfied” or “very satisfied” with their hunting experience in the Pine Ridge Elk Herd Unit. For the secondary objective, the three-year average for mature bulls in the harvest was 93%. Landowner satisfaction, hunter satisfaction, and the percentage of mature bulls in the harvest all exceeded the 60% threshold for bio-year 2016.

Harvest Data

Hunter success has remained high for the last 5 years (72-88%). In the past, antlerless elk licenses were undersubscribed as landowners have been unwilling to allow access for cow hunters. However, landowners have recently become more willing to allow hunting access and harvest more elk. A majority of Type 6 licenses were available as leftovers after the initial drawing in 2016, and 25 remained unsold. Despite the unsold licenses, total harvest was the highest it has ever been in 2016 with 126 elk harvested. Of these, 67% were cows or calves. In years prior to 2013, harvest was typically somewhere between 45 and 50 elk. Since 2012, there has been a steady increase in total harvest, with total harvest ranging from 95 to 126 elk.

Perceived loss of bull quality was also a concern amongst certain landowners in the past. However, landowners in recent years agreed that bull quality was still high and that a quota of 75 was desirable. Landowner perceptions of bull availability are reflected in the harvest results as license success was 72% on the Type 1 license with 85% of those being branch-antlered bulls.

Management Summary

The hunting season in this herd unit opens on October 15th and closes on December 31st. In recent years, closing dates and quotas have been extended as landowners agreed to liberalize access for cow elk hunting later in the season. Type 1 license issuance will remain at 75, and Type 6 license issuance at 150. Some landowners expressed interest in an October 1st opener in order to increase harvest on the southern end of the ridge due to elk residing there during this time. Since the 2016 in-person meeting wasn't possible due to weather this year, managers plan to address this change with landowners prior to formulating the 2018 application packet. Both managers and the majority of the landowners feel that the population trend and level of harvest have improved in recent years and the goal for the 2017 season is to maintain these improvements.

Elk - Pine Ridge
Hunt Area 122
Casper Region
Revised 5/88

Midwest

YRL

122

OUT

Casper

Glenrock