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Acknowledgement

The field data contained in these reports was collected by the combined efforts of the Casper Region Wildlife Division personnel including District Wildlife Biologists, District Game Wardens, the Wildlife Technicians, the Habitat Biologist, the Wildlife Management Coordinator and Region Supervisor, and other Department personnel and volunteers working at check stations. The authors wish to express their appreciation to all those who assisted in data collection.

2013 - JCR Evaluation Form

SPECIES: Pronghorn PERIOD: 6/1/2013 - 5/31/2014

HERD: PR740 - CHEYENNE RIVER

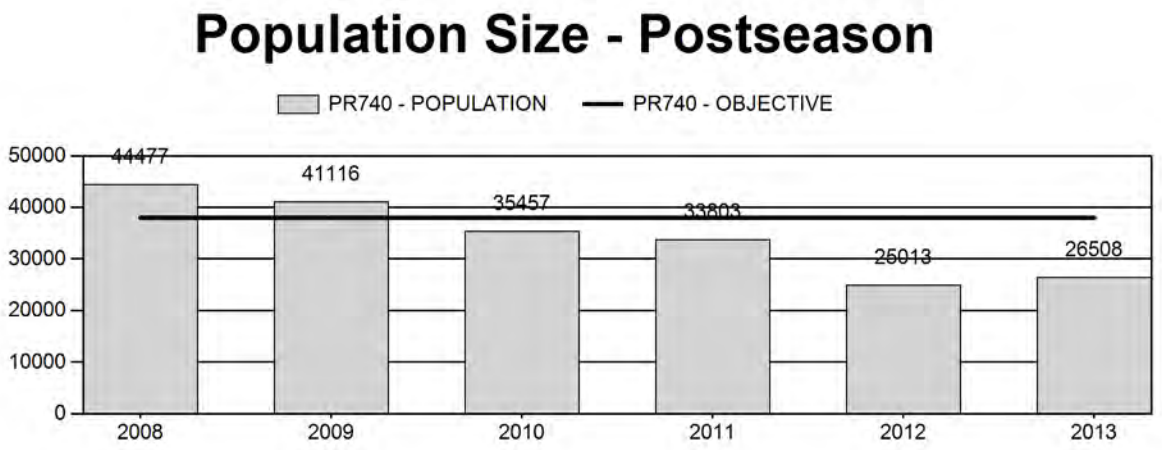
HUNT AREAS: 4-9, 27, 29 PREPARED BY: JOE SANDRINI

	2008 - 2012 Average	2013	2014 Proposed
Population:	35,973	26,508	26,979
Harvest:	5,961	3,055	2,780
Hunters:	6,305	3,927	2,950
Hunter Success:	95%	78%	94%
Active Licenses:	6,921	4,166	3,230
Active License Percent:	86%	73%	86%
Recreation Days:	22,331	11,445	10,285
Days Per Animal:	3.7	3.7	3.7
Males per 100 Females	55	47	
Juveniles per 100 Females	61	67	

Population Objective:	38,000
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-30.2%
Number of years population has been + or - objective in recent trend:	4
Model Date:	01/27/2014

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

	JCR Year	Proposed
Females ≥ 1 year old:	7.3%	5.3%
Males ≥ 1 year old:	32.5%	32.0%
Juveniles (< 1 year old):	1.7%	1.3%
Total:	11.3%	10.2%
Proposed change in post-season population:	+5.6%	+1.8%



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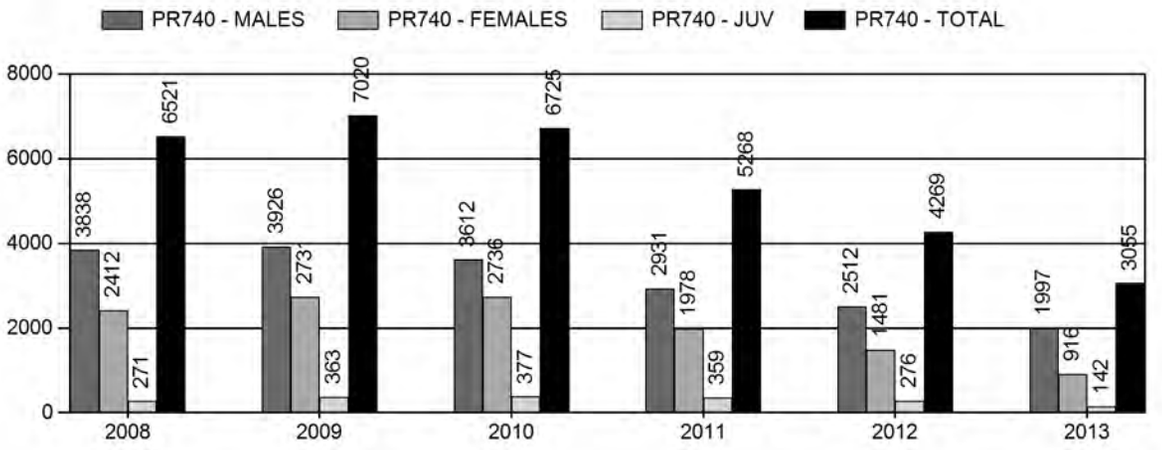
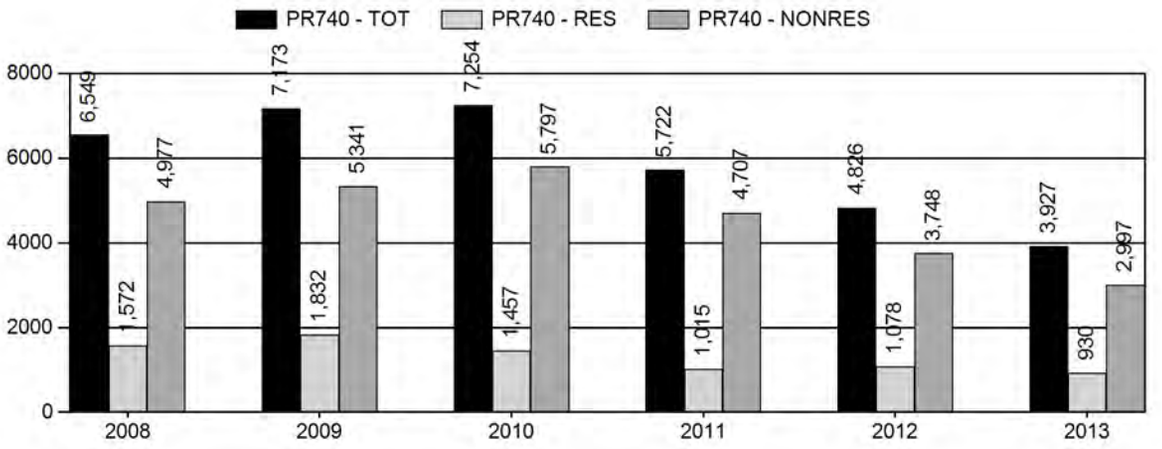


Number of Hunters



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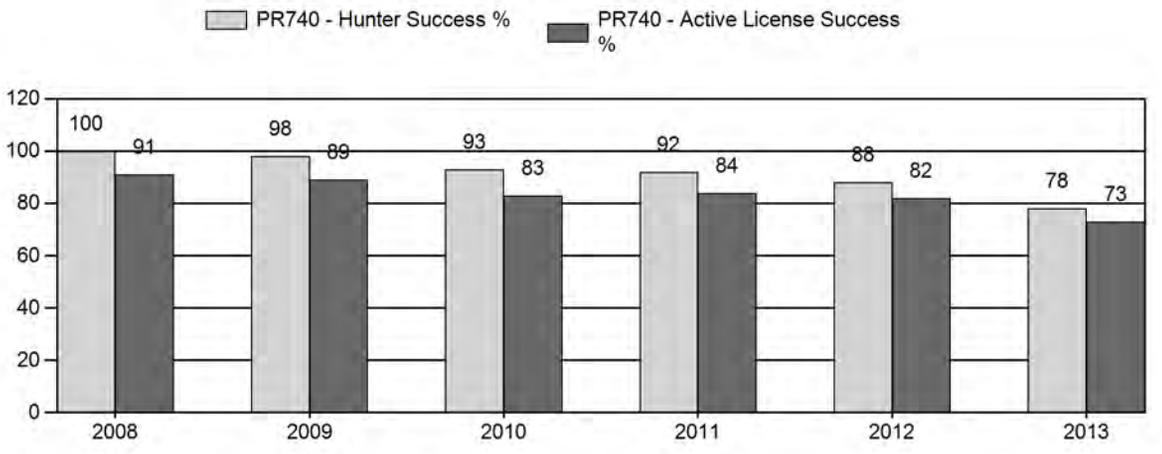

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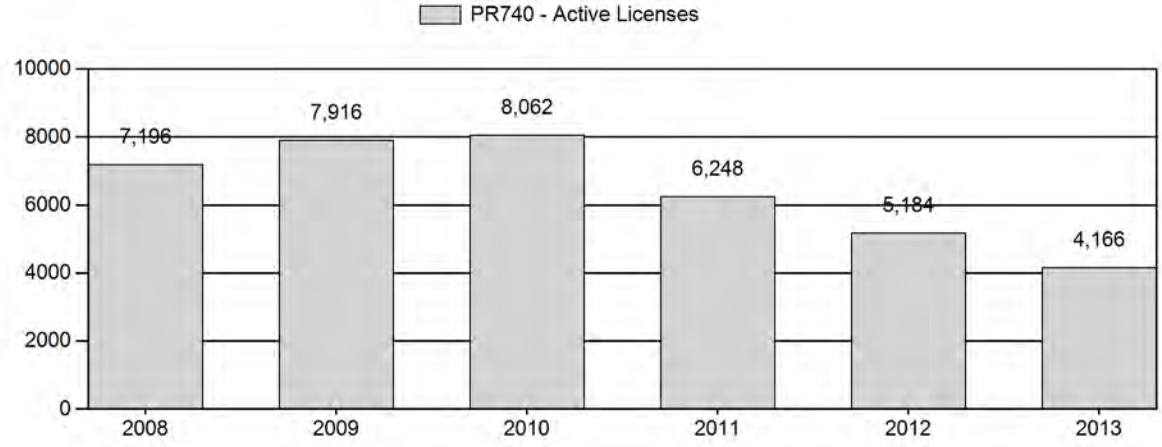
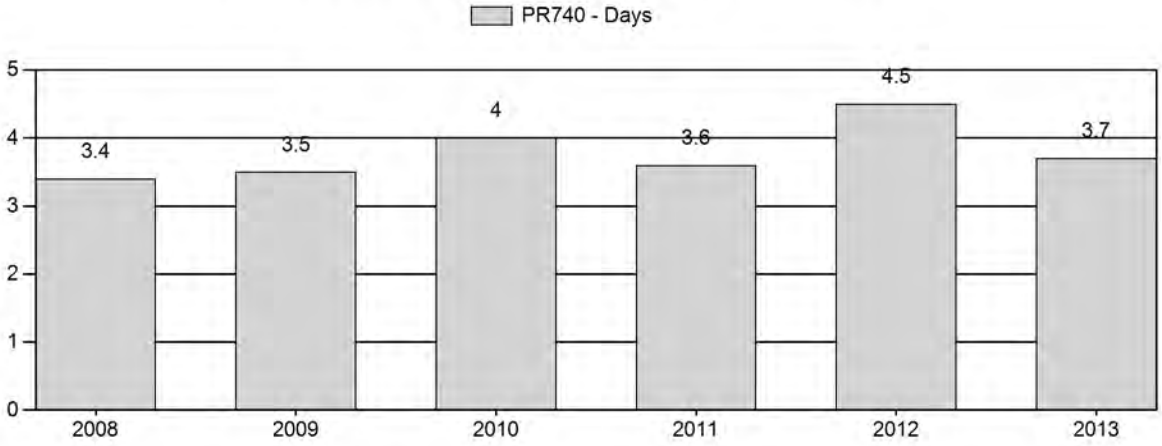
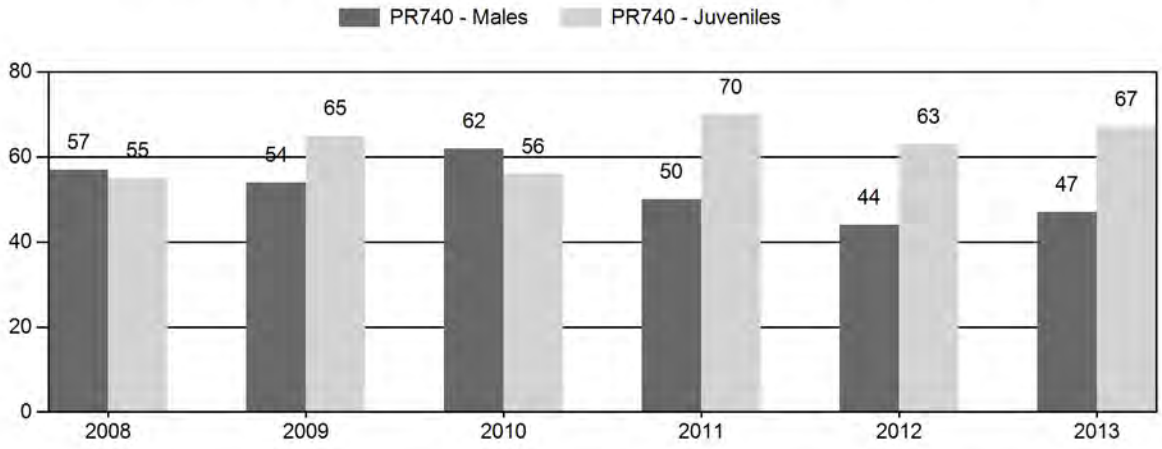


Days Per Animal Harvested



Preseason Animals per 100 Females



2008 - 2013 Preseason Classification Summary

for Pronghorn Herd PR740 - CHEYENNE RIVER

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Pre Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	51,650	601	1,081	1,682	27%	2,950	47%	1,630	26%	6,262	1,982	20	37	57	± 3	55	± 3	35
2009	48,838	395	1,101	1,496	25%	2,757	46%	1,802	30%	6,055	2,429	14	40	54	± 3	65	± 3	42
2010	42,854	411	1,054	1,465	29%	2,345	46%	1,309	26%	5,119	2,261	18	45	62	± 3	56	± 3	34
2011	39,597	208	695	903	23%	1,796	45%	1,258	32%	3,957	2,624	12	39	50	± 3	70	± 4	47
2012	29,709	202	462	664	21%	1,513	48%	960	31%	3,137	2,156	13	31	44	± 3	63	± 4	44
2013	29,868	169	542	711	22%	1,510	47%	1,006	31%	3,227	2,384	11	36	47	± 3	67	± 4	45

2014 HUNTING SEASONS
CHEYENNE RIVER PRONGHORN HERD (PR740)

Hunt Area	Type	Season Dates Opens	Closes	Quota	Limitations
4	1	Oct. 1	Nov. 20	100	Limited quota licenses; any antelope
	6	Oct. 1	Nov. 20	25	Limited quota licenses; doe or fawn
5	1	Oct. 1	Nov. 20	100	Limited quota licenses; any antelope
	6	Oct. 1	Nov. 20	50	Limited quota licenses; doe or fawn valid on private land
6	1	Oct. 1	Oct. 15	350	Limited quota licenses; any antelope also valid in Area 8
7	1	Oct. 1	Oct. 15	300	Limited quota licenses; any antelope
8	1	Oct. 1	Oct. 15	450	Limited quota licenses; any antelope also valid in Area 6
9	1	Oct. 1	Oct. 31	600	Limited quota licenses; any antelope also valid in that portion of Area 11 in Converse or Niobrara counties
	6	Oct. 1	Oct. 31	650	Limited quota licenses; doe or fawn also valid in that portion of Area 11 in Converse or Niobrara counties
27	1	Oct. 1	Oct. 15	300	Limited quota licenses; any antelope
	7	Oct. 1	Oct. 15	75	Limited quota licenses; doe or fawn valid on private land

- continued –

Hunt Area	Type	Season Dates Opens	Closes	Quota	Limitations
29	1	Oct. 1	Oct. 15	100	Limited quota licenses; any antelope
	2	Oct. 1	Oct. 15	500	Limited quota licenses; any antelope valid on private land
	6	Oct. 1	Oct. 15	100	Limited quota licenses; doe or fawn valid on private land
	7	Oct. 1	Nov. 15	100	Limited quota licenses; doe or fawn valid south and west of Interstate Highway 25
Archery 4 & 5		Sep. 1	Sep. 30		Refer to license type and limitations in Section 2.
Archery 6 - 9, 27 & 29		Aug. 15	Sep. 30		Refer to license type and limitations in Section 2.

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	License Type	Quota change from 2013
7	1	-50
7	6	-25
9	1	-100
9	6	-600
27	1	-100
27	6	-150
27	7	+75
29	1	-50
29	2	-50
29	6	-100
29	7	-100
Herd Unit Total	**1**	**-300**
	2	**-50**
	6	**-875**
	7	**-25**

Management Evaluation

Current Postseason Population Management Objective: 38,000
Management Strategy: Recreational
2013 Postseason Population Estimate: ~ 26,500
2014 Proposed Postseason Population Estimate: ~ 27,000

HERD UNIT ISSUES: The management objective of the Cheyenne River Pronghorn Herd Unit is for an estimated post-season population of 38,000 pronghorn. This herd is managed under the recreational management strategy. The population objective and management strategy were set in 1999 when this herd was created by combining the South Black Hills and Thunder Basin Pronghorn Herd Units. This objective is currently under review, and consideration is being given to combining this herd with the Highlight Pronghorn Herd Unit (PR316).

The Cheyenne River Pronghorn herd unit encompasses much of northeastern Wyoming. Because of the disparity of habitats across the herd unit and the preponderance of private land, this herd unit is managed for recreational hunting. The herd unit encompasses 7,466 mi^2, of which 6,443 mi^2 is considered occupied pronghorn habitat. Most of the unoccupied habitat is found in Hunt Areas (HA's) 4 and 5, which include a portion of the Black Hills having topographical and vegetative features unsuitable for pronghorn. Approximately 77% of this herd unit is private land. The remaining 23% includes lands managed by the United States Forest Service (USFS), the Bureau of Land Management (BLM), and the State of Wyoming. Most of the occupied USFS lands are part of the Thunder Basin National Grassland (TBNG) and located in HA's 5, 6, 7, 27, and 29, with HA 27 containing the largest amount. The State of Wyoming owns a large parcel of land in HA 9. Remaining public lands are scattered throughout the herd unit, and most are not accessible to the public. Access fees for hunting are common on private land, and many landowners have leased their property to outfitters. Therefore, accessible public lands are subjected to disproportionately heavy hunting pressure.

Major land uses in this herd unit include livestock grazing, oil and gas production, timber harvest, and farming. There are several oil and gas fields which occur primarily in HA's 6, 7, 8, and 29, and development pressure has increased in recent years in HA's 8 and 29. Two surface coal mines represent a substantial land use within HA 27. Farming generally occurs in the southern most portion of the herd unit, but there are a number of wheat, oat, and alfalfa fields near Sundance and Upton. When pronghorn numbers are high, damage to growing alfalfa can become an issue.

WEATHER: The winter of 2010-11 was very harsh in the northern half of the herd unit. Over-winter mortality was well above average and losses of all ages of pronghorn continued into the spring. During this winter, large scale movements of pronghorn were also observed. Warmer and drier conditions beset the area during the end of bio-year 2011 and continued through the 2012-13 winter, with the 2012 summer being the driest on record in many places. April of 2013 finally saw a break in the drought when temperatures dropped below normal for the entire month, and significant precipitation was again received. This wetter and cooler pattern continued through the summer of 2013. In early October 2013, a winter storm "Atlas" blanketed the herd unit with 12" to nearly 36" of wet snow in some locations and drifts exceeding 6-feet. While no significant level of pronghorn mortality was detected due to this storm, the snow and

resultant muddy conditions forced the cancellation of hunting for some license holders, and made accessing pronghorn difficult in many locations. Towards the end of the hunting seasons, travel conditions improved, but it was apparent winter storm Atlas negatively impacted hunter participation and hampered hunter success. The early winter months of bio-year 2013 brought temperature and precipitation conditions near the recent 30-year average. For detailed weather data see http://www.ncdc.noaa.gov/cag/time-series/us.

HABITAT: The herd unit is dominated by Wyoming big sagebrush (*Artemesia tridentata wyomingensis*), silver sagebrush (*Artemesia cana*), and mid-prairie grasses such as wheatgrasses (*Agropyron* spp.), grama grasses (*Bouteloua* spp.), and needle grasses (*Stipa* spp.). In addition, there are several major drainages dominated by plains cottonwood (*Populus deltoides*) and greasewood (*Sarcobatus vermiculatus*). These drainages include the Cheyenne River, Antelope Creek, Black Thunder Creek, Beaver Creek, Old Woman Creek, Hat Creek, and Lance Creek. Steep canyons dominate the southern Black Hills portion of the herd unit, and there vegetation consists of ponderosa pine (*Pinus ponderosa*) and its associated savannah. Some areas are dominated by agricultural croplands, notably near the towns of Douglas, Lusk, Upton, and Sundance.

Habitat suitability for pronghorn varies greatly throughout the herd unit. Much of the habitat in the northeast portion of the herd unit is marginal, consisting of topography and vegetation not particularly suitable for pronghorn. The west-central portions of the herd unit represent the best block of contiguous sagebrush habitat. While the eastern and southern sections of the herd unit are dominated more by mid-grass prairie and agricultural lands, but locally do support good numbers of pronghorn. Habitat disturbance throughout the herd unit is generally high. There are a number of developed oil fields and areas impacted by bentonite and coal mining. In the central and southern portions of the herd unit, historic sagebrush control projects have decreased the amount of sagebrush available for wintering pronghorn at many sites. Yet, pronghorn still winter in this region. Habitat loss and fragmentation is expected to continue and negatively impact this herd. Based upon current exploration and leasing trends, the amount of disturbance caused by mining, and oil & gas activities will continue to increase in HA's 8, 27 and 29. In addition, a large wind farm is planned in HA 29.

Beginning in the fall of 2001, Department personnel established Wyoming big sagebrush monitoring transects within the herd unit. Forage conditions away from irrigated fields within this herd unit were poor between 2001 and 2004, improved substantially in 2005, and then declined dramatically during 2006, when severe drought plagued the herd unit. Based on these transects, forage conditions rebounded in 2007, and remained good in 2008 and 2009. Leader production measurements were suspended in 2010, but over-winter estimates of use continued through 2011. As previously mentioned, sagebrush leader growth improved in 2007, however, the post-season population of this herd peaked that year and winter use of sagebrush leaders was excessive.[1] It was apparent the population of pronghorn and other animals (notably cotton-tailed rabbits) browsing sagebrush at that time was not sustainable. Increased harvest along with reduced recruitment and survival began to push this pronghorn population down. As this herd declined, winter use of sagebrush dropped and range conditions improved through 2011. Then, the severe drought of 2012 resulted in very poor forage production and elevated use during and

[1] Different technique applied to measure utilization in 2007. Results may not be directly comparable to previous years.

after the growing season. Neither sagebrush production nor utilization was measured in 2013. However, a very wet spring and summer were experienced during 2013, and there were low numbers of pronghorn on the range. Consequently, casual observations of range conditions showed excellent leader growth and reduced winter use.

FIELD DATA: This population's recent decline was accentuated during the winter of 2010-2011 and subsequent drought of 2012. Drought in 2012 negatively impacted fawn survival, and the fawn:doe ratio decreased to 62:100. During 2013, fawn production and survival again were reduced, and late summer losses to Epizootic Hemorrhagic Disease (EHDV) observed. The 2013 observed fawn:doe ratio was 67:100 and adequate sample sizes for each hunt area were attained. While considered low for pronghorn, this value was 8% above the previous five-year average (62:100), but still 7% below the long-term average of 72:100.

Over the last 30^{+} years annual productivity of this herd, as measured by preseason fawn:doe ratios, has generally declined (Figure 1). This is thought to be the result of a reduction in habitat quantity and quality, intensified by drought, plant succession, aging of sagebrush, and over-browsing from both domestic livestock and wildlife. However, productivity was fairly stable and generally good between 1998 and 2006 *(avg. 78; std. dev. 6.3).* A situation credited to mild winters persisting during intensifying drought, even though this population was estimated to be above objective most years. However, as this population moved more significantly above objective beginning in 2005 and drought continued, fawn:doe ratios began to decline. This trend continued through 2008. During this time frame severe snow storms plagued the herd unit each April and May. In addition, June weather each year was cooler and wetter than normal. While this precipitation provided a much-needed boost for rangeland health, the combination is believed to have increased post-season mortality of adults and reduced survival of fawns. Predation of fawns may have also increased during this time as well, as small animal populations dropped throughout the herd unit. Since 2008 the herd's preseason fawn:doe has trended upwards slightly, but has averaged only 63 fawns per 100 does *(std. dev 6.0).* This has translated

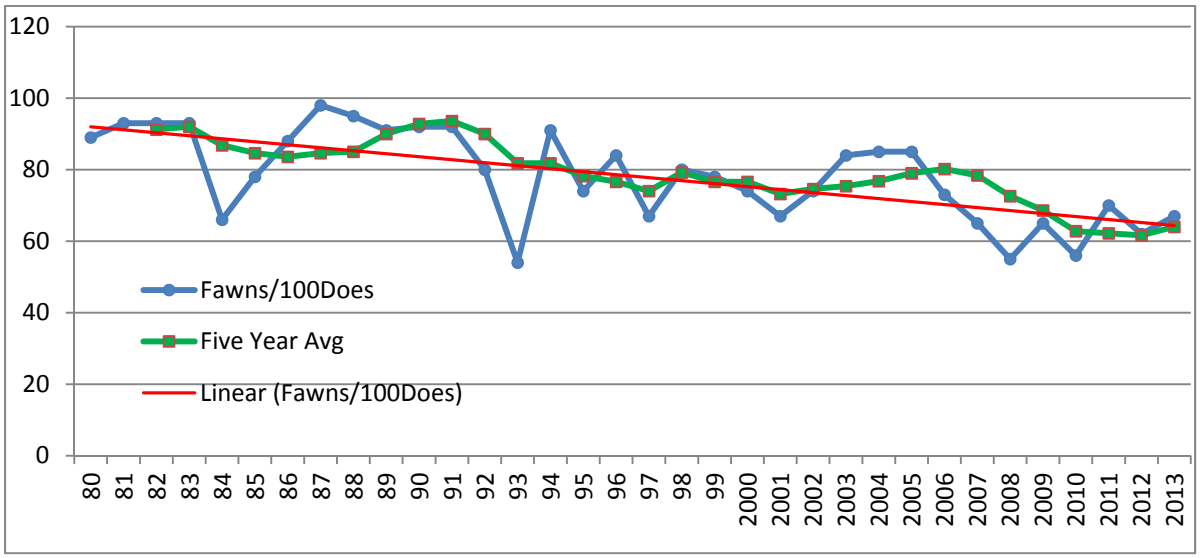


Figure 1: Observed Annual, and Recent Five-Year Average Fawn:Doe Ratios (1980-2013).

into a continued population decline, even as hunting seasons became more conservative.

As this population rose between 2002 and 2006, preseason buck:doe ratios fluctuated, but generally increased. Between 2007 and 2012, preseason buck:doe ratios generally declined, as this population dropped and the relative percentage of bucks harvested from the population increased annually. The population model simulates an increase in buck ratios from 48:100 in 2002 to a peak of 60:100 in 2007 and a subsequent decline back to 48:100 in both 2012 and 2013, a value projected to continue into 2014. This preseason value of 48 bucks per 100 does is near the midpoint of the Department's recreational management criteria.

Small changes in female mortality rates can greatly affect observed male:female ratios (Bender 2006). Historic fluctuations in observed buck:doe ratios in some hunt areas may have been influenced as much by changes in female survival as by buck harvest, at least in hunt areas where we have no difficulty increasing doe harvest, such as HA 27 and portions of HA's 7, 9, and 29. This may explain the wide variation in observed buck:doe ratios within the herd unit between some years. As Bender (2006) states, managers should consider the significant influence small changes in female mortality rates have on observed male:female ratios when managing male escapement from harvest in ungulate populations.

HARVEST DATA: Since 2008 hunter success has dropped and effort has generally continued to increase. In 2013, most hunt areas exhibited low success compared to what is normally observed for pronghorn within the state and this herd unit. Active license success on doe/fawn tags ranged from 60% in HA 29 to 76% in HA's 5 & 27. Type 1 active license success varied from 63% in HA 8 to 89% in HA 6. Herd unit wide, active license success was 67% on doe/fawn tags and 77% on type 1 & 2 licenses. Again, winter storm "Atlas" impacted the entire herd unit during the first week of October, with snow and mud lingering through the hunting season. This resulted in some hunters cancelling planned trips, as the percentage of active licenses fell about ten to fifteen percent from historical values. Additionally, the weather and associated travel conditions likely reduced active license success. Although hunter success has dropped recently, the hunter satisfaction survey revealed herd unit-wide 40% of hunters were very satisfied, and 37% satisfied with their hunt in 2012; and similar values were reported in 2013, with 39% of hunters stating they were very satisfied, and 38% satisfied with their hunt.

POPULATION: Following inclusion of line transect and harvest data collected in 2013, the modeled 2013 post-season population estimate was about 26,500. The revised model significantly lowered estimated populations for the previous 5-years. Consequently, pre and post season population estimates in the JCR database were updated for bio-years 2008 through 2013. This population had been trending downwards each year since peaking at about 51,000 pronghorn in 2006[2]. The recent line transect survey was conducted in June 2013, and resulted in an end of 2012 bio-year population estimate of 20,400 (Appendix 1). This was a notable reduction from the 2011 line transect estimate of 30,900. This population was generally stable near objective between 1993 and 2002. The population then increased rapidly through 2006 as fawn survival was very good, with observed preseason fawn:doe ratios averaging 80:100 between 2002 and 2006. This, coupled with our inability to sell all doe/fawn licenses, made controlling the population difficult. Since then, a reduction in price of doe/fawn licenses, the

[2] 2014 Revised model estimate for 2006 (not recorded in JCR database)

ability for hunters to possess up to four of them, internet license sales, and enrollment of private lands in our PLPW program substantially increased our ability to affect doe/fawn harvest. Between 2007 and 2012 this population dropped significantly in the wake of increased female harvest, reduced fawn recruitment, and increased non-hunting mortality of adults.

As previously mentioned, this population's recent decline, while driven by increased mortality and reduced recruitment, was exasperated by above normal winter and spring mortality in bio-year 2010. In addition to lower fawn production and survival in bio-year 2013, late summer losses of all age classes to Epizootic Hemorrhagic Disease (EHDV) were observed. It is also suspected, although not confirmed, that pronghorn mortality was increased in late summer and early fall both of the previous two bio-years due to EHDV as well.

The "Semi Constant Juvenile & Semi Constant Adult" (SCJ SCA) spreadsheet model was chosen to estimate this herd's population. All three competing models simulate a population rise between 2002 and 2006 or 2007 (TSJ CA), followed by a decline through 2012 and leveling off to slight increase in 2013. However, the SCJ SCA model exhibited the lowest AICc value. The magnitude of trends produced by SCJ SCA model also dovetail well with trends in harvest statistics and the perceptions of local game managers, landowners, and hunters; and amongst competing models it tracks observed data (including recent LT estimates) very well. The SCJ SCA model was also chosen because, along with the lowest AICc, all three competing models produced post-season population estimates for both 2012 and 2013 that were within about 10% of each other. This model functions well because it allows for modeling the increased mortality observed during the severe winters of 2000-2001 and 2010-2011.

MANAGEMENT SUMMARY: The 2012 and 2013 hunting seasons were conservative in this herd unit, and changes for the 2014 season entail continuing and augmenting this same strategy. Doe/fawn harvest has been significantly reduced or eliminated in all hunt areas. Additionally, issuance of any antelope tags was curtailed somewhat to maintain buck:doe ratios at their current level. The largest reductions in harvest should occur in HA's 9, 27, and 29, where most doe/fawn harvest has continued to date. In HA 9, claims for damage from pronghorn are no longer being submitted, and landowners have noted a drop in pronghorn numbers. In HA 29, in response to complaints from landowners and hunters on public land about low pronghorn numbers, last year a type 2 (any antelope) license valid on private land only was issued, while type 1 license numbers were greatly reduced. Here, issuance of type 6 tags was also reduced and were restricted to private land in 2013. These changes were well received by many of the landowners and significantly reduced harvest pressure on public lands in the northern part of HA 29 where pronghorn numbers have plummeted.

Concerns remain about low pronghorn numbers on public lands, notably the TBNG in both HA's 29 & 27. To help address this, reduced priced doe/fawn tags available for HA 27 have been confined in validity to private land via a new type 7 tag, while the type 6 tags have been eliminated. In addition, issuance of type 1 (any antelope) licenses was reduced 25% in HA 27, an area where residents hold 80% of the licenses, draw odds for non-residents are some of the most difficult in the state, and most of the hunting occurs on public land. Here, active type 1 license success has remained below 80% for two years in a row, and the percentage of residents

reporting they were satisfied or very satisfied with their hunt fell from 89% in 2011 to 64% in 2012, and remained similar in 2013 at 68%.

Finally, to address landowner concerns along the boundary of HA's 6 and 8, a change in license limitations allowing hunters with HA 6 tags to hunt in HA 8 and vice versa has been enacted. The east-west boundary between these hunt areas consists of county roads, which antelope frequently cross. Landowners whose properties straddle this boundary have over the years requested ability for hunters to hunt both sides of these roads. Because landownership patterns are similar in both hunt areas, the Department felt we could try this approach for a couple years, which if successful could lead to a combining of hunt areas and regulation simplification in the future.

Given average fawn:doe and buck:doe ratios observed the past 5-years and consistent survival rates, combined with a predicted harvest of 2,780 pronghorn, the 2014 hunting season should allow the post-season population of this herd to grow about 2%, to 27,000 pronghorn.

LITERATURE CITED:

Bender, Louis C. 2006. Uses of herd composition and age ratios in ungulate management. Wildlife Society Bulletin. Vol. 34 (4): 1225-1230.

INPUT	
Species:	Pronghorn
Biologist:	Joe Sandrini
Herd Unit & No.:	Chey. River PR740
Model date:	01/27/14

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	166	175	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	131	151	☑ SCJ,SCA	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	64	171	☐ TSJ,CA Model	

Population Estimates from Top Model

Year	Predicted Prehunt Population (year *i*)			Total	Predicted Posthunt Population (year *i*)			Total	Predicted adult End-of-bio-year Pop (year *i*)			LT Population Estimate		Trend Count	Objective
	Juveniles	Total Males	Females		Juveniles	Total Males	Females		Total Males	Females	Total Adults	Field Est	Field SE		
1993	8278	9460	15284	**33022**	8114	6800	13988	**28902**	8329	14617	**22945**				
1994	13094	8162	14324	**35580**	12941	4892	13054	**30887**	8466	15687	**24153**				
1995	11384	8297	15373	**35054**	11075	5135	13617	**29827**	7955	15338	**23293**				
1996	12608	7796	15031	**35436**	12522	4674	14023	**31219**	8157	16397	**24554**				
1997	10802	7994	16069	**34864**	10730	5095	15116	**30941**	7866	16641	**24507**				
1998	12983	7709	16308	**37000**	12901	5143	15749	**33794**	8798	18075	**26873**				
1999	13815	8622	17714	**40151**	13703	6165	17022	**36889**	9979	19424	**29403**				
2000	13999	9780	19036	**42814**	13886	7158	18312	**39357**	7824	16372	**24197**				
2001	10708	7668	16045	**34421**	10614	5581	15558	**31753**	8374	17049	**25423**	25386	4403		
2002	12307	8207	16708	**37222**	12238	5947	16365	**34550**	9276	18378	**27654**				
2003	15173	9090	18011	**42274**	15039	6534	17221	**38794**	10781	20084	**30865**	26285	4595		
2004	16723	10566	19682	**46970**	16597	7862	18920	**43379**	12470	22115	**34584**				
2005	18374	12220	21673	**52267**	18217	9583	20768	**48568**	14546	24261	**38806**				
2006	17465	14255	23775	**55495**	17319	11041	22471	**50830**	15324	25277	**40601**				
2007	16043	15018	24772	**55833**	15794	10958	22573	**49324**	14505	24604	**39109**				
2008	13323	14215	24112	**51650**	13025	9993	21459	**44477**	12597	22519	**35116**	38196	4139		
2009	14424	12345	22069	**48838**	14025	8027	19065	**41116**	11297	20813	**32111**				
2010	11386	11072	20397	**42854**	10971	7098	17387	**35457**	9406	18230	**27636**	30919	4265		
2011	12514	9218	17865	**39597**	12119	5994	15690	**33803**	6957	14291	**21248**				
2012	8886	6818	14005	**29709**	8583	4055	12376	**25013**	6897	14152	**21049**	20442	1912		
2013	9240	6759	13869	**29868**	9084	4562	12862	**26508**	6990	14439	**21429**				
2014	9036	6850	14150	**30037**	8915	4661	13402	**26979**							
2015															
2016															
2017															
2018															
2019															
2020															
2021															
2022															
2023															
2024															
2025															

Survival and Initial Population Estimates

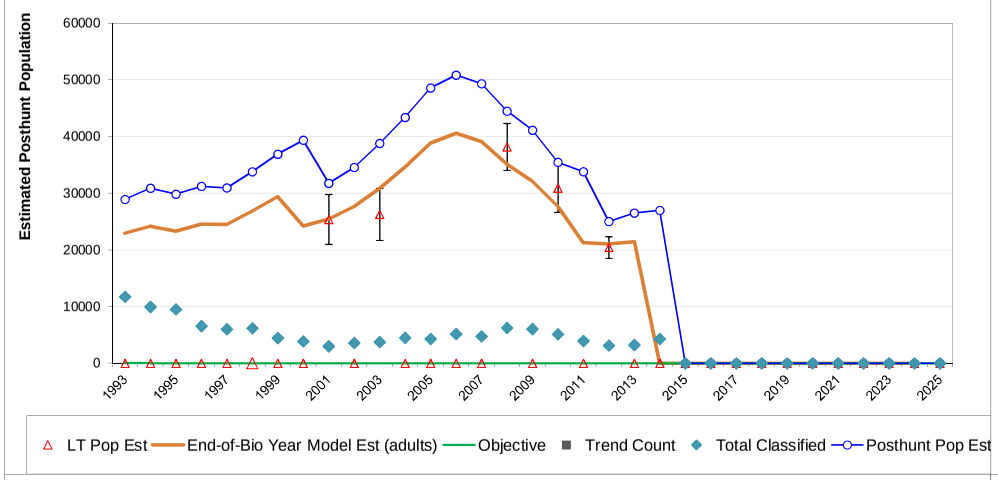
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.75			0.82		
1994	0.75			0.82		
1995	0.75			0.82		
1996	0.75			0.82		
1997	0.75			0.82		
1998	0.75			0.82		
1999	0.75			0.82		
2000	0.50			0.70		
2001	0.75			0.82		
2002	0.75			0.82		
2003	0.75			0.82		
2004	0.75			0.82		
2005	0.75			0.82		
2006	0.75			0.82		
2007	0.75			0.82		
2008	0.75			0.82		
2009	0.75			0.82		
2010	0.75			0.82		
2011	0.50			0.70		
2012	0.75			0.82		
2013	0.75			0.82		
2014	0.75			0.82		
2015						
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

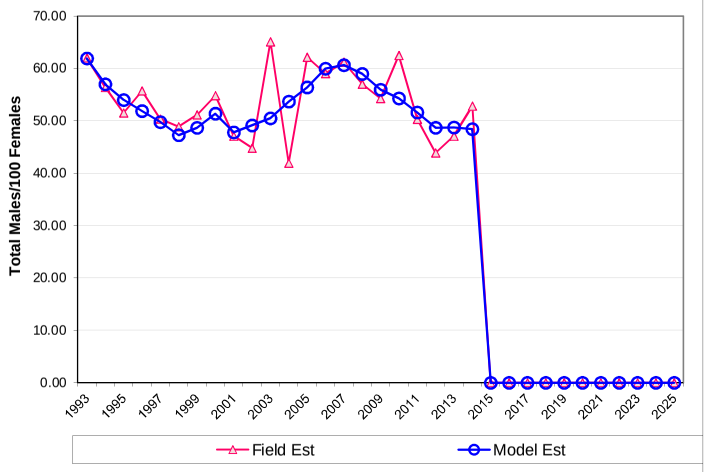
Parameters:	Optim cells
Juvenile Survival =	0.751
Adult Survival =	0.824
Initial Total Male Pop/10,000 =	0.946
Initial Female Pop/10,000 =	1.528

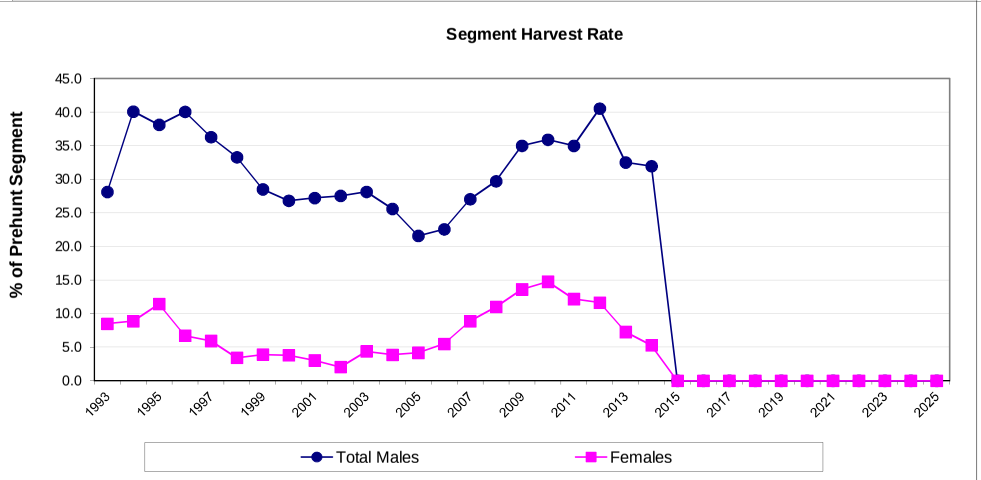
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Over-summer adult surviva	98%

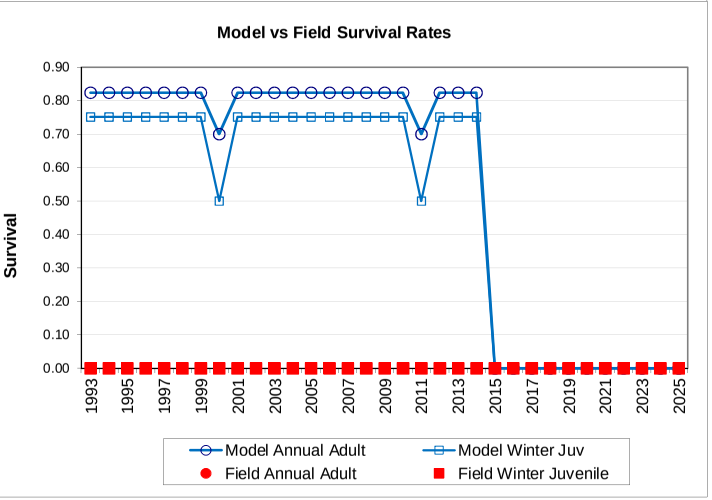
Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio			Harvest				Harvest: Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		54.16	1.24	61.90	62.01	1.36	149	2418	1178	3745	28.1	8.5
1994		91.41	2.09	56.98	56.36	1.48	139	2973	1155	4267	40.1	8.9
1995		74.05	1.75	53.97	51.52	1.36	281	2874	1597	4752	38.1	11.4
1996		83.88	2.37	51.87	55.73	1.78	79	2838	917	3834	40.0	6.7
1997		67.22	2.02	49.75	50.33	1.65	65	2636	866	3567	36.3	5.9
1998		79.61	2.30	47.27	48.89	1.64	74	2332	508	2914	33.3	3.4
1999		77.99	2.67	48.67	51.15	1.99	102	2234	629	2965	28.5	3.9
2000		73.54	2.75	51.37	54.81	2.24	102	2383	658	3143	26.8	3.8
2001		66.74	2.82	47.79	47.08	2.22	85	1897	443	2425	27.2	3.0
2002		73.66	2.79	49.12	44.77	1.99	63	2054	312	2429	27.5	2.1
2003		84.24	3.21	50.47	65.09	2.67	122	2324	718	3164	28.1	4.4
2004		84.96	2.82	53.68	41.93	1.73	114	2458	693	3265	25.6	3.9
2005		84.78	3.00	56.38	62.15	2.41	143	2397	822	3362	21.6	4.2
2006		73.46	2.39	59.96	59.02	2.05	133	2922	1186	4241	22.5	5.5
2007		64.76	2.25	60.63	61.20	2.17	227	3691	1999	5917	27.0	8.9
2008		55.25	1.71	58.95	57.02	1.74	271	3838	2412	6521	29.7	11.0
2009		65.36	1.98	55.94	54.26	1.74	363	3926	2731	7020	35.0	13.6
2010		55.82	1.93	54.28	62.47	2.08	377	3612	2736	6725	35.9	14.8
2011		70.04	2.58	51.60	50.28	2.05	359	2931	1978	5268	35.0	12.2
2012		63.45	2.62	48.68	43.89	2.04	276	2512	1481	4269	40.5	11.6
2013		66.62	2.71	48.73	47.09	2.14	142	1997	916	3055	32.5	7.3
2014		63.86	2.30	48.41	52.82	2.02	110	1990	680	2780	32.0	5.3
2015												
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES









Comments:

Appendix 1
PR 740 Line Transect Results
End of Bio-Year 2012

Effort: 2785.763
samples: 96
Width: 213.5000
Left: 0.0000000
observations: 306

Model 1
Half-normal key, k(y) = Exp(-y**2/(2*A(1)**2))

Parameter	Point Estimate	Standard Error	Percent Coef. Of variation	95 % Confidence Interval	
DS	1.9853	0.17117	8.62	1.6744	2.3540
E(S)	1.5981	0.57992E-01	3.63	1.4880	1.7164
D	3.1728	0.29679	9.35	2.6389	3.8147
N	20442.	1912.2	9.35	17002.	24578.

Measurement Units
Density: Numbers/Sq. miles ESW: meters

Component Percentages of Var(D)

Detection probability: 34.1
Encounter rate: 50.8
Cluster size: 15.0

Estimation Summary - Encounter rates

	Estimate	%CV	df	95% Confidence Interval	
n	306.00				
k	96.000				
L	2785.8				
n/L	0.10984	6.67	48.00	0.96076E-01	0.12559
Left	0.0000				
Width	213.50				

Estimation Summary - Detection probability

Half-normal/Cosine

	Estimate	%CV	df	95% Confidence Interval	
m	1.0000				
LnL	-479.57				
AIC	961.13				
AICc	961.15				
BIC	964.86				
Chi-p	0.25585				
f(0)	0.69785E-02	5.47	305.00	0.62674E-02	0.77702E-02
p	0.67119	5.47	305.00	0.60280	0.74733
ESW	143.30	5.47	305.00	128.70	159.56

Estimation Summary - Expected cluster size

Estimate

Average cluster size	%CV	df	95% Confidence Interval	
1.7778	5.87	305.00	1.5840	1.9953

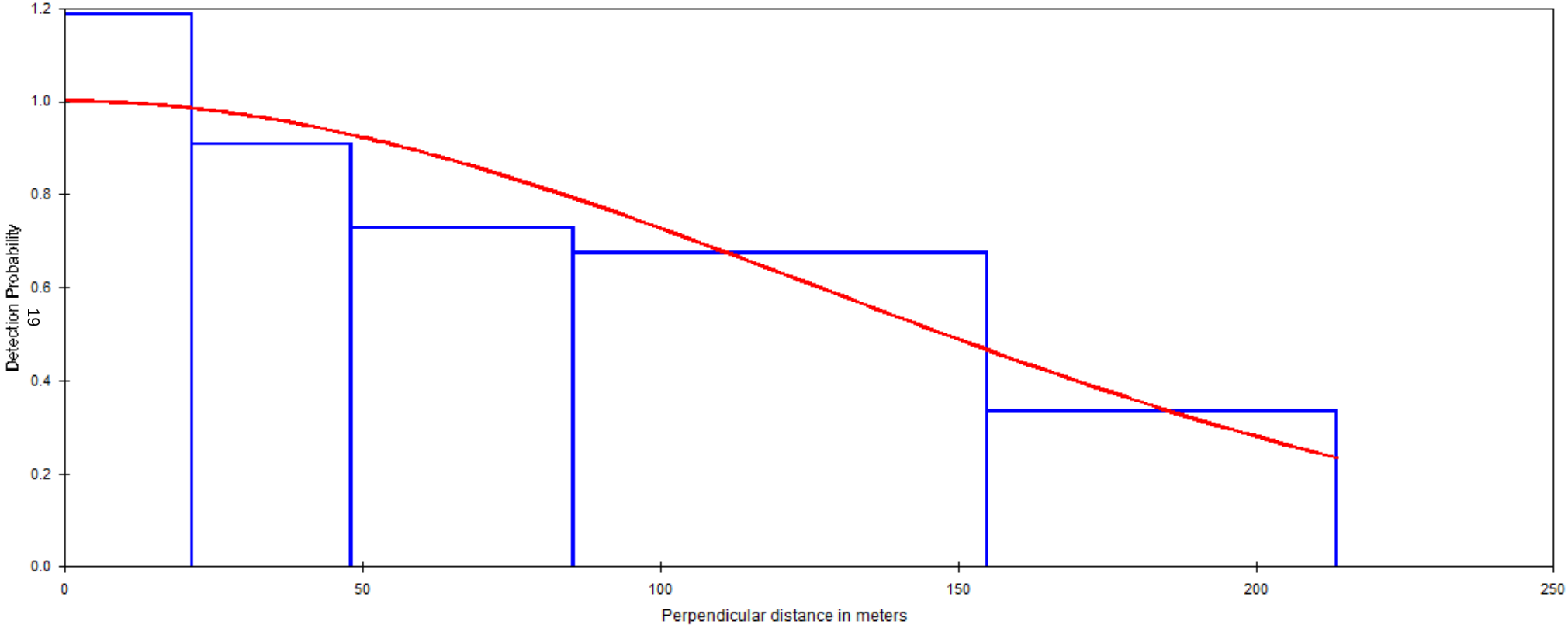
Half-normal/Cosine

	Estimate	%CV	df	95% Confidence Interval	
r	0.60850E-01				
r-p	0.14433				
E(S)	1.5981	3.63	304.00	1.4880	1.7164

Estimation Summary – Density & Abundance

Half-normal/Cosine

	Estimate	%CV	df	95% Confidence Interval	
D	1.9853	8.62	125.25	1.6744	2.3540
DS	3.17828	9.35	171.34	2.6389	3.8147
N	20,442	9.35	171.34	17,002	24,578

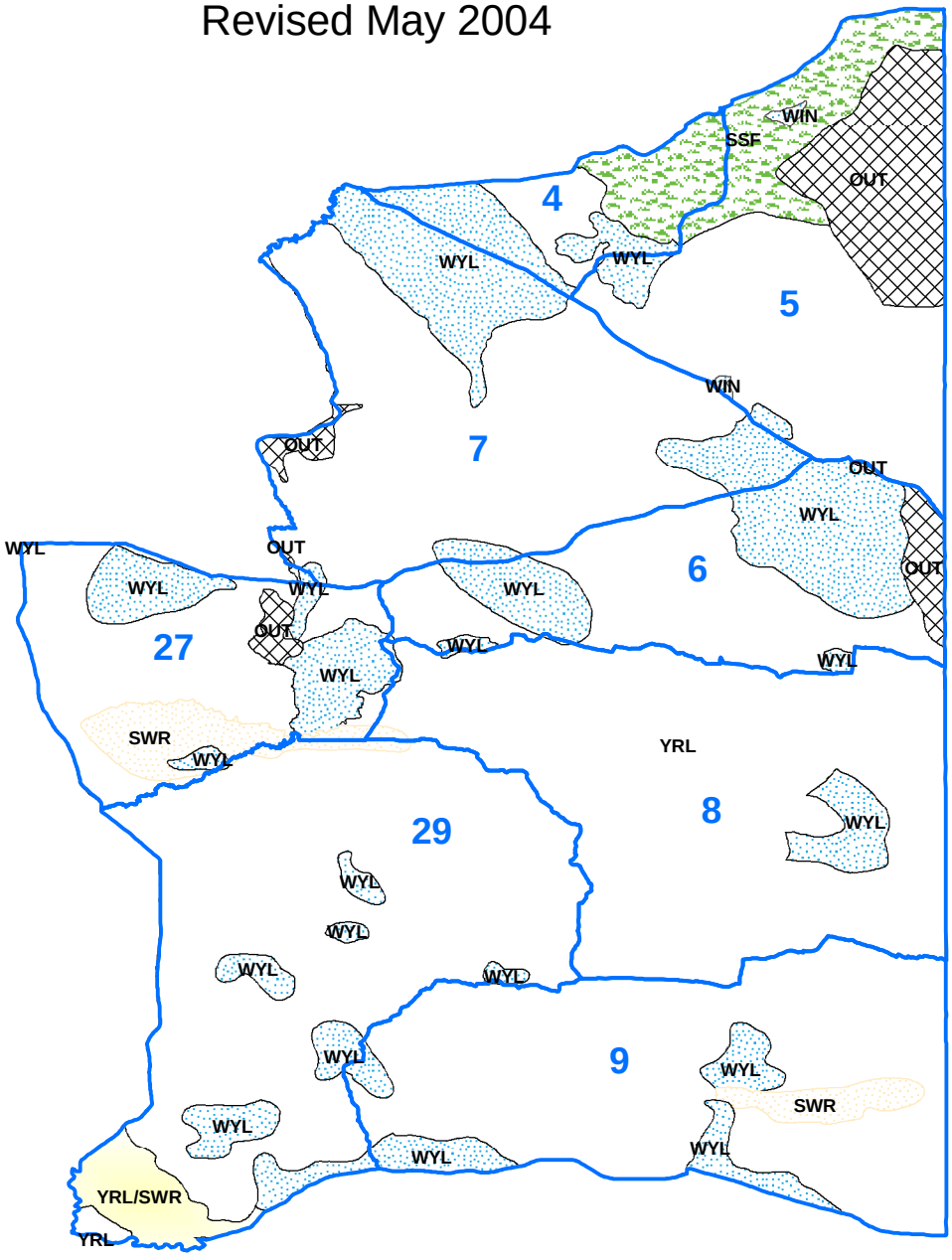

1.2
1.0
0.8
0.6
0.4
0.2
0.0
Detection Probability
19
0
50
100
150
200
250
Perpendicular distance in meters

Pronghorn - Cheyenne River

Hunt Areas 4, 5, 6, 7, 8, 9, 27, & 29

Casper Region

Revised May 2004



2013 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2013 - 5/31/2014

HERD: PR745 - RATTLESNAKE

HUNT AREAS: 70-72

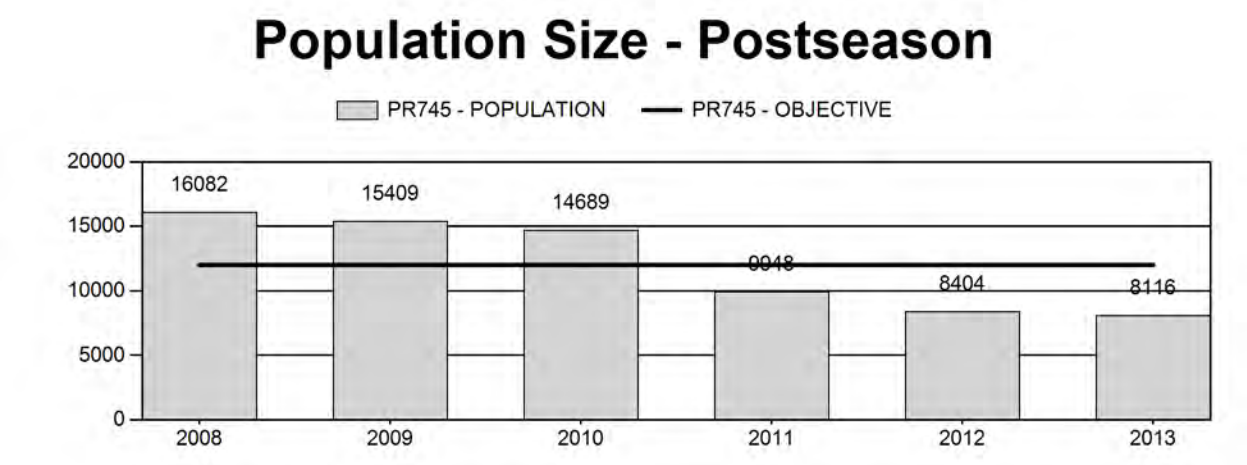
PREPARED BY: HEATHER O'BRIEN

	2008 - 2012 Average	2013	2014 Proposed
Population:	12,906	8,116	8,480
Harvest:	2,441	1,047	800
Hunters:	2,540	1,144	850
Hunter Success:	96%	92%	94 %
Active Licenses:	2,753	1,286	900
Active License Percent:	89%	81%	89 %
Recreation Days:	7,846	4,032	2,800
Days Per Animal:	3.2	3.9	3.5
Males per 100 Females	62	39	
Juveniles per 100 Females	53	61	

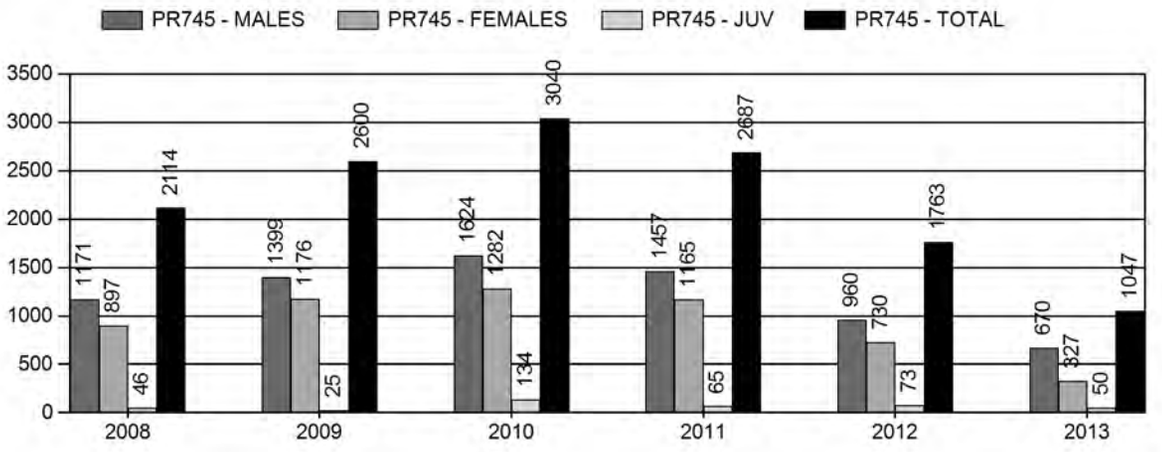
Population Objective:	12,000
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-32.4%
Number of years population has been + or - objective in recent trend:	4
Model Date:	2/26/2014

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

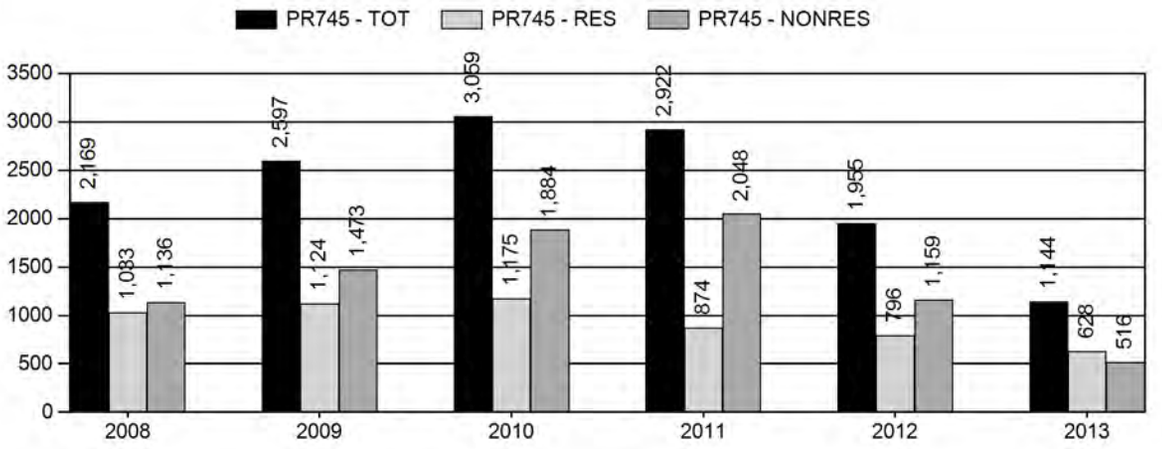
	JCR Year	Proposed
Females ≥ 1 year old:	7.1%	3.8%
Males ≥ 1 year old:	36.4%	33.3%
Juveniles (< 1 year old):	1.8%	0.5%
Total:	11.3%	8.1%
Proposed change in post-season population:	+1.56%	+4.5%



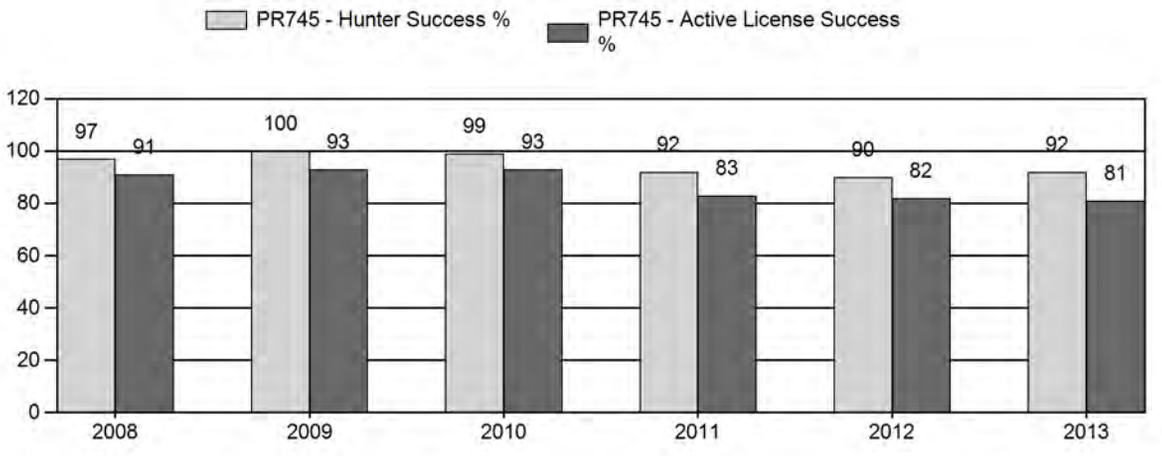
Harvest



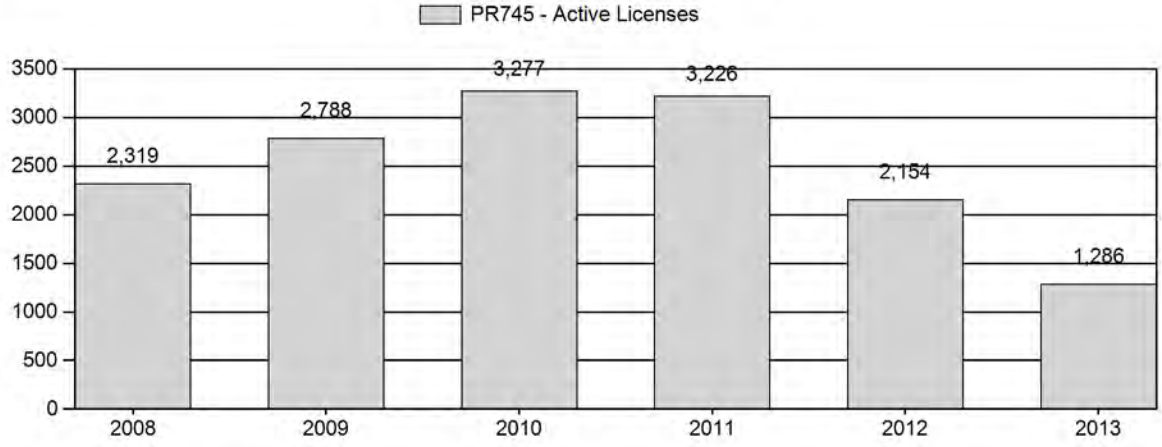
Number of Hunters



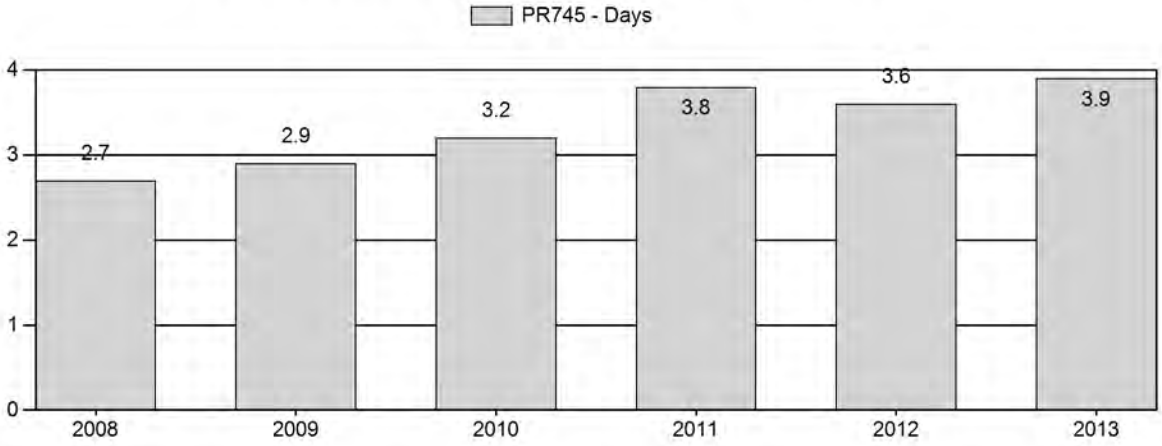
Harvest Success



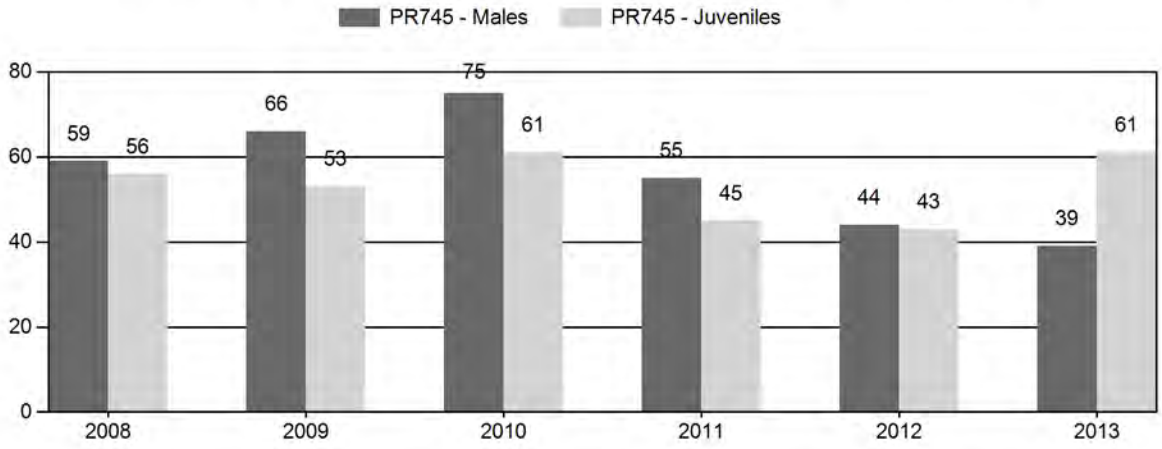
Active Licenses



Days Per Animal Harvested



Preseason Animals per 100 Females



2008 - 2013 Preseason Classification Summary

for Pronghorn Herd PR745 - RATTLESNAKE

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Pre Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	18,407	434	823	1,257	28%	2,114	46%	1,183	26%	4,554	1,952	21	39	59	± 3	56	± 3	35
2009	18,269	330	954	1,284	30%	1,951	46%	1,027	24%	4,262	2,276	17	49	66	± 3	53	± 3	32
2010	18,033	271	933	1,204	32%	1,599	42%	970	26%	3,773	2,827	17	58	75	± 4	61	± 4	35
2011	12,938	195	683	878	27%	1,607	50%	721	22%	3,206	1,616	12	43	55	± 3	45	± 3	29
2012	10,343	82	209	291	24%	662	53%	285	23%	1,238	1,140	12	32	44	± 5	43	± 5	30
2013	9,268	45	199	244	20%	624	50%	381	31%	1,249	1,901	7	32	39	± 5	61	± 6	44

2014 HUNTING SEASONS
RATTLESNAKE PRONGHORN HERD (PR745)

Hunt Area	Type	Date of Seasons Opens	Closes	Quota	Limitations
70	1	Sep. 15	Oct. 31	100	Limited quota; any antelope
	6	Sep. 15	Nov. 30	100	Limited quota; doe or fawn antelope
71	1	Sep. 15	Oct. 31	100	Limited quota; any antelope
	6	Sep. 15	Oct. 31	50	Limited quota; doe or fawn antelope
72	1	Sep. 15	Oct. 31	400	Limited quota; any antelope
	6	Sep.15	Oct. 31	100	Limited quota; doe or fawn antelope
Archery		Aug. 15	Sep. 14		Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2013
70	1	-100
	6	-100
71	1	-100
	6	-50
72	1	-200
	6	-100
Total	1	-400
	6	-250

Management Evaluation

Current Management Objective: 12,000

Management Strategy: Special

2013 Postseason Population Estimate: ~8,100

2014 Proposed Postseason Population Estimate: ~8,500

The Rattlesnake Pronghorn Herd Unit has a post-season population management objective of 12,000 pronghorn. The herd is managed using the special management strategy, with a goal of maintaining preseason buck ratios between 60-70 bucks per 100 does. The objective and management strategy were last revised in 1988, and will be formally reviewed in 2015. A line transect survey will be conducted in May 2014 to be used in conjunction with the formal objective review.

Herd Unit Issues

The 2013 post-season population estimate was approximately 8,100 and trending slightly upward from 2012 estimates. This herd unit did not have a functional population model until 2012, when a spreadsheet-based modeling system replaced the program POP-II to simulate herd dynamics. Prior management decisions for this herd were made using a combination of classification data, harvest statistics, observations of field personnel, and comments from hunters and landowners regarding pronghorn numbers. Line transect surveys were also conducted in 1998, 2000, and 2003 to provide end-of-year population estimates. A subsequent line transect surveys conducted in 2007 was deemed unusable and discarded. The current model is considered to be of poor quality, as personnel believe there to be significant interchange between the Rattlesnake and Beaver Rim Herd Units. For this reason, managers will evaluate the utility of combining these two herd units in 2015.

Hunting access within the herd unit is moderate, with some large tracts of public land as well as walk-in areas and a hunter management area. Traditional ranching and grazing are the primary land use over the whole herd unit, with scattered areas of oil and gas development. Hunt Areas 70 & 71 are dominated by private lands. License issuance is typically maintained in Area 70 to address damage issues on irrigated agricultural fields. Periodic disease outbreaks (i.e. hemorrhagic diseases, *Clostridium spp*. infections) are possible in this herd and can contribute to population declines when environmental conditions are suitable. A small number of pronghorn in the herd were reported to have perished from Epizootic Hemorrhagic Disease (EHD) during the late summer of 2013. Samples sent to the Wyoming Vet Lab from neighboring hunt areas confirmed this. The extent to which pronghorn have been impacted by EHD in recent years is unknown, but is potentially more significant than managers realize.

Weather

The winter of 2010-2011 was severe throughout the herd unit, resulting in higher mortality of pronghorn across all age classes. Conditions were warm and dry for the herd unit in 2011 and shrub production was below average, resulting in poor nutrition of pronghorn entering the winter of 2011-2012. Snow pack and resulting spring moisture was below average for the winter of 2011-2012 which likely had a negative impacts on lactating does and their fawns. The summer of 2012 was the driest on record since 1904 in much of Wyoming, and the winter of 2012 continued the trend with very low snow accumulation and snow pack. Fawn survival over the severely dry summer and winter was low, as evidenced by low yearling buck ratios the following year. April of 2013 finally saw a break in the drought, when temperatures dropped below normal for the entire month and significant precipitation was received. This cooler and wetter pattern continued through the summer of 2013 in much of the herd unit. Heavy rains fell during the

second half of September 2013, making travel in much of the herd unit difficult to impossible. In early October 2013, winter storm "Atlas" blanketed the herd unit with 12-36" of wet snow. While no significant pronghorn mortality was detected as a result, the snow and resulting muddy conditions forced the cancellation of hunting for some license holders, and made accessing pronghorn difficult in many locations. Travel conditions improved toward the end of hunting seasons, but by then it was apparent winter storm Atlas had a negative impact on hunter participation and harvest success. The early winter months of 2013-2014 brought temperature and precipitation conditions near the recent 30-year average. 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 shrub species that are preferred browse for pronghorn. Additionally, there are no comparable habitat transects in neighboring herd units to reference. Anecdotal observations and discussions with landowners in the region indicate that summer and winter forage availability for pronghorn was average in 2013. Herbaceous forage species were observed to be in better condition in 2013 compared to the severely dry 2012, and pronghorn appeared to more widely distributed across suitable habitat.

Field Data

Fawn ratios were high in this herd from 1998-2005, and the population grew markedly during this time period. However, license issuance was modest and the population grew above management control by harvest. Fawn ratios were moderate from 2006-2010, but pronghorn populations were already high by this time period. License issuance increased significantly every year from 2006-2011 in an attempt to curb high pronghorn numbers and reduce the herd toward objective. By 2011, environmental factors combined with low fawn production/survival and high harvest pressure had rapidly reduced this herd below objective. Harsh winter conditions in 2010-11 combined with severe drought in 2012 have since dropped this herd unit below management objective, and license issuance has become more conservative. Improved moisture and favorable weather conditions appeared to have helped fawn production and survival in 2013, as the fawn ratio improved to 61:100 following a low of 43:100 does in 2012.

Buck ratios for the Rattlesnake herd historically range from the mid 40s to mid 70s per 100 does. Buck ratios are most commonly in the upper 50s, just below the lower limit for special management. In more recent years, buck ratios have dropped to the mid-40s as a result of low fawn recruitment and high harvest pressure on a diminishing population. In 2013, the buck ratio for the Rattlesnake Pronghorn Herd reached a 22-year low of 39:100 does. While it can be difficult to maintain this herd within the range of special management due to differing

management strategies for Area 70 versus Areas 71 and 72, hunters have developed high expectations for buck numbers and quality within this herd. Managers thus plan to manage pronghorn to improve and maintain the buck ratio within special management parameters.

Harvest Data

License success in this herd unit is typically in the 90th percentile. Success declined the last three years to the low 80th percentile while hunter days increased, indicating pronghorn were more difficult for hunters to find and harvest. Despite drastic reductions in license numbers in 2012 and 2013, license success and hunter days remained mediocre and effort increased significantly as many hunters remarked that bucks were more difficult to find and of lower quality. While some of the low harvest success can be attributed to poor access due to muddy and/or snowy conditions, fawn production and buck ratios remain below average. Thus, managers will recommend further license reductions in 2014 with the goal of increasing buck ratios and population numbers overall.

Population

The "Time-Specific Juvenile Survival – Constant Adult Survival" (TSJ,CA) spreadsheet model was chosen for the post-season population estimate of this herd. This model seemed most representative of the herd, as it selects for low juvenile survival in the years when managers agree that overwinter fawn survival was very poor – particularly in 2010-2012. The simpler models (CJ,CA and SCA,CA) select for higher juvenile survival rates across years, which does not seem feasible for this herd. All three models follow a trend that is plausible; however the CJ,CA model shows an extremely high buck harvest percentage in 2011, and the SCA,CA model shows a 2006 population peak that seems unrealistic. None of the three models track well with the three line transect estimates, but rather track in between them. While the AIC for the TSJ,CA model is the highest of the three, it is only due to year-by-year penalties on juvenile survival and is still well within one level of power in comparison to the AICs of the simpler models. The TSJ,CA model appears to be the best representation relative to the perceptions of managers on the ground and follows trends with license issuance and harvest success. A line-transect survey is scheduled for May 2014 and should help better align the model. Overall the current model is considered fair in quality as a representation of herd dynamics.

Management Summary

Traditional season dates in this herd unit run from September 15th through October 31st, and through November 30th for Area 70 Type 6 licenses. We recommend the same season dates for 2014, with a reduction of licenses in lieu of poor fawn production/survival and declining buck ratios. The 2014 season includes a total of 600 Type 1 and 250 Type 6 licenses. Goals for 2014

are to increase pronghorn numbers back towards objective, improve buck ratios consistent with special management strategy, and increase hunter success.

If the projected harvest of 750 pronghorn is achieved with fawn production/survival similar to the last few years, this herd will increase slightly in number. The predicted 2014 post-season population size for the Rattlesnake Pronghorn Herd is approximately 8,500 animals, which is 32% below objective.

INPUT	
Species:	Pronghorn
Biologist:	Heather O'Brien
Herd Unit & No.:	Rattlesnake PR745
Model date:	02/25/14

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	140	149	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	132	146	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	70	182	☑ TSJ,CA Model	

Population Estimates from Top Model

Year	Predicted Prehunt Population (year *i*)			Total	Predicted Posthunt Population (year *i*)			Total	Predicted adult End-of-bio-year Pop (year *i*)			LT Population Estimate		Trend Count	Objective
	Juveniles	Total Males	Females		Juveniles	Total Males	Females		Total Males	Females	Total Adults	Field Est	Field SE		
1993	2309	2206	4140	**8654**	2174	1367	3348	**6890**	2084	3840	**5924**				12000
1994	2861	2043	3763	**8667**	2831	1548	3565	**7944**	1893	3716	**5608**				12000
1995	2474	1855	3641	**7970**	2457	1348	3485	**7290**	2248	4184	**6432**				12000
1996	3622	2203	4100	**9925**	3610	1791	3918	**9318**	3153	5064	**8217**				12000
1997	3992	3090	4962	**12044**	3962	2551	4766	**11279**	3892	5894	**9786**				12000
1998	4077	3814	5776	**13667**	4042	2980	5475	**12497**	3332	5608	**8940**	7272	1152		12000
1999	3623	3265	5496	**12385**	3570	2076	5107	**10753**	2898	5685	**8583**				12000
2000	3813	2840	5571	**12225**	3768	1988	5304	**11060**	3367	6376	**9743**	12708	2202		12000
2001	4549	3299	6248	**14097**	4527	2866	6157	**13550**	3389	6343	**9732**				12000
2002	4086	3321	6216	**13623**	4072	2759	6058	**12889**	3187	6156	**9343**	7357	1396		12000
2003	4573	3123	6033	**13728**	4538	2435	5771	**12744**	4138	7143	**11281**				12000
2004	6639	4055	7000	**17695**	6616	3290	6603	**16509**	5020	7997	**13018**				12000
2005	6382	4920	7837	**19140**	6336	4090	7479	**17905**	4778	7835	**12613**				12000
2006	5073	4682	7679	**17434**	5007	3695	7144	**15845**	5244	8353	**13597**				12000
2007	4681	5139	8186	**18007**	4537	3811	7442	**15791**	5261	8548	**13808**				12000
2008	4688	5155	8377	**18219**	4637	3867	7390	**15894**	5366	8518	**13884**				12000
2009	4394	5258	8348	**18001**	4367	3719	7054	**15141**	5078	8057	**13135**				12000
2010	4790	4976	7896	**17662**	4643	3190	6486	**14318**	3475	6437	**9912**				12000
2011	2830	3405	6309	**12545**	2757	1806	4992	**9555**	2508	5330	**7838**				12000
2012	2249	2458	5224	**9930**	2169	1402	4421	**7991**	1878	4706	**6583**				12000
2013	2816	1840	4612	**9268**	2761	1103	4252	**8116**	1882	4819	**6701**				12000
2014	2804	1845	4722	**9371**	2787	1168	4524	**8480**							12000
2015															12000
2016															12000
2017															12000
2018															12000
2019															12000
2020															12000
2021															12000
2022															12000
2023															12000
2024															12000
2025															12000

Survival and Initial Population Estimates

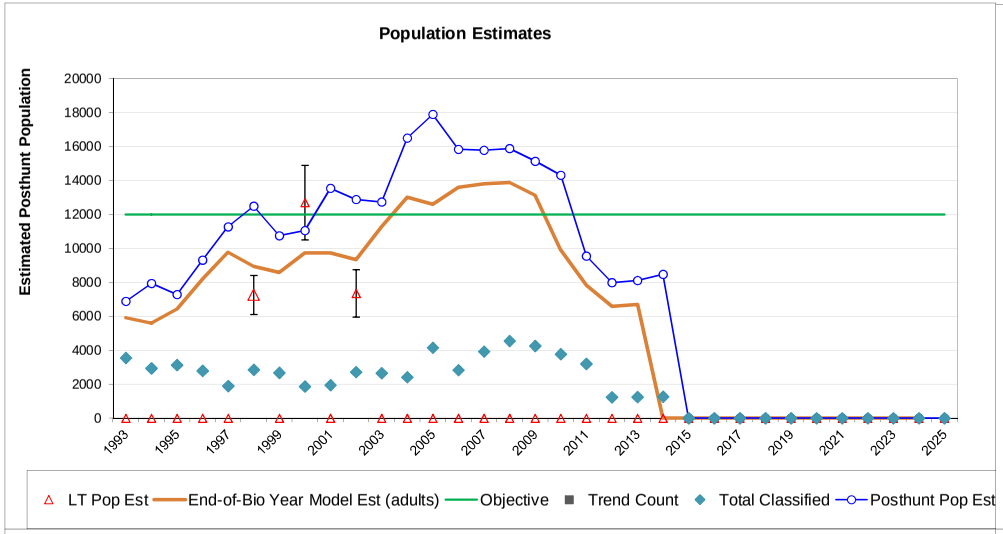
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.90			0.87		
1994	0.42			0.87		
1995	0.90			0.87		
1996	0.88			0.87		
1997	0.85			0.87		
1998	0.40			0.87		
1999	0.68			0.87		
2000	0.90			0.87		
2001	0.40			0.87		
2002	0.40			0.87		
2003	0.90			0.87		
2004	0.66			0.87		
2005	0.40			0.87		
2006	0.83			0.87		
2007	0.90			0.87		
2008	0.90			0.87		
2009	0.90			0.87		
2010	0.40			0.87		
2011	0.40			0.87		
2012	0.40			0.87		
2013	0.66			0.87		
2014	0.67			0.87		
2015						
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

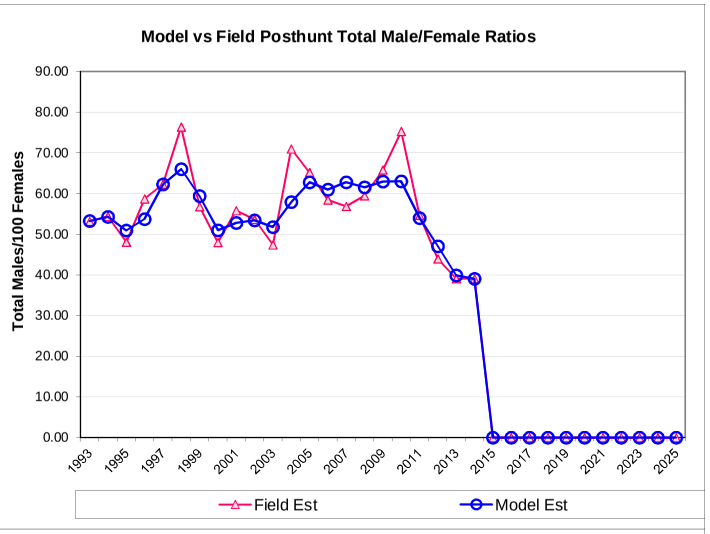
Parameters:	Optim cells
Adult Survival =	0.866
Initial Total Male Pop/10,000 =	0.221
Initial Female Pop/10,000 =	0.414

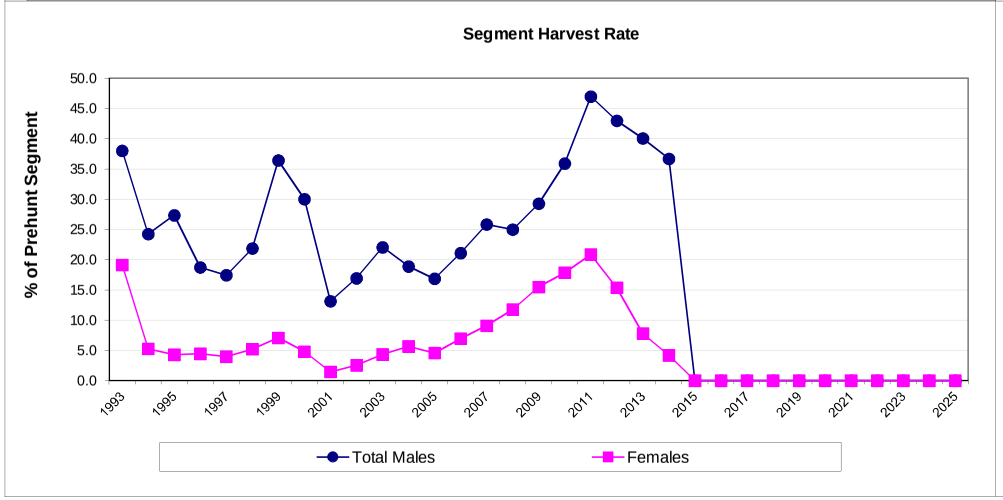
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Over-summer adult surviva	98%

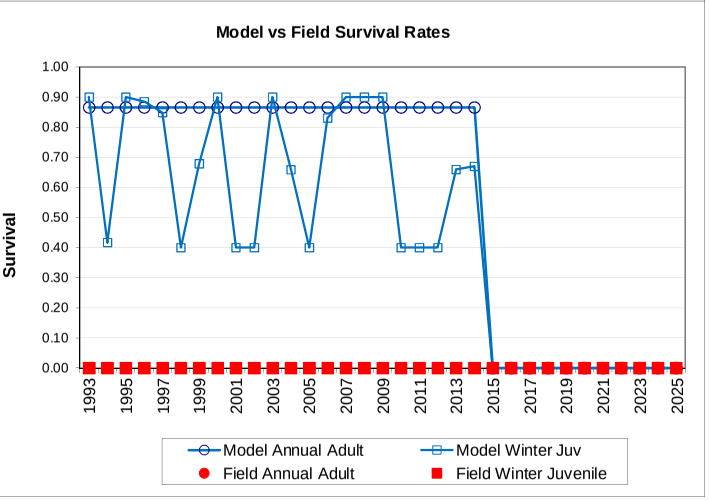
	Classification Counts						Harvest					
Year	Juvenile/Female Ratio			Total Male/Female Ratio							Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est	Field SE	Males	Females	Juveniles	Total Harvest	Total Males	Females
1993		55.76	2.26	53.27	53.18	2.19	762	720	122	1604	38.0	19.1
1994		76.02	3.24	54.28	54.39	2.57	450	180	27	657	24.2	5.3
1995		67.95	2.80	50.94	48.04	2.21	461	142	16	619	27.3	4.3
1996		88.33	3.84	53.73	58.71	2.87	375	166	11	552	18.7	4.5
1997		80.43	4.31	62.28	62.28	3.59	490	179	27	696	17.4	4.0
1998		70.59	3.23	66.02	76.38	3.41	758	274	32	1064	21.9	5.2
1999		65.92	3.02	59.41	56.77	2.72	1081	354	48	1483	36.4	7.1
2000		68.44	3.65	50.98	47.98	2.86	775	243	41	1059	30.0	4.8
2001		72.80	3.84	52.80	55.80	3.19	394	83	20	497	13.1	1.5
2002		65.73	2.96	53.43	53.63	2.58	511	144	12	667	16.9	2.5
2003		75.80	3.35	51.77	47.39	2.42	626	238	31	895	22.0	4.3
2004		94.84	4.51	57.93	70.99	3.65	696	361	21	1078	18.9	5.7
2005		81.44	2.96	62.77	65.18	2.53	754	326	42	1122	16.9	4.6
2006		66.06	2.95	60.98	58.47	2.71	898	486	60	1444	21.1	7.0
2007		57.19	2.21	62.78	56.86	2.20	1207	676	131	2014	25.8	9.1
2008		55.96	2.03	61.54	59.46	2.12	1171	897	46	2114	25.0	11.8
2009		52.64	2.03	62.99	65.81	2.37	1399	1176	25	2600	29.3	15.5
2010		60.66	2.47	63.02	75.30	2.87	1624	1282	134	3040	35.9	17.9
2011		44.87	2.01	53.98	54.64	2.29	1454	1197	67	2718	47.0	20.9
2012		43.05	3.05	47.05	43.96	3.09	960	730	73	1763	43.0	15.4
2013		61.06	3.97	39.90	39.10	2.95	670	327	50	1047	40.1	7.8
2014		59.38	3.85	39.06	39.06	2.91	615	180	15	760	36.7	4.2
2015												
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES



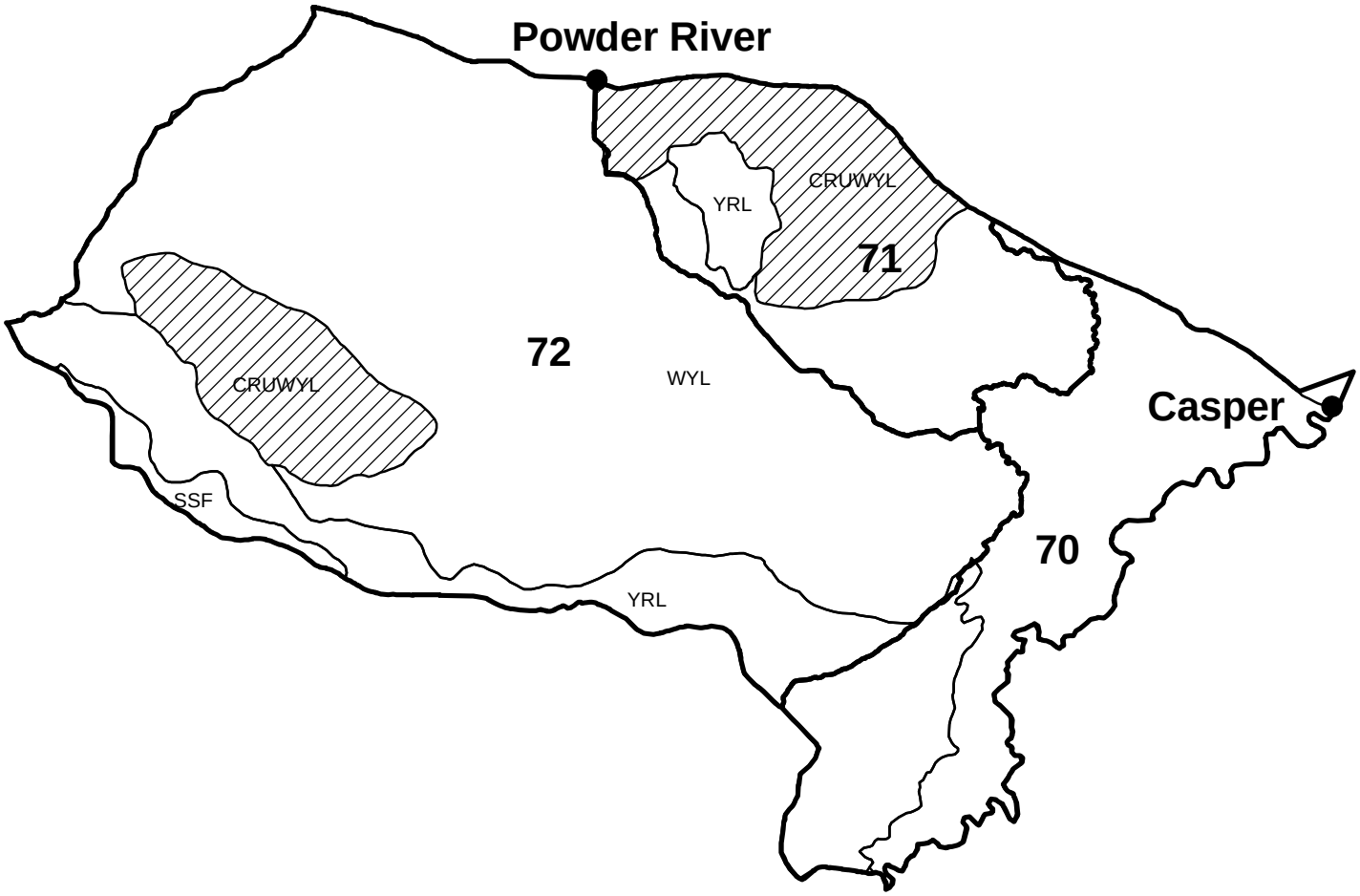






Comments:

Antelope - Rattlesnake
Hunt Areas 70,71,72
Casper Region
Revised 4/88



2013 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2013 - 5/31/2014

HERD: PR746 - NORTH NATRONA

HUNT AREAS: 73

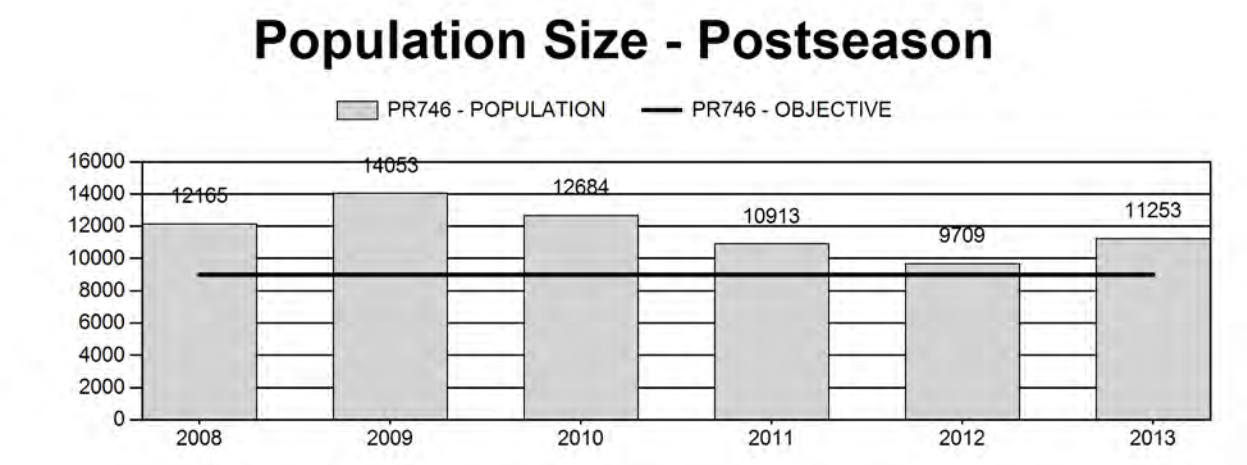
PREPARED BY: HEATHER O'BRIEN

	2008 - 2012 Average	2013	2014 Proposed
Population:	11,905	11,253	11,376
Harvest:	1,000	617	775
Hunters:	1,145	752	900
Hunter Success:	87%	82%	86 %
Active Licenses:	1,204	833	900
Active License Percent:	83%	74%	86 %
Recreation Days:	3,504	3,468	3,100
Days Per Animal:	3.5	5.6	4
Males per 100 Females	58	47	
Juveniles per 100 Females	56	61	

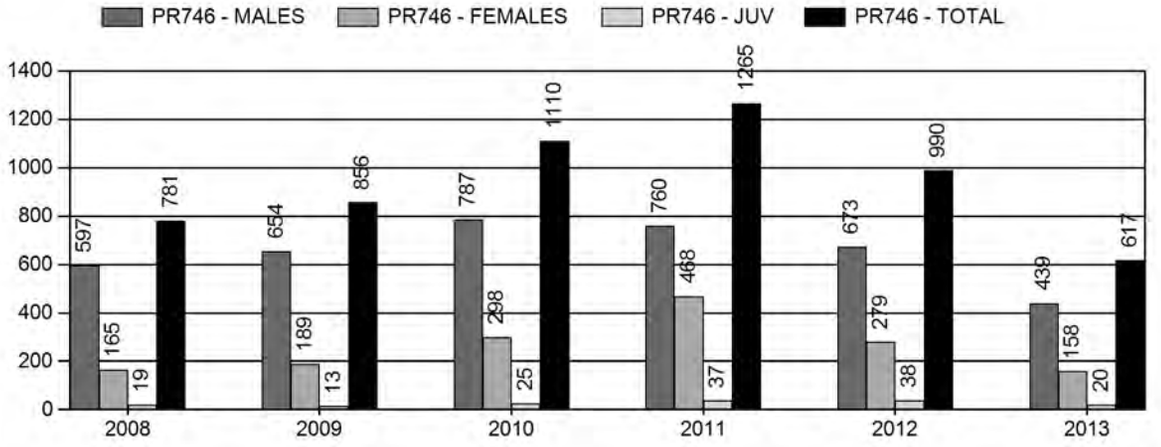
Population Objective:	9,000
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	25%
Number of years population has been + or - objective in recent trend:	2
Model Date:	3/7/2014

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

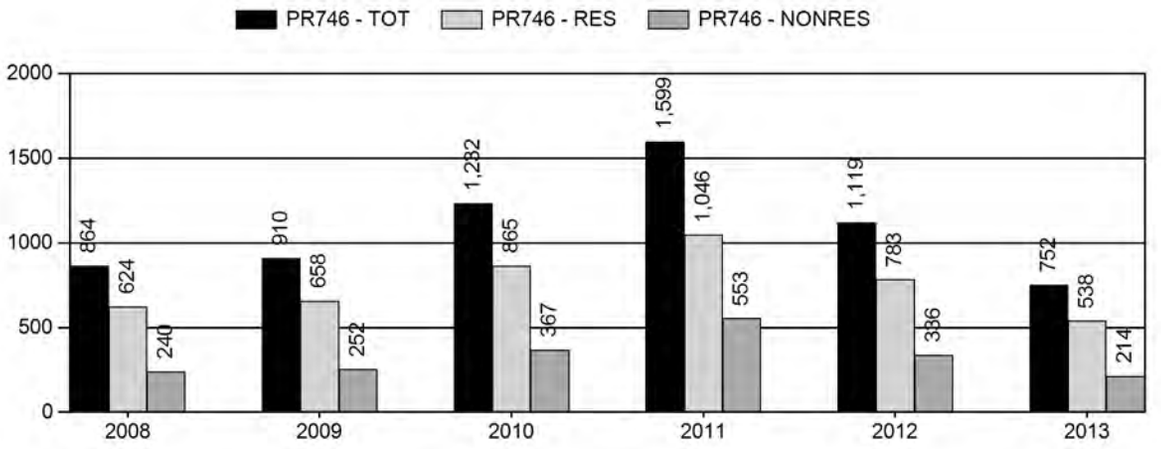
	JCR Year	Proposed
Females ≥ 1 year old:	2.8%	2.6%
Males ≥ 1 year old:	15.9%	18.6%
Juveniles (< 1 year old):	0.6%	0.7%
Total:	5.2%	6.3%
Proposed change in post-season population:	+15%	+1.1%



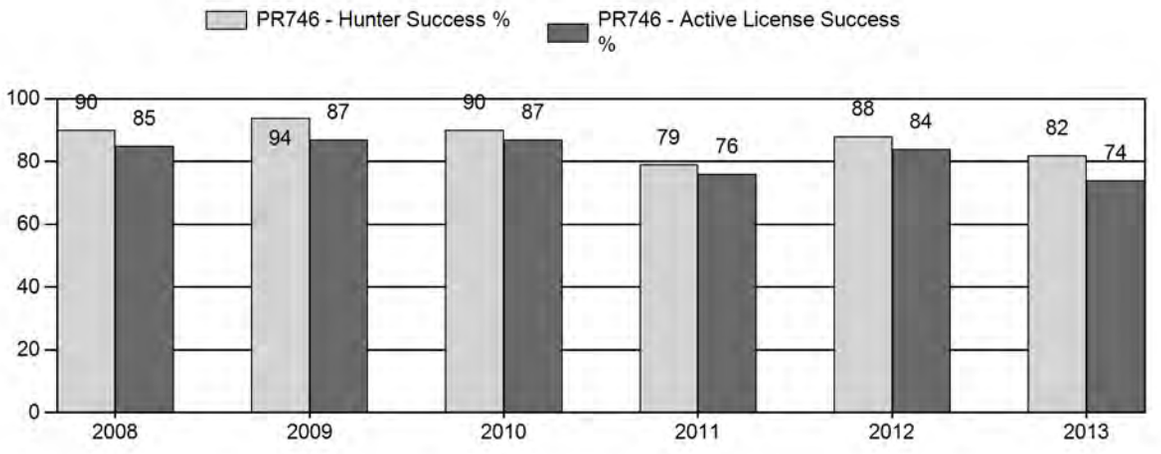
Harvest



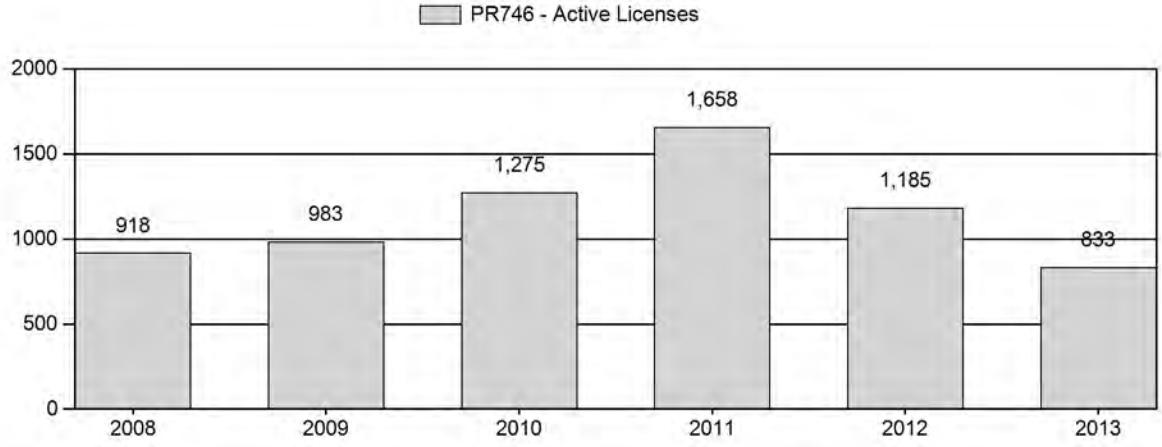
Number of Hunters



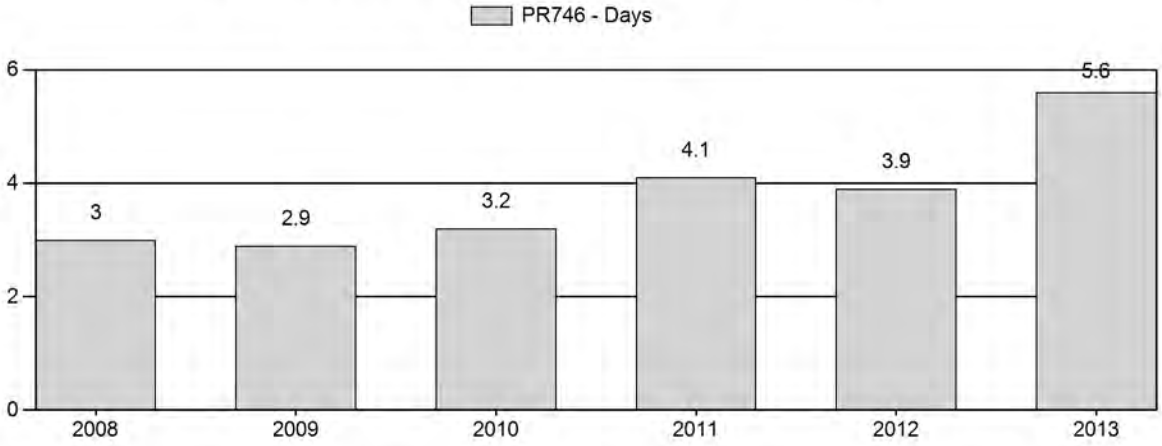
Harvest Success



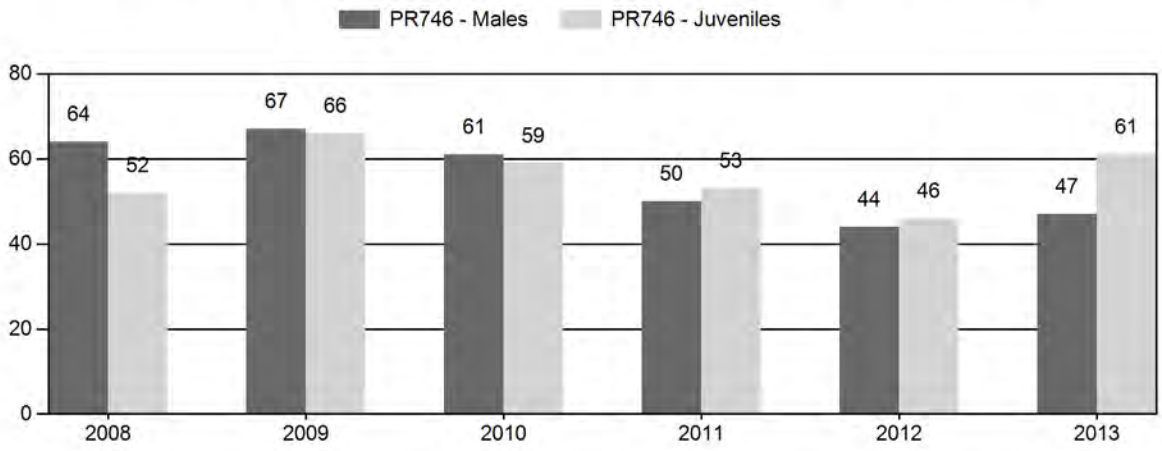
Active Licenses



Days Per Animal Harvested



Preseason Animals per 100 Females



2008 - 2013 Preseason Classification Summary

for Pronghorn Herd PR746 - NORTH NATRONA

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Pre Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	13,024	245	380	625	30%	972	46%	508	24%	2,105	2,056	25	39	64	± 5	52	± 4	32
2009	14,995	273	541	814	29%	1,218	43%	809	28%	2,841	2,361	22	44	67	± 4	66	± 4	40
2010	13,905	172	392	564	28%	932	46%	552	27%	2,048	1,988	18	42	61	± 5	59	± 5	37
2011	12,323	119	540	659	25%	1,322	49%	697	26%	2,678	2,129	9	41	50	± 3	53	± 4	35
2012	10,798	127	190	317	23%	713	53%	327	24%	1,357	1,843	18	27	44	± 5	46	± 5	32
2013	11,932	69	318	387	23%	817	48%	497	29%	1,701	1,832	8	39	47	± 4	61	± 5	41

2014 HUNTING SEASONS
NORTH NATRONA PRONGHORN HERD (PR746)

Hunt Area	Type	Date of Seasons Opens	Closes	Quota	Limitations
73	1	Sep. 15	Oct. 31	800	Limited quota; any antelope
	6	Sep. 15	Oct. 31	100	Limited quota; doe or fawn antelope
Archery		Aug. 15	Sep. 14		Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2013
73	1	No change
	6	No change
	7	-100, removed license type

Management Evaluation

Current Postseason Population Management Objective: ~ 9,000
Management Strategy: Recreational
2013 Postseason Population Estimate: ~ 11,250
2014 Proposed Postseason Population Estimate: ~ 11,400

The North Natrona Pronghorn Herd Unit has a post-season population management objective of 9,000 pronghorn. The herd is managed using the recreational management strategy, with a goal of maintaining preseason buck ratios between 30-59 bucks per 100 does. The objective and management strategy were last revised in 1987, and will be formally reviewed in 2014.

Herd Unit Issues

Hunting access within the herd unit is very good, with large tracts of public lands as well as walk-in areas available for hunting. The southeastern corner of the herd unit is the only area dominated by private lands. In this area, specific doe/fawn licenses have been added to address damage issues on irrigated agricultural fields in years when landowners agree to allow hunting access. The main land use within the herd unit is traditional ranching and grazing of livestock. Industrial scale developments, including oil and gas development, are limited and isolated within this herd unit. Periodic disease outbreaks (i.e. hemorrhagic diseases, *Clostridium spp*. infections)

can impact this herd and contribute to population declines when environmental conditions are suitable.

Weather

The winter of 2010-2011 was severe throughout the herd unit, resulting in higher mortality of pronghorn across all age classes. Conditions were warm and dry for the herd unit in 2011 and shrub production was below average, resulting in poor nutrition of pronghorn entering the winter of 2011-2012. Snow pack and resulting spring moisture was below average for the winter of 2011-2012 which likely had a negative impacts on lactating does and their fawns. The summer of 2012 was the driest on record since 1904 in much of Wyoming, and the winter of 2012 continued the trend with very low snow accumulation and snow pack. Fawn survival over the severely dry summer and winter was low, as evidenced by low yearling buck ratios the following year. April of 2013 finally saw a break in the drought, when temperatures dropped below normal for the entire month and significant precipitation was received. This cooler and wetter pattern continued through the summer of 2013 in much of the herd unit, though the northeastern portion of the unit continued to suffer very dry conditions. In early October 2013, winter storm "Atlas" blanketed the herd unit with 12-36" of wet snow. While no significant pronghorn mortality was detected as a result, the snow and resulting muddy conditions forced the cancellation of hunting for some license holders, and made accessing pronghorn difficult in many locations. Travel conditions improved toward the end of hunting seasons, but by then it was apparent winter storm Atlas had a negative impact on hunter participation and harvest success. The early winter months of 2013-2014 brought temperature and precipitation conditions near the recent 30-year average. For detailed weather data see http://www.ncdc.noaa.gov/gac/time-series/us.

Habitat

Currently, this herd unit has no established habitat transects that measure production and/or utilization on shrub species that are preferred browse for pronghorn. Additionally, there are no comparable habitat transects in neighboring herd units to reference. Through anecdotal observations and shrub monitoring for other big game species, it is believed that summer and winter forage availability for pronghorn was average in 2013, with the possible exception of areas in the northeast that remained dry. Several sagebrush transects will be established in April 2014, with the goal of evaluating utilization from pronghorn in time for the formal objective review. If data prove valuable from these transects, they will be maintained and developed permanently to monitor habitat condition and use by big game species.

Field Data

Fawn ratios were high in this herd from 2002-2005, and the population grew markedly during this time period. Fawn ratios were moderate to poor from 2006-2013, but the population continued to grow through 2009 as license issuance did not keep pace with herd growth. In 2010-2011, license issuance increased sharply to address high antelope numbers and reduce the herd toward objective. By 2012, higher license issuance was no longer necessary to control growth of the herd, and licenses were reduced. Hunter harvest, mortality from harsh winter conditions in 2010-2011, extremely poor fawn production/survival, and severe drought in 2012 has subsequently reduced this herd. License issuance was again reduced in 2013 to compensate for a declining population.

Buck ratios for the North Natrona Herd historically average in the mid-50s:100 does, though they exceeded recreational limits from 2007-2010, when ratios were in the 60s. Since then, buck ratios have dropped markedly each year along with the population as a whole, reaching a 15-year low of 44 bucks per hundred does in 2012. The buck ratio improved slightly in 2013, with 47 bucks:100 does. This is still well within the target range for recreational management, and managers would like to keep buck ratios in this range. Ultimate management goals are to sustain high hunter satisfaction while continuing to offer exceptional opportunity and good drawing odds via recreational management.

Harvest Data

License success in this herd unit is typically in the 80-90th percentile. However, in 2013 license success dropped to 72% for Type 1 licenses and 83% for Type 6 licenses. This sudden decline in license success was due in large part to limited access resulting from heavy snows and muddy road conditions. Rain and snow were prominent during the first half of the hunting season and greatly reduced access to pronghorn and harvest success within the herd unit. Despite this, hunter satisfaction increased from 82% in 2012 to 89% in 2013, indicating that hunters were pleased with their hunt despite issues of poor weather and road conditions. In addition, there were no negative comments submitted from hunters in the harvest report for the North Natrona Herd Unit.

Population

The 2013 post-season population estimate was approximately 11,250 and trending upward after an estimated low in 2012 of 9,700 pronghorn. A line-transect survey was conducted in this herd unit in May 2013 and resulted in an end-of-bioyear population estimate of 11,083, with a standard error of ±2,235 (see Appendix A). The model estimate for end-of-year population size in 2013 is slightly below the confidence intervals for the 2013 line-transect survey.

The "Time-Specific Juvenile Survival - Constant Adult Survival" (TSJ,CA) spreadsheet model was chosen to use for the post-season population estimate of this herd. This model seemed the most representative of the herd, as it selects for higher juvenile survival during the years when field personnel observed more favorable environmental and habitat conditions, particularly from 2003-2008. The simpler models (CJ,CA and SCJ,CA) select for a very low juvenile survival rate across years, which does not seem feasible for this herd. All three models follow a trend that seems representative for this herd unit. The three models each align partially to four line-transect estimates – each model aligning through some but not all line-transect estimates completely. However, the CJ,CA and SCJ,CA models estimate population peaks in 2009 that do not seem realistic compared to the perceptions of field personnel and landowners at that time. While the AIC for the TSJ,CA model is the highest of the three, it is only due to year-by-year penalties and is still well within one level of power in comparison to the AICs of the simpler models. The TSJ, CA model aligns with two of four line transect estimates, and is very close to the confidence intervals for the remaining two. The TSJ,CA model appears to be the best representation relative to the perceptions of managers on the ground, and follows trends with license issuance and harvest success. Overall the model is considered to be fair in representing dynamics of the herd.

Management Summary

Traditional season dates in this herd run from September 15th through October 31st. Season dates will remain the same for 2014, as will Type 1 license issuance. The 2014 season includes 800 Type 1 licenses, and 100 Type 6 licenses. The Type 7 licenses will be eliminated in 2014, as access on private lands in the southeast corner of the herd unit has been poor. Landowners that normally utilize the Type 7 license can still take hunters with a Type 6 license, should they have a need to control for agricultural damage. While fawn ratios and population growth rates have been below average in recent years, habitat conditions appeared to improve in 2013. Goals for 2014 are to maintain pronghorn numbers near objective, maintain buck ratios, and increase hunter success.

If we attain the projected harvest of 775 with fawn ratios similar to the last few years, this herd will remain stable at slightly above objective. The predicted 2014 post-season population size of the North Natrona Pronghorn Herd is approximately 11,400 animals, which is 27% above objective.

Species:	Pronghorn
Biologist:	Heather O'Brien
Herd Unit & No.:	North Natrona PR746
Model date:	03/07/14

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	102	111	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	99	113	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	40	149	☑ TSJ,CA Model	

Population Estimates from Top Model

Year	Predicted Prehunt Population (year *i*)			Total	Predicted Posthunt Population (year *i*)			Total	Predicted adult End-of-bio-year Pop (year *i*)			LT Population Estimate		Trend Count	Objective
	Juveniles	Total Males	Females		Juveniles	Total Males	Females		Total Males	Females	Total Adults	Field Est	Field SE		
1993	2441	2122	3861	**8424**	2373	1409	3331	**7113**	2253	3993	**6246**				9000
1994	3145	2208	3913	**9266**	3124	1779	3805	**8708**	2373	4223	**6596**				9000
1995	2982	2326	4138	**9446**	2970	1916	4049	**8935**	2260	4206	**6466**				9000
1996	4083	2215	4122	**10420**	4072	1812	3965	**9849**	2394	4347	**6741**				9000
1997	2375	2346	4260	**8981**	2351	1921	4125	**8396**	2467	4472	**6939**				9000
1998	4106	2418	4382	**10906**	4080	1960	4243	**10283**	2516	4595	**7111**	5485	995		9000
1999	3052	2466	4503	**10020**	3041	2046	4376	**9462**	2555	4673	**7228**				9000
2000	3442	2504	4580	**10526**	3429	2050	4431	**9910**	2533	4698	**7231**	8211	1412		9000
2001	3030	2482	4604	**10116**	2994	2161	4499	**9654**	2488	4603	**7091**				9000
2002	3226	2438	4511	**10176**	3217	1998	4334	**9550**	2382	4501	**6882**				9000
2003	3322	2334	4411	**10067**	3310	1873	4224	**9407**	2871	5004	**7875**	8514	1020		9000
2004	4115	2813	4904	**11833**	4064	2248	4702	**11013**	3048	5285	**8332**				9000
2005	4398	2987	5179	**12564**	4366	2343	4947	**11657**	3525	5902	**9427**				9000
2006	3043	3454	5784	**12281**	3024	2781	5410	**11215**	3785	6170	**9954**				9000
2007	2594	3709	6046	**12349**	2557	3032	5720	**11309**	3793	6237	**10030**				9000
2008	3194	3717	6112	**13024**	3174	3061	5931	**12165**	4105	6728	**10833**				9000
2009	4379	4023	6593	**14995**	4365	3303	6385	**14054**	3744	6561	**10304**				9000
2010	3808	3669	6429	**13906**	3780	2803	6102	**12685**	3155	6169	**9324**				9000
2011	3187	3092	6045	**12325**	3147	2241	5527	**10914**	2656	5734	**8390**				9000
2012	2577	2603	5620	**10799**	2536	1862	5313	**9710**	2812	5821	**8634**	11083	2235		9000
2013	3471	2756	5705	**11932**	3449	2273	5531	**11253**	2846	5984	**8829**				9000
2014	3576	2789	5864	**12228**	3548	2129	5699	**11376**							9000
2015															9000
2016															9000
2017															9000
2018															9000
2019															9000
2020															9000
2021															9000
2022															9000
2023															9000
2024															9000
2025															9000

Survival and Initial Population Estimates

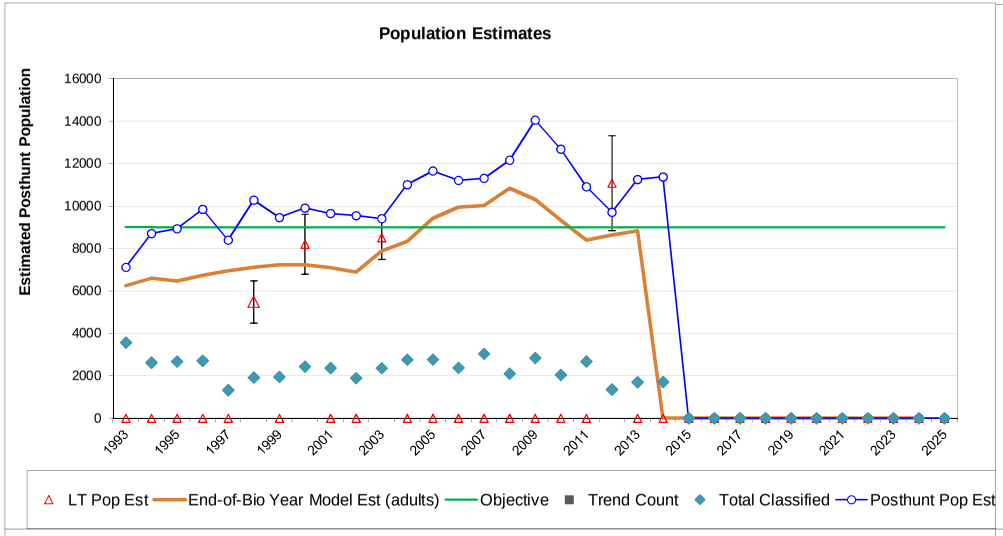
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.90			0.87		
1994	0.53			0.87		
1995	0.40			0.87		
1996	0.40			0.87		
1997	0.68			0.87		
1998	0.40			0.87		
1999	0.51			0.87		
2000	0.44			0.87		
2001	0.40			0.87		
2002	0.40			0.87		
2003	0.75			0.87		
2004	0.54			0.87		
2005	0.68			0.87		
2006	0.90			0.87		
2007	0.90			0.87		
2008	0.90			0.87		
2009	0.40			0.87		
2010	0.40			0.87		
2011	0.40			0.87		
2012	0.75			0.87		
2013	0.60			0.87		
2014	0.58			0.87		
2015						
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

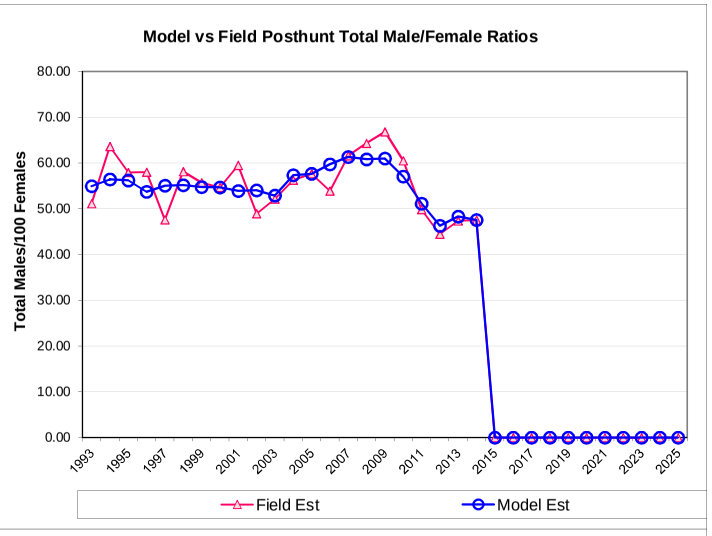
Parameters:	Optim cells
Adult Survival =	0.875
Initial Total Male Pop/10,000 =	0.212
Initial Female Pop/10,000 =	0.386

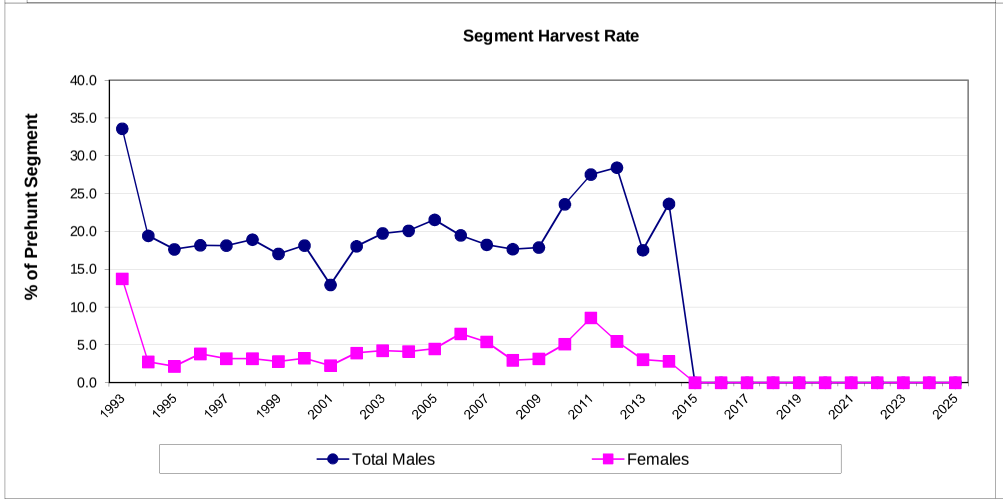
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Over-summer adult surviva	98%

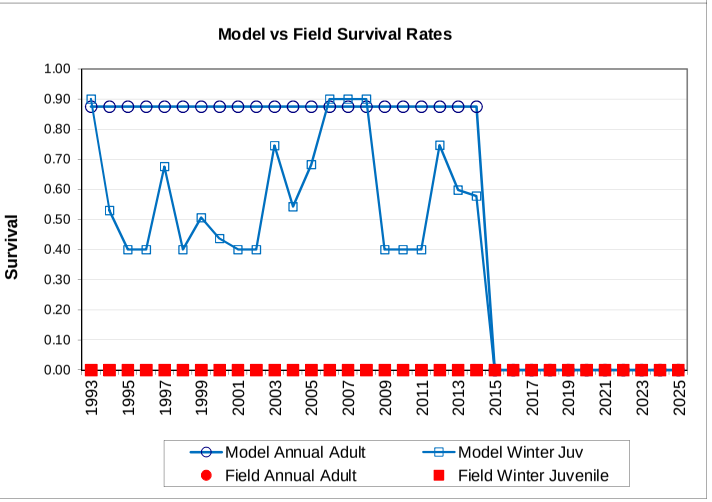
Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio			Harvest				Harvest: Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est	Field SE	Males	Females	Juveniles	Total Harvest	Total Males	Females
1993		63.21	2.49	54.95	51.14	2.15	648	482	61	1191	33.6	13.7
1994		80.37	3.67	56.44	63.63	3.11	390	98	19	507	19.4	2.8
1995		72.06	3.26	56.20	57.95	2.81	373	81	11	465	17.6	2.2
1996		99.05	4.32	53.74	58.01	2.95	366	143	10	519	18.2	3.8
1997		55.74	3.65	55.08	47.63	3.28	387	123	22	532	18.1	3.2
1998		93.70	4.88	55.17	58.14	3.47	416	127	24	567	18.9	3.2
1999		67.78	3.61	54.76	55.73	3.15	382	115	10	507	17.0	2.8
2000		75.17	3.53	54.67	54.67	2.83	413	135	12	560	18.1	3.2
2001		65.81	3.22	53.91	59.52	3.01	292	95	33	420	12.9	2.3
2002		71.51	3.78	54.04	48.95	2.91	400	161	8	569	18.0	3.9
2003		75.31	3.57	52.91	52.17	2.77	419	170	11	600	19.7	4.2
2004		83.91	3.66	57.36	56.26	2.76	514	184	47	745	20.1	4.1
2005		84.93	3.71	57.67	57.67	2.82	585	211	29	825	21.5	4.5
2006		52.60	2.64	59.72	53.91	2.68	612	340	17	969	19.5	6.5
2007		42.90	2.03	61.34	61.62	2.59	615	297	33	945	18.2	5.4
2008		52.26	2.86	60.82	64.30	3.30	597	165	19	781	17.7	3.0
2009		66.42	3.01	61.01	66.83	3.03	654	189	13	856	17.9	3.2
2010		59.23	3.18	57.06	60.52	3.23	787	298	25	1110	23.6	5.1
2011		52.72	2.47	51.15	49.85	2.38	774	471	37	1282	27.5	8.6
2012		45.86	3.06	46.31	44.46	3.00	673	279	38	990	28.4	5.5
2013		60.83	3.46	48.31	47.37	2.92	439	158	20	617	17.5	3.0
2014		60.98	3.46	47.56	47.56	2.93	520	150	25	775	23.7	2.8
2015												
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES









Comments:

Appendix A:
North Natrona Pronghorn Line Transect Survey
Bio-Year 2012 - Results and Histogram

Effort:	483.4900
# samples:	38
Width:	212.0000
Left:	0.0000000
# observations:	216

Model 1
Hazard Rate key, k(y) = 1 - Exp(-(y/A(1))**-A(2))

Parameter	Point Estimate	Standard Error	Percent Coef. of Variation	95% Confidence Interval	
DS	5.6807	1.1247	19.80	3.8594	8.3615
E(S)	1.5659	0.59588E-01	3.81	1.4527	1.6878
D	8.8951	1.7934	20.16	6.0024	13.182
N	11083	2234.5	20.16	7479.0	16425

Measurement Units

Density: Numbers/Sq. miles
ESW: meters

Component Percentages of Var(D)

Detection probability: 79.5
Encounter rate: 16.9
Cluster size: 3.6

Estimation Summary: Encounter Rates

	Estimate	% CV	DF	95% Confidence Interval	
n	216.00				
k	38.000				
L	483.49				
n/L	0.44675	8.29	19.00	0.37572	0.53122
Left	0.0000				
Width	212.00				

Estimation Summary: Detection Probability

Hazard/Polynomial

	Estimate	% CV	DF	95% Confidence Interval	
m	2.0000				
LnL	-288.94				
AIC	581.88				
AICc	581.94				
BIC	588.63				
Chi-p	0.45571				
f(0)	0.79011E-02	17.98	214.00	0.55588E-02	0.11230E-01
p	0.59701	17.98	214.00	0.42003	0.84855
ESW	126.57	17.98	214.00	89.046	179.89

Estimation Summary – Expected Cluster Size

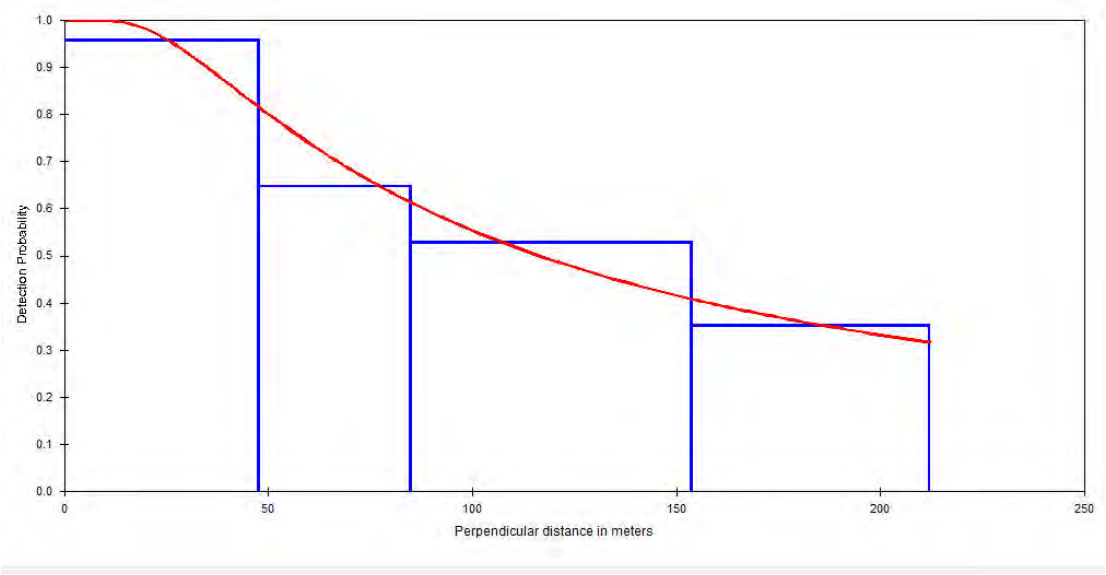
Estimate				
Average cluster size	%CV	df	95% Confidence Interval	
1.6250	5.29	215.00	1.4643	1.8033

Hazard/Polynomial

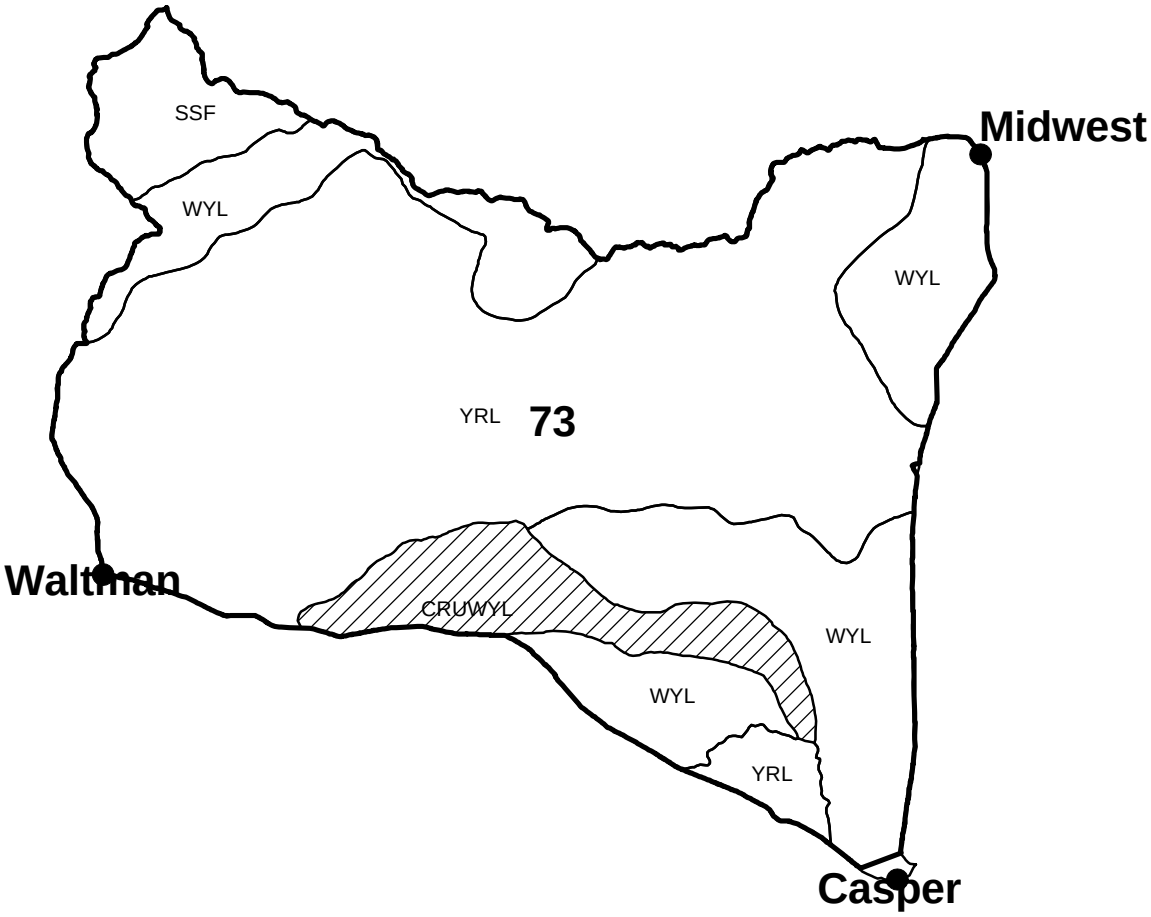
	Estimate	% CV	DF	95% Confidence Interval	
r	-0.34582E-02				
r-p	0.47985				
E(S)	1.5659	3.81	214.00	1.4527	1.6878

Estimation Summary – Density & Abundance

	Estimate	% CV	DF	95% Confidence Interval	
D	.6807	19.80	208.56	3.8594	8.3615
DS	8.8951	20.16	223.96	6.0024	13.182
N	11083	20.16	223.96	7479.0	16425


1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Detection Probability
0
50
100
150
200
250
Perpendicular distance in meters

Antelope - North Natrona
Hunt Area 73
Casper Region
Revised 4/88



2013 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2013 - 5/31/2014

HERD: PR748 - NORTH CONVERSE

HUNT AREAS: 25-26

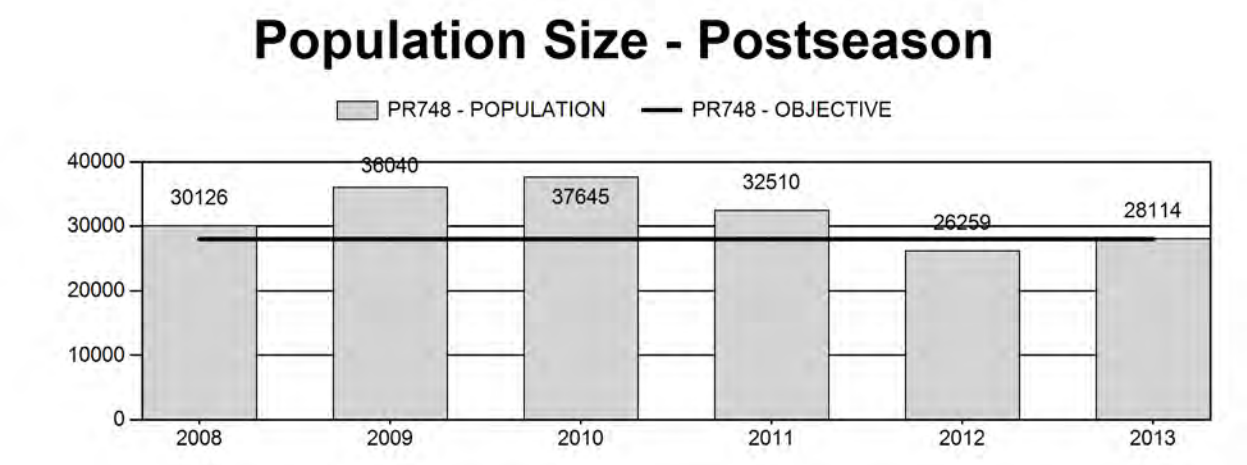
PREPARED BY: ERIKA PECKHAM

	2008 - 2012 Average	2013	2014 Proposed
Population:	32,516	28,114	24,871
Harvest:	2,962	2,268	1,785
Hunters:	3,224	2,784	2,100
Hunter Success:	92%	81%	85%
Active Licenses:	3,386	2,933	1,900
Active License Percent:	87%	77%	94%
Recreation Days:	10,650	8,988	6,400
Days Per Animal:	3.6	4.0	3.6
Males per 100 Females	70	49	
Juveniles per 100 Females	71	62	

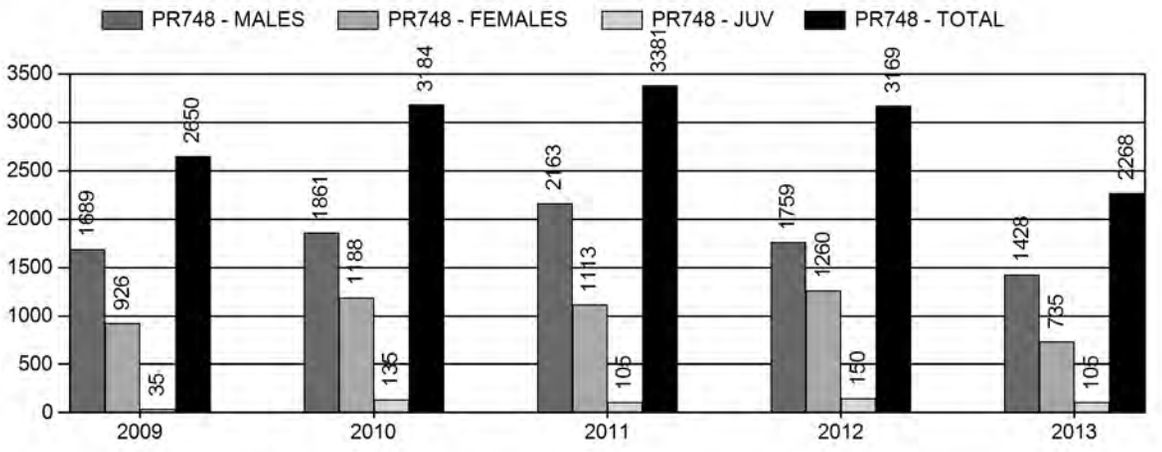
Population Objective:	28,000
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	0%
Number of years population has been + or - objective in recent trend:	1
Model Date:	3/10/2014

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

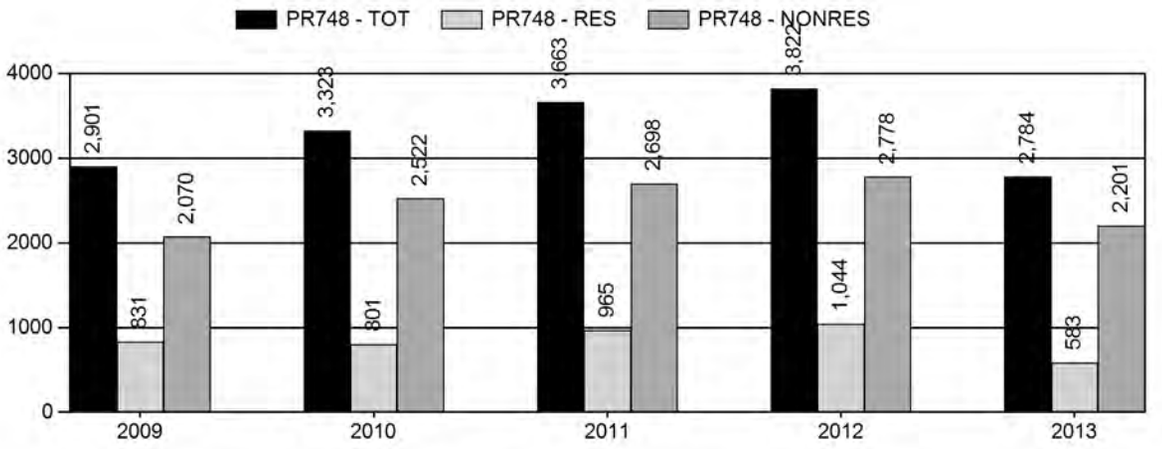
	JCR Year	Proposed
Females ≥ 1 year old:	10%	4.0%
Males ≥ 1 year old:	33%	18.6%
Juveniles (< 1 year old):	0%	0%
Total:	12%	6.7%
Proposed change in post-season population:	-15%	-11.5%



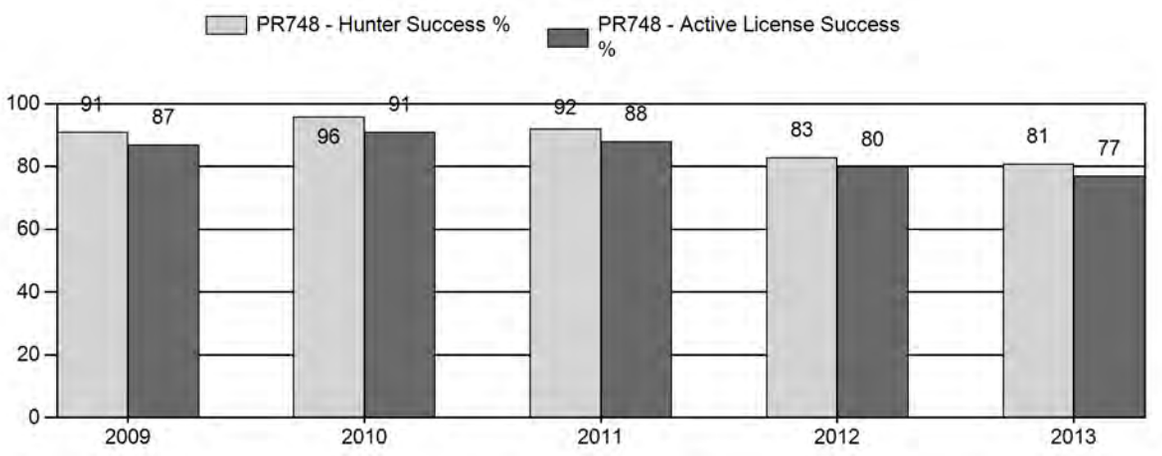
Harvest



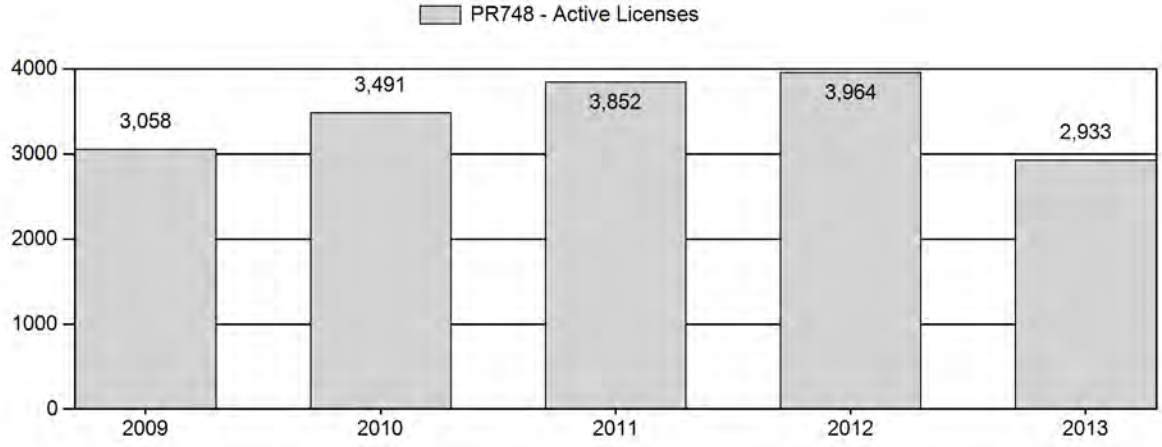
Number of Hunters



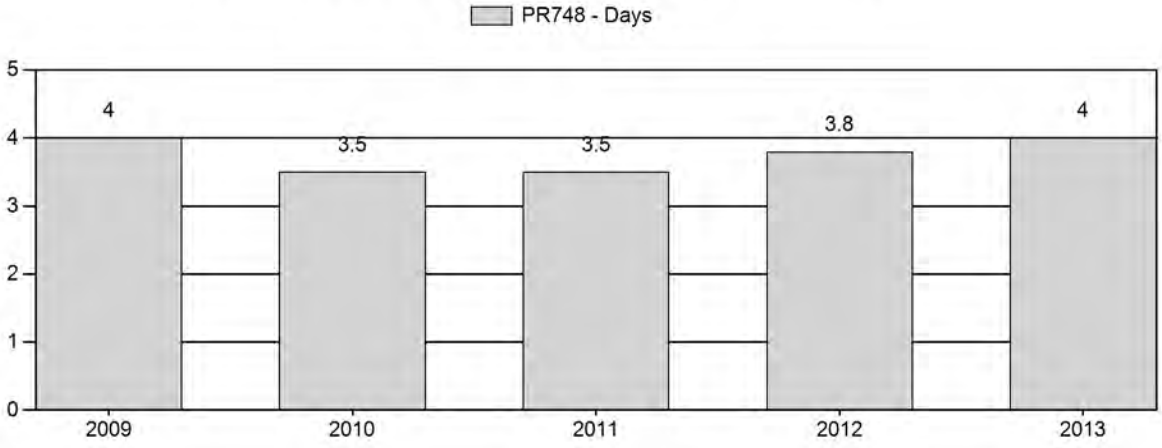
Harvest Success



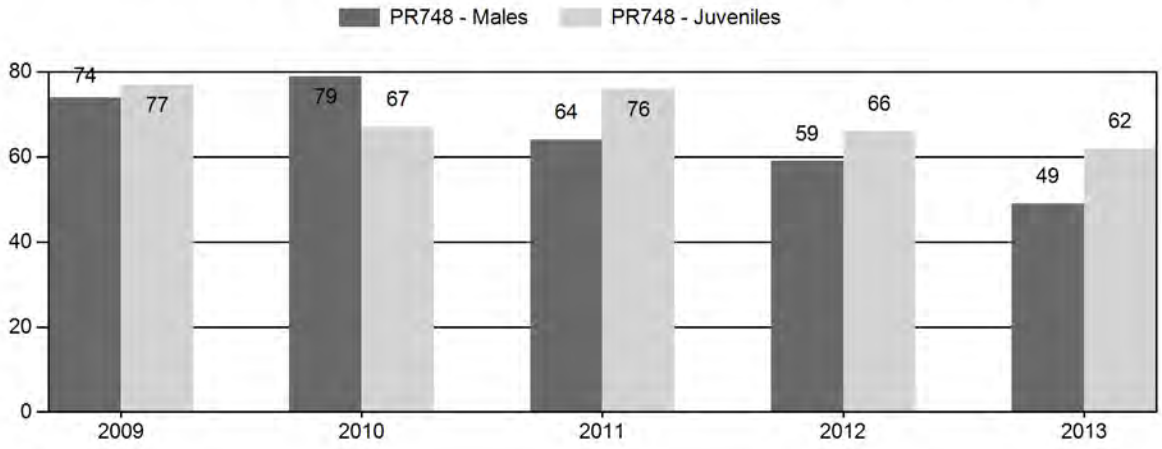
Active Licenses



Days Per Animal Harvested



Preseason Animals per 100 Females



2008 - 2013 Preseason Classification Summary

for Pronghorn Herd PR748 - NORTH CONVERSE

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Pre Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	32,797	289	488	777	27%	1,248	44%	832	29%	2,857	3,496	23	39	62	± 4	67	± 5	41
2009	38,680	312	740	1,052	29%	1,430	40%	1,101	31%	3,583	3,287	22	52	74	± 5	77	± 5	44
2010	35,678	373	807	1,180	32%	1,490	41%	999	27%	3,669	3,160	25	54	79	± 5	67	± 4	37
2011	33,597	93	480	573	27%	895	42%	683	32%	2,151	3,105	10	54	64	± 5	76	± 6	47
2012	29,874	82	253	335	26%	567	44%	376	29%	1,278	3,040	14	45	59	± 7	66	± 7	42
2013	27,293	101	294	395	23%	803	47%	498	29%	1,696	2,059	13	37	49	± 5	62	± 6	42

2014 HUNTING SEASONS
NORTH CONVERSE PRONGHORN HERD (PR748)

Hunt Area	Type	Dates of Seasons Opens	Closes	Quota	Limitations
25	1	Oct. 1	Oct. 14	600	Limited quota licenses; any antelope
	6	Oct. 1	Oct. 14	200	Limited quota licenses; doe or fawn
26	1	Sep. 24	Oct. 14	900	Limited quota licenses; any antelope
	6	Sep. 24	Oct. 14	400	Limited quota licenses; doe or fawn
Archery		Aug. 15	Sep. 30		Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2013
25	1	-300
	6	-300
26	1	-300
	6	-400
Herd Unit Total	**1**	**-600**
	6	**-700**

Management Evaluation
Current Postseason Population Management Objective: 28,000
Management Strategy: Recreational
2013 Postseason Population Estimate: ~28,000
2014 Proposed Postseason Population Estimate: ~24,900

Herd Unit Issues

The North Converse Pronghorn Herd Unit has a post-season population objective of 28,000 pronghorn. This herd is managed under the recreational management strategy, with a goal of maintaining preseason buck ratios between 30-59 bucks per 100 does. The objective and management strategy were last revised in 1989, and are scheduled for revision in 2015.

Public hunting access within the herd unit is poor, with only small tracts of accessible public land interspersed within predominantly private lands. Two Walk-In Areas provide some additional hunting opportunity, although they are relatively small in size. Primary land uses in this herd unit include extensive oil and gas production, large-scale industrial wind generation, In-

Situ uranium production, and traditional cattle and sheep grazing. In recent years, expansion of oil shale development has dramatically escalated anthropogenic disturbance throughout this herd unit. The cumulative impacts on pronghorn from the increased natural resource development in this area are unknown but potentially significant.

Weather

Weather conditions throughout 2012 and into 2013 were extremely dry and warmer than normal. The winter of 2012-2013 was mild, although the 2013-14 winter has been moderate to date with substantial precipitation and multiple sub-zero cold snaps. However, warm conditions often occurred in between the severe cold snaps which served to melt out lowlands and expose forage for wintering pronghorn. An extremely large snowstorm occurred in early October of 2013 and produced two to three feet of snow in most areas. This storm (Winter Storm "Atlas") did not likely impact pronghorn survival as it melted rapidly. However, it may have significantly impeded harvest success in some portions of this herd unit as the storm coincided with the first week of the hunting season in Area 25. In general, winter survival was thought to be normal over the last bio-year. However, the extraordinary drought of 2012 resulted in pregnant females entering the 2012-2013 winter in poor condition, which was perhaps the most significant driver behind the relatively poor fawn production realized in 2013. Fortunately, growing season moisture was markedly improved in 2013, which should benefit pronghorn, especially pregnant females, through the 2013-2014 winter.

Habitat

Although there are no habitat transects in this herd unit, habitat conditions were exceptionally poor through 2012 due to the extreme drought. This was the driest year on record in most of Wyoming. Fortunately, growing season and summer/fall moisture was improved in 2013 which allowed these rangelands to begin recovery. Given the reduced number of pronghorn currently within this herd unit, which will result in reduced herbivory, habitat conditions should begin to improve. However, several consecutive years of improved precipitation will be needed to more completely rejuvenate habitats and provide better conditions for the long-term productivity of this pronghorn herd.

Field Data

It has been increasingly difficult to meet classification sample sizes in this herd unit as it is no longer a budget priority for aerial surveys. Total number of animals classified has markedly decreased since aerial surveys were eliminated in 2011. In 2013, the adequate sample size was 2,100 animals, yet only 1,696 pronghorn were classified with intensive ground coverage.

Overall, fawn production/survival has remained fairly consistent in this herd unit, although the 2013 ratio of 62 was well below the 5-year average of 71. It should be noted that preseason fawn ratios are typically higher in this herd compared to all other adjacent herd units. This is thought to be attributed to intensive predator control efforts that are sustained throughout much of this herd unit due to widespread domestic sheep production. However, despite relatively higher preseason fawn ratios being observed in this herd unit, overall population trend has declined in this herd to nearly the same extent as adjacent herds. This suggests that while over-summer

fawn survival seems to be elevated in this herd, over-winter fawn survival is likely poorer compared to surrounding herds.

Preseason buck ratios declined considerably in 2013 (49 per 100 does), although they remain in line with management strategy criteria. The 2013 ratio was 38% lower than the previous 5-year average of 68. However, in most years, preseason buck ratios have been well above the management strategy maximum, which is a function of limited access due to the preponderance of private land and widespread outfitting. The 2013 buck ratio is the lowest on record for this herd since 1991. The noticeable decline in buck ratios further indicate this population has declined significantly in recent years.

Harvest

Overall harvest has declined precipitously in this herd unit as license issuance has decreased in lieu of population decline. The 2013 total harvest of 2,268 was the lowest total pronghorn harvest obtained in this herd unit since 2006. License success in 2013 (77%) also declined significantly compared to the previous 5-year average of 88%. This is the lowest license success this herd has experienced since 1995. In 2013, all license types were sold by the close of the season despite 2,126 (out of 3,400 issued) being available for leftover sales after the drawing. In addition, the days required to harvest an animal has been steadily climbing over the last few years. In 2013, hunters experienced an increased number of days per animal (4.0), which was somewhat higher than the preceding 5 year average of 3.6 days/animal.

In 2013, 79% of hunters reported being either satisfied or very satisfied with their hunt, indicating a remarkably high level of satisfaction given the lack of public access and population decline. It should be noted that most hunters who speak to Game and Fish personnel are advised to secure access on private land before purchasing a license in areas that have limited public access.

Population

The 2013 post-season population estimate is approximately 28,000, which is at objective. This herd has the potential for rapid growth as has been seen in years past. High fawn productivity coupled with limited access has allowed this herd to exceed the objective very readily. However, this population dropped to objective in the last year and is predicted to continue to decline. As such, the reduction in licenses was warranted for 2014 to manage this herd near objective. This herd began to decline following elevated mortality during the relatively severe 2010-2011 winter. Subsequent poor fawn recruitment has further suppressed this herd. The last line transect survey was conducted in this herd unit in May of 2013, which resulted in an estimated end-of-year population of 27,200 pronghorn (Appendix A).

The “Time Specific Juvenile – Constant Adult” (TSJ-CA) spreadsheet model was chosen for the post-season population estimate of this herd. All three models had very similar relative AIC values. The TSJ-CA model most accurately represented population trend based on field personnel and landowner perceptions. This model is considered to be of fair quality as it tracks through a recent Line Transect end-of-year estimate for bio-year 2012 and tracks well with observed preseason buck ratios.

Management Strategy

The traditional season in this herd unit has ran from October 1st to October 14th in Hunt Area 25 and from September 24th to October 14th in Hunt Area 26. These season dates have typically been adequate to meet landowner desires while accommodating a reasonable harvest. For 2014, both Type 1 and Type 6 license issuance was decreased by 600 and 700, respectively. These reductions were warranted to decrease harvest pressure on both males and females given this population is predicted to decline below objective over the next year. However, given the current size of this population, managers felt pronghorn numbers were sufficiently high to warrant some level of continued doe/fawn harvest. If we attain the projected harvest of ~1,785 individuals and realize normal fawn recruitment, this pronghorn population is projected to decrease to about 24,800 pronghorn, which is 11% below objective.

INPUT	
Species:	Pronghorn
Biologist:	Erika Peckham
Herd Unit & No.:	North Converse (PR748)
Model date:	02/24/14

☑ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	132	141	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	132	146	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	50	150	☑ TSJ,CA Model	

Population Estimates from Top Model

Year	Predicted Prehunt Population (year *i*)			Total	Predicted Posthunt Population (year *i*)			Total	Predicted adult End-of-bio-year Pop (year *i*)			LT Population Estimate		Trend Count	Objective
	Juveniles	Total Males	Females		Juveniles	Total Males	Females		Total Males	Females	Total Adults	Field Est	Field SE		
1993	6798	8708	13308	**28814**	6708	6998	12106	**25811**	8482	12779	**21261**				28000
1994	11511	8313	12523	**32347**	11317	6207	11339	**28863**	7142	11540	**18682**				28000
1995	9264	6999	11309	**27573**	9082	5202	10395	**24679**	8075	12517	**20592**				28000
1996	12764	7914	12266	**32944**	12702	5751	11825	**30279**	9748	15079	**24827**				28000
1997	10809	9553	14777	**35139**	10757	7753	14311	**32821**	10946	16598	**27545**				28000
1998	15685	10728	16266	**42679**	15654	8843	15953	**40450**	10073	16225	**26299**				28000
1999	13214	9872	15901	**38987**	13170	8056	15618	**36844**	8929	15446	**24375**				28000
2000	13155	8751	15137	**37043**	13117	7002	14697	**34815**	8068	14648	**22716**	20200	2901		28000
2001	10426	7906	14355	**32687**	10384	6494	14050	**30927**	7633	14059	**21693**				28000
2002	11818	7481	13778	**33077**	11798	6122	13390	**31310**	7160	13322	**20482**	18507	3491		28000
2003	10431	7016	13056	**30503**	10359	5726	12688	**28773**	6538	12440	**18978**				28000
2004	10609	6407	12191	**29207**	10542	5083	11824	**27448**	8748	14475	**23224**	30769	4602		28000
2005	10689	8573	14186	**33448**	10595	7149	13575	**31319**	7722	13162	**20884**				28000
2006	10878	7567	12899	**31344**	10836	6211	12321	**29368**	9787	14960	**24747**				28000
2007	11900	9591	14661	**36152**	11807	7956	13882	**33646**	10381	15418	**25799**				28000
2008	10073	10173	15110	**35356**	9964	8393	14328	**32685**	11109	16182	**27291**				28000
2009	12210	10887	15858	**38955**	12171	9029	14840	**36040**	12633	17573	**30205**				28000
2010	11546	12380	17221	**41148**	11398	10333	15914	**37645**	10360	15091	**25451**				28000
2011	11286	10153	14790	**36229**	11171	7774	13565	**32510**	8671	13036	**21707**				28000
2012	8472	8498	12775	**29745**	8304	6566	11389	**26259**	9267	13558	**22825**	27242	3552		28000
2013	8240	9081	13287	**30608**	8125	7511	12478	**28114**	7709	12106	**19816**				28000
2014	7415	7555	11864	**26834**	7333	6153	11386	**24871**							28000
2015															28000
2016															28000
2017															28000
2018															28000
2019															28000
2020															28000
2021															28000
2022															28000
2023															28000
2024															28000
2025															28000

Survival and Initial Population Estimates

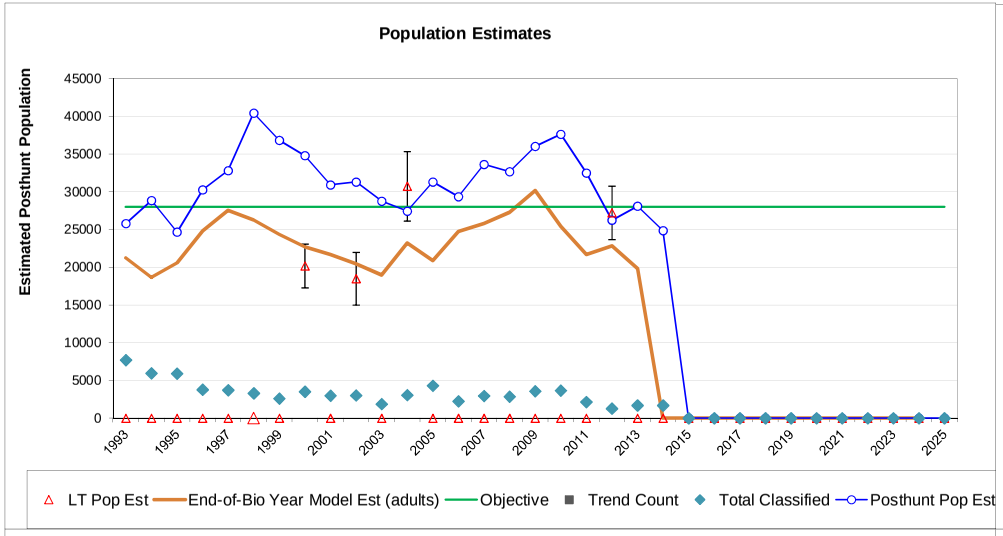
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.90			0.80		
1994	0.44			0.80		
1995	0.90			0.80		
1996	0.84			0.80		
1997	0.90			0.80		
1998	0.40			0.80		
1999	0.40			0.80		
2000	0.40			0.80		
2001	0.49			0.80		
2002	0.40			0.80		
2003	0.40			0.80		
2004	0.90			0.80		
2005	0.40			0.80		
2006	0.90			0.80		
2007	0.69			0.80		
2008	0.90			0.80		
2009	0.90			0.80		
2010	0.40			0.80		
2011	0.40			0.80		
2012	0.90			0.80		
2013	0.40			0.80		
2014	0.62			0.80		
2015						
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

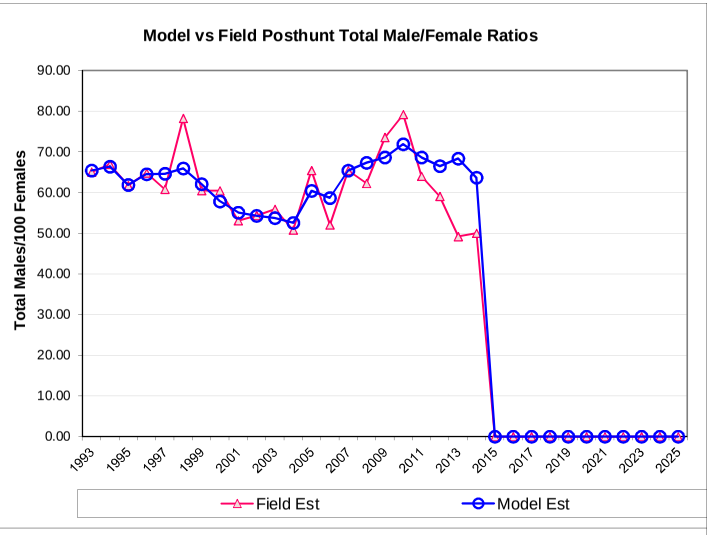
Parameters:	Optim cells
Adult Survival =	0.805
Initial Total Male Pop/10,000 =	0.871
Initial Female Pop/10,000 =	1.331

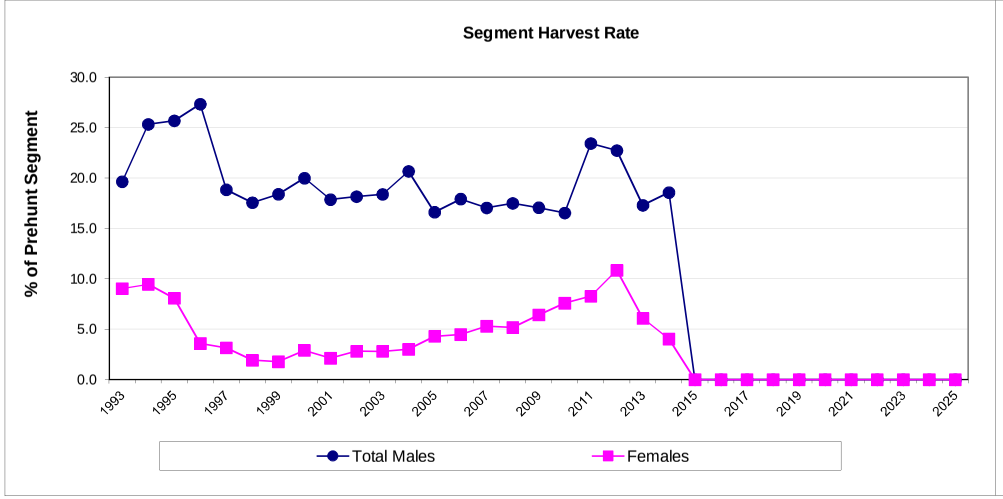
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Over-summer adult surviva	98%

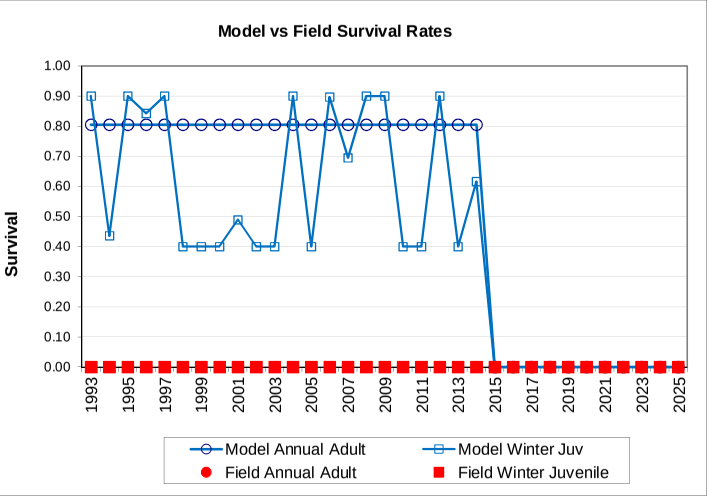
	Classification Counts						Harvest					
Year	Juvenile/Female Ratio			Total Male/Female Ratio							Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est	Field SE	Males	Females	Juveniles	Total Harvest	Total Males	Females
1993		51.08	1.47	65.43	65.07	1.74	1555	1093	82	2730	19.6	9.0
1994		91.92	2.77	66.38	66.93	2.20	1914	1077	176	3167	25.3	9.5
1995		81.92	2.48	61.89	61.74	2.03	1634	831	166	2631	25.7	8.1
1996		104.05	3.89	64.52	64.79	2.76	1966	401	56	2423	27.3	3.6
1997		73.14	2.82	64.64	60.82	2.48	1636	424	47	2107	18.8	3.2
1998		96.43	3.97	65.95	78.24	3.40	1713	285	28	2026	17.6	1.9
1999		83.10	3.77	62.08	60.50	3.01	1651	257	40	1948	18.4	1.8
2000		86.91	3.38	57.81	60.45	2.61	1590	400	35	2025	20.0	2.9
2001		72.62	3.07	55.07	53.09	2.48	1284	278	38	1600	17.9	2.1
2002		85.77	3.56	54.29	54.37	2.58	1235	353	18	1606	18.2	2.8
2003		79.90	4.25	53.74	55.90	3.31	1173	334	66	1573	18.4	2.8
2004		87.02	3.56	52.56	50.82	2.44	1204	334	61	1599	20.7	3.0
2005		75.35	2.71	60.44	65.42	2.46	1295	555	85	1935	16.6	4.3
2006		84.33	4.04	58.67	52.05	2.88	1233	525	38	1796	17.9	4.5
2007		81.17	3.50	65.42	65.42	3.00	1486	708	84	2278	17.0	5.3
2008		66.67	2.98	67.33	62.26	2.85	1618	711	99	2428	17.5	5.2
2009		76.99	3.09	68.65	73.57	2.99	1689	926	35	2650	17.1	6.4
2010		67.05	2.74	71.89	79.19	3.09	1861	1188	135	3184	16.5	7.6
2011		76.31	3.88	68.65	64.02	3.43	2163	1113	105	3381	23.4	8.3
2012		66.31	4.41	66.52	59.08	4.07	1756	1260	153	3169	22.7	10.8
2013		62.02	3.54	68.35	49.19	3.02	1428	735	105	2268	17.3	6.1
2014		62.50	3.56	63.68	50.00	3.06			435	1785	18.6	4.0
2015												
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES









Comments:

Appendix A:
North Converse Pronghorn Line Transect Survey
Bio-Year 2012 - Results and Histogram

Effort:	906.9438
# samples:	57
Width:	206.0000
Left:	0.0000000
# observations:	480

Model 1
Hazard Rate key, k(y) = 1 - Exp(-(y/A(1))**-A(2))

Parameter	Point Estimate	Standard Error	Percent Coef. of Variation	95% Confidence Interval	
DS	7.2787	0.93255	12.81	5.6593	9.3615
E(S)	1.4730	0.35594E-01	2.42	1.4047	1.5446
D	10.721	1.3978	13.04	8.3001	13.848
N	27242	3551.8	13.04	21091	35189

Measurement Units

Density: Numbers/Sq. miles
ESW: meters

Component Percentages of Var(D)

Detection probability:	62.6
Encounter rate:	33.9
Cluster size:	3.4

Estimation Summary: Encounter Rates

	Estimate	% CV	DF	95% Confidence Interval	
n	480.00				
k	57.000				
L	906.94				
n/L	0.52925	7.59	29.00	0.45321	0.61805
Left	0.0000				
Width	206.00				

Estimation Summary: Detection Probability

Hazard/Polynomial

	Estimate	% CV	DF	95% Confidence Interval	
m	2.0000				
LnL	-768.50				
AIC	1541.0				
AICc	1541.0				
BIC	1549.4				
Chi-p	0.70880E-01				
f(0)	0.85456E-02	10.32	478.00	0.69811E-02	0.10461E-01
p	0.56805	10.32	478.00	0.46406	0.69536
ESW	117.02	10.32	478.00	95.596	143.24

Estimation Summary – Expected Cluster Size

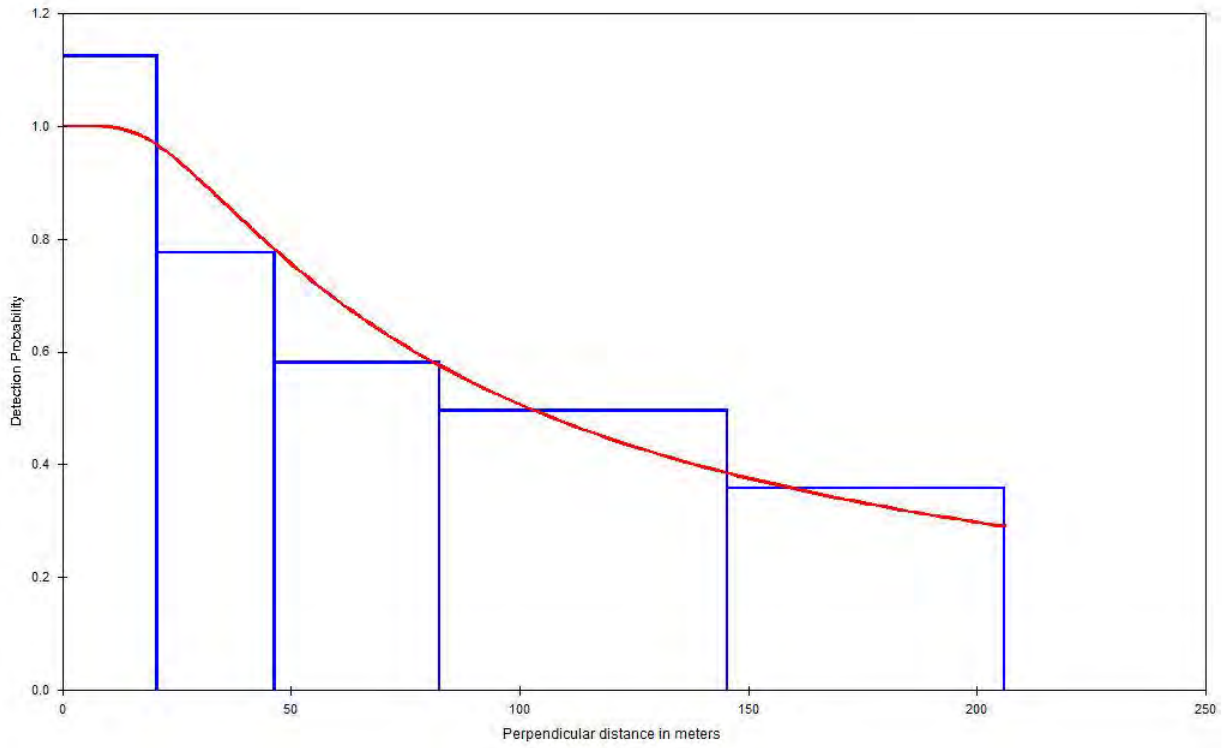
Estimate				
Average cluster size	%CV	df	95% Confidence Interval	
1.5708	3.73	479.00	1.4600	1.6901

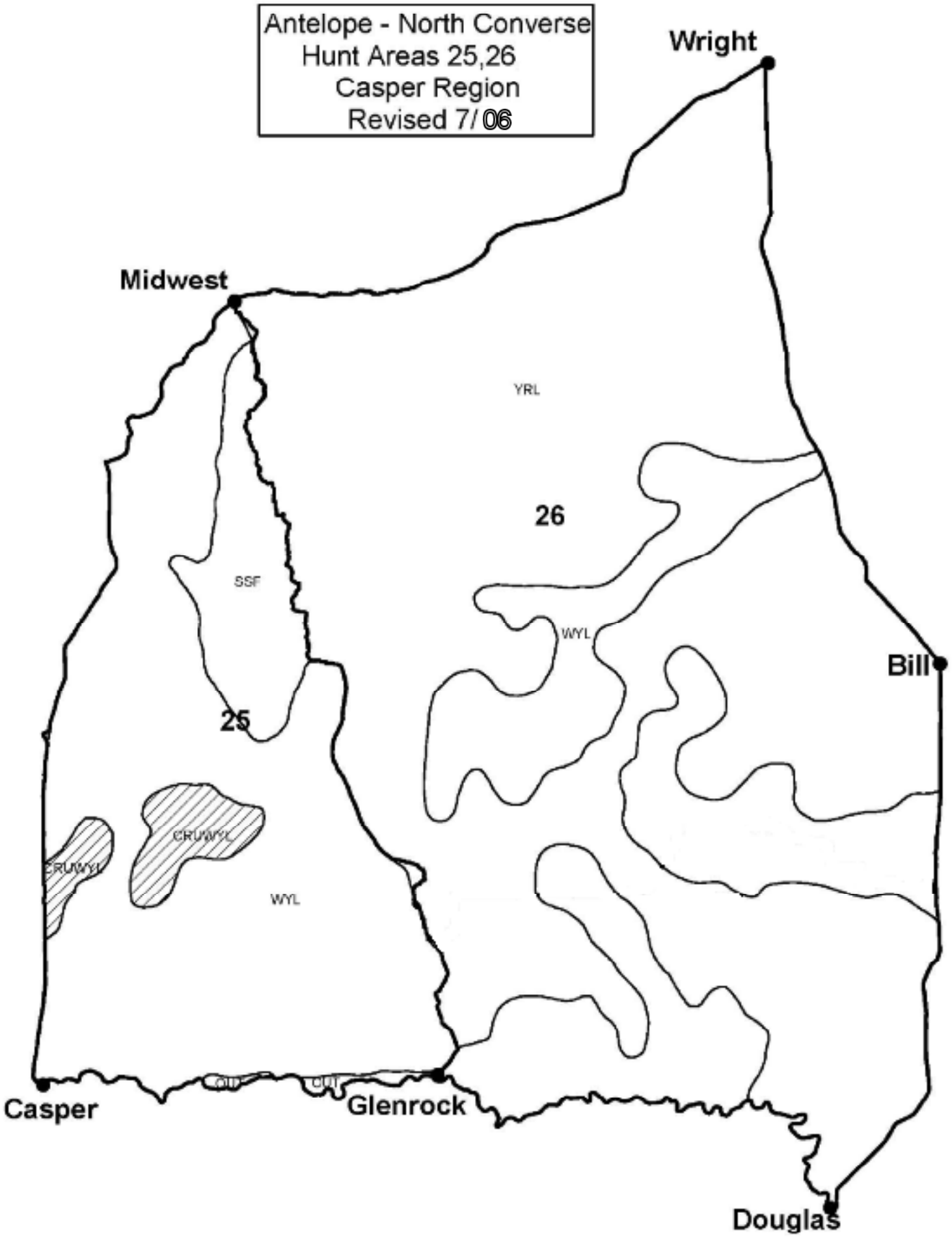
Hazard/Cosine

	Estimate	% CV	DF	95% Confidence Interval	
r	-0.34019E-01				
r-p	0.22856				
E(S)	1.4730	2.42	478.00	1.4047	1.5446

Estimation Summary – Density & Abundance

	Estimate	% CV	DF	95% Confidence Interval	
D	7.2787	12.81	194.63	5.6593	9.3615
DS	10.721	13.04	208.62	8.3001	13.848
N	27242	13.04	208.62	21091	35189


1.2
1.0
0.8
0.6
0.4
0.2
0.0
Detection Probability
0
50
100
150
200
250
Perpendicular distance in meters


Antelope - North Converse
Hunt Areas 25,26
Casper Region
Revised 7/06
Wright
Midwest
YRL
26
SSF
WYL
Bill
25
CRUWYL
CRUWYL
WYL
Casper
Glenrock
Douglas

2013 JCR Evaluation Form

Species: Mule Deer | Period: 6/1/2013 - 5/31/2014

Herd: MD740 - CHEYENNE RIVER

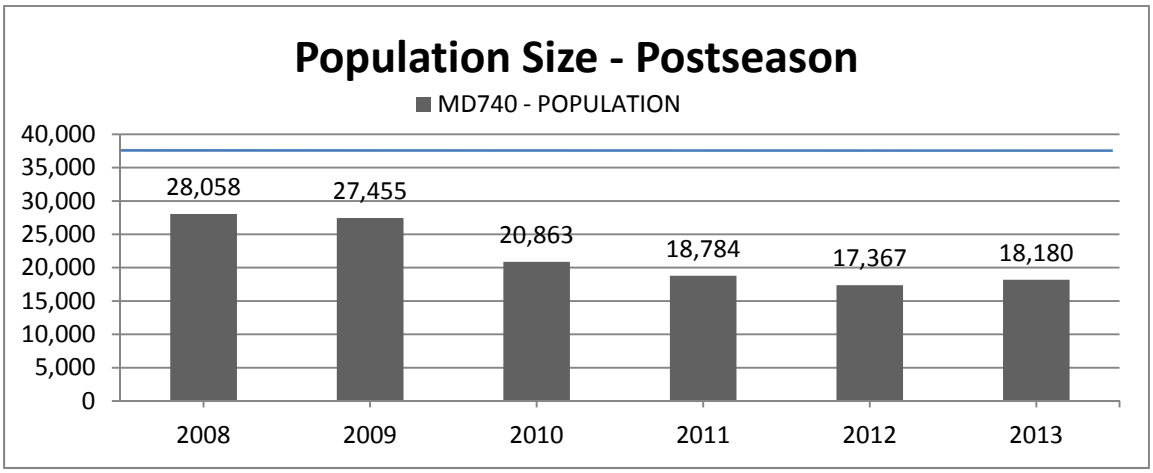
Hunt Areas: 7-14, 21 | Prepared By: JOE SANDRINI

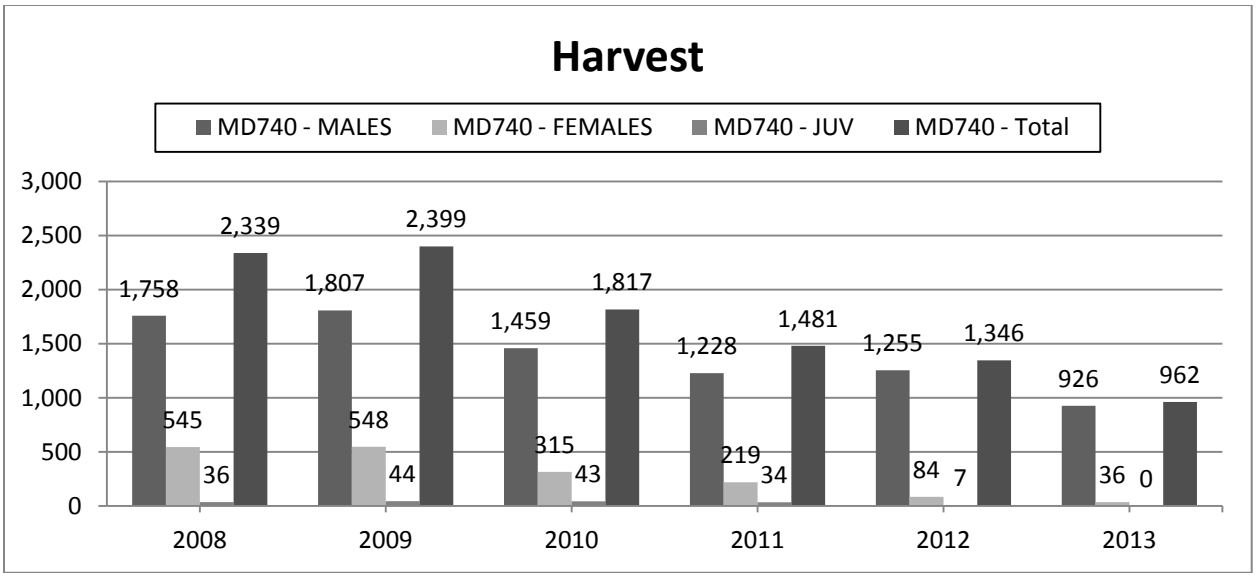
	2008 - 2012 Average	2013	2014 Proposed
Population:	19,005	18,180	18,754
Harvest:	1,551	932	720
Hunters:	2,787	2,107	1,350
Hunter Success:	56%	46%	53%
Active Licenses:	2,865	2,137	1,385
Active License Percent:	54%	45%	52%
Recreation Days:	11,638	8,546	5,400
Days Per Animal:	7.5	8.9	7.5
Ratio Males per 100 Females	33	36	
Ratio Juveniles per 100 Females	54	59	

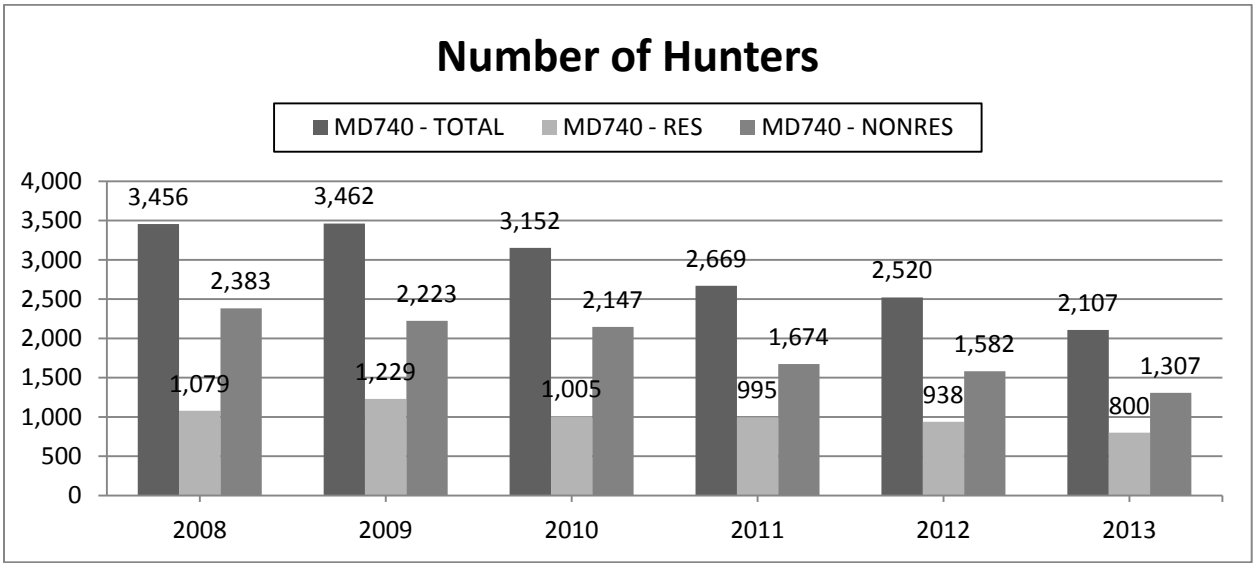
Population Objective:	38,000
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-52.2%
Number of years population has been + or - objective in recent trend:	13
Model Date:	02/20/2014

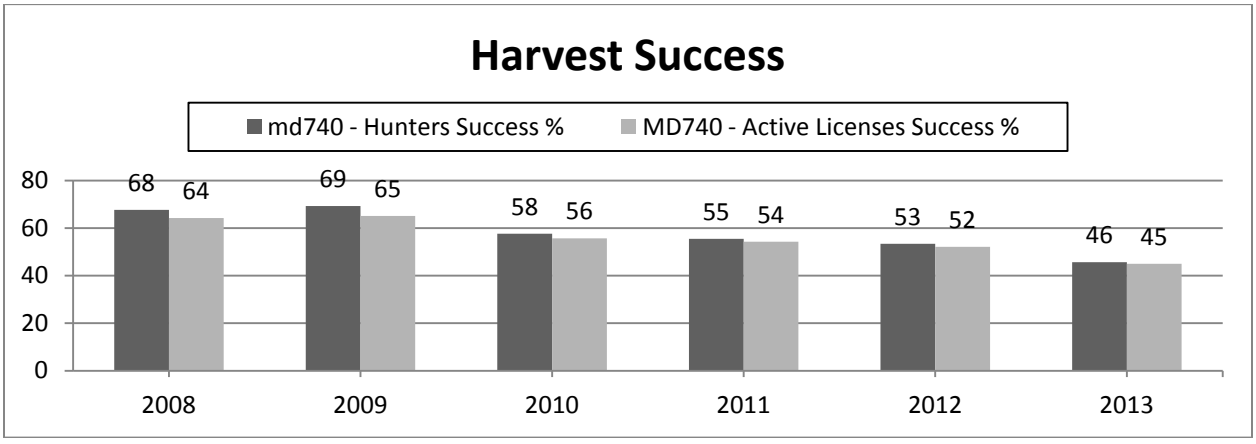
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

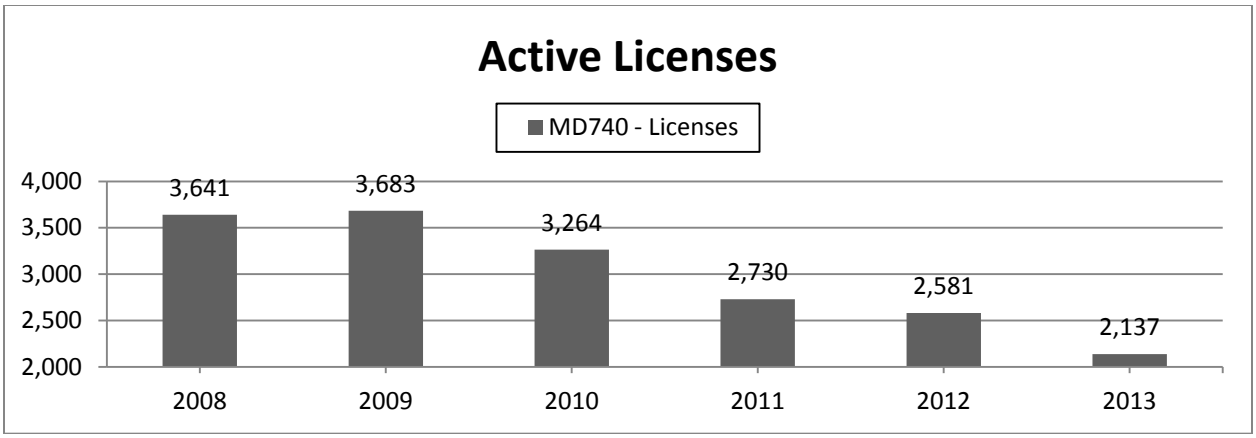
	JCR Year	Proposed
Females ≥ 1 year old:	0.4%	0.4%
Males ≥ 1 year old:	24.4%	16.8%
Juveniles (< 1 year old):	0%	0.01%
Total:	5.5%	4.1%
Projected change in post-season population:	+4.7%	+3.2%

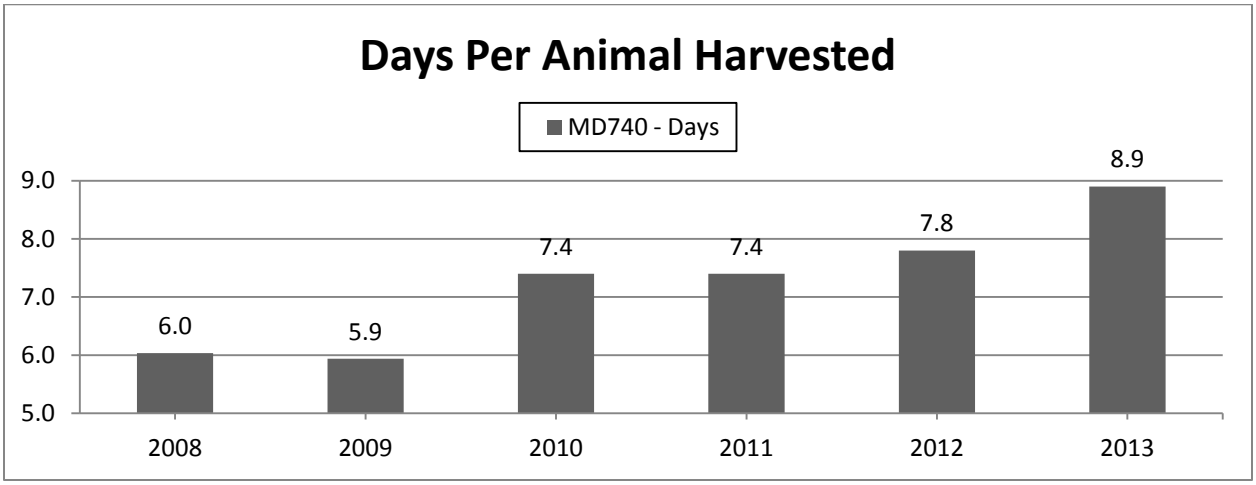


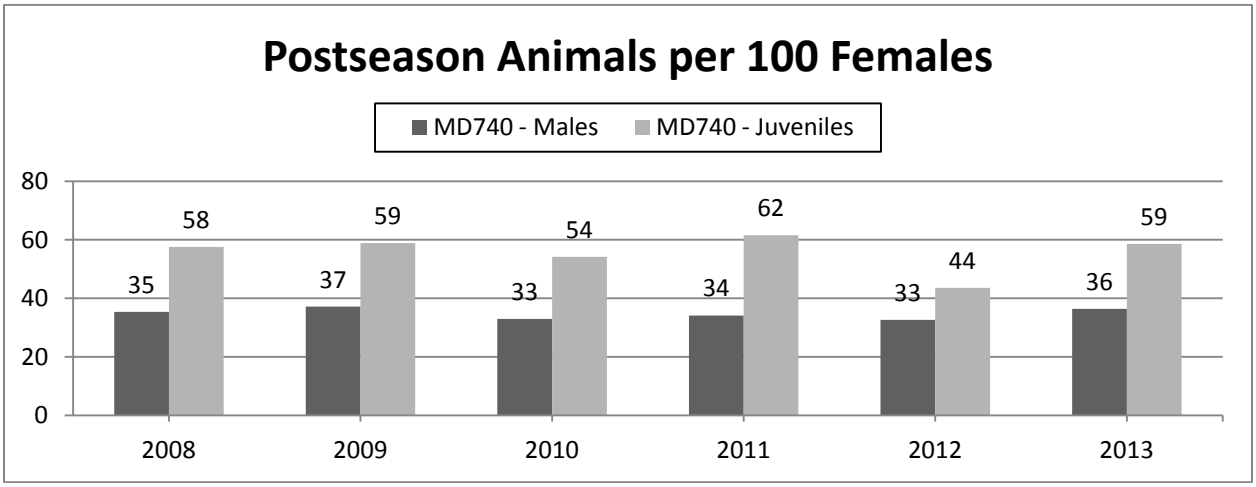

Harvest
MD740 - MALES
MD740 - FEMALES
MD740 - JUV
MD740 - Total
3,000
2,500
2,000
1,500
1,000
500
0
1,758
545
36
2,339
1,807
548
44
2,399
1,459
315
43
1,817
1,228
219
34
1,481
1,255
84
7
1,346
926
36
0
962
2008
2009
2010
2011
2012
2013


Number of Hunters
MD740 - TOTAL
MD740 - RES
MD740 - NONRES
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
3,456
1,079
2,383
3,462
1,229
2,223
3,152
1,005
2,147
2,669
995
1,674
2,520
938
1,582
2,107
800
1,307
2008
2009
2010
2011
2012
2013


Harvest Success
md740 - Hunters Success %
MD740 - Active Licenses Success %
80
60
40
20
0
68
64
69
65
58
56
55
54
53
52
46
45
2008
2009
2010
2011
2012
2013


Active Licenses
MD740 - Licenses
4,000
3,500
3,000
2,500
2,000
3,641
3,683
3,264
2,730
2,581
2,137
2008
2009
2010
2011
2012
2013


Days Per Animal Harvested
MD740 - Days
9.0
8.0
7.0
6.0
5.0
6.0
5.9
7.4
7.4
7.8
8.9
2008
2009
2010
2011
2012
2013


Postseason Animals per 100 Females
MD740 - Males
MD740 - Juveniles
80
60
40
20
0
35
58
37
59
33
54
34
62
33
44
36
59
2008
2009
2010
2011
2012
2013

2008 - 2013 Postseason Classification Summary

for Mule Deer Herd MD740 - CHEYENNE RIVER

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	27,455	165	418	583	19%	1,569	51%	924	30%	3,076	1,159	11	27	37	± 2	59	± 3	43
2010	20,863	89	223	312	18%	947	53%	513	29%	1,772	974	9	24	33	± 3	54	± 4	41
2011	18,784	113	281	394	17%	1,155	51%	711	31%	2,260	1,211	10	24	34	± 2	62	± 4	46
2012	17,367	119	185	304	19%	932	57%	406	25%	1,642	708	13	20	33	± 3	44	± 3	33
2013	18,180	114	302	416	19%	1,142	51%	669	30%	2,227	1,127	10	26	36	± 3	59	± 3	43

Note - Herd data not available in JCR program for years prior to herd unit combination that created Cheyenne River Mule Deer Herd. Figures above this table and JCR 30-30 form generated from Excel spreadsheet data and chart generation on file with Newcastle wildlife biologist

2014 HUNTING SEASONS
CHEYENNE RIVER MULE DEER HERD (MD740)

Hunt Area	Type	Season Dates Opens	Closes	Quota	Limitations
7		Oct. 1	Oct. 15		General license; antlered mule deer or any white-tailed deer
8		Oct. 1	Oct. 15		General license; antlered mule deer or any white-tailed deer
9		Oct. 1	Oct. 15		General license; antlered mule deer or any white-tailed deer
10		Oct. 1	Oct. 7		General license; antlered mule deer three (3) points or more on either antler or any white-tailed deer
11		Oct. 1	Oct. 15		General license; antlered mule deer or any white-tailed deer
12		Oct. 1	Oct. 15		General license; antlered mule deer or any white-tailed deer
	6	Oct. 1	Nov. 30	50	Limited quota licenses; doe or fawn
13		Oct. 1	Oct. 15		General license; antlered mule deer or any white-tailed deer
14		Oct. 1	Oct. 15		General license; antlered mule deer or any white-tailed deer
15		Oct. 1	Oct. 15		General license; antlered mule deer or any white-tailed deer
21		Oct. 1	Oct. 15		General license; antlered mule deer or any white-tailed deer
Archery		Sep. 1	Sep. 30		Refer to license type and limitations in Section 2

Region B Nonresident Quota: 1,000

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	License Type	Quota change from 2013
Herd Unit Totals	6	none
	Region B	**-500**

Management Evaluation
Current Management Objective: 38,000
Management Strategy: Recreational
2012 Postseason Population Estimate: ~ 17,400
2013 Proposed Postseason Population Estimate: ~ 18,200

HERD UNIT ISSUES: The Cheyenne River mule deer herd was created in 2009 by combining the Thunder Basin and Lance Creek herds. The postseason population objective is 38,000, a combination of the parent herds' objectives. The herd is managed for recreational hunting; and the management objective for this herd is scheduled to be reviewed later this year.

There are about 6,350 mi^2 in this herd unit, and 5,485 mi^2 (86%) are considered occupied habitat. Approximately 75% of the land within the herd unit is privately owned, with the remaining lands administered by the United States Forest Service, Bureau of Land Management, or the State of Wyoming. As a result, hunter access is largely limited and controlled by landowners, and access fees along with outfitted hunting are common. Consequently, hunting pressure can be heavy on accessible public land. About two-thirds of the hunters pursuing mule deer in this herd unit are nonresidents. These nonresidents typically are more willing to pay trespass or access fees for hunting privileges on private land or hire an outfitter. Hunt Areas (HA) 8, 10, and 13 are the only areas containing large blocks of accessible public land, which most of the resident hunters seek. These hunt areas typically receive heavy hunting pressure throughout the season.

Primary land uses within the herd unit include livestock grazing, oil and gas production, and some crop production. By far, the dominant land use throughout the herd unit is livestock grazing. The majority of oil and gas development occurs in the western and north central portions of the herd unit. However, substantial new oil and gas development is occurring in the central portion of the herd unit in northwest Niobrara County (HA 11) and near Douglas (HA 14). In addition, horizontal oil well development over a large portion of these same two hunt areas is expected to increase disturbance in the future. There are also several large surface coal mines in HA 10 and HA 21, which create a high level of disturbance. Cultivation of alfalfa, hay, oats, and wheat occur mostly in the southern and eastern portions of the herd unit.

WEATHER: Beginning in 2007, drought combined with poor habitat conditions and more normal winter weather patterns reduced recruitment in this herd. Since then, annual harvest of antlerless deer has dropped significantly, but more severe late winter and early spring weather have impacted the herd. The winter of 2010-11 was very harsh in the northern half of the herd unit, and over-winter mortality was well above average. Warmer and drier conditions beset the area during the end of bio-year 2011 and continued through the 2012-13 winter, with the 2012 summer being the driest on record. Overall, the weather pattern during bio-year 2012 resulted in poor forage production, very low recruitment, and average over-winter survival of all age classes of mule deer. During the past seven years, tougher winter and spring conditions and generally dry summers have resulted in reduced fawn productivity and survival when compared to the preceding decade. These conditions may have also fostered the outbreaks of Epizootic Hemorrhagic Disease (EHDV) observed in late summer / early fall, especially since 2009. As such, the weather patterns over the last decade have been the remote cause for this herd's decline by affecting various proximate mortality factors.

April of 2013 finally saw a break in the recent drought when temperatures dropped below normal for the entire month, and significant precipitation was again received. This cold, wet pattern continued with daily temperatures returning to near long-term averages through the summer of 2013. This helped increase forage production, but fawn survival and recruitment remained suppressed, perhaps due to poor body condition of does resulting from the 2012 drought, and continued EHDV may have increased late summer fawn mortality. In early October 2013, winter storm "Atlas" blanketed the herd unit with 12" to nearly 36" of wet snow and drifts exceeding 6-feet in some locations. While no significant level of mule deer mortality was detected due to this storm, the snow and resulting muddy conditions forced the cancellation of hunting for some license holders, and made accessing deer difficult in many locations. Towards the end of the hunting seasons, travel conditions improved, but it was apparent winter storm Atlas negatively impacted hunter participation and hampered hunting success. The early winter months of bio-year 2013 saw temperature and precipitation conditions near the recent 30-year average. For detailed weather data see http://www.ncdc.noaa.gov/cag/time-series/us.

HABITAT: Sagebrush (*Artemisia ssp*.) steppe and sagebrush grasslands with scattered hills dominated by ponderosa pine (*Pinus ponderosa*) comprise most of the western, central, and northern segments of the herd unit. The eastern most lands in the herd unit are comprised of short grass prairie punctuated by the previously mentioned pine breaks, and there is a small area (about 30 mi^2) of southern Black Hills habitat along the state line near Newcastle. Rolling ponderosa pine and limber pine (*Pinus flexilis*) hills and ridges dominate the southern portions of the herd unit. Major agricultural crops are grass and alfalfa hay, and winter wheat. Croplands are localized and found primarily near Gillette, Moorcroft, Upton, Newcastle, Manville, and Lusk. These variations in habitat types and limited riparian areas affect deer densities and distribution. The majority of mule deer are typically found utilizing broken topography characterized by sagebrush, conifer covered hills, or cottonwood and sagebrush dominated riparian communities. Scattered mule deer are found in the open sagebrush-grassland areas.

Several major cottonwood riparian drainages traverse the herd unit including the Belle Fourche River and Cheyenne Rivers and many of their tributary creeks such as Beaver Creek, Lightning Creek, Twenty-Mile Creek, Lance Creek, and Old Woman Creek. Overstory canopy along these drainages is dominated by decadent stands of plains cottonwood (*Populus deltoides*). These riparian cottonwood groves comprise one of the most important habitat types for mule deer in this herd unit. Unfortunately, many are in poor condition and lack recruitment of new cottonwoods and associated woody understory species. The majority of the drainages are ephemeral, and free flowing springs are rare. Water developments for livestock have benefited mule deer in this herd unit. Coal bed methane development has increased water availability near Wright and Gillette, but this water's quality and effects on the mule deer population are unknown.

Beginning in the fall of 2001, Department personnel established Wyoming big sagebrush monitoring transects within the herd unit. Leader production measurements were suspended in 2010, but over-winter estimates of use continued through 2011. The declining health and/or loss of these shrub stands was born out during this monitoring. In 2006 & 2007, drought coupled with grazing and browsing by wild and domestic animals, negatively impacted winter food

availability. Conditions improved slightly between 2008 and 2010, but observed fawn:doe ratios were low, which was likely due to more normal to severe winter and spring weather patterns. Even without direct measurements being taken in 2012, it was readily apparent shrub condition and forb production declined substantially, when severe drought impeded growth and the fawn:doe ratio plummeted. Neither sagebrush production nor utilization was measured in 2013. However, a very wet spring and summer along with low numbers of mule deer on the range contributed to a visible improvement in range conditions.

The overall lack of cottonwood regeneration is also a concern in this herd unit. Photo-point transects have shown some dramatic losses of seedling and young cottonwood trees. These losses have been primarily attributed to livestock grazing and beaver, and to a lesser extent by deer and elk. The health and vigor of riparian cottonwood communities and shrub stands needs to be enhanced if mule deer are going to thrive in this part of Wyoming.

FIELD DATA: While postseason fawn:doe ratios have undergone cyclical fluctuations, they have generally trended downward (Figure 1). Since 1991, fawn ratios have averaged 67 fawns per 100 does (std. dev. 12), which is below longer-term averages, but above the mean of 55:100 observed over the past 5-years. In 2013, the observed, post-season fawn:doe ratio was 59:100, an improvement from the previous year (44:100), but still below the value needed to halt this population's decline. Recent suppressed fawn:doe ratios are thought to be a result of poor range conditions due the extreme drought of 2012. Notably, observed fawn:doe ratios dropped after the harsher winters of 1983-1984; 1992-1993; and 2000-2001, but increased during the years following each nadir.

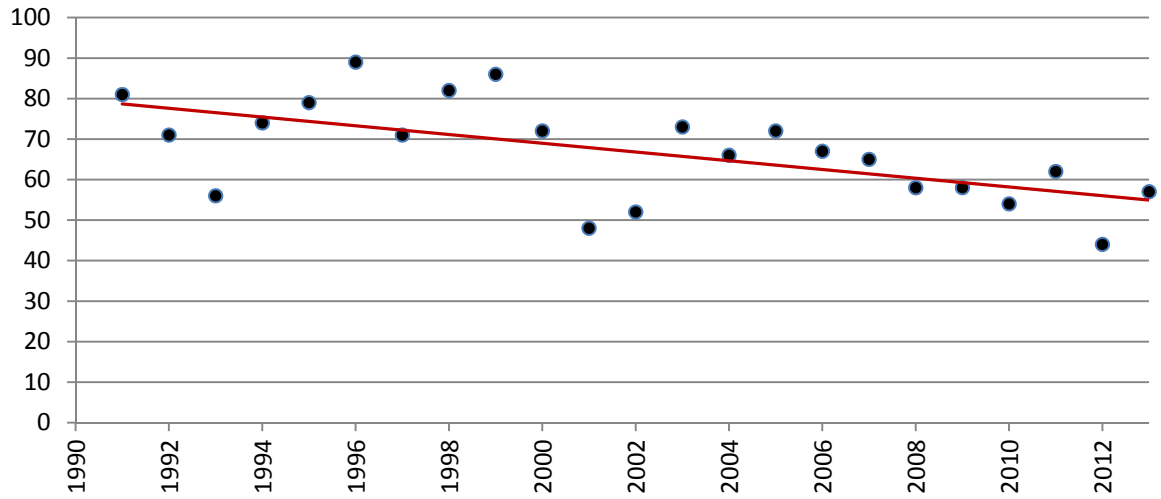


Figure 1. Post-Season Fawn:Doe Ratios: Cheyenne River Mule Deer Herd (1991 – 2013) and linear trend line ($R^2 = 0.36$).

Following the 2010-2011 winter, which was very severe in the northern one-third of the herd unit, fawn-doe ratios actually increased slightly above the preceding year. The apparent effects

of this particular winter being perhaps moderated by a combination of better habitat conditions and fewer deer in the southern two-thirds of the herd unit, and more moderate spring weather with excellent forage production – parameters that did not present themselves following the other winters mentioned. However, extreme drought in 2012 manifested itself in the lowest fawn:doe ratio observed in recent history.

While productivity in this herd unit, as measured by fawn:doe ratios, has declined since the early 1980's, poor reproduction was not considered to be limiting in this herd until recently. Between 2001 and 2009, lower productivity may have been a blessing, as difficult access to private land for hunters limited our ability to regulate deer numbers through sport hunting, and habitat conditions became poor. At the time, area managers strongly believed the observed decrease in productivity was linked primarily to declines in overall quality and quantity of sagebrush and riparian habitat within the herd unit. However, beginning in 2009, weather conditions moved away from drought, and with reduced numbers of both domestic livestock and wild ungulates across the range, shrub conditions began to improve, but fawn:doe ratios remained suppressed. During this timeframe more normal to severe winter weather was experienced and the populations of small game animals dropped. This may have indirectly increased predation on fawn mule deer. It does appear fawn:doe ratios in this herd are very sensitive to weather and habitat conditions. Additionally, since about 2006, there have been reports of dead deer each year in the early fall, and Epizootic Hemorrhagic Disease (EHD) was confirmed in multiple cases.

Buck:doe ratios in this herd increased between 2003 and 2007, peaking at 45:100. Since then, they have declined and stabilized near the 10-year average (35:100). Until 2008, moderate productivity coupled with limited access for hunters to private land yielded an increasing buck:doe ratio (despite enhanced license issuance). Since then, fawn production and survival have dropped resulting in a decline in buck ratios. The 2013 observed, post-season buck:doe ratio was 36:100, while the modeled value was 33:100. Visibility of yearling bucks is high during classifications, and tracking yearling buck ratios provides managers with a good indication of recruitment into this population, given low harvest rates of yearling bucks.

HARVEST DATA: Most harvested mule deer are taken off private land because it provides the majority of mule deer habitat. The Department is currently attempting to balance desires of landowners and hunters to increase deer numbers, but still keep the population at levels that will reduce the chance of a large-scale die-off. Access to private lands for deer hunting continues to decrease due to leasing by outfitters and many landowners are limiting hunting in the wake of declining deer numbers. Over the past two decades, outfitter control has significantly curtailed access to buck deer, and harvest of bucks dropped when seasons were liberalized in the mid 2000's. The reduced access to private land for deer hunters has increased hunting pressure on bucks on accessible public lands, and resulted in lower numbers of bucks there. Many landowners have stated, even when the population of deer was higher, that they are not willing to host increased numbers of hunters, or tolerate much in the way of doe/fawn hunting. Consequently, we have basically reached access saturation at this time on much of the private land in the herd unit.

Since 2006, hunter numbers and harvest have declined steadily, while hunter effort has increased. Initially, most of the decline in hunter numbers was due to a reduction in the number of non-residents hunting mule deer as the Region B quota dropped. More recently, there has been a decline in resident hunters as well. Further, during each of past four hunting seasons, many complaints were received from both hunters and landowners throughout the herd unit with regard to the low number of deer seen and harvested. It is evident from the reduced number of deer found during classification efforts, changes in harvest statistics, and landowner contacts that this herd declined substantially over the past three to four years.

It is interesting that while the preseason population estimate for this herd increased 2% between 2012 and 2013, hunter success drop precipitously and effort increased in 2013, even with fewer hunters afield. These statistics were no doubt influenced by the poor weather and road conditions caused by winter storm Atlas. In addition to the storm's impacts, nearly 20% of the available Region B tags did not sell in the regular drawing, but were purchased after the draw. It was apparent from field contacts that many of the hunters purchasing leftover license were forced to hunt already overcrowded public land; and more than a few landowners turned hunters away whom they previously granted permission to hunt. This large cadre of hunters forced by choice or circumstance to hunt public land could have also impacted the harvest statistics in the manner observed.

POPULATION: The 2013 post-season population estimate for this herd is ~18,200. The population model suggests this population peaked near objective in 2000 and then dropped dramatically following the tough winter of 2000. The herd is projected to have rebounded between 2002 and 2006 and leveled off in 2007 about 15% below objective. Between 2007 and 2012 the herd again declined significantly and may have leveled off again or increased slightly over the last year, but at a level 53% below its present objective.

The Semi-Constant Juvenile / Semi-Constant Adult (SCJ SCA) model was chosen to estimate this herd's population. It was selected over competing models because it had the lowest relative AICc and fit was similar to the better fitting Time Specific Juvenile / Constant Adult Survival (TSJ CA) model. The selected model tracks observed buck:doe ratios well, with changes in preseason population estimates being 91% correlated with changes in hunter success, and inversely correlated 83% with changes in hunter effort between 2007 and 2012. Modeled changes in population size also mirror impressions of field personnel and many landowners. Overall, this model is considered to be of good quality because it has 15^{+} years of data, ratio data are available for all years in the model, and it aligns fairly well with observed data.

MANAGEMENT SUMMARY: The traditional season dates for this herd unit are Oct. 1-15. In order to facilitate population growth commensurate with landowner desires, we have eliminated most doe/fawn harvest and continue antlered-only general license seasons for mule deer. Limited doe/fawn harvest will continue in HA 12, where a couple landowners are experiencing some damage and want to reduce mule deer numbers locally, and also in the northeastern quarter of HA 9 to allow landowners concerned with damage on Stockade Beaver Creek to address the issue if they choose.

Due to intense hunting pressure on public land there is a major discrepancy in deer numbers and densities between private and public land areas. This is best exemplified in HA 10, which contains the highest proportion of public land in the herd unit. To address low buck numbers and hunter crowding in this area, we have been steadily reducing the Region B quota, running a short hunting season, and implemented a 3-point restriction in 2012. The combined strategy of limiting Region B licenses and conservative hunting seasons may be helping. The buck:doe ratio improved in HA 10 to the herd-wide average in 2009 and 2010, but deer densities remained depressed. However, in 2011, the observed buck:doe ratio in HA 10 dropped to 16:100, as did the number of deer observed per hour of classification flight time. This led to the 3-point restriction implemented in 2012, and the post-season buck:doe ratio improved to 42:100 in 2012, but only 27 bucks were observed in over 4 hours of helicopter flight time post-season 2012. The same classification effort in 2013 by the Department along with a fixed winged flight by the Niobrara County Predator Board on private lands found 41 total bucks, and a buck:doe ratio of 35:100. However, the Department's HA 10 effort in 2013, which duplicated that of 2012, found 30 total bucks and a buck:doe ratio of 28:100. While buck:doe ratios have improved in HA 10, overall deer densities remain far below manager's and public desires, and likely habitat carrying capacity.

Many landowners have stated they are not taking deer hunters this again year, or are reducing the number they host. In addition, last year several ranches that together normally host a couple hundred deer hunters turned these hunters away at the start of the season, due to low deer numbers. Harvest statistics from HA 10 also suggest non-resident hunters continue to significantly outnumber resident hunters on public land. Because of the overcrowding of hunters on accessible public land and lack private landowners willing to host hunters, the Region B quota has again been reduced. The Region B quota of 1,000 should allow nearly all 1st choice applicants to draw a license; and the 2014 hunting season should result in harvest of about 680 bucks and 40 antlerless deer. Given five-year average postseason classification values and modeled survival rates, this harvest is projected to allow the post-season population to increase about 3% in 2014, but will remain far below objective.

INPUT	
Species:	Mule Deer
Biologist:	Joe Sandrini
Herd Unit & No.:	Cheyenne R.
Model date:	02/20/14

☑ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	124	133	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	33	73	☑ SCJ,SCA	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	11	104	☐ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population				Predicted Posthunt Population				Objective
	Field Est	Field SE		Juveniles	Total Males	Females	Total	Juveniles	Total Males	Females	Total	
1995				10622	5728	14048	30398	10532	3558	13285	27375	38000
1996				12381	6413	14499	33294	12350	4112	13897	30360	38000
1997				10682	7471	15604	33758	10629	5118	14968	30714	38000
1998				12707	7742	15929	36378	12664	4916	15405	32985	38000
1999				13847	8242	16961	39050	13786	4783	16021	34591	38000
2000				14360	10508	20623	45492	14301	7050	19750	41100	38000
2001				7712	7795	16685	32192	7625	4811	15774	28210	38000
2002				7748	6501	15614	29863	7682	3769	14763	26214	38000
2003				10290	5654	14792	30736	10208	3411	14002	27621	38000
2004				9474	6185	14989	30648	9419	4033	14290	27742	38000
2005				10314	6444	14969	31726	10210	4440	14224	28875	38000
2006				10513	8286	16418	35216	10479	6119	15631	32229	38000
2007				10193	8525	16431	35149	10146	6381	15581	32108	38000
2008				8318	7333	14980	30631	8278	5399	14381	28058	38000
2009				8220	7204	14670	30094	8172	5217	14067	27455	38000
2010				6084	5286	11481	22851	6037	3681	11144	20861	38000
2011				5913	4558	9782	20252	5876	3359	9546	18781	38000
2012				4264	4720	9863	18848	4256	3340	9771	17367	38000
2013				5548	4173	9518	19239	5548	3154	9479	18180	38000
2014				5404	4442	9699	19546	5399	3694	9661	18754	38000
2015												38000
2016												38000
2017												38000
2018												38000
2019												38000
2020												38000
2021												38000
2022												38000
2023												38000
2024												38000
2025												38000
2026												38000
2027												38000

Survival and Initial Population Estimates

Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1995	0.66			0.83		
1996	0.66			0.83		
1997	0.66			0.83		
1998	0.66			0.83		
1999	0.90			0.90		
2000	0.40			0.70		
2001	0.66			0.83		
2002	0.66			0.83		
2003	0.66			0.83		
2004	0.66			0.83		
2005	0.90			0.83		
2006	0.66			0.83		
2007	0.40			0.83		
2008	0.66			0.83		
2009	0.40			0.70		
2010	0.66			0.70		
2011	0.66			0.83		
2012	0.66			0.83		
2013	0.66			0.83		
2014	0.66			0.83		
2015						
2016						
2017						
2018						
2019						
2020						
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2022						
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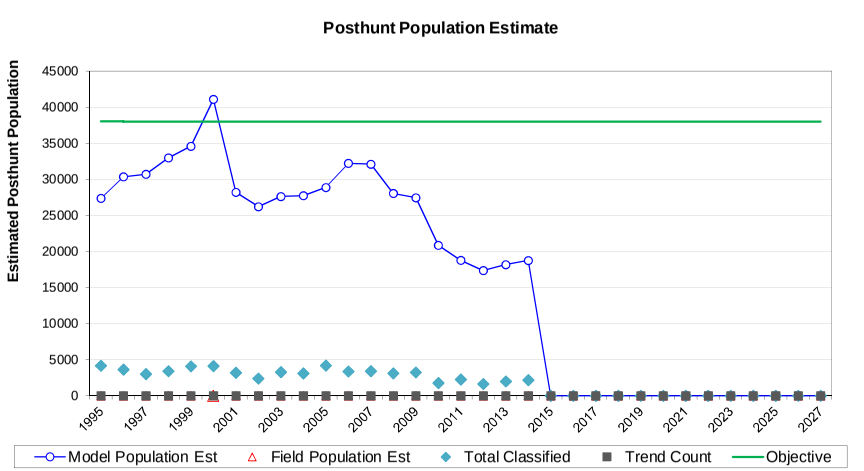
2025						
2026						
2027						

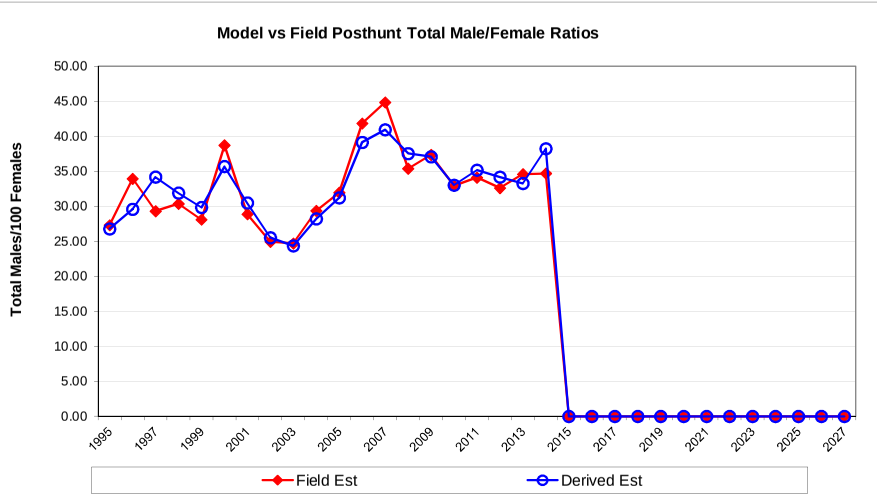
Parameters:	Optim cells
Juvenile Survival =	0.656
Adult Survival =	0.831
Initial Total Male Pop/10,000 =	0.356
Initial Female Pop/10,000 =	1.329

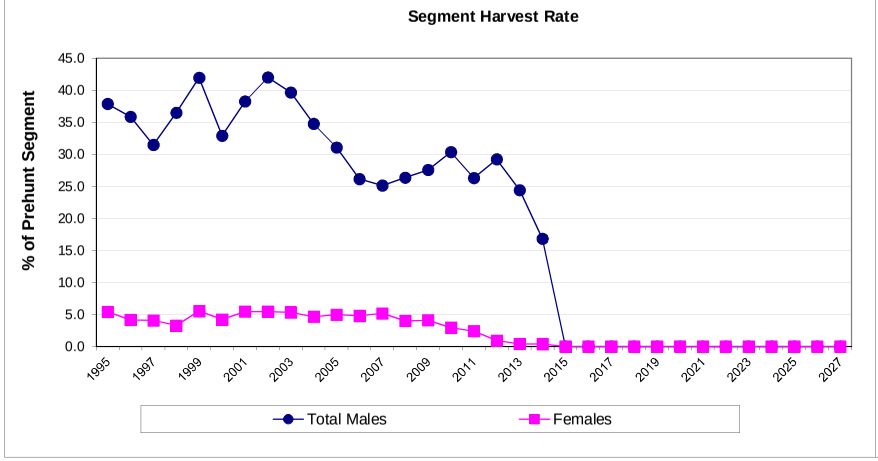
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

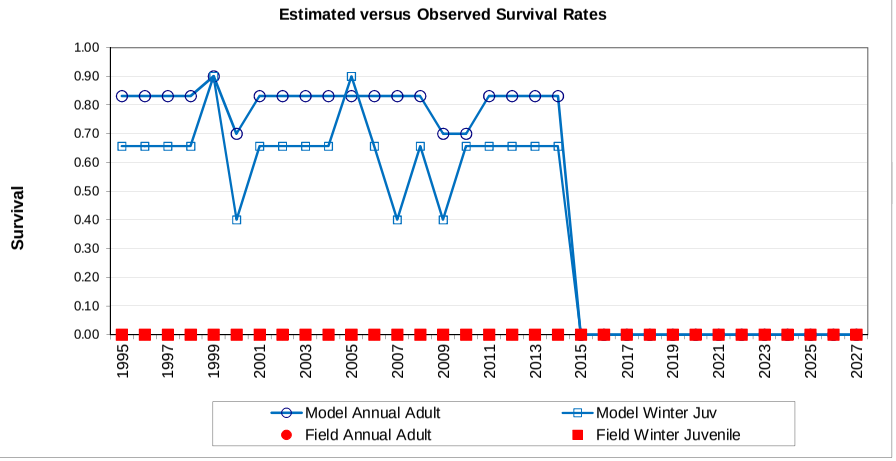
Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio			Harvest				Harvest: Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1995		79.28	2.65	26.78	27.32	1.31	82	1973	693	2748	37.9	5.4
1996		88.87	3.20	29.59	33.94	1.67	28	2092	547	2667	35.9	4.1
1997		71.01	2.84	34.20	29.32	1.59	49	2139	579	2767	31.5	4.1
1998		82.20	3.05	31.91	30.37	1.57	39	2569	476	3084	36.5	3.3
1999		86.05	2.89	29.85	28.11	1.37	55	3145	854	4054	42.0	5.5
2000		72.41	2.53	35.70	38.72	1.66	54	3144	794	3992	32.9	4.2
2001		48.34	1.99	30.50	28.88	1.44	79	2713	828	3620	38.3	5.5
2002		52.04	2.42	25.53	24.94	1.52	60	2484	773	3317	42.0	5.4
2003		72.90	2.75	24.36	24.70	1.36	75	2039	718	2832	39.7	5.3
2004		65.91	2.62	28.22	29.38	1.54	50	1956	635	2641	34.8	4.7
2005		71.78	2.45	31.22	31.96	1.43	94	1821	677	2592	31.1	5.0
2006		67.04	2.63	39.14	41.85	1.91	31	1970	715	2716	26.2	4.8
2007		65.12	2.57	40.95	44.86	1.99	43	1949	773	2765	25.1	5.2
2008		57.57	2.37	37.54	35.39	1.72	36	1758	545	2339	26.4	4.0
2009		58.09	2.35	37.08	37.35	1.75	44	1807	548	2399	27.6	4.1
2010		54.17	2.97	33.03	32.95	2.15	43	1459	307	1809	30.4	2.9
2011		61.56	2.93	35.19	34.11	1.99	33	1090	214	1337	26.3	2.4
2012		43.56	2.59	34.18	32.62	2.15	7	1255	84	1346	29.2	0.9
2013		58.53	3.00	33.28	34.59	2.12	0	926	36	962	24.4	0.4
2014		55.88	2.76	38.24	34.70	2.02	5	680	35	720	16.8	0.4
2015												
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												
2026												
2027												

FIGURES









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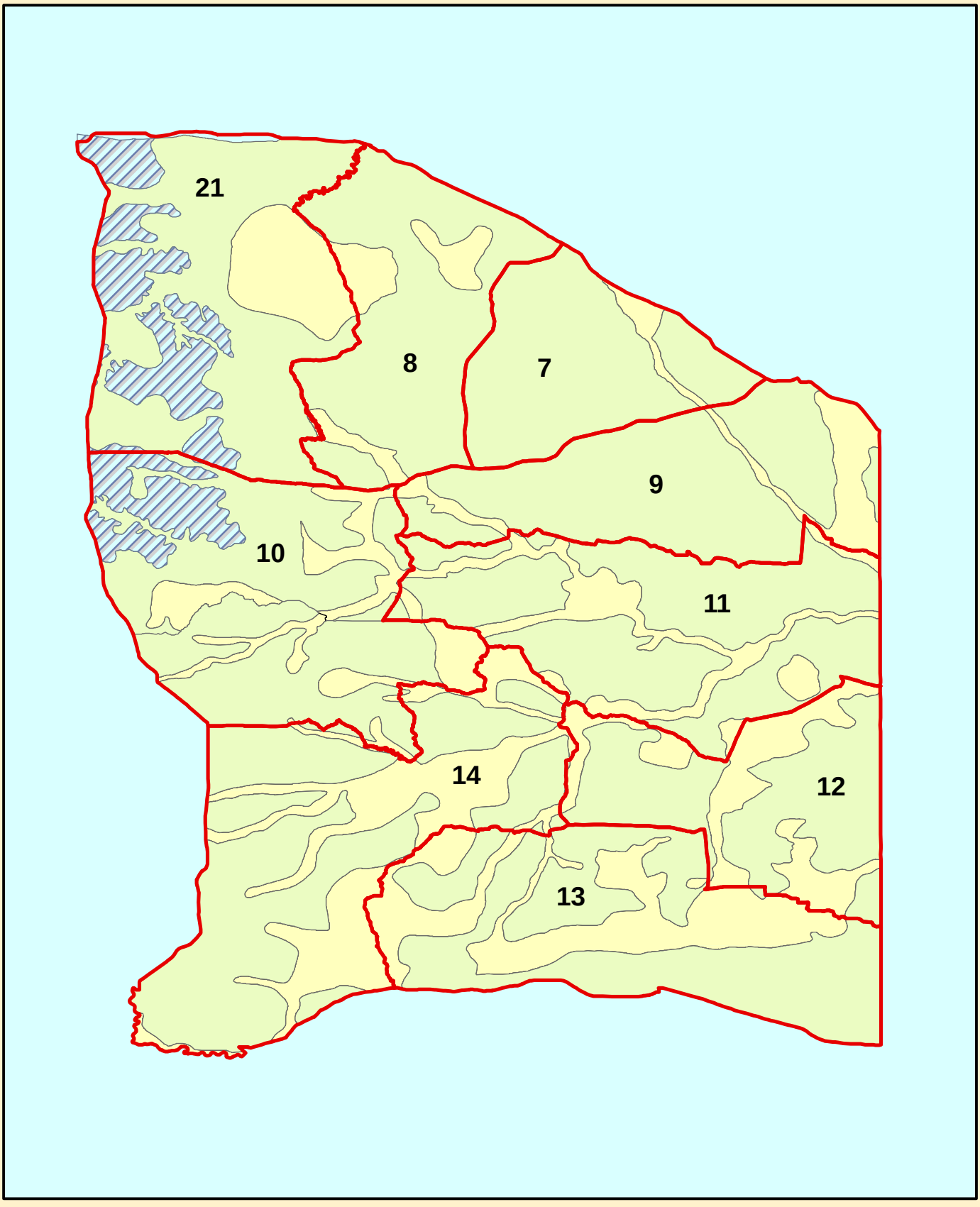


Legend
- Hunt_Areas
- OUT
- YLG
- WYL

MD 740

0 4.25 8.5 17 25.5 34
Miles

Coordinate System:
Central Meridian:
1st Std Parallel:
2nd Std Parallel:
Latitude of Origin:

2013 - JCR Evaluation Form

SPECIES: Mule Deer
PERIOD: 6/1/2013 - 5/31/2014

HERD: MD751 - BLACK HILLS

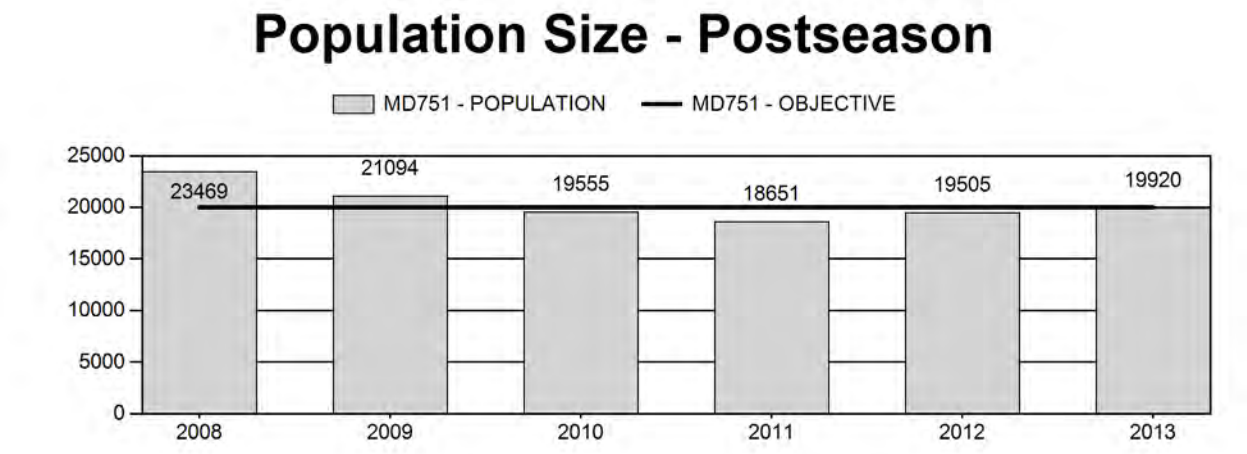
HUNT AREAS: 1-6
PREPARED BY: JOE SANDRINI

	2008 - 2012 Average	2013	2014 Proposed
Population:	20,455	19,920	21,525
Harvest:	2,061	1,548	1,555
Hunters:	5,055	3,719	3,740
Hunter Success:	41%	42%	42 %
Active Licenses:	5,251	3,767	3,790
Active License Percent:	39%	41%	41 %
Recreation Days:	16,104	11,324	11,665
Days Per Animal:	7.8	7.3	7.5
Males per 100 Females	17	21	
Juveniles per 100 Females	70	79	

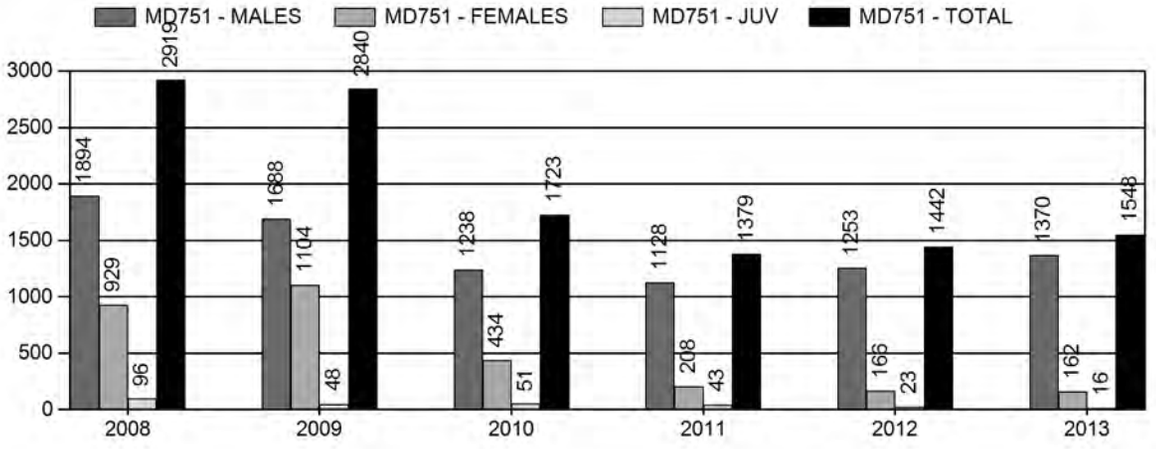
Population Objective:	20,000
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-0.4%
Number of years population has been + or - objective in recent trend:	4
Model Date:	02/20/2014

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

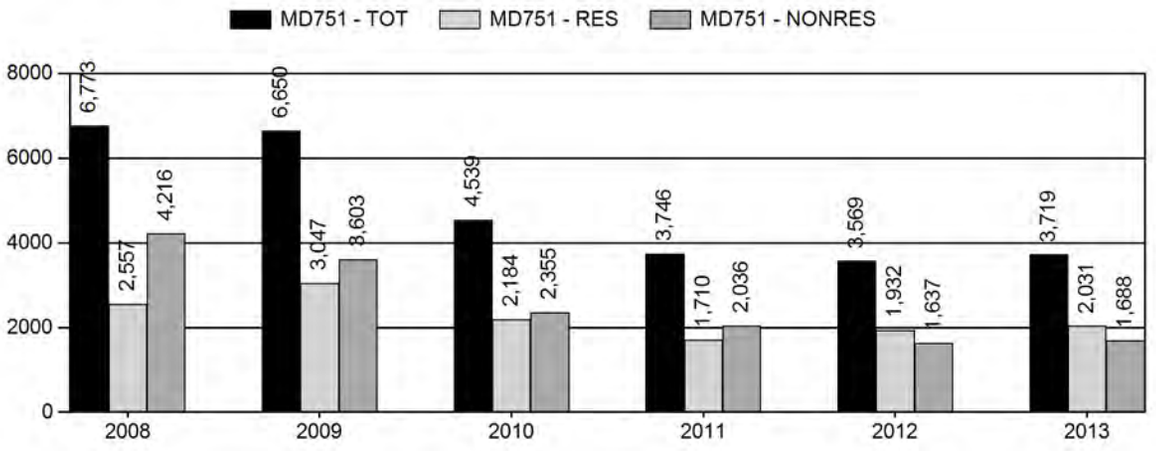
	JCR Year	Proposed
Females ≥ 1 year old:	1.7%	1.6%
Males ≥ 1 year old:	48.1%	37.6%
Juveniles (< 1 year old):	0.2%	0.2%
Total:	7.9%	7.4%
Proposed change in post-season population:	+0.2%	+8.1%



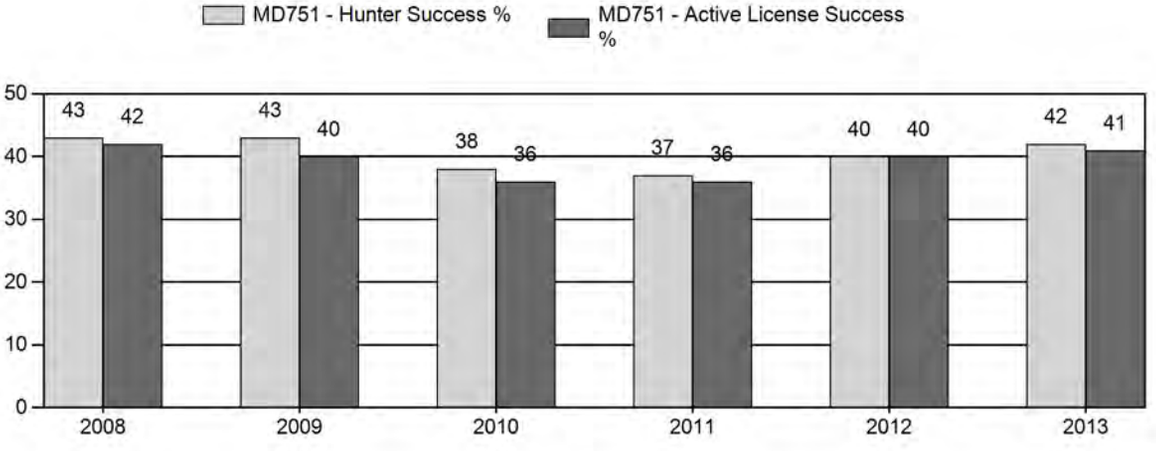
Harvest



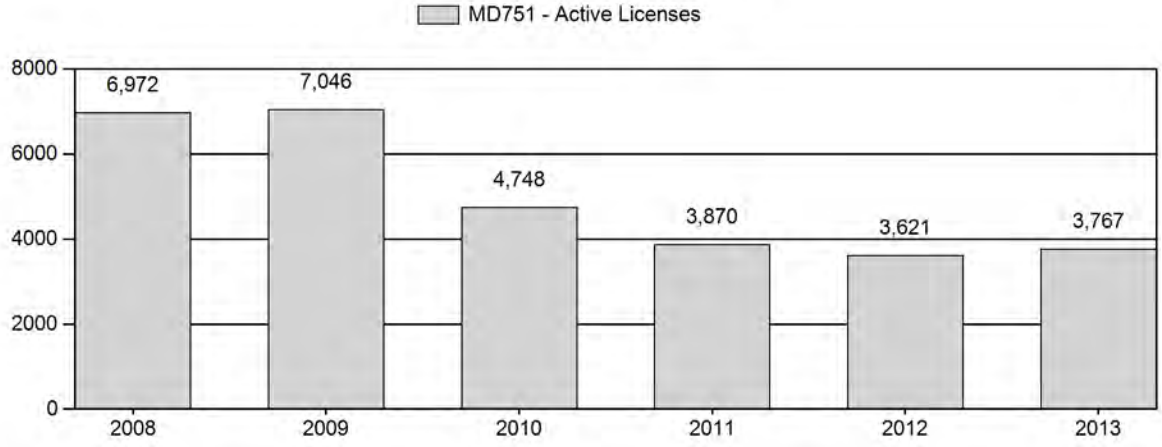
Number of Hunters



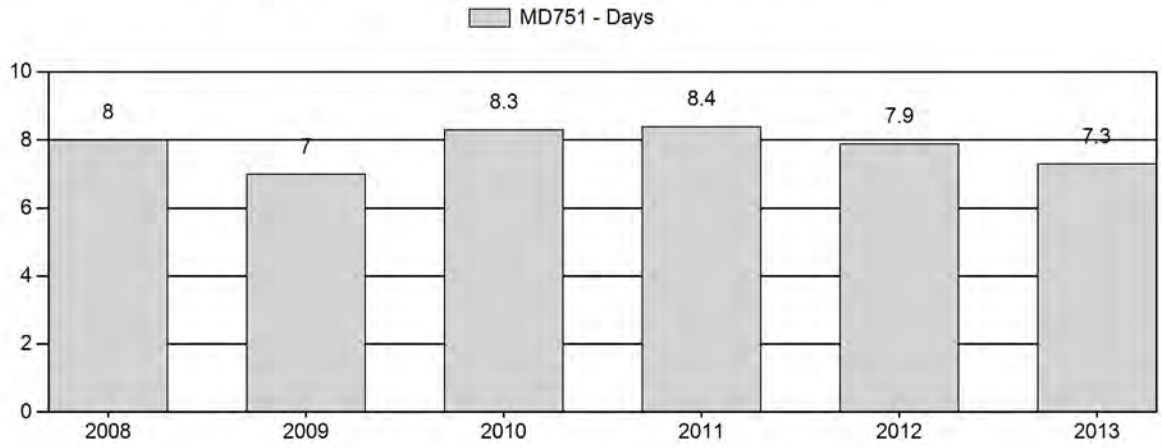
Harvest Success



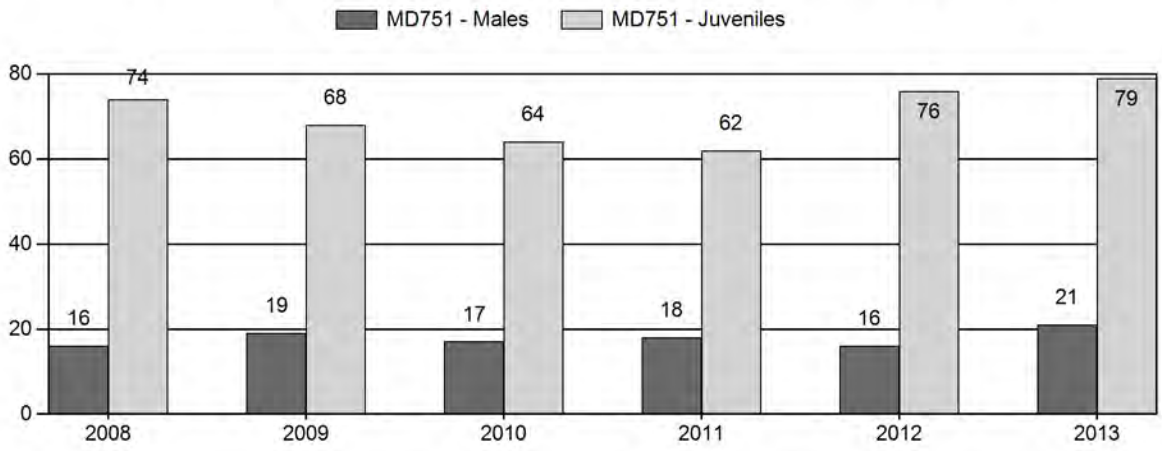
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2008 - 2013 Postseason Classification Summary

for Mule Deer Herd MD751 - BLACK HILLS

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	23,469	73	103	176	9%	1,085	52%	806	39%	2,067	1,505	7	9	16	± 2	74	± 4	64
2009	21,094	48	52	100	10%	522	53%	357	36%	979	1,317	9	10	19	± 3	68	± 6	57
2010	19,555	44	71	115	10%	659	55%	421	35%	1,195	1,174	7	11	17	± 2	64	± 5	54
2011	18,651	41	76	117	10%	658	56%	406	34%	1,181	1,118	6	12	18	± 2	62	± 5	52
2012	19,505	58	70	128	8%	787	52%	596	39%	1,511	1,553	7	9	16	± 2	76	± 5	65
2013	19,920	73	62	135	11%	634	50%	499	39%	1,268	1,700	12	10	21	± 3	79	± 6	65

2014 HUNTING SEASONS
BLACK HILLS MULE DEER HERD (MD751)

Hunt Area	Type	Dates of Seasons Opens	Closes	Quota	License	Limitations
1		Nov. 1	Nov. 21		General	Antlered deer off private land; any deer on private land
2	6	Nov. 1	Nov. 21	50	Limited quota	Doe or fawn valid on private land
2		Nov. 1	Nov. 21		General	Antlered deer off private land; any deer on private land
3		Nov. 1	Nov. 21		General	Antlered deer off private land; any deer on private land
4		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land except the lands of the State of Wyoming's Ranch A property shall be closed
4	6	Nov. 1	Nov. 20	150	Limited quota	Doe or fawn valid on private land
5		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land
5	6	Nov. 1	Nov. 20	25	Limited quota	Doe or fawn
6		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land
6, 9	6	Nov. 1	Nov. 20	10	Limited quota	Doe or fawn valid east of U.S. Highway 85

Region A Nonresident Quota: 2,750

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	License Type	Quota change from 2013
2	6	+25
6	6	-10
Herd Unit Totals	**6**	**+15**
	Region A	**None**

Management Evaluation
Current Postseason Population Management Objective: 20,000
Management Strategy: Recreational
2013 Postseason Population Estimate: ~ 19,900
2014 Proposed Postseason Population Estimate: ~ 21,500

HERD UNIT ISSUES: The management objective of the Black Hills mule deer herd unit is an estimated post-season population of 20,000 mule deer with a recreational management strategy. It is managed for recreational hunting to limit deer numbers to a level compatible with landowner desires. The population objective and management strategy were set in 1986. The objective and management strategy will be reviewed in 2015.

The Black Hills mule deer herd unit encompasses 3,181 mi^2 of occupied habitat**.** 76% of the land in the herd unit is privately owned. Significant blocks of accessible public land are found on the Black Hills National Forest in Hunt Area (HA) 2 and HA 4, and on the Thunder Basin National Grassland in HA 6. A block of BLM land with a couple of access points is also present in HA 1. Because the majority of private landowners charge high access fees for hunting, these parcels of public land receive greater hunting pressure than private lands.

Historically, management of this herd has been a byproduct of managing the Black Hills White-Tailed Deer Herd. Deer hunting seasons have been primarily structured to address the white-tailed deer population. As with many of the herd units in the eastern half of Wyoming, the Game & Fish Department has tried to maintain deer numbers at levels acceptable to landowners. In the case of these two deer herds, landowners typically feel saturated with white-tailed deer before mule deer become a problem.

WEATHER: Drought conditions, which were generally persistent throughout the Black Hills between 2000 and 2006, began to moderate some in 2007. Between 2007 and 2011, annual temperatures were generally near, or below, the previous 30-year average and annual precipitation each year at, or above, that average (http://www.ncdc.noaa.gov/cag/time-series/us). Notably, 2010 was colder and wetter than both the 30-year and 100-year averages; and the winter of 2010-11 severe. Since the late 1890's, only five other winters were as cold and snowy as that of 2010-11. Overall, the predominant weather pattern between 2007 and 2011 was characterized by generally cool summers, more persistent snow cover in late fall and winter, and above normal spring moisture.
Drought returned to the Black Hills in 2012, with well above normal summer temperatures and little rainfall during the growing season. Forage production that year was very poor, and the dry conditions and led to several large wildfires in the southern half of the herd unit. These warm and dry conditions that beset the area in April of 2012 continued through the 2012-13 winter (http://www.ncdc.noaa.gov/cag/time-series/us). April of 2013 finally saw a break in this pattern when temperatures dropped well below normal for the entire month and good precipitation was again received. Through the remainder of the growing season, temperatures were slightly above average and precipitation well above normal. This resulted in excellent forage growth. In early October, 2013 winter storm Atlas blanketed the Black Hills with anywhere from about a foot of wet heavy snow near Newcastle, to three feet on the Bearlodge, and over five feet near Cement Ridge. This single storm event significantly hampered access for hunters on to the BHNF

throughout the hunting season. No large scale die-offs of mule deer were witnessed from this storm, but a few mule deer mortalities on the National Forest south of I-90 were discovered.

Based on weather and habitat conditions over the past five years, it is likely mule deer have entered the winter in fair to good condition most years, except bio-year 2012. More normal winter temperatures and precipitation, punctuated by some severe winter weather, have increased winter stress on mule deer compared to the previous decade, as did the drought of 2012. This recent weather pattern has resulted in recruitment levels that dropped between 2009 and 2011, but have since increased. During this same timeframe, it appears over-winter survival of all age classes of mule deer has been about average, except during the winter of 2010-11 when over-winter mortality is thought to have been significant.

HABITAT: Ponderosa pine (*Pinus ponderosa*) is the dominant overstory species on forested lands. Quaking aspen (*Populus tremuloides*), paper birch (*Betula papyrifera*), and bur oak (*Quercus macrocarpa*) stands are present. Important shrubs include big sagebrush and silver sage (*Artemesia spp.*), Saskatoon serviceberry (*Amelanchier alnifolia*), Oregon grape (*Berberis repens*), common chokecherry (*Prunus virginiana*), spiraea (*Spiraea betulifolia*), and true mountain mahogany (*Cercocarpus montanus*). Many non-timbered lands in the herd unit are dominated by sagebrush or are used to produce agricultural crops such as winter wheat (*Triticum aestivum*), alfalfa hay (*Medicago sativa*), and grass hay.

Currently, little quantified habitat evaluation is being conducted within this herd unit directly applicable to mule deer. A single true mountain mahogany and two bur oak production and utilization transects have been established. The true mountain mahogany transect is located on mule deer winter range typical of the southern Black Hills, and the bur oak transects are in winter range more typical of white-tailed deer habitat in the northern hills. While little habitat data overall have been collected, it appears drought conditions, when present, negatively affected shrub production, and peak mule deer numbers several years ago may have exceeded what forage conditions could sustain between bio-years 2005 and 2008.

FIELD DATA: Between 2002 and 2005, fawn survival was fair, with observed preseason fawn:doe ratios averaging 67:100. Fawn:doe ratios then increased about 15% the next three years ($mean_{(2006\text{-}2008)}$= 77:100) before dropping 16% between 2009 and 2011 ($mean_{(2009\text{-}2011)}$= 65:100). In 2012 and 2013, observed post-season fawn:doe ratios rebounded, exhibiting values of 76:100 & 79:100 respectively. However, this herd's population has not increased significantly as a result. Because a post season ratio of 66 fawns per 100 does is thought to be the level necessary to sustain hunted mule deer populations - it appears the population decline experienced after 2006 was likely due initially to increased harvest rates and a drop in over-winter survival, while increased non-hunting mortality augmented the decline beginning in 2009. In addition, an usually severe winter in bio-year 2010 and localized epizootic hemorrhagic disease (EHDV) outbreaks each of the past five summers have increased annual mortality of all age classes. During the 2007 - 2010 period, evidence suggests the mountain lion population in the Black Hills reached historically high levels. As a result, harvest, weather conditions, disease, and increased predation all acted to cause the estimated post-season population to fall 36% between 2006 and 2011. This same period witnessed a 38% decline in the estimated preseason population, while preseason trend counts dropped 75% (Figure 1). With better fawn production and survival the past two years the declining trend has been reversed, but substantial population increases have not been realized.

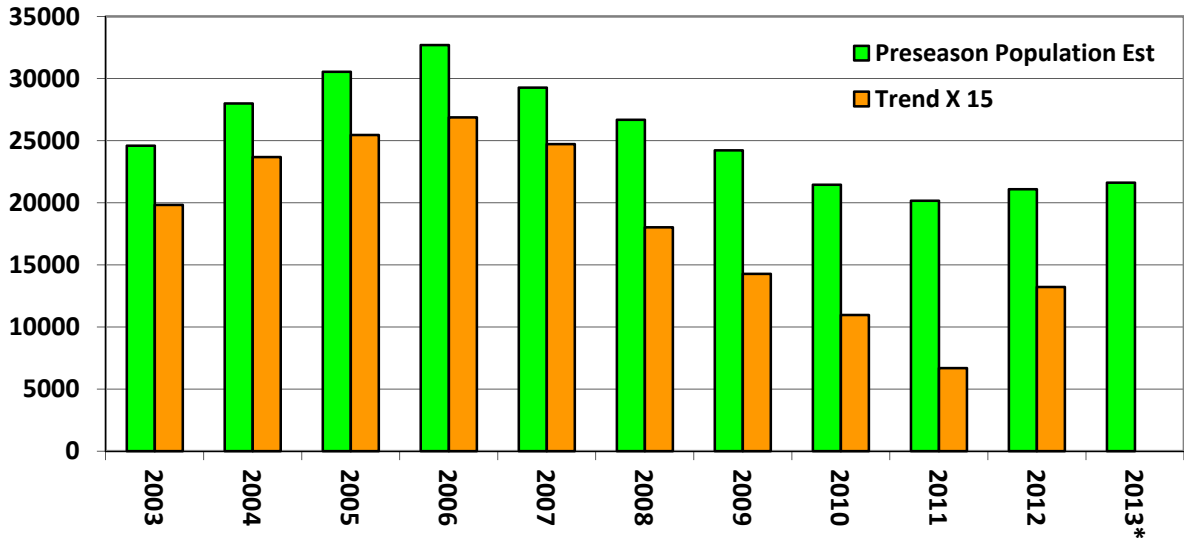


Figure 1. 2003 – 2013 pre-season population estimates produced by TSJ CA model, and mule deer observed preseason along trend count routes (increased by a factor of 15).

**Trend counts were not conducted in 2013 due to winter storm Atlas.*

As this herd grew rapidly between 1997 and 2000, conservative hunting seasons allowed post-season buck:doe ratios to increase. Then, as Region A license issuance increased, buck:doe ratios declined before leveling off at about 22:100 during a time of good fawn survival (2004 – 2009). Following this population's decline, buck:doe ratios again dropped between 2008 and 2012. With better fawn production in 2012, yearling buck numbers increased the observed 2013 buck:doe ratio to 21:100. Since 2004, post-season buck:doe ratios in this herd have averaged 20:100 (std. dev = 3.5), but a mere 18:100 (std. dev.=1.8) over the past five years. As such, this herd generally exhibits buck:doe ratios at the very bottom end, or below, the Department's management criteria for recreational hunting.

HARVEST DATA: Deer seasons in the Black Hills have been traditionally structured to address white-tailed deer management. Consequently, this mule deer herd is managed by balancing white-tailed deer seasons and landowner tolerance for deer (both species) with recreational opportunity. An analysis of harvest information shows the number of hunters in the field pursuing bucks has the greatest impact on total harvest. As such, buck harvest has been regulated by altering non-resident hunter numbers via changes in the Region A quota, while resident buck hunter participation can only be limited by shortening the season – notably by inclusion or removal of the Thanksgiving Day weekend and the days following in November. Department surveys and contacts with non-resident hunters indicate most non-residents want to harvest buck mule deer. This fact, combined with a hunting season that targets bucks during the rut, results in very heavy hunting pressure on buck mule deer. Considering this, and the drop in total buck numbers since 2007, it is prudent to continue to limit harvest of buck mule deer.

With more conservative hunting season structures in place since 2010, mule deer harvest has dropped about 40% from the level experienced when this population peaked. At the same time, hunter success has declined between 2009 & 2011, before increasing in 2012 & 2013, with hunter effort following reverse trends. Hunting seasons the past four years have reduced harvest

of mule deer bucks 38% from that experienced during the immediately preceding 4-year period with a traditional 30 day November season. Comparing these same time periods, resident harvest of mule deer bucks dropped 21%, while non-resident harvest of mule deer bucks dropped 47%. During this time frame, harvest of white-tailed deer bucks declined less (see WD706). Despite these trends, hunter satisfaction essentially remained unchanged for both species the past three years, with about 68% of the hunters reporting they were either satisfied or very satisfied with their Black Hills deer hunt, and around 15% reporting they were either dissatisfied or very dissatisfied – regardless of species. With the slight increase in deer hunter success rates in 2013, hunter satisfaction actually climbed a few percentage points for both species.

POPULATION: The 2013 estimated, post-season population of Black Hills mule deer was about 19,900. The Black Hills mule deer population peaked at an estimated postseason population of around 29,000 mule deer in 2006, and then declined the next five years. It now appears to have stabilized recently at objective, and may be beginning to increase again. The last substantial population decline this herd experienced was in the mid 1990's. That drop was reversed in 1998 and 1999 when very conservative hunting seasons aligned with excellent fawn survival and mild winters.

Population modeling of this herd is difficult. The herd unit violates the closed population assumption of the model. Mule deer regularly cross into the Power River Herd Unit, Montana, South Dakota and the Cheyenne River Herd Unit, as no physical barriers exist to prevent movement. The spreadsheet model chosen to estimate this population was the Time Sensitive Juvenile / Constant Adult survival rate model (TSJ CA), because it had the lowest AICc (119) and best fit (25) of competing models. The preseason population estimates produced by this model between 2003 and 2012 are also 95% correlated with preseason trend counts over the same period.[1] However, this model reached upper or lower constraints on juvenile survival in 9 out of 20 years modeled, and was very close to those constraints in 5 additional years. Overall, we consider this model to be of fair to poor quality due to the lack of herd specific survival data, violations of the closed population assumption, below adequate classification sample sizes 3 of the past 6 years, and aerial classifications in terrain that makes classifying yearling bucks difficult.

MANAGEMENT SUMMARY: The spreadsheet model suggests recent postseason populations have been very close to our current management objective of 20,000 mule deer. If the herd actually numbers about 20,000 head post-season, then our current objective is well below most landowner's and hunter wishes. At this time, many landowners have expressed dissatisfaction with the number of mule deer. Based upon habitat conditions and these desires, a season designed to increase this herd is warranted. However, given the low survival witnessed the past several years, the growth potential of this herd over the next couple of years is low. Therefore, the 2014 hunting season is designed to allow buck hunting opportunity identical to 2012 and 2013, but foster herd growth. Issuance of doe/fawn tags has been increased slightly in HA 2 to allow the few landowners there wishing to control mule deer numbers that opportunity. The past four hunting seasons have seen a consistent take of about 125 mule deer does and about 15 fawns on general licenses. Another 45 or so antlerless mule deer have been harvested each of the past two years on type 6 licenses. This low level of female and juvenile mule deer harvest does not

[1] Trend counts not conducted in 2013 due to winter storm Atlas.

seem to warrant complicating the regulations further by segregating mule deer and white-tailed deer harvest on general licenses, a move opposed by many landowners.

Changes to the 2014 mule deer hunting season in the Black Hills included moving the closing date to November 21st from November 22nd in HA's 1, 2, & 3. This was done to maintain only three full weekends of deer hunting. Staying with the 22nd closing date would have added an additional Saturday to the season when compared to the previous 3 years; and returning to a Thanksgiving Day closing date would have added another full week and weekend of hunting to the season beyond what has been in place the past four years. Mule deer buck numbers are still too depressed to warrant such hunting pressure during the peak of the rut. Continuing with a Region A license quota identical to last year is also intended to limit harvest of mule deer bucks. The 2014 hunting season is expected to yield a 2014 postseason population of about 21,500 mule deer, which represents an 8% increase in the current post-season population. Such a change in the population would result in this herd being 7.5% above objective, but still below the number most hunters and landowners would like to see.

INPUT	
Species:	Mule Deer
Biologist:	Joe Sandrini
Herd Unit & No.:	Black Hills
Model date:	02/20/14

☑ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	276	285	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	134	195	☐ SCJ,SCA	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	25	119	☑ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population				Predicted Posthunt Population				Objective
	Field Est	Field SE		Juveniles	Total Males	Females	Total	Juveniles	Total Males	Females	Total	
1995				6573	3900	8723	19197	6511	1928	8147	16585	20000
1996			9750	6570	3521	8844	18936	6549	1761	8601	16912	20000
1997			6750	4092	2817	8672	15581	4057	1263	8331	13651	20000
1998			8835	7241	2907	8956	19104	7208	1363	8727	17299	20000
1999			13530	8751	4411	10713	23874	8738	2530	10509	21777	20000
2000			15780	8331	6097	12927	27355	8310	4098	12614	25023	20000
2001			9225	6659	5184	12473	24316	6611	3004	12133	21747	20000
2002			14715	8300	4648	12462	25411	8263	2638	12110	23010	20000
2003			19830	7692	4396	12503	24592	7619	1971	11935	21524	20000
2004			23685	9234	5115	13643	27992	9172	2365	12875	24413	20000
2005			25455	9490	6031	15026	30547	9421	3307	14148	26877	20000
2006			26880	11825	5800	15079	32704	11726	3234	14174	29133	20000
2007			24720	9678	5113	14476	29267	9611	2721	13226	25558	20000
2008			18030	9184	4251	13242	26677	9078	2167	12221	23466	20000
2009			14280	7784	3914	12518	24216	7731	2057	11304	21092	20000
2010			10965	6920	3307	11221	21447	6863	1945	10743	19552	20000
2011			6690	6458	3088	10619	20166	6411	1848	10390	18649	20000
2012			13215	7719	3031	10342	21091	7694	1652	10159	19505	20000
2013				8075	3134	10415	21623	8057	1627	10237	19920	20000
2014				7845	4011	11380	23235	7828	2504	11193	21525	20000
2015												20000
2016												20000
2017												20000
2018												20000
2019												20000
2020												20000
2021												20000
2022												20000
2023												20000
2024												20000
2023												20000
2025												20000
2026												20000

Survival and Initial Population Estimates

Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1995	0.57			0.86		
1996	0.40			0.86		
1997	0.90			0.86		
1998	0.90			0.86		
1999	0.90			0.86		
2000	0.40			0.86		
2001	0.63			0.86		
2002	0.52			0.86		
2003	0.90			0.86		
2004	0.87			0.86		
2005	0.63			0.86		
2006	0.40			0.86		
2007	0.40			0.86		
2008	0.45			0.86		
2009	0.40			0.86		
2010	0.41			0.86		
2011	0.45			0.86		
2012	0.45			0.86		
2013	0.65			0.86		
2014	0.40			0.86		
2015						
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2023						
2025						
2026						

Parameters:	Optim cells
Adult Survival =	0.856
Initial Total Male Pop/10,000 =	0.193
Initial Female Pop/10,000 =	0.815

MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

Classification Counts							Harvest					
Year	Juvenile/Female Ratio			Total Male/Female Ratio							Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1995		79.92	3.89	23.66	23.66	1.75	57	1793	524	2374	50.6	6.6
1996		76.14	4.31	20.48	23.72	2.02	19	1600	221	1840	50.0	2.7
1997		48.70	3.96	15.16	12.12	1.72	32	1413	310	1755	55.2	3.9
1998		82.60	5.37	15.62	16.25	1.90	30	1403	208	1641	53.1	2.6
1999		83.14	4.43	24.07	23.81	1.95	12	1710	185	1907	42.6	1.9
2000		65.88	3.60	32.49	33.77	2.31	19	1817	284	2120	32.8	2.4
2001		54.49	3.74	24.76	24.75	2.26	44	1982	309	2335	42.1	2.7
2002		68.23	3.32	21.78	21.79	1.60	34	1828	320	2182	43.3	2.8
2003		63.84	2.87	16.51	14.23	1.13	67	2205	517	2789	55.2	4.5
2004		71.24	3.83	18.37	24.79	1.93	56	2500	698	3254	53.8	5.6
2005		66.59	3.62	23.38	23.38	1.85	63	2476	798	3337	45.2	5.8
2006		82.73	4.20	22.82	25.67	1.94	90	2333	823	3246	44.2	6.0
2007		72.66	3.83	20.57	21.50	1.75	61	2175	1136	3372	46.8	8.6
2008		74.29	3.45	17.73	16.22	1.32	96	1894	929	2919	49.0	7.7
2009		68.39	4.70	18.20	19.16	2.09	48	1688	1104	2840	47.4	9.7
2010		63.88	3.99	18.10	17.45	1.76	51	1238	434	1723	41.2	4.3
2011		61.70	3.89	17.78	17.78	1.78	43	1128	208	1379	40.2	2.2
2012		75.73	4.11	16.26	16.26	1.55	23	1253	166	1442	45.5	1.8
2013		78.71	4.71	15.89	20.98	2.00	16	1370	162	1548	48.1	1.7
2014		69.94	4.27	22.37	18.10	1.81	15	1370	170	1555	37.6	1.6
2015												
2016												
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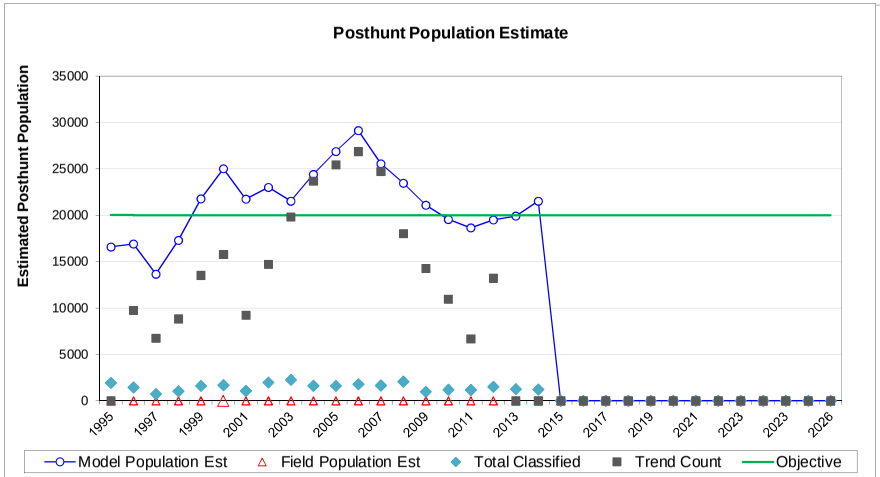
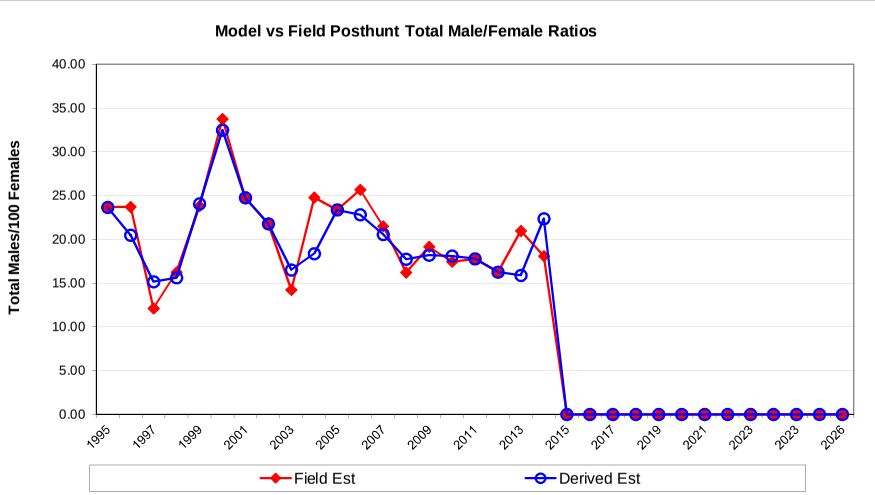
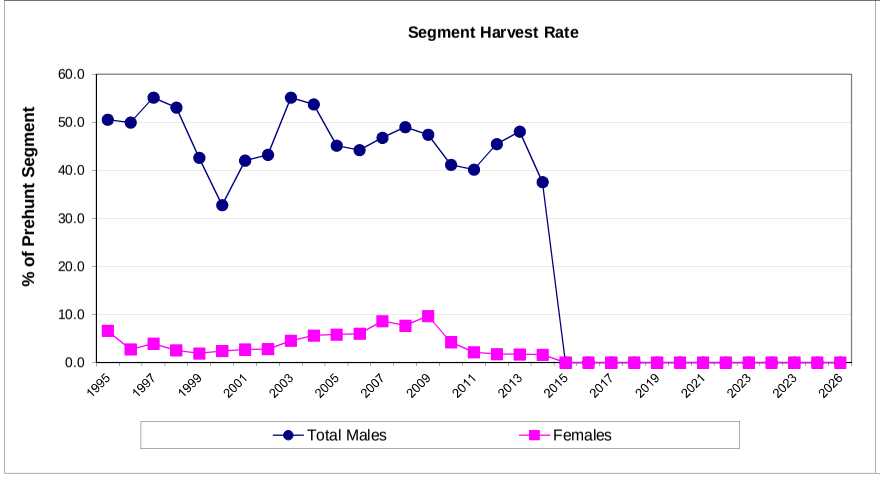
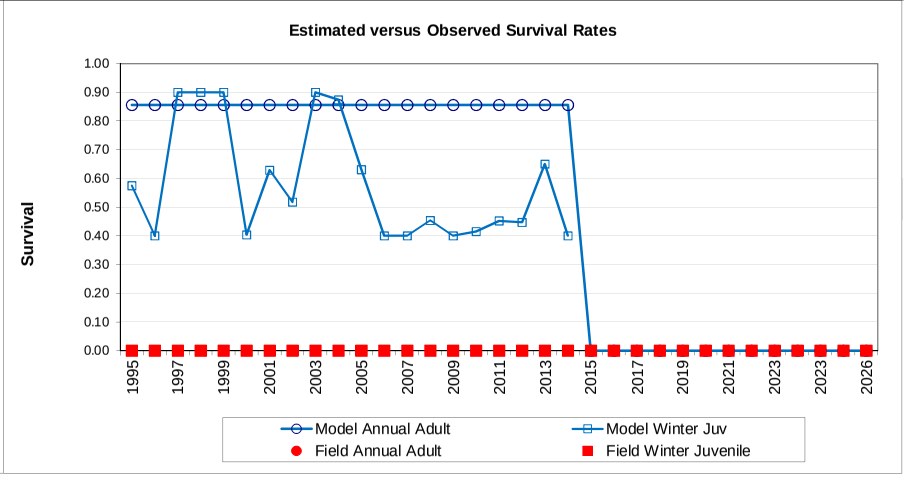
FIGURES









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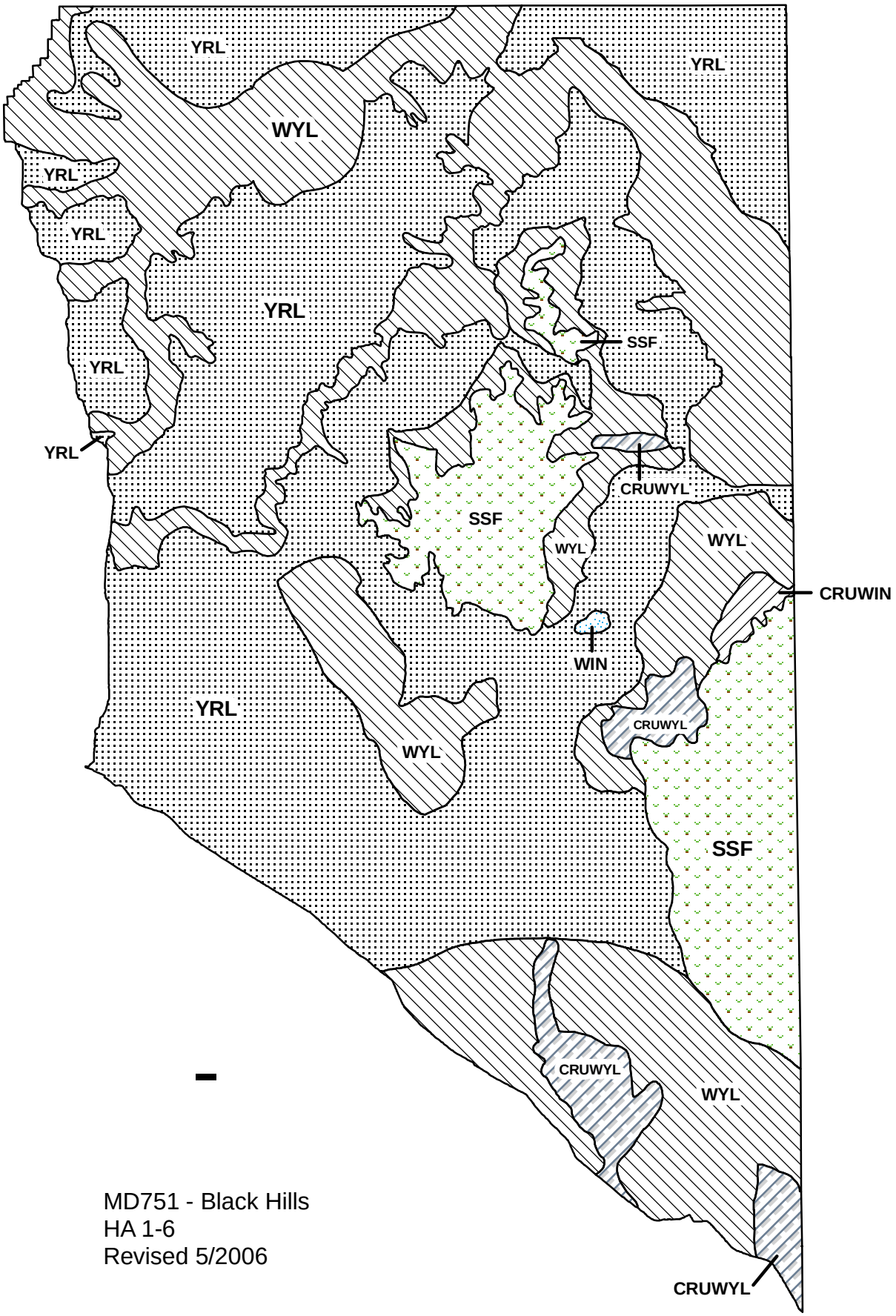


MD751 - Black Hills
HA 1-6
Revised 5/2006

2013 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2013 - 5/31/2014

HERD: MD755 - NORTH CONVERSE

HUNT AREAS: 22

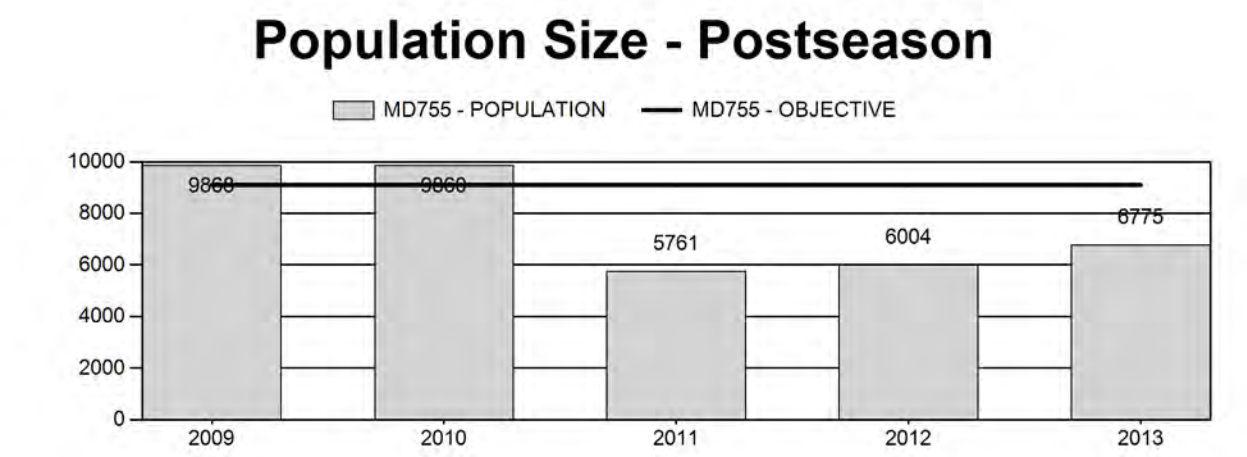
PREPARED BY: ERIKA PECKHAM

	2008 - 2012 Average	2013	2014 Proposed
Population:	8,383	6,775	6,946
Harvest:	715	323	240
Hunters:	839	498	350
Hunter Success:	85%	65%	69 %
Active Licenses:	896	528	325
Active License Percent:	80%	61%	74 %
Recreation Days:	3,340	2,237	1,300
Days Per Animal:	4.7	6.9	5.4
Males per 100 Females	46	25	
Juveniles per 100 Females	67	64	

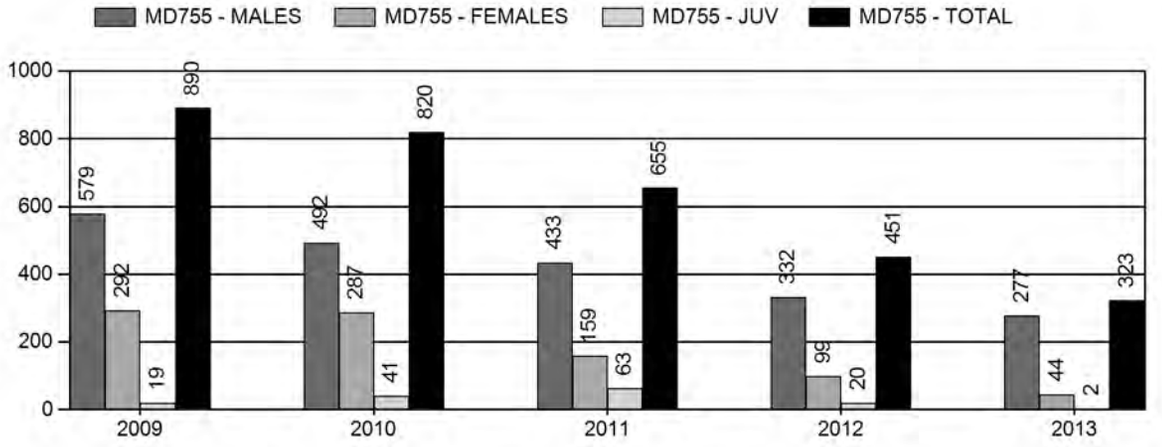
Population Objective:	9,100
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-25.5%
Number of years population has been + or - objective in recent trend:	1
Model Date:	03/04/2014

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

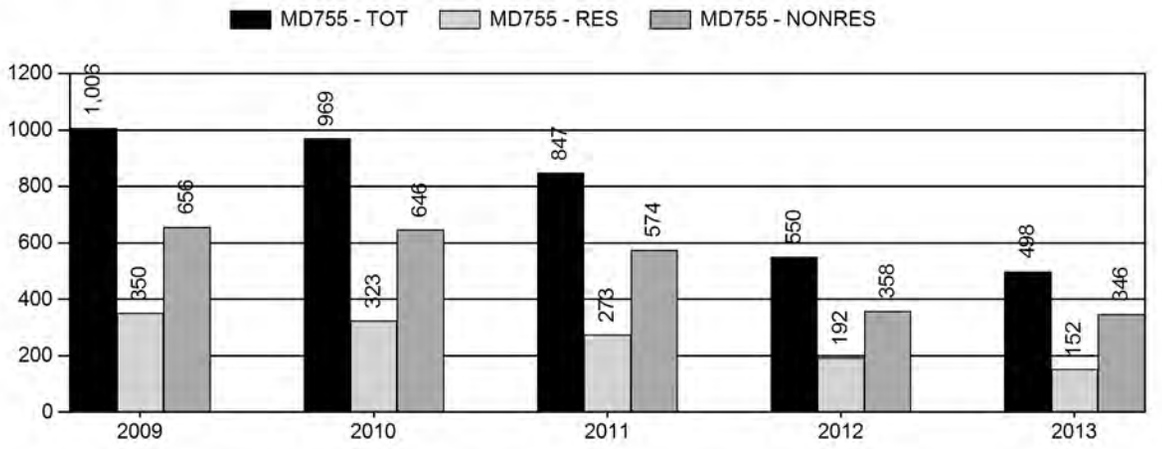
	JCR Year	Proposed
Females ≥ 1 year old:	3.3%	0%
Males ≥ 1 year old:	23.3%	16.4%
Juveniles (< 1 year old):	0%	0%
Total:	6.6%	3.4%
Proposed change in post-season population:	.3%	2.5%



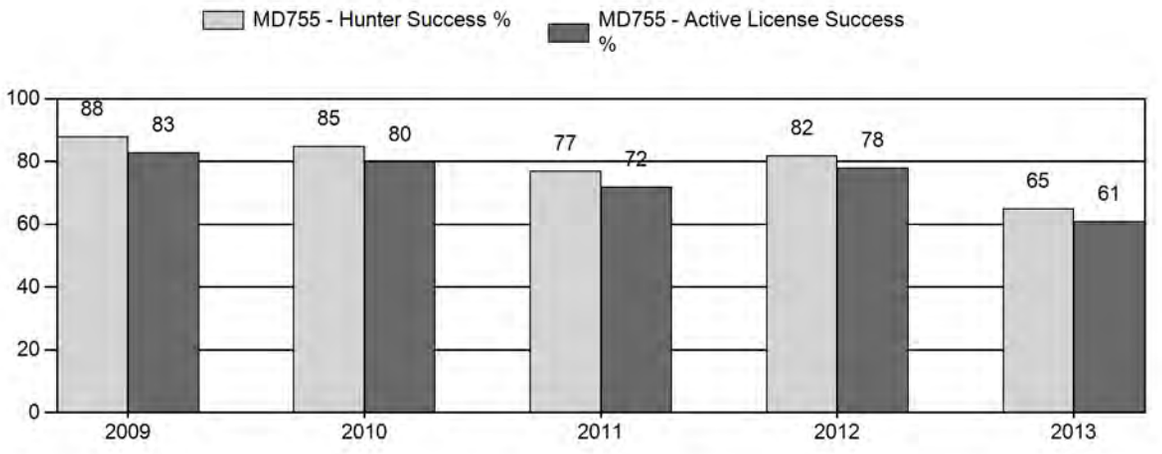
Harvest



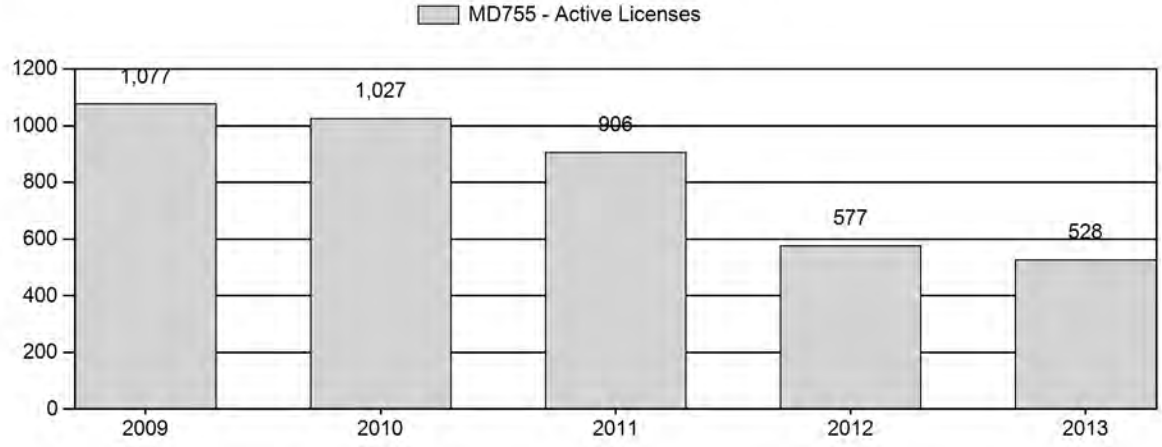
Number of Hunters



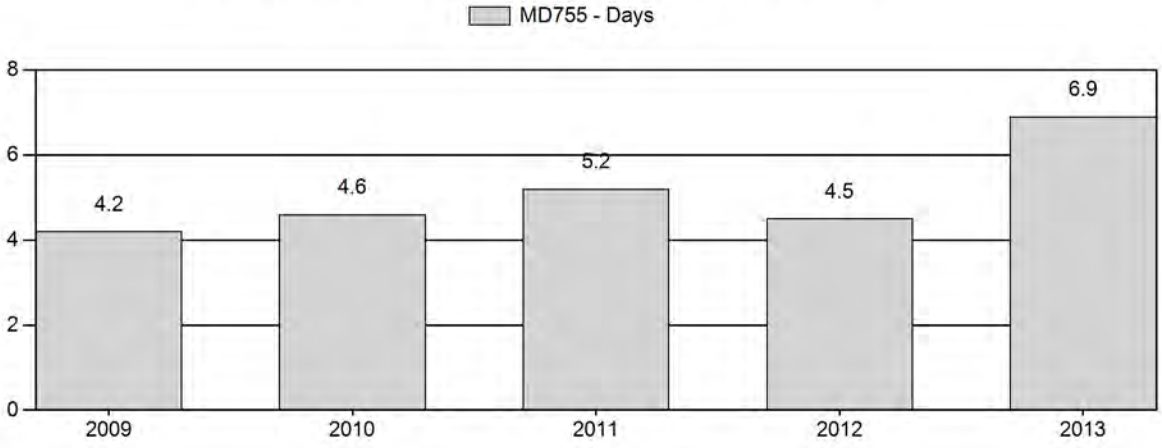
Harvest Success



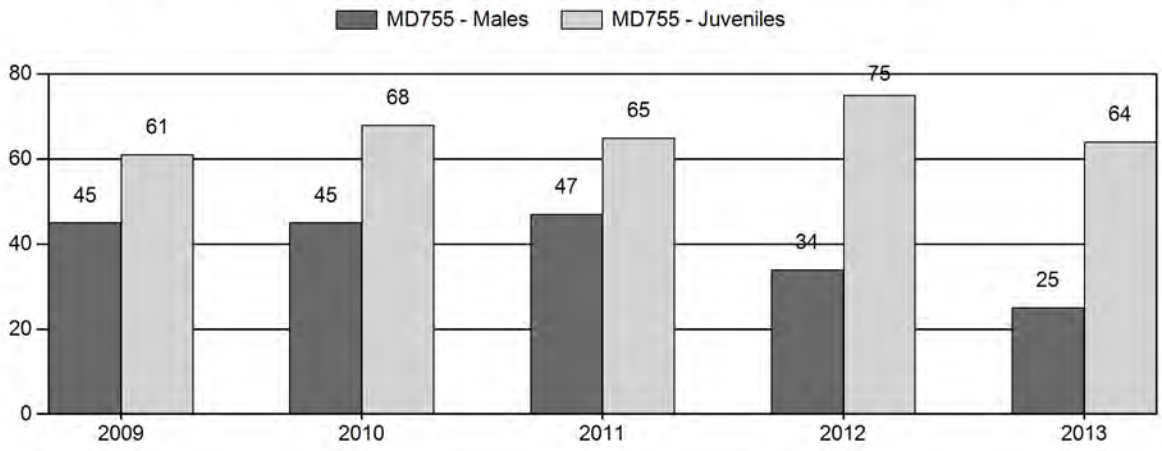
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2008 - 2013 Postseason Classification Summary

for Mule Deer Herd MD755 - NORTH CONVERSE

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	10,424	98	178	276	24%	524	45%	356	31%	1,156	1,975	19	34	53	± 5	68	± 6	44
2009	9,868	49	126	175	22%	393	49%	239	30%	807	1,351	12	32	45	± 5	61	± 6	42
2010	9,860	39	119	158	21%	349	47%	237	32%	744	850	11	34	45	± 5	68	± 7	47
2011	5,761	26	94	120	22%	257	47%	166	31%	543	1,276	10	37	47	± 6	65	± 8	44
2012	6,004	23	44	67	16%	198	48%	149	36%	414	1,216	12	22	34	± 6	75	± 10	56
2013	6,775	30	39	69	13%	275	53%	176	34%	520	1,095	11	14	25	± 4	64	± 8	51

2014 HUNTING SEASONS
NORTH CONVERSE MULE DEER HERD (MD755)

Hunt Area	Type	Dates of Seasons Opens	Closes	Quota	Limitations
22	1	Oct. 1	Oct. 14	400	Limited quota licenses; antlered mule deer or any white-tailed deer
Archery		Sep. 1	Sep. 30		Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2013
22	1	-200
	6	-100

Management Evaluation
Current Postseason Population Management Objective: 9,100
Management Strategy: Special
2013 Postseason Population Estimate: ~6,800
2014 Proposed Postseason Population Estimate: ~6,900

Herd Unit Issues

The North Converse Mule Deer herd has a postseason population objective of 9,100 mule deer and is managed under the special management strategy, with a goal of maintaining postseason buck ratios between 30-45 bucks per 100 does. The objective and management strategy were last revised in 1997, and are scheduled for review in 2015.

Public hunting access within the herd unit is poor, with only small tracts of accessible public land interspersed with predominantly private lands. High trespass fees and outfitting for mule deer are common on most ranches within this herd unit. As a result, licenses remain undersubscribed in years when issuance is elevated to increase harvest on an over-objective population. Primary land uses in this area include extensive oil and gas production, large-scale industrial wind generation, In-situ uranium production, and traditional cattle and sheep grazing. In recent years, expansion of oil shale development has dramatically escalated anthropogenic disturbance throughout this herd unit.

Weather

Weather conditions throughout 2012 and into 2013 were extremely dry and warmer than normal. The winter of 2012-2013 was mild, although the 2013-14 winter has been moderately hard to date with substantial precipitation and multiple sub-zero cold snaps. However, warm conditions often occurred in between the severe cold snaps which served to melt out lowlands and expose forage for wintering mule deer. An extremely large snowstorm occurred in early October of 2013 and produced two to three feet of snow in most areas. This storm (Winter Storm "Atlas") did not likely impact mule deer survival as it melted rapidly. However, it may have significantly impeded harvest rates in some portions of this herd unit as the storm coincided with the first week of the mule deer hunting season. In general, winter survival was thought to be good over the last bio-year. However, the extraordinary drought of 2012 resulted in pregnant females entering the 2012-2013 winter in poor condition, which was perhaps the most significant driver behind the relatively poor fawn production realized in 2013. Fortunately, growing season moisture was markedly improved in 2013, which should benefit mule deer, especially pregnant females, through the 2013-2014 winter.

Habitat

Although there are no habitat transects in this herd unit, habitat conditions were exceptionally poor through 2012 due to the extreme drought. This was the driest year on record in most of Wyoming. Fortunately, growing season and summer/fall moisture was improved in 2013 which is allowing these rangelands to begin recovery. Given the reduced number of mule deer and sympatric pronghorn currently within this herd unit, which will result in reduced herbivory, habitat conditions should begin to improve. However, several consecutive years of improved precipitation will be needed to more completely rejuvenate habitats and provide better conditions for the long-term productivity of this mule deer herd.

Field Data

It has been increasingly difficult to meet classification sample sizes in this herd unit as it is not a budget priority for aerial surveys. Total number of animals classified has steadily decreased since 2009. Although 2013 saw a slight increase in number of animals classified, it was not significant. In 2013, the adequate sample size was 1,095 animals, yet only 520 mule deer were classified despite intensive ground coverage.

Overall, fawn production/survival has remained fairly consistent in this herd unit, with the 2013 ratio of 64 being just slightly below the 5-year average of 67. It should be noted that postseason fawn ratios are typically higher in this herd compared to all other adjacent herd units. This is thought to be attributed to intensive predator control efforts that are sustained throughout much of this herd unit due to widespread domestic sheep production. However, despite relatively higher postseason fawn ratios being observed in this herd unit, overall population trend has declined in this herd to nearly the same extent as adjacent herds. This suggests that while over-summer fawn survival seems to be elevated in this herd, over-winter fawn survival is likely poorer compared to surrounding herds.

Postseason buck ratios declined to 25 in 2013, which is well below special management strategy minimum criteria. Again, classification ratios should be viewed with caution as the sample size

was ~50% below what was needed to ensure adequacy. Regardless, it appears postseason buck ratios have declined considerably as the 2013 ratio was 45% below the 5-year average of 45. The 2013 buck ratio is the lowest on record for this herd since 1992. The noticeable decline in buck ratios further indicate this population has declined significantly in recent years.

Harvest

Overall harvest has declined precipitously in this herd unit as license issuance has decreased in lieu of population decline. The 2013 total harvest of 323 was by far the lowest total deer harvest ever obtained in this herd unit. From 1991 – 2010, an average of 564 bucks were harvested per year in this herd unit. The 2013 harvest of 277 was 51% lower than the long-term average. License success in 2013 (61%) also declined significantly compared to the previous 5-year average of 80%. This is the lowest license success this herd has experienced since 1992. In 2013, all Type 1 licenses were sold by the close of the season despite 277 (out of 600 issued) being available for leftover sales after the drawing. In addition, the days required to harvest an animal has been steadily climbing over the last few years. In 2013, hunters experienced the highest number of days per animal since 1992, with an average of 6.9 days/animal. This is well over the preceding 5 year average of 4.7 days/animal.

In 2013, 72% of hunters reported being either satisfied or very satisfied with their hunt, indicating a remarkably high level of satisfaction given the lack of public access and population decline. It should be noted that most hunters whom speak to Game and Fish personnel are advised to secure access on private land before purchasing a license in areas that have limited public access.

Type 1 licenses have been reduced significantly the past couple of years. As buck ratios are now decreasing while this population continues to decline, Type 1 licenses should continue to be reduced to ensure management prescription is designed to increase buck ratios back within special management criteria. Extensive landowner input has also indicated a strong preference for license reduction.

Population

The 2013 postseason population estimate was about 6,800 mule deer. This herd consistently remained above objective for several years (due to unsold licenses and a lack of public access) until substantial winter mortality occurred in bio-year 2010. This herd has since been on a declining trend as fawn production/survival has declined to moderate levels, and over-winter fawn survival and recruitment appears to be poor.

The “Semi Constant Juvenile – Semi Constant Adult Mortality Rate” (SCJ-SCA) spreadsheet model was chosen for the post-season population estimate of this herd. This model essentially had the lowest relative AIC (84) and most accurately depicted population trend based on field personnel perceptions and extensive landowner input. This model is considered to be of medium quality based on model fit, although managers strongly concur with simulated population trend. Regardless, given consistently inadequate classification sample sizes, observed buck ratios may not be accurate and therefore should not be used as a primary basis for assessing model quality.

Management Summary

The hunting season in this area has traditionally run from October 1st to October 14th. These season dates have generally been adequate to meet landowner desires while allowing a reasonable harvest. For 2014, the Department decreased the Type 1 quota by 200 licenses. In addition, the Type 6 licenses were removed.

If we attain the projected harvest of 240 individuals and experience normal fawn productivity, the predicted 2014 postseason population will likely increase slightly to 6,900 mule deer, which is 24% below objective.

INPUT	
Species:	Mule Deer
Biologist:	Erika Peckham
Herd Unit & No.:	North Converse
Model date:	03/02/14

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	Constant Juvenile & Adult Survival	80	89	☐ CJ,CA Model	
SCJ,SCA	Semi-Constant Juvenile & Semi-Constant Adult Survival	75	84	☑ SCJ,SCA M	
TSJ,CA	Time-Specific Juvenile & Constant Adult Survival	9	461	☐ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population				Predicted Posthunt Population				Objective
	Field Est	Field SE		Juveniles	Total Males	Females	Total	Juveniles	Total Males	Females	Total	
1993				2727	2753	5103	10584	2716	2143	4866	9725	9100
1994				3432	2513	4845	10790	3402	1868	4555	9825	9100
1995				3620	2449	4750	10820	3595	1879	4535	10008	9100
1996				4229	2507	4781	11517	4219	2016	4568	10803	9100
1997				3591	2781	4965	11337	3532	2182	4730	10443	9100
1998				4536	2751	4932	12218	4481	2121	4712	11314	9100
1999				4211	2936	5154	12301	4190	2253	4888	11331	9100
2000				3273	2976	5232	11481	3245	2276	4972	10493	9100
2001				2889	2760	5068	10717	2874	2136	4849	9859	9100
2002				2468	2547	4870	9884	2448	2001	4624	9073	9100
2003				2747	2325	4570	9642	2726	1802	4361	8889	9100
2004				2911	2224	4415	9550	2902	1671	4174	8747	9100
2005				3306	2156	4299	9760	3289	1617	4031	8936	9100
2006				2573	2206	4273	9052	2567	1588	3996	8150	9100
2007				3410	2001	4062	9473	3395	1445	3858	8698	9100
2008				2676	2086	4151	8913	2658	1507	3912	8076	9100
2009				2266	1955	4013	8234	2245	1318	3692	7255	9100
2010				2358	1689	3722	7770	2313	1148	3406	6868	9100
2011				2213	1561	3494	7269	2144	1085	3320	6549	9100
2012				2484	1465	3378	7326	2462	1100	3271	6832	9100
2013				2157	1557	3416	7130	2155	1252	3367	6775	9100
2014				2177	1611	3422	7210	2177	1347	3422	6946	9100
2015												9100
2016												9100
2017												9100
2018												9100
2019												9100
2020												9100
2021												9100
2022												9100
2023												9100
2024												9100
2025												9100

Survival and Initial Population Estimates

Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.50			0.86		
1994	0.50			0.86		
1995	0.50			0.86		
1996	0.50			0.86		
1997	0.50			0.86		
1998	0.50			0.86		
1999	0.50			0.86		
2000	0.50			0.86		
2001	0.50			0.86		
2002	0.50			0.86		
2003	0.50			0.86		
2004	0.50			0.86		
2005	0.50			0.86		
2006	0.50			0.86		
2007	0.50			0.86		
2008	0.50			0.86		
2009	0.50			0.86		
2010	0.50			0.86		
2011	0.50			0.86		
2012	0.50			0.86		
2013	0.50			0.86		
2014	0.50			0.86		
2015						
2016						
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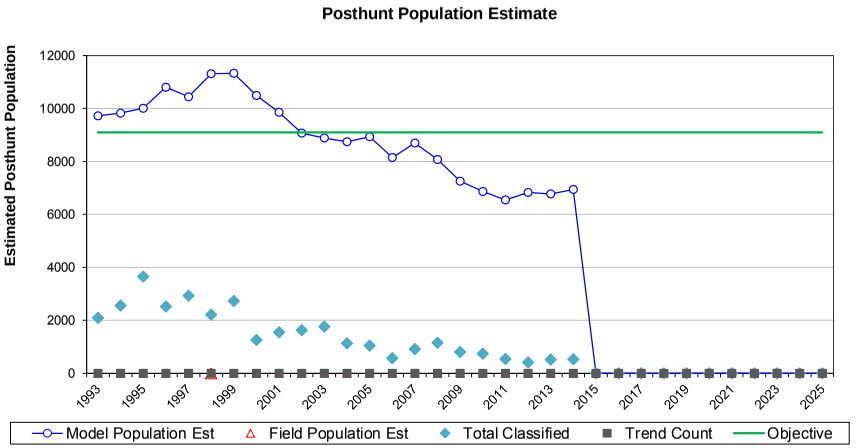
2025						

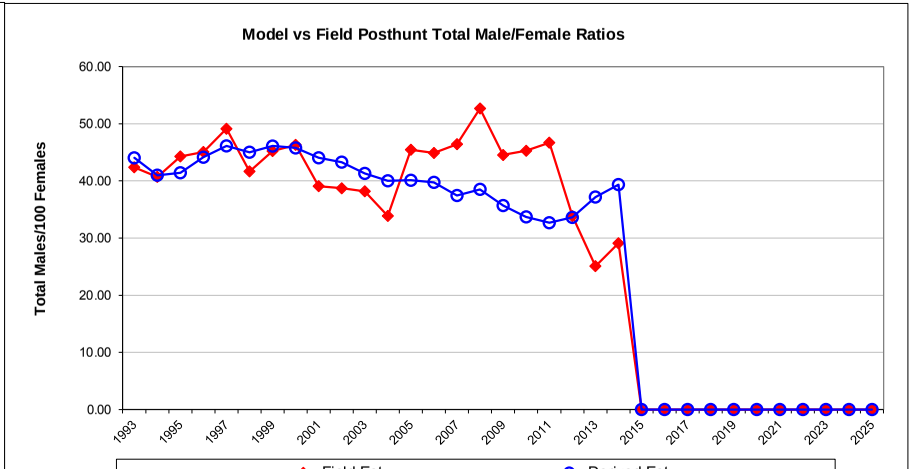
Parameters:	Optim cells
Juvenile Survival =	0.500
Adult Survival =	0.856
Initial Total Male Pop/10,000 =	0.214
Initial Female Pop/10,000 =	0.487

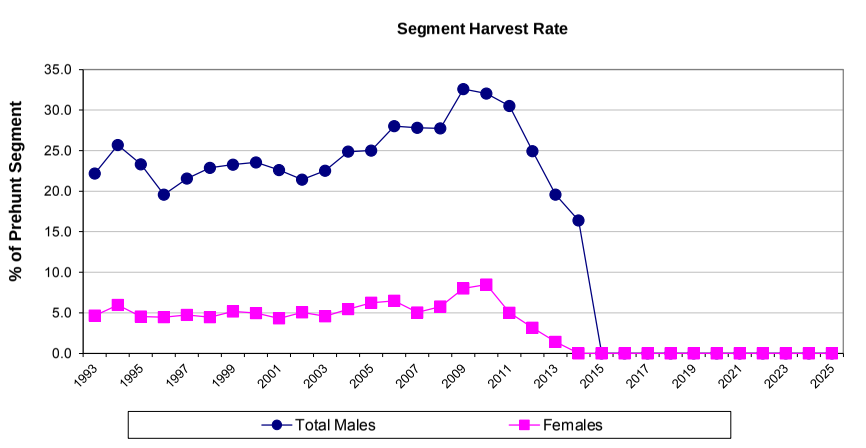
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

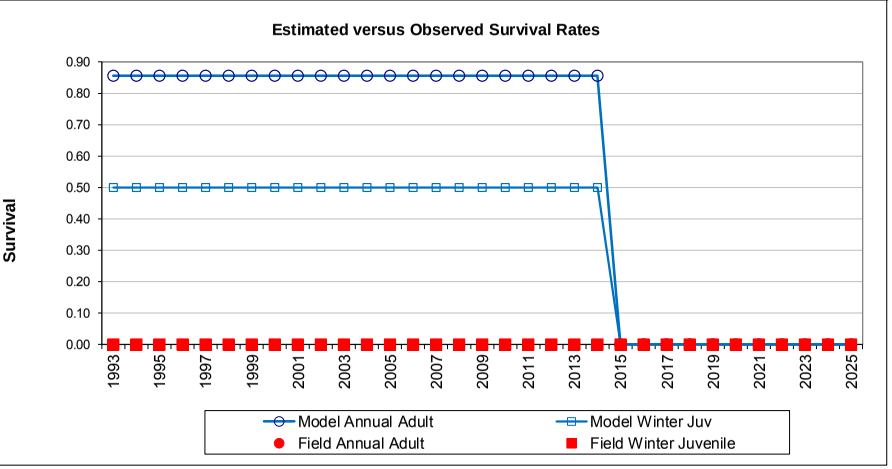
Classification Counts							Harvest					
Year	Juvenile/Female Ratio			Total Male/Female Ratio							Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		55.82	2.87	44.04	42.38	2.39	10	555	216	781	22.2	4.7
1994		74.68	3.31	41.00	40.71	2.19	27	587	263	877	25.7	6.0
1995		79.27	2.95	41.43	44.28	1.98	23	519	196	738	23.3	4.5
1996		92.38	4.09	44.14	45.06	2.48	9	446	194	649	19.6	4.5
1997		74.68	3.15	46.12	49.12	2.36	54	545	214	813	21.6	4.7
1998		95.09	4.45	45.02	41.67	2.51	50	572	200	822	22.9	4.5
1999		85.71	3.67	46.10	45.22	2.36	19	621	242	882	23.3	5.2
2000		65.27	4.25	45.77	46.31	3.37	25	637	236	898	23.5	5.0
2001		59.26	3.47	44.04	39.08	2.63	14	567	199	780	22.6	4.3
2002		52.94	3.09	43.29	38.71	2.51	18	496	224	738	21.4	5.1
2003		62.50	3.40	41.31	38.18	2.45	19	476	190	685	22.5	4.6
2004		69.53	4.60	40.02	33.87	2.85	8	503	219	730	24.9	5.5
2005		81.60	5.66	40.11	45.45	3.78	15	490	244	749	25.0	6.2
2006		64.23	6.20	39.75	44.89	4.87	6	562	252	820	28.0	6.5
2007		88.01	6.50	37.45	46.43	4.16	13	506	186	705	27.8	5.0
2008		67.94	4.67	38.53	52.67	3.92	17	526	218	761	27.7	5.8
2009		60.81	4.99	35.69	44.53	4.05	19	579	292	890	32.6	8.0
2010		67.91	5.72	33.71	45.27	4.34	41	492	287	820	32.0	8.5
2011		64.59	6.43	32.68	46.69	5.16	63	433	159	655	30.5	5.0
2012		75.25	8.16	33.62	33.84	4.78	20	332	97	449	24.9	3.2
2013		64.00	6.18	37.18	25.09	3.38	2	277	44	323	19.6	1.4
2014		63.64	6.15	39.36	29.09	3.70	0	240	0	240	16.4	0.0
2015												
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES









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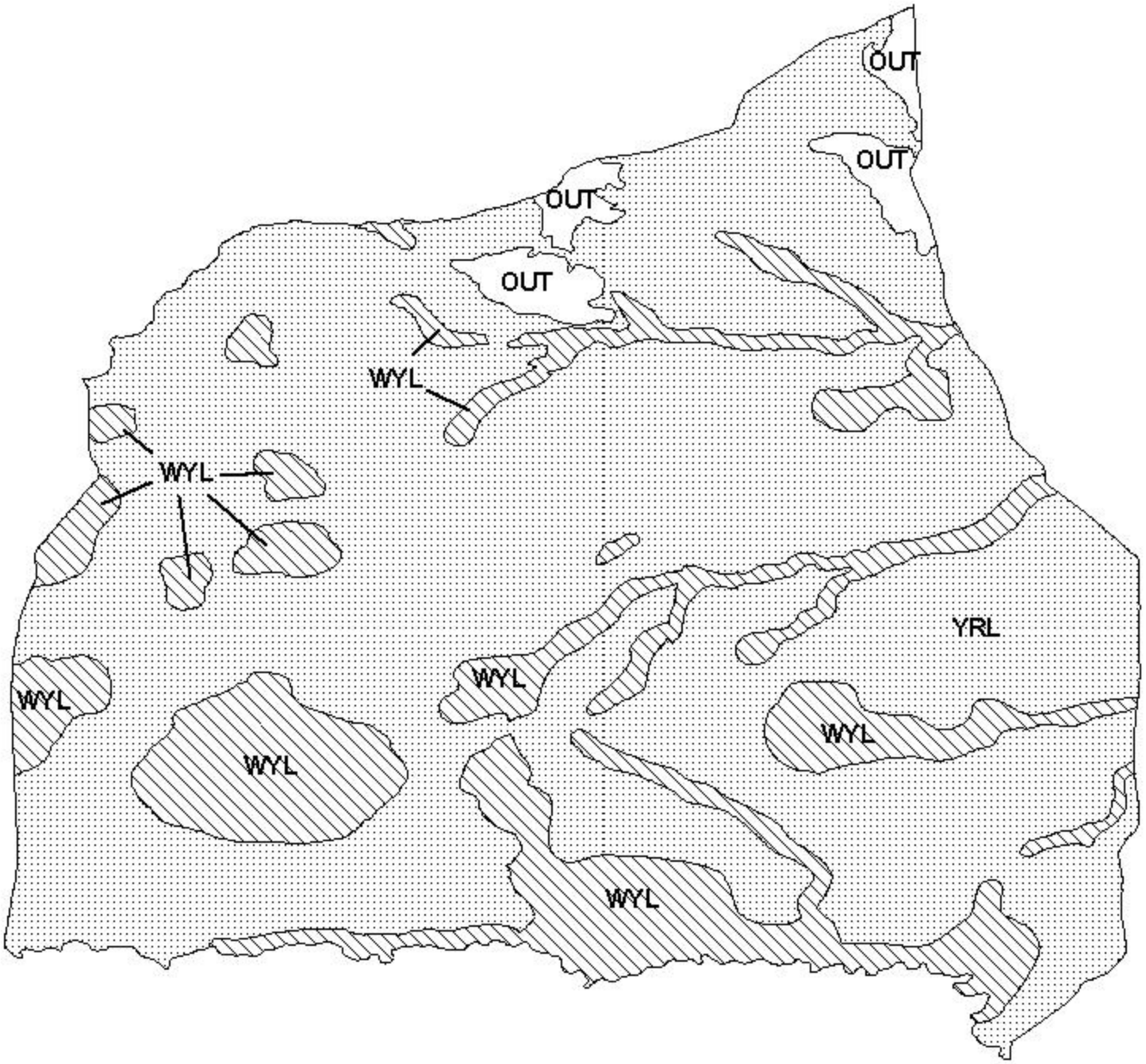


Mule Deer (MD755) - North Converse
HA 22
Revised - 98

2013 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2013 - 5/31/2014

HERD: MD756 - SOUTH CONVERSE

HUNT AREAS: 65

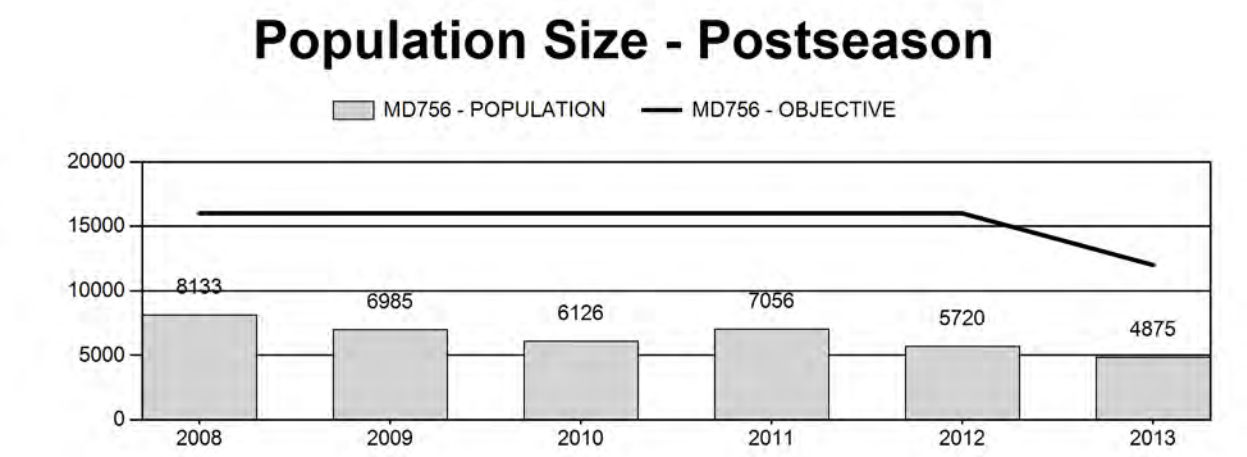
PREPARED BY: HEATHER O'BRIEN

	2008 - 2012 Average	2013	2014 Proposed
Population:	6,804	4,875	4,963
Harvest:	432	252	255
Hunters:	1,022	700	850
Hunter Success:	42%	36%	30%
Active Licenses:	1,036	700	850
Active License Percent:	42%	36%	30%
Recreation Days:	3,978	2,538	2,600
Days Per Animal:	9.2	10.1	10.2
Males per 100 Females	38	29	
Juveniles per 100 Females	49	46	

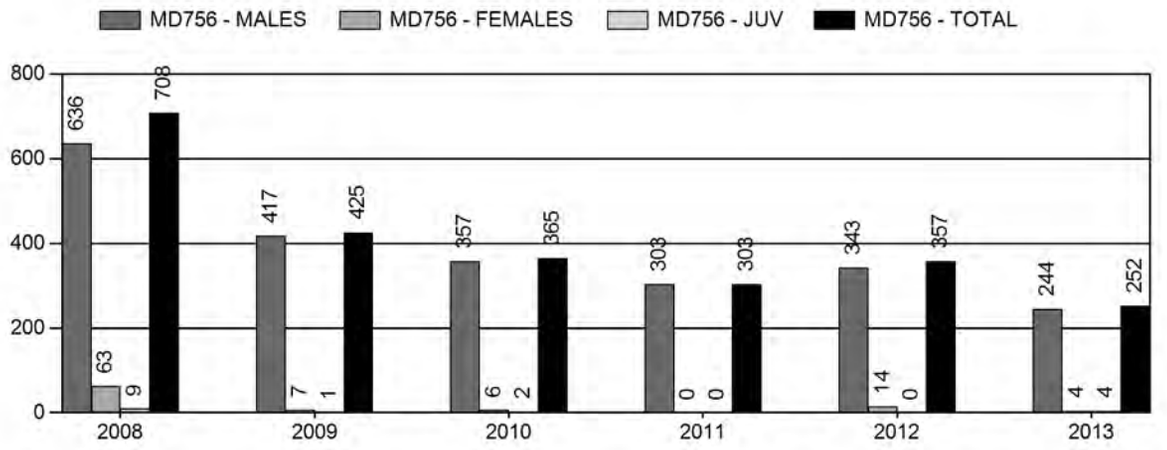
Population Objective:	12,000
Management Strategy:	Private
Percent population is above (+) or below (-) objective:	-59.4%
Number of years population has been + or - objective in recent trend:	13
Model Date:	3/5/2014

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

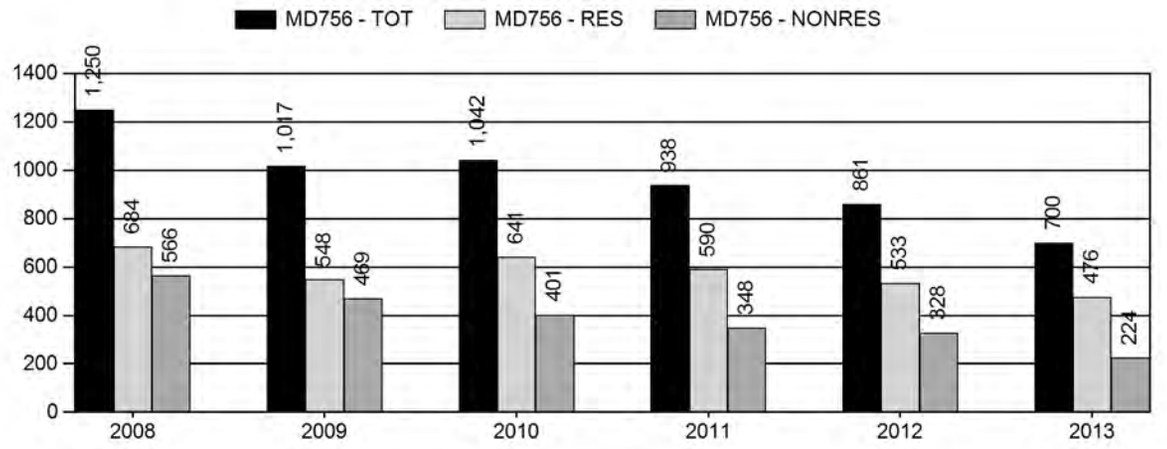
	JCR Year	Proposed
Females ≥ 1 year old:	0.15%	0%
Males ≥ 1 year old:	21.2%	21.0%
Juveniles (< 1 year old):	0.31%	0%
Total:	4.9%	4.8%
Proposed change in post-season population:	-14.6%	+1.8%



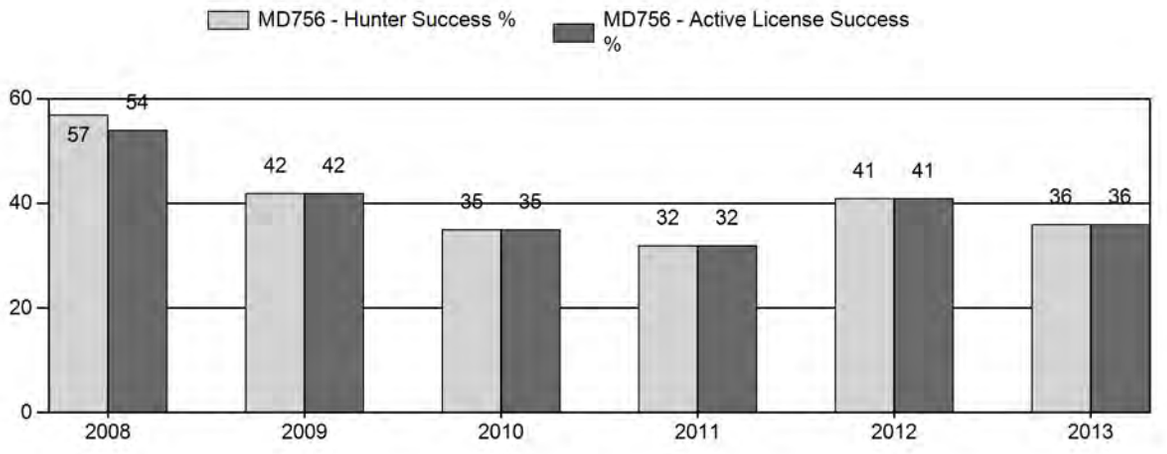
Harvest



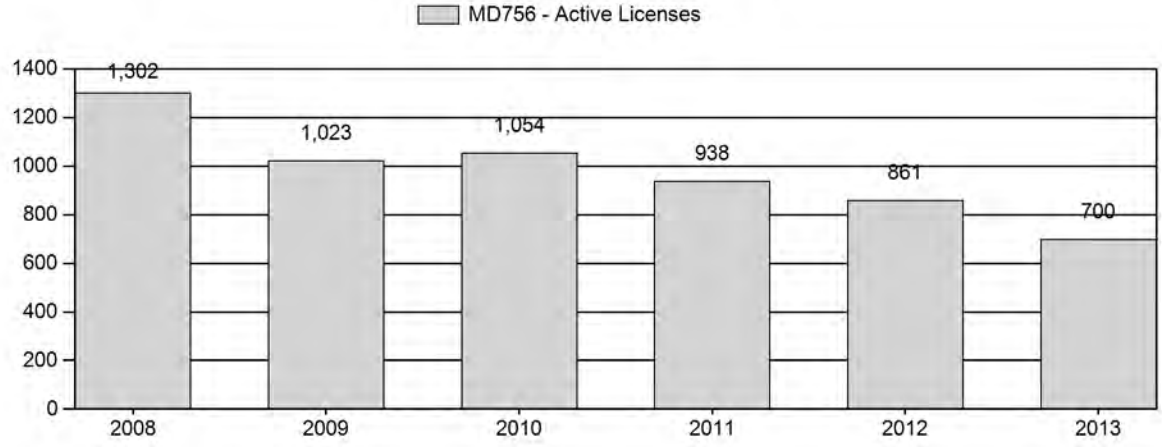
Number of Hunters



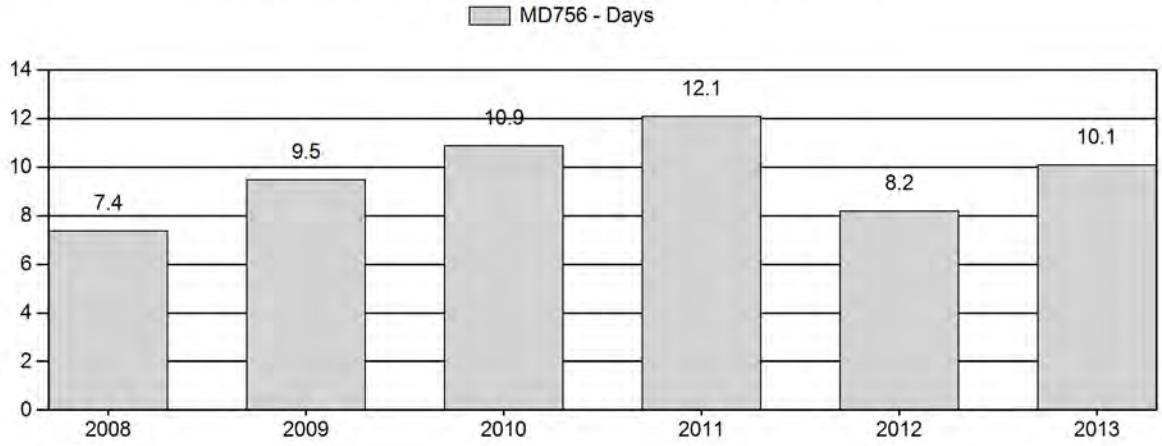
Harvest Success



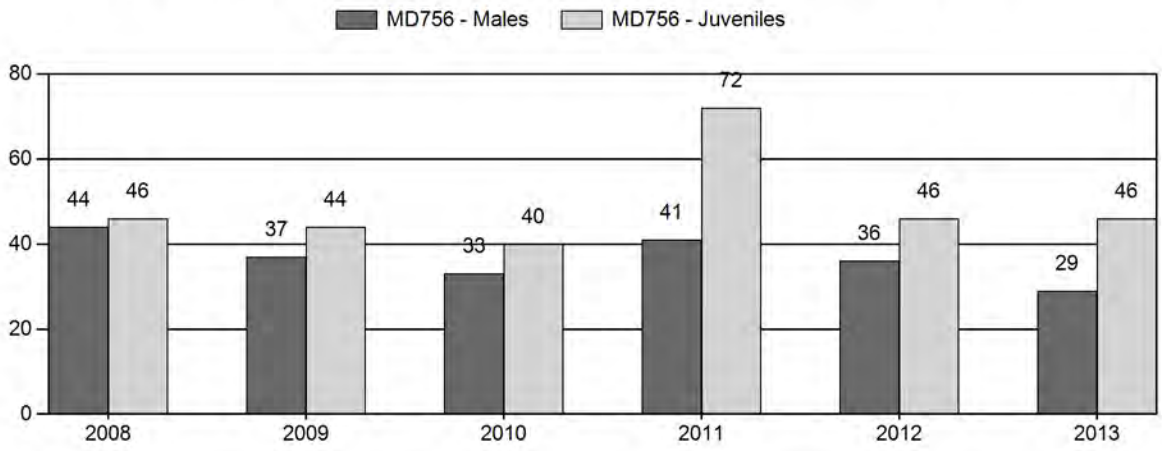
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2008 - 2013 Postseason Classification Summary

for Mule Deer Herd MD756 - SOUTH CONVERSE

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	8,133	63	183	246	23%	558	53%	256	24%	1,060	776	11	33	44	± 4	46	± 4	32
2009	6,985	57	149	206	20%	557	55%	243	24%	1,006	696	10	27	37	± 4	44	± 4	32
2010	6,126	84	154	238	19%	720	58%	287	23%	1,245	585	12	21	33	± 3	40	± 3	30
2011	7,056	83	167	250	19%	612	47%	441	34%	1,303	778	14	27	41	± 4	72	± 5	51
2012	5,720	89	163	252	20%	693	55%	318	25%	1,263	720	13	24	36	± 3	46	± 4	34
2013	4,875	64	90	154	17%	528	57%	245	26%	927	719	12	17	29	± 3	46	± 4	36

2014 HUNTING SEASONS
SOUTH CONVERSE MULE DEER (MD756)

Hunt Area	Type	Date of Seasons Opens	Closes	Quota	Limitations
65		Oct. 15	Oct. 21		General license; antlered mule deer or any white-tailed deer
Archery		Sep. 1	Sep. 30		Refer to license types and limitations in Section 2

Region J Nonresident Quota: 900

Management Evaluation

Current Postseason Population Management Objective: 12,000
Management Strategy: Private Land
2013 Postseason Population Estimate: 4,900
2014 Proposed Postseason Population Estimate: 4,900

The South Converse Mule Deer Herd Unit has a postseason population management objective of 12,000 deer. The herd is managed using the private land management strategy, as buck ratios are difficult to influence with hunting seasons as the majority of mule deer occupy private lands.. The objective and management strategy were last revised in 2013.

Herd Unit Issues

Hunting access within the herd unit is marginal, with tracts of public land and national forest interspersed with predominantly private lands. The main land use is traditional ranching and grazing of livestock, with agricultural fields that have the potential for damage issues when big game are abundant. Doe/fawn licenses have historically been issued to address damage, but are not currently necessary for mule deer. Disease issues are a concern within this herd unit in particular, as the prevalence of Chronic Wasting Disease (CWD) is higher here than any other area in Wyoming or adjacent states. Research investigating population-level effects of recently concluded its fourth and final year within the herd unit. Please refer to Appendix A of this report for further information regarding CWD and ongoing research in the South Converse Herd Unit.

Weather

The winter of 2010-2011 was very harsh throughout the herd unit. Overwinter mortality was above average and losses from all age classes of mule deer continued through spring. Conditions were warm and dry for the herd unit in 2011 and shrub production was below average, resulting

in poor nutrition of mule deer entering the winter of 2011-2012. Snow pack and resulting spring moisture was below average for the winter of 2011-2012 which likely had negative impacts on lactating does and their fawns. The summer of 2012 was the driest on record since 1904 in much of Wyoming, and extremely poor forage conditions contributed to very low fawn production and survival. The winter of 2012 continued the trend with very low snow accumulation and snow pack. April of 2013 finally saw a break in the drought, when temperatures dropped below normal for the entire month and significant precipitation was received. This cooler and wetter pattern continued through the summer of 2013. Despite improved conditions during the growing season, fawn production and survival were still very poor. In early October 2013, winter storm "Atlas" blanketed the herd unit with 12-36" of wet snow. The early winter months of 2013-2014 brought temperature and precipitation conditions near the recent 30-year average. For detailed weather data see http://www.ncdc.noaa.gov/gac/time-series/us.

Habitat

This herd unit has three established habitat transects that measure production and utilization on True Mountain Mahogany (*Cercocarpus montanus*); however no data were collected in 2013. Comparable transects measured in 2013 in the adjacent Bates Hole Mule Deer Herd Unit showed below-average production and moderate utilization on True Mountain Mahogany. It is thus presumed that below-average shrub and herbaceous plant production were prevalent in the South Converse Herd Unit. As a result, lactating does and fawns in particular are likely to have suffered diminished nutrition during the last growing season.

Field Data

Fawn ratios were moderate in this herd from 2000-2007, and the population fluctuated between approximately 8,000 and 12,000 deer during this time period. The general license season during this time period was 11 days, and issuance of doe/fawn licenses ranged from 50 to 400 licenses. A more liberal season was instituted in 2008, lengthening the season to 17 days and offering 200 doe/fawn licenses. From 2008-2013, fawn ratios were extremely poor (40s per 100 does), with the exception of 2011 when the fawn ratio spiked to 72 fawns per 100 does. The population has gradually declined since 2008 from approximately 8,000 to 5,000 deer. In accordance, the general license season was shortened to 7 days and doe/fawn licenses were eliminated.

Buck ratios within the South Converse Herd historically average in the 30s-40s per 100 does, exceeding management goals. These ratios seem counterintuitive, as current CWD research references higher prevalence in males than females (Farnsworth et al, 2005). High buck ratios in this unit are a function of limited access to hunting on private lands, where a minimal level of harvest pressure on bucks is typical. In 2013, the buck ratio dropped to a 15-year low of 29 bucks per 100 does.

Since 2008, bucks classified in the South Converse Mule Deer Herd Unit have been further categorized based on antler size (see Figure 1). 2009 represented the best distribution of mature buck classes, with 58% Class I (small), 33% Class II (medium), and 9% Class III (large) bucks. Bucks classified in 2013 showed a decrease in antler quality compared to previous years. Class III bucks represented 9% of the total classified, but Class II bucks represented only 19% of those surveyed, leaving the majority (72%) of bucks classified as smaller, Class I bucks. This skew towards smaller and presumably younger bucks may be due to greater harvest pressure on larger bucks, or fewer bucks in older age classes resulting from CWD and other sources of mortality.

Bio-Year	Total Class N for HA	# Bucks Classified					Buck Ratios per 100 Females					
		Ylng	Class I	Class II	Class III	Total	Ylng	Class I	Class II	Class III	All Adult	Total
2008	1,060	63	136 (72%)	43 (23%)	4 (2%)	246	11	24	8	1	33	44
2009	1,006	57	98 (65%)	41 (28%)	10 (7%)	206	10	18	7	2	27	37
2010	1,245	84	89 (58%)	51 (33%)	14 (9%)	238	12	12	7	2	21	33
2011	1,303	83	99 (59%)	57 (34%)	11 (7%)	250	14	16	9	2	27	41
2012	1,463	111	124 (68%)	36 (20%)	20 (11%)	291	14	16	5	3	23	37
2013	927	64	65 (72%)	17 (19%)	8 (9%)	154	12	12	3	2	17	29

Figure 1. Antler classification analysis within the South Converse Mule Deer Herd Unit, 2008-2013.

Harvest Data

Hunter success in this herd averaged between 50 and 60 percent from 1998-2008. Harvest success has been much lower in recent years (32-42%) with declines in deer numbers, and was 36% in 2013. Hunter days per animal generally climbed from 1998 to 2011 from 5.1 to 12.1 days. Days per animal improved slightly in 2012, which is likely due in part to the previous year's higher fawn production. In 2013 hunter days increased again, due in part to difficulties with poor weather and resulting poor access. Harvest success and hunter days are not expected to improve in this herd unit until fawn production improves and enhances the growth rate of this population over consecutive years.

Population

The 2013 postseason population estimate was approximately 4,900 and trending downward from an estimated high of 14,600 deer in 1998. Rates of adult survival were added to the model for 2010-2013 utilizing data collected as part of a graduate study of Chronic Wasting Disease within the herd unit. These data helped refine the model, making confidence in population estimates stronger.

The "Time-Specific Juvenile Survival – Constant Adult Survival" (TSJ,CA) spreadsheet model was chosen for the postseason population estimate of this herd. This model seemed the most representative of the herd, as it selects for higher juvenile survival during years when field personnel observed more favorable environmental and habitat conditions. The simpler models (CJ,CA and SCJ,CA) select for a very low juvenile survival rate, which does not seem feasible for this herd. All three models follow a trend that seems representative for the herd unit. However, the CJ,CA and SCJ,CA models estimate a larger population overall which do not seem realistic compared to historic and current perceptions of field personnel. While the TSJ,CA model has the highest AIC, it is still within one order of magnitude of the other model AICs. With the addition of survival data from collared deer, the model is considered to be of good quality.

Management Summary

Opening day for hunting the South Converse Mule Deer Herd Unit has traditionally been October 15th, with closing dates that have changed to offer greater or lesser opportunity depending on the management direction desired. In recent years, general licenses have been valid for antlered mule deer only. Doe/fawn licenses are offered in years the herd is above management objective, or in cases where agricultural damage is an issue. The 2014 hunting season will consist of a short, seven-day season with no doe/fawn licenses, as the population is at a historic low. Until habitat conditions and weather allow for higher fawn production, this population will likely remain low and seasons will remain conservative.

If we attain the projected harvest of 255 bucks and fawn production/survival remain poor, this herd will likely remain stable but low. The predicted 2014 postseason population size of the South Converse Herd is approximately 4,900 mule deer, which is 59% below objective.

Citations

Farnsworth, M.L., L.L. Wolfe, N.T. Hobbs, K.P. Burnham, E.S. Williams, D.M. Theobald, M.M. Conner, & M.W. Miller. Human Land Use Influences Chronic Wasting Disease Prevalence in Mule Deer. Ecological Applications, 15(1): 119-126.

INPUT	
Species:	Deer
Biologist:	Heather O'Brien
Herd Unit & No.:	South Converse
Model date:	02/28/14

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	115	124	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	64	81	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	16	125	☑ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population			Total	Predicted Posthunt Population			Total	Objective
	Field Est	Field SE		Juveniles	Total Males	Females		Juveniles	Total Males	Females		
1993				3462	2531	7934	13928	3431	1224	7303	11959	16000
1994				3158	1644	6398	11199	3151	983	6128	10262	16000
1995				3728	1519	5543	10789	3728	931	5543	10201	16000
1996				5030	2406	6012	13448	5030	1775	6012	12818	16000
1997				5269	2594	5907	13769	5269	1795	5907	12971	16000
1998				7134	2458	5674	15266	7134	1748	5674	14556	16000
1999				5469	2794	5864	14127	5454	1763	5695	12912	16000
2000				3919	2712	5786	12417	3902	1833	5520	11255	16000
2001				2497	2565	5449	10511	2474	1846	5218	9538	16000
2002				2457	1938	4576	8971	2416	1326	4321	8063	16000
2003				2249	1606	3949	7804	2214	1116	3667	6997	16000
2004				2580	1869	3864	8313	2574	1316	3837	7727	16000
2005				2627	2098	4069	8794	2625	1635	4027	8287	16000
2006				2268	2261	4132	8661	2266	1694	4090	8050	16000
2007				2659	2345	4218	9222	2651	1667	4102	8420	16000
2008				1997	2497	4401	8895	1987	1797	4332	8116	16000
2009				1686	1887	3869	7441	1685	1428	3861	6974	16000
2010				1399	1608	3511	6518	1397	1215	3504	6116	16000
2011				2428	1579	3369	7376	2428	1246	3369	7042	16000
2012				1519	1460	3120	6099	1519	1082	3105	5706	16000
2013				1270	1150	2732	5152	1266	882	2728	4875	12000
2014				1336	1232	2676	5244	1336	952	2676	4963	12000
2015												12000
2016												12000
2017												12000
2018												12000
2019												12000
2020												12000
2021												12000
2022												12000
2023												12000
2024												12000
2025												12000

Survival and Initial Population Estimates

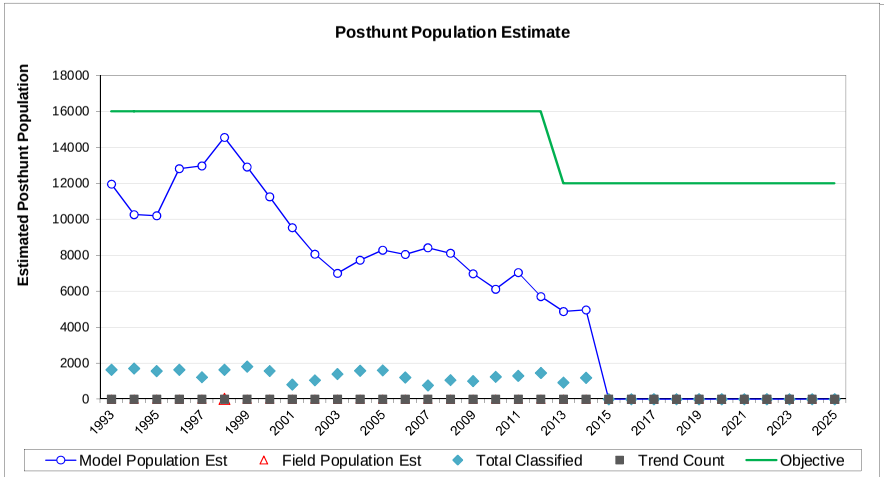
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.40			0.78		
1994	0.48			0.78		
1995	0.90			0.78		
1996	0.48			0.78		
1997	0.40			0.78		
1998	0.40			0.78		
1999	0.49			0.78		
2000	0.58			0.78		
2001	0.40			0.78		
2002	0.47			0.78		
2003	0.90			0.78		
2004	0.83			0.78		
2005	0.75			0.78		
2006	0.90			0.78		
2007	0.90			0.78		
2008	0.48			0.78		
2009	0.58			0.78		
2010	0.90			0.78	0.70	0.07
2011	0.40			0.78	0.65	0.10
2012	0.40			0.78	0.67	0.12
2013	0.86			0.78	0.73	0.14
2014	0.61			0.78		
2015						
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

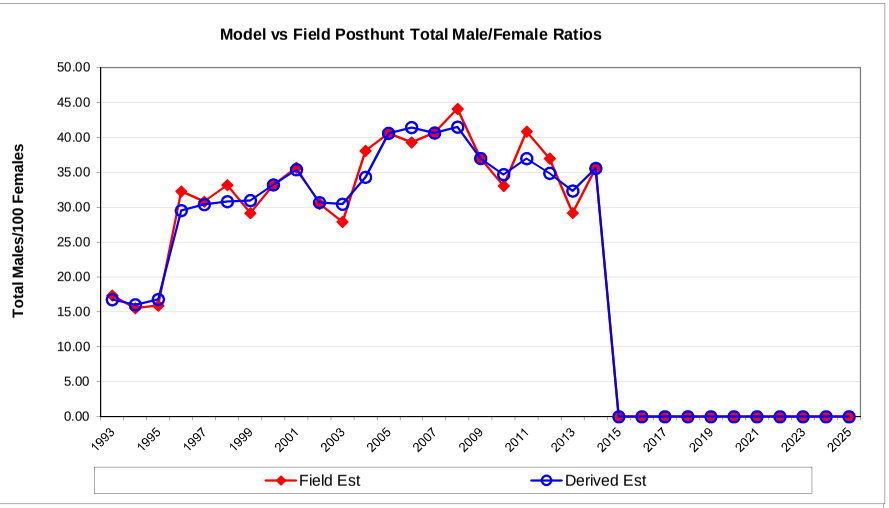
Parameters:	Optim cells
Adult Survival =	0.782
Initial Total Male Pop/10,000 =	0.122
Initial Female Pop/10,000 =	0.730

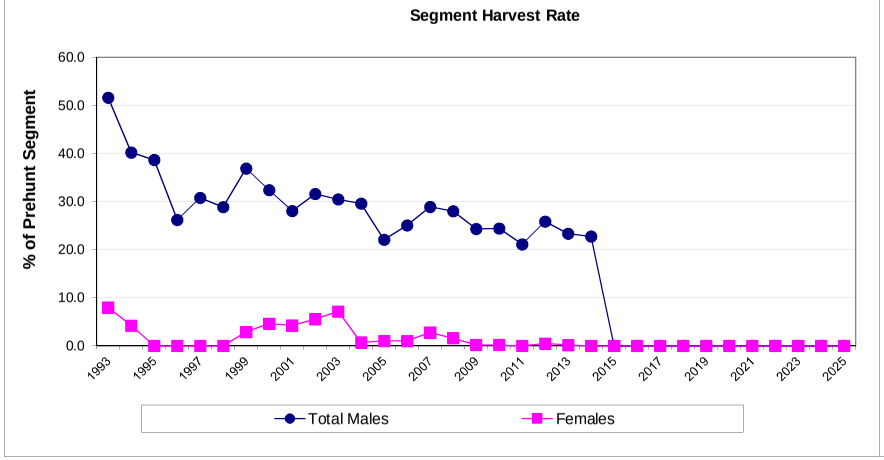
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

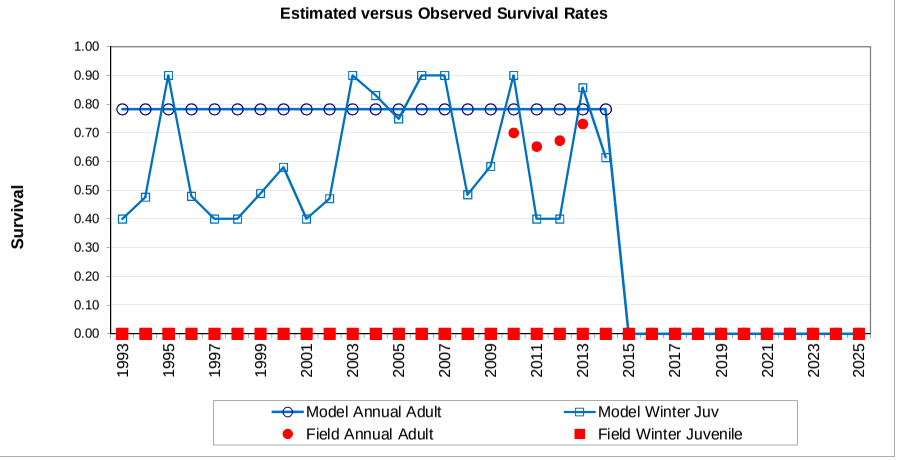
	Classification Counts										Harvest	
Year	Juvenile/Female Ratio			Total Male/Female Ratio							Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		46.99	2.63	16.76	17.37	1.43	28	1188	574	1790	51.6	8.0
1994		51.42	2.76	16.04	15.54	1.32	6	601	245	852	40.2	4.2
1995		67.25	3.63	16.80	15.91	1.47	0	534	0	534	38.7	0.0
1996		83.66	4.50	29.53	32.28	2.37	0	573	0	573	26.2	0.0
1997		89.19	5.51	30.39	30.81	2.69	0	726	0	726	30.8	0.0
1998		125.75	6.70	30.81	33.18	2.64	0	645	0	645	28.9	0.0
1999		95.78	4.82	30.96	29.16	2.16	13	937	154	1104	36.9	2.9
2000		70.69	3.96	33.20	33.20	2.40	15	799	242	1056	32.4	4.6
2001		47.40	3.97	35.38	35.67	3.30	21	654	210	885	28.0	4.2
2002		55.91	3.92	30.68	30.51	2.65	37	557	231	825	31.6	5.6
2003		60.38	3.61	30.44	27.90	2.19	32	445	256	733	30.5	7.1
2004		67.10	3.81	34.30	38.08	2.61	5	503	25	533	29.6	0.7
2005		65.17	3.71	40.59	40.59	2.70	2	421	38	461	22.1	1.0
2006		55.39	3.72	41.42	39.29	2.97	2	515	38	555	25.1	1.0
2007		64.63	5.32	40.64	40.69	3.90	7	616	106	729	28.9	2.8
2008		45.88	3.46	41.49	44.09	3.37	9	636	63	708	28.0	1.6
2009		43.63	3.35	36.99	36.98	3.02	1	417	7	425	24.3	0.2
2010		39.86	2.78	34.68	33.06	2.47	2	357	6	365	24.4	0.2
2011		72.06	4.50	36.97	40.85	3.07	0	303	0	303	21.1	0.0
2012		48.92	3.04	34.86	36.98	2.54	0	343	14	357	25.8	0.5
2013		46.40	3.59	32.33	29.17	2.67	4	244	4	252	23.3	0.2
2014		49.92	3.42	35.57	35.57	2.74	0	255	0	255	22.8	0.0
2015												
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES









Comments:

APPENDIX A

Chronic Wasting Disease in the South Converse Mule Deer Herd Unit: Prevalence and Management Concerns

The South Converse Mule Deer Herd Unit (Wyoming Hunt Area 65) has the highest prevalence of Chronic Wasting Disease (CWD) in Wyoming. High prevalence of CWD in mule deer is of particular concern to local wildlife managers, as mule deer herds statewide have declined due to a number of environmental factors. Managers are concerned that CWD may be an additive factor influencing mortality rates in the South Converse Herd, as it may be degrading the health of breeding-age females, suppressing conception rates, and affecting health and survivorship of neonates. Additionally, CWD may be adversely affecting deer survival due to behavioral changes - rendering infected deer more vulnerable to natural causes of mortality such as predation or exposure.

Hunter-harvested deer have been tested in this herd unit since 2001. It should be noted that hunter-harvested samples do not represent a random sample of this population. Rather, samples are biased towards younger age-class males, as hunting seasons have focused on antlered deer, and hunters who harvest larger mature bucks often decline sampling to preserve them for taxidermy. Thus, prevalence in hunter-harvested deer may not be representative of the herd as a whole, and may be biased low sa CWD prevalence generally increases with age-classes.

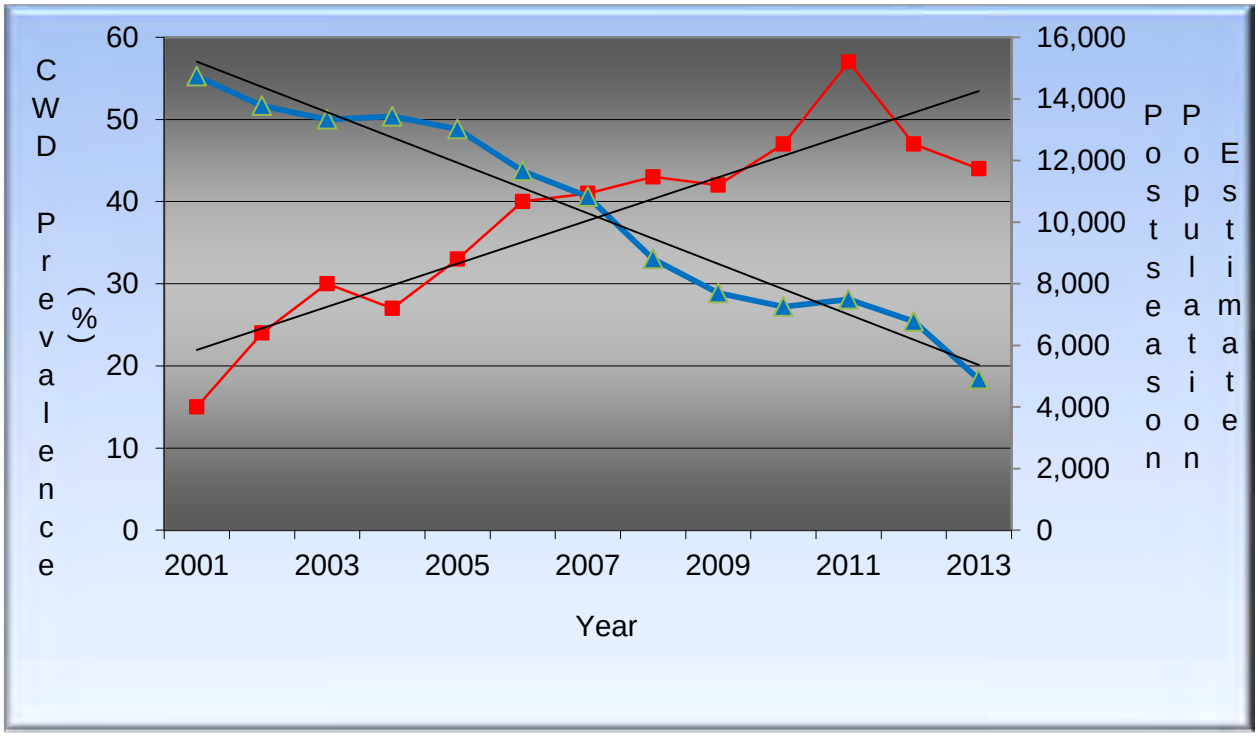
Since 2001, prevalence of CWD in hunter-harvested mule deer has increased significantly in the South Converse Mule Deer Herd, while the population has concurrently decreased (Table 1, Figure 1). Considering CWD is ultimately fatal in cervids, higher prevalence is suspected of having more adverse and perhaps additive impacts at the population level - either directly or indirectly. However, it is difficult to discern or quantify the impacts of CWD on this population without further study and analysis of recently completed research.

A collaborative research project was initiated in 2010 to investigate the effects of CWD on the South Converse Mule Deer Herd. Using GPS-collared deer, a number of variables have been explored to better understand the relationship between CWD and the dynamics of the population. This research is a cooperative effort of the United States Geological Survey, the University of Wyoming, and the Wyoming Game and Fish Department, and recently concluded its fourth and final field season. Results should become available and published as analysis is completed.

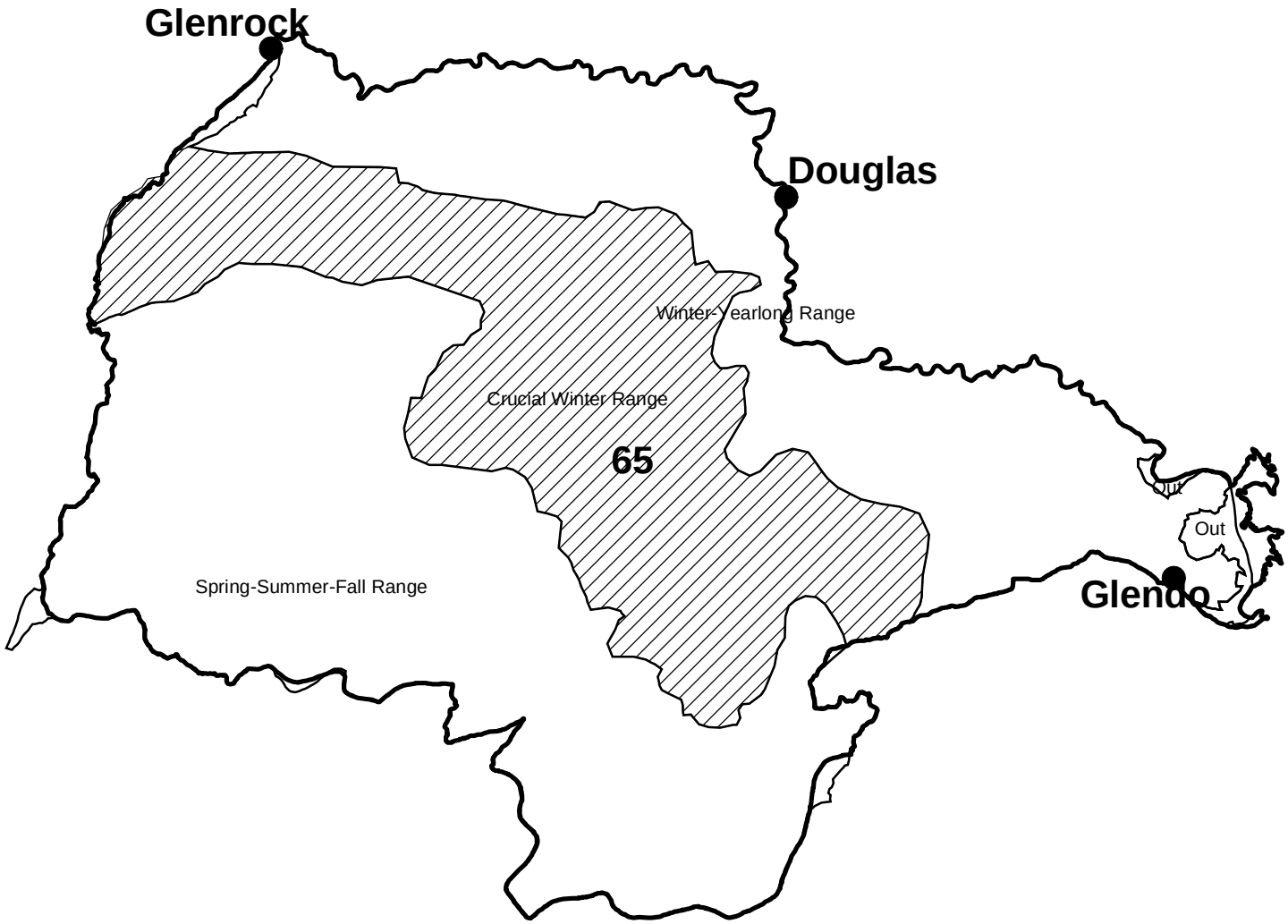
Table 1. CWD surveillance in hunter-harvested mule deer in the South Converse Herd Unit, 2001-2013.

Year	Total Harvest	N Tested	N Positive	**CWD Prevalence**
2001	885	81	12	**15%**
2002	825	98	23	**24%**
2003	733	155	46	**30%**
2004	533	52	14	**27%**
2005	461	88	29	**33%**
2006	555	81	32	**40%**
2007	729	74	30	**41%**
2008	708	44	19	**43%**
2009	425	48	20	**42%**
2010	365	42	20	**47%**
2011	303	35	20	**57%**
2012	357	30	14	**47%**
2013	252	41	18	**44%**

Figure 1. CWD prevalence of hunter-harvested mule deer and postseason population estimates for the South Converse Mule Deer Herd Unit, 2001-2013.



Mule Deer - South Converse
Hunt Area 65
Casper Region
Revised 3/94



2013 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2013 - 5/31/2014

HERD: MD757 - BATES HOLE/HAT SIX

HUNT AREAS: 66-67

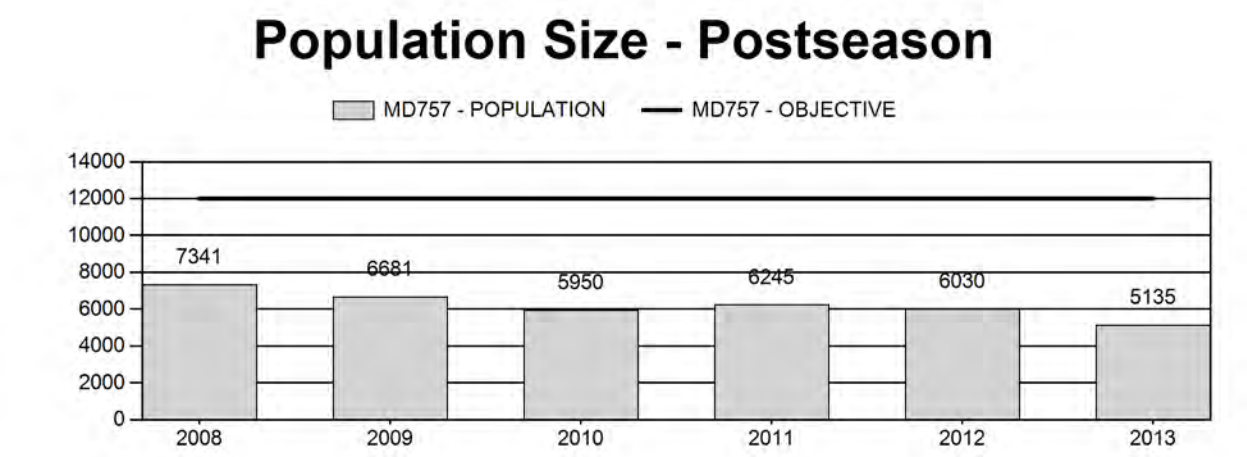
PREPARED BY: HEATHER O'BRIEN

	2008 - 2012 Average	2013	2014 Proposed
Population:	6,449	5,135	4,954
Harvest:	389	165	175
Hunters:	1,001	671	700
Hunter Success:	39%	25%	25%
Active Licenses:	1,005	671	700
Active License Percent:	39%	25%	25%
Recreation Days:	3,493	2,228	2,000
Days Per Animal:	9.0	13.5	11.4
Males per 100 Females	22	20	
Juveniles per 100 Females	58	56	

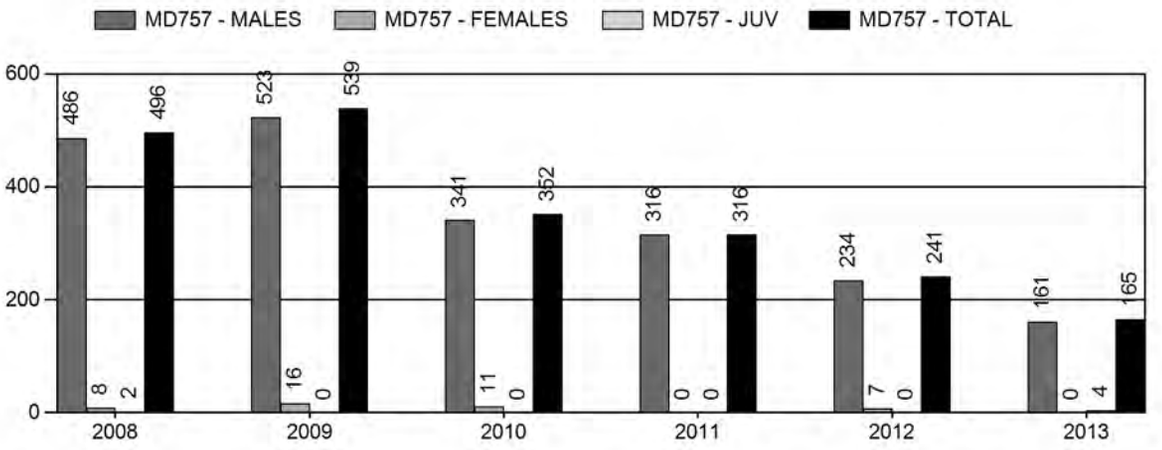
Population Objective:	12,000
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-57.2%
Number of years population has been + or - objective in recent trend:	20
Model Date:	03/05/2014

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

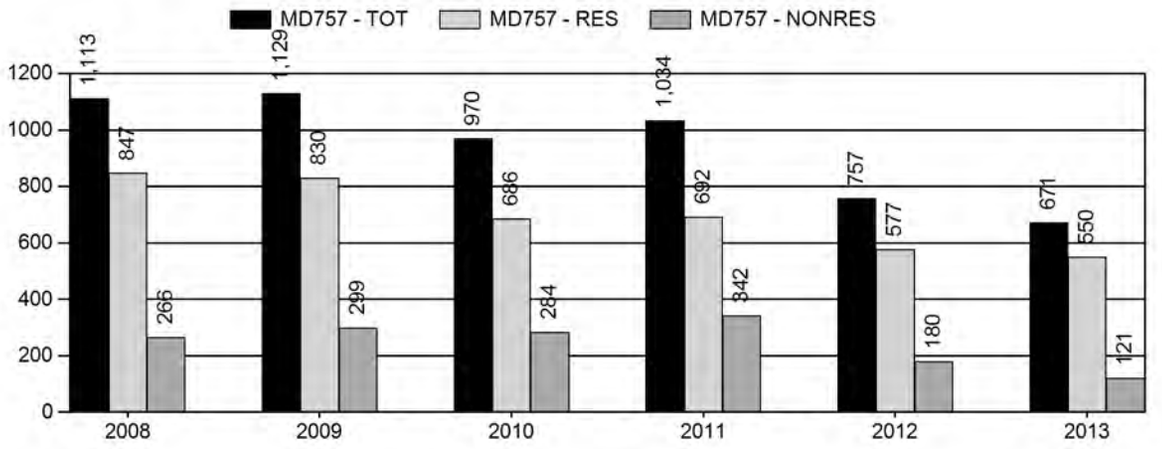
	JCR Year	Proposed
Females ≥ 1 year old:	0.1%	0%
Males ≥ 1 year old:	18.7%	19.6%
Juveniles (< 1 year old):	0%	0%
Total:	3.1%	3.4%
Proposed change in post-season population:	-4.2%	-3.5%



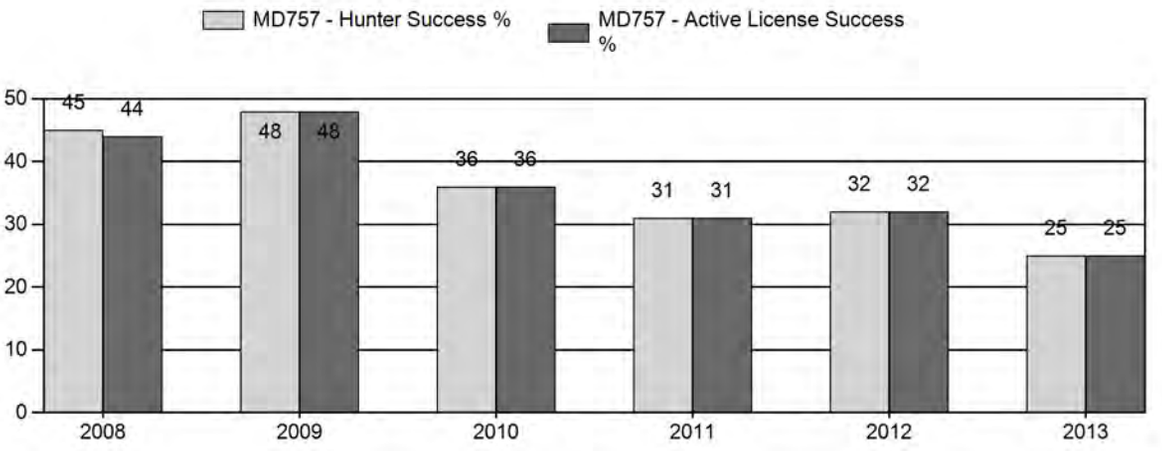
Harvest



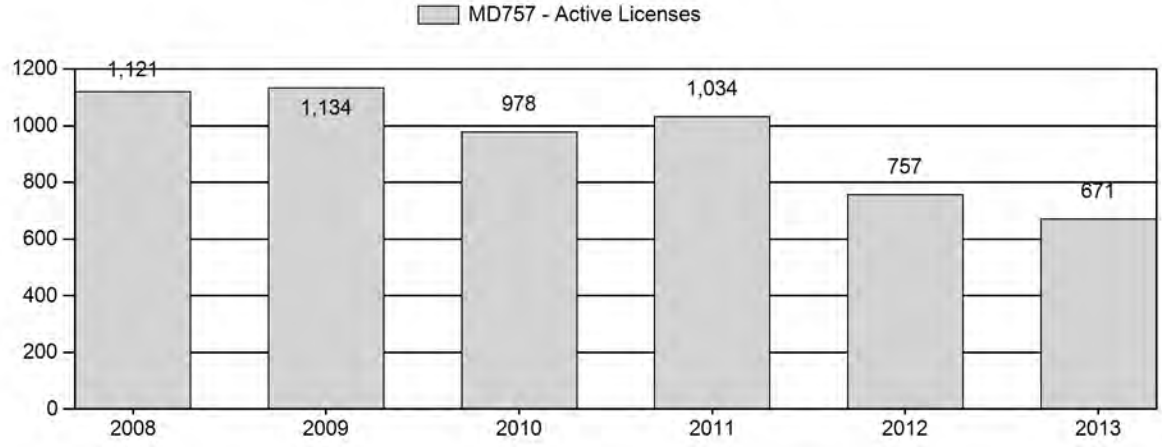
Number of Hunters



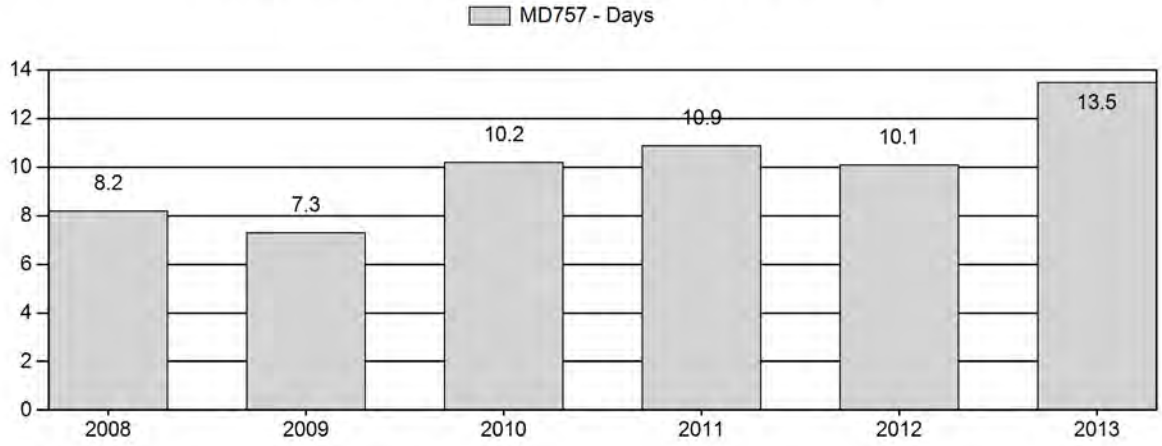
Harvest Success



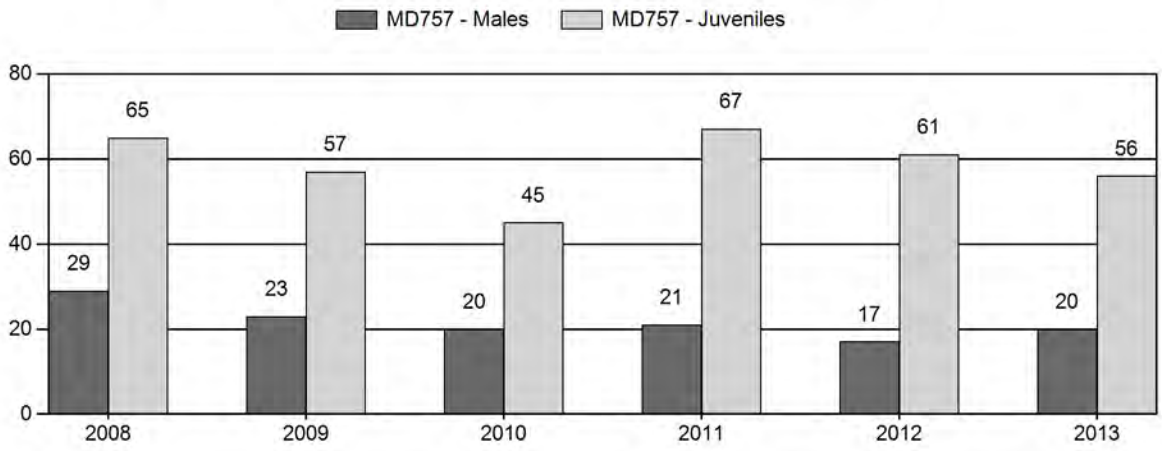
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2008 - 2013 Postseason Classification Summary

for Mule Deer Herd MD757 - BATES HOLE/HAT SIX

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	7,341	75	114	189	15%	647	52%	418	33%	1,254	1,166	12	18	29	± 3	65	± 5	50
2009	6,681	59	112	171	13%	730	55%	419	32%	1,320	934	8	15	23	± 2	57	± 4	47
2010	5,950	82	100	182	12%	894	60%	403	27%	1,479	642	9	11	20	± 2	45	± 3	37
2011	6,245	47	93	140	11%	666	53%	443	35%	1,249	698	7	14	21	± 2	67	± 5	55
2012	6,030	27	90	117	10%	689	56%	418	34%	1,224	650	4	13	17	± 2	61	± 4	52
2013	5,135	86	82	168	11%	845	57%	470	32%	1,483	959	10	10	20	± 2	56	± 3	46

2014 HUNTING SEASONS
BATES HOLE / HAT SIX MULE DEER (MD757)

Hunt Area	Type	Date of Seasons Opens	Closes	Quota	Limitations
66		Oct. 15	Oct. 21		General license; antlered mule deer three (3) points or more on either antler or any white-tailed deer
67					CLOSED
Archery		Sep. 1	Sep. 30		Refer to license type and limitations in Section 2.

Management Evaluation

Current Postseason Population Management Objective: 12,000
Management Strategy: Recreational
2013 Postseason Population Estimate: 5,100
2014 Proposed Postseason Population Estimate: 5,000

The Bates Hole / Hat Six Mule Deer Herd Unit has a postseason management objective of 12,000 deer. The herd is managed using the recreational management strategy, with a goal of maintaining postseason buck ratios between 20-29 bucks per 100 does. The objective and management strategy were last revised in 1990, and will be formally reviewed in 2015.

Herd Unit Issues

Hunting access within the herd unit is very good, with large tracts of public lands as well as a sizeable hunter management area. The main land use within the herd unit is traditional ranching and grazing of livestock. Very little industrial or energy development exists in this herd unit. Area 67, which includes the north-central portion of Casper Mountain, remains closed to hunting. Residents with small properties that dominate the hunt area are strongly opposed to hunting in their portion of the herd unit.

Weather

The winter of 2010-2011 was severe throughout the herd unit and likely resulted in higher mortality of mule deer. Conditions were warm and dry for the herd unit in 2011 and shrub

production was below average, resulting in poor nutrition of mule deer entering the winter of 2011-2012. Snow pack and resulting spring moisture was below average for the winter of 2011-2012 which likely had negative impacts on lactating does and their fawns. The summer of 2012 was the driest on record since 1904 in much of Wyoming, and the winter of 2012 continued the trend with very low snow accumulation and snow pack. Fawn survival over the severely dry summer and winter was low, as evidenced by extremely low yearling buck ratios in 2013. April of 2013 finally saw a break in the drought, when temperatures dropped below normal for the entire month and significant precipitation was received. This cooler and wetter pattern continued through the summer of 2013. In early October 2013, winter storm "Atlas" blanketed the herd unit with 12-36" of wet snow. Lingering snow and resulting muddy conditions made accessing deer difficult in many locations, and it was apparent winter storm Atlas had a negative impact on hunter participation and harvest success. The early winter months of 2013-2014 brought temperature and precipitation conditions near the recent 30-year average. For detailed weather data see http://www.ncdc.noaa.gov/gac/time-series/us.

Habitat

This herd unit has several established transects that measure production (N=6) and utilization (N=7) on True Mountain Mahogany (*Cercocarpus montanus*). Average leader growth in 2013 on mahogany was 0.59 inches (14.99 mm). While production was improved compared to 2012, average leader growth in 2013 was still considered below average. Utilization was moderate, with an average of 20% leaders browsed per shrub. Below-average herbaceous plant production may have been the result of plant senescence despite good moisture during the growing season. However, some portions of the herd unit appeared to be in better condition resulting from more frequent rain events – in particular those areas south of Muddy Mountain and at slightly higher elevation in Bates Hole. Better habitat conditions in this portion of the herd unit may have improved spring and summer fawn survival, and may account for the higher fawn ratio in this herd unit compared to adjacent units.

Field Data

Fawn production/survival were relatively good in this herd from 1998-2005. The population remained relatively stable, until increased issuance of doe/fawn licenses and longer seasons decreased the herd from approximately 9,300 to 7,000 deer. From 2006-present, fawn production/survival has been were moderate to poor. The population began to decline, and with it doe/fawn licenses were reduced and then eliminated. In 2013 fawn ratios were again poor, at 56:100 does. Despite the elimination of doe/fawn hunting and the restrictions placed on buck harvest, this population continues to decline.

Buck ratios for the Bates Hole / Hat Six Herd historically average in the mid-20s, though they have occasionally exceeded recreational limits and risen into the low to mid 30's. In more recent years, the buck ratio has declined, reaching a low of 17 per 100 does in 2012. Buck ratios improved slightly in 2013 to 20 per 100 does. Many landowners and hunters have complained of too much hunter pressure within the herd unit and a lack of mature bucks. Some have voiced a desire to change the herd unit from a general license area to limited quota as a means to improve buck ratio. In an attempt to improve yearling buck survival, an antler-point restriction was added in 2013, requiring harvested bucks to be three points or better on one side. This in addition to poor weather and access conditions reduced the overall buck harvest by 33% from 2012 to 2013. The antler-point restriction allowed yearling bucks the chance to graduate into more mature age classes while reducing overall harvest pressure on the male segment of the herd over the next year. As a result, yearling buck ratios went from 4 in 2012 to 10 in 2013 despite mediocre fawn production. However, improved fawn production and survival will be necessary to enhance population growth for the herd in future years.

Since 2008, bucks classified in Area 66 have been categorized based on antler size (see Figure 1). 2008 represented the best distribution of mature buck classes, with 50% Class I (small), 36% Class II (medium), and 14% Class III (large) bucks. Bucks classified from 2010-2013 showed a decrease in antler quality, as the percentage of Class I bucks increased and percentage of Class II bucks decreased. It should come as no surprise that Class I bucks increased from 2012 to 2013 with the addition of the antler-point restriction to the 2013 hunting season. Class III bucks have consistently remained just under 10% of those surveyed from 2009-2013. This is perhaps surprising at first glance, considering surveys occur post-season, that Area 66 is a general license hunt area, and that hunting pressure is assumed to be high. It may be that hunters in a general license area have low expectations of trophy quality and are thus more likely to harvest smaller bucks as the opportunity arises. It may also be that some Class III bucks, despite their discovery during post-season surveys, are more difficult for hunters to find during hunting season. This concept seems unlikely to managers considering the vast network of roads and lack of escapement habitat in some popular portions of the hunt area. However, there still remain places on private lands where mule deer remain protected from harvest. Further research would be necessary to isolate what factors are contributing to the consistent percentage of Class III bucks observed within the herd unit.

Bio-Year	Total Class N for HA	# Bucks Classified					Buck Ratios per 100 Females					
		Ylng	Class I	Class II	Class III	Total	Ylng	Class I	Class II	Class III	All Adult	Total
2008	1,254	75	57 (50%)	41 (36%)	16 (14%)	189	12	9	6	2	18	29
2009	1,320	59	61 (54%)	41 (37%)	10 (9%)	171	8	8	6	1	15	23
2010	1,479	82	49 (49%)	42 (42%)	9 (9%)	182	9	5	5	1	11	20
2011	1,248	47	52 (56%)	33 (36%)	7 (8%)	139	7	8	5	1	14	21
2012	1,272	28	55 (59%)	30 (32%)	9 (9%)	122	4	8	4	1	13	17
2013	1,483	86	50 (61%)	25 (30%)	7 (9%)	168	10	6	3	1	10	20

Figure 1. Antler classification analysis for **Area 66** within the Bates Hole/Hat Six Mule Deer Herd Unit, 2008 – 2013.

Harvest Data

Hunter success in this herd has fluctuated as a function of population size and season length. In recent years, harvest success was highest when the population was higher and the season was longer. Harvest success has decreased in recent years and hunter days have increased, as the population declined and the season was shortened. No significant female harvest has been prescribed since 2007. The season was reduced to 8 days in 2010 and then to 7 days in 2011-2012. Season length remained at 7 days and a 3-point or better antler point restriction was added in 2013. Harvest success decreased from 32% in 2012 to 26% in 2013 – due in part to the more restrictive season on bucks as well as issues with snow, mud, and poor access conditions. Overall harvest has declined as seasons have grown more conservative. With the addition of the antler-point restriction, harvest declined 33% from 241 in 2012 to 165 in 2013.

Population

The 2013 postseason population estimate was approximately 5,100 and has been declining in recent years, after the herd reached a high of about 6,800 deer in 2008. Postseason classification data and harvest data are applied to the model to predict population size and trends for this herd. No sightability or other population estimate data are currently available to further align the model.

The "Time-Specific Juvenile, Constant Adult (TSJ, CA) spreadsheet model was chosen for the postseason population estimate of this herd. This model seemed the most representative of the herd in terms of recent trends, though some earlier years in the model are not consistent with historic estimates from that era. The TSJ,CA model selects for higher juvenile survival when

field observations confirm that overwinter conditions were very mild (i.e. 2005-2006). The TSJ, CA model also adjusts juvenile survival to optimize model fit based on observed buck ratios. Managers are confident in the accuracy of observed buck ratios in this herd unit, as sample sizes are typically very good and coverage is very thorough. The CJ,CA model depicts a herd that is larger than managers suspect. The SCJ,SCA model predicts a similar population size and trend as the TSJ,CA model for more recent years, but does not align as well to observed buck ratios. The TSJ, CA model ultimately appears to be the best representation relative to the perceptions of managers and field personnel, is of good quality, and follows trends with license issuance and harvest success.

Management Summary

Opening day for hunting the Bates Hole / Hat Six Mule Deer Her has traditionally been October 15th, with closing dates that have changed to offer greater or lesser opportunity depending on the management direction desired. General licenses have been valid only for antlered mule deer since 2000. Doe/fawn licenses have been offered in years when winter range shrub utilization has been excessive. A short, seven-day season with no doe/fawn licenses will be instated for 2014. The 2014 season will be the second year utilizing an antler point restriction (APR) of three points or more on a side for this herd unit. The required selectivity of an APR season will again allow yearling bucks to be recruited into mature age classes. While the APR harvest regime may improve buck ratios and quality in the short term by lowering overall harvest on bucks, it is fawn productivity and survival that must improve markedly for this herd to grow as a whole.

If we attain the projected harvest of 175 deer with fawn ratios similar to the last five years, this herd will continue to decline slowly. The predicted 2014 postseason estimate for the Bates Hole Hat Six Herd is approximately 5,000 animals, which is 58% below objective.

INPUT	
Species:	Deer
Biologist:	Heather O'Brien
Herd Unit & No.:	MD757 Bates Hole-Hat Six
Model date:	03/05/14

☑ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	155	164	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	82	97	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	13	136	☑ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population			Total	Predicted Posthunt Population			Total	Objective
	Field Est	Field SE		Juveniles	Total Males	Females		Juveniles	Total Males	Females		
1993				1140	839	2090	4068	1121	325	1747	3193	12000
1994				997	508	1706	3210	984	302	1581	2867	12000
1995				1161	697	1775	3633	1161	417	1775	3353	12000
1996				1922	873	2018	4814	1922	536	2018	4476	12000
1997				1703	836	2085	4623	1703	534	2085	4322	12000
1998				1857	1217	2523	5596	1857	756	2516	5129	12000
1999				2231	1278	2762	6270	2231	668	2762	5660	12000
2000				1979	1566	3331	6876	1979	969	3331	6279	12000
2001				2274	1468	3458	7200	2268	948	3419	6635	12000
2002				2768	1284	3367	7419	2757	805	3299	6861	12000
2003				2454	1230	3331	7014	2438	771	3171	6380	12000
2004				2186	1485	3508	7179	2168	951	3255	6374	12000
2005				2248	1262	3204	6713	2208	785	2943	5936	12000
2006				1556	1655	3473	6684	1542	1055	3315	5912	12000
2007				1971	1583	3487	7041	1944	1020	3354	6317	12000
2008				2276	1562	3528	7366	2274	1027	3519	6820	12000
2009				1973	1355	3455	6782	1973	779	3437	6190	12000
2010				1478	1051	3291	5820	1478	676	3279	5433	12000
2011				2034	865	3058	5958	2034	529	3058	5621	12000
2012				1790	852	2984	5626	1790	595	2976	5361	12000
2013				1591	859	2865	5316	1591	682	2861	5135	12000
2014				1525	893	2729	5147	1525	701	2729	4954	12000
2015												12000
2016												12000
2017												12000
2018												12000
2019												12000
2020												12000
2021												12000
2022												12000
2023												12000
2024												12000
2025												12000

Survival and Initial Population Estimates

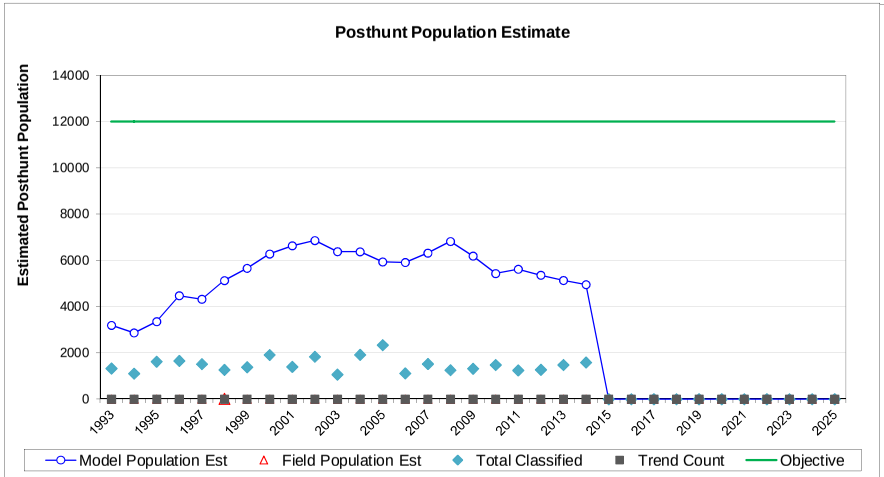
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.42			0.84		
1994	0.90			0.84		
1995	0.90			0.84		
1996	0.40			0.84		
1997	0.90			0.84		
1998	0.69			0.84		
1999	0.90			0.84		
2000	0.66			0.84		
2001	0.43			0.84		
2002	0.40			0.84		
2003	0.69			0.84		
2004	0.43			0.84		
2005	0.90			0.84		
2006	0.90			0.84		
2007	0.72			0.84		
2008	0.43			0.84		
2009	0.40			0.84		
2010	0.40			0.84		
2011	0.40			0.84		
2012	0.40			0.84		
2013	0.40			0.84		
2014	0.60			0.84		
2015						
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

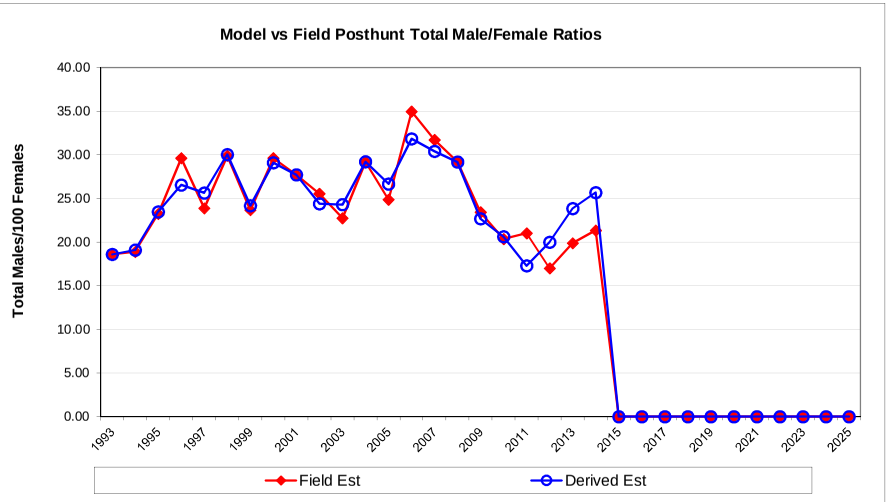
Parameters:	Optim cells
Adult Survival =	0.843
Initial Total Male Pop/10,000 =	0.032
Initial Female Pop/10,000 =	0.175

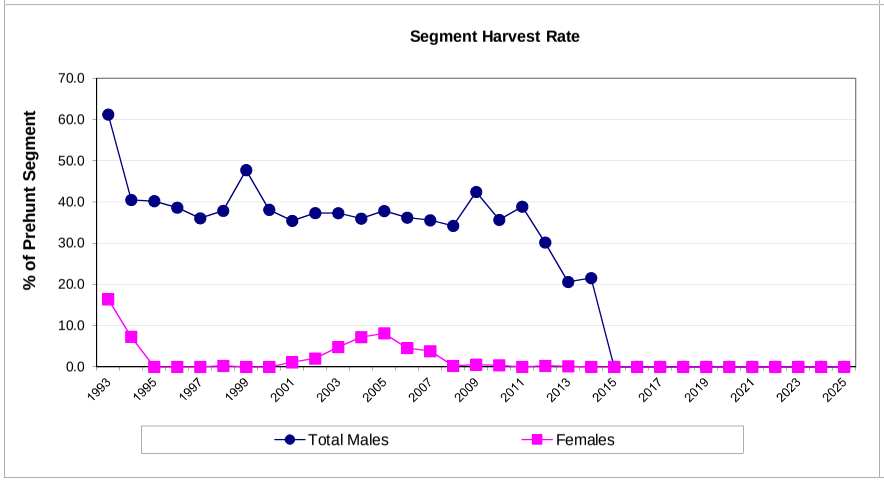
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

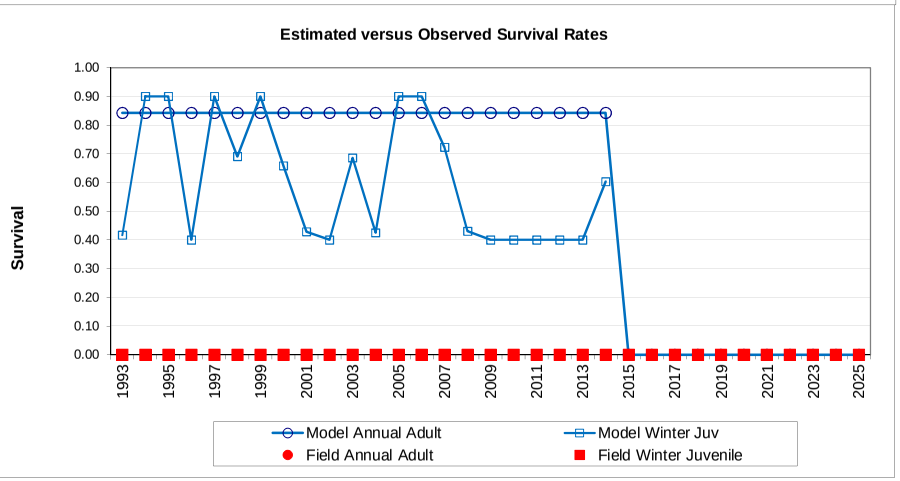
	Classification Counts						Harvest					
Year	Juvenile/Female Ratio			Total Male/Female Ratio							Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		64.19	3.81	18.60	18.60	1.74	17	467	312	796	61.3	16.4
1994		62.23	4.07	19.09	18.88	1.92	12	187	113	312	40.5	7.3
1995		65.39	3.54	23.47	23.23	1.82	0	255	0	255	40.2	0.0
1996		95.24	5.03	26.55	29.62	2.28	0	307	0	307	38.7	0.0
1997		81.68	4.49	25.63	23.88	2.00	0	274	0	274	36.1	0.0
1998		73.79	4.54	30.03	29.90	2.50	0	419	6	425	37.9	0.3
1999		80.77	4.65	24.18	23.67	2.08	0	555	0	555	47.8	0.0
2000		59.43	3.06	29.09	29.62	1.95	0	543	0	543	38.1	0.0
2001		66.34	3.91	27.71	27.70	2.21	5	473	35	513	35.4	1.1
2002		83.58	4.18	24.40	25.54	1.91	10	436	62	508	37.3	2.0
2003		76.88	5.06	24.30	22.74	2.29	14	417	145	576	37.3	4.8
2004		66.60	3.37	29.21	29.21	1.96	16	486	230	732	36.0	7.2
2005		75.04	3.35	26.66	24.87	1.63	36	434	237	707	37.8	8.1
2006		46.50	3.33	31.83	34.96	2.77	13	545	144	702	36.2	4.6
2007		57.96	3.37	30.40	31.72	2.28	25	512	121	658	35.6	3.8
2008		64.61	4.05	29.18	29.21	2.42	2	486	8	496	34.2	0.2
2009		57.40	3.52	22.68	23.42	1.99	0	523	16	539	42.5	0.5
2010		45.08	2.70	20.63	20.36	1.66	0	341	11	352	35.7	0.4
2011		66.52	4.08	17.29	21.02	1.95	0	306	0	306	38.9	0.0
2012		60.17	3.66	19.99	16.99	1.66	0	234	7	241	30.2	0.3
2013		55.62	3.20	23.85	19.88	1.68	0	161	4	165	20.6	0.2
2014		55.87	3.12	25.67	21.34	1.70	0	175	0	175	21.6	0.0
2015												
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES



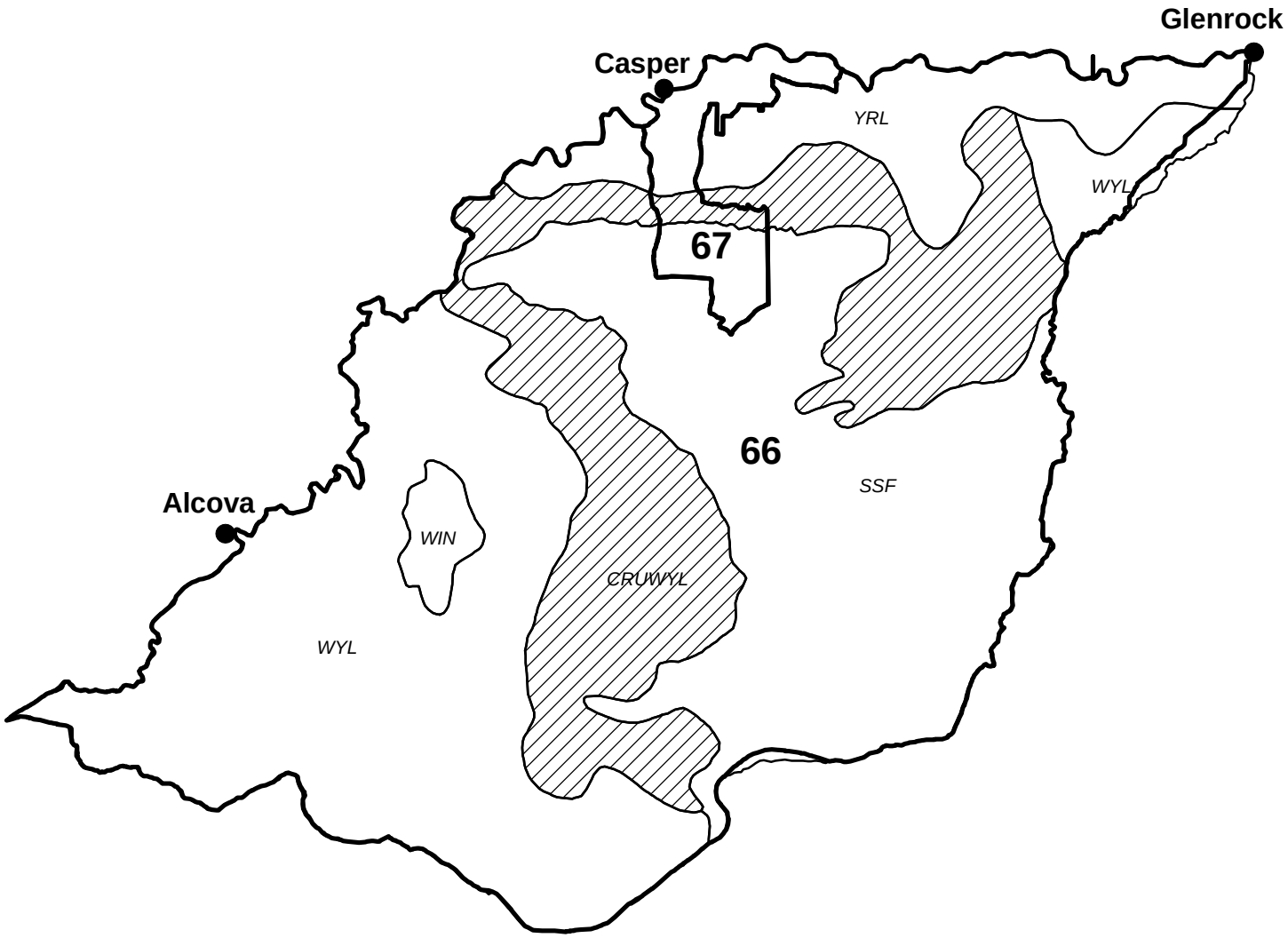






Comments:

Mule Deer - Bates Hole/Hat Six
Hunt Area 66, 67
Casper Region
Revised 2/94



2013 - JCR Evaluation Form

SPECIES: Mule Deer
PERIOD: 6/1/2013 - 5/31/2014

HERD: MD758 - RATTLESNAKE

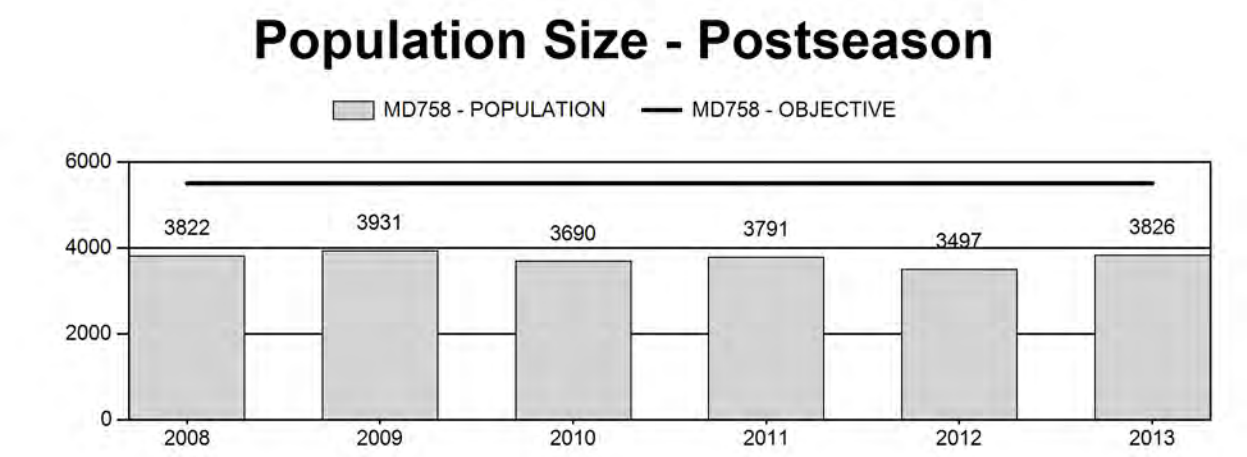
HUNT AREAS: 88-89
PREPARED BY: HEATHER O'BRIEN

	2008 - 2012 Average	2013	2014 Proposed
Population:	3,746	3,826	3,680
Harvest:	393	124	115
Hunters:	629	310	200
Hunter Success:	62%	40%	58%
Active Licenses:	678	319	250
Active License Percent:	58%	39%	46%
Recreation Days:	2,634	1,437	1,100
Days Per Animal:	6.7	11.6	9.6
Males per 100 Females	38	24	
Juveniles per 100 Females	53	53	

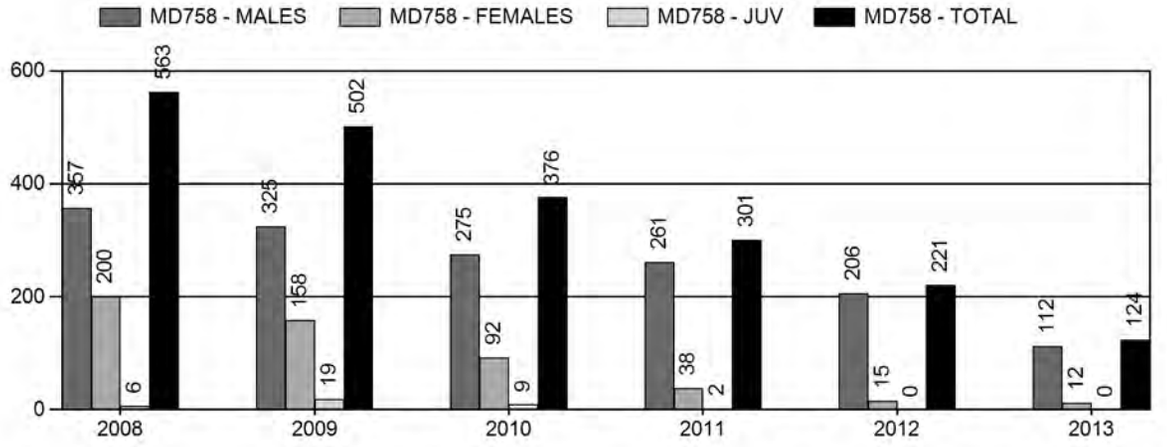
Population Objective:	5,500
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-30.4%
Number of years population has been + or - objective in recent trend:	20
Model Date:	3/3/2014

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

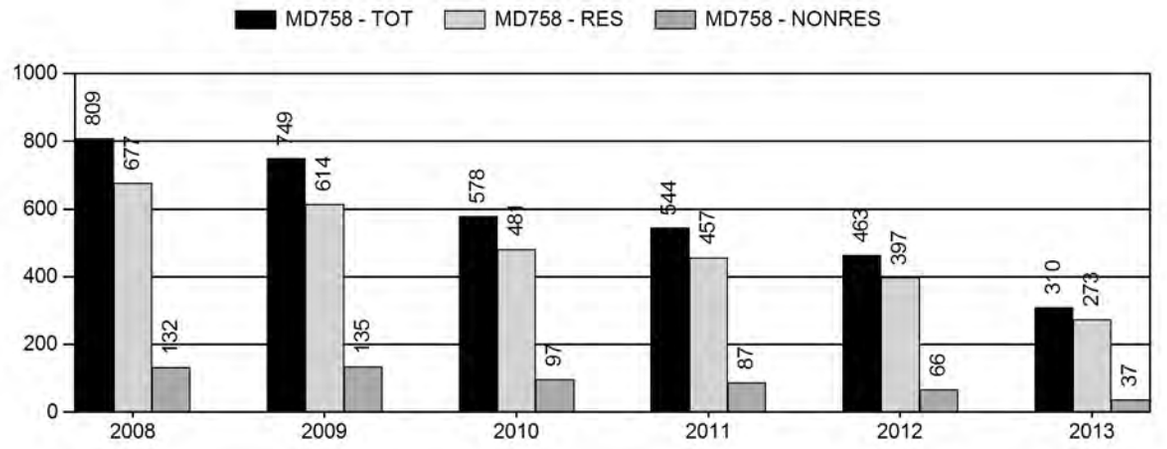
	JCR Year	Proposed
Females ≥ 1 year old:	0.6%	.7%
Males ≥ 1 year old:	16.8%	15.4%
Juveniles (< 1 year old):	0%	0%
Total:	3.1%	3.02%
Proposed change in post-season population:	-3.4%	-3.3%



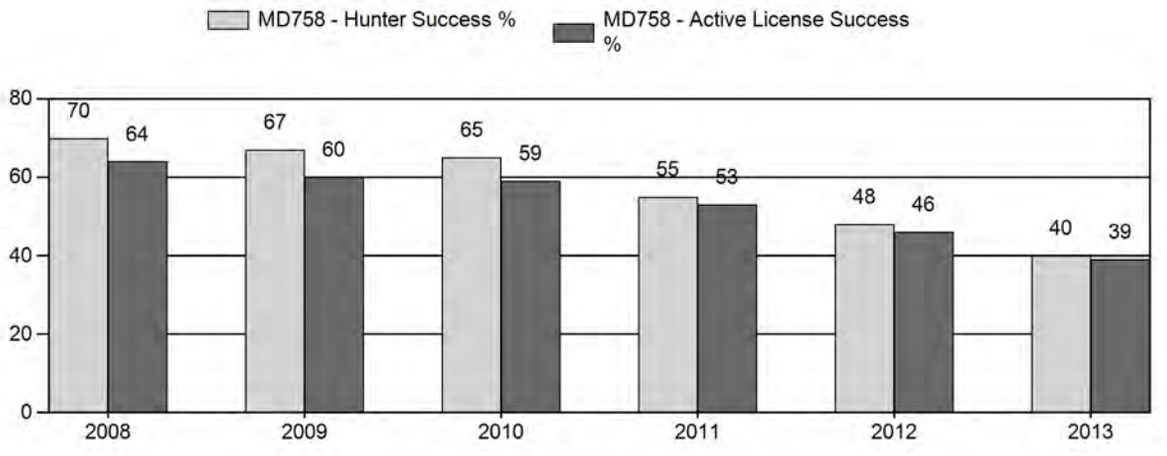
Harvest



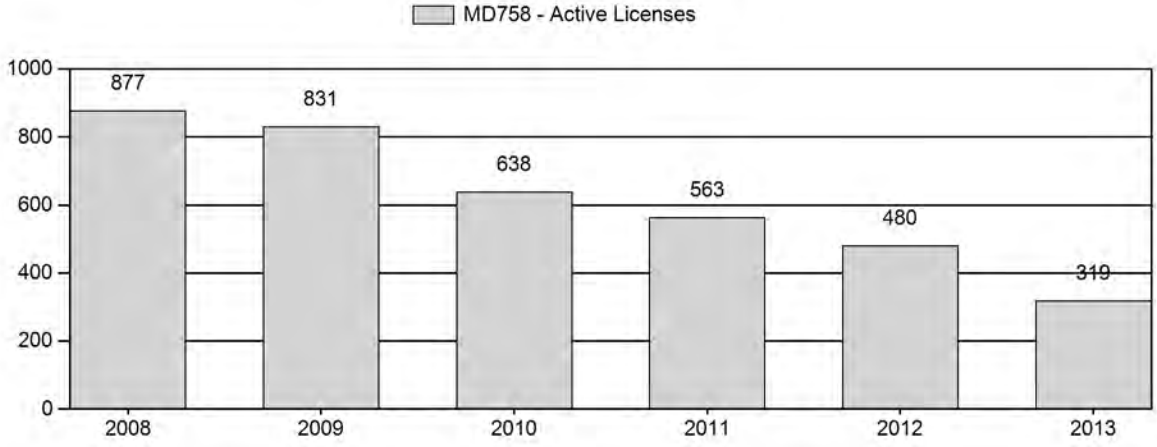
Number of Hunters



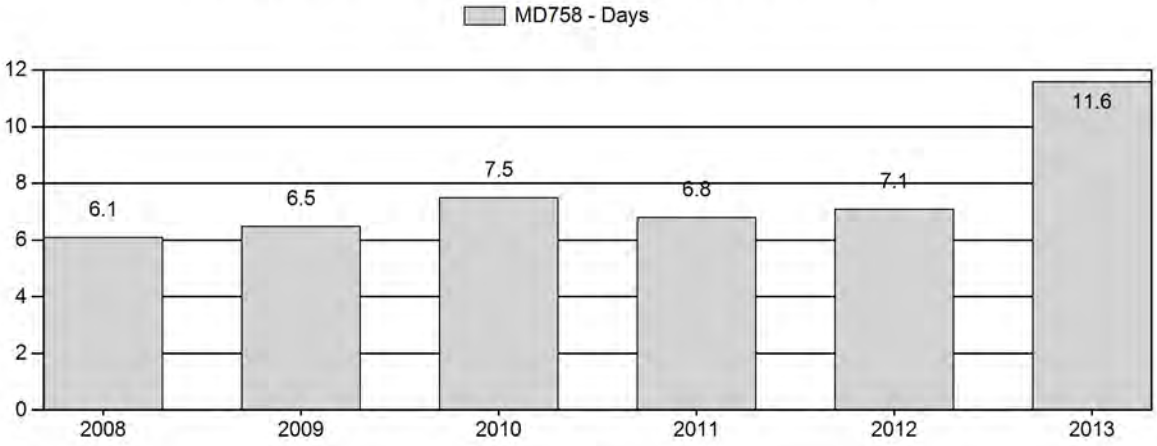
Harvest Success



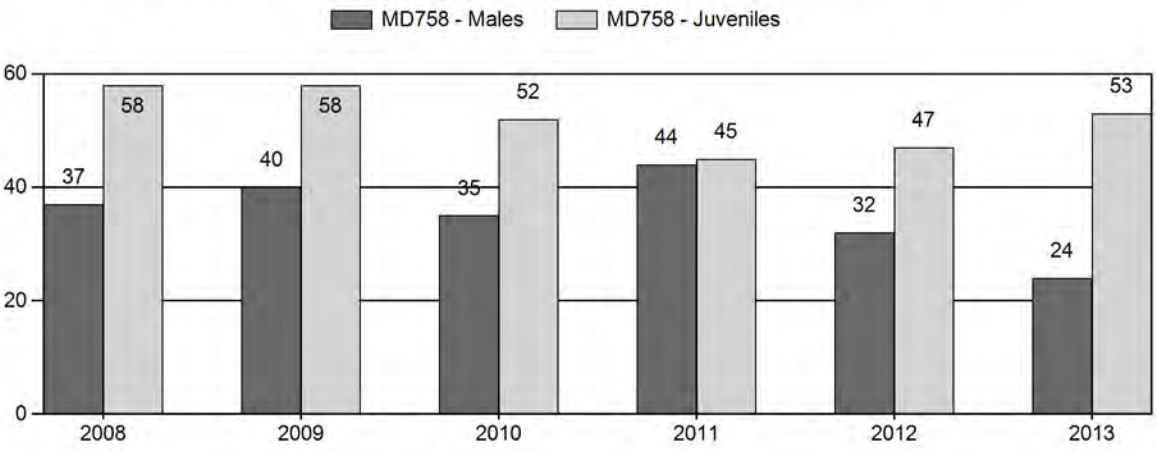
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2008 - 2013 Postseason Classification Summary

for Mule Deer Herd MD758 - RATTLESNAKE

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	3,822	94	185	279	19%	749	51%	434	30%	1,462	924	13	25	37	± 3	58	± 4	42
2009	3,931	34	155	189	20%	469	50%	271	29%	929	922	7	33	40	± 4	58	± 5	41
2010	3,690	49	120	169	19%	487	54%	252	28%	908	797	10	25	35	± 3	52	± 4	38
2011	3,791	53	196	249	23%	570	53%	258	24%	1,077	781	9	34	44	± 4	45	± 4	32
2012	3,497	24	81	105	18%	333	56%	156	26%	594	830	7	24	32	± 4	47	± 5	36
2013	3,826	14	77	91	14%	376	57%	198	30%	665	671	4	20	24	± 3	53	± 5	42

2014 HUNTING SEASONS
RATTLESNAKE MULE DEER (MD758)

Hunt Area	Type	Date of Seasons Opens	Closes	Quota	Limitations
88		Oct. 15	Oct. 21		General license; antlered mule deer or any white-tailed deer
	6	Oct. 15	Nov. 30	25	Limited quota licenses; doe or fawn valid on private land
89	1	Oct. 15	Oct. 31	75	Limited quota licenses; antlered deer
Archery		Sep. 1	Sep. 30		Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2013
88	6	-25
89	1	-50
Total	1	-50
	6	-25

Management Evaluation

Current Postseason Population Management Objective: 5,500
Management Strategy: Special
2013 Postseason Population Estimate: 3,800
2014 Proposed Postseason Population Estimate: 3,700

The Rattlesnake Mule Deer Herd Unit has a postseason population objective of 5,500 deer. The herd is managed using the special management strategy, with the goal of maintaining postseason buck ratios between 30-45 bucks per 100 does. Management of this herd unit and interpretation of harvest data can be perplexing, with different management directions for Area 88 versus 89. The objective and management strategy were last revised in 1985, and will be formally reviewed in 2015.

Herd Unit Issues

Hunting access within the herd unit is moderate. While there are large tracts of public lands and several large walk-in areas in Area 89, there are also many parcels of private land with restricted access. Hunt Area 88 is dominated by private lands with several small public land parcels.

Harvest pressure is consistently maintained in Area 88 to address potential damage issues on irrigated agricultural fields. Traditional ranching and grazing are the primary land use over the whole unit, with scattered areas of oil and gas development. Periodic disease outbreaks (i.e. hemorrhagic diseases) are possible in this herd and can contribute to population declines when environmental conditions are suitable.

Weather

The winter of 2010-2011 was severe throughout the herd unit and likely resulted in higher mortality of mule deer. Conditions were warm and dry for the herd unit in 2011 and shrub production was below average, resulting in poor nutrition of mule deer entering the winter of 2011-2012. Snow pack and resulting spring moisture was below average for the winter of 2011-2012 which likely had negative impacts on lactating does and their fawns. The summer of 2012 was the driest on record since 1904 in much of Wyoming, and the winter of 2012 continued the trend with very low snow accumulation and snow pack. Fawn survival over the severely dry summer and winter was low, as evidenced by extremely low yearling buck ratios in 2013. April of 2013 finally saw a break in the drought, when temperatures dropped below normal for the entire month and significant precipitation was received. This cooler and wetter pattern continued through the summer of 2013. In early October 2013, winter storm "Atlas" blanketed the herd unit with 12-36" of wet snow. Lingering snow and resulting muddy conditions made accessing deer difficult in many locations. Travel conditions improved toward the end of hunting seasons, but by then it was apparent winter storm Atlas had a negative impact on hunter participation and harvest success. The early winter months of 2013-2014 brought temperature and precipitation conditions near the recent 30-year average. 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 shrub species that are preferred browse of mule deer. Additionally, there are no comparable habitat transects in neighboring herd units to reference. Anecdotal observations and discussions with landowners in the region indicate that summer and winter forage availability was fairly average in 2013. Herbaceous forage species were observed to be in good condition compared to the very poor growth year of 2012. Improved range conditions may have contributed to better fawn ratios observed in late summer 2013, though they were still poor compared to historic trends.

Field Data

Fawn production/survival was high in this herd from 1998-2005, and the population grew in stages during this time period. License issuance was modest, until a larger number of doe/fawn licenses were introduced in Area 88 from 2003-2005. Fawn ratios were then moderate to poor from 2006-2013, and the population gradually declined over these years. Issuance of doe/fawn licenses was reduced incrementally in accordance with this decline. Harsh winter conditions in 2010-11 combined with severe drought in 2012 produced the lowest fawn ratios in over 15 years for the herd unit. Fawn ratios recovered slightly in 2013, but were still poor at 53:100 does. Only 25 doe/fawn licenses will be issued in Area 88 for 2014, as complaints of agricultural damage by mule deer are now virtually non-existent.

Buck ratios for the Rattlesnake Mule Deer Herd have been maintained consistently within special management parameters since 1999. As a result, hunters have developed high expectations for buck numbers and quality within this herd unit. Buck ratios for the herd are typically in the mid 30s per 100 does, but were as high as 44 bucks per 100 does in 2005 following several years of high fawn productivity. While this herd has dropped in overall numbers over the past six years, buck ratios have been maintained consistently in the 30s and low 40s by adjusting Area 89 license issuance accordingly. However, the buck ratio dropped below special management range to 24:100 does in 2013. Yearling buck ratios have been extremely low over the past few years, and recruitment of bucks into adult age classes has declined considerably. It can be difficult to maintain buck ratios over the entire herd unit, as Area 88 is managed for a low number of deer and Area 89 is managed for high mature buck ratios. Managers will continue to adjust license numbers in the herd unit so as to maintain the buck ratio within special management parameters and assure that an adequate proportion of mature bucks are available for harvest.

Since 2008, bucks classified in Area 89 have been categorized based on antler size (see Figure 1). 2009 represented the best distribution of mature buck classes, with 53% Class I (small), 39% Class II (medium), and 9% Class III (large) bucks. Bucks classified in 2013 showed a marked decrease in antler quality compared to previous years. Class III bucks only represented 1% of the total classified, while Class I and Class II bucks represented 74% and 25% of those surveyed, respectively. With hunter expectations high for trophy-quality hunting, managers consider this drop in trophy quality as further justification to reduce Type 1 licenses for the 2014 hunting season.

Bio-Year	Total Class N for HA	# Bucks Classified					Buck Ratios per 100 Females					
		Ylng	Class I	Class II	Class III	Total	Ylng	Class I	Class II	Class III	All Adult	Total
2008	1,220	71	126 (74%)	40 (23%)	5 (3%)	242	11	20	6	1	27	38
2009	848	31	74 (53%)	54 (39%)	12 (9%)	171	7	17	13	3	33	40
2010	778	38	59 (54%)	45 (41%)	6 (5%)	148	9	14	11	1	26	35
2011	1,009	48	114 (62%)	61 (33%)	9 (5%)	232	9	21	11	2	34	43
2012	503	17	61 (84%)	10 (14%)	2 (3%)	90	6	22	4	1	26	32
2013	548	11	53 (74%)	18 (25%)	1 (1%)	83	4	17	6	0	24	27

Figure 1. Antler classification analysis for Area 89 within the Rattlesnake Mule Deer Herd Unit, 2008-2013.

Harvest Data

License success in this herd unit is typically in the 60-70th percentile. Overall harvest success has declined the last three years from 55% to 48% to 40% and days per animal has increased. It can be difficult to use days per animal as a reference to population trends in this herd unit however, as hunters in Area 89 tend to be more selective of bucks and thus take more time to harvest a deer. Selectivity and low deer numbers likely combined in recent years to contribute to higher harvest days. License reductions in 2013 did not improve harvest success indicating fewer deer were available to fewer hunters. Hunter satisfaction also declined from 79% in 2012 to 56% in 2013. Thus, managers plan to reduce licenses further in 2014 in an effort to improve license success and improve buck ratios in the herd unit following exceptionally poor fawn productivity.

Population

The 2013 postseason population estimate was approximately 3,800 and trending downward from an estimated high of 6,800 deer in 2005. Postseason classification data and harvest data are applied to the model to predict population size and trends for this herd. No sightability or other population estimate data are currently available to further align the model.

The "Semi-Constant Juvenile, Constant Adult" (SCJ,CA) spreadsheet model was selected for the postseason population estimate of this herd. This model seemed most representative of the herd, as it mirrors fluctuations in herd size observed by field personnel in previous years. The simpler model (CJ,CA) overestimates herd size while the more complicated (TSJ,CA) model

underestimated herd size and displays some trends that do not match with field observations. The SCJ,CA model was used to apply lower constraints on juvenile survival from 2010-2012. These constraints match observed trends of low fawn ratios followed by very poor yearling buck ratios, implying over-winter fawn survival was poor. The AIC for the SCJ, CA model is the higher than the CJ,CA model due only to penalties incurred from constraining juvenile survival in these three years. The SCJ,CA model appears to be the best representation relative to the perceptions of managers on the ground and follows trends with license issuance and harvest success, and is considered to be of fair quality.

Management Summary

Traditional season dates in this herd run from October 15th through October 31st, and November 30th for Area 88 Type 6 licenses. The same season dates will be applied to the 2014 hunting season, with a reduction of Area 89-Type 1 licenses to track with poor fawn ratios and declining buck ratios. Area 88 Type 6 licenses will be reduced and will remain valid on private land only. The 2014 season thus includes a total of 75 Type 1 licenses in Area 89, a general season in Area 88 for antlered mule deer or any white-tailed deer, and 25 Type 6 licenses valid in Area 88 on private land. Goals for 2014 are to improve deer numbers gradually towards objective while giving time for habitats to recover, improve buck ratios, and increase hunter success.

If we attain the projected harvest of 115 deer with fawn ratios similar to the five-year average, this herd will increase slightly in number. The predicted 2013 postseason population size for the Rattlesnake Mule Deer Herd Unit is approximately 3,700 deer, which is 33% below objective.

INPUT	
Species:	Deer
Biologist:	Heather O'Brien
Herd Unit & No.:	Rattlesnake MD
Model date:	03/03/14

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	71	80	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	76	93	☑ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	13	124	☐ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population			Total	Predicted Posthunt Population			Total	Objective
	Field Est	Field SE		Juveniles	Total Males	Females		Juveniles	Total Males	Females		
1993				1549	762	2836	5148	1527	358	2620	4504	5500
1994				1116	655	2657	4428	1079	476	2438	3993	5500
1995				1291	660	2397	4349	1277	506	2324	4108	5500
1996				2306	731	2340	5377	2306	645	2340	5292	5500
1997				2268	1083	2583	5933	2248	847	2491	5587	5500
1998				1890	1248	2703	5842	1884	903	2637	5424	5500
1999				2136	1217	2752	6105	2127	934	2637	5699	5500
2000				1675	1299	2806	5779	1657	1009	2660	5326	5500
2001				1888	1261	2721	5870	1888	1021	2630	5539	5500
2002				2109	1322	2746	6178	2086	1088	2634	5808	5500
2003				2194	1426	2794	6414	2189	1200	2684	6073	5500
2004				2376	1547	2861	6784	2362	1264	2761	6386	5500
2005				2545	1642	2967	7154	2534	1310	2864	6707	5500
2006				1757	1721	3096	6574	1752	1362	2953	6067	5500
2007				1767	1594	3002	6362	1752	1178	2779	5709	5500
2008				1529	1431	2848	5808	1523	1038	2628	5189	5500
2009				1459	1257	2663	5379	1439	899	2490	4827	5500
2010				1263	1115	2522	4900	1253	812	2421	4486	5500
2011				1078	997	2421	4496	1076	700	2378	4154	5500
2012				1092	793	2278	4162	1092	566	2261	3919	5500
2013				1133	665	2165	3962	1133	541	2152	3826	5500
2014				1084	649	2074	3807	1084	539	2058	3680	5500
2015												5500
2016												5500
2017												5500
2018												5500
2019												5500
2020												5500
2021												5500
2022												5500
2023												5500
2024												5500
2025												5500

Survival and Initial Population Estimates

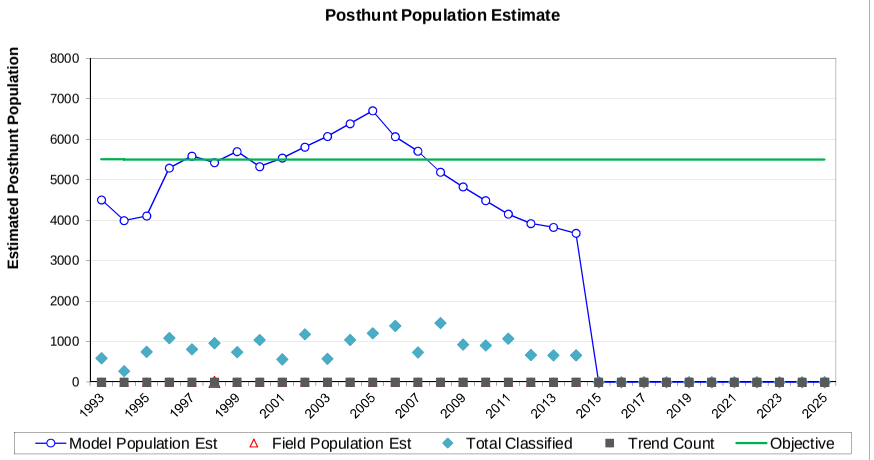
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.44			0.89		
1994	0.44			0.89		
1995	0.44			0.89		
1996	0.44			0.89		
1997	0.44			0.89		
1998	0.44			0.89		
1999	0.44			0.89		
2000	0.44			0.89		
2001	0.44			0.89		
2002	0.44			0.89		
2003	0.44			0.89		
2004	0.44			0.89		
2005	0.44			0.89		
2006	0.44			0.89		
2007	0.44			0.89		
2008	0.44			0.89		
2009	0.44			0.89		
2010	0.44			0.89		
2011	0.32			0.89		
2012	0.30			0.89		
2013	0.30			0.89		
2014	0.44			0.89		
2015						
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

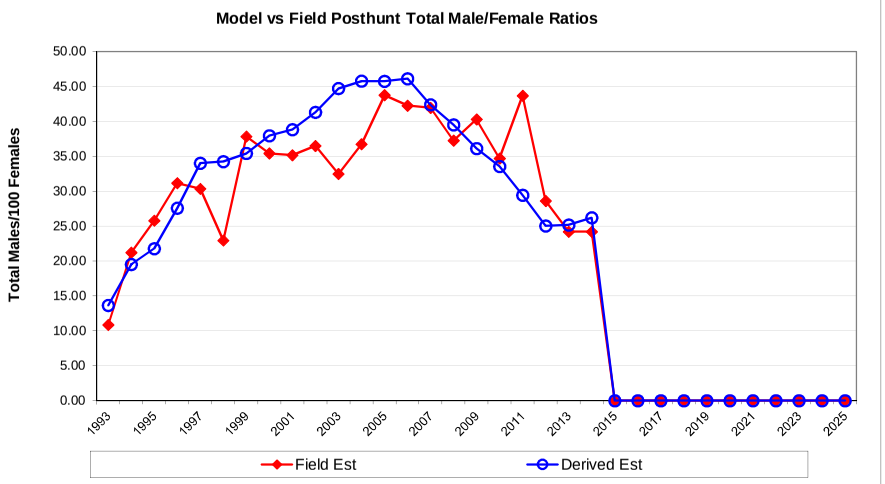
Parameters:	Optim cells
Juvenile Survival =	0.444
Adult Survival =	0.885
Initial Total Male Pop/10,000 =	0.036
Initial Female Pop/10,000 =	0.262

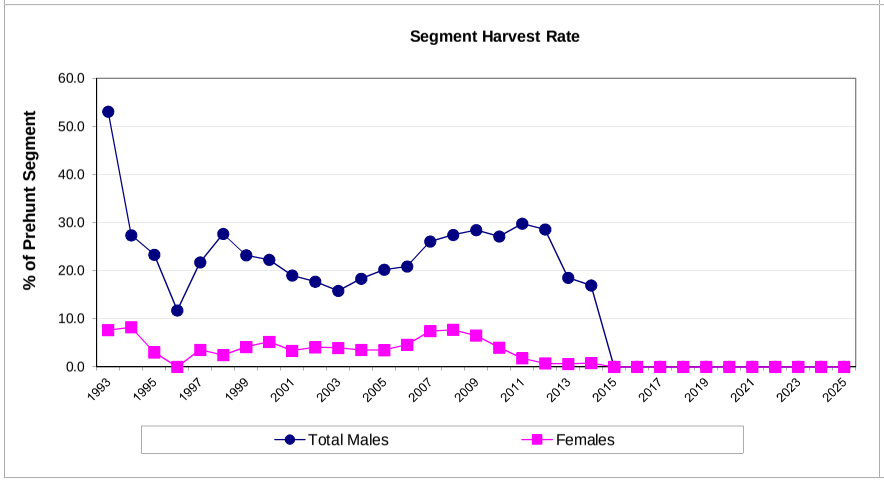
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

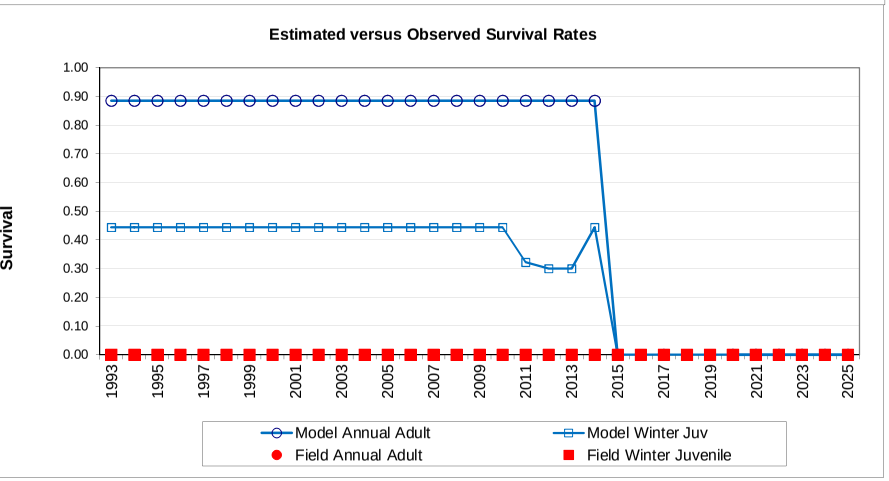
	Classification Counts										Harvest	
Year	Juvenile/Female Ratio			Total Male/Female Ratio							Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		58.29	5.13	13.65	10.86	1.85	20	368	197	585	53.1	7.6
1994		44.24	6.22	19.51	21.21	3.95	34	163	199	396	27.4	8.2
1995		54.94	4.53	21.78	25.78	2.80	13	140	66	219	23.3	3.0
1996		98.53	6.42	27.58	31.16	2.93	0	78	0	78	11.7	0.0
1997		90.24	6.82	34.01	30.35	3.27	18	214	83	315	21.7	3.5
1998		71.43	4.96	34.24	22.94	2.38	6	314	60	380	27.7	2.4
1999		80.65	6.54	35.42	37.83	3.91	8	257	104	369	23.2	4.2
2000		62.31	4.38	37.95	35.42	3.01	16	263	133	412	22.3	5.2
2001		71.79	6.72	38.82	35.16	4.17	0	218	83	301	19.0	3.4
2002		79.20	5.09	41.30	36.50	3.02	21	213	102	336	17.7	4.1
2003		81.55	7.39	44.71	32.47	3.98	5	205	100	310	15.8	3.9
2004		85.56	5.81	45.78	36.73	3.27	13	258	91	362	18.3	3.5
2005		88.48	5.66	45.75	43.76	3.47	10	302	94	406	20.2	3.5
2006		59.33	3.70	46.11	42.26	2.95	4	327	130	461	20.9	4.6
2007		63.06	5.34	42.39	41.94	4.07	13	378	203	594	26.1	7.4
2008		57.94	3.50	39.51	37.25	2.61	6	357	200	563	27.4	7.7
2009		57.78	4.41	36.11	40.30	3.47	19	325	158	502	28.4	6.5
2010		51.75	4.02	33.55	34.70	3.10	9	275	92	376	27.1	4.0
2011		45.26	3.40	29.43	43.68	3.32	2	270	39	311	29.8	1.8
2012		48.29	4.34	25.03	28.61	3.11	0	206	15	221	28.6	0.7
2013		52.66	4.62	25.16	24.20	2.83	0	112	12	124	18.5	0.6
2014		52.66	4.62	26.20	24.20	2.83	0	100	15	115	16.9	0.8
2015												
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES



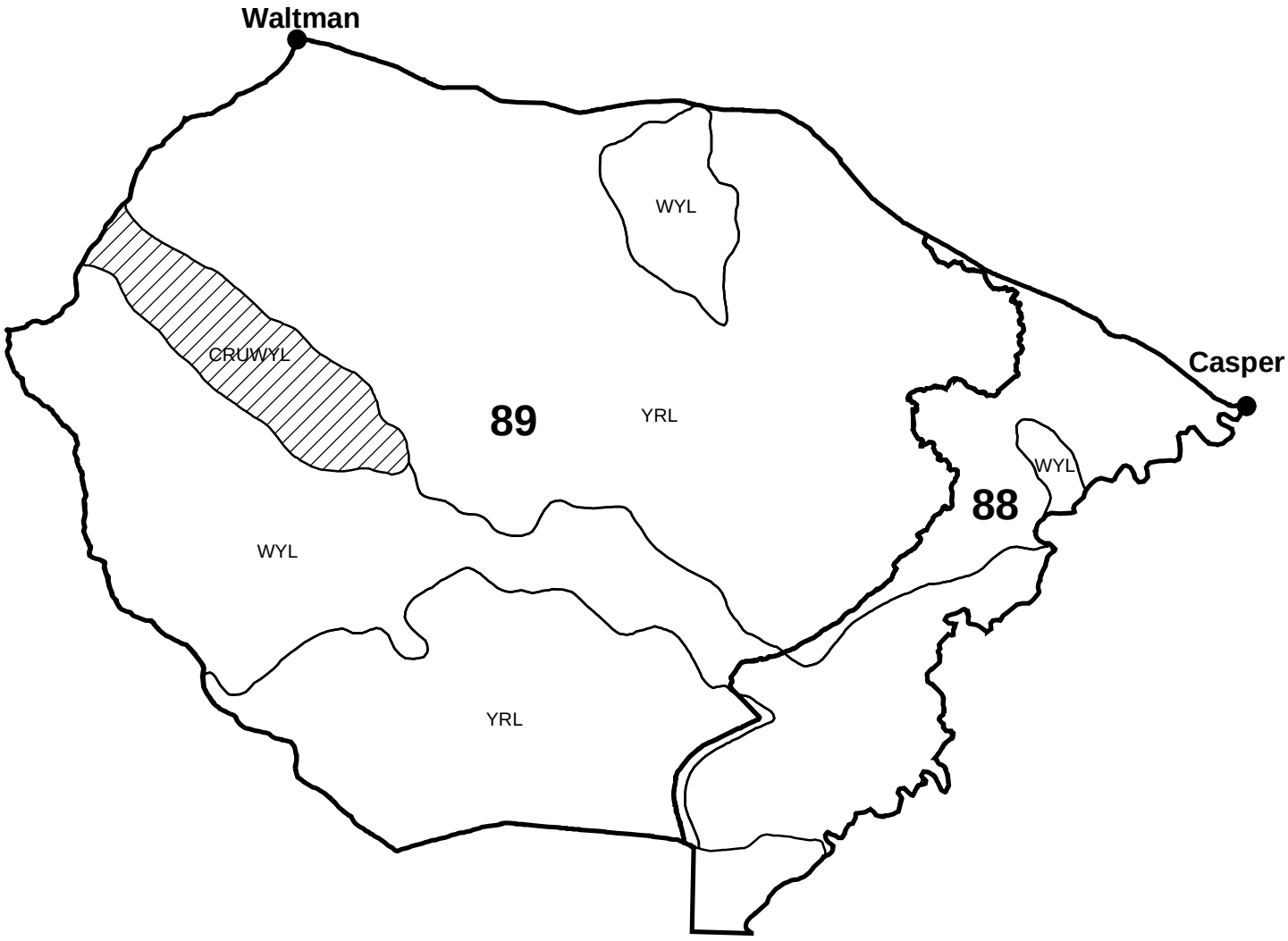






Comments:

Mule Deer - Rattlesnake
Hunt Areas 88, 89
Casper Region
Revised 4/88



2013 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2013 - 5/31/2014

HERD: MD759 - NORTH NATRONA

HUNT AREAS: 34

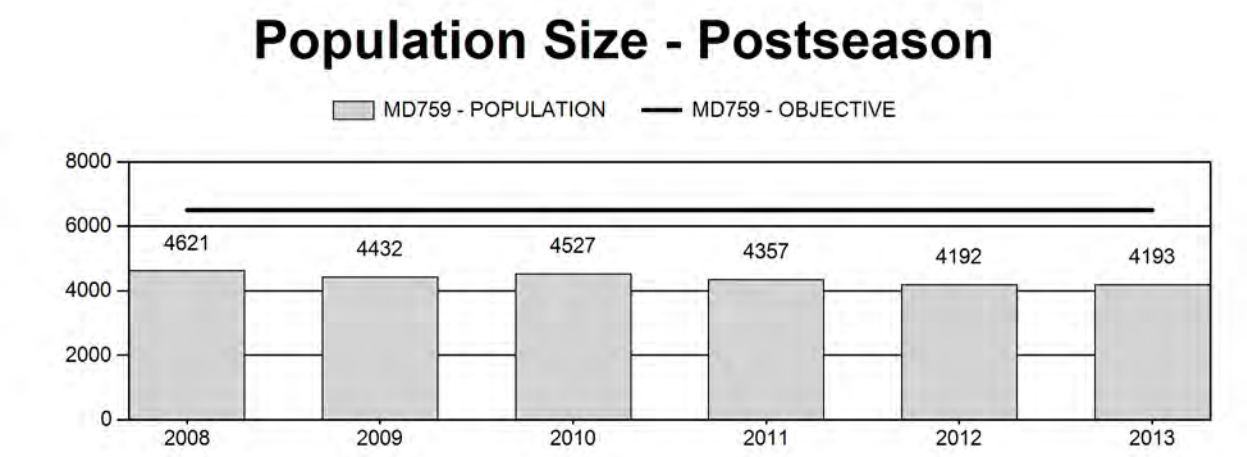
PREPARED BY: HEATHER O'BRIEN

	2008 - 2012 Average	2013	2014 Proposed
Population:	4,426	4,193	4,181
Harvest:	257	192	142
Hunters:	336	259	200
Hunter Success:	76%	74%	71%
Active Licenses:	353	267	225
Active License Percent:	73%	72%	63%
Recreation Days:	1,431	1,257	850
Days Per Animal:	5.6	6.5	6.0
Males per 100 Females	35	32	
Juveniles per 100 Females	48	55	

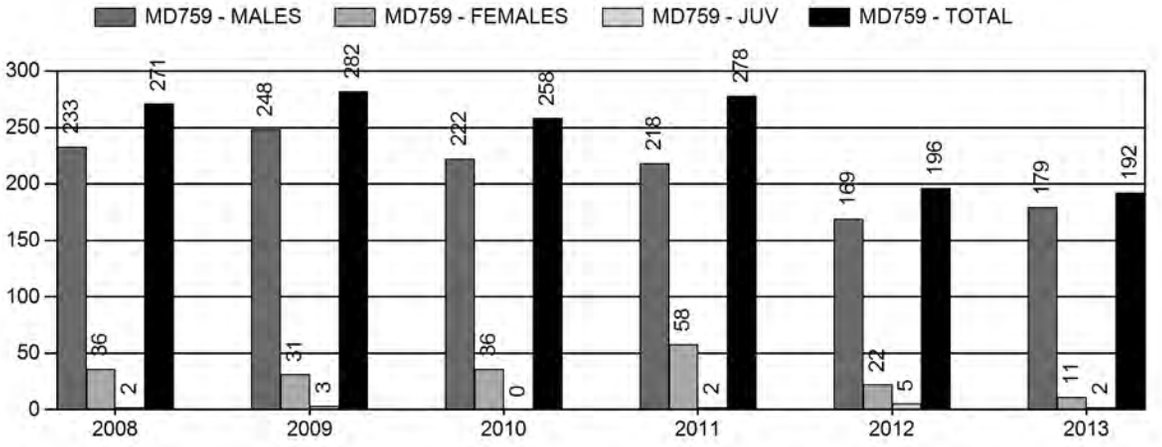
Population Objective:	6,500
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-35.5%
Number of years population has been + or - objective in recent trend:	20
Model Date:	2/25/2014

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

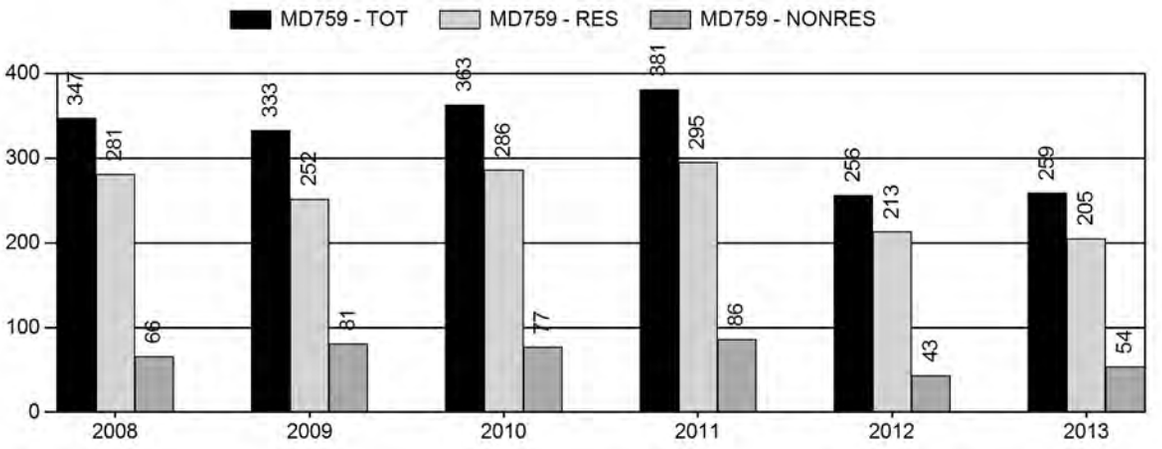
	JCR Year	Proposed
Females ≥ 1 year old:	.5%	.7%
Males ≥ 1 year old:	19.7%	13.4%
Juveniles (< 1 year old):	.2%	.2%
Total:	4.4%	3.3%
Proposed change in post-season population:	-4.4%	-0.2%



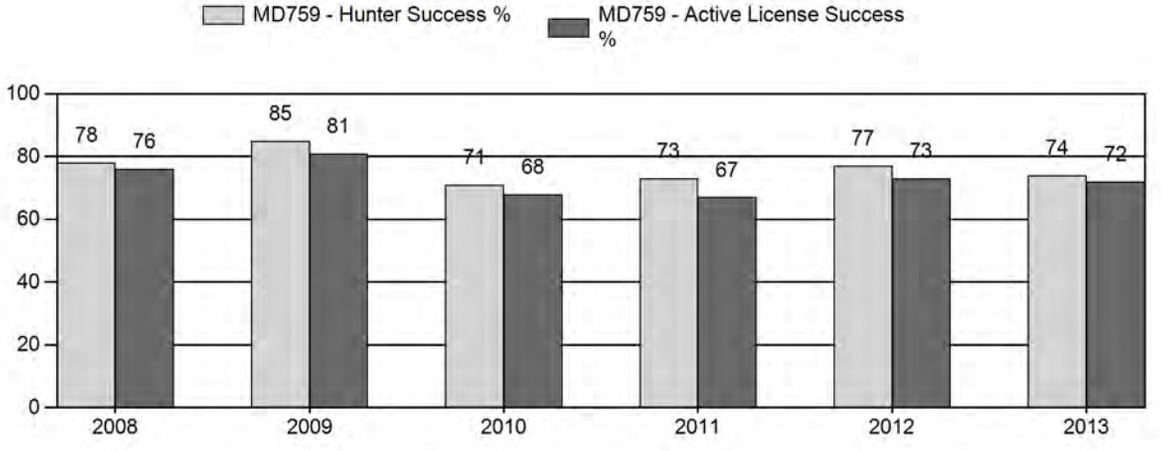
Harvest



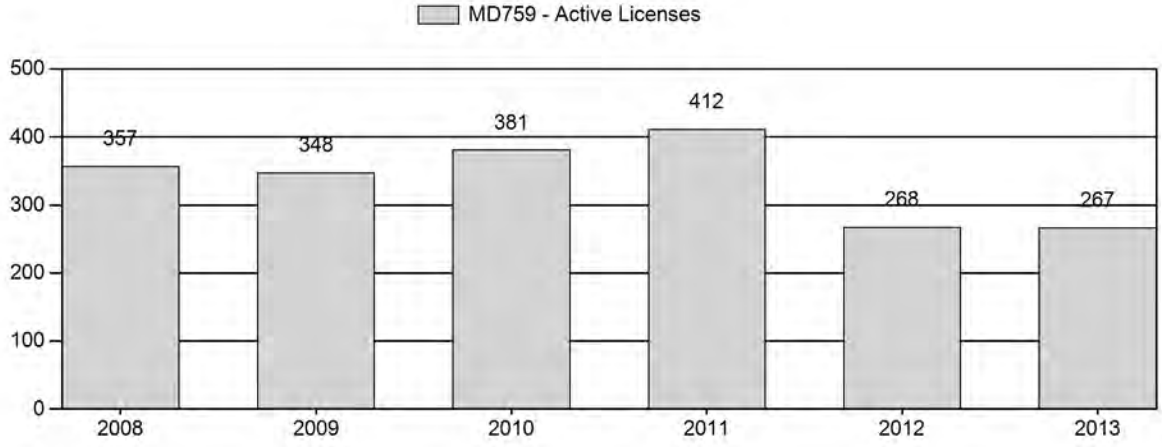
Number of Hunters



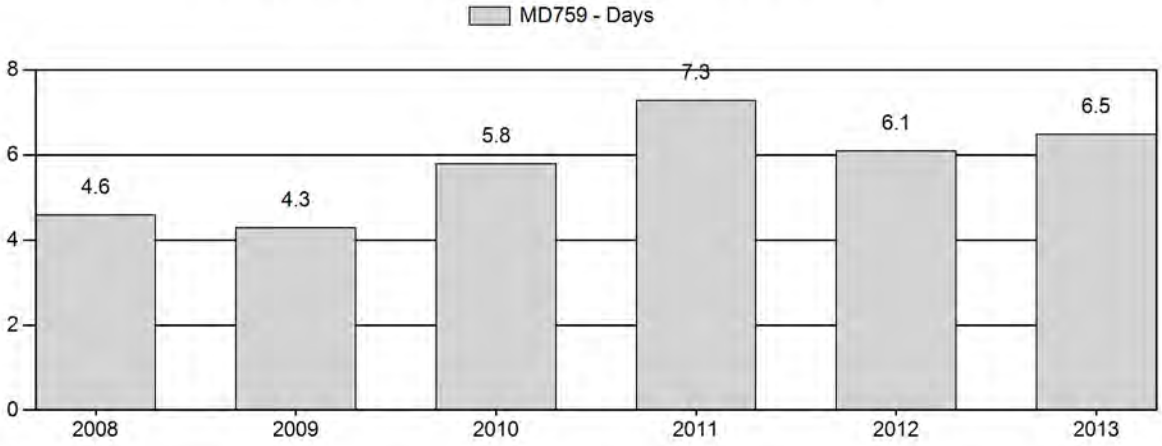
Harvest Success



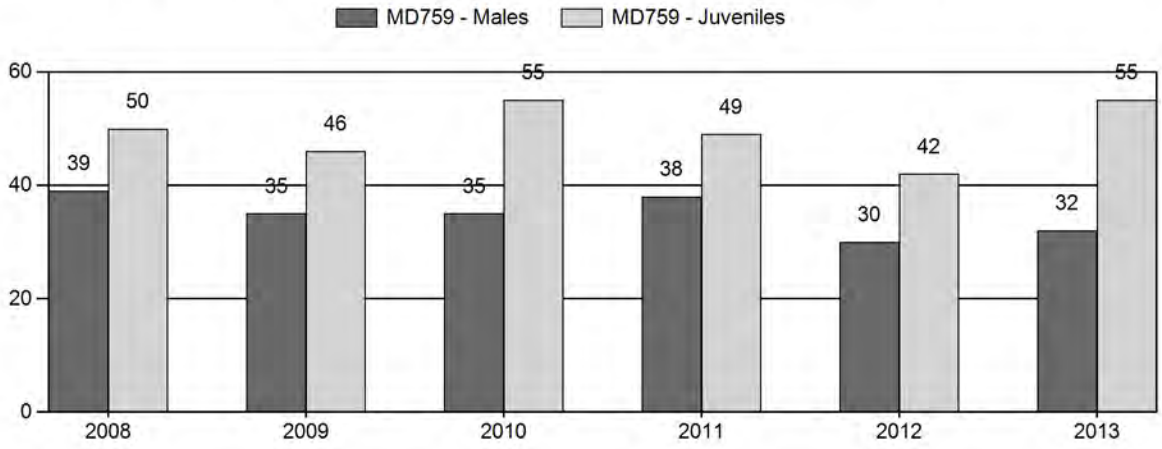
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2008 - 2013 Postseason Classification Summary

for Mule Deer Herd MD759 - NORTH NATRONA

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	4,621	59	152	211	21%	543	53%	269	26%	1,023	760	11	28	39	± 4	50	± 4	36
2009	4,432	51	144	195	19%	558	55%	256	25%	1,009	668	9	26	35	± 3	46	± 4	34
2010	4,527	47	120	167	18%	476	53%	262	29%	905	830	10	25	35	± 4	55	± 5	41
2011	4,357	52	102	154	20%	406	53%	200	26%	760	851	13	25	38	± 4	49	± 5	36
2012	4,192	36	117	153	18%	503	58%	212	24%	868	760	7	23	30	± 3	42	± 4	32
2013	4,193	28	80	108	17%	342	54%	187	29%	637	580	8	23	32	± 4	55	± 6	42

2014 HUNTING SEASONS
NORTH NATRONA MULE DEER HERD (MD759)

Hunt Area	Type	Date of Seasons Opens	Closes	Quota	Limitations
34	1	Oct. 15	Oct. 31	150	Limited quota licenses; antlered deer
Archery		Sep. 1	Sep. 30		Refer to license types and limitations in Section 2

Hunt Area	Type	Quota change from 2013
34	1	-100
	6	-50, license type removed

Management Evaluation

Current Postseason Population Management Objective: 6,500

Management Strategy: Special

2013 Postseason Population Estimate: 4,200

2014 Proposed Postseason Population Estimate: 4,200

The North Natrona Mule Deer Herd Unit has a postseason population management objective of 6,500 mule deer. The herd is managed using the special management strategy, with the goal of maintaining postseason buck ratios between 30-45 bucks per 100 does. The objective and management strategy were last revised in 1988, and will be formally reviewed in 2014.

Herd Unit Issues

Hunting access within the herd unit is very good, with large tracts of public land as well as walk-in areas available for hunting. The southeastern corner of the herd unit is the only area dominated by private lands. In this area, specific doe/fawn licenses have been added to address damage issues on irrigated agricultural fields. The main land use within the herd unit is traditional ranching and grazing of livestock. Industrial-scale developments, including oil and gas development, are limited and isolated within this herd unit.

Weather

The winter of 2010-2011 was severe throughout the herd unit and likely resulted in higher mortality of mule deer. Conditions were warm and dry for the herd unit in 2011 and shrub production was below average, resulting in poor nutrition of mule deer entering the winter of 2011-2012. Snow pack and resulting spring moisture was below average for the winter of 2011-2012 which had negative impacts on lactating does and their fawns. The summer of 2012 was the driest on record since 1904 in much of Wyoming, and the winter of 2012 continued the trend with very low snow accumulation and snow pack. Fawn survival over the severely dry summer and winter was low, as evidenced by extremely low yearling buck ratios in 2013. April of 2013 finally saw a break in the drought, when temperatures dropped below normal for the entire month and significant precipitation was received. This cooler and wetter pattern continued through the summer of 2013 in much of the herd unit, though the northeaster portion of the unit continued to suffer very dry conditions. In early October 2013, winter storm "Atlas" blanketed the herd unit with 12-36" of wet snow. Lingering snow and resulting muddy conditions made accessing deer difficult in many locations. Travel conditions improved toward the end of hunting seasons, but by then it was apparent winter storm Atlas had a negative impact on hunter participation and harvest success. The early winter months of 2013-2014 brought temperature and precipitation conditions near the recent 30-year average. For detailed weather data see http://www.ncdc.noaa.gov/gac/time-series/us.

Habitat

This herd unit contains five habitat transects which measure annual production and utilization of curl leaf mountain mahogany (*Cercocarpus ledifolius*). However, no new production or utilization data were collected on transects in 2013. Anecdotal observations during the summer growing season suggest range conditions were back near average, following extremely poor conditions during the drought of 2012. Habitat and forage conditions appeared more typical during the summer of 2013, and should provide a good food source for mule deer on winter ranges over the 2013-2014 winter.

Field Data

Fawn ratios were moderate (55-66 per 100 does) in this herd from 1998-2002, and license issuance during this time was higher with an emphasis on buck harvest. During the mild years of 2003-2005, fawn production/survival was quite high (73-89 per 100 does). License issuance was very moderate during this time, and the population grew to a high of approximately 5,500 animals. From 2006-present, fawn production/survival was moderate to poor, and reached a 15-year low in 2012. Fawn production/survival recovered slightly in 2013 with 55:100, but was still poor compared to what is needed for population maintenance and/or growth. With continued

reductions in license issuance, the herd has been relatively stable near 4,000 animals from 2007-2013.

Buck ratios for the North Natrona Herd historically average in the mid 30s per 100 does. Type 1 license issuance remained stable at 350 from 2001-2011, as buck ratios stayed well within special management range. In 2012 Type 1 licenses were reduced to 250, as buck ratios were on the lower cusp of special management. Observed buck ratios were again near the lower end of special management in 2013, with 32 bucks per 100 does. In addition, yearling buck ratios have declined the past two years as fawn production has been extremely poor. With yearling buck ratios of only 7 and 8 per 100 does in 2012 and 2013 respectively, recruitment of mature bucks has slowed considerably. This lack of recruitment will in turn reduce the mature buck ratio. While reported hunter satisfaction has remained the same from 2012 to 2013 (~68%), negative hunter comments began to surface within the harvest report in 2013. Hunters have high expectations of buck quality and availability within special management areas, and some hunters commented that the population in the North Natrona Herd was very poor. Until fawn production and survival improve, managers feel it is prudent to reduce Type 1 licenses for 2014, so those hunters who draw have the type of quality opportunity they have come to expect from this herd unit. Management goals for 2014 are to improve buck ratios and maintain them well within the range of special management.

Since 2008, classified bucks have been further categorized based on antler size (see Figure 1). 2010 represented the best distribution of mature buck classes, with 46% Class I (small), 37% Class II (medium), and 18% Class III (large) bucks. Bucks classified in 2013 showed a marked decrease in antler quality compared to previous years. Class III bucks only represented 1% of the total classified, while Class I and Class II bucks represented 75% and 24% of those surveyed, respectively. With hunter expectations high for trophy-quality hunting, managers see this drop in trophy quality as further justification to reduce Type 1 licenses for the 2014 hunting season.

Bio-Year	Total Class N for HA	# Bucks Classified					Buck Ratios per 100 Females					
		Ylng	Class I	Class II	Class III	Total	Ylng	Class I	Class II	Class III	All Adult	Total
2008	1,023	59	111 (73%)	36 (24%)	5 (3%)	211	11	20	7	1	28	39
2009	1,009	51	87 (60%)	44 (31%)	13 (9%)	195	9	16	8	2	26	35
2010	905	47	55 (46%)	44 (37%)	21 (18%)	167	10	12	9	4	25	35
2011	760	52	64 (63%)	34 (33%)	4 (4%)	154	13	16	8	1	25	38
2012	868	36	91 (78%)	20 (17%)	6 (5%)	153	7	18	4	1	23	30
2013	637	28	60 (75%)	19 (24%)	1 (1%)	108	8	18	6	0	23	32

Figure 1. Antler classification analysis for the North Natrona Mule Deer Herd Unit, 2008-2013.

Harvest Data

Hunter success in the North Natrona Mule Deer Herd Unit is typically in the 70-80th percentile, and was 74% in 2013. While harvest success has remained average for the herd in recent years, days per animal have increased. Increasing days per animal typically indicate a shrinking population, as it takes hunters more time to find and harvest fewer animals. However survey totals, comments from hunters and landowners, and population modeling all indicate this herd has remained relatively stable. Thus, managers suspect hunters are being selective, as the herd has developed a reputation of having high quality mature bucks. Poor road and access conditions also may have contributed to an increase in hunter days during the 2013 season.

Tooth age data were collected from harvested bucks in the North Natrona Mule Deer Herd Unit in 2010 and 2013. Comparing data between years shows a consistency of hunter selection for mature bucks, with the average and median age increasing. In 2010, average age of tooth-aged bucks was 4.44 with a median age of 4.5 years (N=68). In 2013, average age of tooth-aged bucks increased to 5.40 with a median age of 5.5 (N=52). Average antler spread reported by hunters showed no change at all between data sets; both years showed an average antler spread of 21.2 inches. This suggests despite hunter selectivity for bigger bucks, availability of bucks has remained static in terms of antler size, despite the age increase of harvested bucks. Age increase may be due to changing distribution of bucks across age classes within the herd, where recent years with low fawn ratios have resulted in fewer bucks recruited into younger age classes. It may also be due to changes in habitat quality and resulting nutrition of mature bucks. Or, increased age but no change in reported antler spread may represent a shift genetically, whereby bucks must age further before their antler quality improves. Further research would be necessary to isolate why average and median age of harvested bucks has increased, but average antler spread has remained static. Regardless, this tooth-age data indicates past and current management prescription has resulted in most hunters harvesting prime-age bucks, which is consistent with management strategy.

Population

The 2013 postseason population estimate was approximately 4,200 and has been fairly stable for the past three years, after an estimated high of 5,200 deer in 2005. Postseason classification data and harvest data are applied to the model to predict population size and trends for this herd. No sightability or other population estimate data are currently available to further align the model.

The “Constant Juvenile Survival – Constant Adult Survival” (CJ,CA) spreadsheet model was chosen for the postseason population estimate of this herd. This model is the simplest and appears to be most representative of trends within the herd. The CJ,CA model selects adult survival rates that seem reasonable for this herd, but only if the juvenile survival rate is increased

slightly. The lower constraint for juvenile survival was thus increased from 0.4 to 0.5. Managers believe this to be an acceptable adjustment, as it is small and accounts for slightly milder habitat and winter conditions, and produces a trend that tracks with observed fawn and buck ratios. The SCJ,SCA model is unnecessary since the simpler model tracks well with the herd unit. The TSJ,CA model, while it trends well with observed population dynamics, does not match trends reported for earlier years when the population was estimated to be larger, and both license issuance and harvest success were higher. All three models have AICs that are low and well within one magnitude of power of each other. Thus, AIC has little bearing on model selection for this herd. The CJ,CA model is considered to be of good quality in representing population trends and estimates for this herd and based on established model criteria.

Management Summary

Traditional season dates in this herd run for two weeks from October 15th through October 31st. The 2014 season follows the same season dates with 150 Type 1 licenses. Type 6 licenses were formerly valid in the southeastern corner of the hunt area, and were intended to address damage issues on agricultural fields. These licenses will be eliminated in 2014, as there are currently no complaints of damage from mule deer. Type 6 licenses may be reinstated in future years should the population grow and damage to agriculture in this area become a concern once again.

If we attain the projected harvest of 140 mule deer with fawn ratios similar to the past 5 years, this herd will remain stable. The predicted 2014 postseason population size of the North Natrona Mule Deer Herd is approximately 4,200 animals.

INPUT	
Species:	Deer
Biologist:	Heather O'Brien
Herd Unit & No.:	MD 759 North Natrona
Model date:	02/25/14

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	28	37	☑ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	24	38	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	4	127	☐ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population			Total	Predicted Posthunt Population			Total	Objective
	Field Est	Field SE		Juveniles	Total Males	Females		Juveniles	Total Males	Females		
1993				919	882	2471	4272	901	541	2270	3712	6500
1994				1219	702	2225	4146	1214	474	2123	3811	6500
1995				1446	721	2174	4341	1435	482	2062	3979	6500
1996				1701	784	2175	4660	1701	580	2116	4397	6500
1997				1496	936	2290	4723	1484	664	2238	4386	6500
1998				1273	956	2343	4572	1273	704	2297	4273	6500
1999				1353	938	2342	4634	1349	671	2236	4256	6500
2000				1225	929	2308	4461	1210	545	2225	3980	6500
2001				1444	782	2263	4489	1434	599	2159	4191	6500
2002				1228	886	2260	4374	1225	646	2192	4064	6500
2003				1655	876	2238	4768	1645	677	2191	4512	6500
2004				2012	1007	2341	5361	2010	740	2264	5014	6500
2005				1750	1154	2498	5402	1746	905	2397	5048	6500
2006				1111	1234	2549	4894	1109	947	2459	4514	6500
2007				1591	1111	2444	5146	1583	863	2330	4776	6500
2008				1196	1156	2449	4801	1194	900	2409	4503	6500
2009				1099	1091	2421	4611	1095	818	2387	4301	6500
2010				1287	995	2377	4659	1287	751	2338	4375	6500
2011				1140	983	2381	4504	1137	745	2309	4192	6500
2012				973	941	2319	4232	967	755	2294	4017	6500
2013				1233	907	2263	4404	1231	710	2251	4193	6500
2014				1112	934	2291	4337	1110	796	2275	4181	6500
2015												6500
2016												6500
2017												6500
2018												6500
2019												6500
2020												6500
2021												6500
2022												6500
2023												6500
2024												6500
2025												6500

Survival and Initial Population Estimates

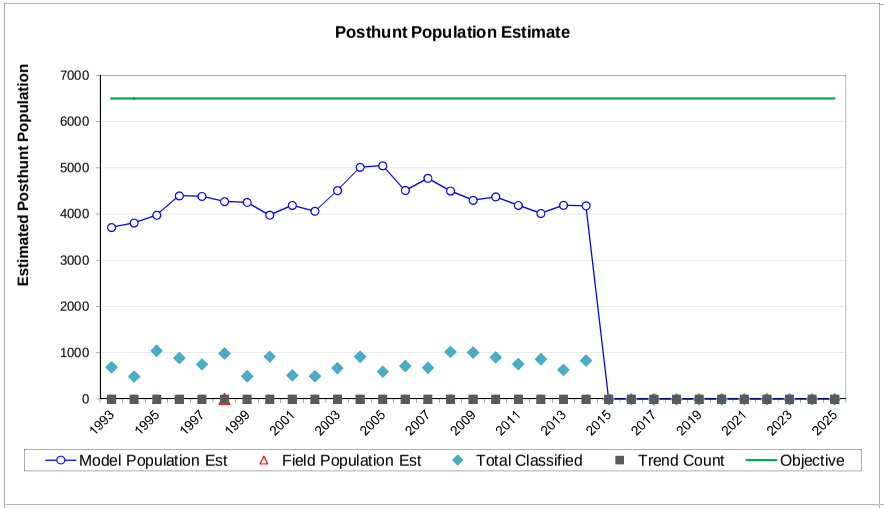
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.50			0.88		
1994	0.50			0.88		
1995	0.50			0.88		
1996	0.50			0.88		
1997	0.50			0.88		
1998	0.50			0.88		
1999	0.50			0.88		
2000	0.50			0.88		
2001	0.50			0.88		
2002	0.50			0.88		
2003	0.50			0.88		
2004	0.50			0.88		
2005	0.50			0.88		
2006	0.50			0.88		
2007	0.50			0.88		
2008	0.50			0.88		
2009	0.50			0.88		
2010	0.50			0.88		
2011	0.50			0.88		
2012	0.50			0.88		
2013	0.50			0.88		
2014	0.50			0.88		
2015						
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

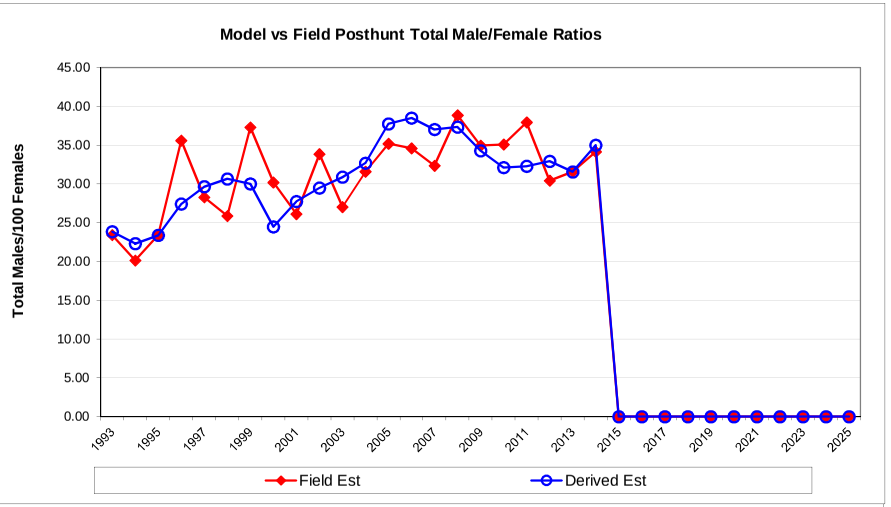
Parameters:	Optim cells
Juvenile Survival =	0.500
Adult Survival =	0.881
Initial Total Male Pop/10,000 =	0.054
Initial Female Pop/10,000 =	0.227

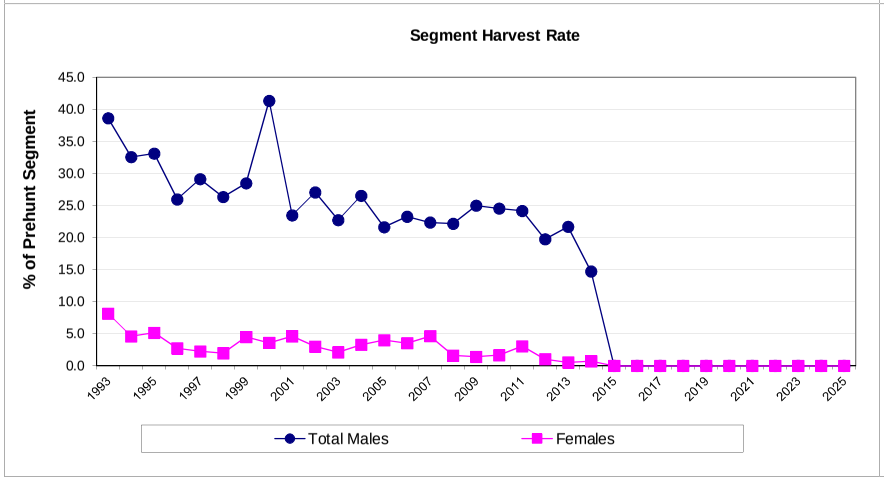
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

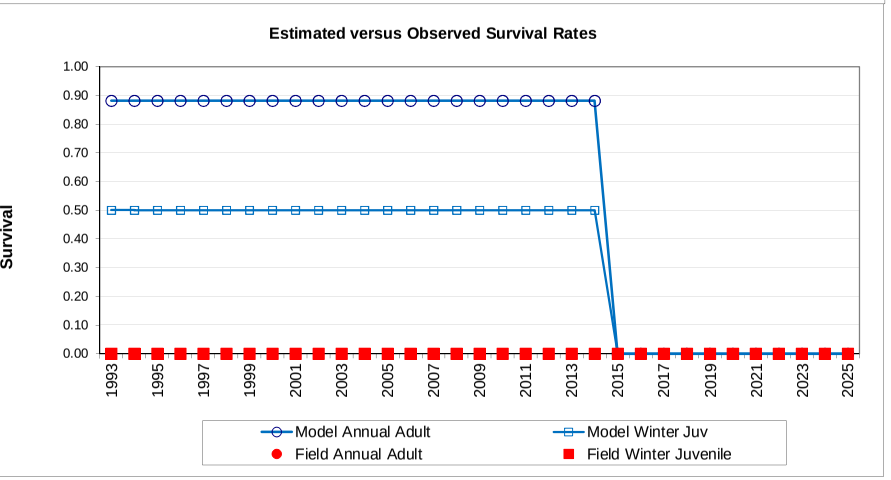
Classification Counts							Harvest					
Year	Juvenile/Female Ratio			Total Male/Female Ratio							Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		39.72	3.62	23.85	23.40	2.61	16	310	183	509	38.6	8.1
1994		57.19	5.69	22.31	20.14	2.95	4	208	93	305	32.6	4.6
1995		69.61	4.66	23.38	23.39	2.31	10	217	102	329	33.1	5.2
1996		80.39	5.93	27.42	35.59	3.42	0	185	54	239	26.0	2.7
1997		66.32	5.33	29.65	28.28	3.05	11	248	47	306	29.1	2.3
1998		55.41	3.98	30.65	25.87	2.44	0	229	42	271	26.4	2.0
1999		60.32	6.19	30.01	37.30	4.51	4	243	96	343	28.5	4.5
2000		54.40	4.10	24.48	30.20	2.80	13	349	75	437	41.3	3.6
2001		66.42	6.42	27.74	26.12	3.51	9	167	95	271	23.5	4.6
2002		55.89	5.76	29.48	33.84	4.15	2	218	62	282	27.1	3.0
2003		75.08	6.28	30.89	27.03	3.21	9	181	43	233	22.7	2.1
2004		88.76	6.33	32.68	31.58	3.15	2	243	70	315	26.5	3.3
2005		72.82	6.62	37.74	35.19	4.07	4	227	91	322	21.6	4.0
2006		45.11	4.05	38.50	34.59	3.42	2	261	82	345	23.3	3.5
2007		67.94	5.79	37.02	32.35	3.55	7	226	103	336	22.4	4.6
2008		49.54	3.69	37.34	38.86	3.15	2	233	36	271	22.2	1.6
2009		45.88	3.46	34.28	34.95	2.91	3	248	31	282	25.0	1.4
2010		55.04	4.23	32.11	35.08	3.16	0	222	36	258	24.5	1.7
2011		49.26	4.26	32.29	37.93	3.59	2	216	66	284	24.2	3.0
2012		42.15	3.45	32.92	30.42	2.81	5	169	22	196	19.8	1.0
2013		54.68	4.97	31.55	31.58	3.49	2	179	11	192	21.7	0.5
2014		48.80	3.99	35.00	34.14	3.17	2	125	15	142	14.7	0.7
2015												
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES



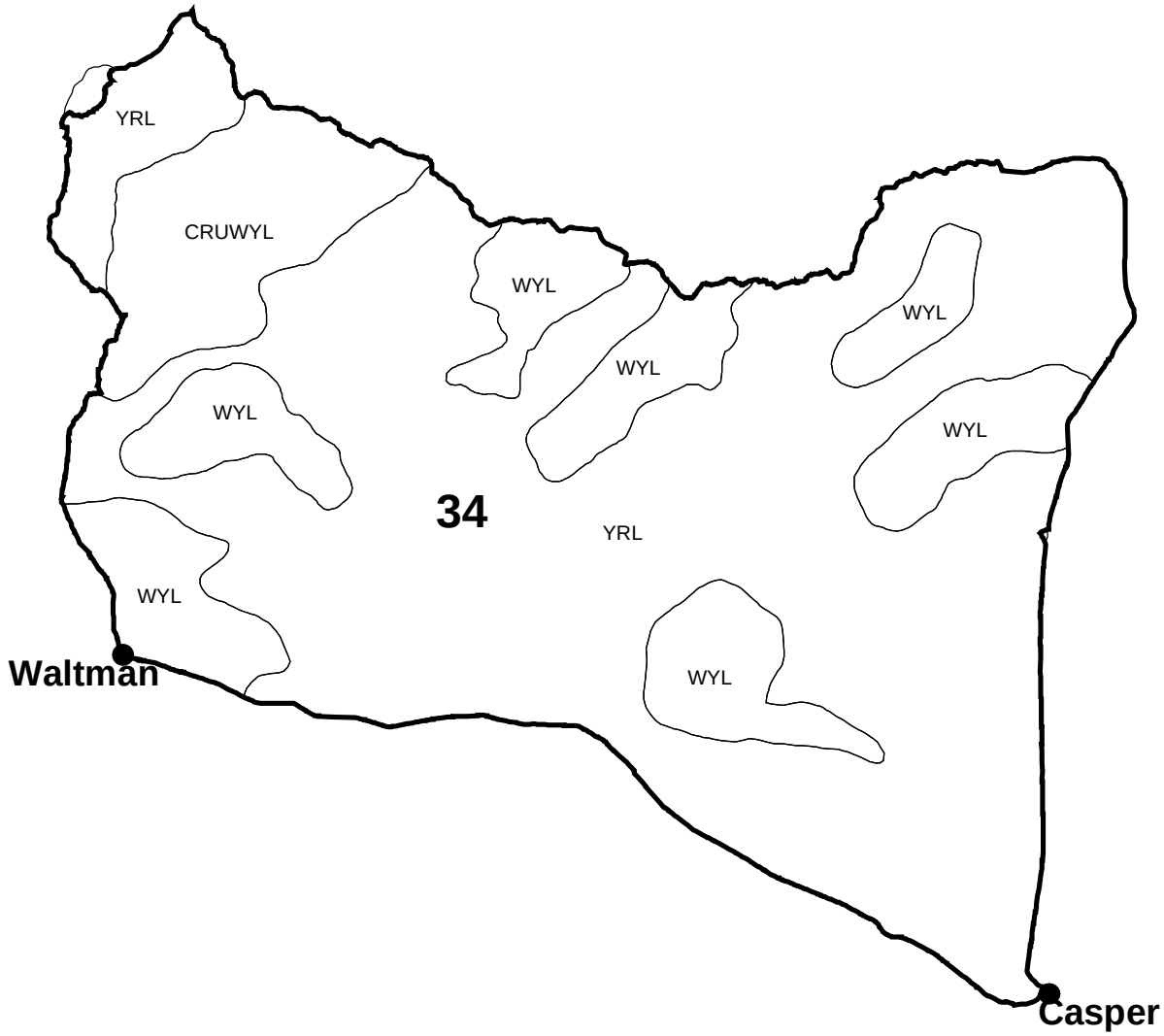






Comments:

Mule Deer - North Natrona
Hunt Area 34
Casper Region
Revised 4/88



2013 - JCR Evaluation Form

SPECIES: White tailed Deer
PERIOD: 6/1/2013 - 5/31/2014

HERD: WD706 - BLACK HILLS

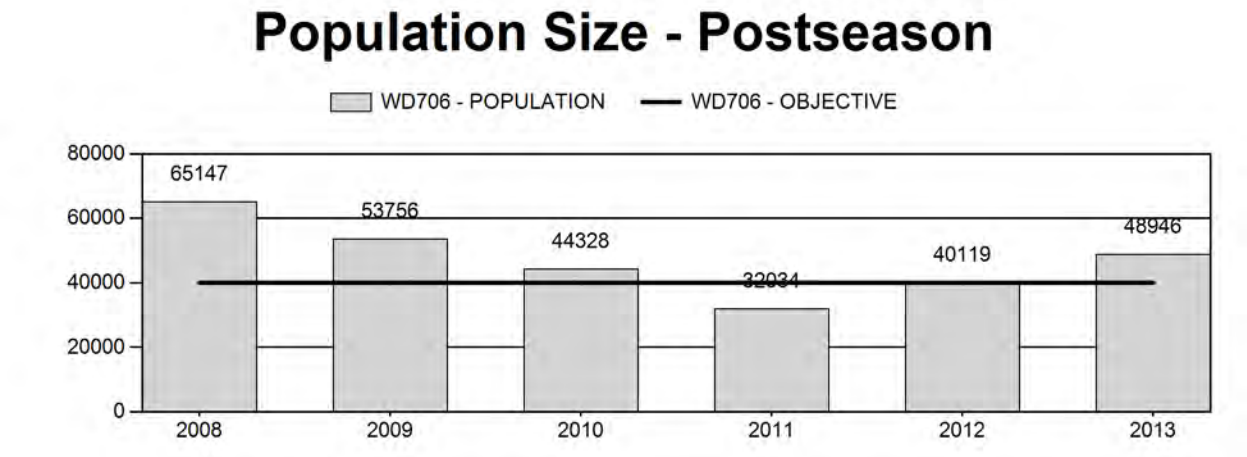
HUNT AREAS: 1-6
PREPARED BY: JOE SANDRINI

	2008 - 2012 Average	2013	2014 Proposed
Population:	47,077	48,946	58,800
Harvest:	4,764	3,482	3,735
Hunters:	8,299	6,110	6,550
Hunter Success:	57%	57%	57%
Active Licenses:	8,699	6,456	6,800
Active License Percent:	55%	54%	55%
Recreation Days:	34,637	25,404	27,250
Days Per Animal:	7.3	7.3	7.3
Males per 100 Females	26	24	
Juveniles per 100 Females	67	63	

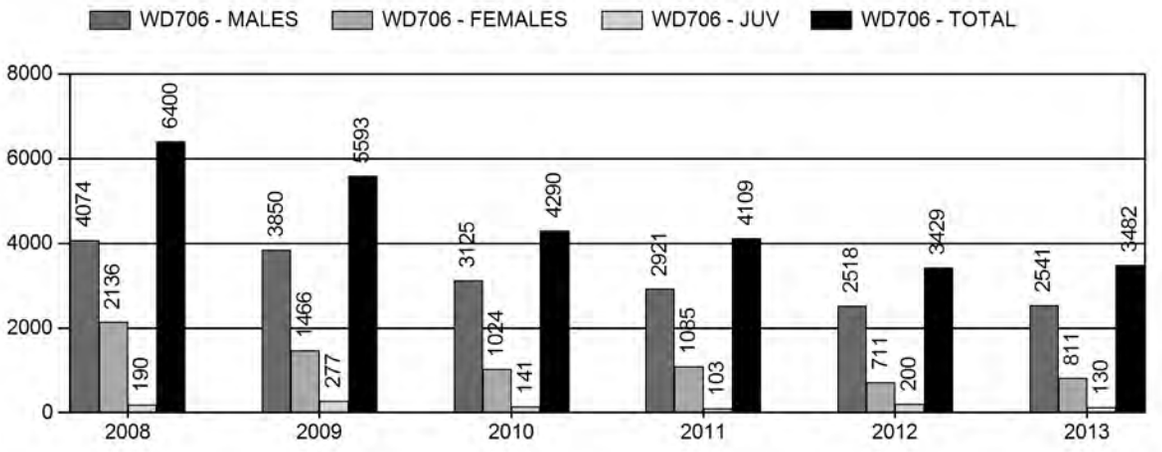
Population Objective:	40,000
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	22%
Number of years population has been + or - objective in recent trend:	2
Model Date:	02/20/2013

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

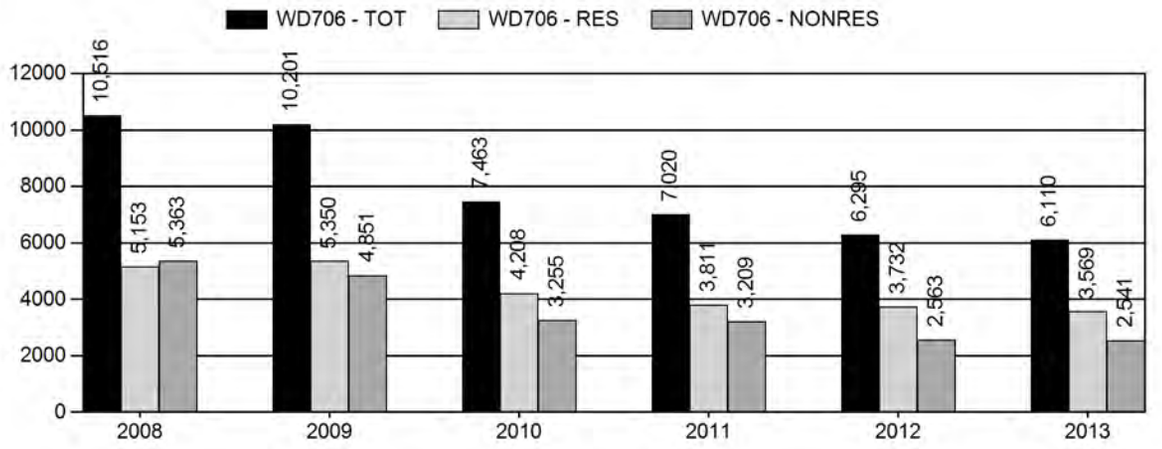
	JCR Year	Proposed
Females ≥ 1 year old:	3.5%	3.8%
Males ≥ 1 year old:	26.5%	20.6%
Juveniles (< 1 year old):	0.9%	0.9%
Total:	7.4%	7.8%
Proposed change in post-season population:	+ 19.4%	+ 22.7%



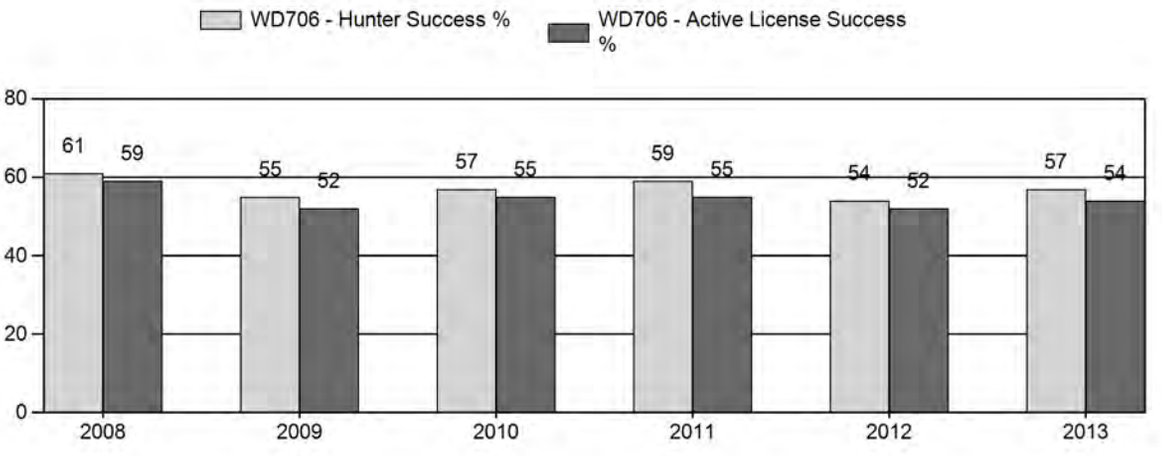
Harvest



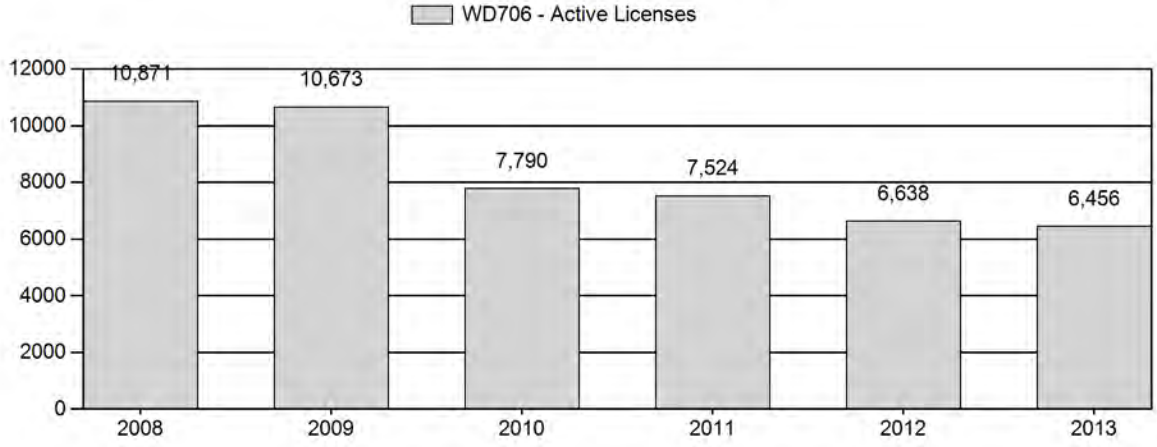
Number of Hunters



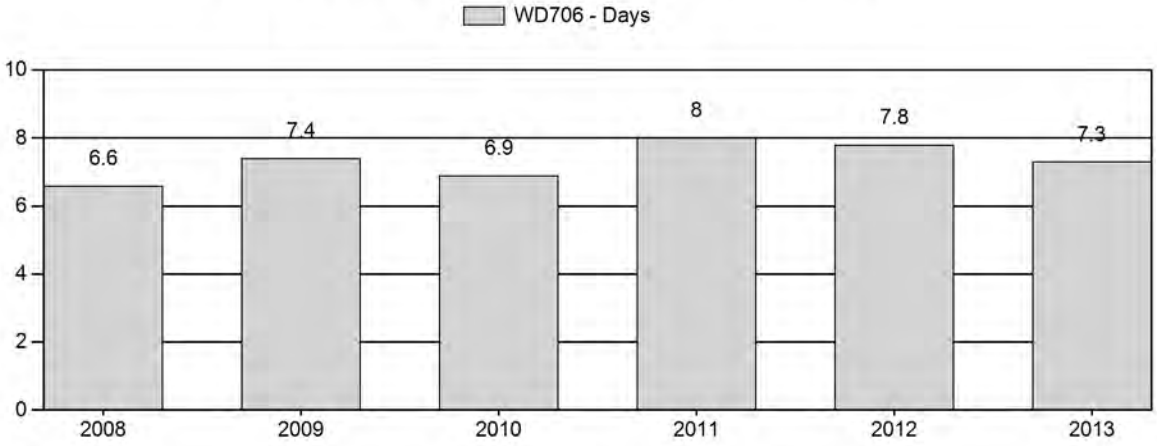
Harvest Success



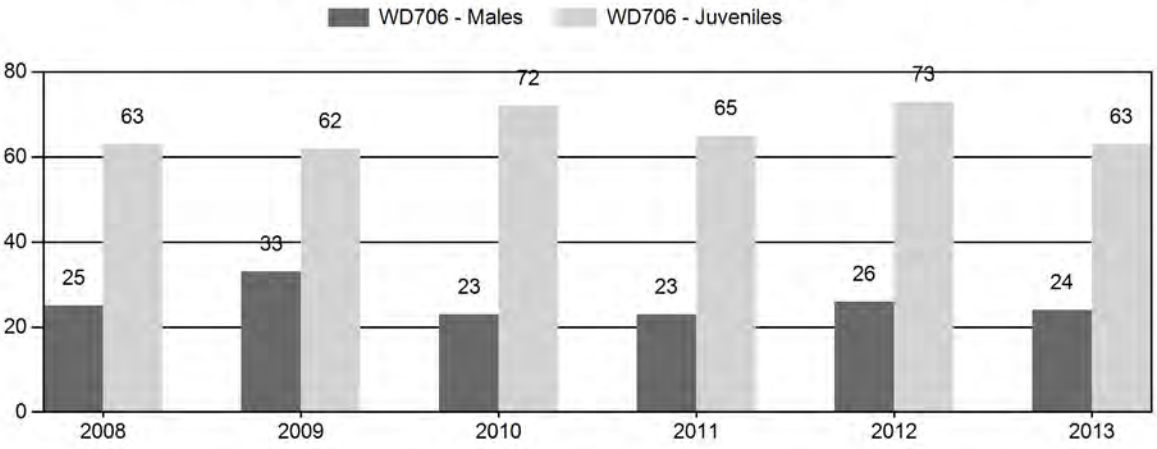
Active Licenses



Days Per Animal Harvested



Preseason Animals per 100 Females



2008 - 2013 Preseason Classification Summary

for White tailed Deer Herd WD706 - BLACK HILLS

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Pre Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	72,187	127	222	349	13%	1,381	53%	871	33%	2,601	1,247	9	16	25	± 0	63	± 0	50
2009	59,908	131	224	355	17%	1,079	51%	672	32%	2,106	1,260	12	21	33	± 0	62	± 0	47
2010	49,047	93	232	325	12%	1,407	51%	1,016	37%	2,748	1,536	7	16	23	± 0	72	± 0	59
2011	36,554	48	149	197	12%	856	53%	559	35%	1,612	1,278	6	17	23	± 0	65	± 0	53
2012	43,891	93	143	236	13%	919	50%	675	37%	1,830	1,590	10	16	26	± 0	73	± 0	58
2013	52,709	163	153	316	13%	1,303	53%	827	34%	2,446	1,232	13	12	24	± 0	63	± 0	51

2014 HUNTING SEASONS
BLACK HILLS WHITE-TAILED DEER HERD (WD706)

Hunt Area	Type	Dates of Seasons Opens	Dates of Seasons Closes	Quota	License	Limitations
1		Nov. 1	Nov. 21		General	Antlered deer off private land; any deer on private land
1, 2, 3	8	Nov. 1	Nov. 21	1200	Limited quota	Doe or fawn white-tailed deer valid on private land
2	6	Nov. 1	Nov. 21	50	Limited quota	Doe or fawn valid on private land
2		Nov. 1	Nov. 21		General	Antlered deer off private land; any deer on private land
3		Nov. 1	Nov. 21		General	Antlered deer off private land; any deer on private land
4		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land except the lands of the State of Wyoming's Ranch A property shall be closed
4	6	Nov. 1	Nov. 20	150	Limited quota	Doe or fawn valid on private land
5		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land
5	6	Nov. 1	Nov. 20	25	Limited quota	Doe or fawn
6		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land
6, 9	6	Nov. 1	Nov. 20	10	Limited quota	Doe or fawn valid east of U.S. Highway 85

Region A Nonresident Quota: 2,750

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	License Type	Quota change from 2013
2	6	+25
1,2	8	+400
Herd Unit Totals	**6**	**+25**
	8	**+400**
	Region A	**None**

Management Evaluation
Current Management Objective: 40,000
Management Strategy: Recreational
2013 Postseason Population Estimate: ~ 47,900
2014 Proposed Postseason Population Estimate: ~ 58,800

HERD UNIT ISSUES: The management objective of the Black Hills white-tailed deer herd unit is an estimated post-season population of 40,000 deer. This herd is managed under the recreational management strategy. The population objective and management strategy were set thirty years ago. It is apparent this objective is not commensurate with current population estimates relative to landowner and hunter desires. Thus, the management objective and strategy are scheduled for review during 2015. This will allow for several years of spreadsheet modeling before a proposed revision is taken to the public.

Over the years, modeling this population has been extremely difficult and frustrating. This is due to substantial interstate movement of deer, fluctuations in observed fawn:doe ratios, regular outbreaks of epizootic hemorrhagic disease (EHDV), increased predation in recent years, a high level of vehicle-deer collisions, the apparent low productivity of this herd compared to other white-tailed deer herds, severe winter and spring weather events, and low and irregular visibility of bucks during classifications. Consequently, the population model is thought to be of low quality and estimates produced by the model should be viewed cautiously. Because of this, and the fact that much of the herd unit is comprised of private property, management of this herd has been based heavily on perceptions of deer numbers relative to landowner tolerance.

The Black Hills White-Tailed Deer Herd unit is primarily located within Crook and Weston Counties in northeastern Wyoming and encompasses about 3,140 mi^2 of occupied habitat. Seasonal range maps for this herd were updated in 2004, and currently 335 mi^2 are delineated as crucial winter range. Approximately 79% of the land in this herd unit is privately owned. The largest blocks of accessible public land are found on the Black Hills National Forest in Hunt Areas (HA) 2 and 4, Thunder Basin National Grasslands in HA 6, and BLM lands in HA 1. Due to the late timing of deer hunting season in the Black Hills relative to other deer hunt areas in Wyoming, and the potential to harvest a whitetail on public land, this herd unit is extremely popular with resident hunters. Its proximity to the upper Midwestern United States and availability of sympatric mule deer hunted concurrently also make it very popular with non-residents. Access fees for hunting are very common on private land, and many holdings have been leased to outfitters. Consequently, accessible public lands are subject to very heavy hunting pressure. Due to limited access for hunters on private land, keeping the growth of this herd in check is difficult when habitat and weather conditions are favorable.

Whitetails are the most numerous deer species in HA's 2 and 4, whereas more equal proportions or greater numbers of mule deer occupy HA's 1, 3, 5, and 6 depending upon habitat type. A high proportion of white-tailed deer in the herd unit reside on private land. This results in their management being strongly influenced by landowner tolerance. Field personnel report white-tailed deer numbers are now generally below local tolerance, and most landowners and the hunting public desire to see more deer.

Dominant land uses in the herd unit include agricultural grazing and forage crop production. Most forested lands are actively managed for timber production and harvest. There is some

extraction of minerals, primarily bentonite and oil. The majority of white-tailed deer are found in the eastern two-thirds of this herd unit and along the Belle Fourche River drainage where habitat is favorable.

WEATHER: Drought conditions, which were generally persistent throughout the Black Hills between 2000 and 2006, began to moderate some in 2007. Between 2007 and 2011, annual temperatures were generally near, or below, the previous 30-year average and annual precipitation each year at, or above, that average (http://www.ncdc.noaa.gov/cag/time-series/us). Notably, 2010 was colder and wetter than both the 30-year and 100-year averages; and the winter of 2010-11 severe. Since the late 1890's, only five other winters were as cold and snowy as that of 2010-11. Overall, the predominant weather pattern between 2007 and 2011 was characterized by generally cool summers, more persistent snow cover in late fall and winter, and above normal spring moisture.

Drought returned to the Black Hills in 2012, with above normal summer temperatures and little rainfall during the growing season. Forage production that year was very poor, and the dry conditions led to several large wildfires in the southern half of the herd unit. These warm and dry conditions that beset the area in April of 2012 continued through the 2012-13 winter (http://www.ncdc.noaa.gov/cag/time-series/us). April of 2013 finally saw a break in this pattern when temperatures dropped well below normal for the entire month and good precipitation was again received. Through the remainder of the growing season, temperatures were slightly above average and precipitation well above normal. This resulted in excellent forage growth. In early October, 2013 winter storm Atlas blanketed the Black Hills with anywhere from about a foot of wet heavy snow near Newcastle, to three feet on the Bearlodge, and over five feet near Cement Ridge. This single storm event significantly hampered access for hunters on the BHNF throughout the hunting season. No large scale die-offs of white-tailed deer were witnessed from this storm, but some white-tailed deer mortalities on the National Forest south of I-90 were discovered. This storm also displaced a large number of white-tailed deer from higher elevations on the BHNF to lower elevation private lands.

Based on weather and habitat conditions over the past five years, it is likely white-tailed deer entered the winter in fair condition most years, except bio-year 2012. More normal winter temperatures and precipitation, punctuated by some severe winter and spring weather, have increased stress on white-tailed deer compared to the previous decade, as did the drought of 2012. This recent weather pattern resulted in fluctuation in observed fawn:doe ratios and some inconsistent, annual recruitment of fawns in to the adult population.

HABITAT: Ponderosa pine (*Pinus ponderosa*) is the dominant overstory species on forested lands. Quaking aspen (*Populus tremuloides*), paper birch (*Betula papyrifera*), and bur oak (*Quercus macrocarpa*) stands are also present. Many areas dominated by deciduous trees are in late successional stages. Important shrubs include Saskatoon serviceberry (*Amelanchier alnifolia*), Oregon grape (*Berberis repens*), common chokecherry (*Prunus virginiana*), and spiraea (*Spirea betulifolia*). Non-timbered lands in this portion of the herd unit are used to produce agricultural crops such as winter wheat (*Triticum aestivum*), alfalfa hay (*Medicago sativa*), or mixed-grass hay. White-tailed deer in the western one-third of the herd unit are limited mainly to riparian habitats and associated agricultural ground. Outside of these riparian

corridors habitat in this portion of the herd unit is dominated by sagebrush steppe and grasslands with scattered ponderosa pine covered hills.

Winter forage production and utilization has been measured along two bur oak monitoring transects on the Black Hills National Forest (BHNF). These transects reveal very consistent, annual mean leader growth between 2003 and 2009 (no production data have been collected since). Annual leader growth averaged about two inches, with a standard deviation of less than one-half of an inch. The lowest production occurred between 2003 and 2005 and the greatest in 2009. It appears bur oak may invest extra water resources in either leader growth or mast production. This may be a function of timing of precipitation events, and complicates year to year comparisons of production data along with applying these data to deer management recommendations. Utilization of bur oak leaders available to deer measured between 2003 and 2011 averaged 59% (std. dev. 9%). This level of use was considered excessive, since it regularly exceeded 50%, and suggests wintering white-tailed deer numbers in these areas may lead to excessive herbivory when this population is at objective.

FIELD DATA: Preseason age and sex classifications are conducted in this herd unit the second half of October along standardized routes. Most of these routes have been used for over 40 years. In 2013, classifications were not conducted along these routes due to impossible travel conditions created by winter storm Atlas. Instead, ground based classifications were conducted in areas personnel could access to meet required sample sizes.

During the past three decades, fawn production and survival (based upon preseason classification counts) has been well below most white-tailed deer herds, and at times fluctuated dramatically. The underlying cause is thought to be related to over-winter nutritional condition of does (pers. Comm. SDGF&P). Over the past decade, observed fawn:doe ratios have improved, likely a result of vegetative responses to fire. Since 2003, observed preseason fawn:doe ratios fluctuated between 56:100 and 73:100 ($mean_{(03\text{-}13)}$ = 64.9; std dev = 4.9), but exhibited a general trend upwards, improving about 10%. On the other hand, observed preseason buck:doe ratios, while also fluctuating, have declined about 12% ($mean_{(03\text{-}13)}$ = 26.7; std dev = 3.6). This is thought to be a result of increased non-hunting mortality, since hunting seasons the past several years have become more conservative. For example, 2010-11 over-winter mortality was likely significant considering the observed 2010 preseason fawn;doe ratio (72:100) and the 2011 observed yearling buck:doe ratio (6:100). Overall, this herd's preseason buck:doe ratios are generally at the lower end of the Department's recreational management criteria. It should be noted, however, that classifications are made outside the rut and because whitetails are secretive, we have always modeled this herd's preseason buck:doe ratio about 30% above observed values. This has been necessary to create functional models, and seems reasonable given the classification protocol.

HARVEST DATA: In the Black Hills, deer management entails regulating both mule deer and whitetail harvest under a single season structure, across a variety of habitats and habitat conditions, with serious deference given to landowner desires. An analysis of harvest information suggests hunter numbers has the greatest impact on buck harvest. Therefore, buck harvest has been regulated by altering non-resident hunter numbers via changes in the Region A quota, while resident buck hunter participation can only be limited by shortening the season – notably by inclusion or removal of the Thanksgiving Day weekend and the days following in November, due to the large influx of hunters during this time period when buck deer are highly vulnerable to harvest. With more conservative hunting season structures in place since 2010,

harvest has dropped. At the same time, hunter success generally declined and effort increased until 2013, when this trend began to reverse itself.

Hunting seasons the past four years reduced harvest of whitetail bucks an average of 30% from that experienced during the traditional November season the preceding four years. Comparing these same time periods, resident harvest of white-tailed bucks dropped 19%, while non-resident harvest of white-tailed bucks dropped 40%. During this time period, harvest of mule deer bucks declined more precipitously (see MD751). Despite these trends, observed preseason, whitetail buck:doe ratios have been fairly stable ($mean_{(2010\text{-}2013)}$ = 24.0, std dev = 1.4) and deer hunter satisfaction essentially remained unchanged. About 68% of hunters of both deer species have reported they were either satisfied or very satisfied with their Black Hills deer hunt each of the past three years, while only around 15% reported they were either dissatisfied or very dissatisfied – regardless of species. With the slight increase in deer hunter success rates in 2013, hunter satisfaction actually climbed a few percentage points for both species.

POPULATION: Population modeling of this herd has been difficult and fraught with problems. The population violates the closed population assumption due to significant interstate movement of deer between Wyoming, Montana, and South Dakota. In addition, fluctuations in observed fawn:doe ratios, outbreaks of EHDV, increased predation, a high level of vehicle-deer collisions, the low productivity of this herd, occasional severe winter and spring weather events, and reduced visibility of bucks during classifications make use of classification data tenuous for constructing a population model. Of the three competing spreadsheet models, the Semi-Constant Juvenile / Semi-Constant Adult survival (SCJ SCA) model was selected to estimate the population. The Constant Juvenile / Constant Adult survival (CJ CA) model would not function with this herd's observed data despite repeated efforts and alterations. The Time Sensitive Juvenile / Constant Adult survival model (TSJ CA) was also rejected even though it exhibited the lowest AICc value and best fit. This was because it constrained juvenile survival rates to set limits 14 out of 22 years, and was not correlated well with trend data or harvest statistics. Alternatively, the SCJ SCA model was about 80% correlated with preseason trend counts (1996-2012) and approximately 60% correlated with trend counts between 2008 & 2012 (Figure 1). Because this model was best correlated with trend count data, it was selected over the TSJ CA model despite a higher AICc value and poorer fit. Further, changes in the preseason population estimates produced by the SCJ SCA model are inversely correlated with changes in hunter effort, while the TSJ CA model exhibits a slight positive correlation. With regards to changes in hunter success, none of the models correlate well with harvest statistics, but the SCJ SCA model does the best job. Additionally, the SCJ SCA model estimates about 35% to 45% of bucks in the preseason population are being harvested most years (mean 37%), and in a couple years 50% or more are taken, something that seems unlikely. On the other hand, the TSJ CA model exhibits about half as much variation in the estimated percentage of bucks harvested annually, but still yielding a mean value of 33%. Therefore, due to the variety of factors identified, we consider the chosen model to be of poor quality, but better than the competing models.

According to the selected spreadsheet model, this population grew 115% between 2001 and 2007. The population then declined 57% to its nadir in 2011 (20% below objective), before rebounding nearly 50% through 2013. If population estimates produced by the spreadsheet model are close to accurate, then our current objective is likely well below landowner and hunter desires, as many landowners and hunters have noted deer numbers are still below the level they would like to see.

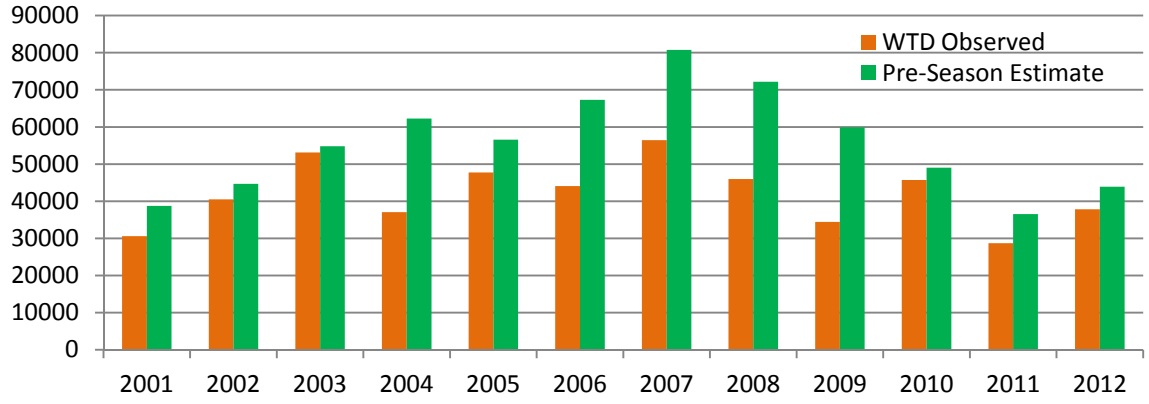


Figure 1. 2001-2012 white-tailed deer, estimated preseason population and trend count data, increased by a factor of 10.

Beginning in 2002, hunting seasons were structured to retard growth. Population growth was reversed in 2007, but this directional change was primarily due to increased non-hunting mortality rather than enhanced harvest. Changes in survival rates have been most ostensibly attributed to increased over-winter mortality caused by late spring blizzards in 2008 & 2009, and an unusually severe winter in bio-year 2010. These weather events combined with epizootic hemorrhagic disease (EHDV) outbreaks each of the past six years to increase annual mortality in all sex and age classes of deer. Between 2007 and 2010, evidence also suggests the mountain lion population in the Black Hills reached historically high levels. As a result, elevated harvest, weather conditions, disease, and increased predation acted in concert to reduce this population substantially. In response, hunting seasons have been conservative since 2010, allowing this herd to increase the past three years.

MANAGEMENT SUMMARY: Changes to the 2014 white-tailed deer hunting season in the Black Hills were designed to continue conservative harvest of bucks, but allow increased take of antlerless white-tailed deer. Changes included moving the closing date to November 21st from November 22nd in Hunt Areas 1, 2, and 3. This was done to maintain just three full weekends of deer hunting. Staying with the 22nd closing date would have added an additional Saturday to the season when compared to the previous 3 years; and returning to a Thanksgiving Day closing date would have added another full week and additional weekend of hunting to the season beyond what has been in place the past four years. Whitetail deer buck numbers seem to be improving, and based upon classification data and population estimates there should be a good cohort of 1 and 2 year old bucks available for hunters in 2014, but significantly lower numbers of 3 & 4 year old bucks than in recent years. As such, it seems prudent to limit buck harvest until we have an increase in the number of older bucks and can spread harvest pressure out more amongst age classes, something most hunters desire. Continuing with a Region A license quota identical to last year is also intended to limit harvest of bucks. In order to help temper herd growth and allow landowners to be proactive in curbing increases in whitetail numbers, issuance of type 8 doe/fawn white-tailed deer licenses valid on private land was increased 50% with these tags also being made valid in HA 3 in addition to HA's 1 & 2; and the relatively low number of type 6 doe/fawn licenses valid on private land for either deer species doubled.

The 2014 hunting season is expected to yield an estimated 2014 postseason population of 58,800 white-tailed deer, which represents a 23% increase in the current post-season population and assumes losses to EHDV will be less than have been experienced in recent years. Such a change in the population would result in a herd 47% above objective, but hopefully get us close to a number of deer most hunters and landowners would like to see.

INPUT	
Species:	White-Tail Deer
Biologist:	Sandrini
Herd Unit & No.:	Black Hills
Model date:	02/20/13

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	1553362	1553371	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Adult Survival**	218	288	☑ SCJ,SCA	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	77	179	☐ TSJ,CA Model	

Population Estimates from Top Model

Year	Pre-Rifle Pop Pop Est		Trend Count	Pre-Archery Season Population (year i)			Total	Pre-Rifle Season Population (year i)			Total	Predicted Posthunt Population (year *i*)			Total	Objective
	Field Est	Field SE		Juveniles	Total Males	Females		Juveniles	Total Males	Females		Juveniles	Total Males	Females		
1993				11298	5968	**17479**	**34745**	11298	5968	17479	**34745**	10583	2237	13897	**26717**	40000
1994				11107	6147	**17232**	**34486**	11107	6147	17232	**34486**	11012	3096	16680	**30788**	40000
1995				9284	6308	**17675**	**33268**	9284	6308	17675	**33268**	9205	3644	17044	**29893**	40000
1996			22250	8611	6095	**17222**	**31928**	8611	6095	17222	**31928**	8569	3769	16862	**29200**	40000
1997			19300	6427	6924	**19461**	**32811**	6427	6924	19461	**32811**	6403	4350	18982	**29735**	40000
1998			31580	11146	6589	**20595**	**38329**	11146	6589	20595	**38329**	11104	4290	20238	**35632**	40000
1999			41940	14974	8955	**24203**	**48132**	14974	8955	24203	**48132**	14940	7369	23973	**46282**	40000
2000			42560	14774	12956	**28798**	**56529**	14774	12956	28798	**56529**	14707	9270	28169	**52146**	40000
2001			30610	6527	9043	**23189**	**38760**	6527	9043	23189	**38760**	6414	5693	22307	**34414**	40000
2002			40500	13122	7822	**23729**	**44673**	13122	7822	23729	**44673**	13048	4402	23234	**40685**	40000
2003			53140	18217	9278	**27315**	**54810**	18217	9278	27315	**54810**	17985	5196	26317	**49498**	40000
2004			37050	18075	11979	**32198**	**62252**	18075	11979	32198	**62252**	17920	8091	31163	**57174**	40000
2005			47730	17282	10137	**29165**	**56584**	17282	10137	29165	**56584**	17089	5969	27749	**50806**	40000
2006			44080	21799	12350	**33179**	**67328**	21799	12350	33179	**67328**	21549	8026	31438	**61013**	40000
2007			56470	26192	16095	**38465**	**80751**	26192	16095	38465	**80751**	25997	11604	36412	**74014**	40000
2008			45970	22182	14836	**35170**	**72188**	22182	14836	35170	**72188**	21973	10355	32820	**65148**	40000
2009			34410	18353	12087	**29469**	**59908**	18353	12087	29469	**59908**	18048	7852	27856	**53756**	40000
2010			45710	16934	8662	**23451**	**49047**	16934	8662	23451	**49047**	16779	5224	22325	**44328**	40000
2011			28700	11933	6349	**18273**	**36554**	11933	6349	18273	**36554**	11820	3135	17079	**32035**	40000
2012			37850	15375	7584	**20932**	**43891**	15375	7584	20932	**43891**	15155	4815	20150	**40120**	40000
2013				15999	10540	**25208**	**51747**	15999	10540	25208	**51747**	15856	7745	24316	**47916**	40000
2014				19845	13613	**29450**	**62908**	19845	13613	29450	**62908**	19664	10808	28328	**58800**	40000
2015																40000
2016																40000
2017																40000
2018																40000
2019																40000
2020																40000
2021																40000
2022																40000
2023																40000
2024																40000
2025																40000

Survival and Initial Population Estimates

Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.81			0.95		
1994	0.81			0.80		
1995	0.81			0.80		
1996	0.81			0.95		
1997	0.81			0.95		
1998	0.90			0.95		
1999	0.81			0.95		
2000	0.50			0.70		
2001	0.81			0.95		
2002	0.81			0.95		
2003	0.81			0.95		
2004	0.50			0.80		
2005	0.81			0.95		
2006	0.81			0.95		
2007	0.50			0.80		
2008	0.50			0.75		
2009	0.50			0.70		
2010	0.50			0.65		
2011	0.81			0.95		
2012	0.81			0.95		
2013	0.81			0.95		
2014	0.81			0.95		
2015						
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

Parameters:	Optim cells
Juvenile Survival =	0.808
Adult Survival =	0.950
Initial Total Male Pop/10,000 =	0.597
Initial Female Pop/10,000 =	1.748

MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Buck Adjustment Factor	70%

Classification Counts							Total Harvest (Rifle+Archery)					
Year	Juvenile/Female Ratio			Total Male/Female Ratio							Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field est w/ buck Adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		64.64	3.46	34.14	38.13	1.95	650	3392	3256	7298	62.5	20.5
1994		64.45	2.78	35.67	34.72	1.49	86	2774	502	3362	49.6	3.2
1995		52.53	2.69	35.69	42.42	1.86	72	2422	574	3068	42.2	3.6
1996		50.00	2.49	35.39	40.68	1.74	38	2115	327	2480	38.2	2.1
1997		33.03	1.92	35.58	29.29	1.44	22	2340	435	2797	37.2	2.5
1998		54.12	2.17	31.99	25.48	1.09	38	2090	324	2452	34.9	1.7
1999		61.87	2.18	37.00	40.20	1.31	31	1442	209	1682	17.7	0.9
2000		51.30	1.92	44.99	42.73	1.36	61	3351	572	3984	28.5	2.2
2001		28.15	1.38	39.00	34.47	1.26	103	3046	802	3951	37.1	3.8
2002		55.30	2.00	32.96	35.20	1.20	67	3109	450	3626	43.7	2.1
2003		66.69	2.12	33.97	36.65	1.14	211	3711	907	4829	44.0	3.7
2004		56.14	2.17	37.20	37.14	1.33	141	3534	941	4616	32.5	3.2
2005		59.26	2.02	34.76	38.60	1.22	176	3789	1287	5252	41.1	4.9
2006		65.70	2.31	37.22	48.65	1.50	227	3931	1583	5741	35.0	5.2
2007		68.09	3.04	41.84	38.66	1.67	177	4082	1866	6125	27.9	5.3
2008		63.07	2.73	42.18	36.10	1.51	190	4074	2136	6400	30.2	6.7
2009		62.28	3.06	41.02	47.00	2.01	277	3850	1466	5593	35.0	5.5
2010		72.21	2.97	36.93	33.00	1.42	141	3125	1024	4290	39.7	4.8
2011		65.30	3.55	34.74	32.88	1.82	103	2921	1085	4109	50.6	6.5
2012		73.45	3.72	36.23	36.69	1.87	200	2518	711	3429	36.5	3.7
2013		63.47	2.82	41.81	34.65	1.52	130	2541	811	3482	26.5	3.5
2014		67.39	3.18	46.22	36.71	1.70	165	2550	1020	3735	20.6	3.8
2015												
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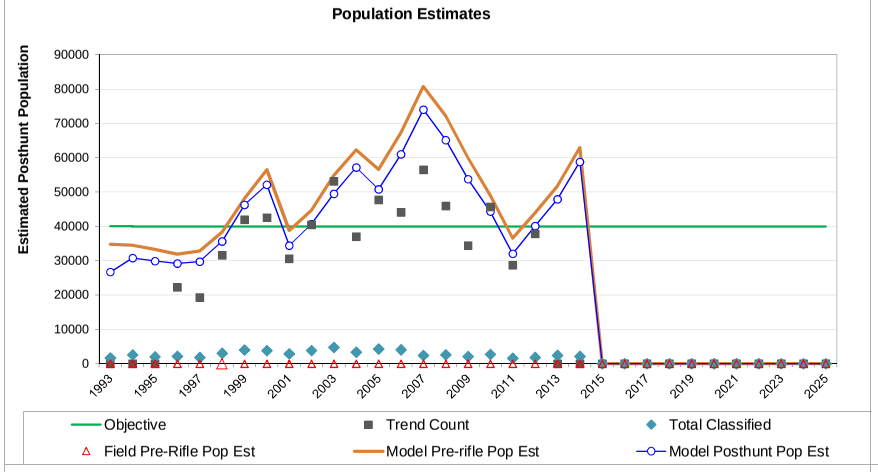
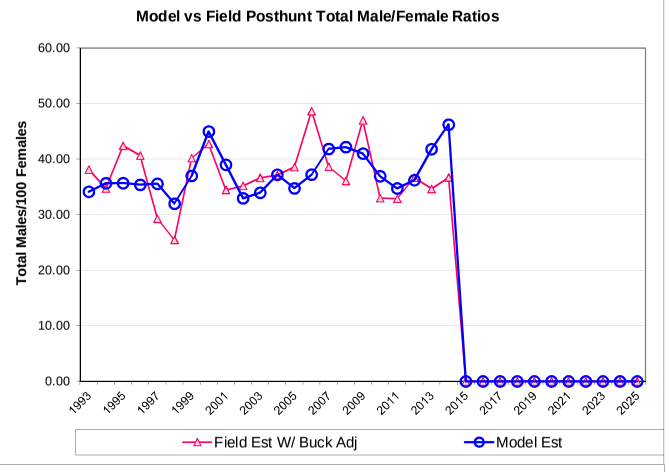
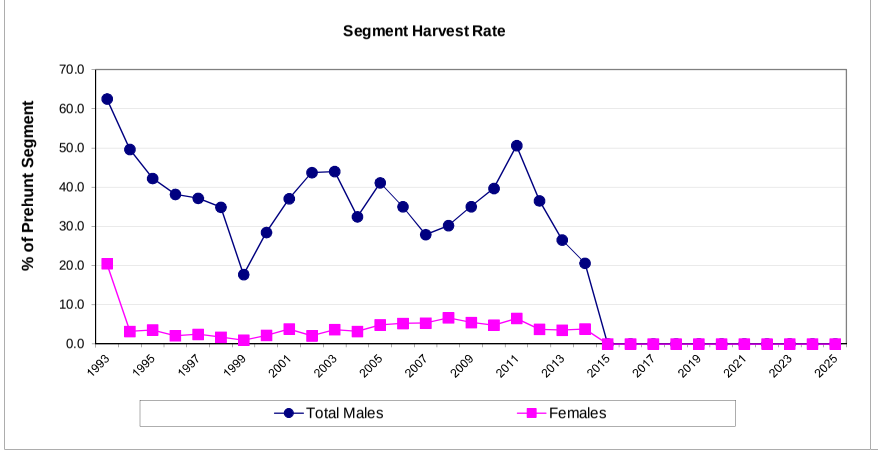
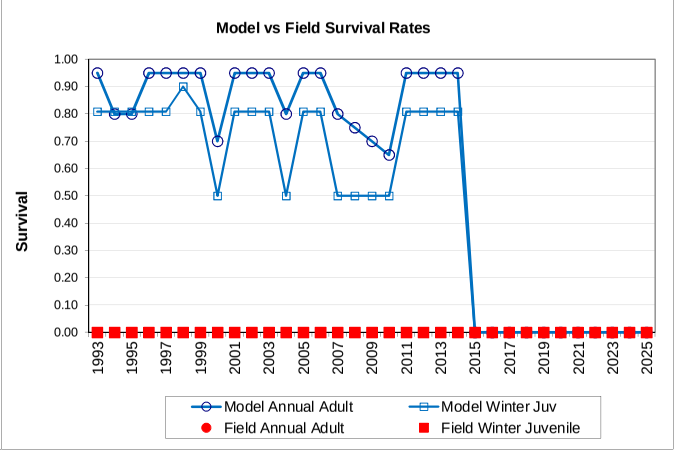
FIGURES









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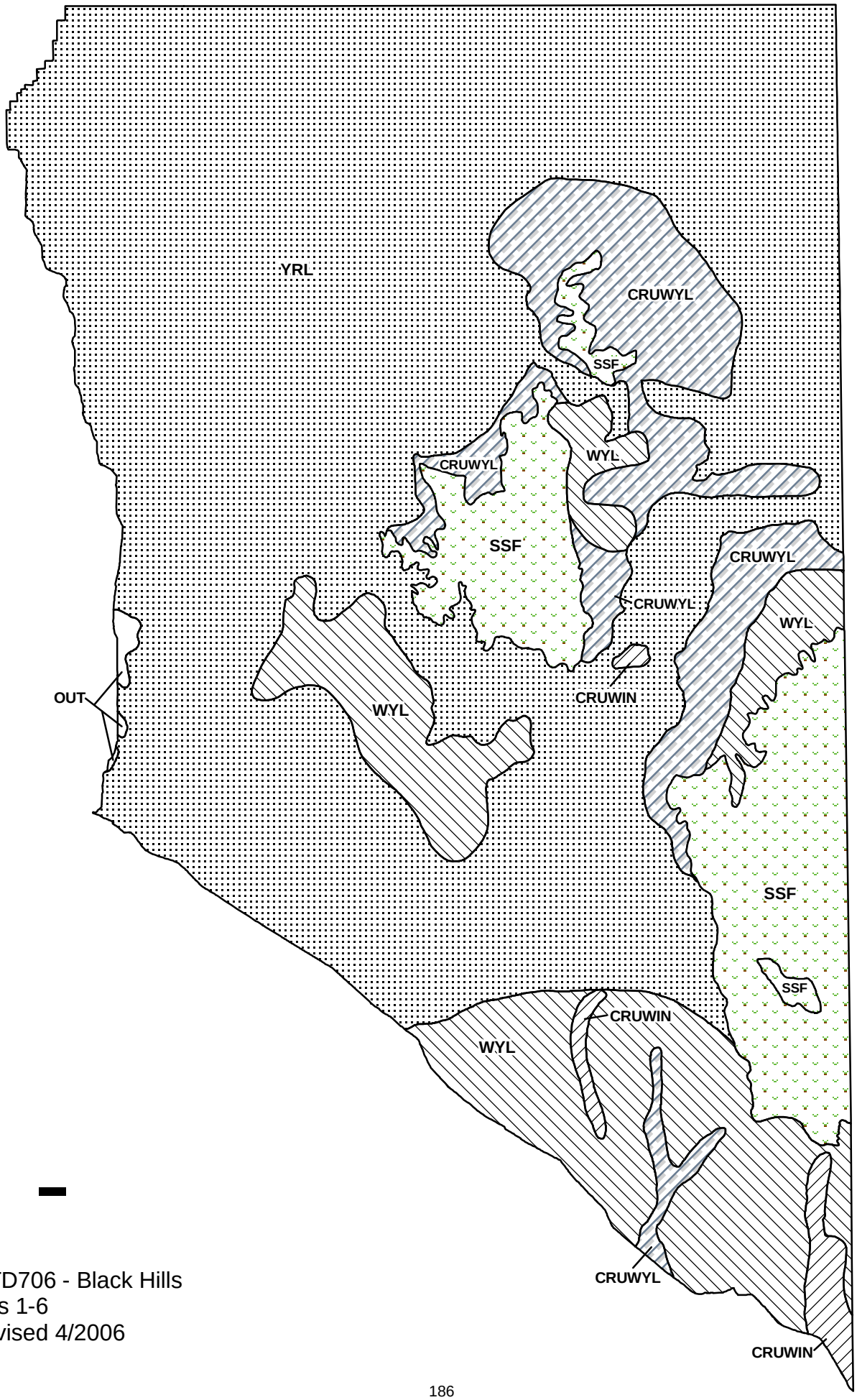


WTD706 - Black Hills
HAs 1-6
Revised 4/2006

2013 - JCR Evaluation Form

SPECIES: White tailed Deer
PERIOD: 6/1/2013 - 5/31/2014

HERD: WD707 - CENTRAL

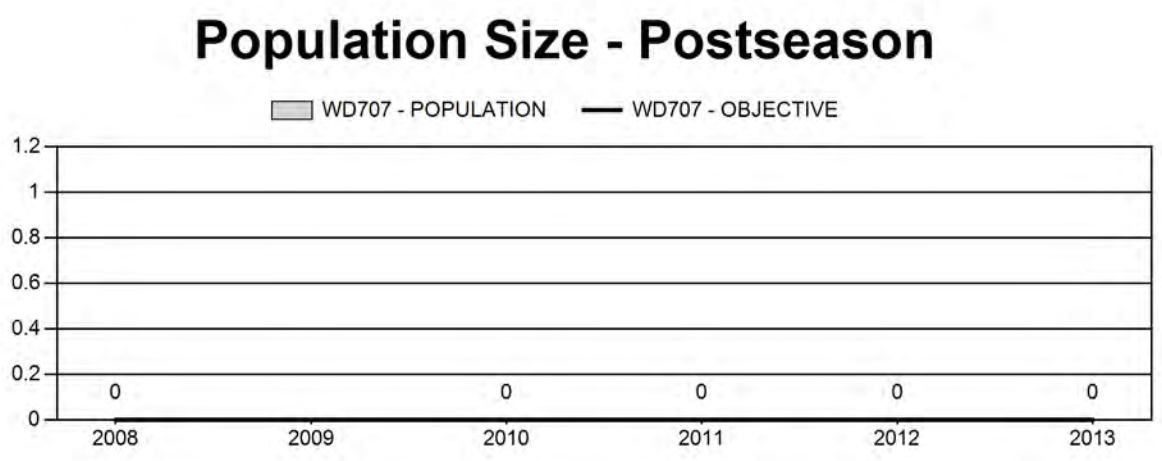
HUNT AREAS: 7-14, 21-22, 34, 65-67, 88-89
PREPARED BY: HEATHER O'BRIEN

	2008 - 2012 Average	2013	2014 Proposed
Population:	0	N/A	N/A
Harvest:	1,396	1,043	725
Hunters:	2,877	2,567	1,400
Hunter Success:	49%	41%	52 %
Active Licenses:	3,257	3,014	1,375
Active License Percent:	43%	35%	53 %
Recreation Days:	13,227	13,799	8,000
Days Per Animal:	9.5	13.2	11.0
Males per 100 Females	35	43	
Juveniles per 100 Females	63	64	

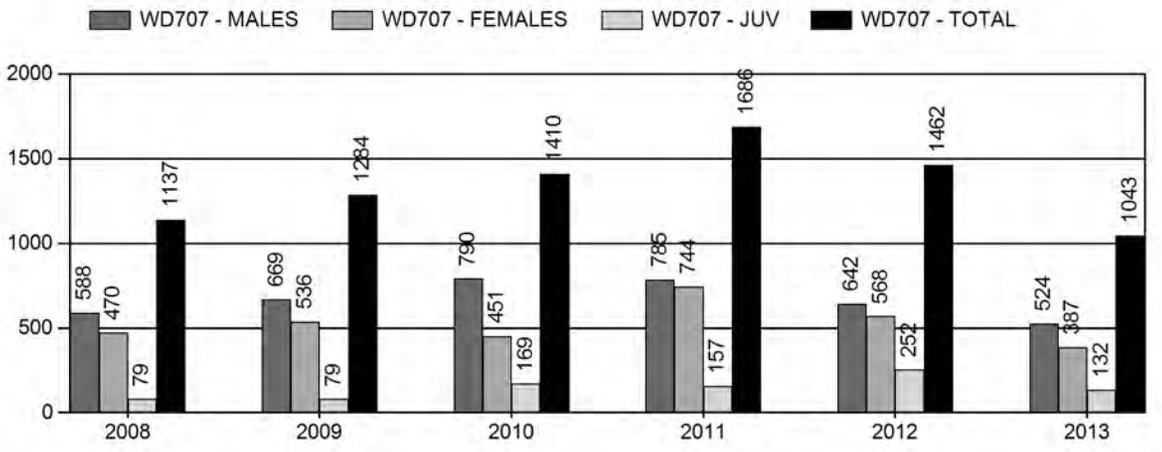
Population Objective:	0
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	N/A%
Number of years population has been + or - objective in recent trend:	3
Model Date:	None

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

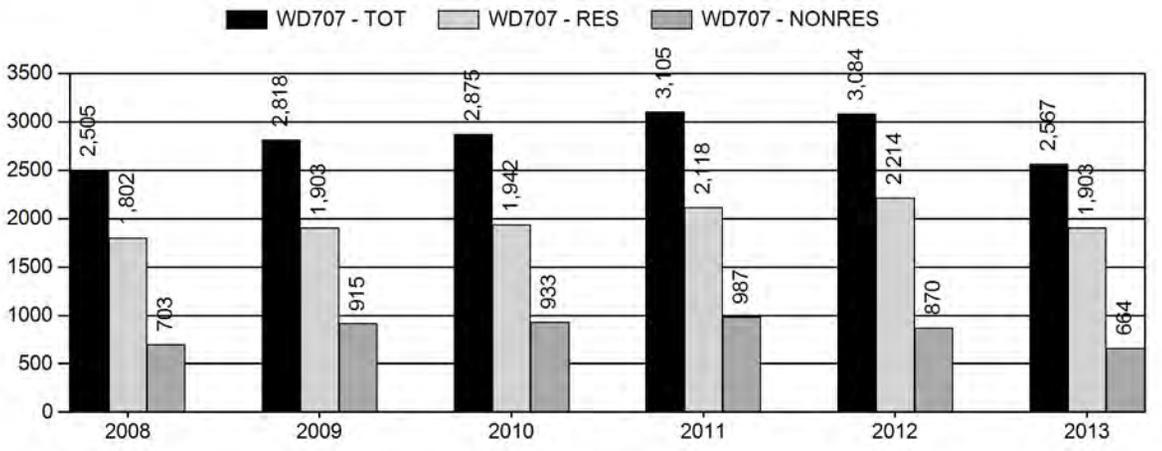
	JCR Year	Proposed
Females ≥ 1 year old:	0%	0%
Males ≥ 1 year old:	0%	0%
Juveniles (< 1 year old):	0%	0%
Total:	0%	0%
Proposed change in post-season population:	0%	0%



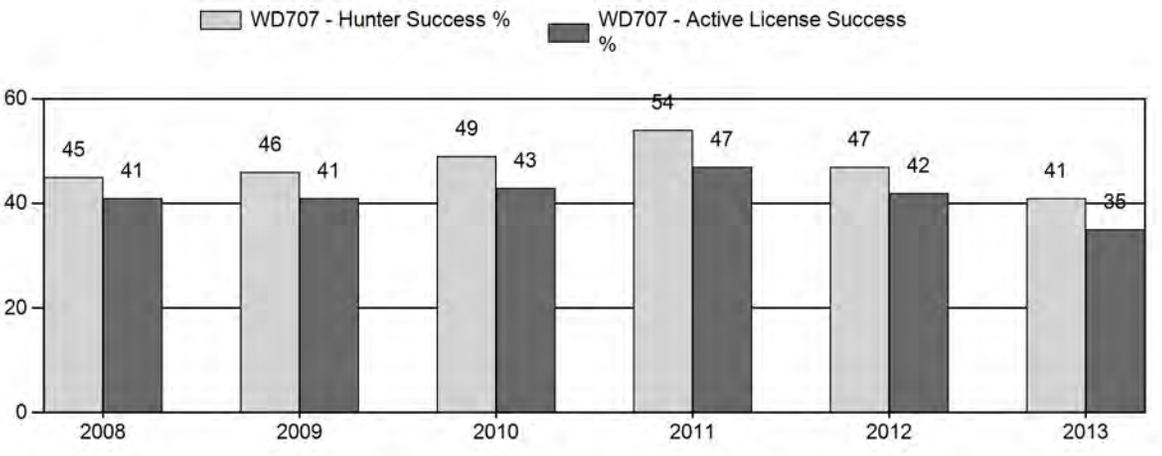
Harvest



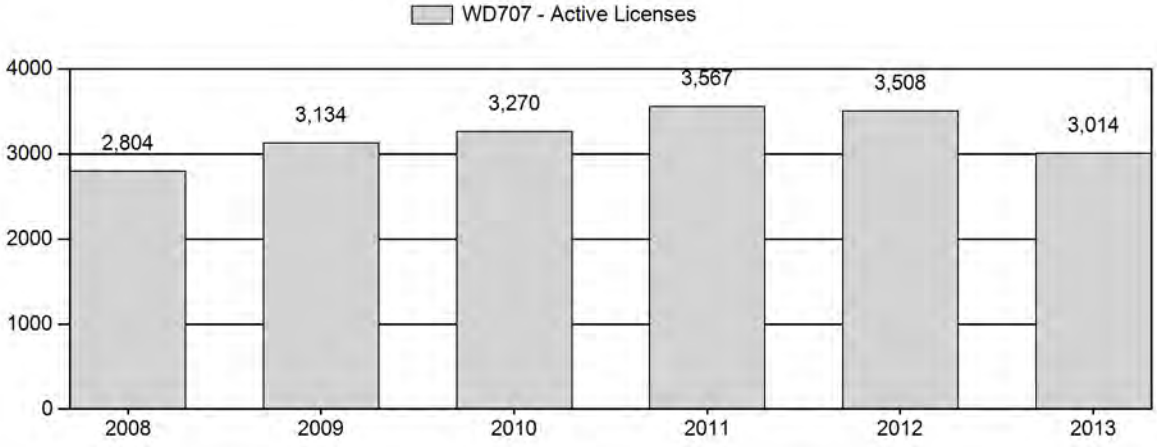
Number of Hunters



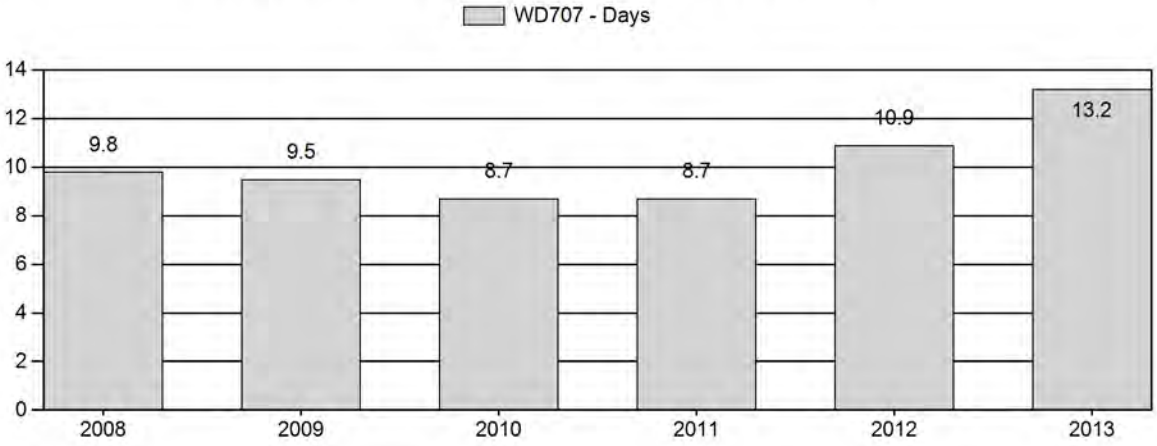
Harvest Success



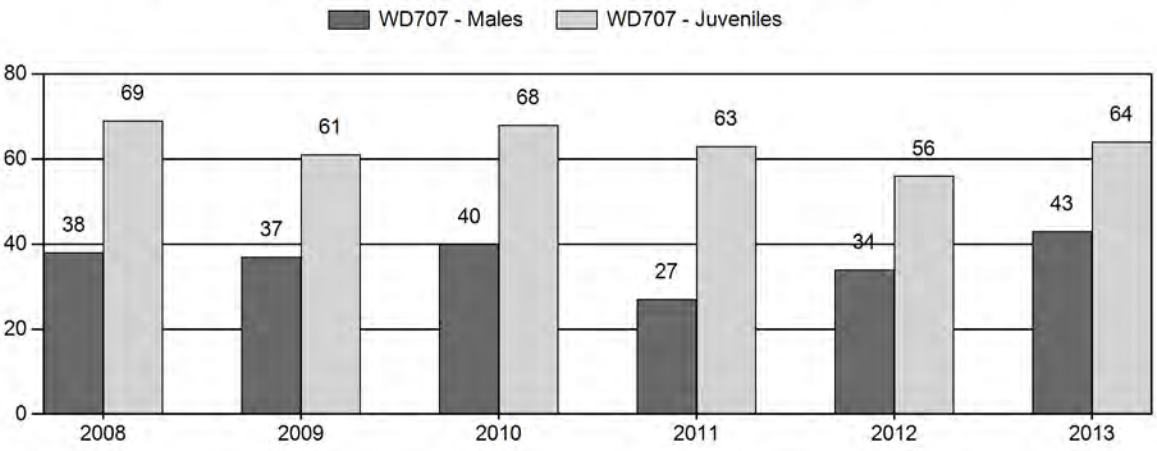
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2008 - 2013 Postseason Classification Summary

for White tailed Deer Herd WD707 - CENTRAL

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	0	54	91	145	18%	386	48%	266	33%	797	0	14	24	38	± 0	69	± 0	50
2009	0	49	108	157	19%	430	51%	261	31%	848	0	11	25	37	± 0	61	± 0	44
2010	0	60	87	147	19%	372	48%	253	33%	772	0	16	23	40	± 0	68	± 0	49
2011	0	45	81	126	14%	467	53%	292	33%	885	0	10	17	27	± 0	63	± 0	49
2012	0	54	76	130	18%	381	53%	212	29%	723	0	14	20	34	± 0	56	± 0	41
2013	0	19	61	80	21%	188	48%	121	31%	389	0	10	32	43	± 0	64	± 0	45

2014 HUNTING SEASONS
CENTRAL WHITE-TAILED DEER (WD707)

Hunt Area	Type	Date of Seasons Opens	Closes	Quota	Limitations
10,11,12 13,14	3	Oct. 1	Nov. 30	400	Limited quota licenses; any white-tailed deer
	8	Oct. 1	Nov. 30	300	Limited quota licenses; doe or fawn white-tailed deer
		Oct. 16	Nov. 30		General license; any white-tailed deer
22	3	Oct. 1	Nov. 30	50	Limited quota licenses; any white-tailed deer
	8	Oct. 1	Nov. 30	25	Limited quota licenses; doe or fawn white-tailed deer
34	3	Oct. 15	Nov. 30	35	Limited quota licenses; any white-tailed deer
	8	Oct. 15	Nov. 30	50	Limited quota licenses; doe or fawn white-tailed deer
65, 66, 88, 89	3	Oct. 15	Nov. 30	300	Limited quota licenses; any white-tailed deer
	8	Oct. 15	Nov. 30	400	Limited quota licenses; doe or fawn white-tailed deer
Archery					Refer to license type and limitations in Section 2

Note: The above season limitations are restricted to only those lines in the Chapter 6 Regulation that directly affect white-tailed deer hunting. Additional general and limited quota seasons occur in hunt areas 7-14, 22, 34, 65-67, 88, and 89 but are not captured here.

Hunt Area	Type	Quota Change
10, 11, 12, 13, 14	3	-100
	8	-200
22	3	-50
	8	-75
34	3	-15
	8	-50
65, 66, 88, 89	3	-200
	8	-300
WD707 Total (excluding Type 6 & 7 licenses)	**3**	**-365**
	8	**-625**

Management Evaluation

Current Management Objective: ≥ 20 bucks:100 does postseason

Management Strategy: Recreational

2013 Postseason Population Estimate: NA

2014 Proposed Postseason Population Estimate: NA

The Central White-tailed Deer Herd Unit has a postseason management objective of ≥20 bucks per 100 does. No population model exists for this herd unit, as this is not a well-defined or closed population. Managers are unable to obtain adequate classifications over this large herd unit due to poor sightability of white-tailed deer in cottonwood riparian habitats. Access to perform ground surveys is inconsistent and highly variable from year to year as most white-tailed deer inhabit private lands.

Herd Unit Issues

White-tailed deer densities in this herd are highest along major cottonwood riparian communities of the Cheyenne River and North Platte River drainages and on irrigated hay fields in the La Prele Creek, La Bonte Creek, and Casper Creek drainages. Most white-tailed deer habitats in this herd unit are on private lands. Landowners typically have a low tolerance for white-tailed deer, and access to hunt is generally good. Periodic disease outbreaks (i.e. hemorrhagic diseases, adenovirus, Asian louse, Chronic Wasting Disease) are known to occur within this herd, and can contribute to population declines in localized areas when environmental conditions are suitable. Female harvest in this herd is typically insufficient to curtail population growth as many Type 8 licenses remain unsold. Epizootic Hemorrhagic Disease (EHD) often regulates this population given the lack of female harvest.

Weather

The winter of 2010-2011 was severe across most of the herd unit, and likely increased mortality of white-tailed deer across all age classes. Conditions were warmer and drier in 2011, and white-tailed deer were more confined to riparian areas as forage conditions in drier habitats was poor. The summer of 2012 was the driest on record since 1904 in much of Wyoming, and the winter of 2012 continued the trend with very low snow accumulation and snow pack. Severe drought conditions in 2012 confined not only white-tailed deer but also other big game species to riparian areas. Thus, competition for available forage increased significantly along most drainages. Post-season fawn ratios dropped markedly as a result in 2012. April of 2013 finally saw a break in the drought, when temperatures dropped below normal for the entire month and significant precipitation was received. This cooler and wetter pattern continued through the summer and fall of 2013 in much of the herd unit, and post-season fawn ratios rebounded as a result. The early winter months of 2013-2014 brought temperature and precipitation conditions near the recent 30-year average. 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 growth and/or utilization on shrub species that are preferred browse of white-tailed deer. However, browse quality and availability appeared to increase along riparian corridors as moisture improved from 2012 to 2013. Anecdotal observations from field personnel noted average moisture conditions resulting in average to good upland shrub and herbaceous forb conditions. Many landowners also reported improved conditions for irrigation of hay fields during the 2013 growing season.

Field Data

Fawn ratios are typically good for this herd and range in the 60-70s per 100 does. 2013 was an average year with observed fawn ratios of 64 per 100 does. Still, white-tailed deer appear to be at a low point in their population within this herd unit due to disease outbreak, harsh winters in 2010 and 2011, and the severe drought of 2012. This herd unit will require several more years of improved fawn production and survival before managers can expect any significant increase in population size.

Buck ratios for the Central White-tailed Deer Herd historically average in the mid 30s per 100 does, but occasionally swell into the 40s or drop into the 20s. In 2013 the observed buck ratio was 43 per 100 does. Observed ratios may vary from year to year due to differing levels of effort or success in sampling white-tailed deer during post-season classification surveys. Buck ratios

vary widely across the large variety of habitats in this herd unit as well. Additionally, white-tailed deer can be difficult to classify on private lands and in riparian cover, particularly bucks that may be solitary and elusive. Still, observed buck ratios have always met management objectives for this herd by remaining at or above 20 bucks per 100 does.

Reports of dead white-tailed deer were prevalent along the North Platte River and its drainages west of the city of Casper during the late summer of 2013. Lab analysis confirmed the fatalities were the result of epizootic hemorrhagic disease (EHD). Suspected EHD outbreaks also occurred throught the Cheyenne River drainages in the eastern portion of the herd unit. While cases were not as wide-spread as those reported in the central portions of the herd unit in 2012, presence of EHD increased overall mortality in the herd during the late summer of 2013.

Harvest Data

License success in this herd unit is typically in the 40-50th percentile, and was 41 percent in 2013. License issuance varies greatly between the many hunt areas contained within the herd unit. Hunters can typically take white-tailed deer on general licenses and also purchase additional limited quota licenses valid for any white-tailed deer or doe/fawn white-tailed deer. Issuance of limited quota licenses is managed from year to year depending on perceived numbers of white-tailed deer on private lands. Potential damage issues and willingness of landowners to provide access are also factors influencing license issuance.

Access to white-tailed deer hunting opportunity generally increased and peaked in 2011 with a total of over 3,100 hunters. Since then license issuance has been gradually reduced, as the population – and hunting access – have decreased. From 2011-2013, harvest success has declined 24%, while hunter effort has increased 52%. Hunter comments in 2013 also reflect reduced access resulting from reduced numbers of white-tailed deer in the herd unit. Many phone calls were received by Casper Region personnel from hunters seeking access for white-tailed deer hunting, as landowners with fewer deer turned hunters away. Additional comments were received via harvest surveys from hunters expressing their dissatisfaction as opportunity to hunt white-tails on private lands was low. Observations from field personnel, harvest statistics, and hunter comments all indicate that this herd unit is at a population low. Concequently, license issuance will be reduced within this herd unit for 2014.

Population

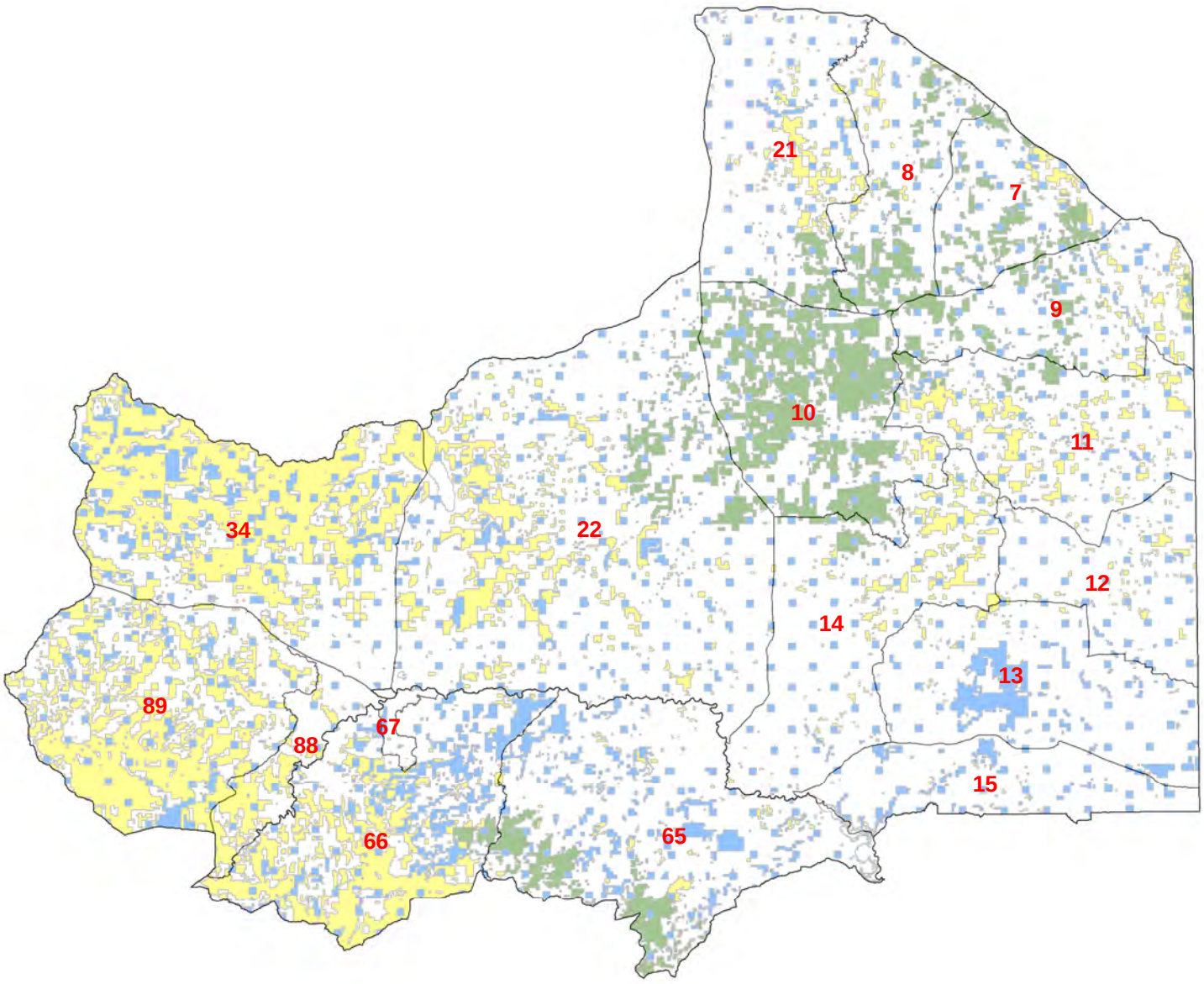
Currently there is no population model that accurately represents this herd. Management is instead based on postseason buck ratios with a goal of maintaining $\geq$20 bucks per 100 does.

Management Summary

Traditional season dates in this herd vary from one hunt area to the next. Generally, white-tailed deer seasons run concurrently with October mule deer seasons, and are extended into November to maximize hunter opportunity and harvest. The 2014 season includes 775 Type 3 licenses, 775 Type 8 licenses, and additional opportunities to harvest white-tailed deer on General, Type 1, and Type 6 licenses. Type 3 and Type 8 licenses were reduced by 375 and 625 respectively, to address a decrease in access to white-tailed deer throughout the herd unit. Goals for 2014 are to maintain buck ratios, improve hunter opportunity, and address agricultural damage on private lands.

If we attain the projected harvest of 725 with fawn production/survival similar to the five-year average, buck ratios should be maintained above 20 per 100 does.

Central White-tailed Deer Herd Unit
(WD707)
Revised May 12, 2010
Hunt Areas 7-15, 21, 22, 34, 65-67, 88, 89

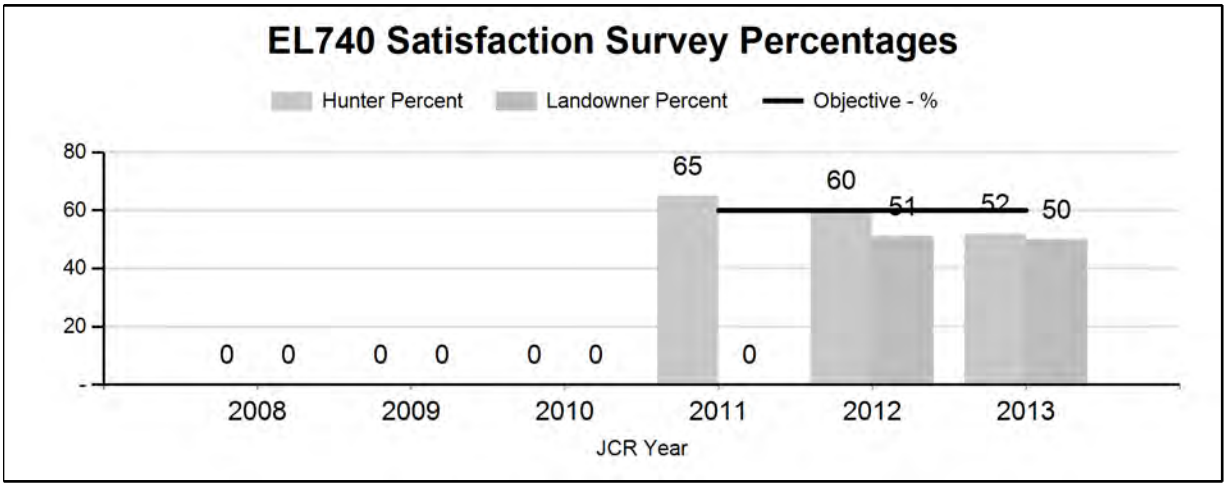


2013 - JCR Evaluation Form

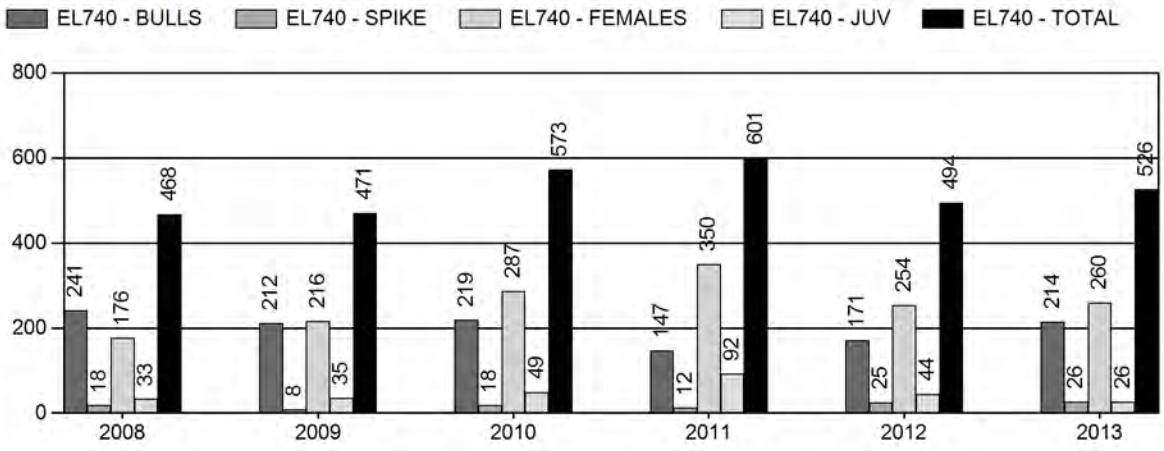
SPECIES: Elk
PERIOD: 6/1/2013 - 5/31/2014
HERD: EL740 - BLACK HILLS
HUNT AREAS: 1, 116-117
PREPARED BY: JOE SANDRINI

	2008 - 2012 Average	2013	2014 Proposed
Hunter Satisfaction Percent	63%	52%	60%
Landowner Satisfaction Percent	51%	50%	60%
Harvest:	521	526	650
Hunters:	1,073	1,812	1,850
Hunter Success:	49%	29%	35%
Active Licenses:	1,115	28%	1,925
Active License Percentage:	47%	28%	34%
Recreation Days:	11,938	17,880	14,950
Days Per Animal:	22.9	34.0	23
Males per 100 Females:	27	32	
Juveniles per 100 Females	29	41	

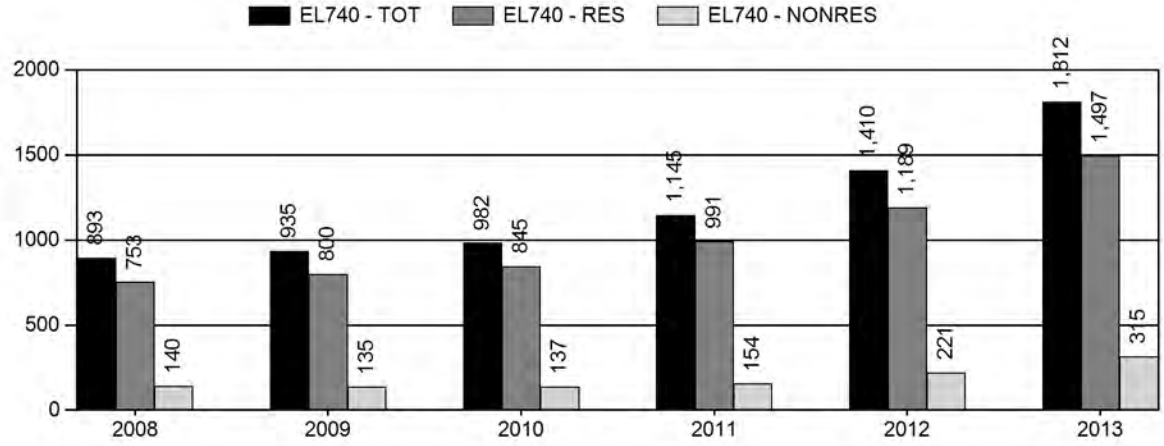
Satisifaction Based Objective	60%
Management Strategy:	Private
Percent population is above (+) or (-) objective:	-9%
Number of years population has been + or - objective in recent trend:	2



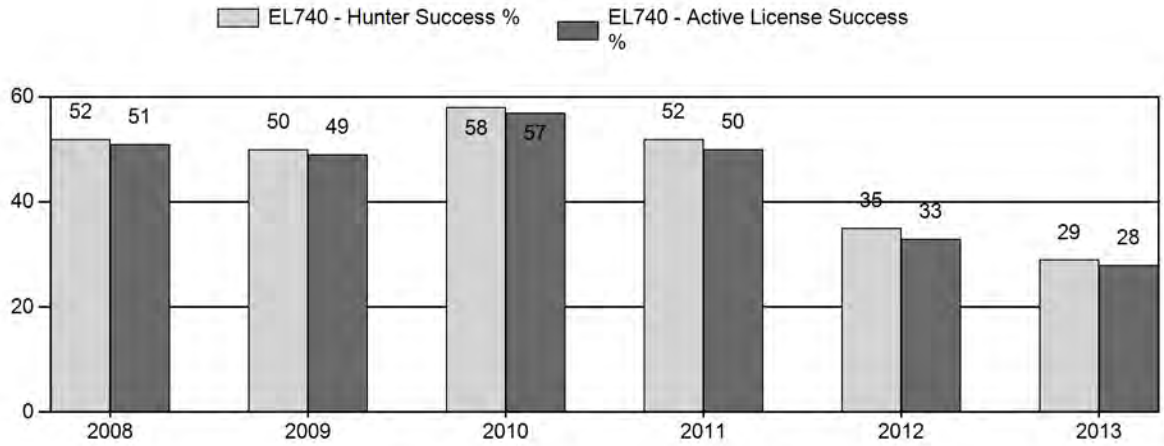
Harvest



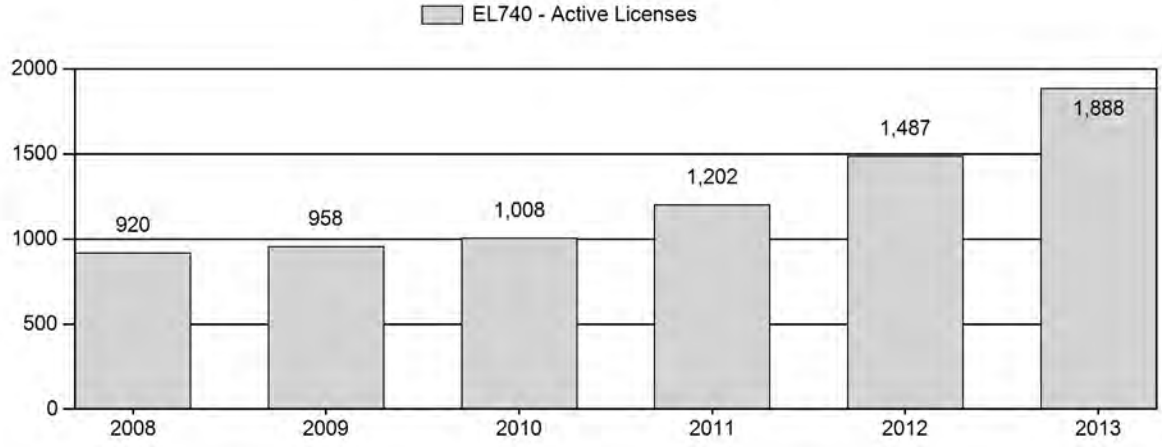
Number of Hunters



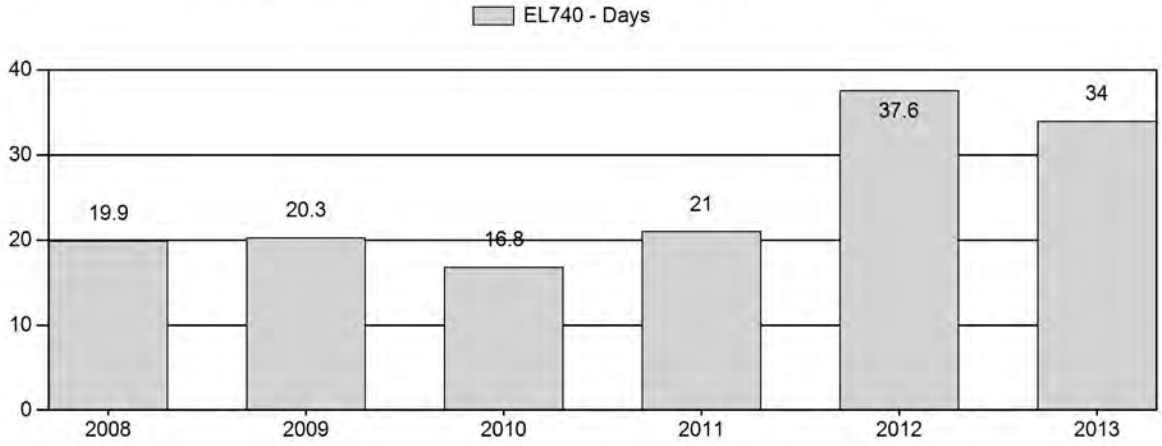
Harvest Success



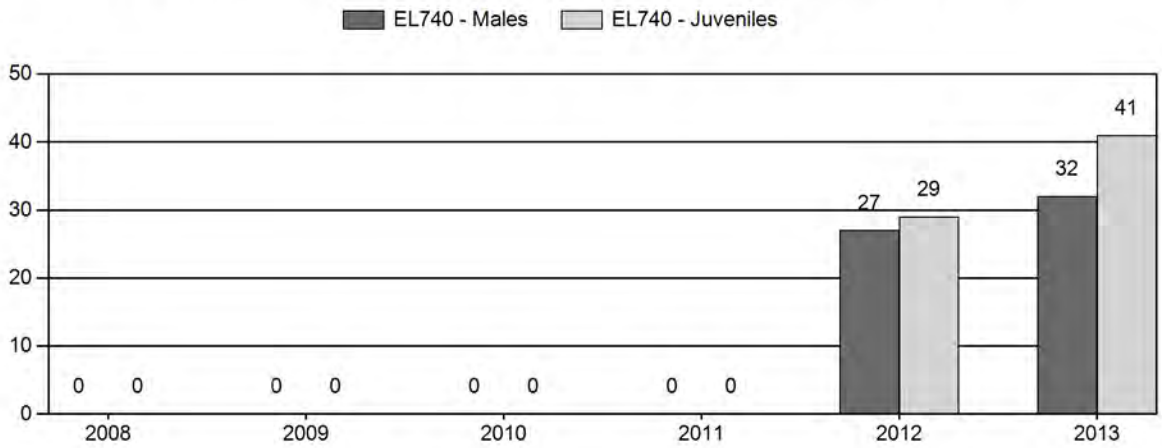
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2014 HUNTING SEASONS
BLACK HILLS ELK HERD (EL740)

Hunt Area	Type	Season Dates Opens	Closes	Quota	Limitations
1	1	Oct. 15	Nov. 30	100	Limited quota licenses; any elk
	4	Oct. 15	Nov. 30	75	Limited quota licenses; antlerless elk
116		Oct. 15	Nov. 10		General license; any elk
		Nov. 11	Nov. 30		General license; antlerless elk
	6	Oct. 15	Jan. 31	250	Limited quota licenses; cow or calf
	8	Aug. 15	Oct. 14	50	Limited quota licenses; cow or calf valid off national forest
117	1	Oct. 15	Nov. 30	275	Limited quota licenses; any elk
		Dec. 1	Jan. 31		Unused Area 117 Type 1 licenses valid for antlerless elk
	4	Oct. 15	Jan. 31	250	Limited quota licenses; antlerless elk
	6	Oct. 15	Jan. 31	250	Limited quota licenses; cow or calf
	8	Aug. 15	Oct. 14	50	Limited quota licenses; cow or calf valid off national forest
Archery		Sep. 1	Sep. 30		Refer to license type and limitations in Section 2

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	Type	Change from 2013
Herd Unit Totals	1	none
	4	none
	6	none
	8	none

Management Evaluation

Current Hunter/Landowner Satisfaction Management Objective: 60% landowner & hunter
Management Strategy: Private Land
Secondary Management Strategy: Age distribution of harvested bulls

2013 Hunter Satisfaction Estimate: 52%
2013 Landowner Satisfaction Estimate[1]: 50%

Most Recent 3-year Running Average Hunter Satisfaction Estimate: 59%
Most Recent 3-year Running Average Landowner Satisfaction Estimate[2]: 50%

2013 Postseason Population Estimate: None - *Field Estimate ~ 2,500*
2014 Proposed Postseason Population Estimate: None - *Field Estimate ~ 2,500*

HERD UNIT ISSUES: The Black Hills Elk Herd Unit has a management objective 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% that are ½ to 2 years old; 60% that are 3 to 5 years old; and 20% that are 6 years old, or older (± 5% in all categories). These management objectives and strategies were adopted in 2013.

We can neither construct a population model, nor generate a population estimate for this herd as the Department has never been able to collect meaningful classification data. Additionally, radio collar data show substantial numbers of elk regularly cross the Wyoming/South Dakota Stateline violating the closed population assumption of population models. Consequently, no attempts have been made to model this population since 1996. Instead, this herd was managed in an ad hoc fashion over the past decade and an half to provide ample recreational opportunity and address depredation complaints. In many locations across the herd unit, management of elk numbers has been hampered due to constrained access to private land for elk hunting. Consequently, the above mentioned non-numerical management objectives were adopted in 2013. Field personnel anecdotally estimate Wyoming's Black Hills elk population to have numbered about 2,500 at the close of the 2013 hunting season.

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 mi^2, of which 1,920 mi^2 are considered occupied habitat.[3] Elk are not ubiquitous across occupied habitat either in time or space. Rather, they tend to move about depending upon range conditions, snow depth and human activity, with some areas seeing regular elk use and other areas very infrequent use. 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 comprises 14% of the occupied habitat. HA 1 is

[1] Based upon individual contacts with 30 landowners in Jan. & Feb., 2014; bio-year 2012 value (51%) based upon mail survey to 167 landowners and 71 useable responses.
[2] Actually a 2-year average, no data available for bio-year 2011.
[3] Based upon revised seasonal range map Feb., 2014.

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 consequently harvest, in those areas are not consistent.

Statewide, at the herd unit level, elk hunter success is highly correlated with reported hunter satisfaction 84% in 2013 (and over 90% in previous years). 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, which did not sell out in the draw. This resulted in a large number of license holders hunting only accessible public lands, where few elk reside or were harvested. Consequently, hunter success on general licenses was only 17%, with about 30% of cow/calf hunters being successful and total active license success being 21%. These poor success rates were reflected in low hunter satisfaction in HA 116. Only 47% of the HA 116 elk hunters reported being satisfied or very satisfied with their hunt. These figures biased the herd unit hunter satisfaction numbers low as well, since 55% of the hunters at the herd unit level were sampled from HA 116. Overall hunter satisfaction in HA 1 and HA 117 was 63% and 56%, respectively. In these two hunt areas, hunter satisfaction was within a couple percentage points of that reported in 2012, but these values were still below the 64% reported for both areas in 2011, when hunter success was the highest in recent years.

Landowner satisfaction with elk numbers was first measured in the spring of 2013, as we prepared to move the herd unit objective away from a numerical value. At that time, 167 Black Hills landowners who have elk on their property, at least occasionally, were mailed a short survey with a prepaid return envelope to gauge their satisfaction with elk numbers and support for moving to a non-numerical objective. A total of 71 landowners responded, and 60% noted they were satisfied, very satisfied, or neutral with respect to elk numbers in the Black Hills. However, Department criteria for satisfaction do not consider “neutral” respondents, which is unfortunate because these individuals are not expressing specific dissatisfaction with elk numbers. Therefore, a value of 51% was recorded as the 2012 bio-year landowner satisfaction measure. During the first two months of 2014, a total of 30 large landowners who regularly harbor elk, allow some level of hunting and often experience conflict with elk were contacted individually by Department personnel. In all, 48% of these landowners reported being either satisfied or very satisfied with elk numbers. In this survey, respondents were given the choice of “no opinion” instead of “neutral.” This may explain some of the change in landowner satisfaction between 2012 & 2013, as does the selection of landowners sampled in 2013 versus 2014. The widespread mail sample of 2013 captured many non-traditional landowners and folks who experience little in the way of elk damage. It is difficult to broadly quantify satisfaction amongst landowners because many Black Hills landowners are small by Wyoming standards and/or not dependent on agriculture for profit. On the other hand, there are a few large traditional ranching landowners significantly impacted by elk, and frustrated with the damage they cause. A greater proportion of those types of landowners were sampled in 2014. This landowner satisfaction survey will be modified appropriately in the future.

The herd unit boundary has been revised several times over the past 30 years as hunt area boundaries were altered. The most recent change came in 2013, when HA 116 was expanded in order for the herd unit to encapsulate the Wyoming Black Hills ecosystem, and allow general

license hunting in this same hunt area. Future changes in hunt area boundaries are not anticipated. The herd's seasonal range map was updated in February, 2014 using field observations, contacts with landowners, and the knowledge of local Game & Fish personnel to delineate ranges. Delineation of crucial winter and winter ranges were not made at this time, due to the lack of data required to define these types of seasonal ranges.

WEATHER: Drought conditions, which were generally persistent throughout the Black Hills between 2000 and 2006, began to moderate some in 2007. Between 2007 and 2011, annual temperatures were near, or below, the previous 30-year average and annual precipitation each year at, or above, that average (http://www.ncdc.noaa.gov/cag/time-series/us). Notably, 2010 was colder and wetter than both the 30-year and 100-year averages; and the winter of 2010-11 was severe. Since the late 1890's, only five other winters were as cold and snowy as that of 2010-11. Overall, the predominant weather pattern between 2007 and 2011 was characterized by generally cool summers, more persistent snow cover in late fall and winter, and above normal spring moisture. This combination of average winter weather and fair forage conditions seemed to have been neither detrimental, nor beneficial for Black Hills elk; but did result in some localized depredation complaints in late December and early January each year.

Drought returned to the Black Hills in 2012, with well above normal summer temperatures and little rainfall during the growing season. Forage production that year was very poor, and the dry conditions led to several large wildfires in the southern half of the herd unit. These warm and dry conditions beset the area in April of 2012, and continued through the 2012-13 winter (http://www.ncdc.noaa.gov/cag/time-series/us). April of 2013 finally saw a break in this pattern when temperatures dropped well below normal for the entire month and good precipitation was again received. Through the remainder of the growing season, temperatures were slightly above average and precipitation well above normal. This resulted in excellent forage growth. In early October, 2013 winter storm Atlas blanketed the Black Hills with anywhere from about a foot of wet heavy snow near Newcastle, to over five feet near Cement Ridge. This single storm event significantly reduced the ability of hunters to access a large portion of HA 1 and limited access to elk on public land in many other places for most of the hunting season. No die-offs of elk were witnessed from this storm, but some deer mortalities on the National Forest south of I-90 were discovered.

Based on weather and habitat conditions over the past five years, it is likely elk have entered the winter in fair to good condition most years, except in 2012. More normal winter temperatures and precipitation, punctuated by some severe winter weather, have increased winter stress on elk compared to the previous decade, as did the drought of 2012. In summary, weather the past several years, while not highly favorable for elk, has not been significantly detrimental. However, these fluctuations in weather have exacerbated elk damage at times.

HABITAT: The Black Hills is the western most extension of many eastern plant species. These species are often 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 areas of private land in this ecosystem. These fires have been beneficial for elk by creating early successional plant communities and increasing available forage.

Elk habitat quantity and quality are good, but security areas may be decreased or lacking in areas due to high road densities. High 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 expanded through most of the previous decade. Several factors have benefited this population. First, herbaceous forage is abundant, and wildfires have increased elk forage. Second, despite high road densities, much of the land inhabited by elk is privately owned. This private land experiences limited human activity, so roads there may not significantly impact elk. Many of these same private land areas provide elk refuge from hunting pressure during the fall. The USFS has also increased the number of road closures on the Black Hills National Forest over the past 10-years, and recently adopted a revised travel management plan, although enforcement of closures is lax.

Currently, there are no habitat evaluation or vegetation surveys located within this herd unit related directly to elk forage or cover. A single mountain mahogany, and two bur oak, production and utilization transects were established within the herd unit in 2003 to quantify habitat conditions related to deer management.

FIELD DATA: Collection of classification data was suspended in this herd in 1996, and only occasionally are limited classification data garnered during other field activities. In December of 2013, 230 elk were classified in HA 117 yielding a calf:cow ratio of 41:100; a mature bull:cow ratio of 18:100 with a yearling bull:cow ratio 12:100 and total bull:cow ratio of 30:100. A similar sample in 2012 revealed an almost identical mature bull:cow ratio and a slightly reduced yearling bull:cow ratio, but a 30% lower calf:cow ratio. These recent post-season data are pretty similar to the other, limited and incidental classification data collected over the past decade, although observed bull:cow ratios have dropped.

While classification data are lacking, tooth age data have been collected from harvested elk since 1987.[4] Tooth age data can estimate annual recruitment by considering the percentage of yearlings in the female segment of the harvest (Figure 1). Since 1987, this figure has averaged[5] 16.4% (std. dev. 8.0%) suggesting 10 to 20 yearling bulls and 10 to 20 yearling cows are normally added per 100 adult cows into this population annually. However, recruitment of yearling elk has declined since 2000. Between 1987 and 1999, as this herd grew rapidly, older age classes of female elk were well distributed throughout the harvest and there was an increasing percentage of yearling cows represented in the harvest. However, this trend reversed itself beginning in 2000 (Figure 1). A Student's T-Test indicates yearling recruitment was significantly higher between 1987 and 1999 when there were an average of 20% yearlings in the

[4] Budgetary constraints prevented tooth age data collection in 2002 & 2003.
[5] Omitting 1990 data reduces this average to 15.3% with a std. dev. 6.2%.

female harvest, versus an average of 11% after 2000 (p=0.0002)[6]. Since 2000, with significantly increased license issuance and extended hunting seasons, there has been a general increase in the percentage of female elk over age 5 harvested 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). This trend, while less pronounced, has generally continued over the past 5-years.

Of course there is greater hunter selectivity when it comes to take of bulls. Since 2000, tooth age data has revealed a slight decline in the relative percentages of both middle-aged (3-5 year old) and young (≤ 2 years old) males in the bull harvest, with a slight increase in the percentage of older bulls (6^{+} years old) harvested (Figure 3). However, since 2008, this trend has begun to shift, as a greater proportion of younger bulls (≤ 5 years old) have been harvested. Over the past 10 years, bull hunter success has remained unchanged in HA 117 (where the bulk of the tooth age data are returned) while antlerless hunter success has generally increased. Taken with the disparate increases in any elk versus antlerless elk license issuance here, it makes sense that we have impacted the antlerless segment of the herd more than the mature bull segment. This is evident in the shift towards harvesting older cows and could be elevating bull:cow ratios. If this population has stabilized, we may be forcing harvest pressure on to younger-aged bulls, and if these recent trends continue it could limit our ability to meet our secondary objective (Table 1).

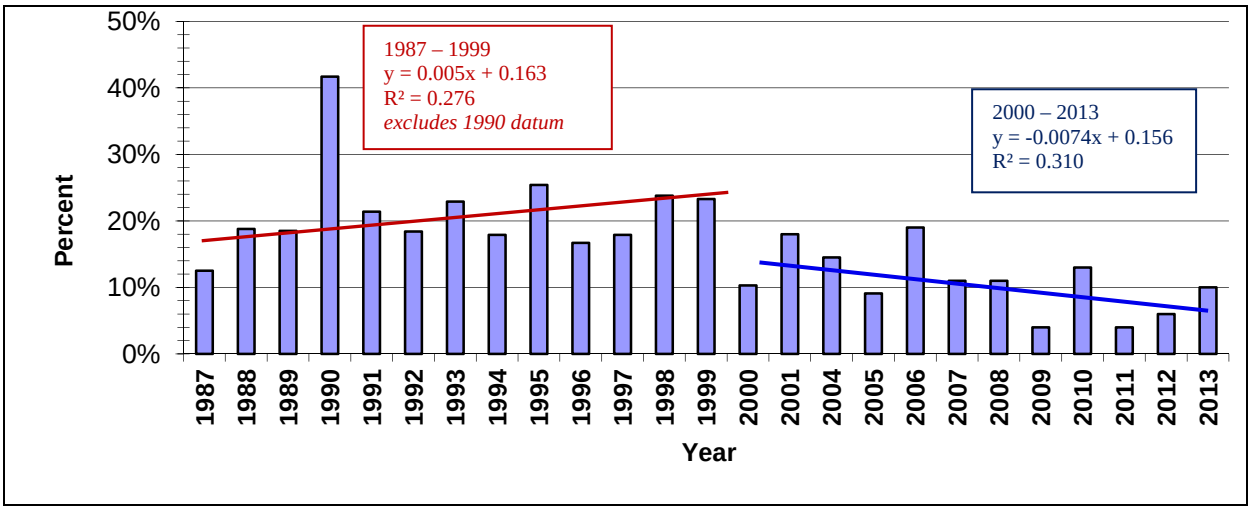


Figure 1. Percentage of yearlings in the female segment of the elk harvest (1987 – 2013).

[6] Including 1990 data in T-test yields a significant difference (P= 0.0002) with $Mean_{(1987\text{-}1990)}$ of 22%; and $Mean_{(2000\text{-}2013)}$ of 10.8%.

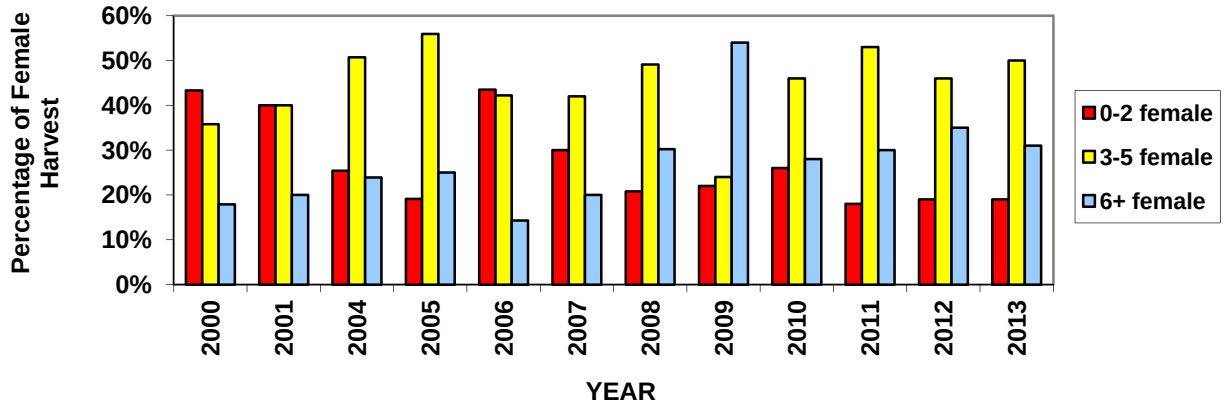


Figure 2. Relative percentages of various age classes of female elk harvested (2000 – 2013).

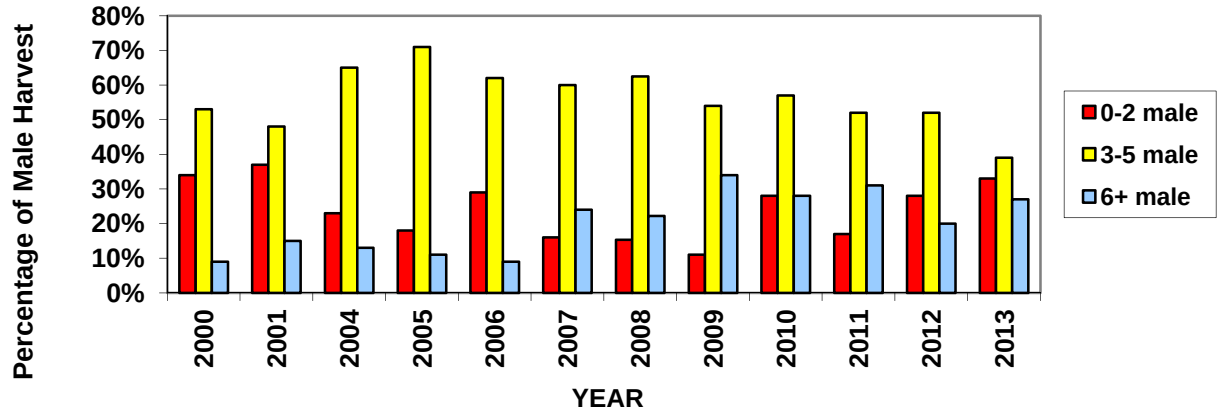


Figure 3. Relative percentages of various age classes of male elk harvested (2000 – 2013).

HARVEST: The low number of yearling females present in the harvest in recent years suggests reduced recruitment, as does the fact elk are not pioneering into unoccupied habitats as they once were. However, while adequate harvest may be achieved some years south of I-90, poor success by hunters pursuing female elk in HA 116 is likely allowing that portion of the herd to grow. This stems from a few landowners restricting access to the majority of elk during the hunting season. However, between 2008 and 2012 it was difficult to gauge total take and the potential rate of increase north of I-90 because a substantial portion the herd unit moved into general license HA 129. Due to harvest survey constraints, there was no way to determine how many elk were harvested in from that part of the herd unit formerly included in HA 129, which is now in general license HA 116. Consequently, over the years, the bulk of tooth age data have returned from HA 1 and 117, any decrease in recruitment should only be ascribed south of I-90.

Segment of Bull Harvest	Objective	2011	2012	2013
Bulls 0-2 yrs. old	20%	17%	28%	33%
3 yr. mean				**26%**
Bulls 3-5 yrs. old	60%	52%	52%	39%
3 yr. mean				**48%**
Bulls 6+ yrs. old	20%	31%	20%	27%
3 yr. mean				**26%**

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

Limited quota license issuance and harvest are positively correlated within this herd unit. Between 1992 and 2002, license issuance increased exponentially while harvest increased more linearly. Between 2002 and 2010 changes in harvest were not as disparate with changes in license issuance. But, over the past three years, license issuance again has substantially outpaced increases in harvest. Consequently, hunter success has dropped. Overall, active hunting licenses have increased about 250% since 1999, while harvest increased a bit more than 100% (Figure 4).

Access to private land for hunting remains limited and field personnel have great difficulty placing the increased number of hunters, many of whom make repeated phone calls to local game managers and landowners without securing a place to hunt.

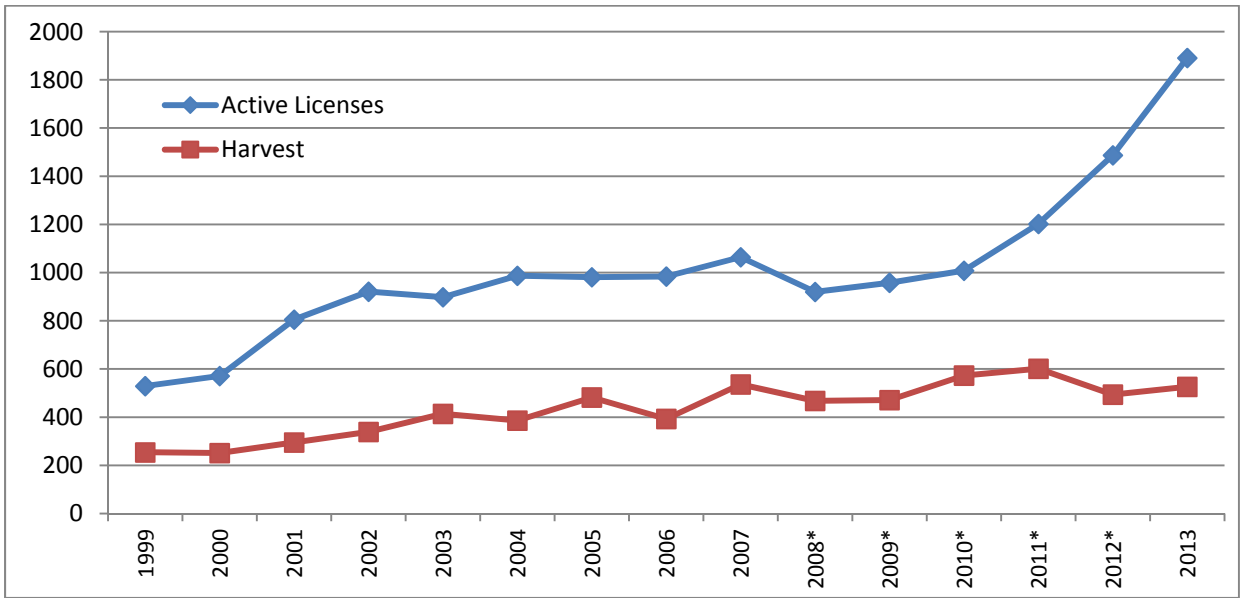


Figure 4. Active hunting licenses & elk harvest in the Black Hills Herd Unit (1999 – 2013). **Note, between 2008 and 2012 large portions of Hunt Areas 116 & 117 were put into General License Hunt Area 129 and active license numbers not captured. In 2013 these areas were included in Hunt Area 116.*

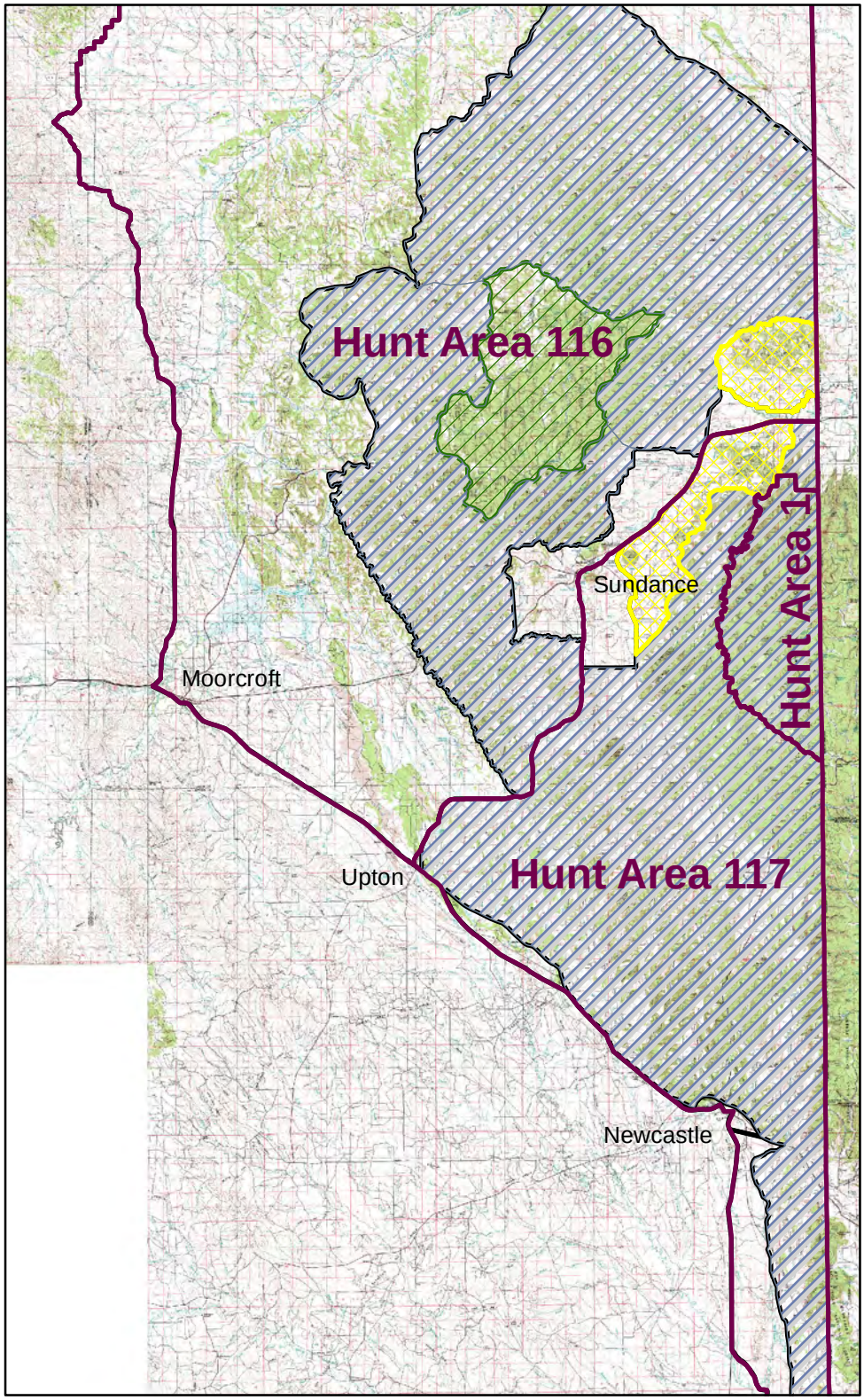
Given average yearling recruitment of 30 yearling elk per 100 cows (based upon 15% yearling cows in total cow elk harvest) and assuming a pre-season herd composition of 40 bulls per 100 cows and 47 calves per 100 cows (based on SDGF&P data), the 2013 estimated harvest of 500 adult elk would have removed the annual recruitment of yearlings from a total population of about 3,115 elk. As such, and based upon anecdotal population estimates, the 2013 harvest should have about kept this herd at its current level, or reduced it slightly. However, several hundred elk (perhaps nearly 1,000 head) regularly cross the Stateline, and a significant number of these winter in South Dakota making it difficult to determine what effect harvest is having on our post-season population.

POPULATION: Despite the lack of a population estimate, indications are elk numbers increased quite a bit over the past 30 years. The population appeared to increase rapidly during the 1990's and early part of the next decade when elk significantly expanded their distribution. Silvicultural practices and wildfires throughout the region have created habitat favorable for elk. Although habitat changes have favored elk in recent years, elk have not continued to pioneer into previously unoccupied areas. Harvest statistics and tooth age data also suggest population growth may have been curbed recently, at least south of Interstate Highway 90 (I-90). Given the high quality habitat in the region and limited access to hunt elk on private land, this population will likely continue to grow in areas where limited hunter take, due to access constraints, thwarts efforts to obtain adequate harvest.

MANAGEMENT SUMMARY: Changes implemented during the 2013 Black Hills elk hunting season included expanding HA 116 to include all of the lands within Wyoming's Black Hills ecosystem previously enrolled in HA 129 and hunting this area under a combination of general and type 6 and 8 cow/calf licenses. Also, because hunter success and satisfaction had dropped south of I-90, issuance of all license types in HA 1 and HA 117 were reduced as well. The proportion of active licenses relative to the total number of licenses issued also dropped in 2013 as did success rates in some areas where access to elk was hampered due to snow conditions. 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. This statistic bears out the fact that while many landowners complain about elk numbers, few are willing to allow hunting at the levels needed to significantly reduce this population. As a result, no changes to the hunting season structure are being implemented in 2014. This strategy should allow hunter success to increase, except perhaps for general license hunters in HA 116 where the numbers of elk on accessible public land are very limited.

Given mean hunter participation and success rates over the past decade and a half, the 2014 harvest should result in about 650 elk taken. This harvest estimate is predicated on a similar number of elk being harvested from HA 116 on general licenses and a return to average success rates in other areas. However, the long season for antlerless elk hunting in HA's 116 and 117 (five and a half months) could increase antlerless harvest above predicted values if access to elk improves. If projected harvest levels are reached, elk numbers should decline south of I-90, while elk numbers north of the Interstate may stabilize or increase. Based on 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 650 total elk, or about 620 adult elk, would remove the annual yearling recruitment from a herd of about 3,860 elk (all age classes), a number well above what field personnel believe to be present at this time.



Legend

- E740_Revised_WINYLG
- E740_Revised_YLG
- E740Revised_out
- E740 ssf

2013 - JCR Evaluation Form

SPECIES: Elk

PERIOD: 6/1/2013 - 5/31/2014

HERD: EL741 - LARAMIE PEAK/MUDDY MOUNTAIN

HUNT AREAS: 7, 19

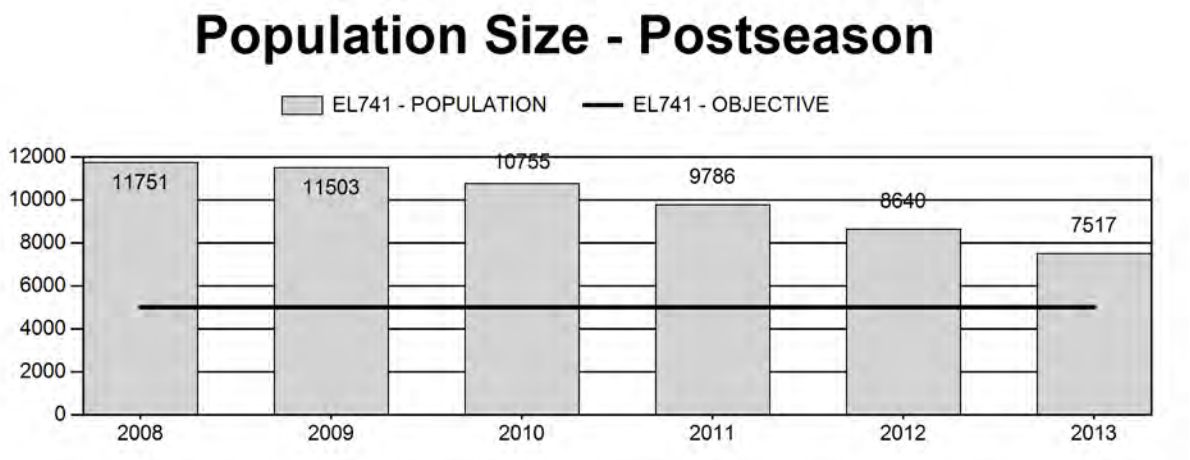
PREPARED BY: HEATHER O'BRIEN

	2008 - 2012 Average	2013	2014 Proposed
Population:	10,487	7,517	6,299
Harvest:	2,346	2,136	2,305
Hunters:	4,322	4,942	4,500
Hunter Success:	54%	43%	51%
Active Licenses:	4,391	5,028	4,500
Active License Percent:	53%	42%	51%
Recreation Days:	33,798	38,853	35,000
Days Per Animal:	14.4	18.2	15.2
Males per 100 Females	34	31	
Juveniles per 100 Females	40	33	

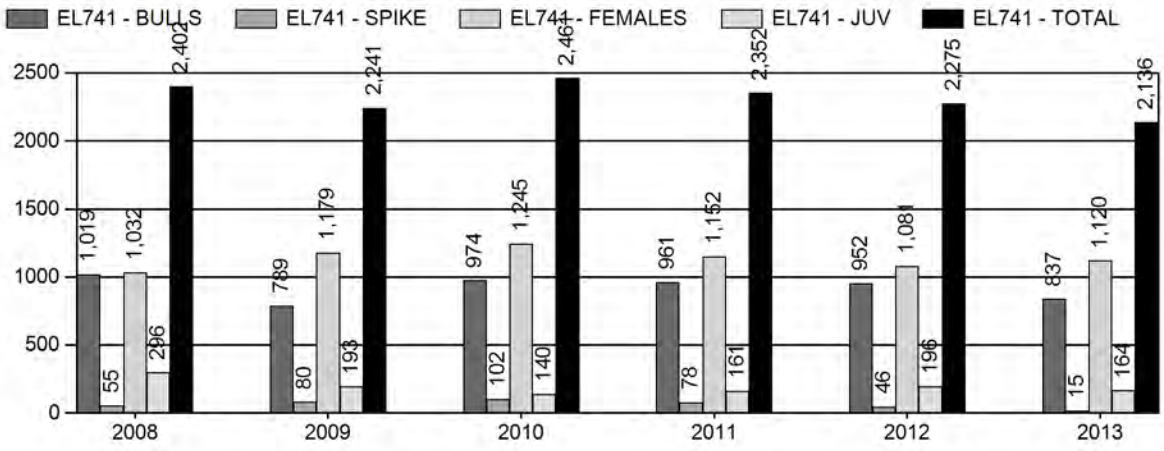
Population Objective:	5,000
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	50%
Number of years population has been + or - objective in recent trend:	13
Model Date:	4/7/2014

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

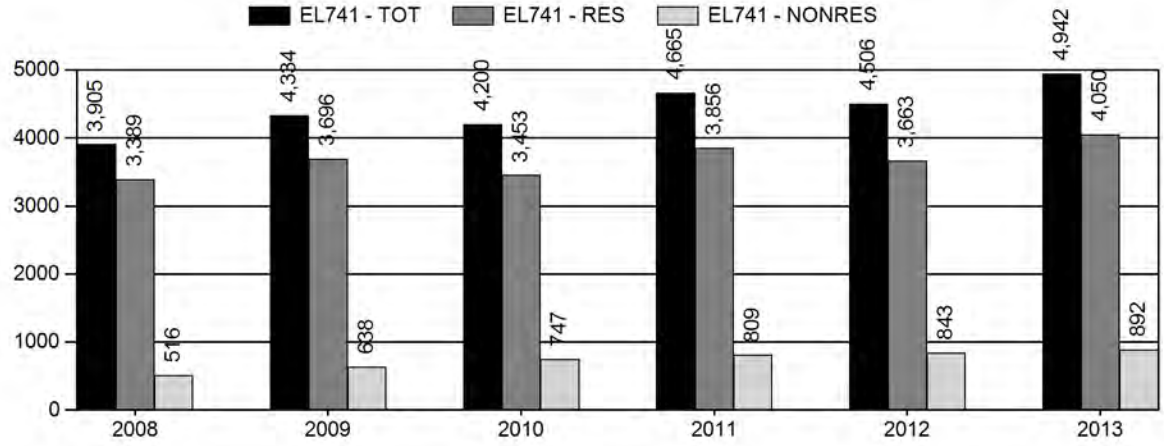
	JCR Year	Proposed
Females ≥ 1 year old:	20.5%	24.9%
Males ≥ 1 year old:	30%	35.9%
Juveniles (< 1 year old):	10.3%	11.9%
Total:	21.6%	26.1%
Proposed change in post-season population:	-23.8%	-28.7%



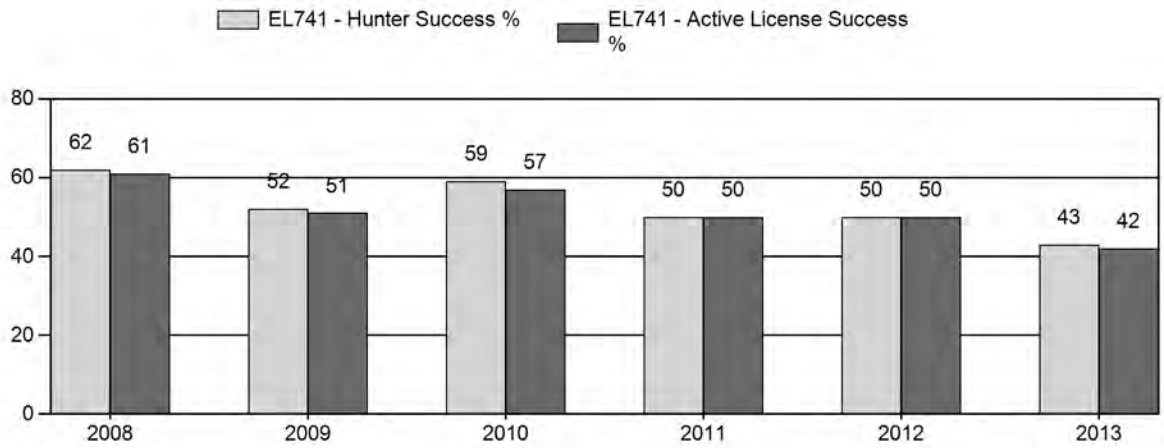
Harvest



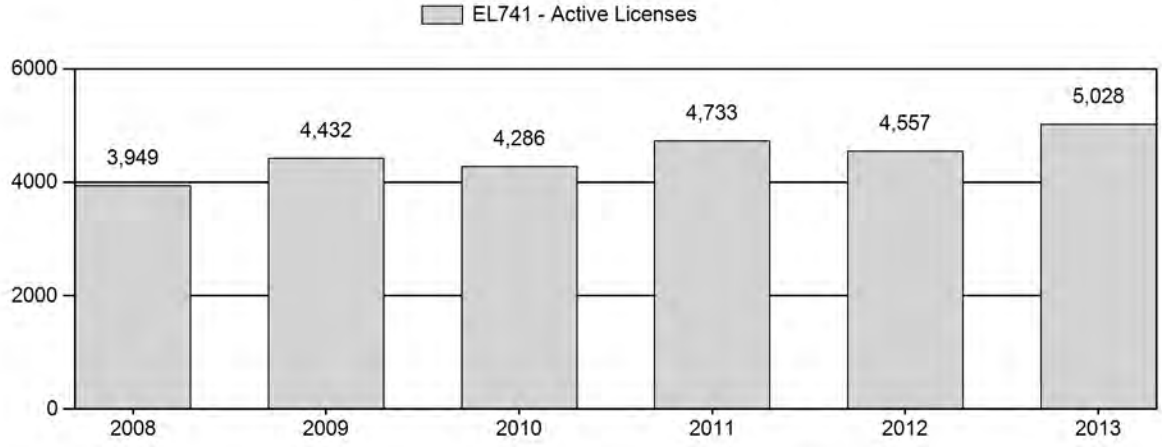
Number of Hunters



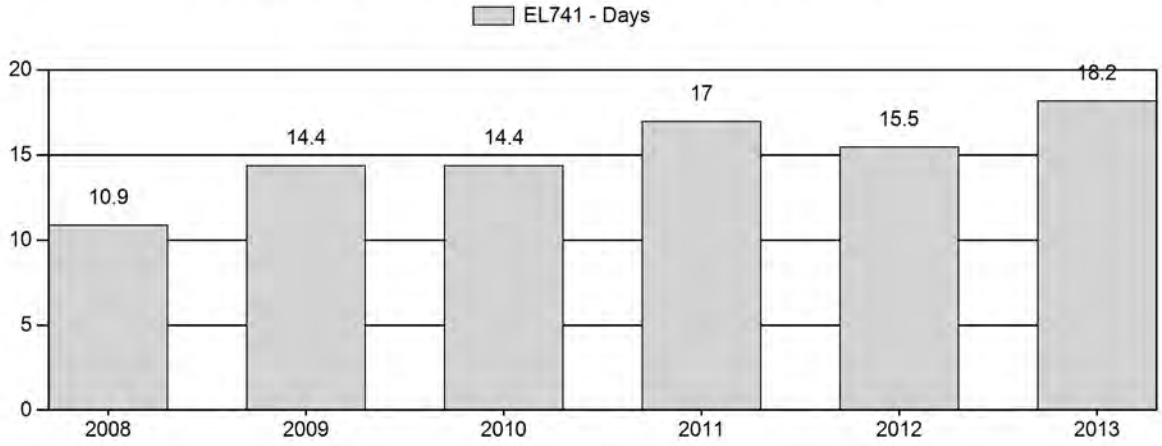
Harvest Success



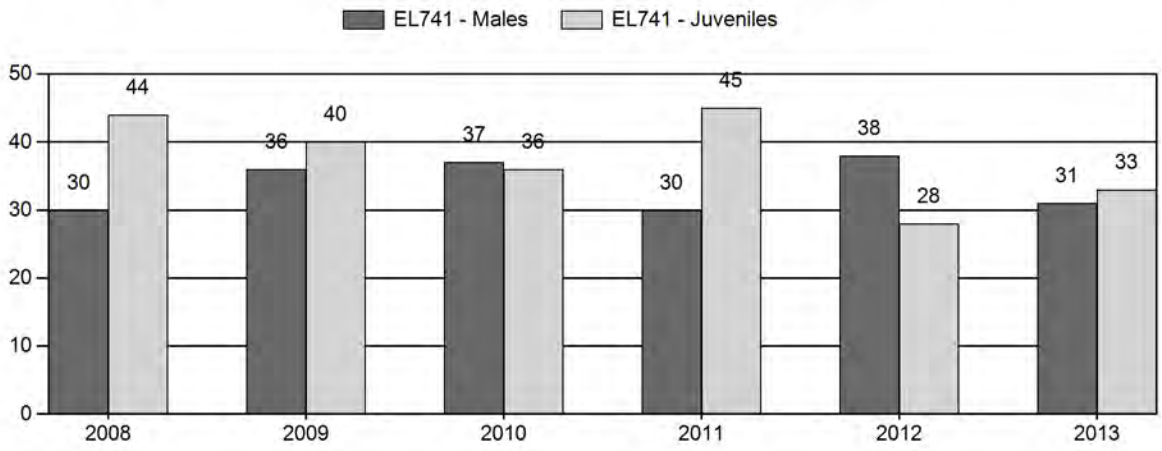
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2008 - 2013 Postseason Classification Summary

for Elk Herd EL741 - LARAMIE PEAK/MUDDY MOUNTAIN

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	11,751	297	512	809	17%	2,720	57%	1,208	26%	4,737	679	11	19	30	± 1	44	± 2	34
2009	11,503	259	572	831	21%	2,281	57%	908	23%	4,020	607	11	25	36	± 2	40	± 2	29
2010	10,755	475	639	1,114	21%	3,020	58%	1,094	21%	5,228	545	16	21	37	± 1	36	± 1	26
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 HUNTING SEASONS
LARAMIE PEAK MUDDY MOUNTAIN ELK (EL741)

Hunt Area	Type	Date of Seasons Opens	Closes	Quota	Limitations
7	1	Oct. 15	Nov. 20	1,500	Limited quota licenses; any elk
		Nov. 21	Dec. 31		Unused Area 7 Type 1 licenses valid for antlerless elk
	4	Oct. 15	Dec. 31	1,250	Limited quota licenses; antlerless elk
	6	Aug. 15	Oct. 14	1,750	Limited quota licenses; cow or calf valid in those portions of Area 7 in Platte County and on private land in Albany and Converse Counties
		Oct. 15	Dec 31		Unused Area 7 Type 6 licenses valid in the entire area
	7	Jan. 1	Jan. 31	500	Limited quota licenses; cow or calf
19	1	Oct. 1	Oct. 14	150	Limited quota licenses; any elk
	2	Nov. 1	Nov. 20	150	Limited quota licenses; any elk
	4	Oct. 1	Oct. 14	125	Limited quota licenses; antlerless elk
	5	Nov. 1	Dec. 31	125	Limited quota licenses; antlerless elk
	6	Oct. 1	Oct. 14	225	Limited quota licenses; cow or calf
		Nov. 1	Dec. 31		Unused Area 19 Type 6 licenses
		Nov. 21	Dec. 31		Unused Area 19 Type 1, Type 2, and Type 4 licenses valid for antlerless elk
Archery		Sep. 1	Sep. 30		Refer to licenses and type limitations in Section 2.

Hunt Area	Type	Quota change from 2013
7	1	-250
	4	0
	6	0
	7	+250
	8	-50
19	1	0
	2	0
	4	0
	5	0
	6	+25
Total	1	**-250**
	6	**+25**
	7	**+250**
	8	**-50**

Management Evaluation

Current Postseason Population Management Objective: 5,000
Management Strategy: Special
2013 Postseason Population Estimate: 7,500
2014 Proposed Postseason Population Estimate: 6,300

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 and hunter management areas greatly expands access to 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 (8% in 2012 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 markedly low at 28 calves per 100 cows. The winter of 2012 continued to be dry, with very low snow accumulation and snow pack, allowing wide distribution of elk at higher elevations. April of 2013 finally saw a break in the drought, when temperatures dropped below normal for the entire month and significant precipitation was received. This cooler and wetter pattern continued through the summer of 2013 in much of the herd unit. In early October 2013, winter storm "Atlas" blanketed the area with 12-36" of wet snow, with greater depths at higher elevations. The snow and resulting muddy conditions forced the cancellation of hunting for some license holders, and made accessing elk difficult in many locations. Travel conditions improved for late seasons, but by then it was apparent winter storm Atlas had a negative impact on early hunter participation and harvest success. The early winter months of 2013-2014 brought temperature and precipitation conditions near the recent 30-year average, and hunters had good access and success on the Pinto Creek and McFarlane HMAs during December and January. 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 there are few natural predators and 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 continued to increase, and the population has begun to decrease as harvest pressure on cows has greatly intensified. In 2013, the calf ratio was below average for the second year in a row, with 33 calves per 100 cows. Cow harvest continues to remain high, though weather conditions may have stifled total harvest in 2013. While the low calf production/survival of 2012-2013 will contribute to population decline, continued high license issuance and harvest of cows will be necessary to further 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. It should be noted that the accuracy of bull ratios can change from year to year in this herd. While the herd is covered thoroughly during post-season classifications,

changes in distribution of elk, ability to locate large cow/calf groups, and concealment of bulls in timber during January can skew results from year to year. Issuance of Type 1 any elk licenses has consistently increased in the herd unit along with population growth, and has remained high since 2009. In 2011, it appeared that high Type 1 license issuance may have been taking its toll, as the observed bull ratio dropped to 30 per 100 cows. Type 1 license issuance was high in 2013, but male harvest dropped due to weather and access issues. Hunters and landowners in the Wheatland and Laramie areas expressed concern in 2013 that bull quality may be in decline, though mature bull numbers and quality appeared to be good in the Casper, Glenrock, and Douglas areas. Tooth-age and antler-class data collected annually show a slight increase in average bull age and an increase of Class-II antlered bulls, which contradicts hunter/landowner complaints of fewer mature bulls in the herd (see Appendix A). However, the observed bull ratio in 2013 was 31 per 100 cows – approaching the minimum for special management. Consequently, Type 1 license issuance will be lowered slightly to improve bull ratios and bull quality within the herd unit.

Harvest Data

License success in this herd unit is typically in the 50th percentile. Hunter days per animal have generally increased since 2008, as the population has dropped in size and more effort is necessary to harvest an elk. Hunter crowding on public lands with higher license issuance may be another factor that contributes to higher hunter days per animal. It should also be noted that days per animal can be high in this herd unit as hunters have high expectations regarding bull quality, and will exert more effort in finding a mature bull. Days per animal increased markedly in 2013, indicating that hunters had a more difficult time compared to the 2009-2012 seasons. In addition, habitat changes from 2012 fires may have changed the distribution of elk in 2013, and heavy snowfall made accessing elk more difficult in early seasons. Overall harvest success in 2013 (43%) was lower than the average harvest success of the previous ten years (55%). Total animals harvested also dropped compared to the 5-year average.

Population

The 2013 postseason population estimate was approximately 7,500 and trending downward from an estimated high of 12,300 elk in 2005. Postseason classification data and harvest data are applied to the model to predict population size and trends for this herd. No sightability or other population estimate data are currently available to further align the model.

The “Time-Specific Juvenile Survival – Constant Adult Survival” (TSJ,CA) spreadsheet model was selected to represent the Laramie Peak / Muddy Mountain Herd Unit. This model seemed the most representative of herd dynamics, as it selects for higher juvenile survival during years when field personnel observed more favorable environmental and habitat conditions, particularly

from 2004-2009. The simpler models (CJ,CA and SCJ,CA) select the lowest value for juvenile survival, which does not seem feasible for this herd. The TJS,CS,MSC model was not considered for the Laramie Peak / Muddy Mountain Herd, since it does not have a high level of natural predation. The other three models produce trends that seem representative for this herd, but the CJ,CA and SCJ,CA models estimate a population size that is unrealistically high. Surprisingly, the TSJ,CA model has a low AIC compared to the simpler models, but all models score similarly so the difference in AIC is unimportant in model selection for this herd. The TSJ,CA model appears to be the best representation relative to the perceptions of managers on the ground, and follows trends with license issuance and harvest success. Overall, this model is of fair quality.

Management Summary

Season dates for this herd have changed from year to year, and in general have been liberalized over time to maximize harvest and reduce damage on agricultural fields. Season dates will be similar for the 2014 season, with a couple of minor changes. The early cow rifle season for the Area 7-Type 6 licenses will now be valid on private lands in Converse County to address damage to agricultural fields on private lands, and the Type 8 license specific to Converse County will be eliminated. This should provide cow hunters more options in the early season without confining them to specific parcels of private land. All license types except Type 7 licenses will continue to close on December 31st. Area 7-Type 7 licenses will again be valid in January only, but an additional 250 licenses will be added. Managers in the Laramie and Wheatland portions of Area 7 were very pleased with the January season but wanted additional licenses to take advantage of cow/calf herds that were available near the Pinto Creek and McFarlane HMAs. Area 7-Type 1 licenses will be decreased to 1,500, to improve bull ratios and quality. Area 19 Type 6 licenses will be increased by 25 to offer additional hunter opportunity and hopefully increase cow harvest. Access is predicted to be similar in 2014 to previous years. Goals for 2014 are to continue reduction of the herd towards objective, to 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 2,305 elk with average calf ratios, this herd will decline further toward objective. The predicted 2014 postseason population size of the Laramie Peak / Muddy Mountain Elk Herd is approximately 6,300 animals, which is 26% above objective.

INPUT	
Species:	Elk
Biologist:	Heather O'Brien
Herd Unit & No.:	EL741 Laramie/Muddy
Model date:	04/07/14

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	377	386	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	376	386	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	220	342	☑ TSJ,CA Model	
TSJ,CA,MSC	**Time-Specific Juv, Constant Adult Survival, Male survival coefficient**	187	321	☐ TSJ,CA,MSC Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population				Predicted Posthunt Population				Objective
	Field Est	Field SE		Juveniles	Total Males	Females	Total	Juveniles	Total Males	Females	Total	
1993				2697	1158	4836	8690	2617	768	4543	7928	5000
1994				2224	1407	5106	8738	2150	1068	4743	7961	5000
1995				1949	1584	5186	8719	1894	1184	4909	7986	5000
1996				2094	1634	5284	9011	2022	1234	4725	7982	5000
1997				2325	1797	5218	9341	2189	1208	4929	8326	5000
1998				2648	2223	5870	10742	2515	1739	5308	9563	5000
1999				2340	2333	5831	10504	2254	1835	5335	9423	5000
2000				2533	2362	5791	10686	2397	1805	5257	9459	5000
2001				2936	2740	6123	11799	2862	2177	5717	10756	5000
2002				2391	2849	6318	11558	2284	2144	5834	10263	5000
2003				2915	3186	6802	12904	2726	2413	6306	11445	5000
2004				2878	3046	6862	12785	2757	2406	6368	11530	5000
2005				3281	3373	7256	13910	3150	2658	6455	12263	5000
2006				2738	3550	7271	13559	2574	2603	6508	11685	5000
2007				3340	3773	7601	14714	3000	2846	6583	12429	5000
2008				3133	3794	7456	14383	2807	2612	6321	11741	5000
2009				2693	3894	7528	14115	2481	2938	6231	11650	5000
2010				2297	4057	7285	13639	2143	2874	5916	10932	5000
2011				2469	3389	6370	12229	2292	2246	5103	9642	5000
2012				1608	3290	6090	10988	1392	2192	4901	8486	5000
2013				1592	2810	5464	9866	1412	1873	4232	7517	5000
2014				1510	2506	4818	8834	1312	1488	3498	6299	5000
2015												5000
2016												5000
2017												5000
2018												5000
2019												5000
2020												
2021												
2022												
2023												
2024												
2025												

Survival and Initial Population Estimates

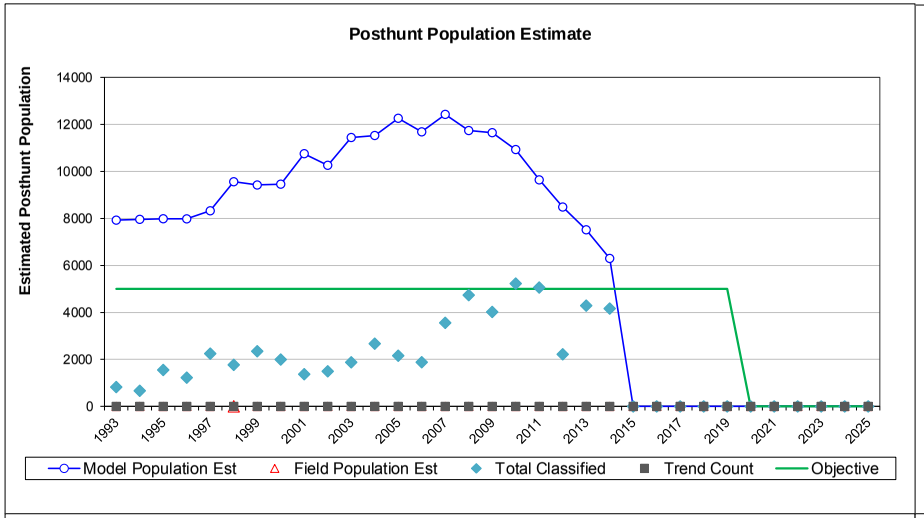
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.50			0.98		
1994	0.50			0.98		
1995	0.50			0.98		
1996	0.58			0.98		
1997	0.95			0.98		
1998	0.50			0.98		
1999	0.50			0.98		
2000	0.81			0.98		
2001	0.50			0.98		
2002	0.95			0.98		
2003	0.50			0.98		
2004	0.74			0.98		
2005	0.60			0.98		
2006	0.95			0.98		
2007	0.67			0.98		
2008	0.95			0.98		
2009	0.95			0.98		
2010	0.53			0.98		
2011	0.95			0.98		
2012	0.95			0.98		
2013	0.95			0.98		
2014	0.71			0.98		
2015						
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

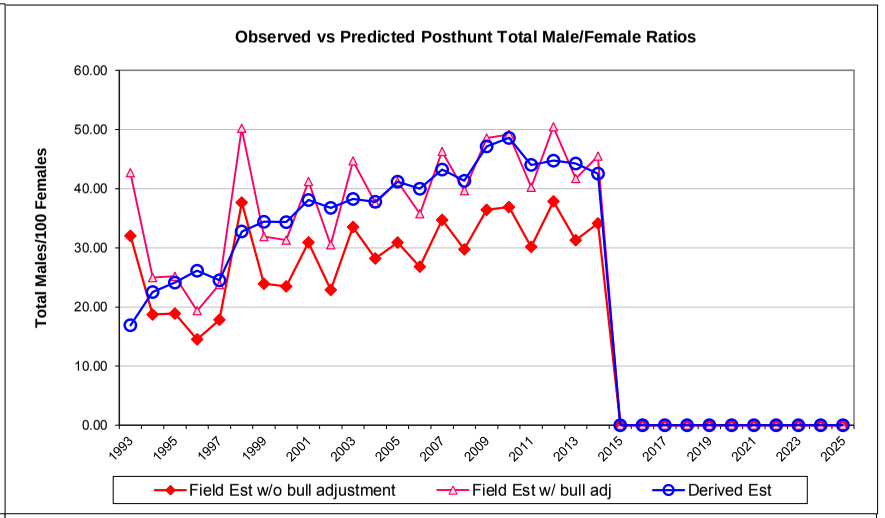
Parameters:	Optim cells
Adult Survival =	0.980
Initial Total Male Pop/10,000 =	0.077
Initial Female Pop/10,000 =	0.454

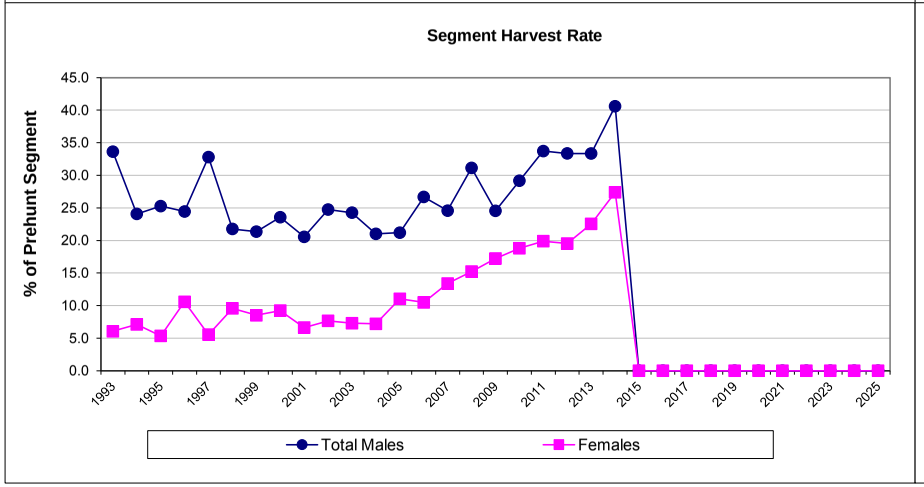
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Total Bulls Adjustment Factor	75%

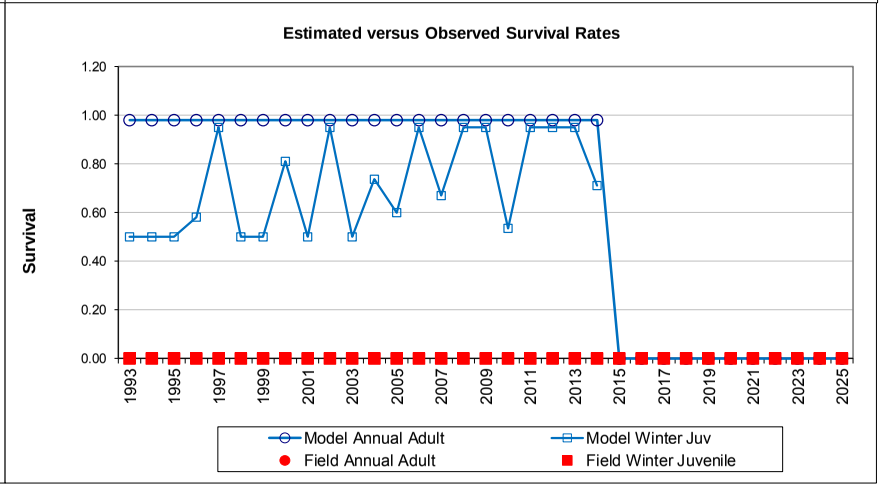
Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio				Harvest					Segment Harvest Rate (% of Prehunt Segment)	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/ bull adj	Field Est w/o bull adj	Field SE	Juv	Yrl males	2+ Males	Females	Total Harvest	Total Males	Females
1993		57.60	4.57	16.91	42.70	32.03	3.12	73	105	249	266	693	33.6	6.1
1994		45.32	4.03	22.52	24.96	18.72	2.34	68	73	235	330	706	24.1	7.1
1995		38.58	2.33	24.12	25.18	18.88	1.51	50	50	314	252	666	25.3	5.3
1996		42.80	2.80	26.12	19.37	14.52	1.46	65	35	328	508	936	24.4	10.6
1997		44.40	2.15	24.51	23.78	17.83	1.23	124	42	494	263	923	32.8	5.5
1998		47.38	2.70	32.77	50.21	37.66	2.33	121	98	342	511	1072	21.8	9.6
1999		42.25	2.06	34.40	31.89	23.92	1.45	78	68	385	451	982	21.4	8.5
2000		45.59	2.37	34.34	31.30	23.47	1.57	124	112	394	486	1116	23.6	9.2
2001		50.07	3.15	38.08	41.22	30.91	2.31	67	91	421	369	948	20.6	6.6
2002		39.15	2.43	36.75	30.51	22.89	1.75	97	71	570	440	1178	24.7	7.7
2003		43.22	2.41	38.26	44.70	33.52	2.05	172	61	642	451	1326	24.3	7.3
2004		43.29	2.00	37.78	37.59	28.20	1.52	110	54	528	449	1141	21.0	7.2
2005		48.79	2.46	41.18	41.19	30.89	1.83	119	103	547	728	1497	21.2	11.0
2006		39.56	2.21	39.99	35.75	26.81	1.73	149	54	807	693	1703	26.7	10.5
2007		45.57	1.83	43.23	46.29	34.72	1.54	309	86	757	925	2077	24.6	13.4
2008		44.41	1.54	41.33	39.66	29.74	1.19	296	55	1019	1032	2402	31.1	15.2
2009		39.81	1.56	47.14	48.58	36.43	1.48	193	80	789	1179	2241	24.6	17.2
2010		36.23	1.28	48.58	49.18	36.89	1.29	140	102	974	1245	2461	29.2	18.8
2011		44.91	1.50	44.02	40.23	30.17	1.17	161	78	961	1152	2352	33.7	19.9
2012		28.41	1.65	44.74	50.47	37.86	1.98	196	46	952	1081	2275	33.4	19.5
2013		33.36	1.31	44.25	41.71	31.29	1.26	164	15	837	1120	2136	33.4	22.5
2014		37.51	1.46	42.55	45.51	34.13	1.37	180	25	900	1200	2305	40.6	27.4
2015														
2016														
2017														
2018														
2019														
2020														
2021														
2022														
2023														
2024														
2025														

FIGURES









Comments:

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, both in terms of high bull ratios and bull quality. Bull ratios are managed under the special management criteria, with a goal of maintaining 30-40 per 100 cows. Bull quality is monitored annually using cementum annuli tooth age 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 1997-2013. 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 2013, a total of 965 "any elk" hunters and 650 antlerless elk hunters in the herd unit were solicited for tooth samples. Of those solicited, 150 returned teeth from bulls and 78 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 sampled adult males has slowly increased since 1999, while average tooth age of female elk has remained relatively stable (see Figure 1 & 2). In 2013, the average age of female elk sampled was 5.70, and the average age of male elk was 6.07. Median age of females was 5.5 and of males was 6.0. Of those bulls sampled, 47% were age 2-5 and 49% were age 6-10. Of those cows sampled, 61% were age 2-5 and 26% were age 6-10. This disparity between harvested bull age versus harvested cow age illustrates hunter preferences for older aged bulls.

Percentage of bulls aged 6-10 has gradually increased from 2001-2013, indicating that older age-class bulls have been 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 (see Figure 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. Regardless, one must assume inherent biases within this sampling scheme apply equally across years. Thus, emerging trends in mean and median ages of sampled bulls warrant discussion.

The increasingly high percentage of older age-class bull elk is a surprising trend, considering that managers believe this herd has been decreasing since 2009. License issuance has remained high,

and one would expect it to become more and more difficult to find and harvest older age-class bulls in a declining population. At the same time, average tooth age of sampled cows has slowly decreased since 2007 but was higher (and very similar to bull tooth age) in 2013, while license issuance and season length have been liberalized. This seems to corroborate the declining trend seen in the population model.

Trends in antler class of classified bull elk are more difficult to interpret on their own. Percentage Class II bulls declined from 2008-2011, but then increased in 2012 and 2013. During the same time period, average tooth-age of harvested bulls increased steadily from 5.01 to 5.99. The divergence between the two data sets in 2012-2013 suggests antler quality is not necessarily correlated positively with bull age for this herd. Factors such as nutrition, genetics, or classification biases may also be contributing to antler quality. Trends in the tooth-age dataset certainly temper any assumptions made regarding changes in the antler class dataset and aids in making sound management decisions for this herd. Collectively, these data seem to indicate this herd can continue support a high number of any-elk licenses and a high level of harvest without compromising bull ratios or bull quality. Any observed decline in Class II bulls during postseason classifications may be related more to environmental variables, as it is not borne out in tooth age data.

Figure 1. Tooth-age data analysis for adult bull elk harvested within the Laramie Peak/Muddy Mountain Herd Unit, 1997 - 2013.

	Number of Adult Males per Age Class (Tooth Sampling)																				
Year	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
1998	1	16	19	10	10	4	3	2	1	2	1	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
2000	22	36	41	28	24	13	6	1	3	1	1	0	0	0	0	1	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
2004	7	8	16	19	6	10	5	3	1	0	1	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
2007	1	11	24	18	12	12	8	3	0	0	1	1	0	0	0	1	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
2010	4	3	16	27	32	27	13	2	1	2	5	1	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
2012	2	9	9	22	22	20	9	3	4	0	1	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

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**

	Percentages				
Year	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%

Figure 2. Tooth-age data analysis for adult female elk harvested within the Laramie Peak/Muddy Mountain Herd Unit, 1997 - 2013.

	Number of Adult Females per Age Class (Tooth Sampling)																				
Year	**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
1998	3	14	6	10	6	7	5	2	1	2	1	1	1	0	0	0	1	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	1
2000	19	26	21	17	13	11	6	4	6	0	4	3	0	1	2	1	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
2004	8	4	13	8	8	6	3	2	3	0	0	1	0	0	0	0	0	0	0	0	0	0
2005	26	14	39	34	21	14	16	15	4	6	5	5	0	4	4	0	0	1	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
2008	8	11	14	14	17	8	11	5	3	2	1	2	3	1	0	2	1	1	0	1	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
2011	4	4	11	10	14	6	7	6	2	1	0	0	0	0	1	2	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
2013	5	1	11	20	14	8	4	3	3	2	1	4	0	0	0	0	0	0	0	0	0	0

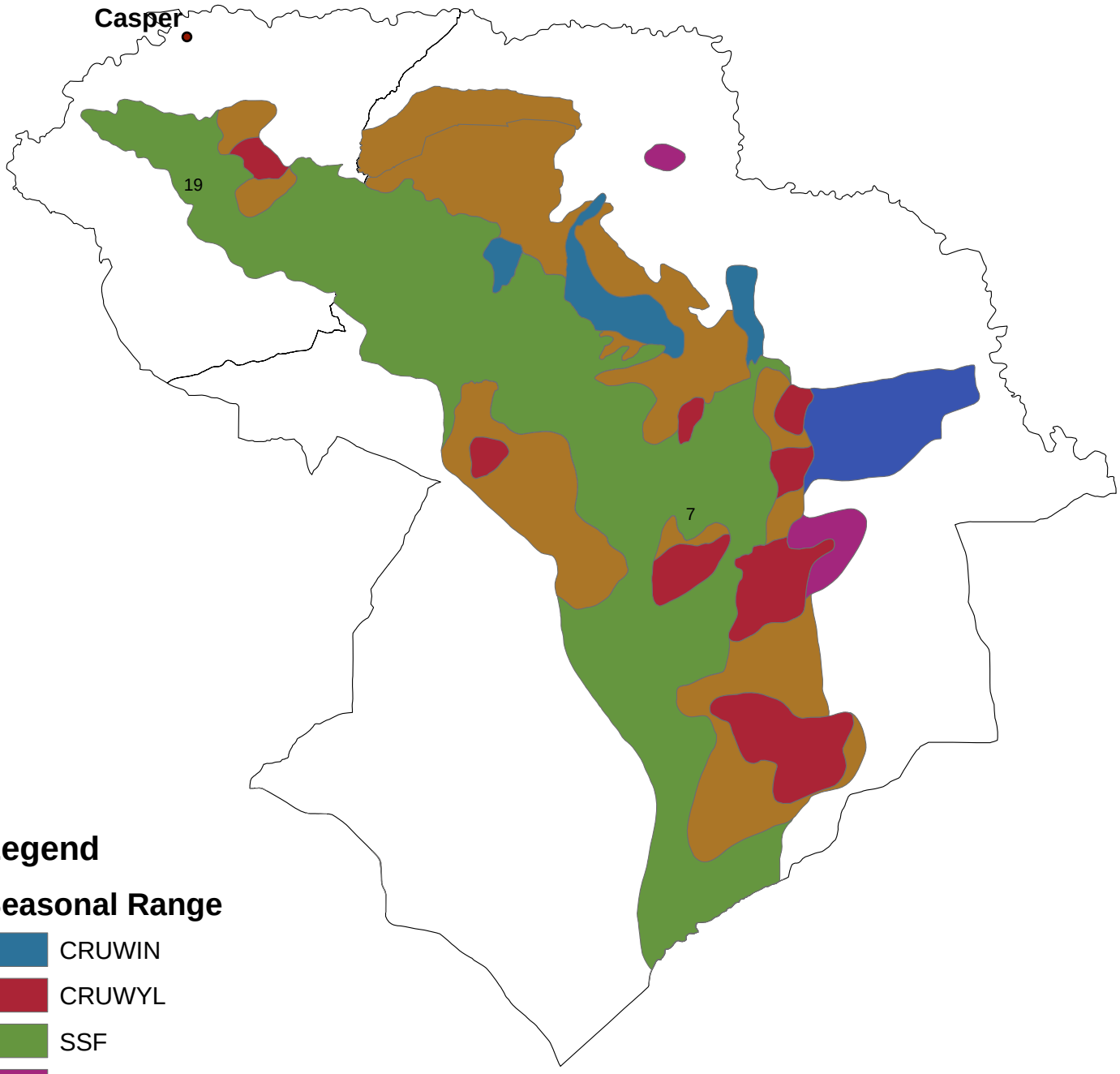
Year	**1**	**2-5**	**6-10**	**11-12**	**13+**	**N**	**Avg Age**
1997	8	22	6	3	0	39	**4.38**
1998	3	36	17	2	2	60	**4.90**
1999	14	66	25	11	5	121	**5.02**
2000	19	77	27	7	5	135	**4.61**
2001	11	65	32	6	1	115	**4.84**
2004	8	33	14	1	0	56	**4.27**
2005	26	108	55	10	9	208	**5.16**
2007	4	57	34	7	6	108	**5.97**
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**

	Percentages				
Year	**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%

Figure 3. Antler classification of bull elk from the Laramie Peak/Muddy Mountain Herd Unit, 2008-2013.

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**

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

2013 - JCR Evaluation Form

SPECIES: Elk

PERIOD: 6/1/2013 - 5/31/2014

HERD: EL742 - RATTLESNAKE

HUNT AREAS: 23

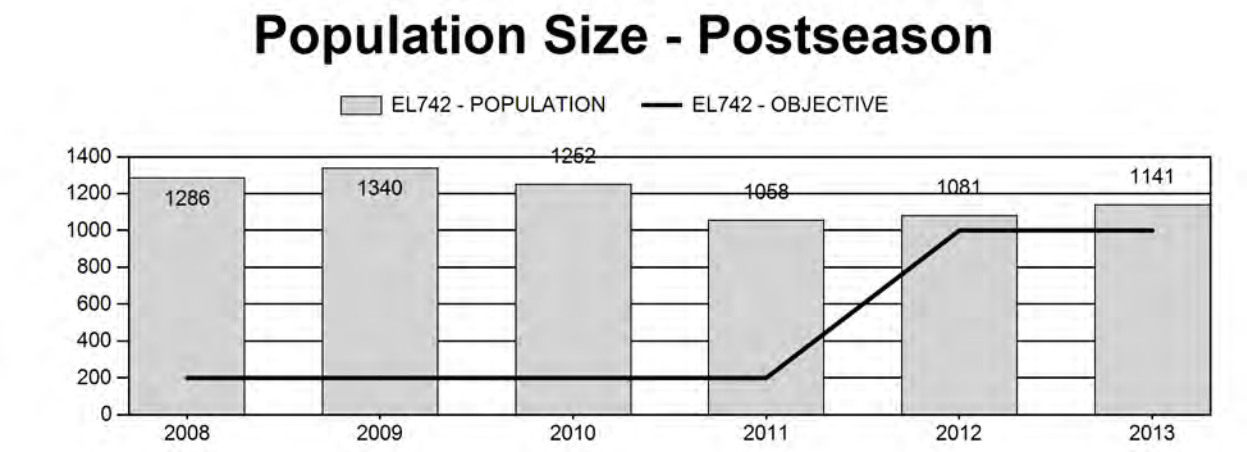
PREPARED BY: HEATHER O'BRIEN

	2008 - 2012 Average	2013	2014 Proposed
Population:	1,203	1,141	1,037
Harvest:	153	157	179
Hunters:	344	360	400
Hunter Success:	44%	44%	45%
Active Licenses:	364	366	425
Active License Percent:	42%	43%	42%
Recreation Days:	3,101	2,964	3,300
Days Per Animal:	20.3	18.9	18.4
Males per 100 Females	44	33	
Juveniles per 100 Females	35	39	

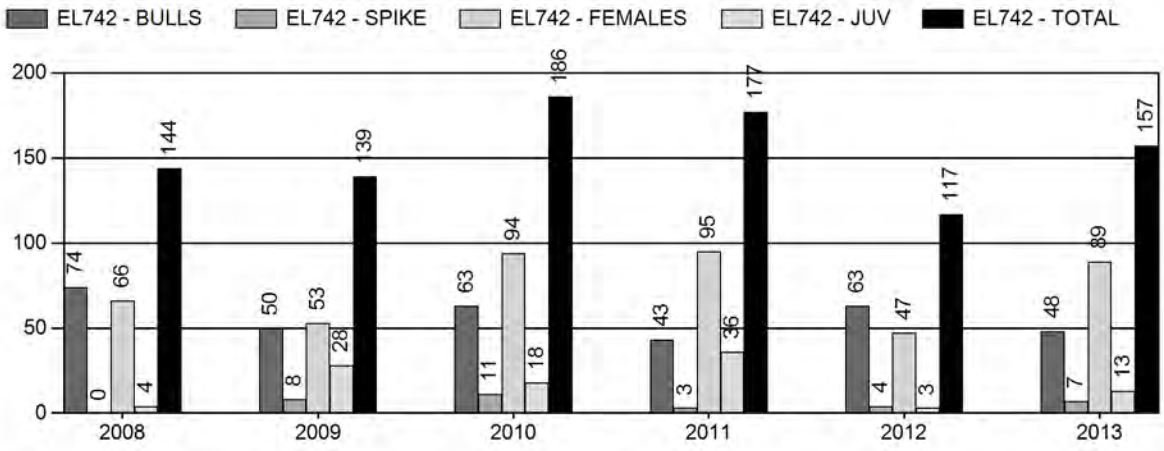
Population Objective:	1,000
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	14%
Number of years population has been + or - objective in recent trend:	23
Model Date:	4/2/2014

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

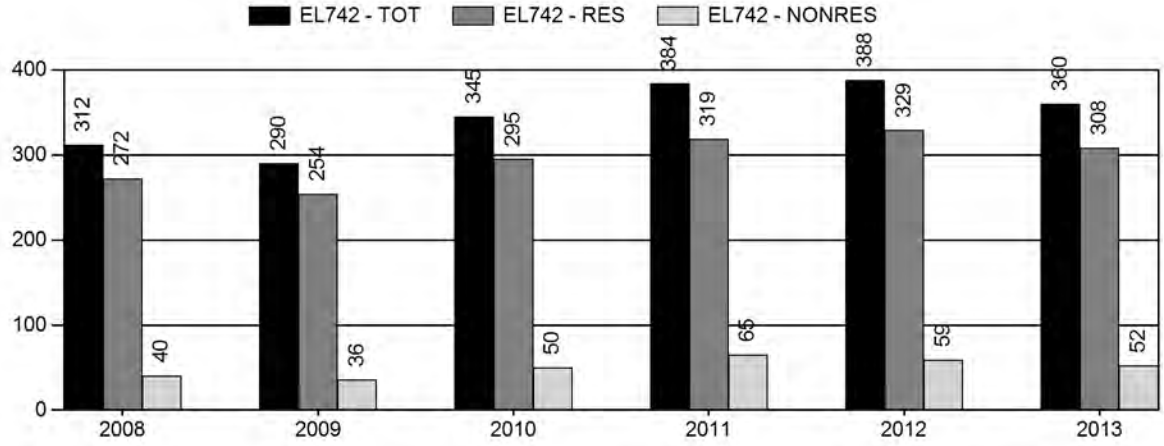
	JCR Year	Proposed
Females ≥ 1 year old:	11.5%	13.9%
Males ≥ 1 year old:	21.3%	20.7%
Juveniles (< 1 year old):	4.5%	8.5%
Total:	12.6%	14.6%
Proposed change in post-season population:	-13.9%	-16.1%



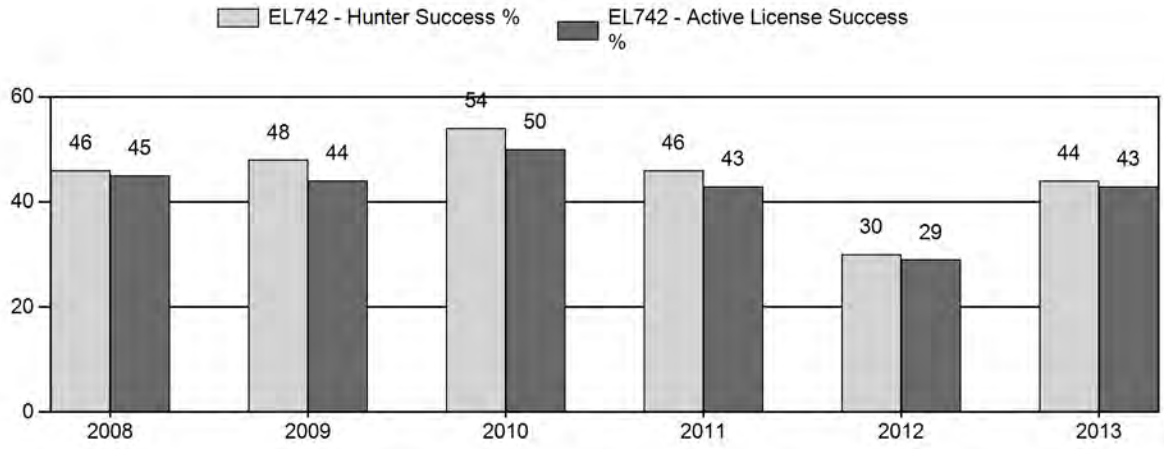
Harvest



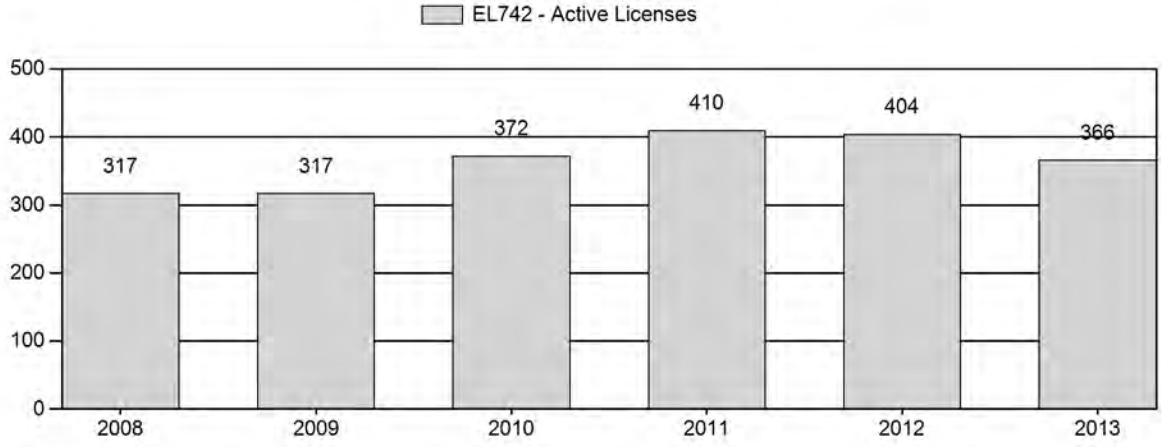
Number of Hunters



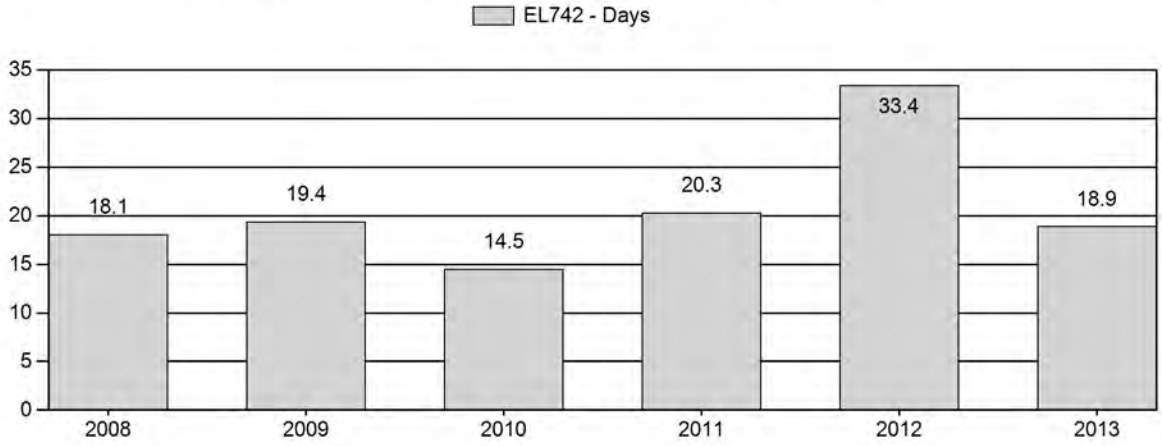
Harvest Success



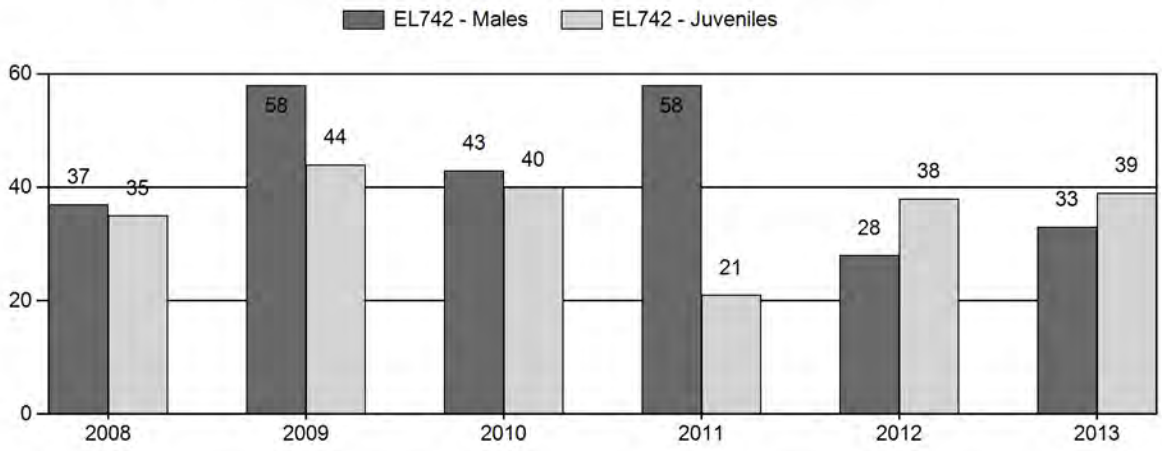
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2008 - 2013 Postseason Classification Summary

for Elk Herd EL742 - RATTLESNAKE

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	1,286	38	34	72	21%	195	58%	68	20%	335	375	19	17	37	± 6	35	± 5	25
2009	1,340	27	84	111	29%	192	49%	85	22%	388	579	14	44	58	± 7	44	± 6	28
2010	1,252	24	47	71	23%	166	55%	66	22%	303	415	14	28	43	± 7	40	± 6	28
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	1,132	26	102	128	19%	390	58%	153	23%	671	479	7	26	33	± 3	39	± 3	30

2014 HUNTING SEASONS
RATTLESNAKE ELK (EL742)

Hunt Area	Type	Date of Seasons Opens	Closes	Quota	Limitations
23	1	Oct. 1	Oct. 31	125	Limited quota licenses; any elk
		Nov. 15	Dec. 15		Unused Area 23 Type 1 licenses
	4	Oct. 1	Oct. 31	125	Limited quota licenses; antlerless elk
		Nov.15	Dec. 15		Unused Area 23 Type 4 licenses, also valid in Area 128
	6	Oct. 1	Oct. 31	200	Limited quota licenses; cow or calf
		Nov. 15	Dec. 15		Unused Area 23 Type 6 licenses, also valid in Area 128
Archery		Sep. 1	Sep. 30		Refer to license and type limitations in Section 2

Hunt Area	Type	Quota change from 2013
23	1	0
	4	0
	6	0
	7	0

Management Evaluation

Current Postseason Population Management Objective: 1,000
Management Strategy: Recreational
2013 Postseason Population Estimate: 1,100
2014 Proposed Postseason Population Estimate: 1,000

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 from a postseason objective of 200 to 1,000. The old objective was antiquated, unreasonable, and inadequate to meet the expectations of hunters, landowners, and managers.

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 concern in this herd unit.

Weather

The summer of 2012 was the driest on record since 1904 in much of Wyoming, though it did not seem to effect elk distribution within this herd unit. The winter of 2012 continued the dry trend with very low snow accumulation and snow pack, allowing wide distribution of elk. April of 2013 finally saw a break in the drought, when temperatures dropped below normal for the entire month and significant precipitation was received. This cooler and wetter pattern continued through the summer of 2013 in much of the herd unit. In early October 2013, winter storm "Atlas" blanketed the area with 12-36" of wet snow, with greater depths at higher elevations. The snow and resulting muddy conditions forced the cancellation of hunting for some license holders, and made accessing elk difficult in some locations. In contrast, heavy snows in several cases elicited movement of elk and created opportunity for harvest on public lands within the herd unit. Travel conditions improved for late seasons, but by then it was apparent winter storm Atlas had a negative impact on early hunter participation and harvest success. The early winter months of 2013-2014 brought temperature and precipitation conditions near the recent 30-year average, and hunters had improved access and success during the late cow season. For detailed weather data see http://www.ncdc.noaa.gov/gac/time-series/us.

Habitat

Currently there are no established habitat transects to quantify vegetative production or utilization trends in the herd unit. Anecdotally, field personnel observed improved habitat conditions in 2013 compared to the severe drought of 2012.

Field Data

Observed calf ratios are highly erratic in this herd unit due to varying 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. Instead managers continue to focus on maximizing cow harvest without over-saturating the area with hunter pressure. Increases in 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 as low as 13 to as high as 58 per 100 cows. 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, or elk are immigrating/emigrating to and from adjacent hunt areas. Again, license issuance and season structure changes in this herd are not typically made based on observed bull ratios. Instead, seasons are designed to maximize cow harvest and maintain 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, indicating that 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 reduced harvest success in most years. In 2013, weather conditions were severe enough to force elk onto adjacent public lands where they were more readily harvested. The new split season in 2013 also facilitated movement of elk off of private refugia. During the two-week closure mid-season, hunting pressure was removed and elk began to move back to public lands. Late-season licenses were also valid for use in the adjacent Hunt Area 128. Field personnel received several positive comments from hunters and landowners who were pleased with both of these changes to the hunting season. Overall harvest (157) increased significantly compared to 2012 (117).

Population

The 2013 postseason population estimate was approximately 1,100 and decreasing. Postseason classification data and harvest data are applied to the model to predict population size and trends for this herd. No sightability or other population estimate data are currently available to further align the model. Managers are currently discussing expanding this herd into a portion of Area 128, where interchange of animals is known to occur. Modeling a larger herd with less interchange should produce a higher quality model that predicts trends more accurately.

The "Constant Juvenile Survival – Constant Adult Survival" (CJ,CA) 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 ratios also render this herd challenging to model. The TSJ,CA model was discarded, as it predicts population sizes that are lower than actual observed survey totals. When juvenile survival was increased in years known to have mild winter conditions, the SCJ,CA model also predicted a population size lower than actual numbers of elk observed. The TSJ,CA,MSC model was not used as it does not seem applicable or necessary for this herd, which does not have elevated predation rates from large carnivores. While the CJ,CA model appears to be the best choice to represent the herd, it should be noted that this model selected for the lowest juvenile and the highest adult constraints, indicating that it is of poor quality. Managers recommend combining or re-drawing this and adjacent herds to account for interchange and to model a more closed population in future years.

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 structures have also changed to include split seasons in some years in an attempt to maximize cow harvest. Input from hunters following the 2012 season indicated poor bull hunting opportunity. Thus for 2013, season dates were extended significantly for bull hunting. Since this appeared to work well in 2013, the same season is being implemented for 2014. Goals for 2014 are to continue high harvest pressure on cows, extend opportunity to hunt bulls, and improve overall harvest success.

If we attain the projected harvest of approximately 179 elk and assuming average calf production/survival, this herd will maintain itself near objective. The predicted 2014 postseason population estimate for the Rattlesnake Elk Herd is approximately 1,000 animals, which is at objective.

INPUT	
Species:	Elk
Biologist:	Heather O'Brien
Herd Unit & No.:	Rattlesnake
Model date:	04/02/14

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	Constant Juvenile & Adult Survival	374	383	☑ CJ,CA Model	
SCJ,SCA	Semi-Constant Juvenile & Semi-Constant Adult Survival	374	383	☐ SCJ,SCA Mod	
TSJ,CA	Time-Specific Juvenile & Constant Adult Survival	207	330	☐ TSJ,CA Model	
TSJ,CA,MSC	Time-Specific Juv, Constant Adult Survival, Male survival coefficient	190	325	☐ TSJ,CA,MSC Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population				Predicted Posthunt Population				Objective
	Field Est	Field SE		Juveniles	Total Males	Females	Total	Juveniles	Total Males	Females	Total	
1993				212	98	637	947	206	59	617	882	200
1994				339	110	656	1105	335	71	645	1051	200
1995				270	153	716	1139	269	116	696	1080	200
1996				207	181	749	1137	205	126	727	1058	200
1997				347	175	764	1285	343	123	734	1200	200
1998				562	206	805	1573	557	161	774	1493	200
1999				274	297	898	1469	265	258	812	1335	200
2000				380	319	862	1561	348	242	773	1363	200
2001				212	324	845	1381	188	253	783	1225	200
2002				283	295	815	1393	261	241	763	1266	200
2003				357	302	813	1471	346	250	771	1367	200
2004				316	332	842	1490	306	265	793	1363	200
2005				440	336	853	1629	432	281	832	1546	200
2006			786	326	383	924	1634	313	318	839	1471	200
2007			544	263	390	901	1554	249	322	823	1394	200
2008			385	282	378	868	1528	278	297	796	1370	200
2009			858	381	360	849	1590	350	296	791	1437	200
2010			899	322	378	863	1562	302	297	759	1358	200
2011			1037	190	366	820	1375	145	314	704	1163	200
2012			912	258	344	726	1328	255	271	674	1200	1000
2013				260	329	725	1314	246	268	627	1141	1000
2014				233	324	676	1233	211	254	571	1037	1000
2015												1000
2016												1000
2017												1000
2018												1000
2019												1000
2020												1000
2021												1000
2022												
2023												
2024												
2025												

Survival and Initial Population Estimates

Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.50			0.98		
1994	0.50			0.98		
1995	0.50			0.98		
1996	0.50			0.98		
1997	0.50			0.98		
1998	0.50			0.98		
1999	0.50			0.98		
2000	0.50			0.98		
2001	0.50			0.98		
2002	0.50			0.98		
2003	0.50			0.98		
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2010	0.50			0.98		
2011	0.50			0.98		
2012	0.50			0.98		
2013	0.50			0.98		
2014	0.50			0.98		
2015						
2016						
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Parameters:	Optim cells
Juvenile Survival =	0.500
Adult Survival =	0.980
Initial Total Male Pop/10,000 =	0.006
Initial Female Pop/10,000 =	0.062

MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Total Bulls Adjustment Factor	75%

Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio				Harvest					Segment Harvest Rate (% of Prehunt Segment)	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/ bull adj	Field Est w/o bull adj	Field SE	Juv	Yrl males	2+ Males	Females	Total Harvest	Total Males	Females
1993		33.33	5.87	9.64	32.04	24.03	4.81	6	10	25	18	59	39.3	3.1
1994		51.90	7.06	11.04	37.13	27.85	4.75	4	5	30	10	49	35.1	1.7
1995		38.61	5.82	16.68	31.22	23.42	4.28	1	10	24	18	53	24.4	2.8
1996		28.14	4.65	17.31	30.34	22.75	4.09	2	13	37	20	72	30.4	2.9
1997		46.78	6.34	16.73	32.75	24.56	4.23	3	28	19	27	77	29.6	3.9
1998		71.98	6.04	20.80	36.18	27.14	3.19	4	4	37	28	73	21.9	3.8
1999		32.60	3.09	31.71	23.20	17.40	2.12	8	5	31	78	122	13.3	9.6
2000		45.00	5.03	31.25	29.79	22.34	3.26	29	0	70	81	180	24.2	10.3
2001		24.01	2.80	32.36	22.87	17.15	2.30	22	11	53	56	142	21.7	7.3
2002		34.25	3.25	31.65	16.86	12.64	1.81	20	4	45	47	116	18.2	6.3
2003		44.81	5.19	32.45	43.71	32.78	4.25	10	16	31	38	95	17.1	5.1
2004		38.63	4.40	33.38	22.14	16.61	2.64	9	6	55	45	115	20.2	5.9
2005		51.96	5.30	33.73	32.27	24.20	3.27	7	2	48	19	76	16.4	2.4
2006		37.33	4.86	37.94	67.59	50.69	5.93	12	2	57	77	148	16.9	9.2
2007		30.32	3.78	39.16	22.62	16.97	2.68	12	0	62	71	145	17.5	8.7
2008		34.87	4.91	37.27	49.23	36.92	5.09	4	0	74	66	144	21.5	8.4
2009		44.27	5.77	37.46	77.08	57.81	6.89	28	8	50	53	139	17.7	6.9
2010		39.76	5.79	39.05	57.03	42.77	6.07	18	11	63	94	186	21.5	12.0
2011		20.54	3.66	44.64	77.12	57.84	7.02	41	3	44	105	193	14.1	14.1
2012		37.75	5.05	40.11	37.91	28.43	4.23	3	4	63	47	117	21.4	7.1
2013		39.23	3.74	42.80	43.76	32.82	3.34	13	7	48	89	157	18.4	13.5
2014		37.00	4.73	44.46	55.80	41.85	5.11	20	7	57	95	179	21.7	15.5
2015														
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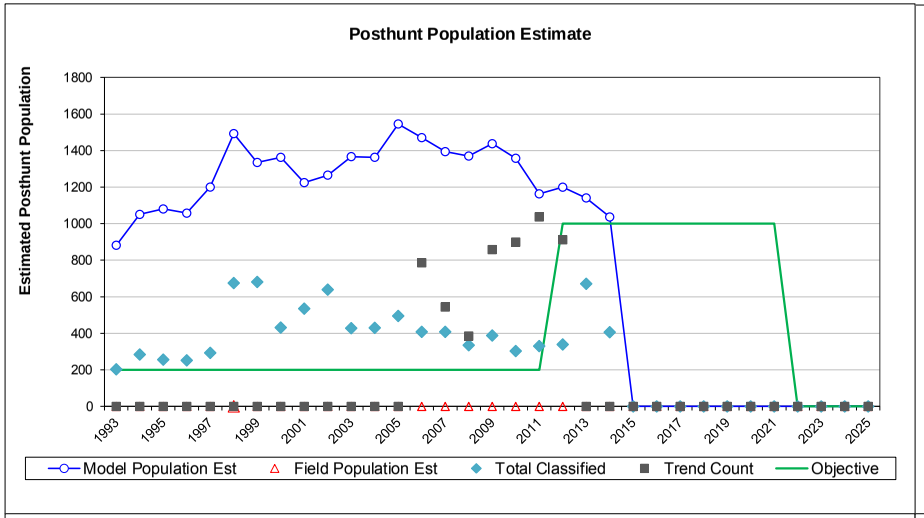
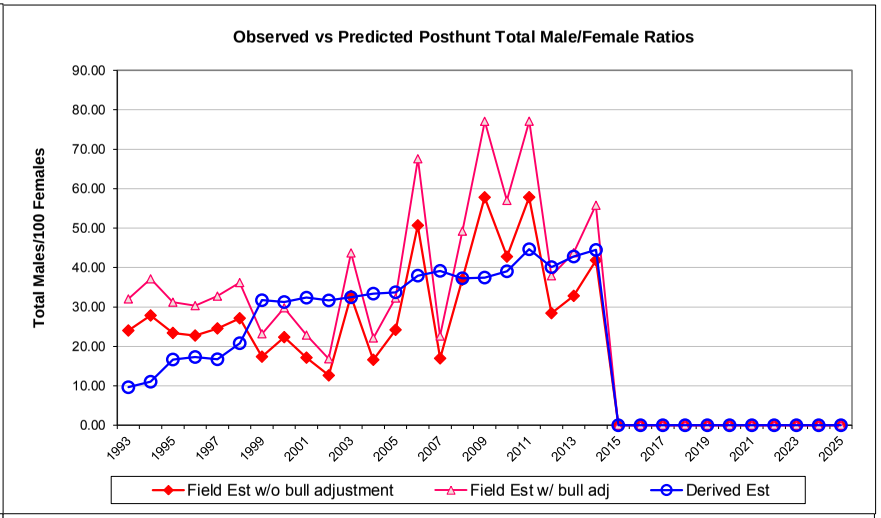
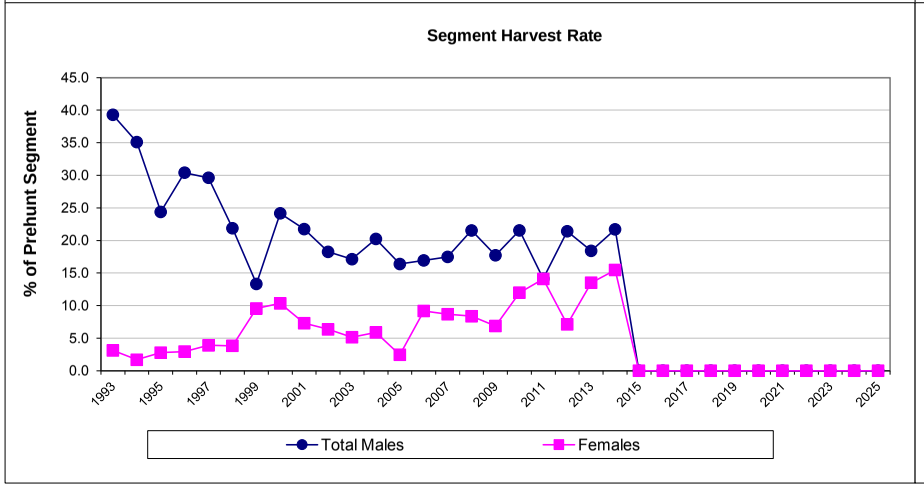
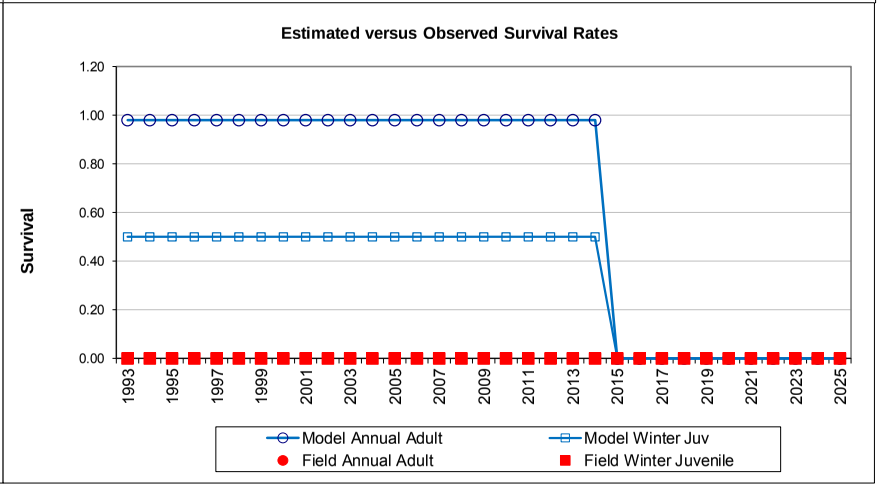
FIGURES



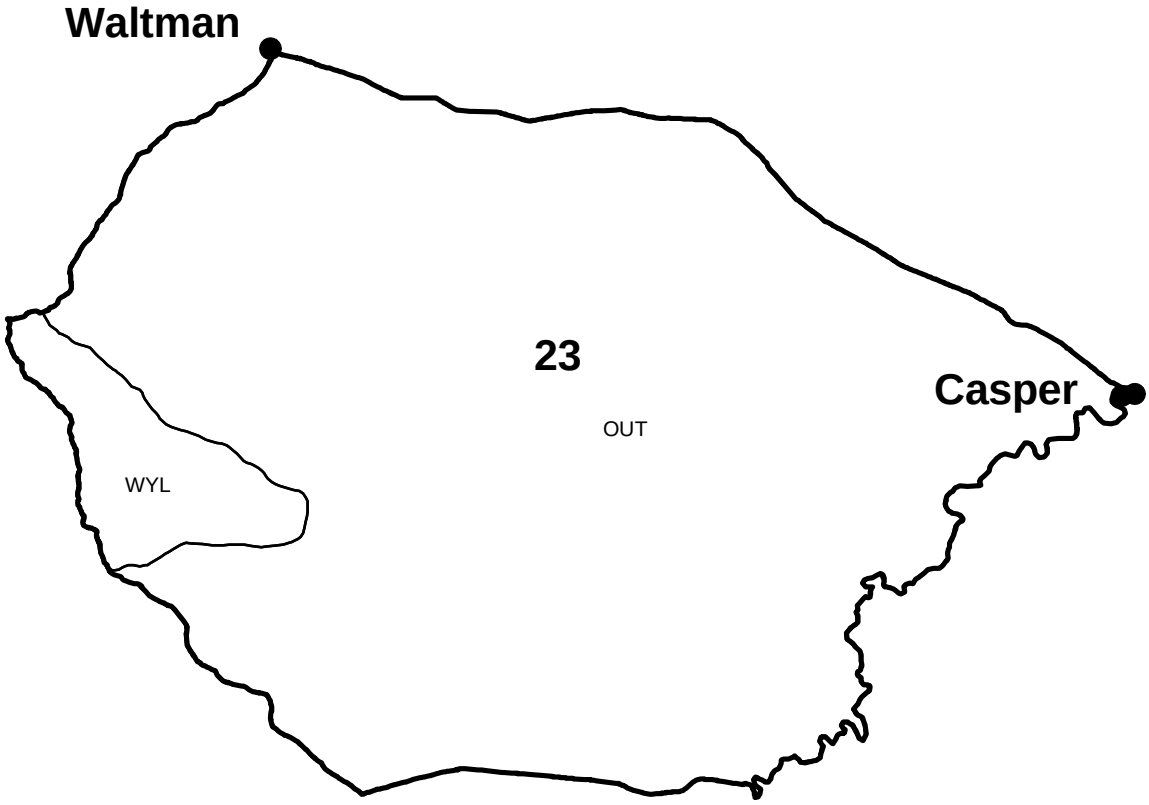






Comments:

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

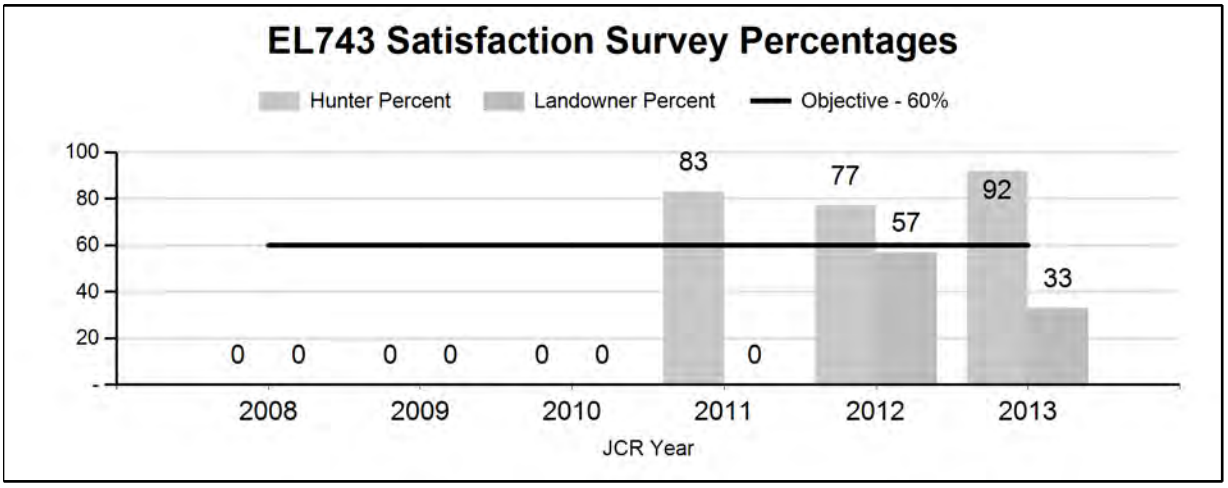


2013 - JCR Evaluation Form

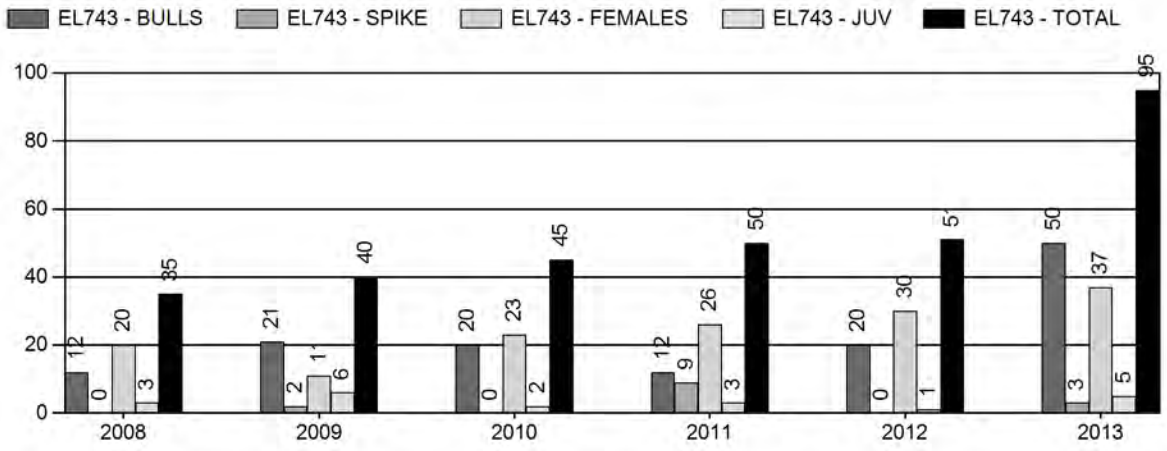
SPECIES: Elk
PERIOD: 6/1/2013 - 5/31/2014
HERD: EL743 - PINE RIDGE
HUNT AREAS: 122
PREPARED BY: HEATHER O'BRIEN

	2008 - 2012 Average	2013	2014 Proposed
Hunter Satisfaction Percent	80%	92%	90%
Landowner Satisfaction Percent	57%	33%	60%
Harvest:	44	95	100
Hunters:	65	126	130
Hunter Success:	68%	75%	77%
Active Licenses:	68	134	145
Active License Percentage:	65%	71%	69%
Recreation Days:	297	600	520
Days Per Animal:	6.8	6.3	5.2
Males per 100 Females:	0	0	
Juveniles per 100 Females	0	0	

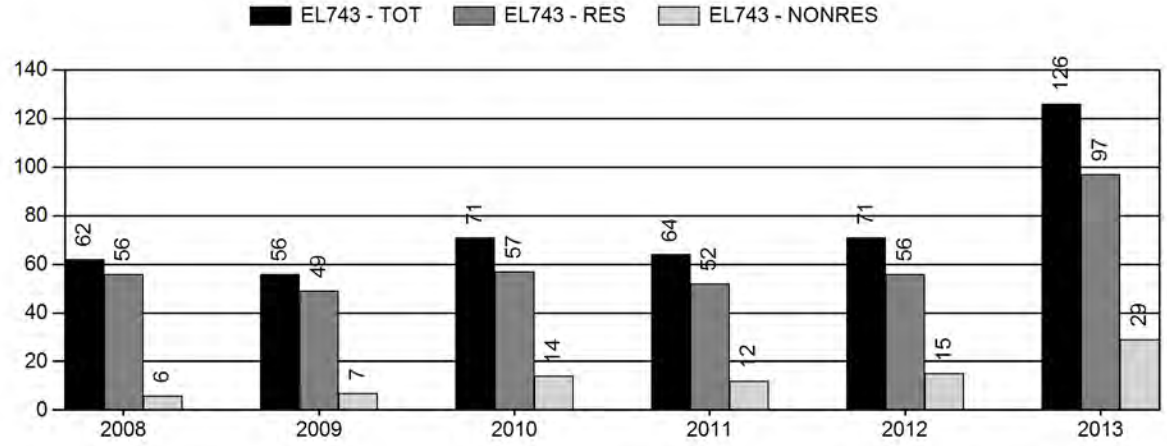
Satisifaction Based Objective	60%
Management Strategy:	Private
Percent population is above (+) or (-) objective:	2%
Number of years population has been + or - objective in recent trend:	1



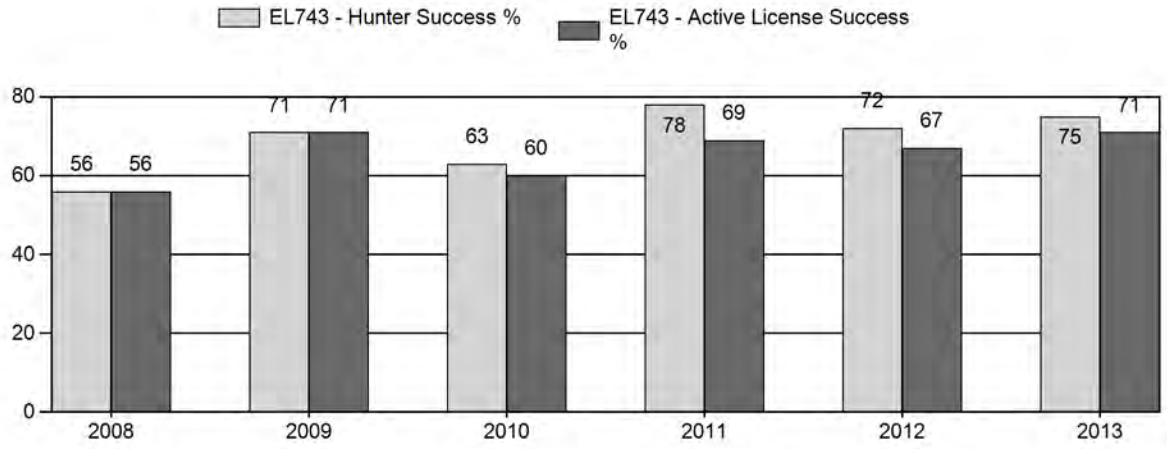
Harvest



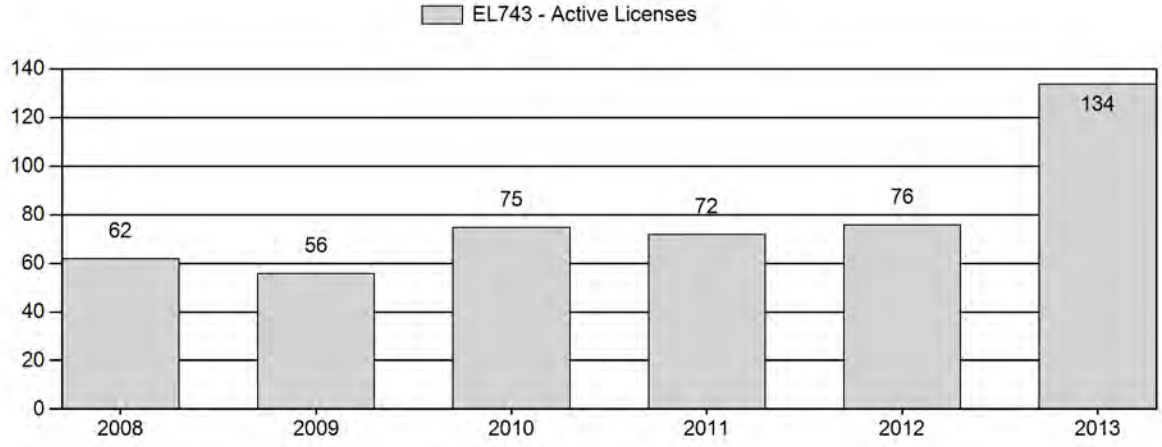
Number of Hunters



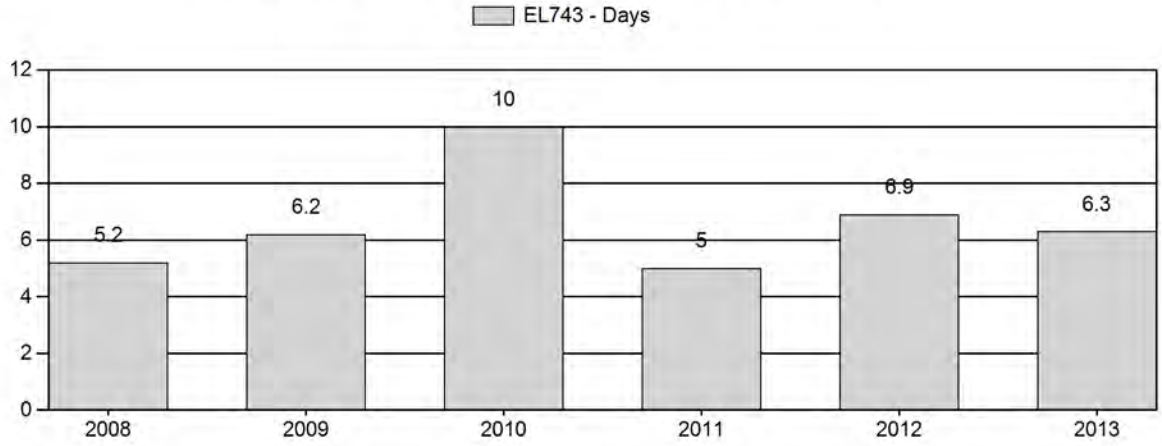
Harvest Success



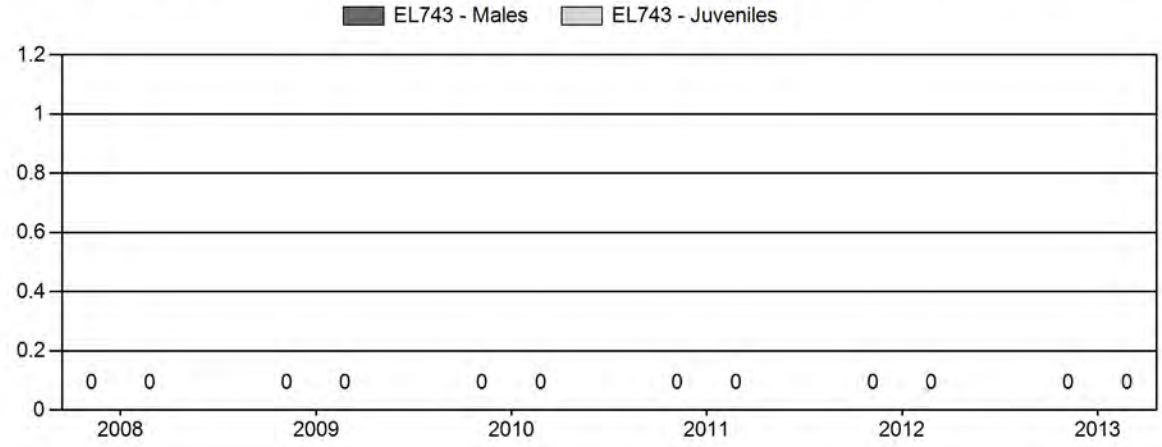
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2014 HUNTING SEASONS
PINE RIDGE ELK (EL743)

Hunt Area	Type	Date of Seasons Opens	Closes	Quota	Limitations
122	1	Oct. 15	Nov. 30	75	Limited quota licenses; any elk
		Dec. 1	Dec. 14		Unused Area 122 Type 1 licenses valid for antlerless elk
	6	Oct. 15	Dec. 14	100	Limited quota licenses; cow or calf
Archery		Sep. 1	Sep. 30		Refer to license and type limitations in Section 2

Hunt Area	Type	Quota change from 2013
122	1	-25
	6	0

Management Evaluation

Current Hunter/Landowner Satisfaction Management Objective: 60% hunter/landowner satisfaction; bull quality
Management Strategy: Private Land
2013 Hunter Satisfaction Estimate: 92%
2013 Landowner Satisfaction Estimate: 33%
Most Recent 3-year Running Average Hunter Satisfaction Estimate: 84%
Most Recent 3-year Running Average Landowner Satisfaction Estimate: NA

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 is very difficult. Most landowners have historically voiced satisfaction with the number of elk on their lands within this herd, thus hunter access has remained restricted. More recently,

some landowners have begun to complain of fence damage and competition of elk with their livestock. Other landowners complain that elk compete with their livestock in the winter, but are not available on their property for harvest during the hunting season. Many landowners that control access to elk in this herd charge high fees for bull hunting, and access for cow/calf hunting is limited such that two thirds of Type 6 licenses typically remain unsold annually. This herd will continue to grow and cause damage issues until landowners open their properties to increased cow harvest.

Weather & Habitat

The Pine Ridge Elk Herd resides in relatively low-elevation habitat, and weather typically has minimal influence on elk 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 there are no population or habitat data to correlate to weather conditions.

Field Data

Fixed-wing winter trend counts are conducted in the herd unit as budget and weather conditions allow. Past trend counts of this herd typcally found between 150 and 350 elk. In 2013, a winter trend count conducted under optimum conditions found a total of 840 elk. These results further indicated to mangers 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. Managers still estimate that there are likely 900-1,000 elk in this herd, if not more.

Landowner and hunter satisfaction surveys are used to manage the Pine Ridge Elk Herd Unit. Survey results must show that 60% hunters alike were either "satisfied" or "very satisfied" with the previous year's hunting season. In addition, landowner surveys must show that 60% or more respondents believe the herd to be "at or about at desired levels" in order to justify similar seasons for the following year. 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 (i.e. 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. In 2013, 50% of landowners believed the elk herd to be "at or about at desired levels", while 92% of hunters who returned surveys said they were "satisfied" or "very satisfied" with the number of elk in the Pine Ridge Elk Herd Unit. For the secondary objective, the three-year average for mature bulls in the harvest was 83%. While hunter satisfaction and quality of harvested bulls exceeded the 60% threshold, landowner perceptions of the herd did not. Managers are therefore tasked with making changes to the 2014 hunting season in an attempt to improve landowner

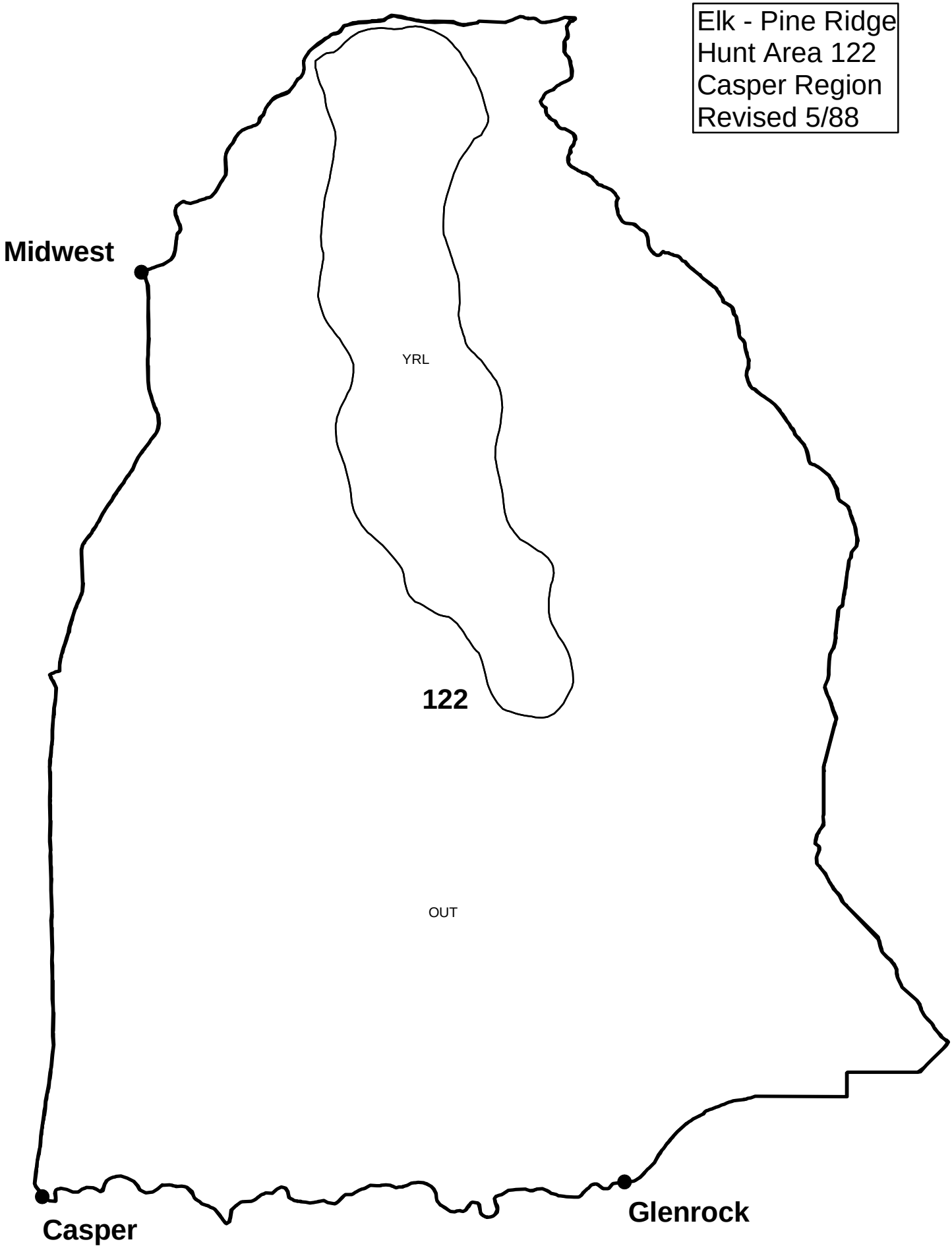
perceptions. Comments from landowners who responded to the satisfaction survey included complaints regarding over-harvest of bulls and loss of trophy quality, complaints of damage from too many elk, requests for a shorter hunting season, and complaints about neighbors hazing elk for harvest.

Harvest Data

Hunter success in this herd unit is typically in the 50-70th percentile and fluctuates with access and license issuance. Hunter success has remained high for the last 5 years, but antlerless elk licenses have remained undersold as landowners are unwilling to allow access for cow hunters. Improved harvest success is likely associated with a growing number of elk in the Pine Ridge Herd. In addition, an increase in Type 1 licenses in 2013 resulted in a 238% increase in bull harvest compared to the 5-year average (50 versus 21 bulls harvested, respectively). Antlerless licenses sales also increased (42% unsold) compared to past years (average 67% unsold), which was attributed to the increase in Type 1 license issuance and hunters buying antlerless tags in addition. Despite improved hunter success, leftover antlerless licenses indicate landowner tolerance of hunters still remains low while tolerance of elk (despite growing complaints) remains high. Until landowners agree to provide more liberal access to antlerless elk hunters, an increase in antlerless elk license issuance is not warranted. Since a portion of landowner dissatisfaction was attributed to perceived loss of bull quality, Type 1 license issuance will be reduced for 2014. Managers are hopeful that encouraging landowners to take bull hunters who are also willing to buy a reduced-price Type 6 tag will increase cow harvest in the herd unit. Landowners will need to do this, or tolerate additional cow hunters in order to reduce the herd and eliminate damage issues.

Management Summary

The elk season in this herd unit opens on October 15th following the close of deer seasons. In more recent years, closing dates have been extended as landowners have agreed to somewhat liberalize access later in the season. The same season dates will be used for 2014, with a decrease of Type 1 licenses to reduce harvest pressure on bulls. An increase of Type 6 licenses cannot be justified until access improves for antlerless hunters within the herd unit. Goals for 2014 are to increase communications with landowners to discuss options that will increase female elk harvest, to improve hunting access, and ultimately improve landowner satisfaction regarding elk numbers in this herd.


Elk - Pine Ridge
Hunt Area 122
Casper Region
Revised 5/88
Midwest
YRL
122
OUT
Casper
Glenrock