

2014 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2014 - 5/31/2015

HERD: MD740 - CHEYENNE RIVER

HUNT AREAS: 7-14, 21

PREPARED BY: JOE SANDRINI

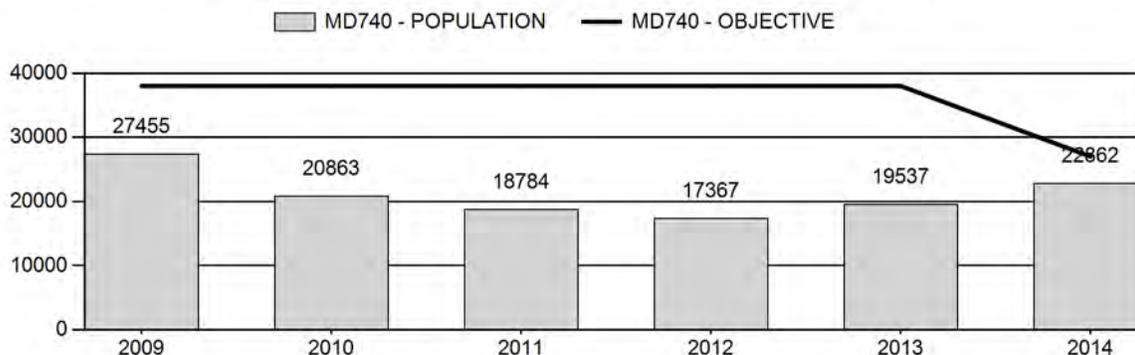
	<u>2009 - 2013 Average</u>	<u>2014</u>	<u>2015 Proposed</u>
Population:	20,801	22,862	23,606
Harvest:	1,123	872	790
Hunters:	2,093	1,740	1,540
Hunter Success:	54%	50%	51%
Active Licenses:	2,146	1,759	1,560
Active License Success:	52%	50%	51%
Recreation Days:	8,692	7,563	6,550
Days Per Animal:	7.7	8.7	8.3
Males per 100 Females	35	37	
Juveniles per 100 Females	56	84	

Population Objective ($\pm 20\%$) :	27000 (21600 - 32400)
Management Strategy:	Private Land
Percent population is above (+) or below (-) objective:	-15.3%
Number of years population has been + or - objective in recent trend:	5
Model Date:	02/20/2015

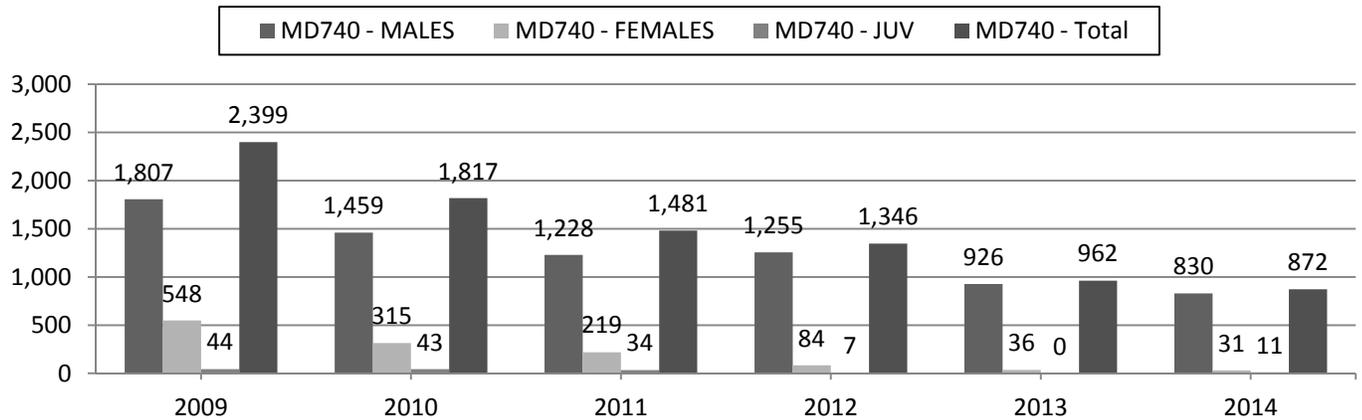
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0.3%	0.3%
Males ≥ 1 year old:	19.3%	13.8%
Juveniles (< 1 year old):	0.01%	0.1%
Total:	4.0%	3.6%
Proposed change in post-season population:	+17%	+3.3%

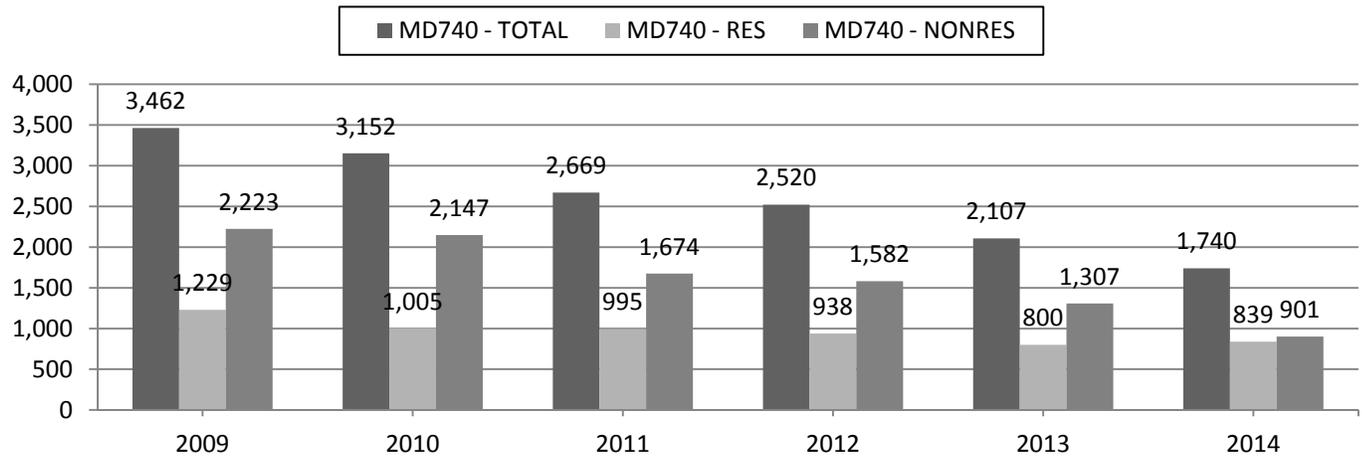
Population Size - Postseason



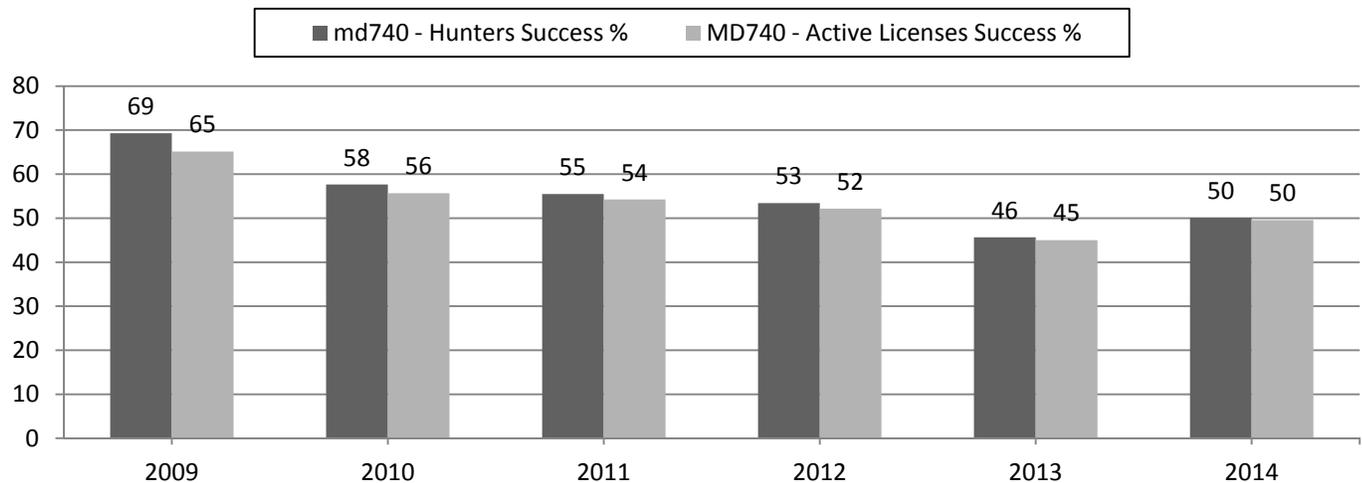
Harvest



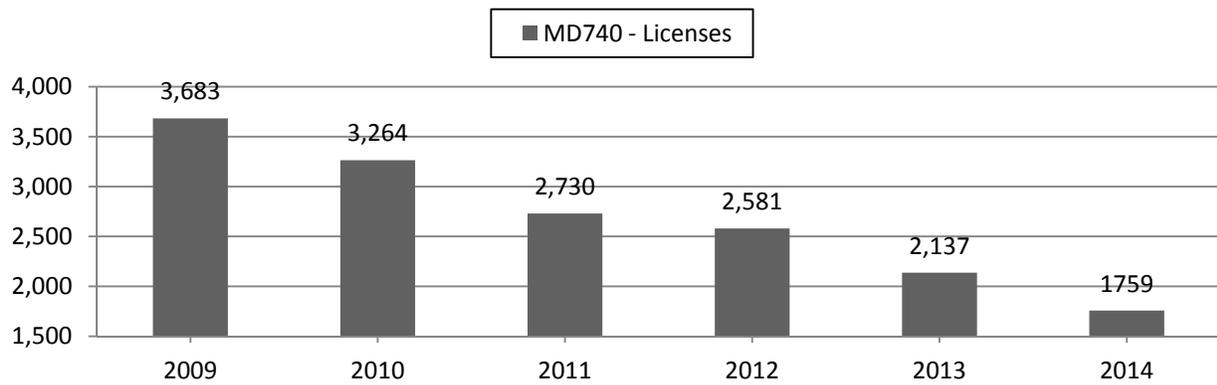
Number of Hunters



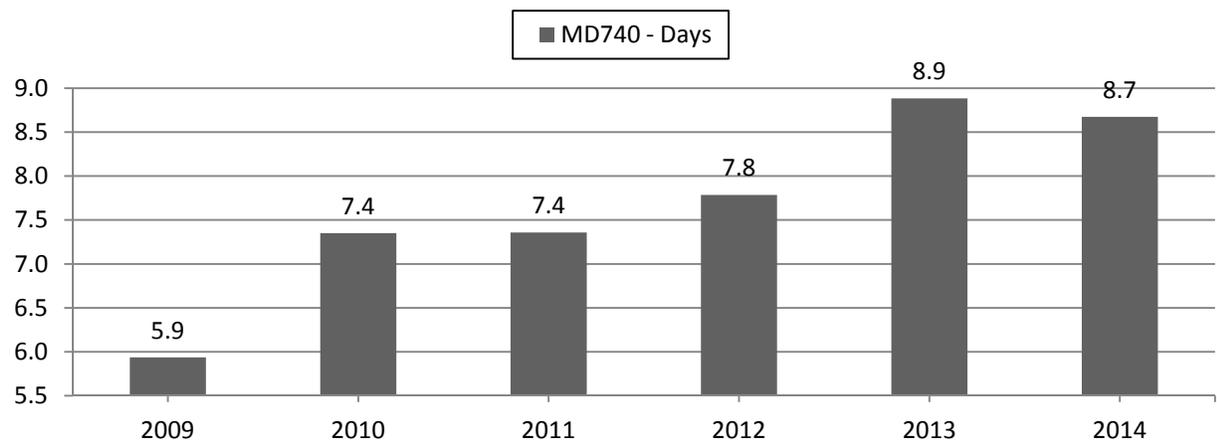
Harvest Success



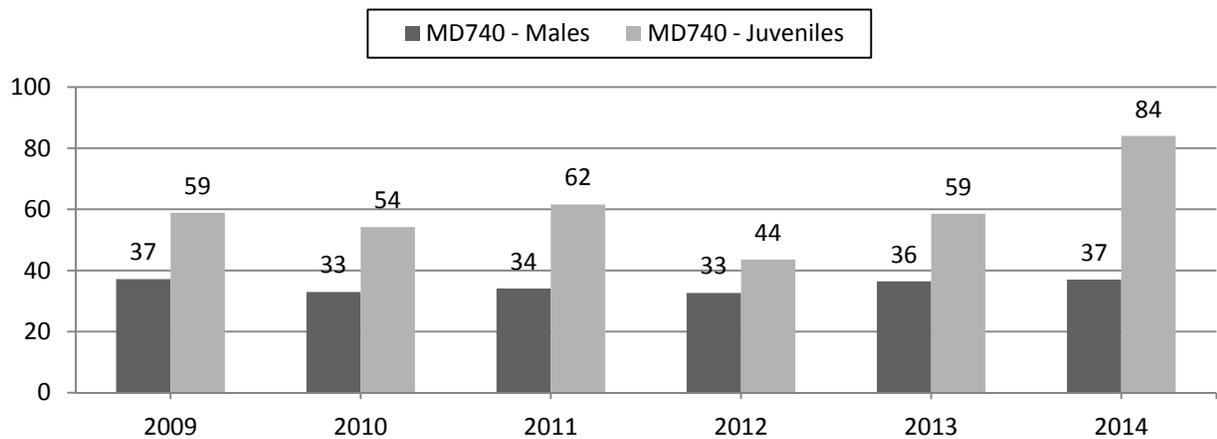
Active Licenses



Days Per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 Postseason Classification Summary

for Mule Deer Herd MD740 - CHEYENNE RIVER

Year	Post Pop	MALES								FEMALES		JUVENILES		Tot CIs	Cls Obj	Males to 100 Females				Young to		
		Ylg	2+ CIs 1	2+ CIs 2	2+ CIs 3	2+ UnCls	Total	%	Total	%	Total	%	YIng			Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult	
2009	27,455	165	0	0	0	418	583	19%	1,569	51%	924	30%	3,076	1,159	11	27	37	± 2	59	± 3	43	
2010	20,863	89	0	0	0	223	312	18%	947	53%	513	29%	1,772	974	9	24	33	± 3	54	± 4	41	
2011	18,784	113	0	0	0	281	394	17%	1,155	51%	711	31%	2,260	1,211	10	24	34	± 2	62	± 4	46	
2012	17,367	119	0	0	0	185	304	19%	932	57%	406	25%	1,642	708	13	20	33	± 3	44	± 3	33	
2013	19,537	114	0	0	0	302	416	19%	1,142	51%	669	30%	2,227	1,137	10	26	36	± 3	59	± 3	43	
2014	22,862	186	0	0	0	336	522	17%	1,426	45%	1,198	38%	3,146	2,053	13	24	37	± 2	84	± 4	61	

**2015 HUNTING SEASONS
CHEYENNE RIVER MULE DEER HERD (MD740)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
7		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
8		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
9		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
10	1	Oct. 1	Oct. 15	100	Limited quota	Antlered deer
11		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
11		Oct. 16	Nov. 30		General	Any white-tailed deer
12		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
12		Oct. 16	Nov. 30		General	Any white-tailed deer
12	6	Oct. 1	Nov. 30	50	Limited quota	Doe or fawn
13		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
13		Oct. 16	Nov. 30		General	Any white-tailed deer
14		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
14		Oct. 16	Nov. 30		General	Any white-tailed deer
21		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer

Special Archery Season Hunt Areas	Season Dates	
	Opens	Closes
1-14, 21	Sep. 1	Sep. 30

Region B Nonresident Quota: 800

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	License Type	Quota change from 2014
Herd Unit Totals	1	+100
	6	-10
	Region B	-200

Management Evaluation

Current Management Objective: 27,000

Management Strategy: Private Land Management

2014 Postseason Population Estimate: ~ 22,900

2015 Proposed Postseason Population Estimate: ~ 23,600

2014 Hunter Satisfaction: 64% Satisfied, 17% Neutral, 19% Dissatisfied

HERD UNIT ISSUES: The Cheyenne River mule deer herd was created in 2009 by combining the Thunder Basin and Lance Creek herds. In 2014, following an internal review and public input process, the postseason population objective was revised from 38,000 to 27,000 and its management strategy changed from recreational to private land. This was done to better align the post-season population objective with historic herd performance, habitat capacities, and address the impacts of limited access to private land for mule deer hunting (Appendix 1).

There are about 6,350 mi² in this herd unit, and 5,485 mi² (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. Historically, these areas receive heavy hunting pressure throughout the mule deer hunting 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 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 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, grass 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, while more severe late winter and early spring weather has 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. Between 2006 and 2012, tougher winter and spring conditions coupled with generally dry summers 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 (EHD) observed in late summer and early fall, especially between 2009 and 2012. 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 drought conditions when temperatures dropped below normal for the entire month, and significant precipitation was received. A 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 EHD 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. Ambient temperatures and precipitation were close to long-term averages during the remainder of 2013-14 winter. The following spring and summer saw a growing season with slightly above normal temps and above normal moisture. This yielded excellent forage production. The early winter months of bio-year 2014 have brought temperature and precipitation conditions close to 30-year averages, with a trend towards milder than normal conditions. 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 pine breaks, and there is a small area (about 30 mi²) 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 is a concern. 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.

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 or 2014. However, wetter and warmer than normal growing seasons, along with low numbers of pronghorn and mule deer on the range contributed to a visible improvement in range conditions.

FIELD DATA: While postseason fawn:doe ratios have undergone cyclic fluctuations, they have generally trended downward (Figure 1). In 2014, the observed, post-season fawn:doe ratio was 84:100, a notable improvement from the previous year (59:100), and a value greater than any observed since 2000. Generally suppressed fawn:doe ratios since 2000 are thought to have been a result of poor range conditions due to protracted drought. In fact, extreme drought in 2012 manifested itself in the lowest fawn:doe ratio observed in recent history. Following this nadir, excellent moisture and forage production in 2013 and 2014 allowed doe body condition to improve resulting in an eventual spike in fawn production during bio-year 2014.

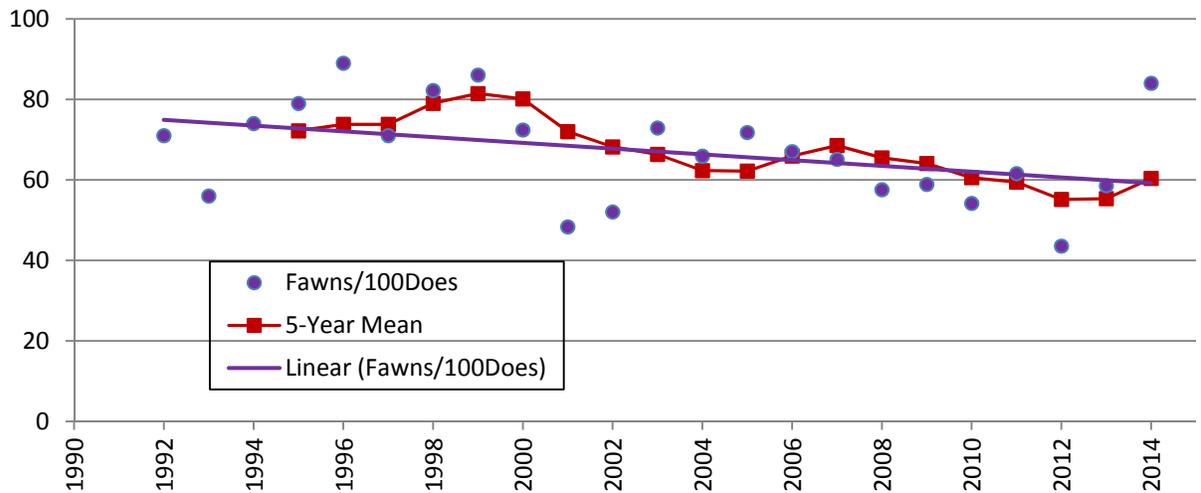


Figure 1. Post-Season Fawn:Doe Ratios, and 5-year mean values (1991 – 2014): Cheyenne River Mule Deer Herd.

While productivity in this herd unit, as measured by fawn:doe ratios, has declined since the early 1980's, poor reproduction did not seem to limit this herd until more recently. Between 2001 and 2009 lower productivity may have been a blessing, as difficult access to private land for hunters hampered 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 began to move 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 generally stabilized near the 10-year average of 36:100 (Figure 2). Until 2008, moderate productivity coupled with limited access for hunters to private land yielded an increasing buck:doe ratio (despite enhanced license issuance). Then, as fawn production and survival dropped, buck:doe ratios declined. The 2013 observed, post-season buck:doe ratio was 36:100 and in 2014 it was 37:100. Because access to private land for buck hunters has become so limited, the post-season buck:doe ratio will likely continue to exceed the recreational management maximum. This is why this herd unit was moved to private land management strategy in 2014.

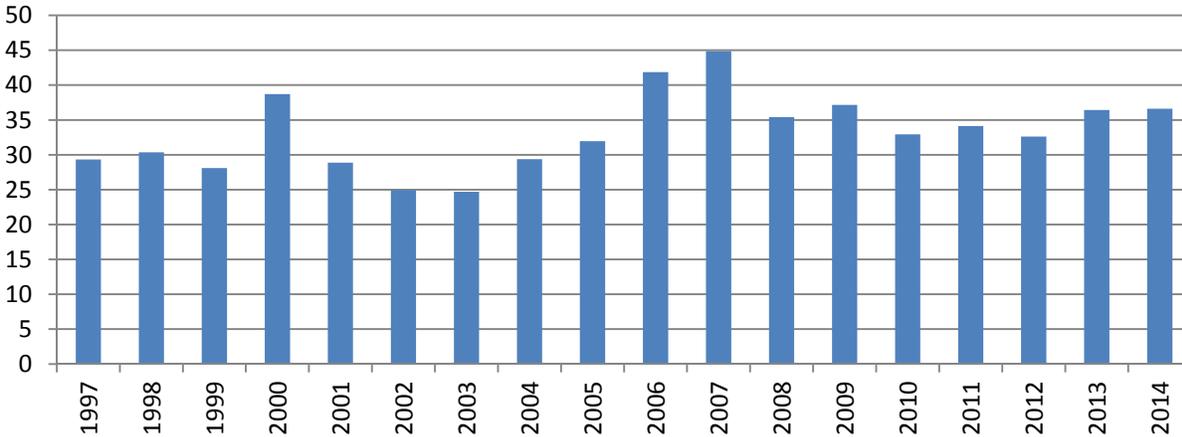


Figure 2. Post-Season Buck:Doe Ratios, Cheyenne River Mule Deer Herd (1997-2014).

HARVEST DATA: Most harvested mule deer are taken off private land because, as previously noted, 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. This was part of the reason for altering the post-season population objective in 2014 (Appendix 1).

Access to private lands for deer hunting continues to decrease due to leasing by outfitters and landowners limiting hunting in the wake of declining deer numbers. 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 within the herd unit. Compounding this situation, outfitter control has significantly curtailed public hunting access to buck deer, and harvest of bucks dropped even when seasons were liberalized in the mid 2000's. The reduced access to private land for deer hunters has also increased hunting pressure on bucks on accessible public lands, and resulted in lower numbers of bucks there. This was one of the reasons HA 10 was changed to limited quota hunting in 2014.

Between 2006 and 2013, hunter numbers and harvest declined steadily, while hunter effort increased. This trend was slightly ameliorated in 2014, as the population began to increase and hunter participation declined. Non-resident hunter participation has dropped steadily since 2006, with the Region B quota being successively lowered most years, while resident hunter numbers declined steadily through 2013 before increasing about 5% in 2014. Further, during each of past five hunting seasons, complaints were received from both hunters and landowners throughout the herd unit with regard to the low number of deer seen and harvested.

It was evident from the reduced number of deer found during classification efforts between 2010 and 2013, changes in harvest statistics and landowner contacts that this herd declined substantially during this timeframe. These observations in 2013 were contrary to the population model, which suggested a population increase that year. It is remarkable that the modeled,

preseason population estimate for this herd increased 12% between 2012 and 2013, but hunter success dropped precipitously and effort increased substantially in 2013, even with fewer hunters afield. The 2013 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 that year, 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. In 2014, harvest statistics indicate preseason mule deer numbers were improved, and more deer were classified post-season, particulars that dovetail with model projections. However, while trends in harvest statistics reversed themselves in 2014, the magnitude of the change was not congruent with the projected increase in the population, especially considering fewer hunters were in the field and the modeled population is projected to have increased 17% between 2013 and 2014. The majority of this simulated population increase stems from the high fawn production measured in 2014.

POPULATION: The 2014 post-season population estimate for this herd is ~22,850. The population model implies this population peaked in 2000 and then dropped following the tough winter that year. The herd is projected to have then rebounded between 2001 and 2005, when it leveled off through 2007 at about 15% above the current objective. Between 2007 and 2012 the herd declined to 31% below its present objective, before returning to its current level. It should be noted the inherent constraints in the spreadsheet models make population estimates at the extremes of the years modeled most tenuous.

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 observed buck ratios relatively well without being overly parameterized. The selected model aligns well with observed buck:doe ratios, and changes in preseason population estimates are about 56% correlated with changes in hunter success, and inversely correlated 90% with changes in hunter effort between 2006 and 2014. However, modeled changes in population size do not seem to be of the magnitude field personnel and many landowners report, as there seemed to be more of a peak in deer numbers about 2006 or 2007 with a steeper increase preceding this and more abrupt decline following. Consequently, the model is considered to be of only fair quality because it has 15-20 years of data; ratio data available for all years in model; the juvenile and adult survival estimates are reasonable; it exhibits modest fit; and results are generally defensible biologically.

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.

Due to intense hunting pressure on public land there is a major discrepancy in deer numbers and densities between private and public land. 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 steadily reduced the Region B quota for many years, decreased season length and finally implemented a 3-point restriction in 2012. These strategies helped improved

the HA 10 buck:doe ratio to the herd-wide average in 2009 and 2010, but deer densities remained depressed; and the observed buck:doe ratio dropped to 16:100 in 2011. With the 3-point restriction in place during 2012, the post-season buck:doe ratio improved to 42:100, but only 27 bucks were observed in over 4 hours of helicopter flight time. The same classification effort in 2013 detected 30 bucks, and these data along those recorded during a fixed winged flight by the Niobrara County Predator Board over private lands found a total of 41 total bucks and a buck:doe ratio of 35:100. As a result, and commensurate with public and hunter sentiments polled during the 2014 hunting season, this HA was moved to limited quota hunting in 2015 with 100 licenses being issued for a season running October 1 to 15.

Many landowners have stated they are not taking deer hunters again this year, or continuing with the reduced number they have hosted recently. In addition, during the past couple of years several ranches that normally hosted several hundred deer hunters have turned these hunters away 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 crowding of hunters on accessible public land, the estimated displacement of almost 200 non-residents from HA 10 with the move to limited quota, and lack private landowners willing to host hunters, the Region B quota has again been reduced. The Region B quota of 800 should allow about 85% of first choice applicants to draw a license; and the 2015 hunting season should result in harvest of about 750 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 2015, but it will remain well below objective.

INPUT	
Species:	Mule Deer
Biologist:	Joe Sandrini
Herd Unit & No.:	Cheyenne River MD740
Model date:	02/20/15

MODELS SUMMARY			Relative AICc	Notes
	Fit			
C,J,CA	Constant Juvenile & Adult Survival	113	122	<input type="checkbox"/> C,J,CA Model <input checked="" type="checkbox"/> S,C,J,SCA <input type="checkbox"/> T,S,J,CA Model
S,C,J,SCA	Semi-Constant Juvenile & Semi-Constant Adult Survival	50	77	
T,S,J,CA	Time-Specific Juvenile & Constant Adult Survival	5	120	

Check best model to create report

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	Juveniles	Total Males	Females		
1995				10300	5764	13642	29706	3594	12879	26683	38000
1996				11928	6254	13989	32170	3953	13387	29237	38000
1997				10218	7092	14950	32260	4739	14313	29216	38000
1998				12081	7194	15168	34443	4368	14644	31050	38000
1999				13584	8096	16656	38336	4636	15716	33877	38000
2000				13313	9948	19177	42437	6489	18303	38046	38000
2001				8297	8056	17896	34249	5072	16985	30267	38000
2002				8350	6846	16770	31966	4114	15920	28318	38000
2003				11102	6072	15906	33080	3830	15116	29965	38000
2004				10213	6709	16110	33033	4558	15412	30128	38000
2005				11112	7040	16081	34234	5037	15337	31383	38000
2006				10427	7712	16290	34430	5545	15504	31442	38000
2007				10064	7938	16233	34235	5794	15383	31194	38000
2008				8912	8025	16012	32949	6091	15413	30376	38000
2009				8802	7907	15671	32381	5920	15069	29742	38000
2010				7256	6025	13646	26927	4420	13308	24937	38000
2011				6377	4685	10536	21599	3486	10301	20128	38000
2012				4587	4929	10605	20122	3549	10513	18641	38000
2013				5958	4418	10219	20595	3400	10179	19537	38000
2014				8705	4735	10382	23821	3822	10348	22862	27000
2015				7120	5959	11395	24475	5134	11362	23606	27000
2016											
2017											
2018											
2019											
2020											
2021											
2022											
2023											
2024											
2025											
2026											
2027											

Survival and Initial Population Estimates

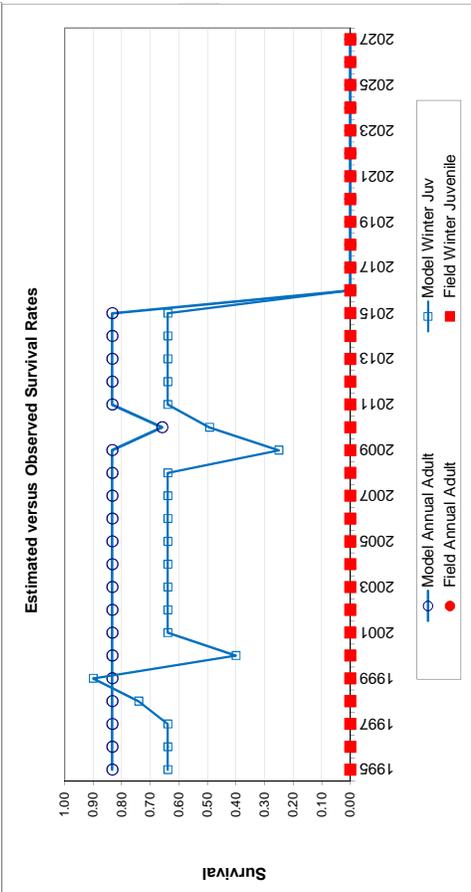
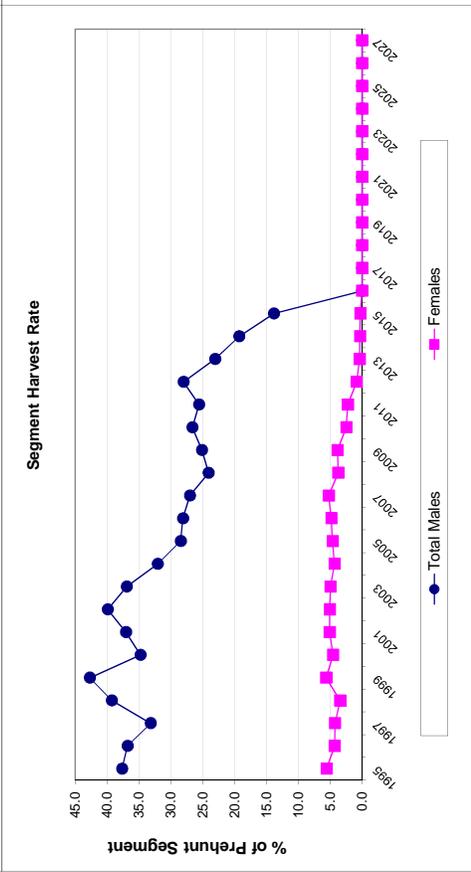
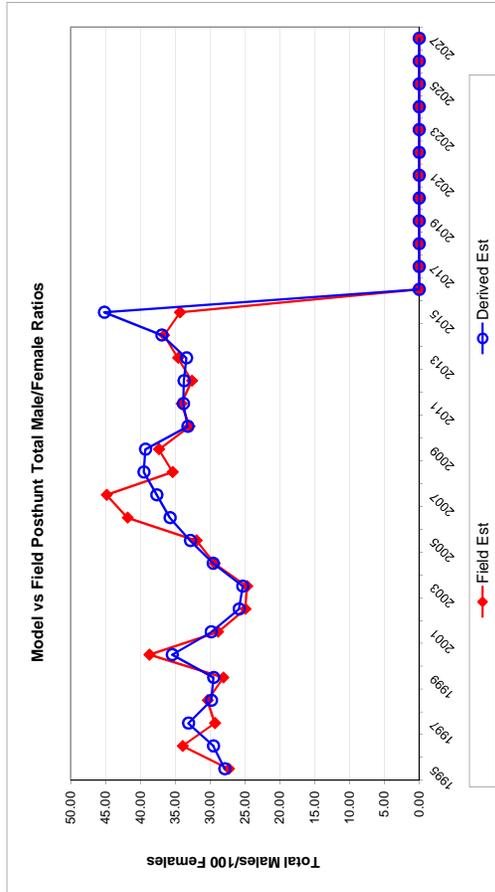
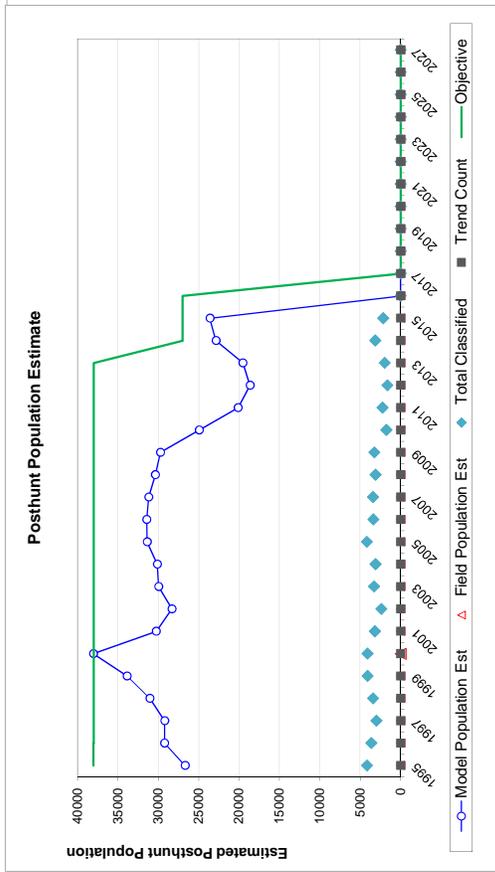
Year	Annual Juvenile Survival Rates		Annual Adult Survival Rates	
	Model Est	Field Est SE	Model Est	Field Est SE
1995	0.64		0.83	
1996	0.64		0.83	
1997	0.64		0.83	
1998	0.74		0.83	
1999	0.90		0.83	
2000	0.40		0.83	
2001	0.64		0.83	
2002	0.64		0.83	
2003	0.64		0.83	
2004	0.64		0.83	
2005	0.64		0.83	
2006	0.64		0.83	
2007	0.64		0.83	
2008	0.64		0.83	
2009	0.25		0.83	
2010	0.49		0.66	
2011	0.64		0.83	
2012	0.64		0.83	
2013	0.64		0.83	
2014	0.64		0.83	
2015	0.64		0.83	
2016				
2017				
2018				
2019				
2020				
2021				
2022				
2023				
2024				
2025				
2026				
2027				

Parameters:		Optim cells
Juvenile Survival =		0.639
Adult Survival =		0.833
Initial Total Male Pop/10,000 =		0.359
Initial Female Pop/10,000 =		1.288

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

Year	Classification Counts						Harvest						
	Juvenile/Female Ratio			Total Male/Female Ratio			Total 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	27.90	27.32	1.31	82	1973	693	2748	37.7	5.6	
1996		88.87	3.20	29.53	33.94	1.67	28	2092	547	2667	36.8	4.3	
1997		71.01	2.84	33.11	29.32	1.59	49	2139	579	2767	33.2	4.3	
1998		82.20	3.05	29.83	30.37	1.57	39	2569	476	3084	39.3	3.5	
1999		86.05	2.89	29.50	28.11	1.37	55	3145	854	4054	42.7	5.6	
2000		72.41	2.53	35.45	38.72	1.66	54	3144	794	3992	34.8	4.6	
2001		48.34	1.99	29.86	28.88	1.44	79	2713	828	3620	37.0	5.1	
2002		52.04	2.42	25.84	24.94	1.52	60	2484	773	3317	39.9	5.1	
2003		72.90	2.75	25.33	24.70	1.36	75	2039	718	2832	36.9	5.0	
2004		65.91	2.62	29.57	29.38	1.54	50	1956	635	2641	32.1	4.3	
2005		71.78	2.45	32.85	31.96	1.43	94	1821	677	2592	28.5	4.6	
2006		67.04	2.63	35.76	41.85	1.91	31	1970	715	2716	28.1	4.8	
2007		65.12	2.57	37.66	44.86	1.99	43	1949	773	2765	27.0	5.2	
2008		57.57	2.37	39.52	35.39	1.72	36	1758	545	2339	24.1	3.7	
2009		58.09	2.35	39.28	37.35	1.75	44	1807	548	2399	25.1	3.8	
2010		54.17	2.97	33.21	32.95	2.15	43	1459	307	1809	26.6	2.5	
2011		61.56	2.93	33.85	34.11	1.99	33	1090	214	1337	25.6	2.2	
2012		43.56	2.59	33.76	32.62	2.15	7	1255	84	1346	28.0	0.9	
2013		58.53	3.00	33.40	34.59	2.12	0	926	86	962	23.1	0.4	
2014		84.01	3.29	36.93	36.61	1.87	11	830	31	872	19.3	0.3	
2015		62.57	3.04	45.19	34.34	2.05	10	750	30	790	13.8	0.3	
2016													
2017													
2018													
2019													
2020													
2021													
2022													
2023													
2024													
2025													
2026													
2027													

FIGURES



Comments:

END



WYOMING GAME AND FISH DEPARTMENT

5400 Bishop Blvd. Cheyenne, WY 82006

Phone: (307) 777-4600 Fax: (307) 777-4699

wgfd.wyo.gov

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May 29, 2014

MEMORANDUM

TO: Scott Smith, Assistant Chief - Wildlife Division

FROM: Justin Binfet and Joe Sandrini

COPY TO: Jahnke, Peckham, Hibbs, file

SUBJECT: Proposed Objective Change Summary: Cheyenne River Mule Deer

The management objective for the Cheyenne River Mule Deer (MD740) herd has been reviewed by both the Sheridan and Casper Regions. This Herd Unit was created in 2009 by combining the Thunder Basin (MD752) and Lance Creek herds (MD753), and it is comprised of Hunt Areas 7 through 14, and 21. These Hunt Areas also encapsulate Non-Resident Deer Region B. The postseason population objective is currently 38,000 (a combination of the population objectives of its parent herds), and it managed for recreational hunting. We are proposing to change the post-season population objective to 27,000 and manage the herd under the Department's "Private Land Management" framework. These changes would also precipitate a proposal to shift to limited quota license issuance in Hunt Area 10 during the 2015 hunting season.

Following internal review and development of the proposed changes, a broad based public information dissemination and comment gathering effort was completed. This effort included:

- Letters mailed to approximately 275 landowners in the herd unit who had submitted deer license landowner coupons in recent years (copy attached).
- Letters soliciting comments on our proposals were mailed to the BLM's Newcastle Field Office; USFS – Thunder Basin National Grasslands; Inyan Kara Grazing Association; and the Thunder Basin Grassland Prairie Ecosystem Association.
- About 35 personal contacts were made with affected landowners, a summary table of these contacts is attached.
- A press release detailing proposed changes, the reasons for the changes and information on public meetings was disseminated to media outlets in northeast Wyoming, including Gillette, Wright, Douglas, Lusk, Newcastle and Sundance. (copy attached)
- Four public meetings presenting the proposals and soliciting public comment were hosted. Meetings were held in Newcastle, Lusk, Douglas, and Wright. A copy of the presentation given along with attendance and comment sheets are attached.

Having completed our herd unit review and considering the public comments received, we offer the following proposal for Commission approval:

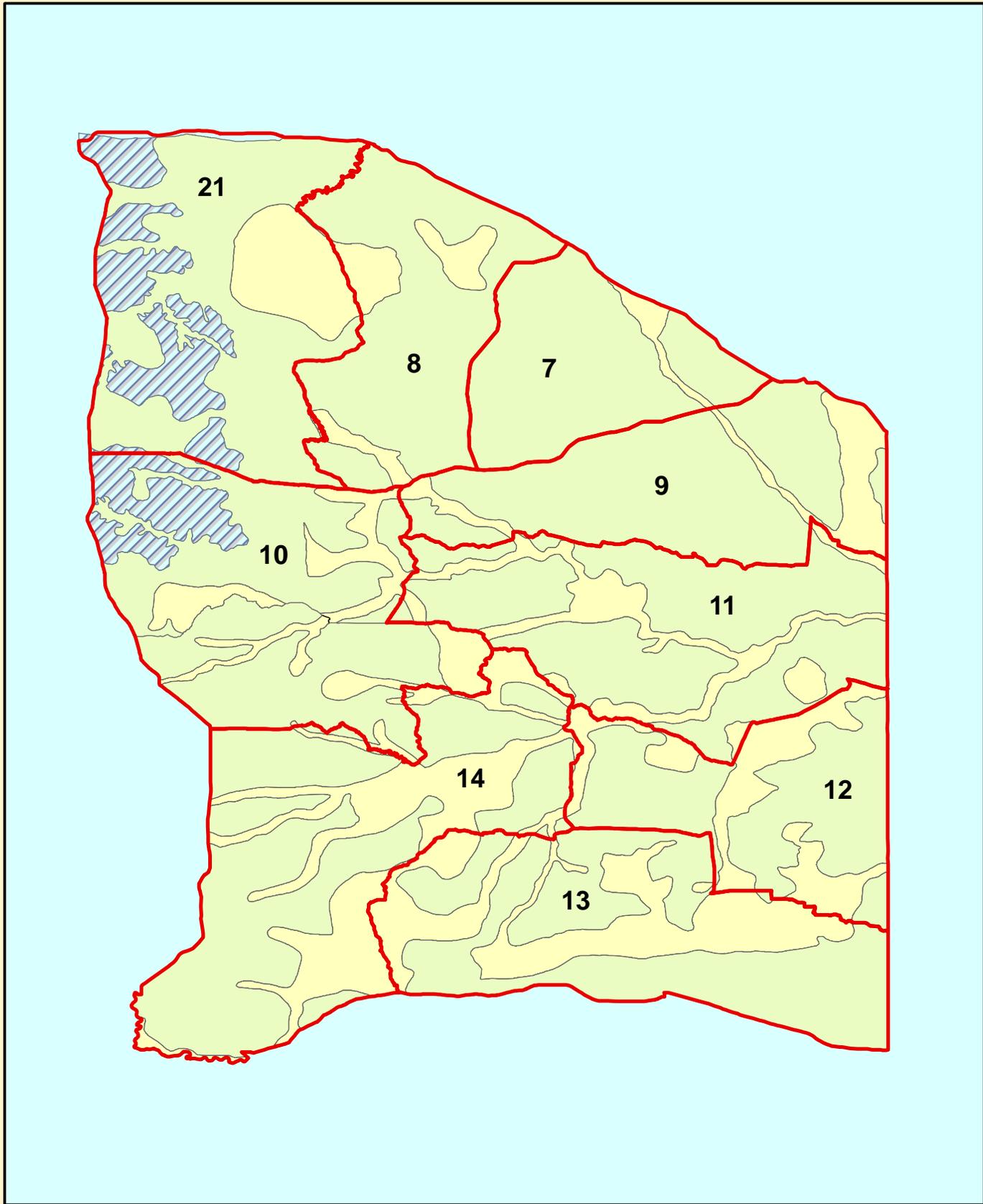
Justification:

- This herd unit approximates in size and location the Cheyenne River Pronghorn herd unit, which also has a current population objective of 38,000. It seems incongruent to have a mule deer objective identical to that of a sympatric pronghorn herd objective (which nearly covers the same land mass) given the habitat composition and much higher number of pronghorn here.
- The spreadsheet model for MD740 produces an average, post-season population of approximately 28,000 mule deer since 1995 (std. dev ~ 5,950). The highest estimated population was in 2000 at ~ 41,000, and the lowest in 2012 (~ 17,400). The 2013 postseason estimate was ~18,200.
- Excluding the 2000 population estimate, the population has averaged ~27,200 (std. dev ~ 5,175) since 1995. Since 2001, this population has averaged 25,200 individuals post-season.
- Given fluctuations in weather conditions and ongoing habitat loss to various forms of development, it is likely this herd cannot support more than 27,000 individuals for any significant period of time.
- Habitat monitoring in mule deer wintering areas revealed over-browsing when the population model suggested this population was higher than about 28,000 – 30,000 individuals.
- In years when the population was above 27,000 recruitment appeared to be extremely sensitive to weather conditions. In recent years, low recruitment has occurred in both dry and wet years, even with improved shrub conditions. This suggests factors other than habitat and weather may now be influencing recruitment in this herd.
- An objective of 27,000 seems appropriate given long-term trends in this population, habitat conditions and reduced recruitment and survival in recent years.
- Across the board, landowners and hunters have expressed significant dissatisfaction with deer numbers and harvest opportunity since the 2010 hunting season, a year when the post-season population estimate dropped from 27,000 to 20,000.
- The proposed objective of 27,000 mule deer post season represents a 49% increase over the current post-season population estimate.
- The private land management strategy is appropriate for this area given the vast majority of occupied habitat is privately owned. Furthermore, there has been a substantial decline in hunter access to private lands given the decline of this population. In recent years, an increasing percentage of Region B license holders have been relegated to small parcels of public land or Thunder Basin National Grasslands in Area 10 where mule deer densities are extremely low.
- The majority of occupied habitat in this herd unit is privately owned (approximately 75%). As a result, postseason buck ratios typically exceed recreational management maximums despite this population declining substantially over the last 10+ years. This stems from the fact that landowners reduce hunting access in lieu of population decline despite the proportion of bucks in the population. Neither season length nor Region B

quotas are now able to influence buck ratios as private land access has been significantly curtailed in recent years.

Public Input / Response:

- Three landowners telephoned local personnel after receiving their notification letter. None were opposed to the proposed changes. Rather, concern was expressed about addressing predation on mule deer and provision for doe/fawn seasons in the event damage becomes an issue in the future. Department personnel indicated agreement with their concerns and offered tangible responses in the form of support for ADMB projects in the area and issuance of area specific doe/fawn tags to address damage.
- While not submitting formal comments, representatives from both the Inyan Kara Grazing Association and Newcastle BLM voiced support for all the proposed changes to Newcastle wildlife biologist, Joe Sandrini.



Legend

- Hunt_Areas
- OUT
- YLG
- WYL

MD 740



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

2014 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2014 - 5/31/2015

HERD: MD751 - BLACK HILLS

HUNT AREAS: 1-6

PREPARED BY: JOE SANDRINI

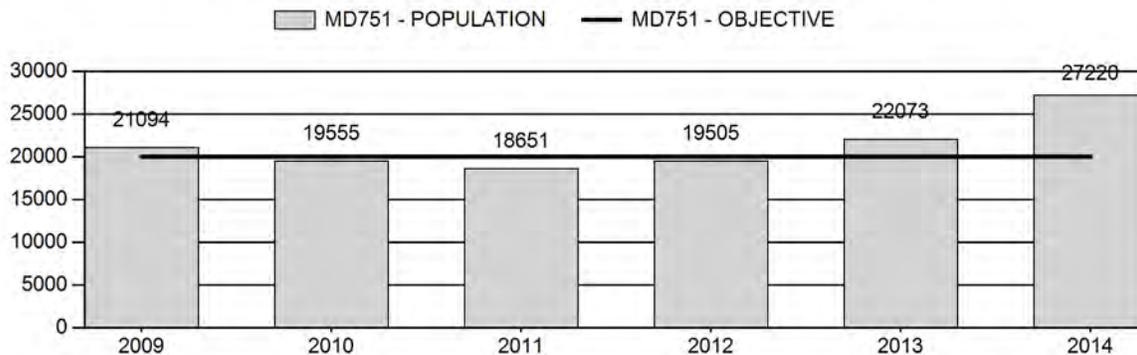
	<u>2009 - 2013 Average</u>	<u>2014</u>	<u>2015 Proposed</u>
Population:	20,176	27,220	29,361
Harvest:	1,786	1,864	2,490
Hunters:	4,445	3,828	5,010
Hunter Success:	40%	49%	50 %
Active Licenses:	4,610	3,867	5,200
Active License Success:	39%	48%	48 %
Recreation Days:	13,709	13,370	17,700
Days Per Animal:	7.7	7.2	7.1
Males per 100 Females	18	24	
Juveniles per 100 Females	70	96	

Population Objective (± 20%) :	20000 (16000 - 24000)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	36%
Number of years population has been + or - objective in recent trend:	2
Model Date:	02/20/2015

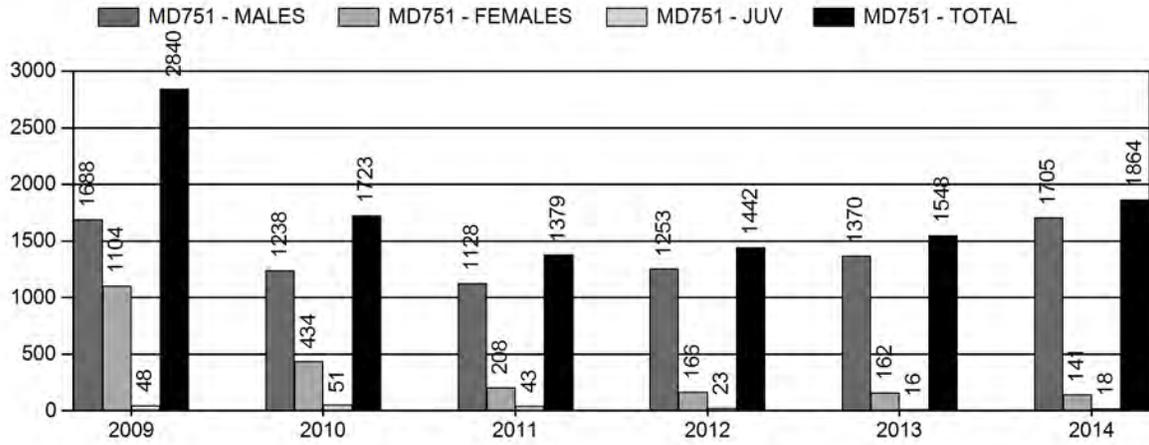
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	1.2%	2.1%
Males ≥ 1 year old:	39.6%	38.5%
Juveniles (< 1 year old):	0.2%	0.4%
Total:	7.0%	8.5%
Proposed change in post-season population:	+23.6%	+7.9%

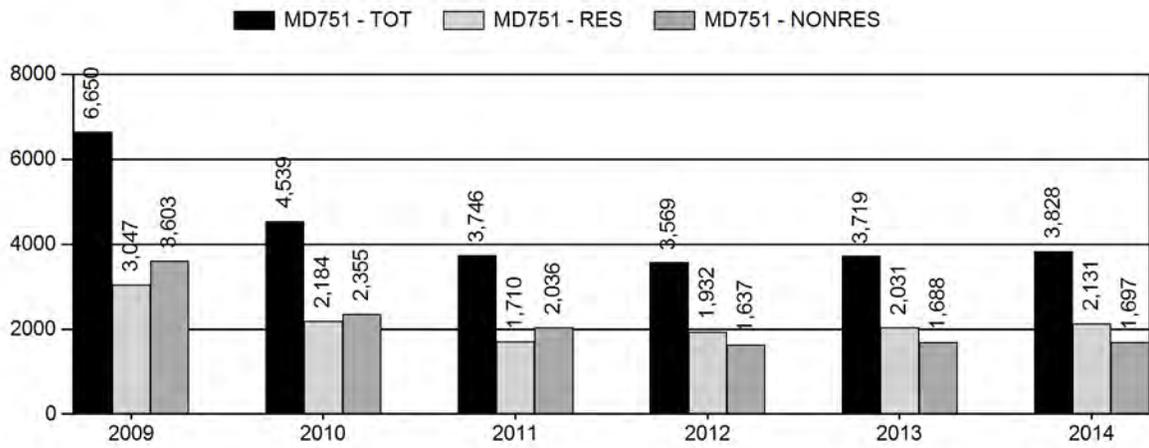
Population Size - Postseason



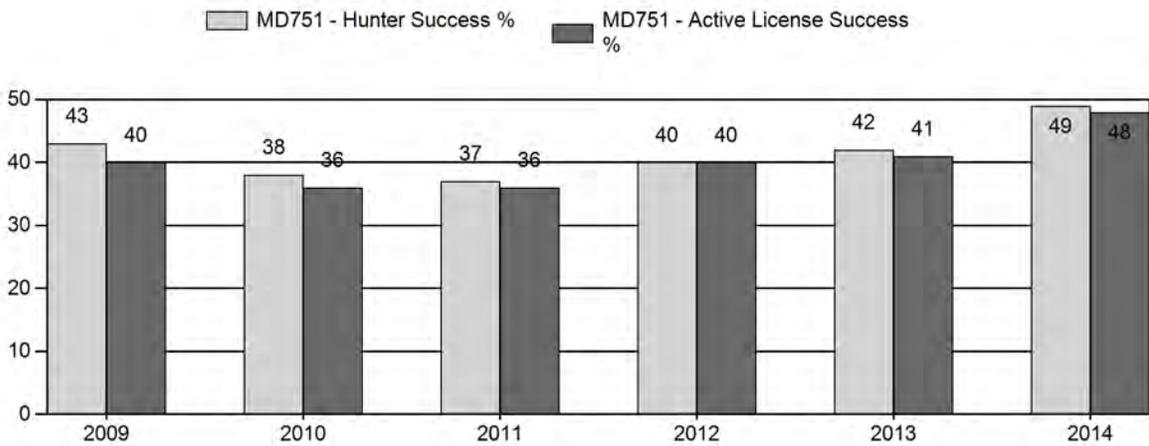
Harvest



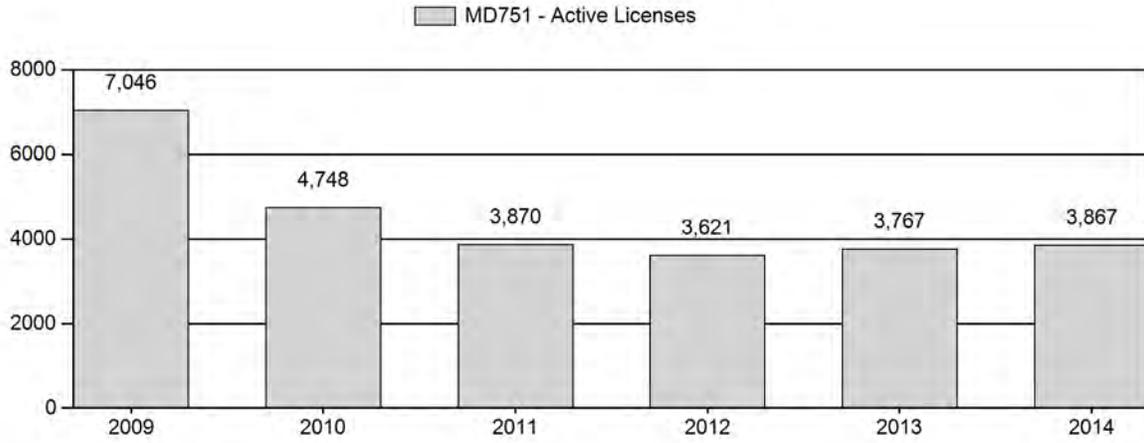
Number of Hunters



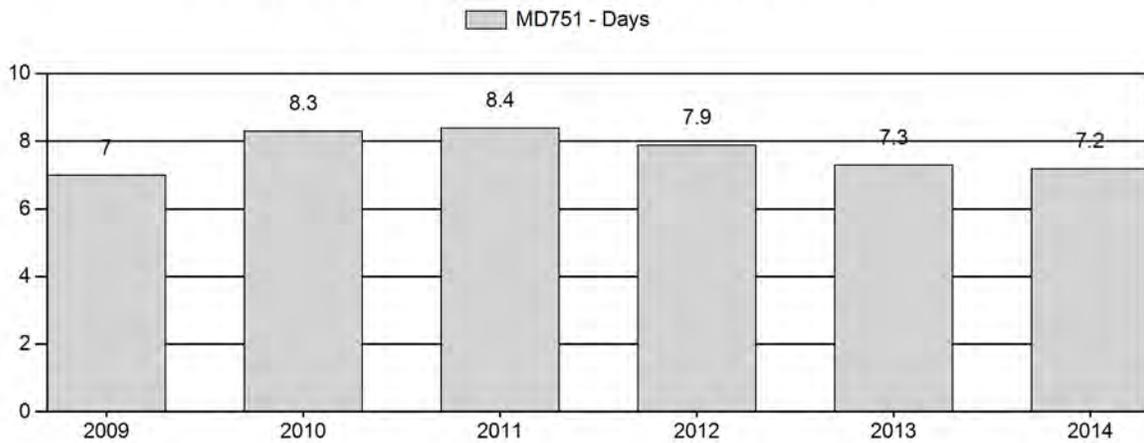
Harvest Success



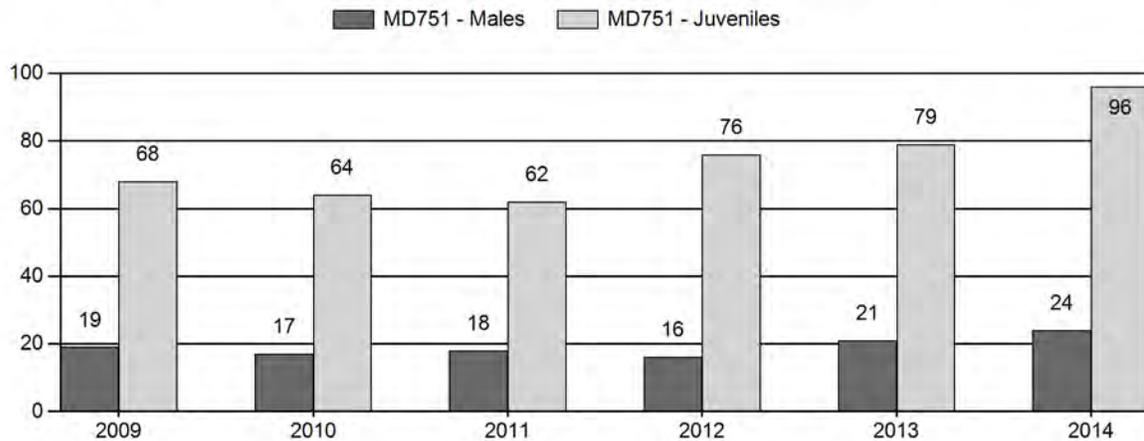
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 Postseason Classification Summary

for Mule Deer Herd MD751 - BLACK HILLS

Year	Post Pop	MALES								FEMALES		JUVENILES		Males to 100 Females				Young to			
		Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Tot Cls	Clb Obj	YIng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	21,094	48	0	0	0	52	100	10%	522	53%	357	36%	979	1,317	9	10	19	± 3	68	± 6	57
2010	19,555	44	0	0	0	71	115	10%	659	55%	421	35%	1,195	1,174	7	11	17	± 2	64	± 5	54
2011	18,651	41	0	0	0	76	117	10%	658	56%	406	34%	1,181	1,118	6	12	18	± 2	62	± 5	52
2012	19,505	58	0	0	0	70	128	8%	787	52%	596	39%	1,511	1,553	7	9	16	± 2	76	± 5	65
2013	22,073	71	0	0	0	62	133	11%	634	50%	499	39%	1,266	1,714	11	10	21	± 2	79	± 6	65
2014	27,220	98	0	0	0	113	211	11%	880	45%	847	44%	1,938	2,475	11	13	24	± 2	96	± 6	78

**2015 HUNTING SEASONS
BLACK HILLS MULE DEER HERD (MD751)**

Hunt Area	Type	Dates of Seasons		Quota	License	Limitations
		Opens	Closes			
1		Nov. 1	Nov. 20		General	Antlered mule deer off private land; any mule deer on private land
2		Nov. 1	Nov. 30		General	Antlered deer off private land; any deer on private land
2	6	Nov. 1	Nov. 30	250	Limited quota	Doe or fawn valid on private land
3		Nov. 1	Nov. 30		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	200	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	50	Limited quota	Doe or fawn
6		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Region A Nonresident Quota: 3,500

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	License Type	Quota change from 2014
2	6	+200
4	6	+50
5	6	+25
6	6	-10
Herd Unit Totals	6	+265
	Region A	+750

Management Evaluation

Current Postseason Population Management Objective¹: 20,000

Management Strategy: Recreational

2014 Postseason Population Estimate: ~ 27,200

2015 Proposed Postseason Population Estimate: ~ 29,400

2014 Hunter Satisfaction: 75% Satisfied, 15% Neutral, 10% Dissatisfied

HERD UNIT ISSUES: The management objective of the Black Hills Mule Deer Herd Unit was set in 1986 for an estimated post-season population of 20,000 mule deer. The herd is managed under the recreational management strategy. It is apparent the current objective is not commensurate with newer population estimates relative to landowner and hunter desires. Thus, the management objective and strategy are currently under review, and a proposed new objective of 30,000 will be taken out for public comment during the spring of 2015.

The Black Hills mule deer herd unit encompasses 3,181 mi² of occupied habitat. Approximately 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 access fees for hunting, these parcels of public land receive much greater hunting pressure than private lands; and are some of the most heavily hunted in the State.

Historically, management of this herd has been a derivative of managing the Black Hills White-Tailed Deer Herd, as 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.

White-tailed deer are the more 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. The vast majority of mule deer in the herd unit reside on private land. This results in their management being strongly influenced by landowner sentiments. Field personnel report mule deer numbers are improving and nearing tolerance levels in some locations; but many landowners, especially those south of I-90, desire to see more mule deer. A survey of about 450 Black Hills landowners at the end of 2014 revealed a bit more than half of the respondents (54%) who have mule deer on their property believed their numbers to be "about right;" while 42% reported numbers to be "too low;" and only 4% felt mule deer numbers were "too high." Over the past four years, many landowners and the hunting public have expressed the strong desire to see more mule deer, something that is now beginning to be addressed as this population has begun to rebound.

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

¹ Currently under review and slated for revision.

each year was at or above 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 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. No large scale die-offs of mule deer were witnessed after this storm, but a few mule deer mortalities on the National Forest south of I-90 were discovered. The remainder of the fall and the 2013-14 winter brought very close to average temperatures and snow fall, which resulted in continuous snow cover over much of the Black Hills until late May, and elevated spring run-off. Spring weather was similar to the previous year with temperatures just below normal and about 20% more precipitation than average. This was followed by a summer with close to average temperatures and precipitation about 25% above normal, resulting in a second year of excellent forage production and ultimately fawn production. To date, the 2014-15 winter has been generally mild with below normal amounts of snowfall in most locations.

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 weather, have increased winter stress on mule deer compared to the previous decade, as did the drought of 2012. This weather pattern 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. With favorable weather conditions the past two years, this herd has begun to respond with increased productivity and survival.

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. Important shrubs include big sagebrush and silver sage (*Artemisia spp.*), Saskatoon serviceberry (*Amelanchier alnifolia*), Oregon grape (*Berberis repens*), common chokecherry (*Prunus virginiana*), wild 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, no significant quantification of mule deer habitat quality or quantity are being conducted within this herd unit. 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 transitional and 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 negatively affected shrub production, and peak mule deer numbers several years ago may have exceeded what the forage conditions could sustain given the lack of precipitation at the time. The past two years have seen excellent forage production, and browse on winter and transitional ranges has appeared to be in generally good to excellent condition.

FIELD DATA: Between 2009 and 2011 observed fawn:doe ratios were consistently low, exhibiting a mean of 65:100. From 2012 through 2014, observed post-season fawn:doe ratios rebounded, exhibiting increasing values of 76:100, 79:100, and 96:100 each year, respectively. This herd's population now appears to be beginning to increase significantly. Because a post-season ratio of 66 fawns per 100 does is thought to be the level necessary to sustain hunted mule deer populations, 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 summer between 2008 and 2013 increased annual mortality of all age classes. During the 2007 - 2010 period, evidence suggests the mountain lion population in the Black Hills also reached historically high levels. As a result of harvest pressure, weather conditions, disease, and increased predation the estimated post-season population² fell 54% between 2006 and 2011. This same period witnessed a similar decline in the estimated pre-season population, while pre-season trend counts dropped 75% (Figure 1). With better fawn production and survival since 2012, the declining trend has been reversed.

As this population declined after 2006, buck:doe ratios dropped, averaging 17:100 from 2008 through 2012. With better fawn production in 2012 and 2013, yearling buck numbers increased as did the total observed buck:doe ratio, moving up to 21:100 and 24:100 in 2013 & 2014, respectively. Over the past five years, post-season buck:doe ratios in this herd have averaged 19:100 (std. dev.= 3.1). As such, this herd generally exhibits buck:doe ratios at the very bottom end, or below, the Department's management criteria for recreational hunting. Provided non-hunting mortality remains near what it has been the past year or two, we anticipate the buck:doe ratio to stay closer 24:100 over the next couple of years, which is closer to the long-term mean.

² Based on revised model of 02/20/2015

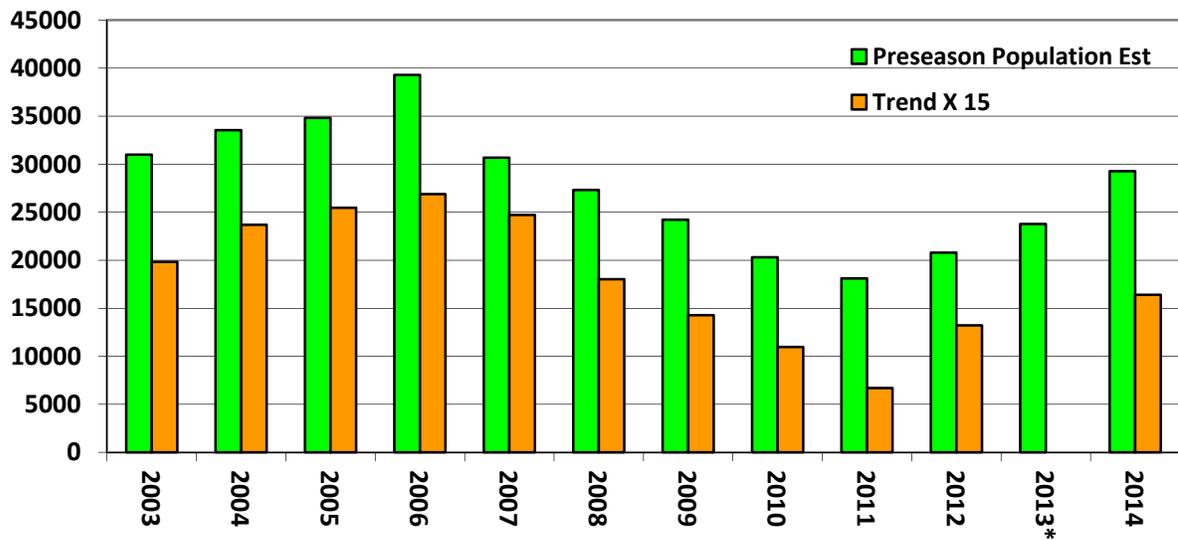


Figure 1. 2003 – 2014 pre-season population estimates produced by TSJ CA model, and mule deer observed pre-season along trend count routes (increased by a factor of 15). * Trend counts were not conducted in 2013 due to winter storm Atlas.

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 between 2007 and 2011, it was prudent to limit harvest of buck mule deer through last year. We are now at a point following 3-years of good fawn production and survival, especially in 2014, that harvest of mule deer can be liberalized, at least north of I-90.

With more conservative hunting season structures in place between 2010 and 2014, mule deer harvest dropped about 40% from the level experienced when this population peaked, although reported harvest did bump up substantially in 2014³ along with hunter success. However, hunter success has declined between 2009 & 2011 before trending upwards beginning in 2012; while hunter effort followed a reverse trend. Hunting seasons the past five years reduced harvest of mule deer bucks about 37% from that experienced during the immediately preceding 5-year period with the traditional 30-day November season north of I-90. Comparing these same time periods, resident harvest of mule deer bucks dropped a bit more than 20%, while non-resident harvest of mule deer bucks dropped closer to 50%. During this time frame, harvest of white-

³ 2014 harvest survey statistics indicate mule deer buck harvest increased about 36% in 2014, something that appears somewhat incongruent with season structure, population trends and field observations.

tailed deer bucks declined less (see WD706). As a result, post-season mule deer buck:doe ratios held fairly stable and then began to improve and deer hunter satisfaction essentially remained unchanged between 2011 and 2013, with about 68% of hunters of both deer species reporting they were either satisfied or very satisfied with their Black Hills deer hunt; and only around 15% indicating they were either dissatisfied or very dissatisfied – regardless of species. Notably, satisfaction measures improved in 2014 with 75% of both mule deer and white-tailed deer hunters reporting they were satisfied with their Black Hills deer hunt, and only 10% reporting negative satisfaction – again regardless of species. It can be inferred from the inherent correlation between harvest success and hunter satisfaction that increases in deer hunter success from 2013 to 2014 influenced reported increases in hunter satisfaction.

POPULATION: Population modeling of this herd has always been difficult. The population violates the closed population assumption due to significant interstate movement of deer combined with interchange between adjacent mule deer herds in Wyoming. In addition, changes in doe harvest rates, outbreaks of EHDV, increased predation, a high level of vehicle-deer collisions, occasional severe weather events, and inadequate classification sample sizes at times make constructing a reliable population model questionable at best. In 2014, the spreadsheet model for this herd was reconstructed and re-initiated after correcting errors detected in the previous model. The present model was set to solve only on years for which field data were available (1993-2014), but used to project the 2015 population. The corrected and revised model produced a higher estimated peak population in 2006 and lower population nadir in 2011 compared to the previously used model. It also indicates a more rapidly growing population the past two years as fawn production and survival have increased.

The 2014 estimated, post-season population⁴ of Black Hills mule deer is about 27,200, a value we believe to be artificially high due to significantly increased reported harvest in 2014 without commensurate changes in season structure or perceived population size. This population is projected to have peaked in 2006 at an estimated postseason population of around 36,000 mule deer, and then declined to near 16,500 in 2011. It is then estimated to have begun to rebound, growing almost 65% into post-season 2014. Because the models we use to simulate populations produce their most unreliable estimates in the first and last few years of model construction, we question whether this population has grown as much as indicated over the past three years. This is because 2012 and 2014 trend counts were about 20% to 30% below those found in years contained in the middle of the model at a time when this population is projected to have been at a similar level. At any rate, this herd has begun to rebound after a substantial decline, and while its growth may now need to be tempered in some locations, many landowners and hunters still desire more mule deer on the ground. The last sizeable population decline this herd experienced was in the mid 1990's. That drop was quickly reversed in 1998 and 1999 when very conservative hunting seasons aligned with excellent fawn survival and mild winters. The same scenario may now be unfolding in 2013 & 2014.

As mentioned above, population modeling of this herd is difficult. The Semi Constant Juvenile / Semi Constant Adult (SCJ SCA) model was chosen to estimate this population this year. While the TSJ CA model exhibited the lowest AICc (127) and best fit (12) of competing models, the AICc of the SJC SJA model was very close at 138, with estimates of the preseason population better correlated with trend counts since 1996. In fact, the preseason population estimates

⁴ 02/20/2015 model version.

produced by this model between 2003 and 2014 are 95% correlated with preseason trend counts over the same period;⁵ and the relative changes projected in the population more in line anecdotal observations of field personnel and landowners. However, this model reaches upper constraints on adult survival (0.9) in all years not allowed to vary independently, something that is unlikely. The TSJ CA model on the other hand, produces a nearly equivalent adult survival rate of 0.877, but very high juvenile survival rates during many of the first years modeled and low juvenile survival rates most years after. Overall, we consider the model for this herd 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 4 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 exceeded our current management objective of 20,000 mule deer. If the herd actually now numbers closer to 27,000, then our current objective is well below most landowner's and hunter wishes. As reported above, many landowners have expressed dissatisfaction with the number of mule deer, especially south of I-90. Based upon habitat conditions, the desires of hunters and landowner sentiments, a season designed to increase this herd is warranted. However, given the increased productivity and survival witnessed the past couple of years, the growth potential of this herd must be tempered, at least north of I-90. Therefore, the 2015 hunting season is designed to allow increased buck hunting opportunity and begin to increase harvest of does in HA 2, while still fostering total herd growth.

Changes to the 2015 mule deer hunting season in the Black Hills included moving the closing date in HA 1 to November 20th from the 21st, while going to a November 30th closing date for whitetails in this same hunt area and both deer species hunt areas 2 and 3. This change was made to address desires expressed by some landowners and outfitters in hunt area 1 for a shorter deer hunting season, especially for mule deer. The Region A quota was increased from 2,750 to 3,500 to allow for more buck hunting opportunity as this herd approaches what will likely be its revised objective. Additionally, issuance of Type 6 doe/fawn licenses in HA 2, which are valid for both mule deer and white-tailed deer on private lands, have been increased from 50 to 250, while similar license types in HA 4 and HA 5 have been increased from 150 to 200 and 25 to 50, respectively to slow herd growth. The ten Type 6 licenses valid and HA 6 & 9 issued in 2014 have been eliminated as mule deer number here remain depressed.

Mule deer buck numbers are improving. Based upon classification data and population estimates, there should be good cohorts of 1, 2 and even some 3 year-old bucks available for hunters in 2015, but reduced numbers of 4 & 5 year-old bucks. As such, it seems sensible to liberalize buck harvest, something that attracts more hunters into the area, many of whom will harvest whitetail does – something we should encourage to slow the growth of the whitetail population. The increase in Region A license issuance and 30-day season north of Interstate 90 is projected to boost buck mule deer harvest about 30% above the more conservative hunting seasons the past several years. However, if reported mule deer harvest was actually as high as the 2014 harvest survey indicates, the liberalized season structure could increase take up to 60%. Despite this increase in buck harvest, buck:doe ratios should maintain or even slightly increase as this population grows.

⁵ Trend counts not conducted in 2013 due to winter storm Atlas.

Issuance of doe/fawn tags has been increased substantially in HA 2 to allow landowners there wishing to control mule deer numbers that opportunity. The past five hunting seasons have seen a consistent take of about 100 to 125 mule deer does and about 15 fawns on general licenses. It is anticipated doe/fawn harvest on General Licenses will also increase about 30% given the changes to the season structure. This relatively low level of female and juvenile mule deer harvest does not 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. Another 45 or so antlerless mule deer have been harvested each of the past three years on Type 6 licenses, and harvest on these license types is expected to increase another 70 or so with changes license issuance.

The 2015 hunting season is expected to yield a 2015 postseason population of about 29,400 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 45% above the current objective, but much closer the number most hunters and landowners would like to see, and near the value of what will likely be proposed as a revised objective.

INPUT	
Species:	Mule Deer
Biologist:	Joe Sandrini
Herd Unit & No.:	Black Hills MD751
Model date:	02/20/15

Clear form

MODELS SUMMARY			Relative AICc	Notes
	Fit	Check best model to create report		
C,J,CA	266	<input type="checkbox"/> C,J,CA Model	275	
SC,J,SCA	76	<input checked="" type="checkbox"/> SC,J,SCA	138	
TS,J,CA	12	<input type="checkbox"/> TS,J,CA Model	127	

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population			Predicted Posthunt Population			Objective		
	Field Est	Field SE		Juveniles	Total Males	Females	Juveniles	Total Males	Females			
1995				6283	3933	8360	18575	6220	1961	7783	15864	20000
1996			650	6603	3647	8888	19138	6582	1887	8644	17114	20000
1997			450	4145	2699	8781	15625	4110	1145	8440	13695	20000
1998			589	7646	2880	9445	19971	7613	1337	9217	18166	20000
1999			902	9391	4391	11483	25286	9378	2510	11280	23168	20000
2000			1052	8373	5098	12990	26461	8352	3099	12678	24129	20000
2001			615	7457	5317	13938	26713	7409	3137	13598	24144	20000
2002			961	9678	5066	14481	29225	9641	3055	14129	26825	20000
2003			1322	9691	5668	15634	30993	9617	3242	15065	27925	20000
2004			1579	11248	5829	16470	33546	11186	3079	15702	29967	20000
2005			1697	11149	6157	17518	34824	11080	3433	16640	31153	20000
2006			1792	14514	6444	18330	39287	14415	3877	17424	35717	20000
2007			1648	10161	5378	15140	30679	10094	2986	13891	26970	20000
2008			1202	9504	4136	13673	27313	9398	2052	12651	24102	20000
2009			952	7745	4012	12462	24219	7683	2155	11248	21095	20000
2010			731	6542	3134	10630	20306	6486	1772	10153	18411	20000
2011			446	5791	2785	9537	18113	5744	1544	9309	16596	20000
2012			881	7548	3128	10116	20793	7523	1750	9934	19206	20000
2013				8706	3852	11217	23776	8689	2345	11039	22073	20000
2014			1093	11964	4740	12565	29270	11945	2865	12410	27220	20000
2015				11121	6194	14784	32100	11077	3807	14476	29361	20000
2016												20000
2017												20000
2018												20000
2019												20000
2020												20000
2021												20000
2022												20000
2023												20000
2024												20000
2025												20000
2026												20000

Survival and Initial Population Estimates

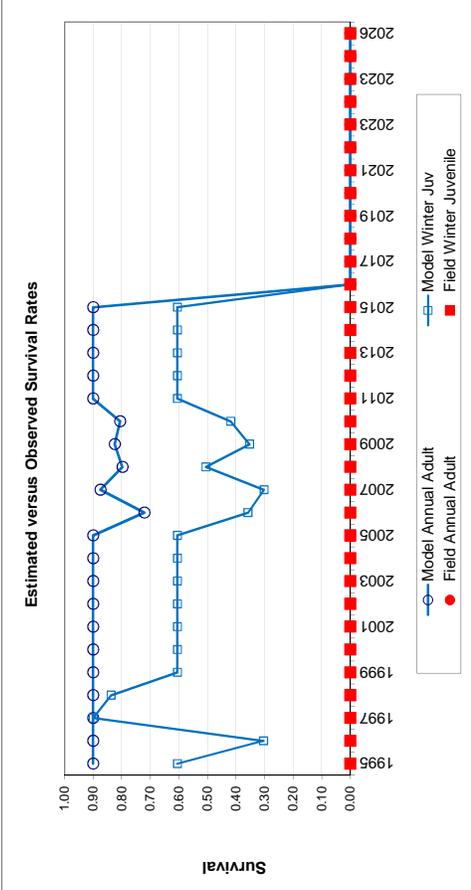
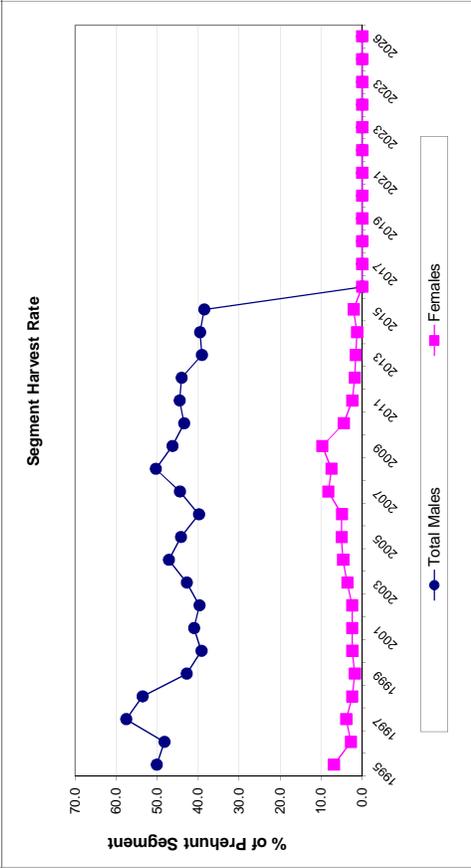
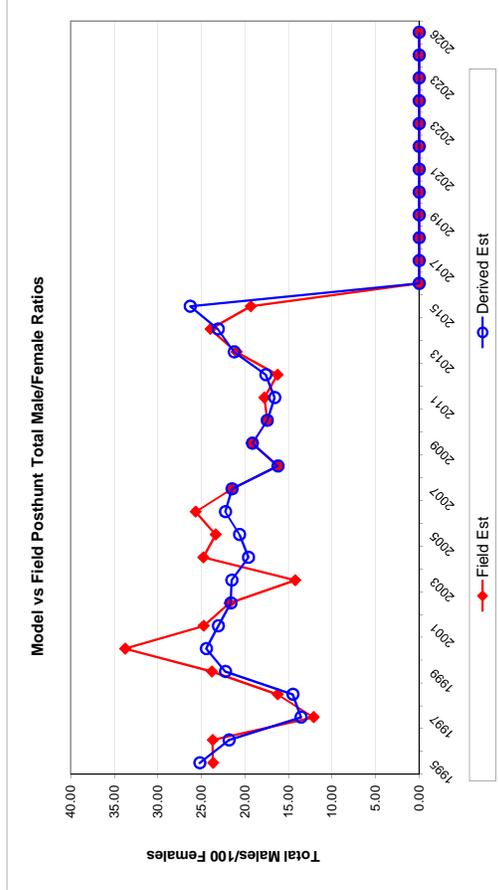
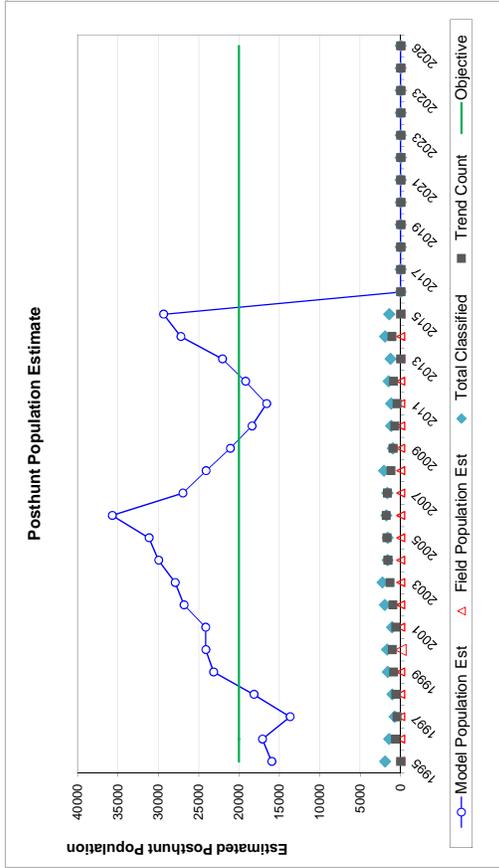
Year	Annual Juvenile Survival Rates		Annual Adult Survival Rates	
	Model Est	Field Est	Model Est	Field Est
1995	0.61		0.90	
1996	0.30		0.90	
1997	0.90		0.90	
1998	0.84		0.90	
1999	0.61		0.90	
2000	0.61		0.90	
2001	0.61		0.90	
2002	0.61		0.90	
2003	0.61		0.90	
2004	0.61		0.90	
2005	0.61		0.90	
2006	0.36		0.72	
2007	0.30		0.87	
2008	0.51		0.80	
2009	0.35		0.82	
2010	0.42		0.81	
2011	0.61		0.90	
2012	0.61		0.90	
2013	0.61		0.90	
2014	0.61		0.90	
2015	0.61		0.90	
2016				
2017				
2018				
2019				
2020				
2021				
2022				
2023				
2024				
2025				
2026				

Parameters:		Optim cells
Juvenile Survival =		0.605
Adult Survival =		0.900
Initial Total Male Pop/10,000 =		0.196
Initial Female Pop/10,000 =		0.778

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

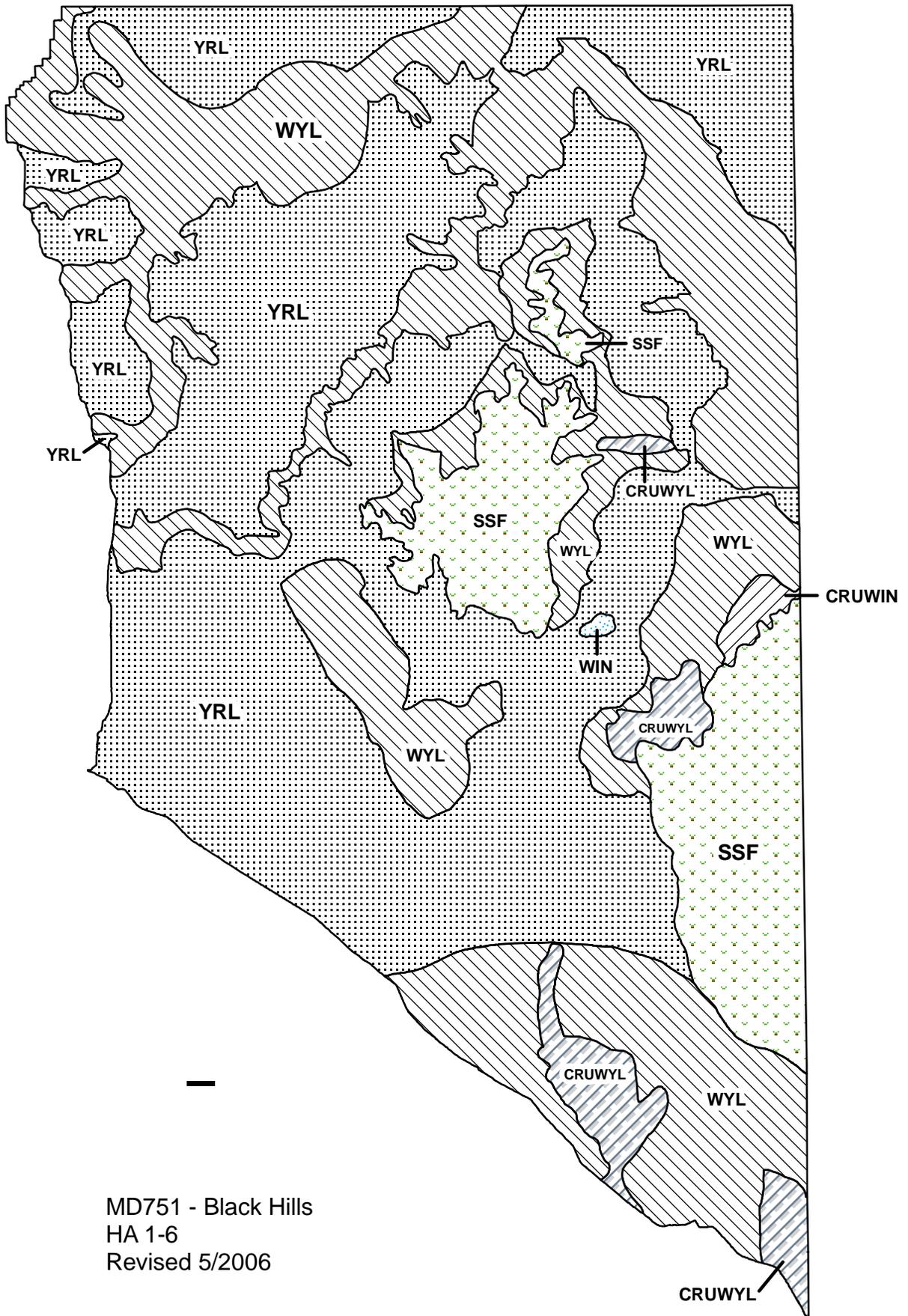
Year	Classification Counts						Harvest					
	Juvenile/Female Ratio			Total Male/Female Ratio			Total Harvest			Segment Harvest Rate (% of		
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1995		79.92	3.89	25.19	23.66	1.75	57	1793	524	2374	50.1	6.9
1996		76.14	4.31	21.83	23.72	2.02	19	1600	221	1840	48.3	2.7
1997		48.70	3.96	13.57	12.12	1.72	32	1413	310	1755	57.6	3.9
1998		82.60	5.37	14.50	16.25	1.90	30	1403	208	1641	53.6	2.4
1999		83.14	4.43	22.26	23.81	1.95	12	1710	185	1907	42.8	1.8
2000		65.88	3.60	24.45	33.77	2.31	19	1817	284	2120	39.2	2.4
2001		54.49	3.74	23.07	24.75	2.26	44	1982	309	2335	41.0	2.4
2002		68.23	3.32	21.62	21.79	1.60	34	1828	320	2182	39.7	2.4
2003		63.84	2.87	21.52	14.23	1.13	67	2205	517	2789	42.8	3.6
2004		71.24	3.83	19.61	24.79	1.93	56	2500	698	3254	47.2	4.7
2005		66.59	3.62	20.63	23.38	1.85	63	2476	798	3337	44.2	5.0
2006		82.73	4.20	22.25	25.67	1.94	90	2333	823	3246	39.8	4.9
2007		72.66	3.83	21.50	21.50	1.75	61	2175	1136	3372	44.5	8.3
2008		74.29	3.45	16.22	16.22	1.32	96	1884	929	2919	50.4	7.5
2009		68.39	4.70	19.16	19.16	2.09	48	1688	1104	2840	46.3	9.7
2010		63.88	3.99	17.45	17.45	1.76	51	1238	434	1723	43.5	4.5
2011		61.70	3.89	16.59	17.78	1.78	43	1128	208	1379	44.6	2.4
2012		75.73	4.11	17.62	16.26	1.55	23	1253	166	1442	44.1	1.8
2013		78.71	4.71	21.24	20.98	2.00	16	1370	162	1548	39.1	1.6
2014		96.25	4.63	23.08	23.98	1.84	18	1705	141	1864	39.6	1.2
2015		76.52	4.32	26.30	19.34	1.79	40	2170	280	2490	38.5	2.1
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												
2026												

FIGURES



Comments:

END



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

2014 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2014 - 5/31/2015

HERD: MD755 - NORTH CONVERSE

HUNT AREAS: 22

PREPARED BY: WILLOW HIBBS

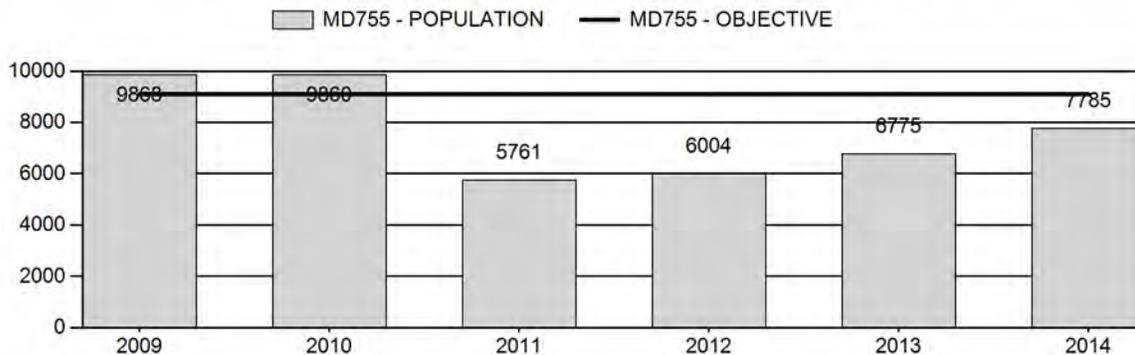
	<u>2009 - 2013 Average</u>	<u>2014</u>	<u>2015 Proposed</u>
Population:	7,654	7,785	7,949
Harvest:	628	254	210
Hunters:	774	359	260
Hunter Success:	81%	71%	81 %
Active Licenses:	823	359	260
Active License Success:	76%	71%	81 %
Recreation Days:	3,038	1,301	1,000
Days Per Animal:	4.8	5.1	4.8
Males per 100 Females	40	30	
Juveniles per 100 Females	66	92	

Population Objective (± 20%) :	9100 (7280 - 10920)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-14.5%
Number of years population has been + or - objective in recent trend:	13
Model Date:	02/19/2015

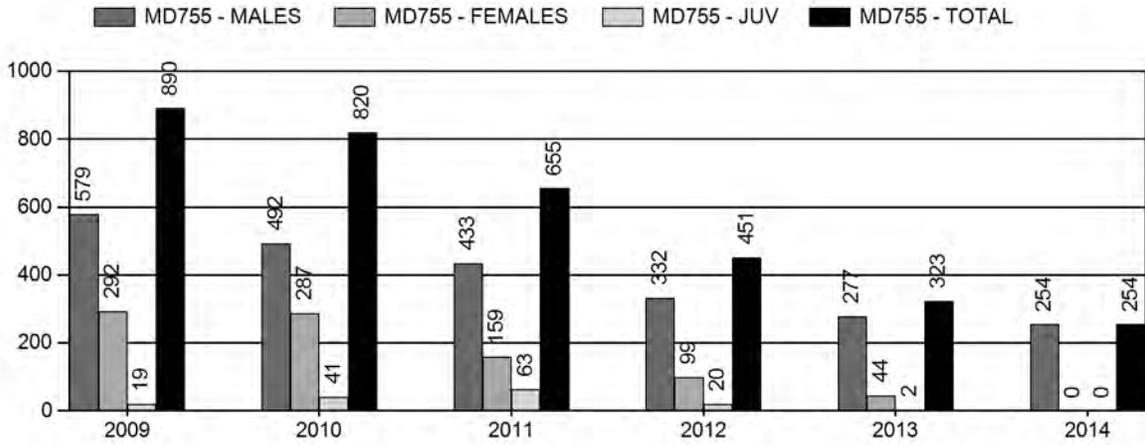
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0%	0%
Males ≥ 1 year old:	16.1%	11.1%
Juveniles (< 1 year old):	0%	0%
Total:	3.2%	2.6%
Proposed change in post-season population:	-3.5%	-2.8%

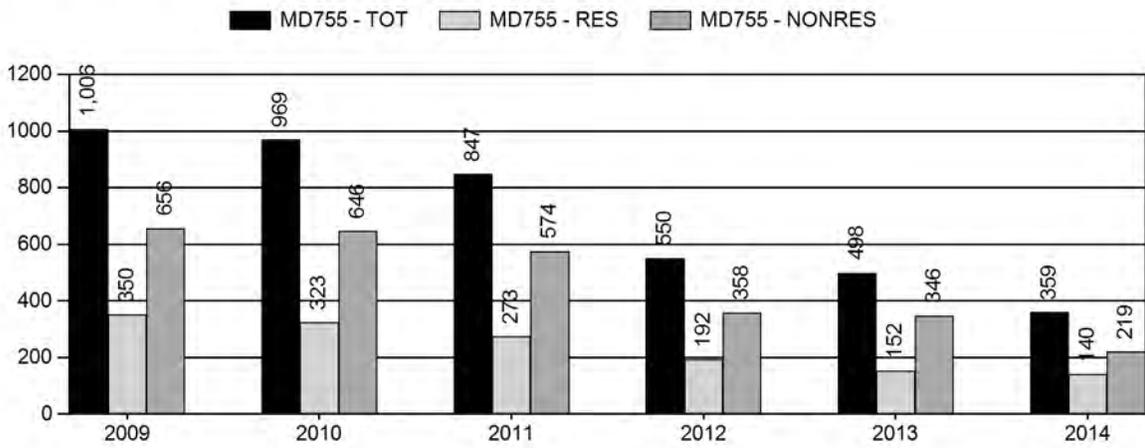
Population Size - Postseason



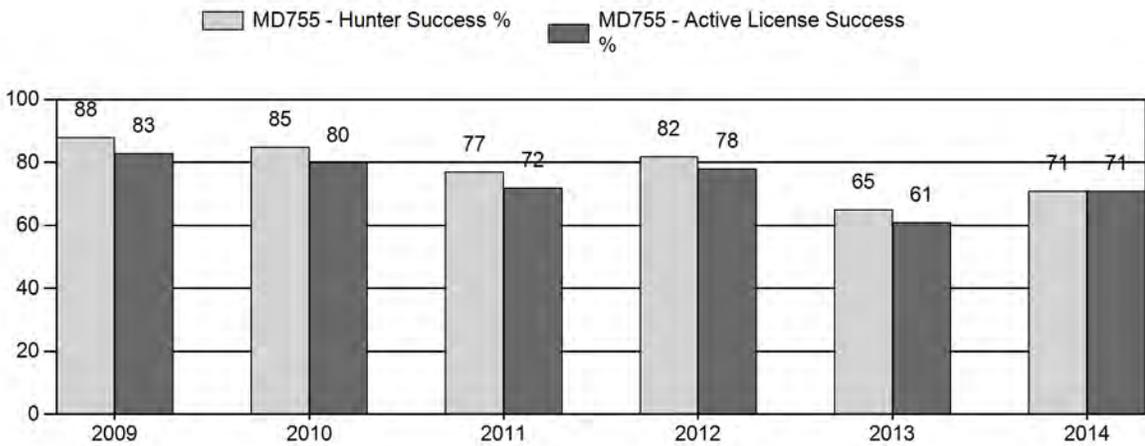
Harvest



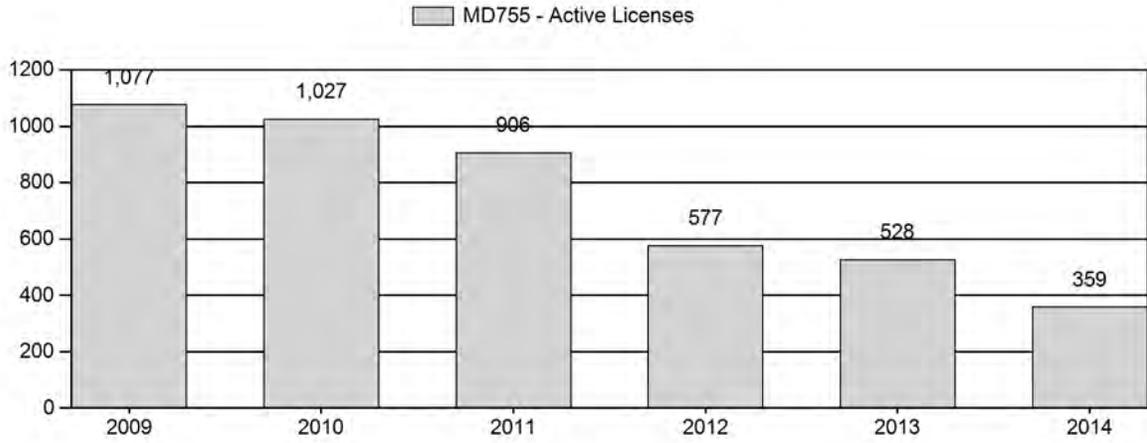
Number of Hunters



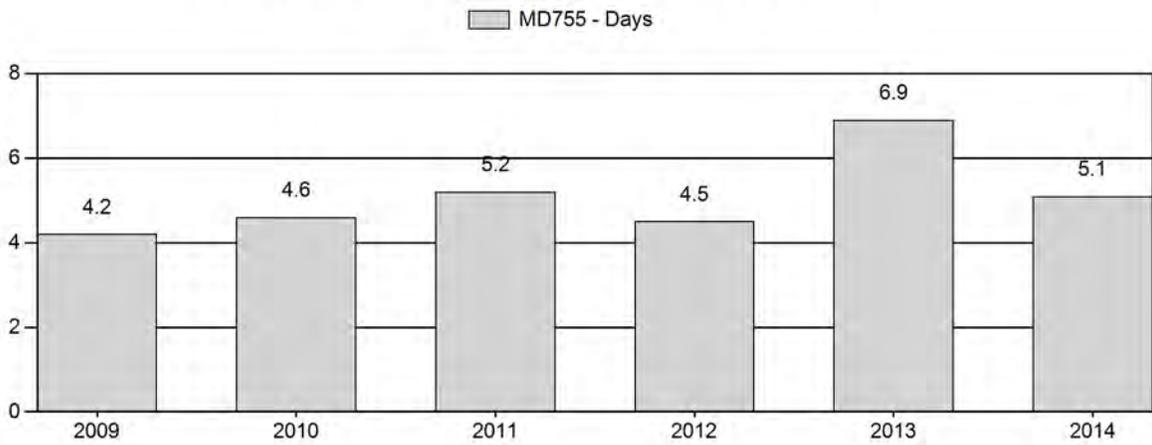
Harvest Success



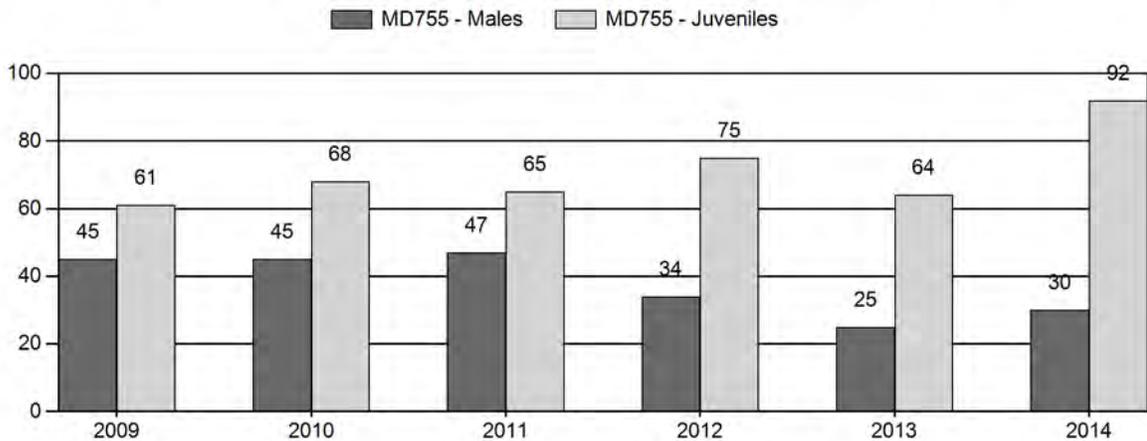
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 Postseason Classification Summary

for Mule Deer Herd MD755 - NORTH CONVERSE

Year	Post Pop	MALES								FEMALES		JUVENILES		Tot Cls	Cls Obj	Males to 100 Females				Young to		
		Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Yng			Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult	
2009	9,868	49	0	0	0	126	175	22%	393	49%	239	30%	807	1,351	12	32	45	± 5	61	± 6	42	
2010	9,860	39	0	0	0	119	158	21%	349	47%	237	32%	744	850	11	34	45	± 5	68	± 7	47	
2011	5,761	26	0	0	0	94	120	22%	257	47%	166	31%	543	1,276	10	37	47	± 6	65	± 8	44	
2012	6,004	23	0	0	0	44	67	16%	198	48%	149	36%	414	1,216	12	22	34	± 6	75	± 10	56	
2013	6,775	30	0	0	0	39	69	13%	275	53%	176	34%	520	1,095	11	14	25	± 4	64	± 8	51	
2014	7,785	23	26	14	3	0	66	14%	220	45%	202	41%	488	1,936	10	20	30	± 5	92	± 11	71	

**2015 HUNTING SEASONS
NORTH CONVERSE MULE DEER HERD (MD755)**

Hunt Area	Type	Dates of Seasons		Quota	License	Limitations
		Opens	Closes			
22	1	Oct. 1	Oct. 14	300	Limited quota	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 2014
22	1	-100

Management Evaluation

Current Postseason Population Management Objective: 9,100

Management Strategy: Special

2014 Postseason Population Estimate: ~7,800

2015 Proposed Postseason Population Estimate: ~7,900

2014 Hunter Satisfaction: 63% Satisfied, 20% Neutral, 17% Dissatisfied

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. 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 2014 produced above average precipitation, especially during the growing season. These conditions yielded high fawn production while providing for good body condition of mule deer going into winter. The 2014-2015 winter has been moderate to date with several sub-zero cold snaps and precipitation events occurring earlier in the season, and warmer conditions with mild precipitation realized later in the season. Following more substantial precipitation events earlier in the year, warm conditions often occurred in between cold snaps which served to melt out lowlands and expose forage for wintering mule deer. Therefore, winter survival was thought to be normal over the last bio-year.

Habitat

Although there are no habitat transects in this herd unit, habitat conditions were excellent throughout 2014 due to above average precipitation and good residual conditions from 2013. Given the extreme drought in 2012, additional 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. Given the relatively low density of mule deer and pronghorn currently in this herd unit, herbivory pressure should continue to be a relatively low impact, which should also assist in yielding desirable range conditions. However, shrub condition and in some portions of this herd unit is poor due to long-term drought, domestic sheep grazing, and multiple wildfires that have removed sagebrush cover resulting in long-term reductions in habitat quality.

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. In 2014, the adequate sample size was 1,946 animals, yet only 488 mule deer were classified despite intensive ground coverage.

Fawn production/survival dramatically improved in 2014, with a ratio of 92 fawns per 100 does being well above the 5-year average of 67. Several consecutive years of average to above average fawn production and survival will be needed to continue trending towards the population objective.

Postseason buck ratios increased slightly from 2013 (25), but remained relatively low in 2014 (30), which is at the lower end of special management criteria. Again, classification ratios should be viewed with caution as the sample size was ~75% below what was needed to ensure adequacy at a 90% confidence interval. Regardless, it appears postseason buck ratios have declined considerably in the past few years as they typically run in the mid 40s, a notion that has been corroborated by landowners and outfitters.

Harvest

Overall harvest has declined in this herd unit as license issuance has decreased to address population decline. The 2014 harvest of 254 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 2014 harvest of 254 was 55% lower than the long-term average. License success in 2014 (71%) improved from 2013 (61%) but is still lower than the previous 5-year average of 79%. In 2013, hunters experienced a dramatic increase in the number of days per animal (6.9), which is well over the preceding 5 year average of 4.7 days/animal. However, in 2014 the number of days to harvest an animal was reduced to 5.1, indicating buck availability may have been more commensurate with license issuance.

In 2014, 63% 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, or at least be aware of the limited availability of accessible public land.

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

Population

The 2014 postseason population estimate was about 7,800 mule deer. After population decline following substantial winter mortality in bio-year 2010, this herd is beginning to trend toward objective due to increased fawn production.

The “Constant Juvenile – Constant Adult Mortality Rate” (CJ-CA) spreadsheet model was chosen for the post-season population estimate of this herd. This model had a low relative AIC (90) and most accurately depicted population trend and size based on field personnel perceptions and landowner input. This model is considered to be of fair quality based on model fit and simulated population trend. Given consistently inadequate classification sample sizes, observed buck ratios may not be accurate, rendering population estimates simulated by the model somewhat questionable.

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 2015, the Department decreased the Type 1 quota by 100 licenses in order to address declining buck ratios.

If we attain the projected harvest of 210 individuals and experience normal fawn productivity, the predicted 2015 postseason population will likely increase slightly to 7,900 mule deer, which is 13% below objective.

INPUT	
Species:	Mule Deer
Biologist:	Willow Hibbs
Herd Unit & No.:	North Converse
Model date:	02/19/15

Clear form

MODELS SUMMARY			Relative AICc	Fit	Notes
CJ,CA	Constant Juvenile & Adult Survival	81	90	<input checked="" type="checkbox"/> CJ,CA Model	
SCJ,S CA	Semi-Constant Juvenile & Semi-Constant Adult Survival	75	84	<input type="checkbox"/> SCJ,S CA Mod	
TSJ,J,CA	Time-Specific Juvenile & Constant Adult Survival	7	133	<input type="checkbox"/> TSJ,J,CA Model	

Year	Posthunt Population Est. Field Est	Field SE	Trend Count	Predicted Prehunt Population		Predicted Posthunt Population		Total	Objective	
				Juveniles	Total Males	Juveniles	Total Males			Females
1993				2740	2758	2729	2147	4889	9766	9100
1994				3447	2519	3417	1873	4864	9866	9100
1995				3634	2457	3608	1886	4768	10046	9100
1996				4243	2515	4233	2025	4796	10841	9100
1997				3601	2790	3542	2191	4978	10475	9100
1998				4545	2759	4490	2130	4942	11343	9100
1999				4217	2945	4197	2262	5162	11354	9100
2000				3276	2984	3249	2283	5237	10509	9100
2001				2890	2765	2875	2141	5070	9867	9100
2002				2467	2550	2447	2005	4868	9073	9100
2003				2743	2327	2723	1803	4565	8882	9100
2004				2906	2223	2897	1670	4407	8732	9100
2005				3296	2152	3280	1613	4288	8912	9100
2006				2564	2200	2557	1582	4258	8119	9100
2007				3394	1992	3379	1436	4044	8655	9100
2008				2661	2073	2643	1494	4129	8026	9100
2009				2251	1939	2230	1302	3988	7198	9100
2010				2339	1671	2294	1130	3694	6802	9100
2011				2193	1540	2124	1064	3463	6476	9100
2012				2458	1441	2436	1076	3344	6748	9100
2013				2133	1529	2131	1224	3378	6684	9100
2014				3104	1580	3104	1301	3381	7785	9100
2015				2624	1888	2624	1657	3668	7949	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

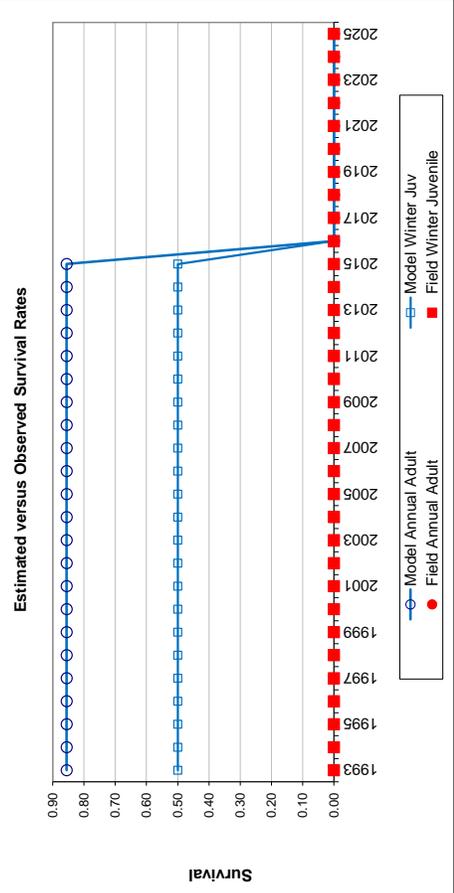
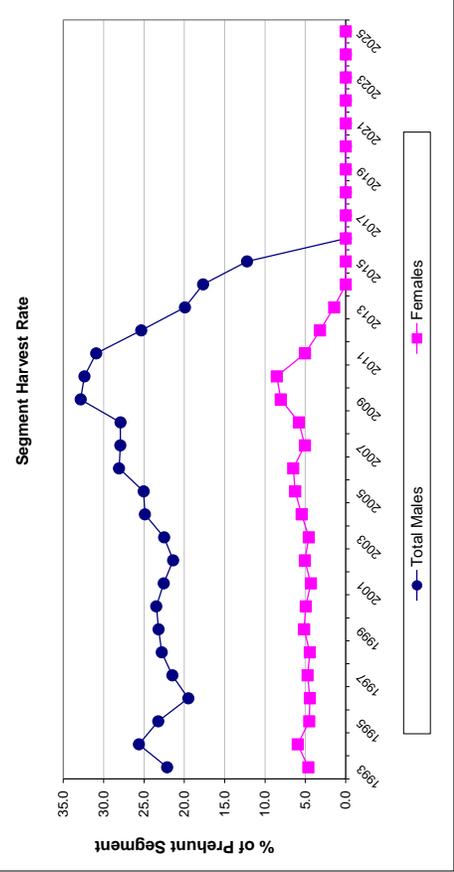
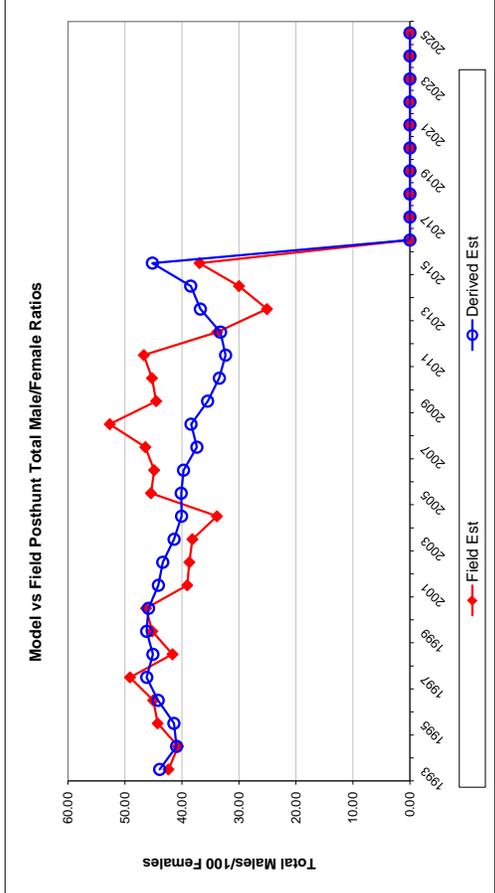
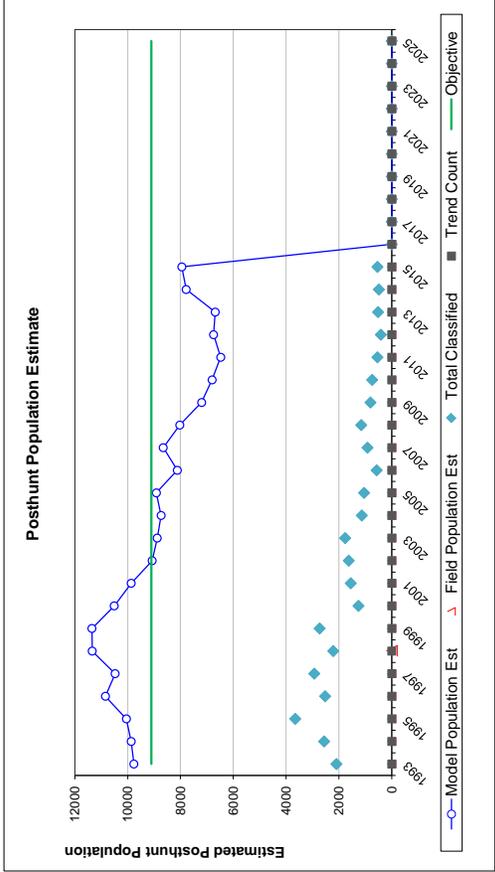
Year	Annual Juvenile Survival Rates		Annual Adult Survival Rates	
	Model Est	Field Est	Model Est	Field Est
1993	0.50		0.86	
1994	0.50		0.86	
1995	0.50		0.86	
1996	0.50		0.86	
1997	0.50		0.86	
1998	0.50		0.86	
1999	0.50		0.86	
2000	0.50		0.86	
2001	0.50		0.86	
2002	0.50		0.86	
2003	0.50		0.86	
2004	0.50		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	0.50		0.86	
2016				
2017				
2018				
2019				
2020				
2021				
2022				
2023				
2024				
2025				

Parameters:	Optim cells
Juvenile Survival =	0.500
Adult Survival =	0.855
Initial Total Male Pop/10,000 =	0.215
Initial Female Pop/10,000 =	0.489

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

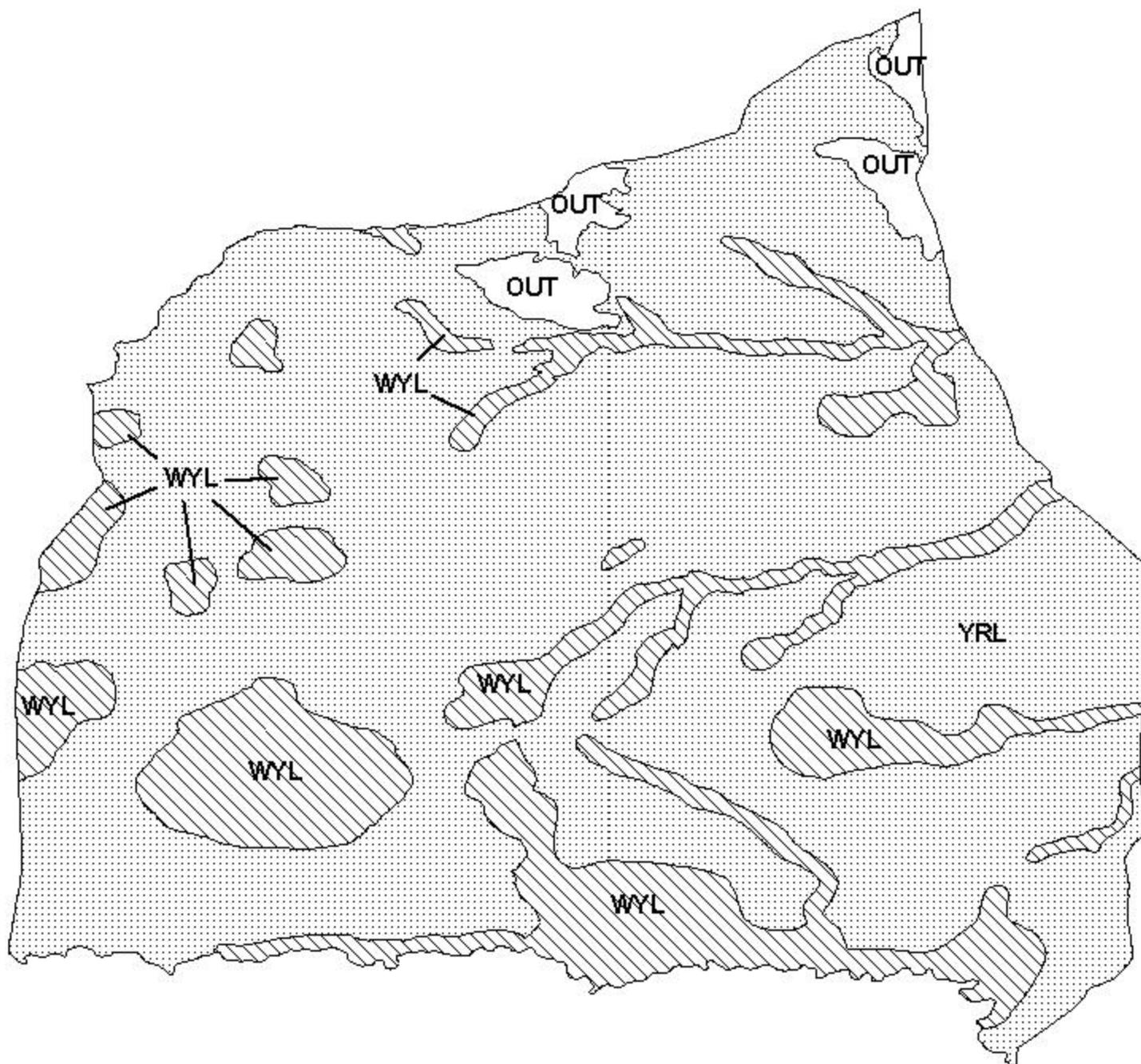
Year	Classification Counts						Harvest						
	Juvenile/Female Ratio			Total Male/Female Ratio			Juv	Males	Females	Total Harvest	Segment Harvest Rate (% of		
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE					Total Males	Females	
1993		55.82	2.87	43.92	42.38	2.39	10	555	216	761	22.1	4.6	
1994		74.68	3.31	40.95	40.71	2.19	27	587	263	877	25.6	5.9	
1995		79.27	2.95	41.43	44.28	1.98	23	519	196	738	23.2	4.5	
1996		92.38	4.09	44.18	45.06	2.48	9	446	194	649	19.5	4.4	
1997		74.68	3.15	46.19	49.12	2.36	54	545	214	813	21.5	4.7	
1998		95.09	4.45	45.11	41.67	2.51	50	572	200	822	22.8	4.5	
1999		85.71	3.67	46.19	45.22	2.36	19	621	242	862	23.2	5.2	
2000		65.27	4.25	45.87	46.31	3.37	25	637	236	898	23.5	5.0	
2001		59.26	3.47	44.14	39.08	2.63	14	567	199	780	22.6	4.3	
2002		52.94	3.09	43.38	38.71	2.51	18	496	224	738	21.4	5.1	
2003		62.50	3.40	41.39	38.18	2.45	19	476	190	685	22.5	4.6	
2004		69.53	4.60	40.08	33.87	2.85	8	503	219	730	24.9	5.5	
2005		81.60	5.66	40.14	45.45	3.78	15	490	244	749	25.0	6.3	
2006		64.23	6.20	39.73	44.89	4.87	6	562	252	820	28.1	6.5	
2007		88.01	6.50	37.39	46.43	4.16	13	506	186	705	27.9	5.1	
2008		67.94	4.67	38.42	52.67	3.92	17	526	218	761	27.9	5.8	
2009		60.81	4.99	35.51	44.53	4.05	19	579	292	890	32.9	8.1	
2010		67.91	5.72	33.45	45.27	4.34	41	492	287	820	32.4	8.5	
2011		64.59	6.43	32.35	46.69	5.16	63	433	159	655	30.9	5.1	
2012		75.25	8.16	33.23	33.84	4.78	20	332	97	449	25.3	3.2	
2013		64.00	6.18	36.77	25.09	3.38	2	277	44	323	19.9	1.4	
2014		91.82	8.95	38.47	30.00	4.21	0	254	0	254	17.7	0.0	
2015		71.54	6.87	45.19	36.92	4.41	0	210	0	210	12.2	0.0	
2016													
2017													
2018													
2019													
2020													
2021													
2022													
2023													
2024													
2025													

FIGURES



Comments:

END



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



2014 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2014 - 5/31/2015

HERD: MD756 - SOUTH CONVERSE

HUNT AREAS: 65

PREPARED BY: WILLOW HIBBS

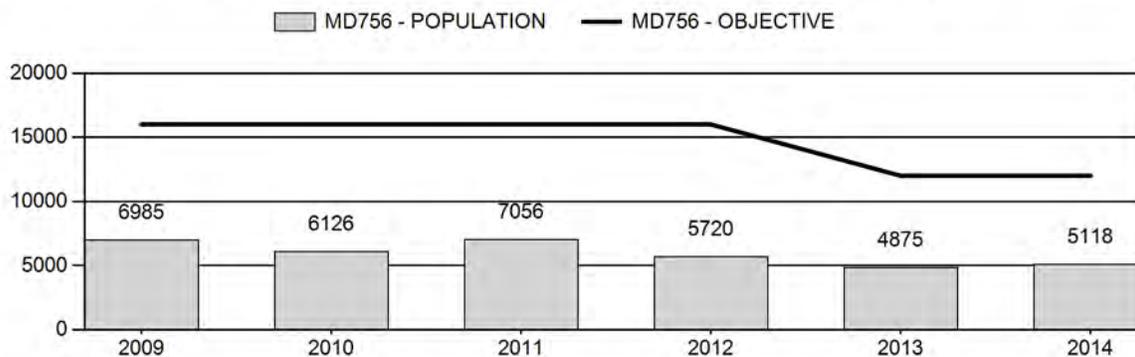
	<u>2009 - 2013 Average</u>	<u>2014</u>	<u>2015 Proposed</u>
Population:	6,152	5,118	4,996
Harvest:	340	253	253
Hunters:	912	719	720
Hunter Success:	37%	35%	35 %
Active Licenses:	915	719	720
Active License Success:	37%	35%	35 %
Recreation Days:	3,434	3,019	3,020
Days Per Animal:	10.1	11.9	11.9
Males per 100 Females	36	33	
Juveniles per 100 Females	50	73	

Population Objective (± 20%) :	12000 (9600 - 14400)
Management Strategy:	Private Land
Percent population is above (+) or below (-) objective:	-57.4%
Number of years population has been + or - objective in recent trend:	15
Model Date:	02/19/2015

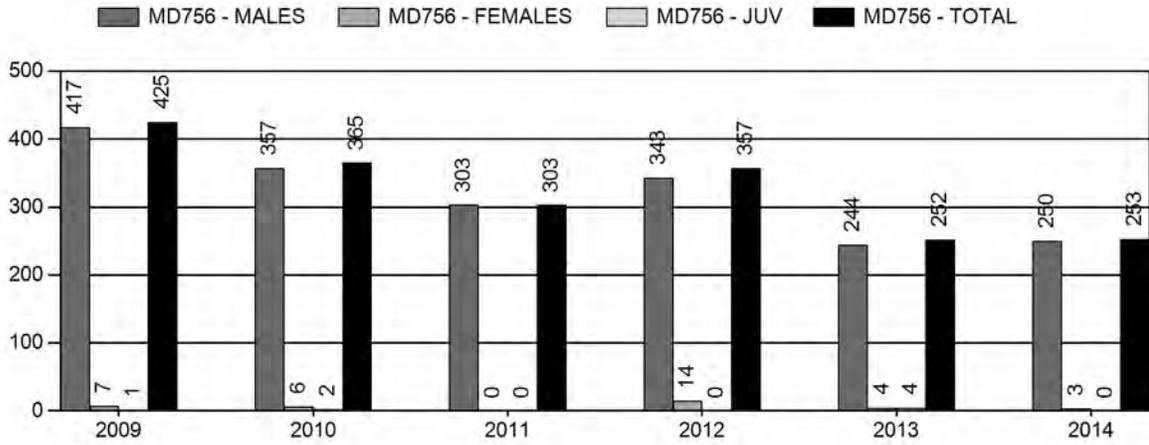
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	.12%	.12%
Males ≥ 1 year old:	23.3%	20.6%
Juveniles (< 1 year old):	0%	0%
Total:	4.7%	4.8%
Proposed change in post-season population:	5.2%	5.3%

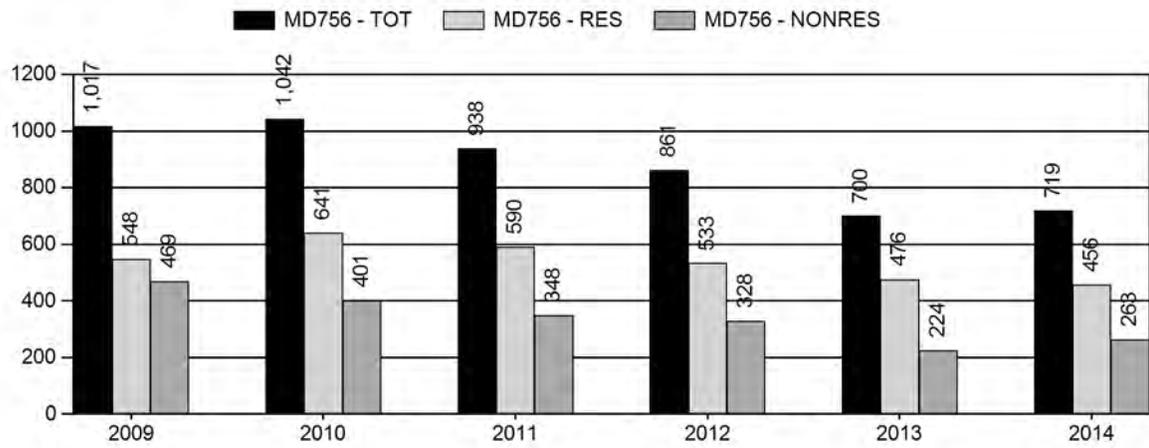
Population Size - Postseason



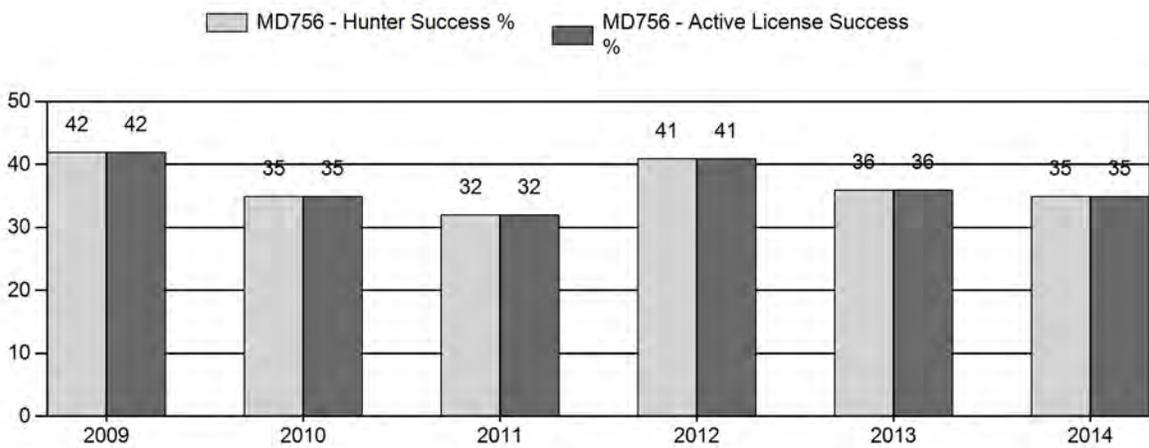
Harvest



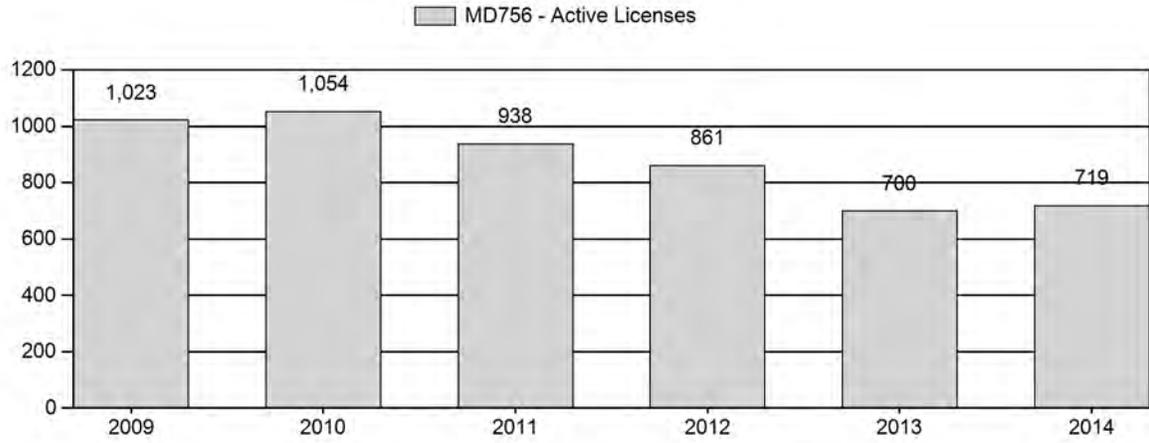
Number of Hunters



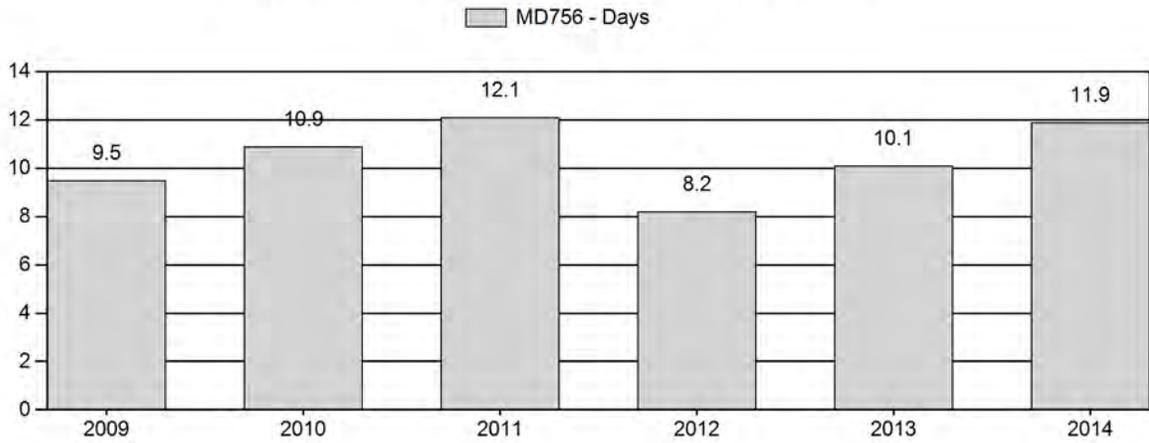
Harvest Success



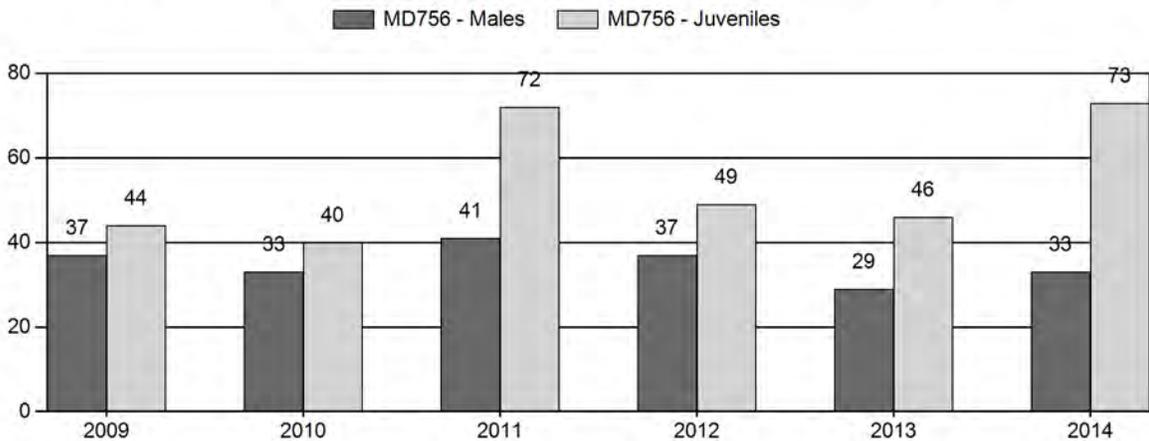
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 Postseason Classification Summary

for Mule Deer Herd MD756 - SOUTH CONVERSE

Year	Post Pop	MALES							FEMALES		JUVENILES		Tot CIs	CIs Obj	Males to 100 Females				Young to		
		Ylg	2+ CIs	2+ CIs	2+ CIs	2+ UnCIs	Total	%	Total	%	Total	%			YIng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	6,985	57	98	41	10	0	206	20%	557	55%	243	24%	1,006	696	10	27	37	± 4	44	± 4	32
2010	6,126	84	89	51	14	0	238	19%	720	58%	287	23%	1,245	585	12	21	33	± 3	40	± 3	30
2011	7,056	83	99	57	11	0	250	19%	612	47%	441	34%	1,303	778	14	27	41	± 4	72	± 5	51
2012	5,720	111	124	36	20	0	291	20%	787	54%	385	26%	1,463	720	14	23	37	± 3	49	± 3	36
2013	4,875	64	65	17	8	0	154	17%	528	57%	245	26%	927	719	12	17	29	± 3	46	± 4	36
2014	5,118	30	56	24	19	0	129	16%	393	49%	286	35%	808	1,281	8	25	33	± 4	73	± 7	55

**2015 HUNTING SEASONS
SOUTH CONVERSE MULE DEER (MD756)**

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

Management Evaluation

Current Management Objective: 12,000

Management Strategy: Private Land

2014 Postseason Population Estimate: ~ 5,100

2015 Proposed Postseason Population Estimate: ~ 5,000

2014 Hunter Satisfaction: 58% Satisfied, 18% Neutral, 24% Dissatisfied

The South Converse Mule Deer Herd Unit has a postseason population management objective of 12,000 deer. The herd is managed using a private land management strategy, as buck ratios are difficult to influence with hunting seasons as the majority of mule deer in this herd unit 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. Walk-in and hunter management areas have provided additional hunting opportunity in several places within the herd unit. 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 CWD was concluded in 2014, with analysis pending. Please refer to Appendix A of this report for further information regarding CWD and recently completed research in the South Converse Herd Unit.

Weather

This herd was impacted by the harsh winter conditions of 2010-2011 and the 2012 drought. Conditions improved in 2013 with adequate precipitation throughout the growing season and

moderate winter conditions. Weather conditions throughout 2014 produced above average precipitation, especially during the growing season, which resulted in excellent forage production throughout the herd unit. Such improved forage yielded good fawn production and excellent body condition of mule deer going into winter. The 2014-2015 winter has been moderate to date with several sub-zero cold snaps and precipitation events occurring earlier in the season, and warmer conditions with mild precipitation realized later in the season. Following more substantial precipitation events earlier in the year, warm conditions often occurred in between cold snaps which allowed for a high degree of mobility and access to forage throughout the winter. Therefore, winter survival should be normal over this bio-year.

Habitat

This herd unit has several established habitat transects that measure production and utilization on True Mountain Mahogany (*Cercocarpus montanus*); however no data were collected in 2014. Given high precipitation and informal assessments of habitat condition throughout this herd unit, forage production and quality were relatively high in 2014 based on field personnel observations. Hunter harvested deer were in good body condition, further indicating improved habitat conditions as a result of high moisture availability throughout the year. However, a significant portion of mule deer habitat in this herd unit is comprised of decadent shrubs with lower palatability and available nutrition. The poor condition of these decadent shrub stands throughout the herd unit may be one of the primary limiting factors on this deer herd.

Field Data

Fawn production/survival was moderate in this herd through the mid-2000's, 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 poor (40s per 100 does), with the exception of 2011 when the fawn ratio spiked to 72. 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. Doe/fawn licenses were diminished and subsequently eliminated from the 2011-2014 hunting seasons. In 2014, fawn production improved (73), and the population appears to have stabilized. Several more years of adequate fawn production will be needed for this herd to increase toward objective.

Buck ratios within the South Converse Herd historically average in the 30s-40s. These ratios seem counterintuitive, as CWD research references higher prevalence in males than females (Farnsworth et al, 2005). Despite the general season structure, higher buck ratios in this unit are a function of limited access to hunting on private lands, where minimal harvest pressure on bucks is typical. In 2013, the buck ratio dropped to a 15-year low of 29, but increased to 33 in 2014.

Since 2008, bucks classified in the South Converse Mule Deer Herd Unit have been further categorized based on antler size. Classification efforts in 2014 showed the highest availability of Class III bucks, with 56% Class I (small), 24% Class II (medium), and 19% Class III (large) bucks. It should be noted that 2014 efforts also obtained the lowest sample size due to a reduction in flight time as a result of helicopter mechanical issues. However, managers feel there is indeed a relatively higher availability of mature bucks in the population, especially larger trophy class bucks, which is corroborated by landowner perceptions. Such increased buck availability is yet another indication that mule deer may be beginning to rebound, which is also supported by the model. Additionally, hunter harvest and pressure has been steadily decreasing over the past several years due to reductions in private land hunting permissions and lower abundance of mule deer which may also be allowing for more mature bucks to enter the population.

Harvest Data

Harvest success was 35% in 2014, which is comparable to the previous 5-year average of 37%. However, there has been a steady decrease in active licenses and buck harvest, with 719 active licenses and 250 harvested bucks in 2014, which is significantly less than the previous 5-year average of 915 active licenses and 333 harvested bucks. Reductions in nonresident hunting pressure can most likely be attributed to nonresident Region J quotas reductions (50% since 2011). However, resident hunting pressure has also decreased with 456 resident hunters in 2014, as compared to the previous 5-year average of 558. Given that this herd unit has a general season structure, reductions in resident hunting pressure is most likely attributable to fewer deer, reduced private land hunting permission, and some level of hunter self-regulation as many hunters have expressed dissatisfaction with availability of mule deer on the few parcels of publicly accessible land in the herd unit. Therefore it is likely that harvest success has remained relatively constant throughout the past few years despite population declines due to decreases in hunting pressure. Harvest success is not expected to improve in this herd unit until fawn production/ survival improves and enhances the growth rate of this herd.

Population

The 2014 postseason population estimate was approximately 5,100 mule deer and has recently leveled off following a downward trend from an estimated high of 14,600 deer in 1998. Population declines in this herd are thought to be a combination of multiple limiting factors including poor habitat condition, lower fawn productivity/survival, and high prevalence of CWD. 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 simulate population trends that seem 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, coupled with adequate classification data in all years, 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. The 2015 hunting season will consist of a short, seven-day season with no doe/fawn licenses, as the population is considerably below objective. Until habitat conditions and weather allow for higher fawn production and survival, this population will likely remain low and seasons will remain conservative. Again, the impacts of such a high prevalence of CWD on this herd are unknown but potentially significant.

If we attain the projected harvest of 250 bucks and fawn production remains poor, this herd will likely remain stable but low. The predicted 2015 postseason population size of the South Converse Herd is approximately 5,000 mule deer which is comparable to current estimates. Given that habitat conditions are generally poor in this herd unit, and may be a limiting factor to population growth given continual poor fawn production/ recruitment, management goals for 2015 include initiating a habitat treatment in a publicly accessible True Mountain Mahogany stand which will improve browse palatability and nutrition.

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:	Willow Hibb
Herd Unit & No.:	South Converse
Model date:	02/28/14

Clear form

MODELS SUMMARY			Relative AICc	Fit	Notes
C,J,CA	Constant Juvenile & Adult Survival	118	127	<input type="checkbox"/> C,J,CA Model	
SC,J,SCA	Semi-Constant Juvenile & Semi-Constant Adult Survival	65	82	<input type="checkbox"/> SC,J,SCA Mod	
TS,J,CA	Time-Specific Juvenile & Constant Adult Survival	16	129	<input checked="" type="checkbox"/> TS,J,CA Model	

Check best model to create report

Year	Posthunt Population Est. Field Est	Field SE	Trend Count	Predicted Prehunt Population			Predicted Posthunt Population			Objective	
				Juveniles	Total Males	Females	Juveniles	Total Males	Females		Total
1993				3474	2534	7960	3443	1227	7328	11999	16000
1994				3165	1647	6412	3159	986	6143	10288	16000
1995				3730	1519	5547	3730	932	5547	10209	16000
1996				5029	2406	6011	5029	1776	6011	12816	16000
1997				5263	2593	5901	5263	1795	5901	12960	16000
1998				7120	2455	5662	7120	1745	5662	14527	16000
1999				5452	2787	5847	5438	1756	5677	12871	16000
2000				3906	2706	5768	3889	1827	5502	11218	16000
2001				2488	2561	5431	2465	1841	5200	9506	16000
2002				2445	1931	4655	2404	1318	4301	8023	16000
2003				2238	1601	3931	2203	1112	3649	6964	16000
2004				2565	1860	3842	2559	1307	3814	7680	16000
2005				2613	2089	4048	2611	1626	4006	8242	16000
2006				2259	2257	4116	2257	1690	4074	8021	16000
2007				2645	2336	4198	2637	1658	4081	8377	16000
2008				1985	2482	4374	1975	1783	4305	8063	16000
2009				1677	1880	3850	1676	1421	3843	6940	16000
2010				1394	1606	3497	1391	1214	3491	6096	16000
2011				2416	1574	3353	2416	1241	3353	7009	16000
2012				1510	1452	3102	1510	1075	3086	5671	16000
2013				1261	1142	2713	1257	873	2708	4838	12000
2014				1820	1071	2505	1820	796	2501	5118	12000
2015				1516	1214	2545	1516	939	2542	4996	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

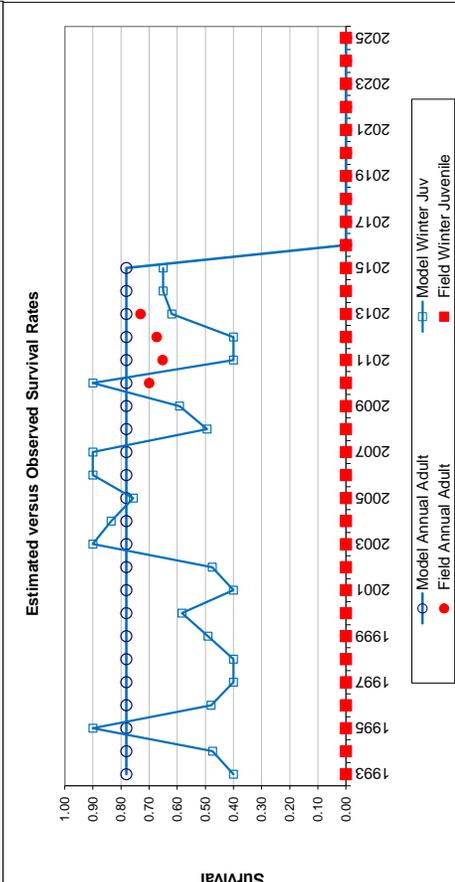
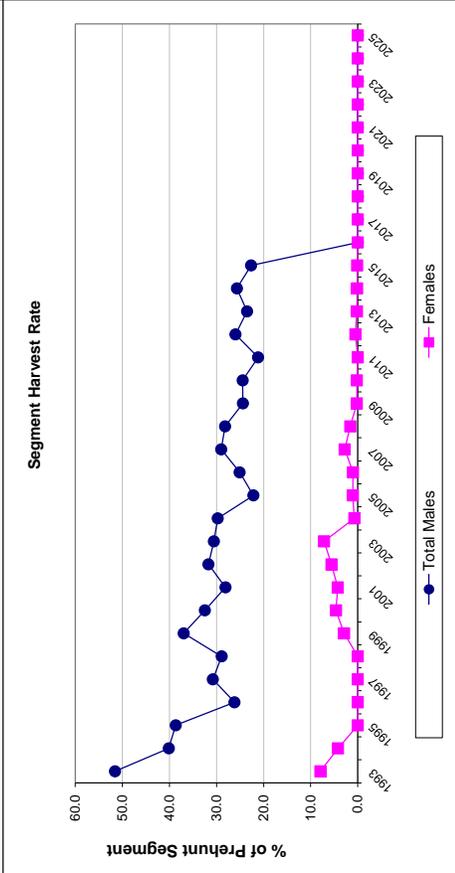
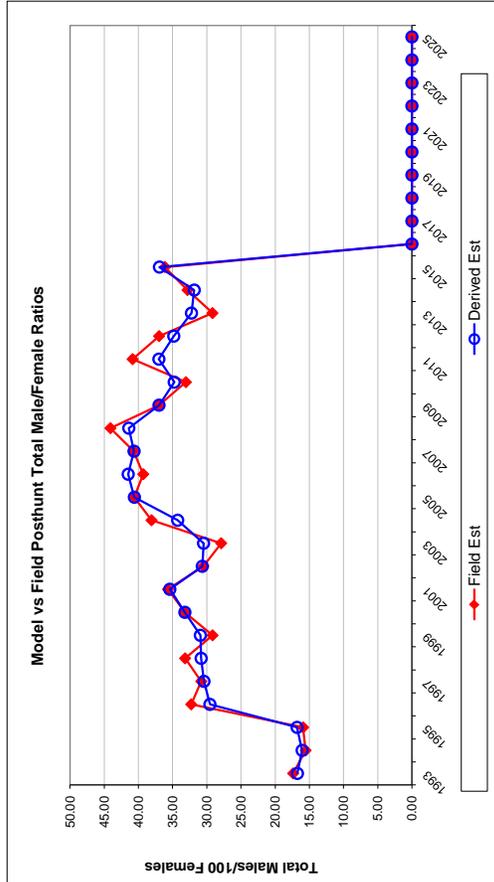
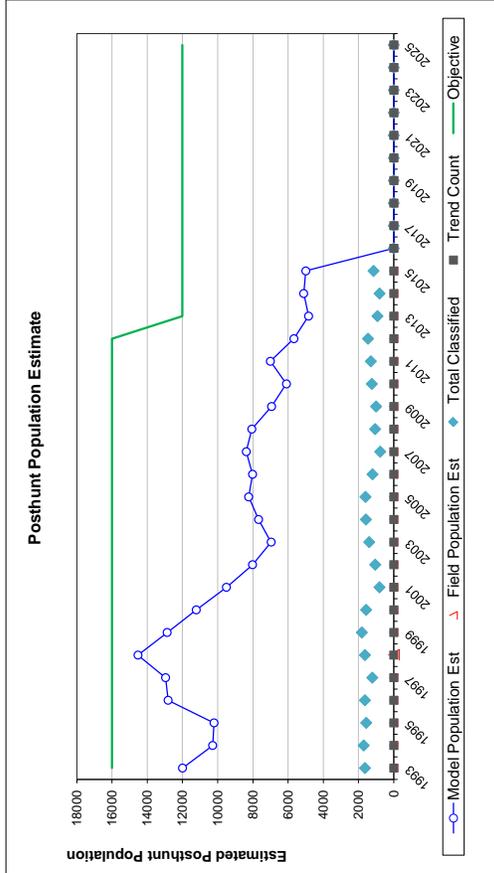
Year	Annual Juvenile Survival Rates		Annual Adult Survival Rates	
	Model Est	Field Est	Model Est	Field Est
1993	0.40		0.78	
1994	0.47		0.78	
1995	0.90		0.78	
1996	0.48		0.78	
1997	0.40		0.78	
1998	0.40		0.78	
1999	0.49		0.78	
2000	0.58		0.78	
2001	0.40		0.78	
2002	0.48		0.78	
2003	0.90		0.78	
2004	0.84		0.78	
2005	0.76		0.78	
2006	0.90		0.78	
2007	0.90		0.78	
2008	0.49		0.78	
2009	0.59		0.78	
2010	0.90		0.78	0.70
2011	0.40		0.78	0.65
2012	0.40		0.78	0.67
2013	0.62		0.78	0.73
2014	0.65		0.78	0.14
2015	0.65		0.78	
2016				
2017				
2018				
2019				
2020				
2021				
2022				
2023				
2024				
2025				

Parameters:	Optim cells
Adult Survival =	0.781
Initial Total Male Pop/10,000 =	0.123
Initial Female Pop/10,000 =	0.733

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

Year	Classification Counts						Harvest						
	Juvenile/Female Ratio			Total Male/Female Ratio			Juv	Males	Females	Total Harvest	Segment Harvest Rate (% of		
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE					Total Males	Females	
1993		46.89	2.63	16.74	17.37	1.43	28	1188	574	1790	51.6	7.9	
1994		51.42	2.76	16.05	15.54	1.32	6	601	245	852	40.1	4.2	
1995		67.25	3.63	16.79	15.91	1.47	0	534	0	534	38.7	0.0	
1996		83.66	4.50	29.54	32.28	2.37	0	573	0	573	26.2	0.0	
1997		89.19	5.51	30.41	30.81	2.69	0	726	0	726	30.8	0.0	
1998		125.75	6.70	30.82	33.18	2.64	0	645	0	645	28.9	0.0	
1999		95.78	4.82	30.94	29.16	2.16	13	937	154	1104	37.0	2.9	
2000		70.69	3.96	33.20	33.20	2.40	15	799	242	1056	32.5	4.6	
2001		47.40	3.97	35.41	35.67	3.30	21	654	210	865	28.1	4.3	
2002		55.91	3.92	30.66	30.51	2.65	37	557	231	825	31.7	5.6	
2003		60.38	3.61	30.47	27.90	2.19	32	445	256	733	30.6	7.2	
2004		67.10	3.81	34.26	38.08	2.61	5	503	25	533	29.7	0.7	
2005		65.17	3.71	40.59	40.59	2.70	2	421	38	461	22.2	1.0	
2006		55.39	3.72	41.49	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	29.0	2.8	
2008		45.88	3.46	41.41	44.09	3.37	9	636	63	708	28.2	1.6	
2009		43.63	3.35	36.99	36.98	3.02	1	417	7	425	24.4	0.2	
2010		39.86	2.78	34.76	33.06	2.47	2	357	6	365	24.4	0.2	
2011		72.06	4.50	37.01	40.85	3.07	0	303	0	303	21.2	0.0	
2012		48.92	3.04	34.83	36.98	2.54	0	343	14	357	26.0	0.5	
2013		46.40	3.59	32.24	29.17	2.67	4	244	4	252	23.5	0.2	
2014		72.77	5.66	31.83	32.82	3.33	0	250	3	253	25.7	0.1	
2015		59.63	4.03	36.92	36.12	2.89	0	250	3	253	22.7	0.1	
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. Thus, prevalence in hunter-harvested deer may not be representative of the herd as a whole, but trends are likely to be similar.

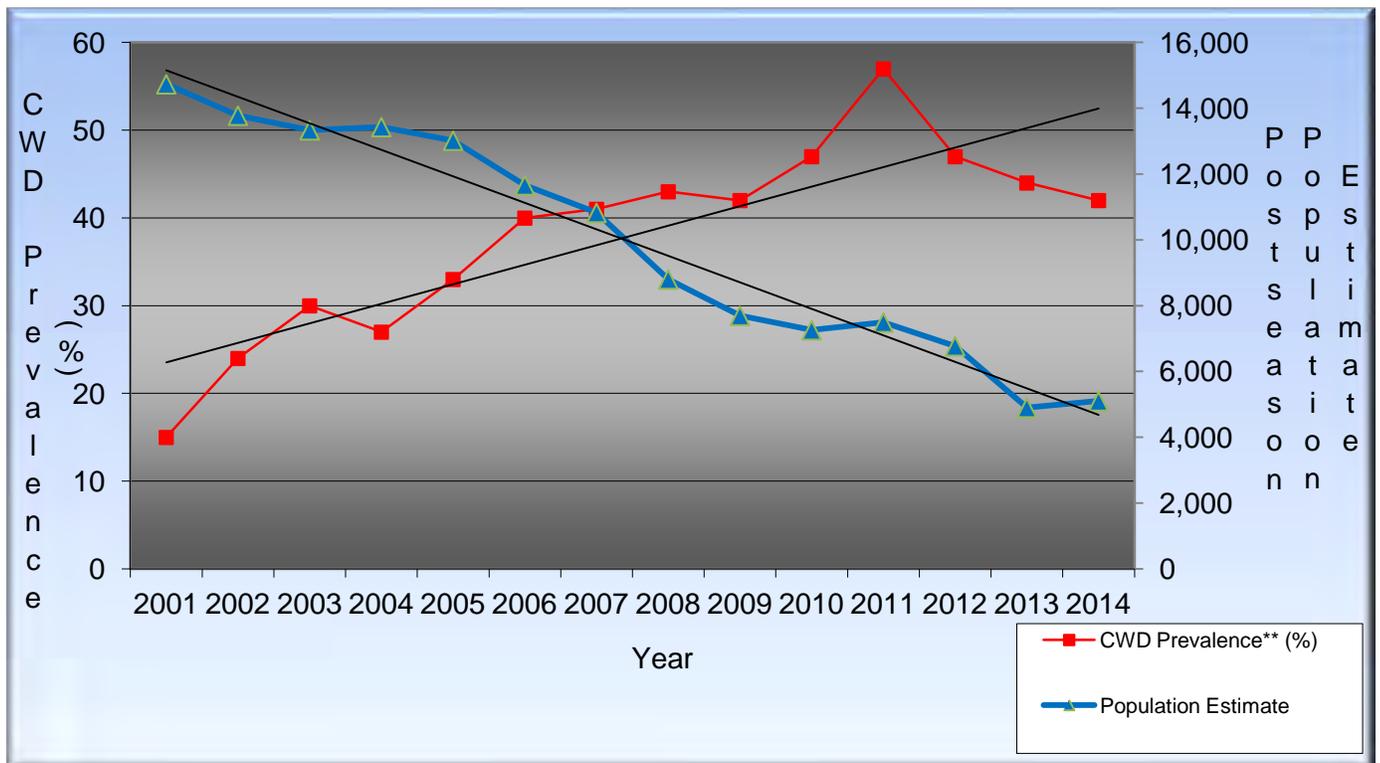
Since 2001, prevalence of CWD in hunter-harvested mule deer has increased significantly in the South Converse Mule Deer Herd, while the population has concurrently decreased (Table 1, Figure 1). Considering CWD is ultimately fatal in cervids, higher prevalence is suspected of having more adverse and 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.

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 were explored to better understand the relationship between CWD and the dynamics of the population. This research was a cooperative effort of the United States Geological Survey, the University of Wyoming, and the Wyoming Game and Fish Department, and was concluded in 2014, with analysis pending.

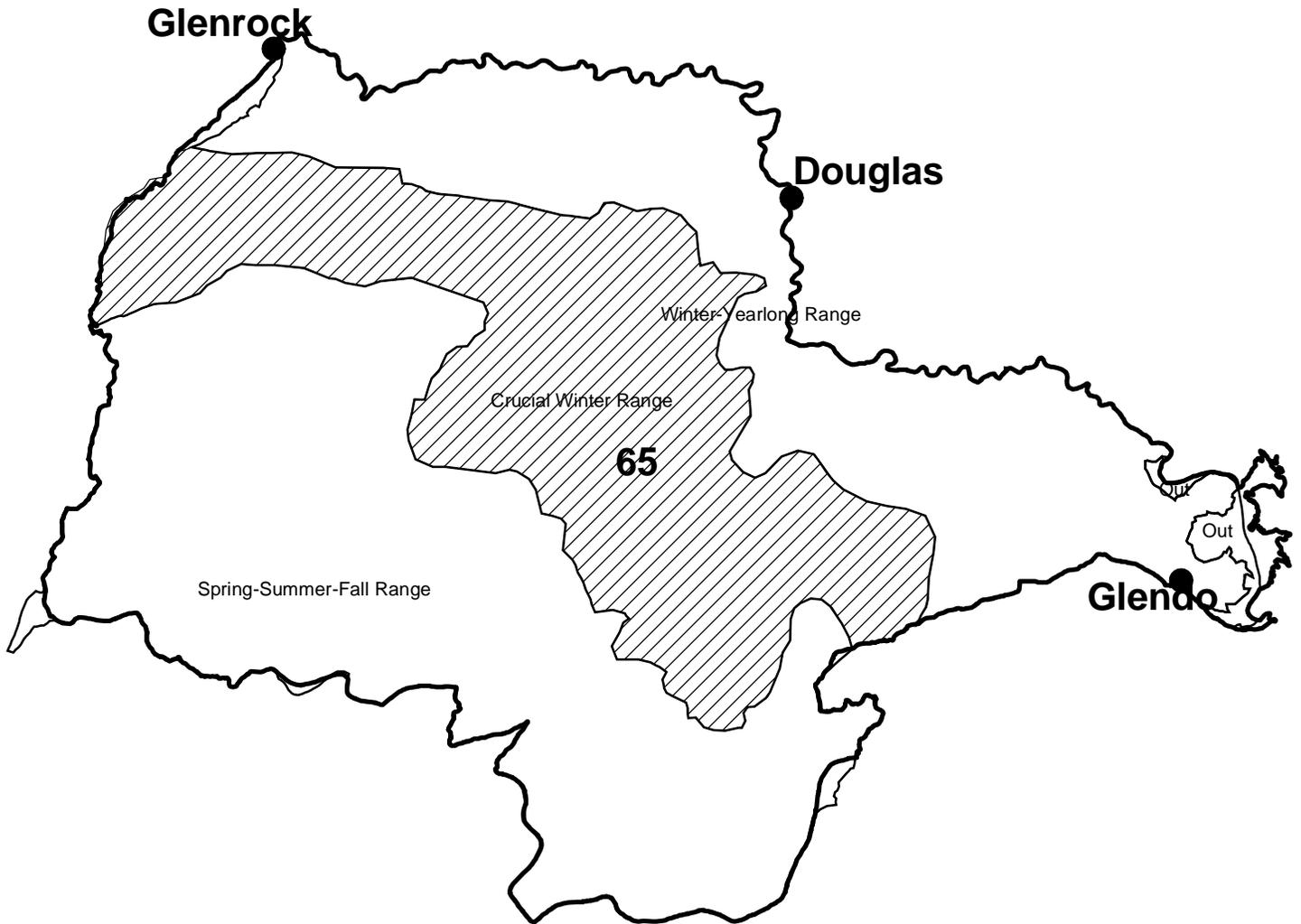
Table 1. CWD surveillance in hunter-harvested mule deer in the South Converse Herd Unit, 2001-2014.

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	345	30	14	47%
2013	253	41	18	44%
2014	253	38	12	32%

Figure 1. CWD prevalence of hunter-harvested mule deer and postseason population estimates for the South Converse Mule Deer Herd Unit, 2001-2014.



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



2014 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2014 - 5/31/2015

HERD: MD757 - BATES HOLE/HAT SIX

HUNT AREAS: 66-67

PREPARED BY: HEATHER O'BRIEN

	<u>2009 - 2013 Average</u>	<u>2014</u>	<u>2015 Proposed</u>
Population:	6,008	5,578	5,917
Harvest:	323	239	237
Hunters:	912	717	730
Hunter Success:	35%	33%	32 %
Active Licenses:	915	717	730
Active License Success:	35%	33%	32 %
Recreation Days:	3,125	3,278	2,850
Days Per Animal:	9.7	13.7	12.0
Males per 100 Females	20	29	
Juveniles per 100 Females	56	82	

Population Objective (± 20%) : 12000 (9600 - 14400)

Management Strategy: Recreational

Percent population is above (+) or below (-) objective: -53.5%

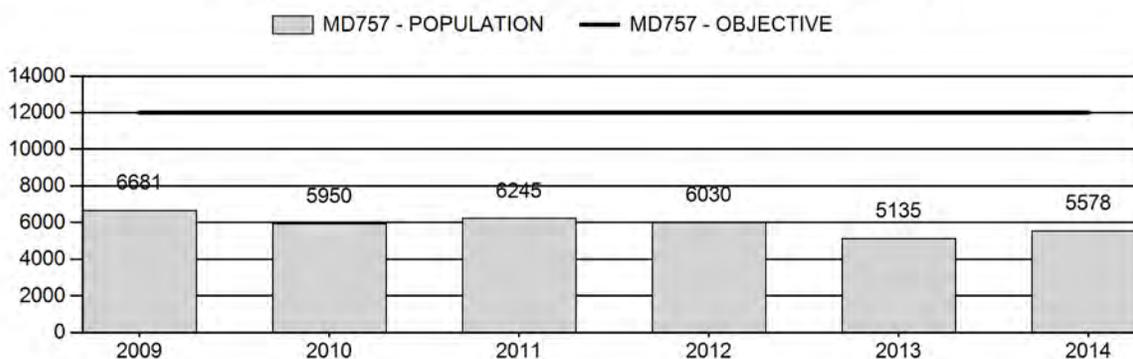
Number of years population has been + or - objective in recent trend: 22

Model Date: 02/28/2015

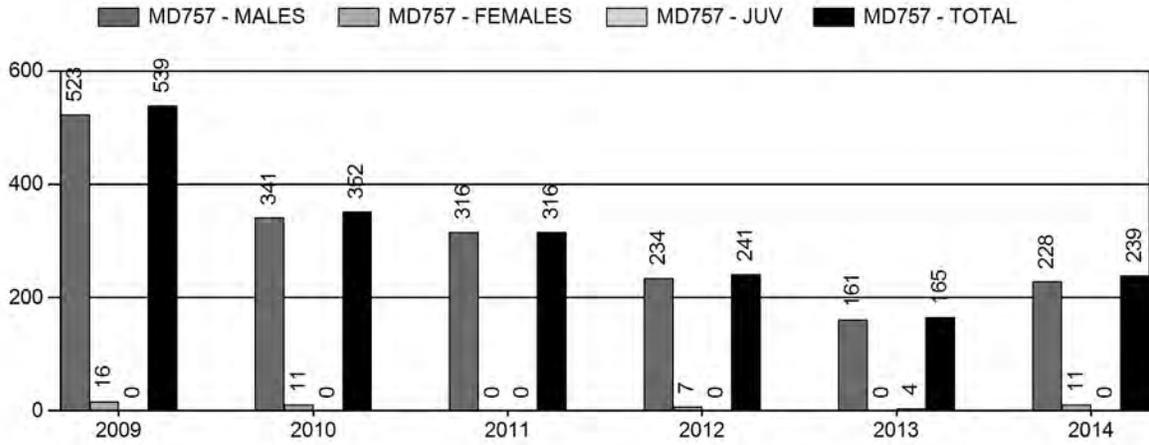
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0.04%	0.06%
Males ≥ 1 year old:	25.6%	19.4%
Juveniles (< 1 year old):	0%	0%
Total:	4.1%	3.80%
Proposed change in post-season population:	+9.9%	+5.77%

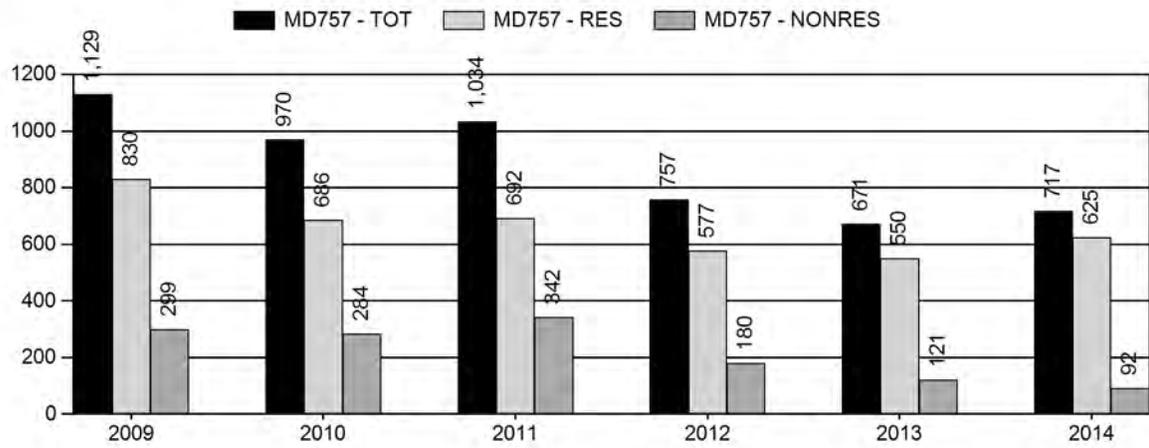
Population Size - Postseason



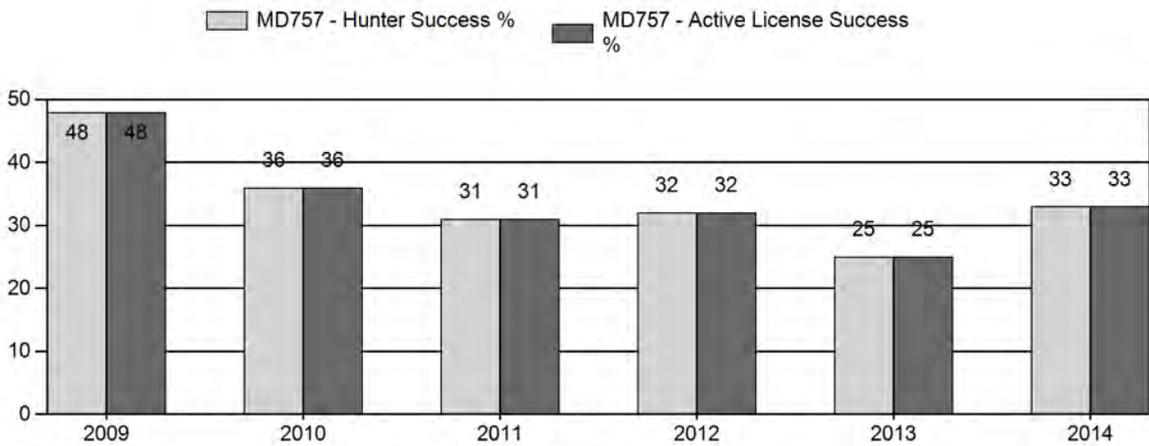
Harvest



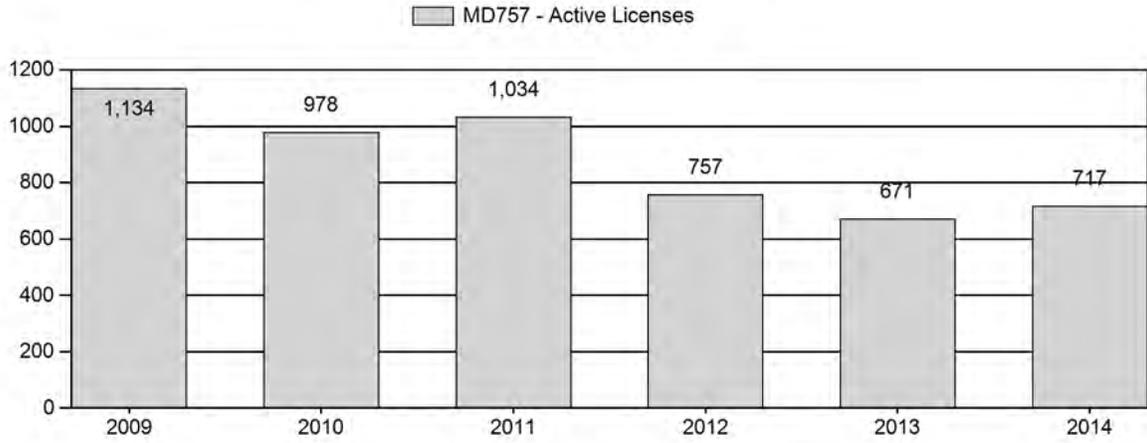
Number of Hunters



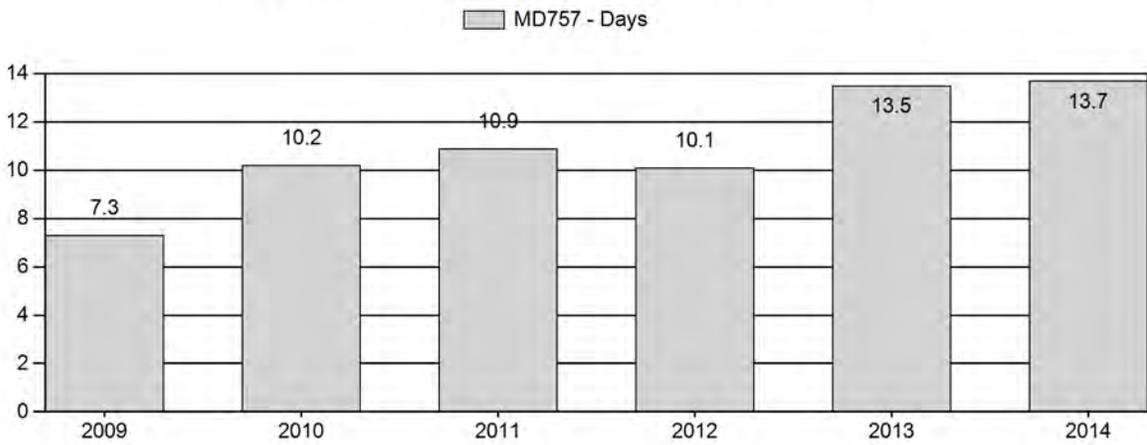
Harvest Success



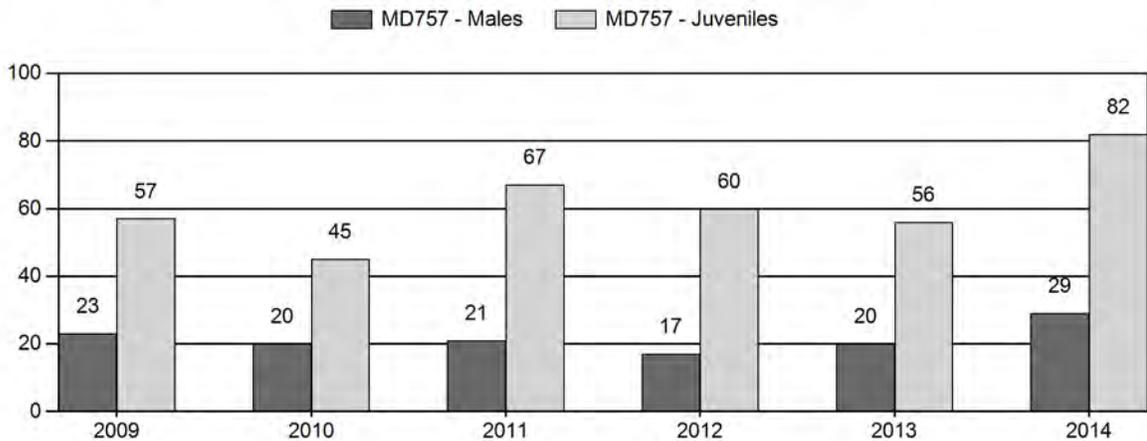
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 Postseason Classification Summary

for Mule Deer Herd MD757 - BATES HOLE/HAT SIX

Year	Post Pop	MALES							FEMALES		JUVENILES		Tot Cls	Cls Obj	Males to 100 Females				Young to		
		Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%			YIng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	6,681	59	61	41	10	0	171	13%	730	55%	419	32%	1,320	934	8	15	23	± 2	57	± 4	47
2010	5,950	82	49	42	9	0	182	12%	894	60%	403	27%	1,479	642	9	11	20	± 2	45	± 3	37
2011	6,245	47	52	33	7	0	139	11%	666	53%	443	35%	1,248	698	7	14	21	± 2	67	± 5	55
2012	6,030	28	55	30	9	0	122	10%	718	56%	432	34%	1,272	650	4	13	17	± 2	60	± 4	51
2013	5,135	86	50	25	7	0	168	11%	845	57%	470	32%	1,483	959	10	10	20	± 2	56	± 3	46
2014	5,578	83	79	26	7	0	195	14%	665	47%	543	39%	1,403	1,464	12	17	29	± 3	82	± 5	63

**2015 HUNTING SEASONS
BATES HOLE / HAT SIX MULE DEER (MD757)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
66		Oct. 15	Oct. 21		General	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

2014 Postseason Population Estimate: 5,600

2015 Proposed Postseason Population Estimate: 5,900

2014 Hunter Satisfaction: 50% Satisfied, 22% Neutral, 28% Dissatisfied

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, resulting in slightly higher mortality of mule deer 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 mule deer entering

the winter of 2011-2012. Snow pack and resulting spring moisture were below average for the winter of 2011-2012 which likely had a negative impact 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. The spring of 2013 was cool with significant precipitation, and average rainfall over the summer as well. Still, habitat conditions appeared to be poor for much of the growing season. Heavy precipitation during the fall of 2013 caused a beneficial late green-up, but also made travel very difficult for hunters. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. Grass and forb growth was excellent, making 2014 the best growing season the region had seen in years. The spring and summer of 2014 undeniably produced improved range conditions that benefitted mule deer. 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 2014 on mahogany was 2.82 inches (71.6 mm), and represents a significant increase in production from the previous two years (see Figure 1). Average growth was well below average in 2012-2013, while growth in 2014 was similar to production seen from 2008-2011. Utilization was low, with an average of 5.5% of leaders browsed per shrub. Above-average herbaceous plant production was likely the result of excellent moisture during the growing season. Better habitat conditions in the herd unit for 2014 likely resulted in improved spring and summer fawn survival, and may account for the higher fawn ratio in this herd unit compared to previous years.

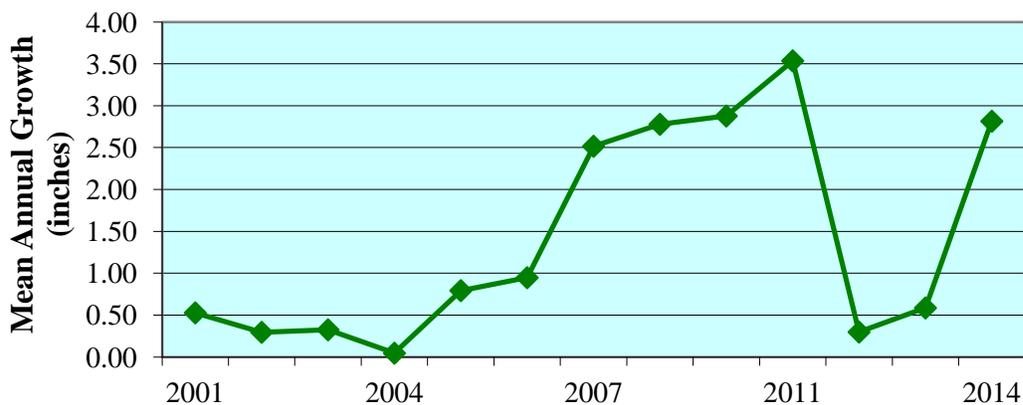


Figure 1. Mean annual growth of true mountain mahogany (*Cercocarpus montanus*) in the Bates Hole / Hat Six Mule Deer Herd Unit, 2001-2014

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 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 per 100 does. Despite the elimination of doe/fawn hunting and the restrictions placed on buck harvest, this population continued to decline. Fawn ratios finally improved in 2014 to 82 per 100 does. Winter conditions from 2013-2014 were mild for pregnant does, and were followed by spring weather and range conditions that were excellent throughout the region. Additional years of improved fawn production and survival will be necessary to enhance population growth for the herd in future years.

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. 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. The antler-point restriction has 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. Overall buck ratios improved in 2013 to 20 per 100 does, and again in 2014 to 29 per 100 does. The antler point restriction will remain in place for one more year before it is removed, at which point managers will need to discuss the most appropriate way to proceed with regards to herd health, population status, and public desires.

Despite the current short hunting season and the antler point restriction, many landowners and hunters continue to complain 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 ratios. As part of the statewide Mule Deer Initiative, a citizen working group was formed to discuss these issues in 2014 for the Bates Hole Hat Six Mule Deer Herd Unit. The group will develop a management plan and formal recommendations to Department managers by summer 2015.

Since 2008, bucks classified in Area 66 have been categorized based on antler size (see Figure 2). 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 2010-2014 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 2014

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. In 2014, the proportion of Class III bucks declined to 6%, but the total number of large bucks seen in the survey remained the same. This again is due to the higher total number of Class I bucks present in the postseason population due to the antler-point restriction. The consistent number of Class III bucks surveyed across years 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 are less concerned with 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 number of Class III bucks observed within the herd unit.

Bio-Year	Total Class N for HA	# Bucks Classified					Buck Ratios per 100 Females					
		YIng	Class I	Class II	Class III	Total	YIng	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
2014	1,403	83	79 (71%)	26 (23%)	7 (6%)	195	12	12	4	1	17	29

Figure 2. Antler classification analysis for **Area 66** within the Bates Hole/Hat Six Mule Deer Herd Unit, 2008 – 2014.

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. Hunter satisfaction has been low in this herd,

which may be a function of hunter crowding and a perceived lack of deer. 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. Hunter participation and overall harvest declined when antler point restrictions were added – from around 1,000 total hunters in 2011 to about 700 hunters in 2014. At the same time, Region D non-resident license issuance was reduced significantly: from 2,100 licenses in 2011 to only 400 in 2014. In Area 66, only 13% of hunters were non-residents during the 2014 season. Harvest success was only 26% in 2013 – due in part to the more restrictive season on bucks as well as issues with snow, mud, and poor access conditions. Harvest success in 2014 returned to near the five-year average as weather and access conditions were very good during the hunting season. Overall harvest improved in 2014 as well, despite the antler-point restriction and virtually no harvest of does or fawns. Hunters and landowners commented on seeing more mule deer in the field, especially yearling bucks and does with fawns.

Population

The 2014 postseason population estimate was approximately 5,600 and has recovered slightly, after reaching a low of about 5,100 deer in 2013. 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 seems 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 Herd 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 reinstated for 2015. The 2015 season will be the third and final 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 237 deer with fawn ratios similar to the last five years, this herd will grow slightly. The predicted 2015 postseason estimate for the Bates Hole Hat Six Herd is approximately 5,900 animals, which is 51% below objective.

INPUT
 Species: Deer
 Biologist: Heather O'Brien
 Herd Unit & No.: MD757 Bates Hole-Hat Six
 Model date: 02/27/15

Clear form

MODELS SUMMARY			Relative AICc	Fit	Notes
C,J,CA	Constant Juvenile & Adult Survival	134	143		
SC,J,SCA	Semi-Constant Juvenile & Semi-Constant Adult Survival	94	108	<input type="checkbox"/> C,J,CA Model <input type="checkbox"/> SC,J,SCA Mod	
TS,J,CA	Time-Specific Juvenile & Constant Adult Survival	13	139	<input checked="" type="checkbox"/> TS,J,CA Model	

Check best model to create report

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population		Predicted Posthunt Population		Total	Objective	
	Field Est	Field SE		Juveniles	Total Males	Juveniles	Total Males			Females
1993			1140	839	2090	1121	325	1747	3193	12000
1994			997	508	1706	984	302	1581	2867	12000
1995			1161	697	1775	1161	417	1775	3353	12000
1996			1922	873	2018	1922	536	2018	4476	12000
1997			1703	836	2085	1703	534	2085	4322	12000
1998			1857	1217	2523	1857	756	2516	5129	12000
1999			2231	1278	2762	2231	668	2762	5660	12000
2000			1979	1566	3331	1979	969	3331	6279	12000
2001			2274	1468	3458	2268	948	3419	6635	12000
2002			2768	1284	3367	2757	805	3299	6861	12000
2003			2454	1230	3331	2438	771	3171	6380	12000
2004			2186	1485	3508	2168	951	3255	6374	12000
2005			2248	1262	3204	2208	785	2943	5936	12000
2006			1556	1655	3473	1542	1055	3315	5912	12000
2007			1971	1583	3487	1944	1020	3354	6317	12000
2008			2276	1562	3528	2274	1027	3519	6820	12000
2009			1973	1355	3455	1973	779	3437	6190	12000
2010			1478	1051	3291	1478	676	3279	5433	12000
2011			2034	865	3058	2034	529	3058	5621	12000
2012			1790	852	2984	1790	595	2976	5361	12000
2013			1591	859	2865	1591	682	2861	5135	12000
2014			1218	893	2729	1218	642	2717	5578	12000
2015			2010	1210	2958	2010	952	2956	5917	12000
2016									12000	12000
2017									12000	12000
2018									12000	12000
2019									12000	12000
2020									12000	12000
2021									12000	12000
2022									12000	12000
2023									12000	12000
2024									12000	12000
2025									12000	12000

Survival and Initial Population Estimates

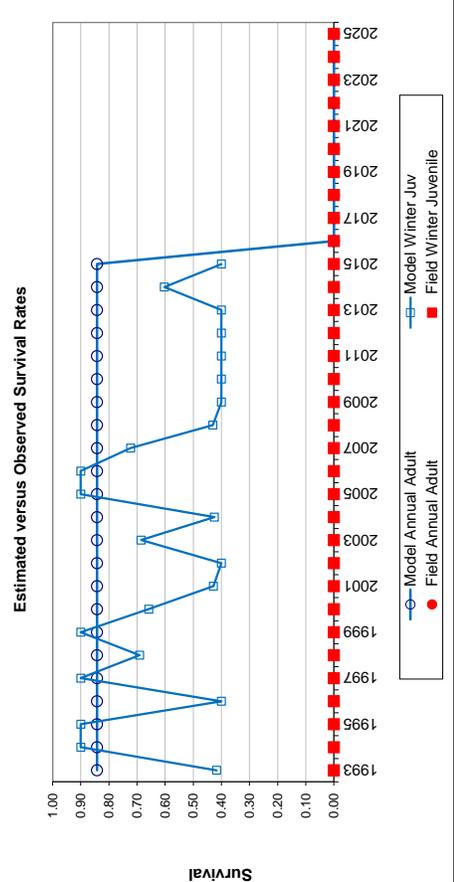
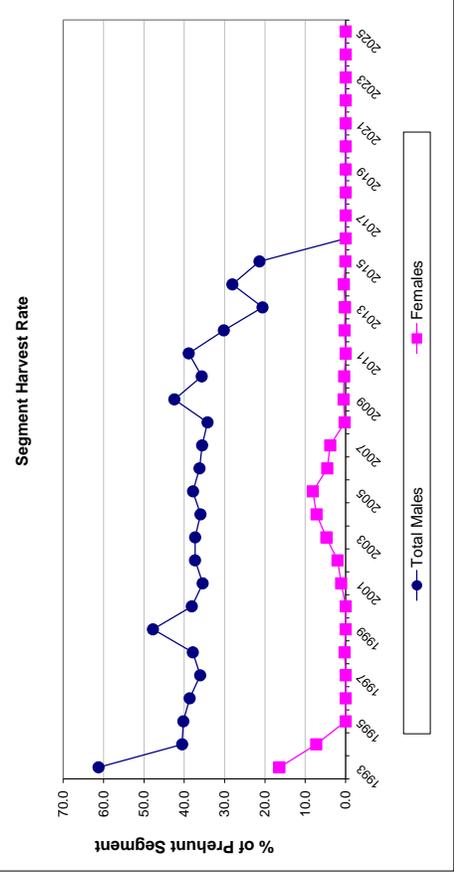
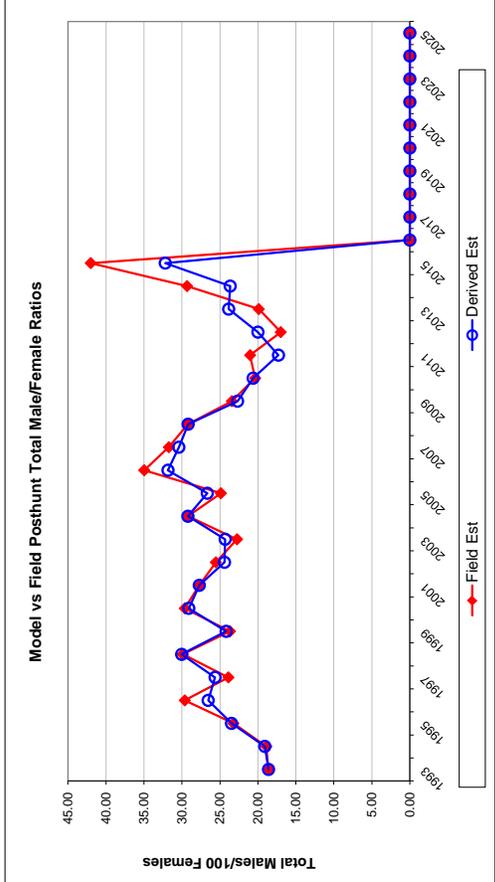
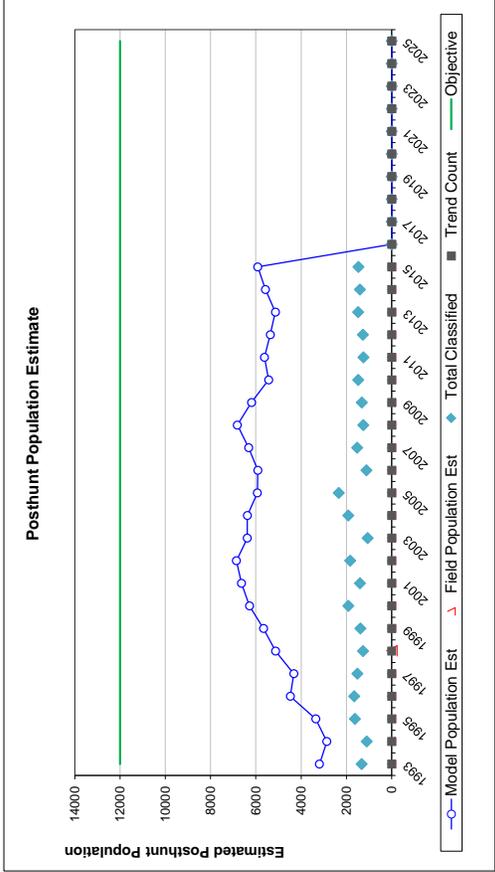
Year	Annual Juvenile Survival Rates		Annual Adult Survival Rates	
	Model Est	Field Est SE	Model Est	Field Est SE
1993	0.42		0.84	
1994	0.90		0.84	
1995	0.90		0.84	
1996	0.40		0.84	
1997	0.90		0.84	
1998	0.69		0.84	
1999	0.90		0.84	
2000	0.66		0.84	
2001	0.43		0.84	
2002	0.40		0.84	
2003	0.69		0.84	
2004	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	0.40		0.84	
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%

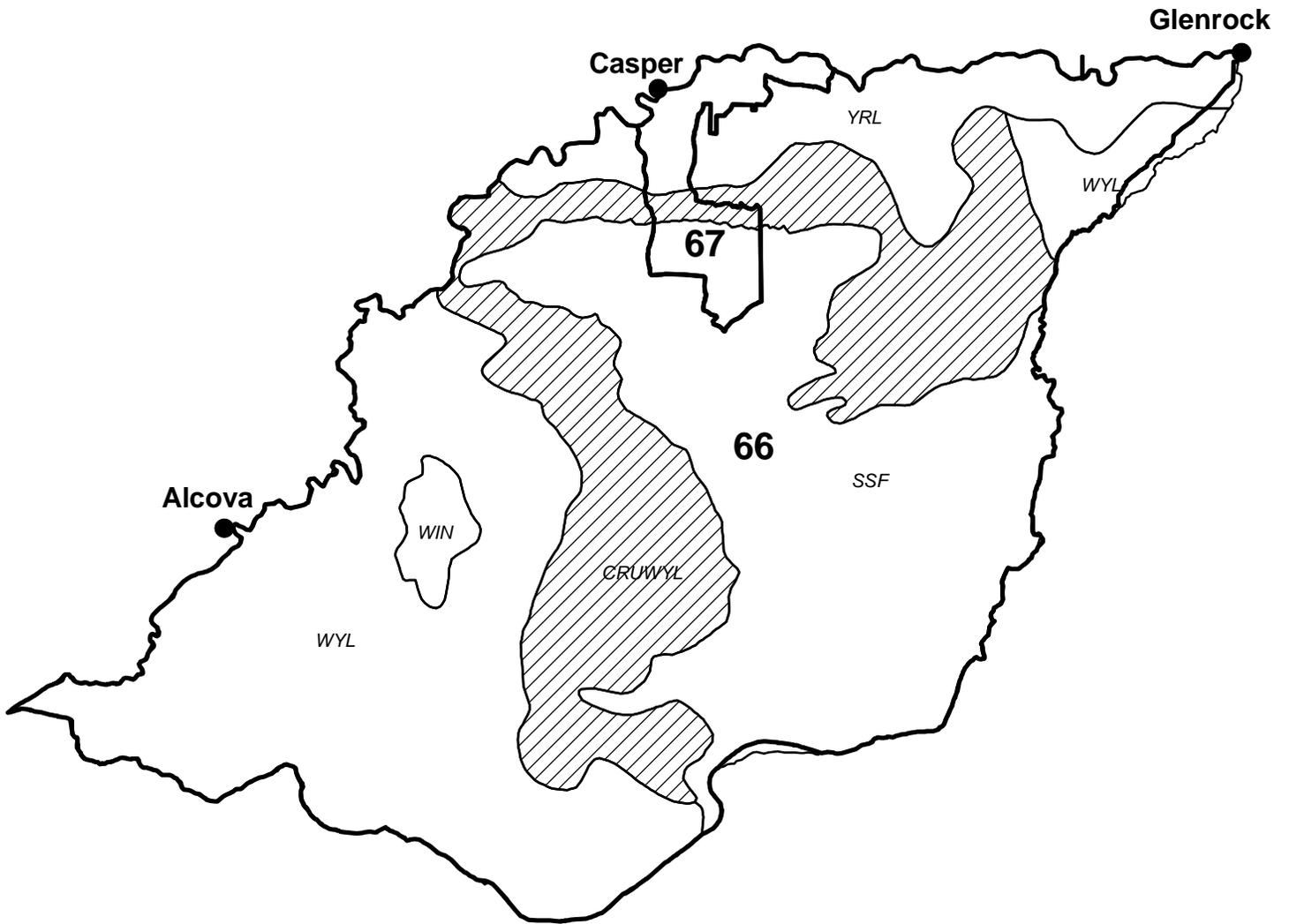
Year	Classification Counts					Harvest					
	Juvenile/Female Ratio		Total Male/Female Ratio			Juv	Males	Females	Total Harvest	Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est					w/o bull adj	Field SE
1993		64.19	3.81	18.60	18.60	17	467	312	796	61.3	16.4
1994		62.23	4.07	19.09	19.09	12	187	113	312	40.5	7.3
1995		65.39	3.54	23.47	23.47	0	255	0	255	40.2	0.0
1996		95.24	5.03	26.55	26.55	0	307	0	307	38.7	0.0
1997		81.68	4.49	25.63	25.63	0	274	0	274	36.1	0.0
1998		73.79	4.54	30.03	30.03	0	419	6	425	37.9	0.3
1999		80.77	4.65	24.18	24.18	0	555	0	555	47.8	0.0
2000		59.43	3.06	29.09	29.09	0	543	0	543	38.1	0.0
2001		66.34	3.91	27.71	27.71	5	473	35	513	35.4	1.1
2002		83.58	4.18	24.40	24.40	10	436	62	508	37.3	2.0
2003		76.88	5.06	24.30	24.30	14	417	145	576	37.3	4.8
2004		66.60	3.37	29.21	29.21	16	486	732	486	36.0	7.2
2005		75.04	3.35	26.66	26.66	36	434	237	707	37.8	8.1
2006		46.50	3.33	31.83	31.83	13	545	144	702	36.2	4.6
2007		57.96	3.37	30.40	30.40	25	512	121	658	35.6	3.8
2008		64.61	4.05	29.18	29.18	2	486	8	496	34.2	0.2
2009		57.40	3.52	22.68	22.68	0	523	16	539	42.5	0.5
2010		45.08	2.70	20.63	20.63	0	341	11	352	35.7	0.4
2011		66.52	4.08	17.29	17.29	0	306	0	306	38.9	0.0
2012		60.17	3.66	19.99	19.99	0	234	7	241	30.2	0.3
2013		55.62	3.20	23.85	23.85	0	161	4	165	20.6	0.2
2014		81.65	4.72	23.64	23.64	0	228	11	239	28.1	0.4
2015		68.00	4.04	32.19	32.19	0	235	2	237	21.4	0.1
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



2014 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2014 - 5/31/2015

HERD: MD758 - RATTLESNAKE

HUNT AREAS: 88-89

PREPARED BY: HEATHER O'BRIEN

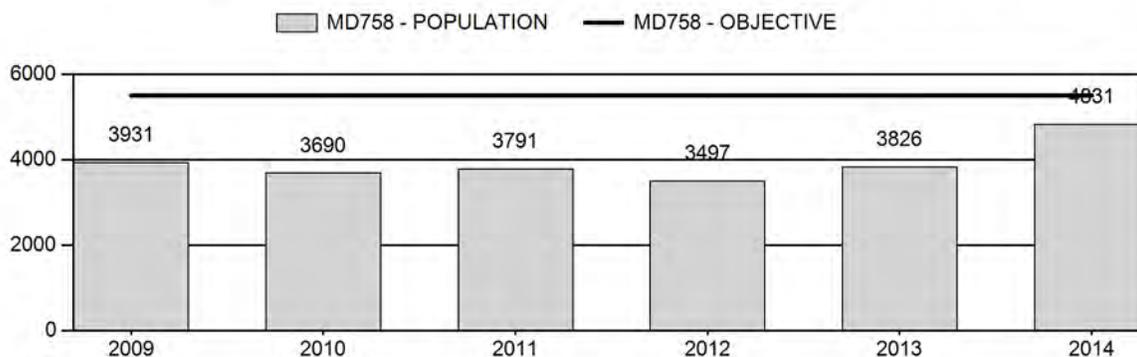
	<u>2009 - 2013 Average</u>	<u>2014</u>	<u>2015 Proposed</u>
Population:	3,747	4,831	4,660
Harvest:	305	123	115
Hunters:	529	309	250
Hunter Success:	58%	40%	46 %
Active Licenses:	566	312	250
Active License Success:	54%	39%	46 %
Recreation Days:	2,229	1,086	950
Days Per Animal:	7.3	8.8	8.3
Males per 100 Females	35	44	
Juveniles per 100 Females	51	83	

Population Objective (± 20%) :	5500 (4400 - 6600)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-12.2%
Number of years population has been + or - objective in recent trend:	7
Model Date:	02/27/2015

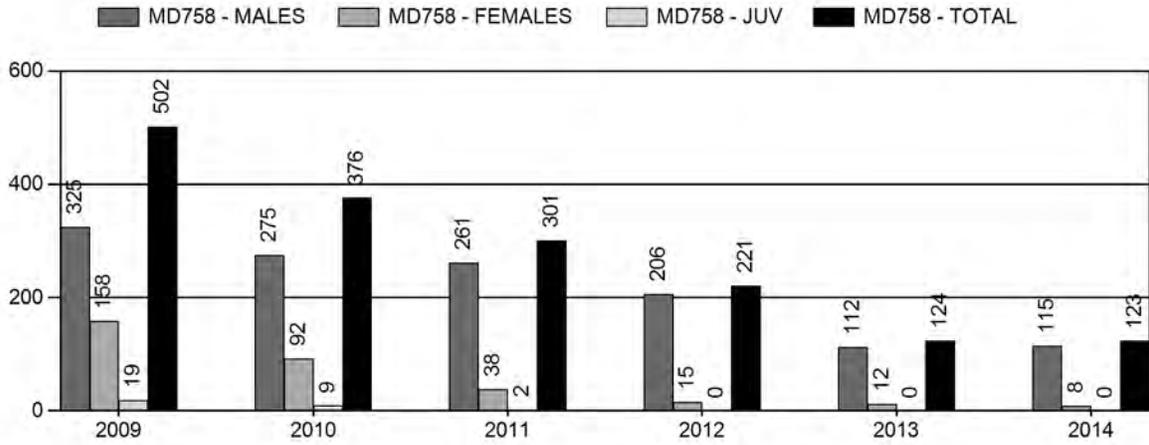
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0.1%	0%
Males ≥ 1 year old:	13.7%	11.0%
Juveniles (< 1 year old):	0%	0%
Total:	2.5%	2.4%
Proposed change in post-season population:	+16.0%	-3.5%

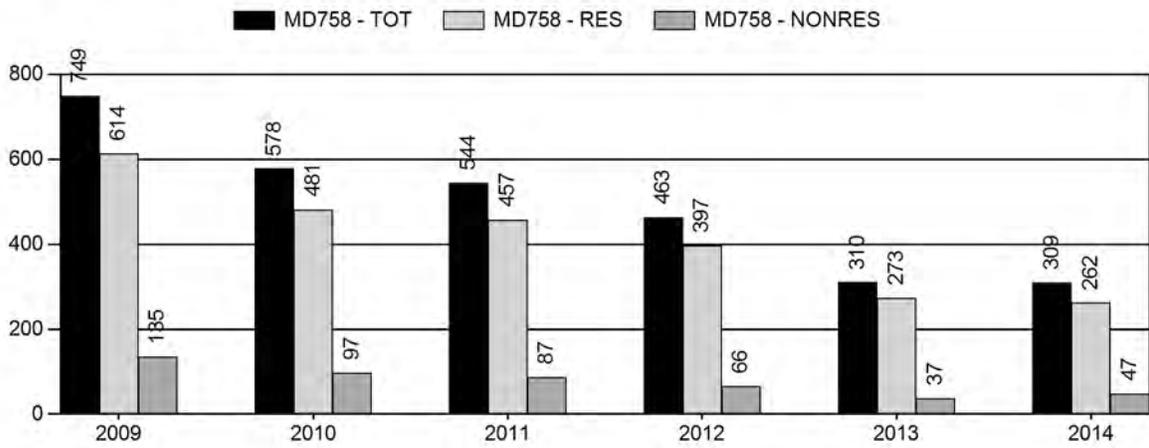
Population Size - Postseason



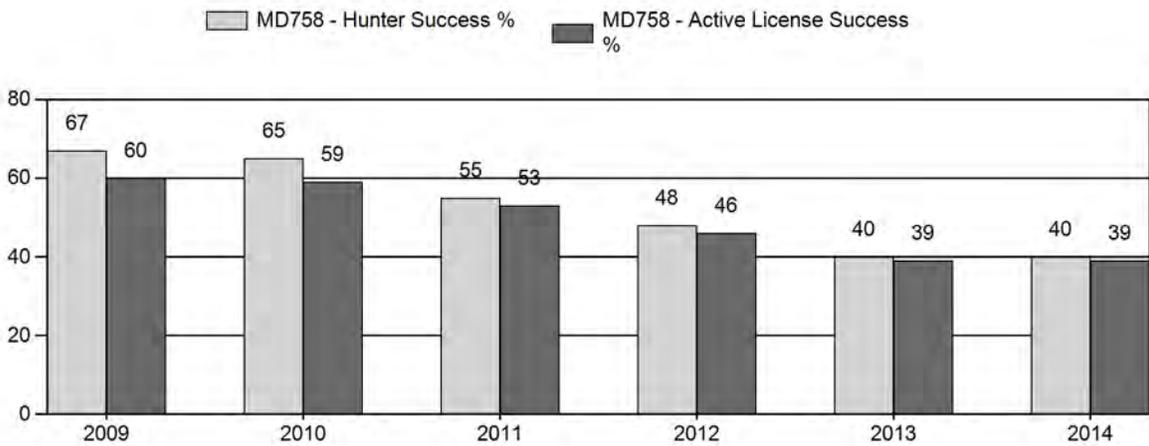
Harvest



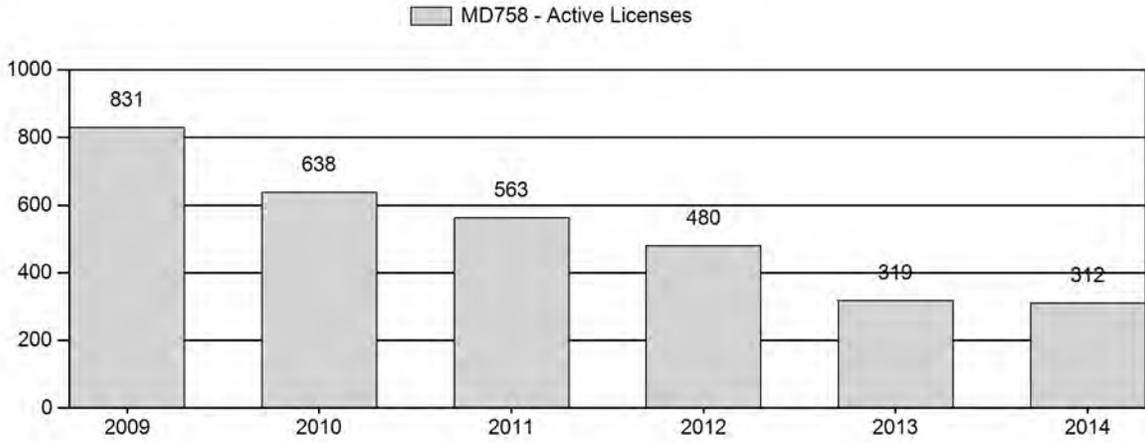
Number of Hunters



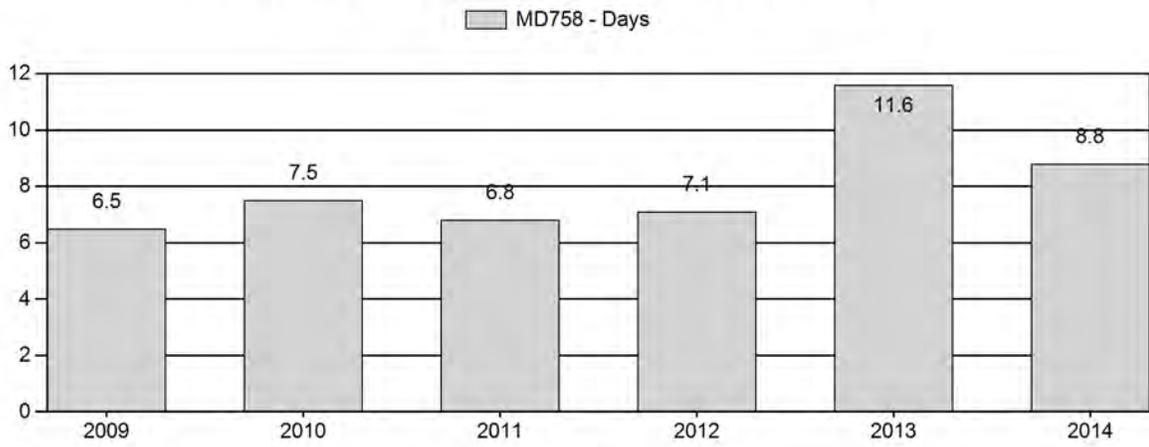
Harvest Success



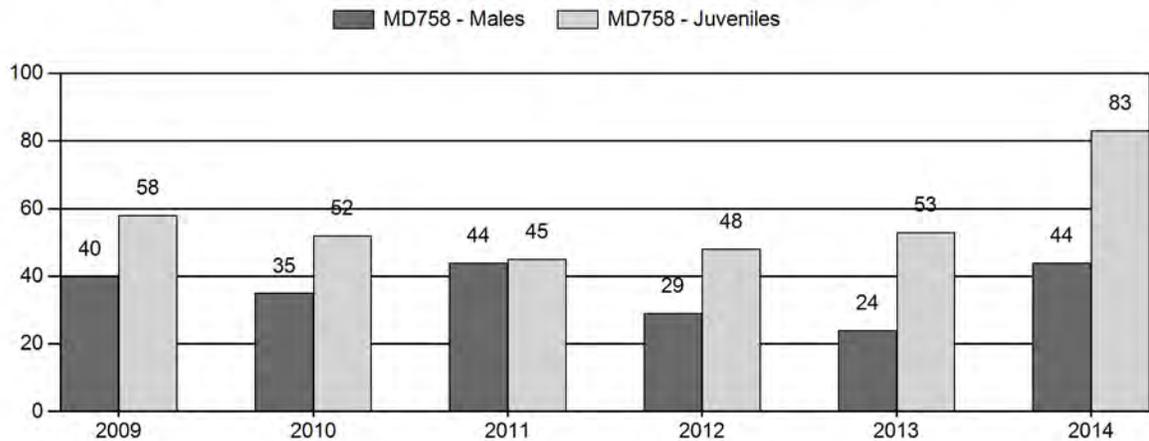
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 Postseason Classification Summary

for Mule Deer Herd MD758 - RATTLESNAKE

Year	Post Pop	MALES							FEMALES		JUVENILES		Tot Cls	Cls Obj	Males to 100 Females				Young to		
		Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%			YIng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	3,931	34	82	76	12	0	189	20%	469	50%	271	29%	929	922	7	33	40	± 4	58	± 5	41
2010	3,690	49	73	51	6	0	169	19%	487	54%	252	28%	908	797	10	25	35	± 3	52	± 4	38
2011	3,791	53	136	63	9	0	249	23%	570	53%	258	24%	1,077	781	9	34	44	± 4	45	± 4	32
2012	3,497	25	83	10	2	0	109	16%	381	57%	184	27%	674	830	7	22	29	± 4	48	± 5	38
2013	3,826	14	61	20	1	0	91	14%	376	57%	198	30%	665	671	4	20	24	± 3	53	± 5	42
2014	4,831	47	84	36	6	0	161	19%	368	44%	304	36%	833	1,446	13	31	44	± 5	83	± 7	57

**2015 HUNTING SEASONS
RATTLESNAKE MULE DEER (MD758)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
88	1	Oct. 15	Oct. 21		General	Antlered mule deer or any white-tailed deer
89	1	Oct. 15	Oct. 31	75	Limited quota	Antlered deer
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2014
88	6	-25
89	1	No Change
Total	1	-25

Management Evaluation

Current Postseason Population Management Objective: 5,500

Management Strategy: Special

2014 Postseason Population Estimate: 4,800

2015 Proposed Postseason Population Estimate: 4,700

2014 Hunter Satisfaction: 55% Satisfied, 20% Neutral, 25% Dissatisfied

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 Area 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. Consequently, hunting pressure can be disproportionately high on public lands within Area 88. Managers will conduct a review of hunt area boundaries in 2015, to consider moving public lands in the southern portion of Area 88 into Area 89. Traditional ranching and grazing are the primary land use over the whole unit, with scattered areas of oil and gas development and bentonite mining. 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, which may have resulted in somewhat 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 were below average for the winter of 2011-2012 which likely had a negative impact 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. The spring of 2013 was cool with significant precipitation, and average rainfall over the summer as well. Still, habitat conditions appeared to be poor for much of the growing season. Heavy precipitation during the fall of 2013 caused a beneficial late green-up, but also made travel very difficult for hunters. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. Grass and forb growth was excellent, making 2014 the best growing season the region had seen in years. The spring and summer of 2014 undeniably produced improved range conditions that benefitted mule deer. 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. Anecdotal observations and discussions with landowners in the region indicate that summer and winter forage availability for mule deer was very good in 2014. Herbaceous forage species were observed to be in very good condition in 2014 compared to previous years, and mule deer appeared to be in excellent body condition by winter 2014.

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, and then improved significantly in 2014 with 83 per 100 does.

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. After a reduction in license issuance in 2013, buck ratios recovered to within special management range in 2014, with 33 bucks per 100 does observed postseason. 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. In 2014, distribution of surveyed bucks across antler classes improved slightly, with a higher percentage of Class II and Class III bucks. Still, overall distribution of bucks remains weighted toward smaller antler classes. With hunter expectations high for trophy-quality hunting, managers consider this further justification to maintain Type 1 license numbers rather than increasing hunter opportunity for the 2015 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
2014	684	37	66 (65%)	30 (29%)	6 (6%)	139	12	22	10	2	34	46

Figure 1. Antler classification analysis for Area 89 within the Rattlesnake Mule Deer Herd Unit, 2008-2014.

Harvest Data

License success in this herd unit is typically in the 60-70th percentile. Overall harvest success declined from 2010-2013, and days per animal increased. In 2014, overall harvest success was again low (39%) for the herd unit. Area 89 had the same harvest success in 2013 and 2014 (66%) with an increase in days per animal, despite a reduction from 125 licenses to 75 licenses. 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 have likely combined in recent years to contribute to higher harvest days. License reductions in 2013 and 2014 did not improve harvest success, indicating fewer deer were available to fewer hunters. Hunter satisfaction also declined from 2012-2014, from 79% to 56% to 55%, respectively. Continued years with improved fawn production and recruitment are necessary before this herd can support higher harvest. Managers thus plan to maintain record low license issuance in an effort to improve harvest success and hunter satisfaction while maintaining special management buck ratios in the herd unit.

Population

The 2014 postseason population estimate was approximately 4,800 mule deer and trending suddenly upward from an estimated low of 4,100 deer in 2012. 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. However, since managers believe the herd unit boundaries to be highly permeable, and because there are no additional survival or population estimate data to augment the model, it is only considered to be fair in quality.

Management Summary

Traditional season dates in this herd run from October 15th through October 31st for limited quota licenses in Area 89, and October 15th through October 21st for general licenses in Area 88. The same season dates will be applied to the 2015 hunting season, with no changes in issuance of Area 89-Type 1 licenses. Area 88-Type 6 licenses will be eliminated, as there are currently no concerns regarding damage and few access opportunities on private lands. The 2015 season thus includes a total of 75 Type 1 licenses in Area 89, and a general season in Area 88 for antlered mule deer or any white-tailed deer. Goals for 2015 are to improve buck ratios, and increase hunter success and satisfaction.

If we attain the projected harvest of 115 deer with fawn ratios similar to the five-year average, this herd will decrease just slightly in number. The predicted 2015 postseason population size for the Rattlesnake Mule Deer Herd Unit is approximately 4,700 deer, which is 12% below objective.

INPUT
 Species: Deer
 Biologist: Heather O'Brien
 Herd Unit & No.: Rattlesnake MD
 Model date: 02/24/15

Clear form

MODELS SUMMARY		Relative AICc	Fit	Notes
CJ,CA	Constant Juvenile & Adult Survival	69	60	
SC,J,SCA	Semi-Constant Juvenile & Semi-Constant Adult Survival	107	90	
TS,J,CA	Time-Specific Juvenile & Constant Adult Survival	120	15	

Year	Posthunt Population Est. Field Est	Field SE	Trend Count	Predicted Prehunt Population		Predicted Posthunt Population		Total	Objective		
				Juveniles	Total Males	Females	Total			Juveniles	Total Males
1993				1549	762	2836	1527	358	2620	4504	5500
1994				1117	656	2658	1079	477	2439	3996	5500
1995				1293	663	2399	1278	509	2327	4113	5500
1996				2309	735	2344	2309	649	2344	5302	5500
1997				2273	1088	2588	2253	853	2497	5604	5500
1998				1896	1257	2712	1890	911	2646	5447	5500
1999				2144	1227	2762	2135	945	2648	5728	5500
2000				1683	1311	2819	1665	1022	2672	5360	5500
2001				1899	1275	2736	1899	1036	2645	5579	5500
2002				2123	1339	2763	2100	1105	2651	5856	5500
2003				2210	1445	2814	2205	1220	2704	6128	5500
2004				2396	1571	2884	2382	1287	2784	6452	5500
2005				2569	1669	2994	2558	1337	2890	6785	5500
2006				1775	1753	3127	1771	1393	2984	6148	5500
2007				1788	1627	3036	1773	1211	2812	5797	5500
2008				1550	1467	2884	1543	1074	2664	5281	5500
2009				1481	1294	2701	1460	937	2527	4924	5500
2010				1283	1154	2562	1273	852	2461	4585	5500
2011				1097	1037	2461	1095	740	2418	4253	5500
2012				1131	874	2359	1131	647	2343	4121	5500
2013				1204	799	2299	1204	676	2286	4166	5500
2014				1863	839	2264	1863	713	2255	4831	5500
2015				1330	1045	2411	1330	919	2411	4660	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

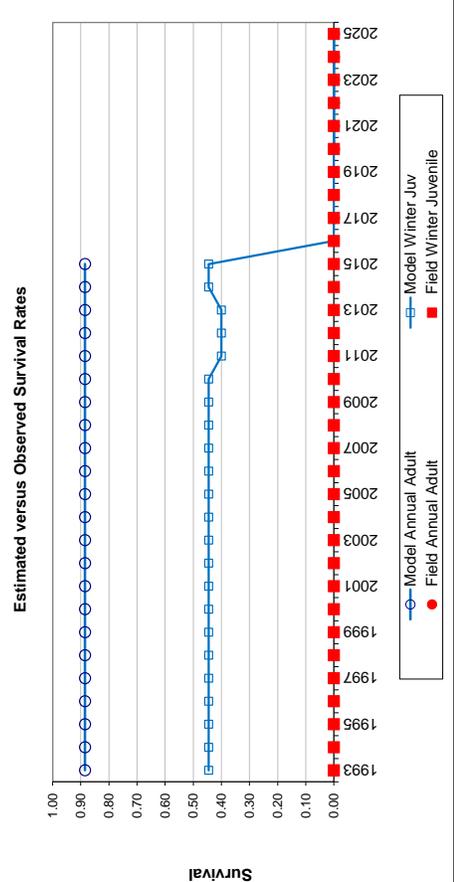
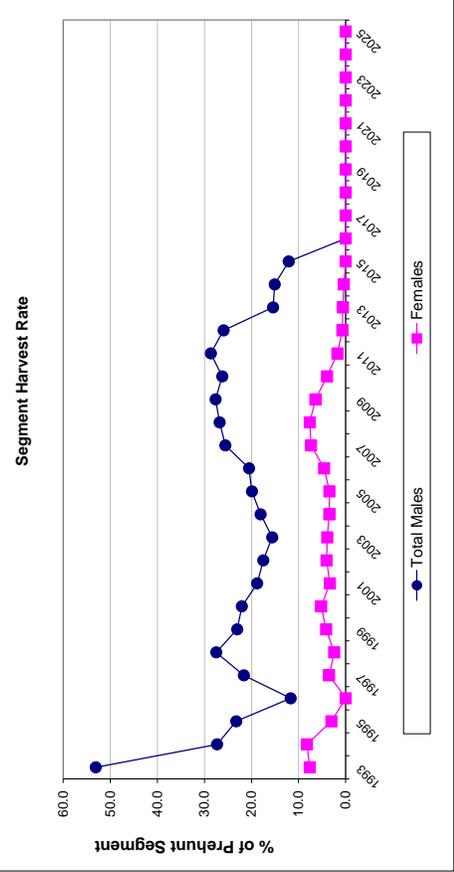
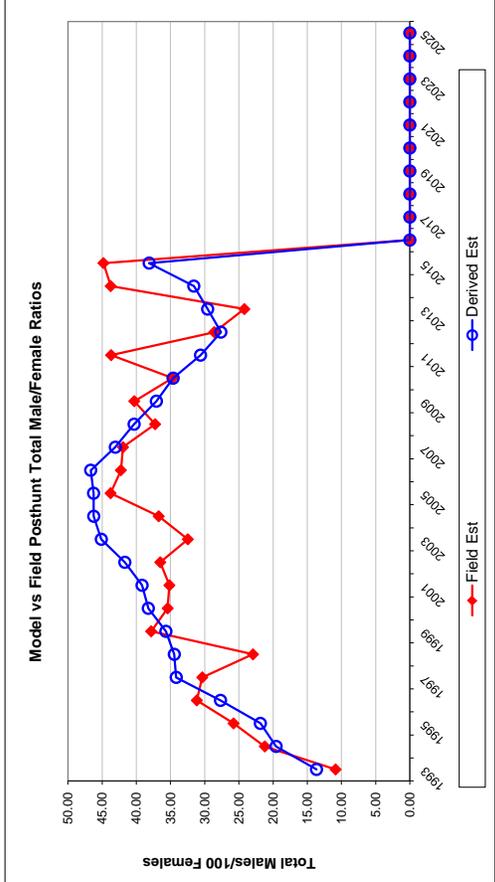
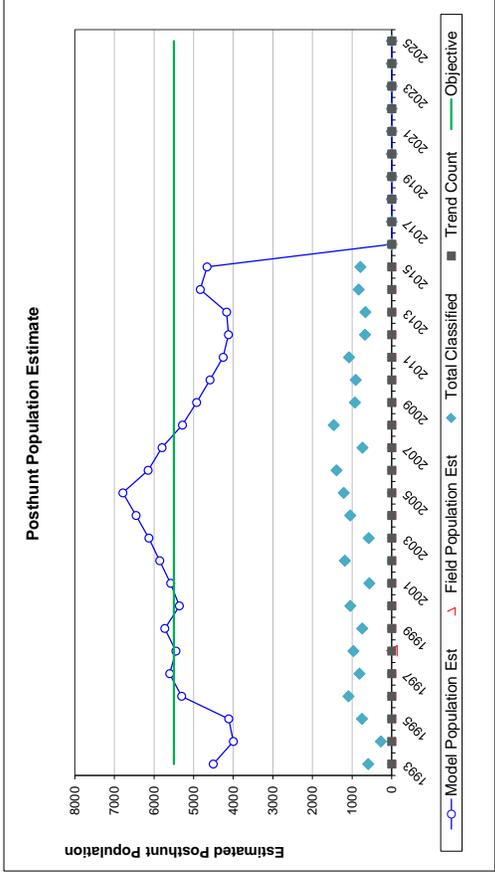
Year	Annual Juvenile Survival Rates		Annual Adult Survival Rates	
	Model Est	Field Est	Model Est	Field Est
1993	0.45		0.89	
1994	0.45		0.89	
1995	0.45		0.89	
1996	0.45		0.89	
1997	0.45		0.89	
1998	0.45		0.89	
1999	0.45		0.89	
2000	0.45		0.89	
2001	0.45		0.89	
2002	0.45		0.89	
2003	0.45		0.89	
2004	0.45		0.89	
2005	0.45		0.89	
2006	0.45		0.89	
2007	0.45		0.89	
2008	0.45		0.89	
2009	0.45		0.89	
2010	0.45		0.89	
2011	0.40		0.89	
2012	0.40		0.89	
2013	0.40		0.89	
2014	0.45		0.89	
2015	0.45		0.89	
2016				
2017				
2018				
2019				
2020				
2021				
2022				
2023				
2024				
2025				

Parameters:	Optim cells
Juvenile Survival =	0.445
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%

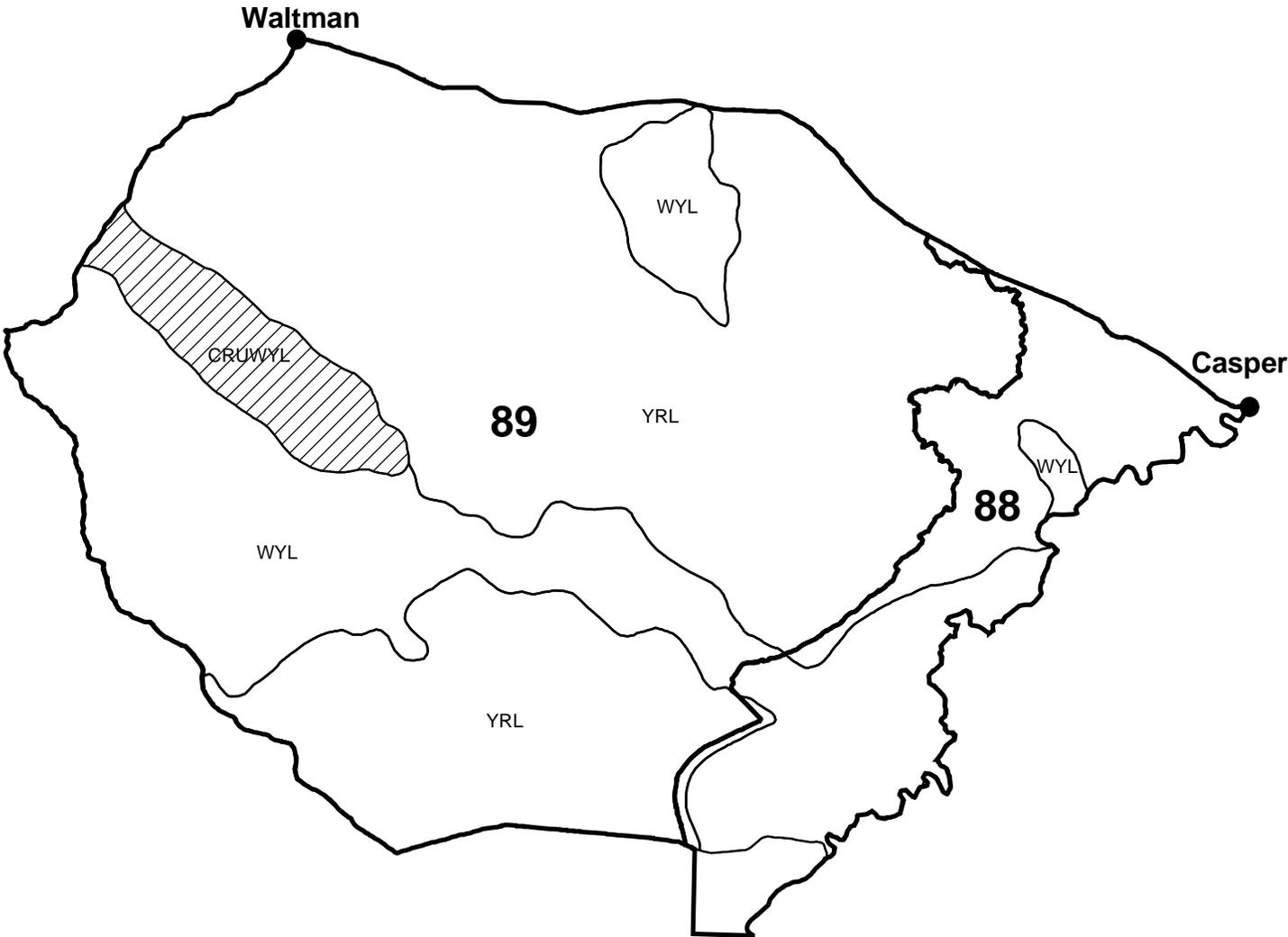
Year	Classification Counts						Harvest						
	Juvenile/Female Ratio			Total Male/Female Ratio			Juv	Males	Females	Total Harvest	Segment Harvest Rate (% of		
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE					Total Males	Females	
1993		58.29	5.13	13.65	10.86	1.85	20	368	197	565	53.1	7.6	
1994		44.24	6.22	19.56	21.21	3.95	34	163	199	396	27.3	8.2	
1995		54.94	4.53	21.86	25.78	2.80	13	140	66	219	23.2	3.0	
1996		98.53	6.42	27.69	31.16	2.93	0	78	0	78	11.7	0.0	
1997		90.24	6.82	34.16	30.35	3.27	18	214	83	315	21.6	3.5	
1998		71.43	4.96	34.45	22.94	2.38	6	314	60	380	27.5	2.4	
1999		80.65	6.54	35.67	37.83	3.91	8	257	104	369	23.0	4.1	
2000		62.31	4.38	38.25	35.42	3.01	16	263	133	412	22.1	5.2	
2001		71.79	6.72	39.16	35.16	4.17	0	218	83	301	18.8	3.3	
2002		79.20	5.09	41.68	36.50	3.02	21	213	102	336	17.5	4.1	
2003		81.55	7.39	45.12	32.47	3.98	5	205	100	310	15.6	3.9	
2004		85.56	5.81	46.23	36.73	3.27	13	258	91	362	18.1	3.5	
2005		88.48	5.66	46.25	43.76	3.47	10	302	94	406	19.9	3.5	
2006		59.33	3.70	46.67	42.26	2.95	4	327	130	461	20.5	4.6	
2007		63.06	5.34	43.07	41.94	4.07	13	378	203	584	25.6	7.4	
2008		57.94	3.50	40.32	37.25	2.61	6	357	200	563	26.8	7.6	
2009		57.78	4.41	37.07	40.30	3.47	19	325	158	502	27.6	6.4	
2010		51.75	4.02	34.61	34.70	3.10	9	275	92	376	26.2	4.0	
2011		45.26	3.40	30.61	43.68	3.32	2	270	39	311	28.6	1.7	
2012		48.29	4.34	27.64	28.61	3.11	0	206	15	221	25.9	0.7	
2013		52.66	4.62	29.57	24.20	2.83	0	112	12	124	15.4	0.6	
2014		82.61	6.40	31.60	43.75	4.13	0	115	8	123	15.1	0.4	
2015		55.19	4.66	38.12	44.81	4.05	0	115	0	115	12.1	0.0	
2016													
2017													
2018													
2019													
2020													
2021													
2022													
2023													
2024													
2025													

FIGURES



Comments:

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



2014 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2014 - 5/31/2015

HERD: MD759 - NORTH NATRONA

HUNT AREAS: 34

PREPARED BY: HEATHER O'BRIEN

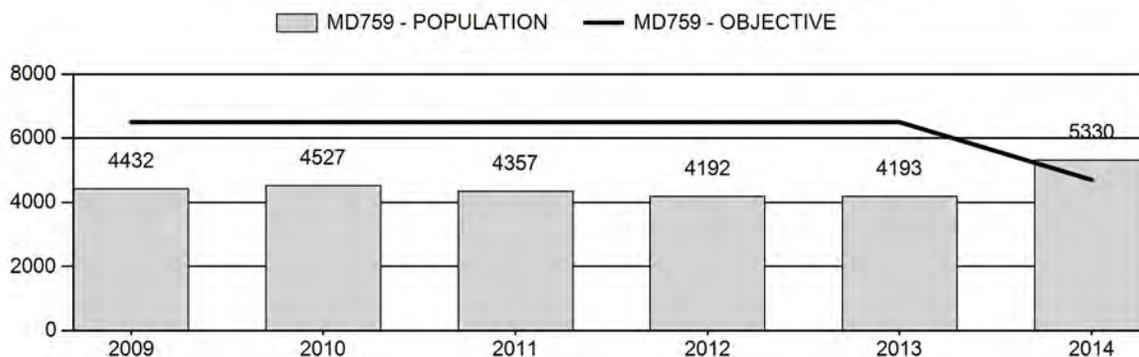
	<u>2009 - 2013 Average</u>	<u>2014</u>	<u>2015 Proposed</u>
Population:	4,340	5,330	5,277
Harvest:	241	107	112
Hunters:	318	130	140
Hunter Success:	76%	82%	80%
Active Licenses:	335	130	140
Active License Success:	72%	82%	80%
Recreation Days:	1,435	709	700
Days Per Animal:	6.0	6.6	6.2
Males per 100 Females	34	38	
Juveniles per 100 Females	49	96	

Population Objective ($\pm 20\%$) :	4700 (3760 - 5640)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	13%
Number of years population has been + or - objective in recent trend:	1
Model Date:	02/23/2015

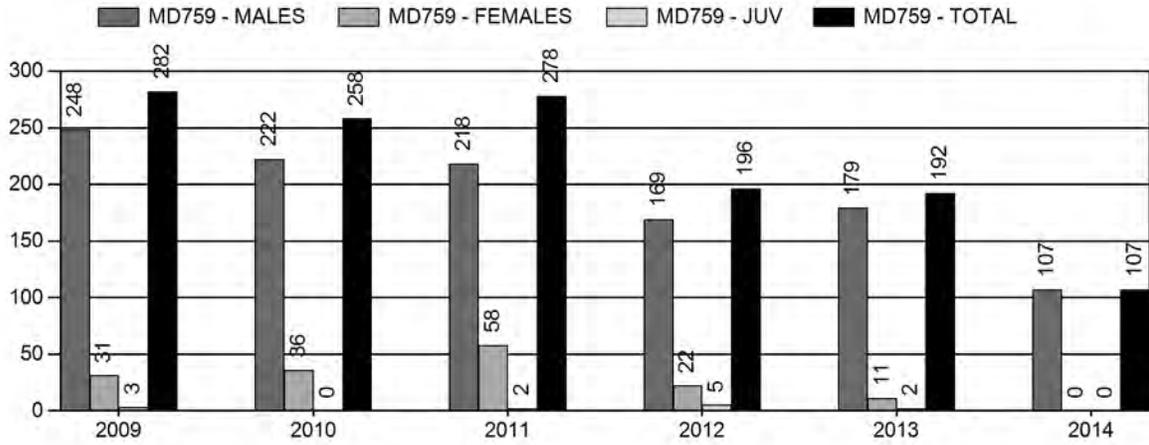
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0%	0%
Males ≥ 1 year old:	11.4%	8.7%
Juveniles (< 1 year old):	0%	0%
Total:	1.96%	2.07%
Proposed change in post-season population:	+26.8%	-0.01%

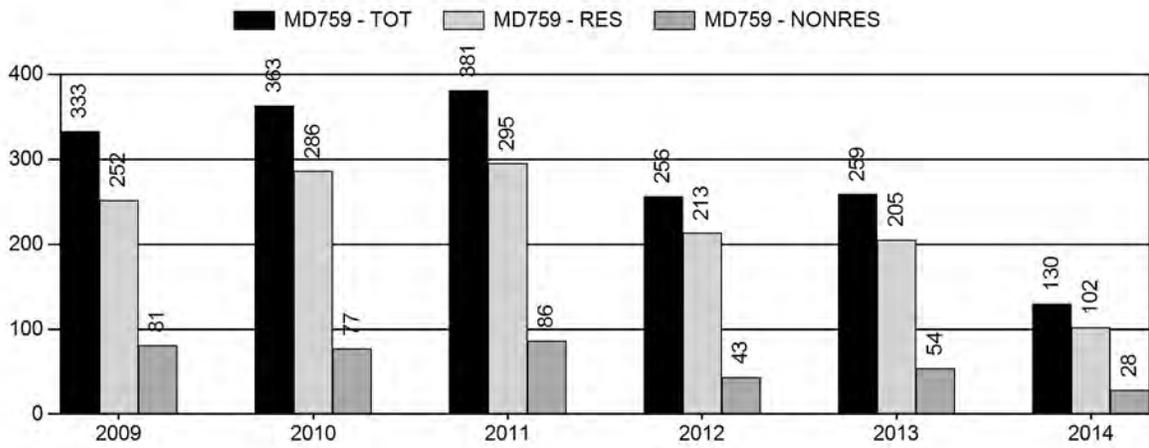
Population Size - Postseason



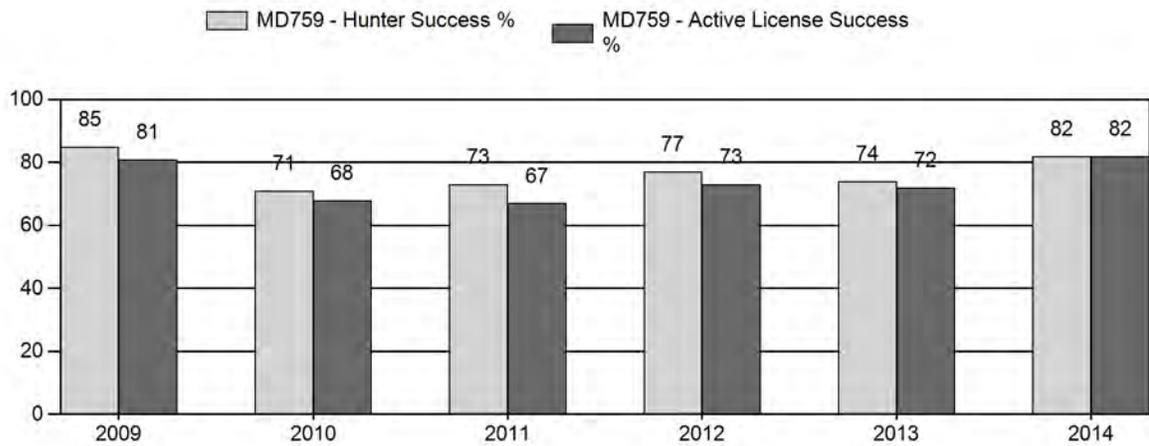
Harvest



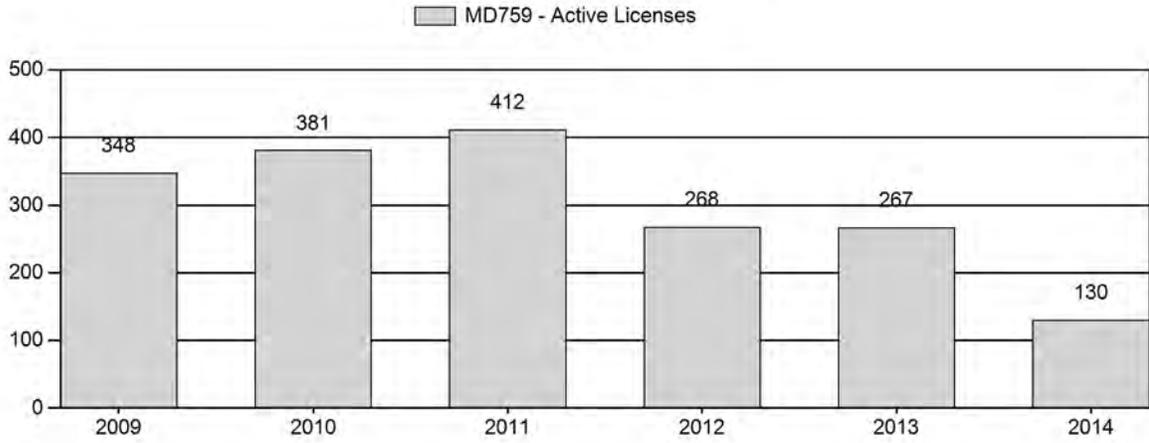
Number of Hunters



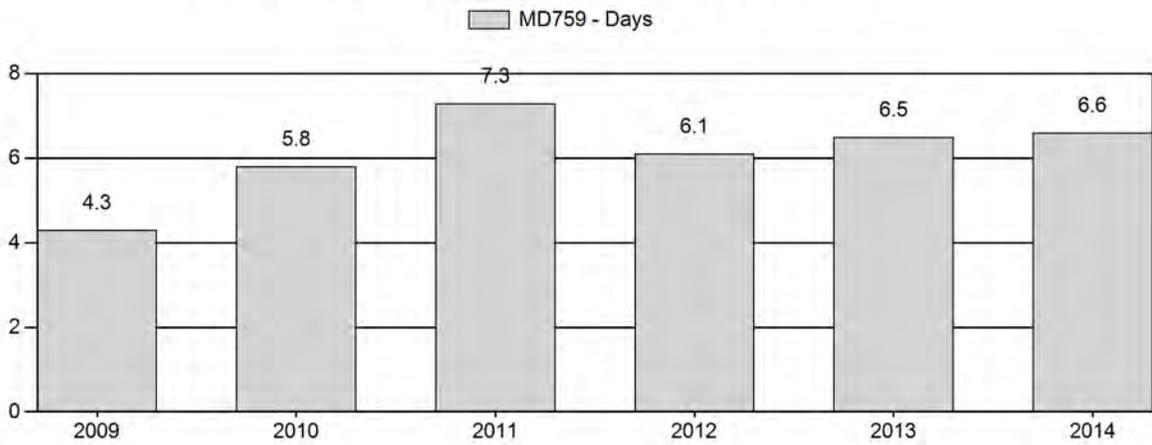
Harvest Success



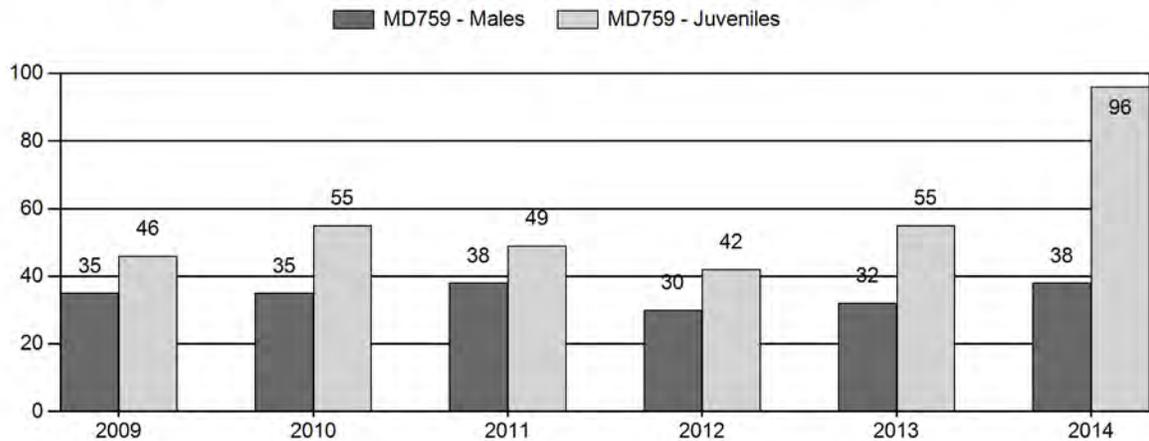
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 Postseason Classification Summary

for Mule Deer Herd MD759 - NORTH NATRONA

Year	Post Pop	MALES							FEMALES		JUVENILES		Tot Cls	Cls Obj	Males to 100 Females				Young to		
		Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%			YIng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	4,432	51	87	44	13	0	195	19%	558	55%	256	25%	1,009	668	9	26	35	± 3	46	± 4	34
2010	4,527	47	55	44	21	0	167	18%	476	53%	262	29%	905	830	10	25	35	± 4	55	± 5	41
2011	4,357	52	64	34	4	0	154	20%	406	53%	200	26%	760	851	13	25	38	± 4	49	± 5	36
2012	4,192	36	91	20	6	0	153	18%	503	58%	212	24%	868	760	7	23	30	± 3	42	± 4	32
2013	4,193	28	60	19	1	0	108	17%	342	54%	187	29%	637	580	8	23	32	± 4	55	± 6	42
2014	5,330	51	84	30	2	0	167	16%	441	43%	425	41%	1,033	1,713	12	26	38	± 4	96	± 8	70

**2015 HUNTING SEASONS
NORTH NATRONA MULE DEER HERD (MD759)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
34	1	Oct. 15	Oct. 31	150	Limited quota	Antlered deer
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2014
34	1	No Change

Management Evaluation

Current Postseason Population Management Objective: 4,700

Management Strategy: Special

2014 Postseason Population Estimate: 5,300

2015 Proposed Postseason Population Estimate: 5,300

2014 Hunter Satisfaction: 81% Satisfied, 9% Neutral, 10% Dissatisfied

The North Natrona Mule Deer Herd Unit has a postseason population management objective of 4,700 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 was formerly reviewed and revised in 2014. Prior to this review, the population objective was 6,500.

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 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.

Weather

The winter of 2010-2011 was severe throughout the herd unit, which may have resulted in somewhat 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 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 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. The spring of 2013 was cool with significant precipitation, with average rainfall over the summer as well. Still, habitat conditions remained poor in portions of the herd that received less spring and summer rain. Heavy precipitation during the fall of 2013 caused a beneficial late green-up, but also made travel difficult to impossible for hunters. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. Grass and forb growth were excellent, making 2014 the best growing season the region had seen in years. The spring and summer of 2014 undeniably produced improved range conditions that benefitted mule deer. 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 2014. Anecdotal observations during the summer growing season suggest range conditions were well above average, following extremely poor conditions that prevailed in 2012-2013. Herbaceous forage species were observed to be in very good condition in 2014 compared to previous years, and mule deer appeared to be in excellent body condition by winter 2014.

Field Data

Fawn production 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 with regard to conditional needs for population maintenance and/or growth. Fawn production improved strikingly in 2014, reaching a historic high of 96 per 100 does. Mild winter weather followed by an excellent growing season helped to improve conditions for fawns and

lactating does in 2014. Overwinter survival of fawns appeared to improve from 2013 to 2014 as well, as evidenced by higher yearling buck ratios.

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, 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. Yearling buck ratios were extremely poor during the same period, indicating poor recruitment and slowing recovery of mature buck ratios. Hunter satisfaction was also low in 2012 to 2013 (~68%), as hunters have high expectations of buck quality and availability within this special management area. Managers further reduced Type 1 licenses in 2014, to improve hunt quality and reduce pressure on mature bucks. As a result, buck ratios increased to 38 per 100 does, harvest success increased to 82%, and hunter satisfaction improved to 81%. Management goals for 2015 are to maintain or improve buck ratios within the range of special management, and maintain or improve harvest success and hunter satisfaction.

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. Bucks classified in 2014 showed similar distribution, with a slight shift from Class I to Class II. With hunter expectations high for trophy-quality hunting, managers view this poor availability of trophy class bucks as further justification to maintain low issuance of Type 1 licenses for the 2015 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
2014	1,033	51	84 (72%)	30 (26%)	2 (2%)	167	12	19	7	1	26	38

Figure 1. Antler classification analysis for the North Natrona Mule Deer Herd Unit, 2008-2014.

Harvest Data

Hunter success in the North Natrona Mule Deer Herd Unit is typically in the 70-80th percentile, and was 82% in 2014. Hunter days remained fairly average for this herd unit, at 6.6 days per animal, despite a reduction of Type 1 licenses. Survey totals, comments from hunters and landowners, and population modeling all indicate this herd remained relatively stable through 2013. Thus, managers suspect hunters are being selective, as the herd has developed a reputation of having high quality mature bucks. Extremely high fawn production is expected to cause a burst of growth in this herd for 2014, provided overwinter survival for 2014-2015 is good.

Tooth age data were collected from harvested bucks in the North Natrona Mule Deer Herd Unit in 2010, 2013, and 2014 (see Figure 2). It should be noted that changes in overall sample size between years are in part due to reductions in license issuance between sample years. Comparing data between years shows a consistency of hunter selection for mature bucks, with the average and median age remaining within prime age classes for mule deer. Average antler spread reported by hunters showed no change for 2010 and 2013, but decreased slightly in 2014. Fairly static results for average and median age of harvested bucks suggests availability of mature bucks has remained relatively constant due to adjustments in license issuance. Slight shifts in average and median age between sample years may be due to variations in age class distribution from one year to the next. No definite trend is apparent with only three years of collected data however, and further research would be necessary to isolate what population and harvest variables may contribute to these shifts. Regardless, these tooth-age data indicate past and current management prescription has resulted in most hunters harvesting prime-age bucks, which is consistent with management strategy.

	2010	2013	2014
Average Age	4.44	5.4	5.27
Median Age	4.5	5.5	4.5
Average Antler Spread	21.2	21.2	20
Sample Size (N) =	68	52	44

Figure 2. Lab tooth age and antler spread data from Area 34 harvested mule deer, 2010, 2013, & 2014.

Population

The 2014 postseason population estimate was approximately 5,300, which represents an increase of approximately 1,000 deer since postseason 2013. Postseason classification data and harvest data are applied to the model to predict population size and trends for this herd. The high fawn ratio observed during 2014 postseason classification surveys contributed nearly twice as many

juveniles to the model simulation compared to the previous year, creating a sudden increase in overall population size. 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 are very 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 based on established model criteria.

Management Summary

Traditional season dates in this herd run for two weeks from October 15th through October 31st. The 2015 season follows the same season dates with 150 Type 1 licenses. While buck ratios are in the middle of special management range, distribution of mature bucks across antler classes is still mediocre. Thus, increases in license issuance and are not yet warranted. Managers would prefer to maintain high harvest success and hunter satisfaction, while allowing an additional year for bucks to progress into older age classes. Type 6 licenses were eliminated in 2014, as there are currently no complaints of damage from mule deer. While fawn production in 2014 caused a sudden estimated population increase, fawn survival over the 2014-2015 winter will still need to be above average for this herd unit to grow as the model predicts. Type 6 licenses may be reinstated in future years should the population grow and damage to agriculture in this area become a concern again.

If we attain the projected harvest of 112 mule deer with fawn ratios similar to a 5-year average, this herd will remain stable. The predicted 2015 postseason population size of the North Natrona Mule Deer Herd is approximately 5,300 animals, or 13% above objective.

INPUT
 Species: Deer
 Biologist: Heather O'Brien
 Herd Unit & No.: MD 759 North Natrona
 Model date: 02/20/15

Clear form

MODELS SUMMARY			Relative AICc	Fit	Notes
CJ,CA	Constant Juvenile & Adult Survival	29	38	<input checked="" type="checkbox"/> CJ,CA Model	
SC,J,SCA	Semi-Constant Juvenile & Semi-Constant Adult Survival	25	39	<input type="checkbox"/> SCJ,SCA Mod	
TS,J,CA	Time-Specific Juvenile & Constant Adult Survival	4	130	<input type="checkbox"/> TSJ,CA Model	

Check best model to create report

Year	Posthunt Population Est. Field Est	Trend Count	Predicted Prehunt Population		Predicted Posthunt Population		Total	Objective		
			Juveniles	Total Males	Juveniles	Total Males			Females	
1993			918	882	2470	901	541	2268	3710	6500
1994			1218	702	2224	1214	473	2122	3809	6500
1995			1446	721	2173	1435	482	2061	3978	6500
1996			1701	783	2175	1701	580	2115	4396	6500
1997			1496	936	2289	1484	663	2238	4385	6500
1998			1273	956	2343	1273	704	2297	4273	6500
1999			1353	938	2342	1349	671	2237	4257	6500
2000			1225	929	2308	1211	545	2226	3981	6500
2001			1444	783	2264	1434	599	2160	4193	6500
2002			1228	886	2262	1226	647	2193	4066	6500
2003			1656	876	2239	1646	677	2192	4515	6500
2004			2014	1008	2343	2011	741	2266	5018	6500
2005			1752	1156	2500	1748	906	2400	5053	6500
2006			1113	1235	2552	1110	948	2461	4520	6500
2007			1593	1113	2447	1585	865	2333	4783	6500
2008			1198	1158	2453	1195	902	2413	4510	6500
2009			1100	1084	2425	1097	821	2391	4309	6500
2010			1289	998	2381	1289	753	2342	4384	6500
2011			1142	986	2386	1140	749	2313	4202	6500
2012			975	945	2324	969	759	2299	4027	6500
2013			1236	911	2269	1234	714	2256	4204	6500
2014			2214	938	2297	2214	820	2297	5330	4700
2015			1546	1276	2577	1546	1153	2577	5277	4700
2016										4700
2017										4700
2018										4700
2019										4700
2020										4700
2021										4700
2022										4700
2023										4700
2024										4700
2025										4700

Survival and Initial Population Estimates

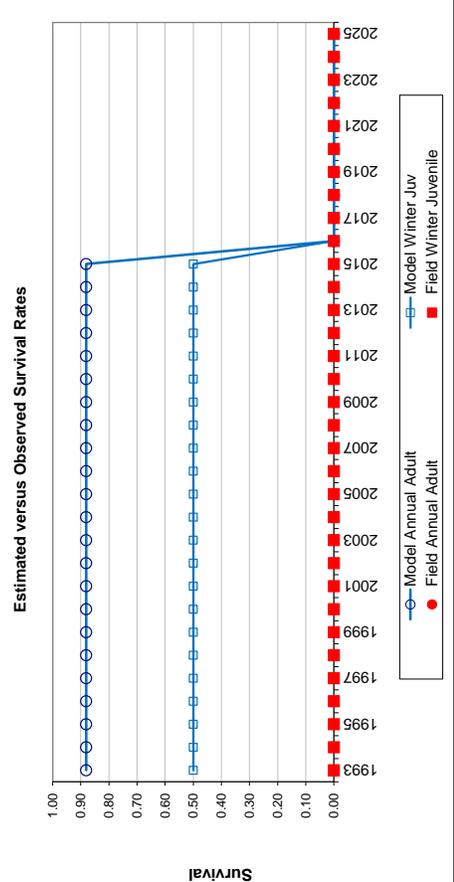
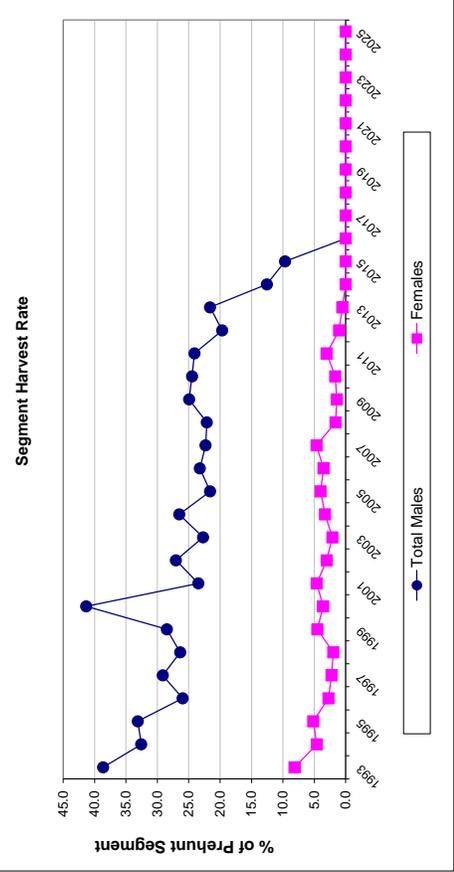
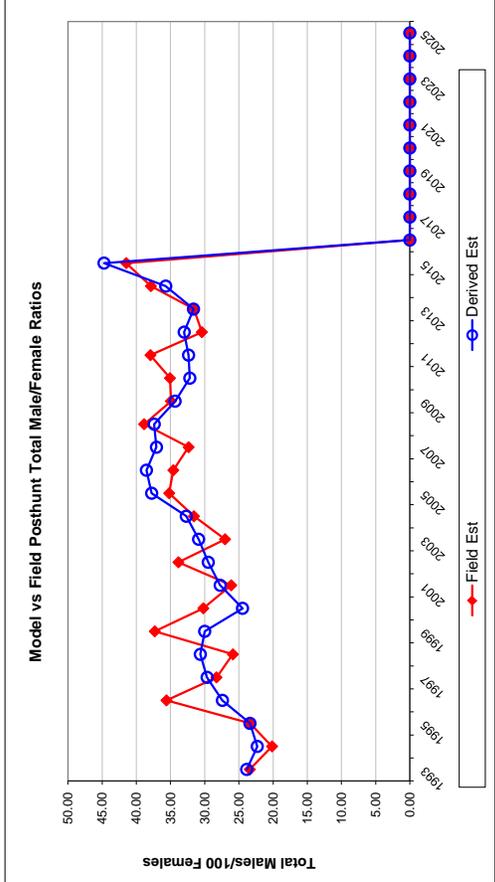
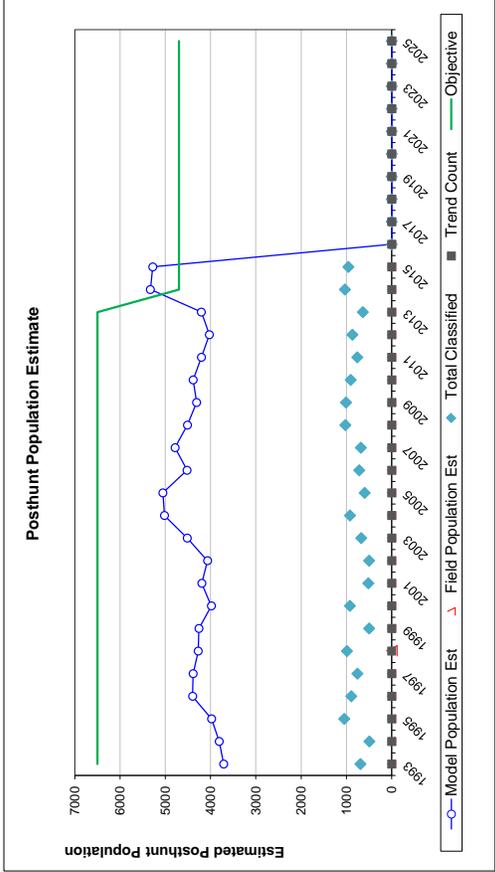
Year	Annual Juvenile Survival Rates		Annual Adult Survival Rates	
	Model Est	Field Est	Model Est	Field Est
1993	0.50		0.88	
1994	0.50		0.88	
1995	0.50		0.88	
1996	0.50		0.88	
1997	0.50		0.88	
1998	0.50		0.88	
1999	0.50		0.88	
2000	0.50		0.88	
2001	0.50		0.88	
2002	0.50		0.88	
2003	0.50		0.88	
2004	0.50		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	0.50		0.88	
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%

Year	Classification Counts						Harvest						
	Juvenile/Female Ratio			Total Male/Female Ratio			Juv	Males	Females	Total Harvest	Segment Harvest Rate (% of		
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE					Total Males	Females	
1993		39.72	3.62	23.86	23.40	2.61	16	310	183	509	38.6	8.2	
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	27.41	35.59	3.42	0	185	54	239	26.0	2.7	
1997		66.32	5.33	29.64	28.28	3.05	11	248	47	306	29.1	2.3	
1998		55.41	3.98	30.64	25.87	2.44	0	229	42	271	26.4	2.0	
1999		60.32	6.19	30.00	30.20	4.51	4	243	96	343	28.5	4.5	
2000		54.40	4.10	24.47	30.20	2.80	13	349	75	437	41.3	3.6	
2001		66.42	6.42	27.73	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	32.69	31.58	3.15	2	243	70	315	26.5	3.3	
2005		72.82	6.62	37.75	35.19	4.07	4	227	91	322	21.6	4.0	
2006		45.11	4.05	38.52	34.59	3.42	2	261	82	345	23.2	3.5	
2007		67.94	5.79	37.05	32.35	3.55	7	226	103	336	22.3	4.6	
2008		49.54	3.69	37.38	38.86	3.15	2	233	36	271	22.1	1.6	
2009		45.88	3.46	34.33	34.95	2.91	3	248	31	282	24.9	1.4	
2010		55.04	4.23	32.17	35.08	3.16	0	222	36	258	24.5	1.7	
2011		49.26	4.26	32.36	37.93	3.59	2	216	66	284	24.1	3.0	
2012		42.15	3.45	33.00	30.42	2.81	5	169	22	196	19.7	1.0	
2013		54.68	4.97	31.64	31.58	3.49	2	179	11	192	21.6	0.5	
2014		96.37	6.55	35.70	37.87	3.44	0	107	0	107	12.6	0.0	
2015		60.00	4.50	44.72	41.47	3.51	0	112	0	112	9.7	0.0	
2016													
2017													
2018													
2019													
2020													
2021													
2022													
2023													
2024													
2025													

FIGURES



Comments:

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

