

## 2013 JCR Evaluation Form

Species: Mule Deer

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

Herd: MD740 - CHEYENNE RIVER

Hunt Areas: 7-14, 21

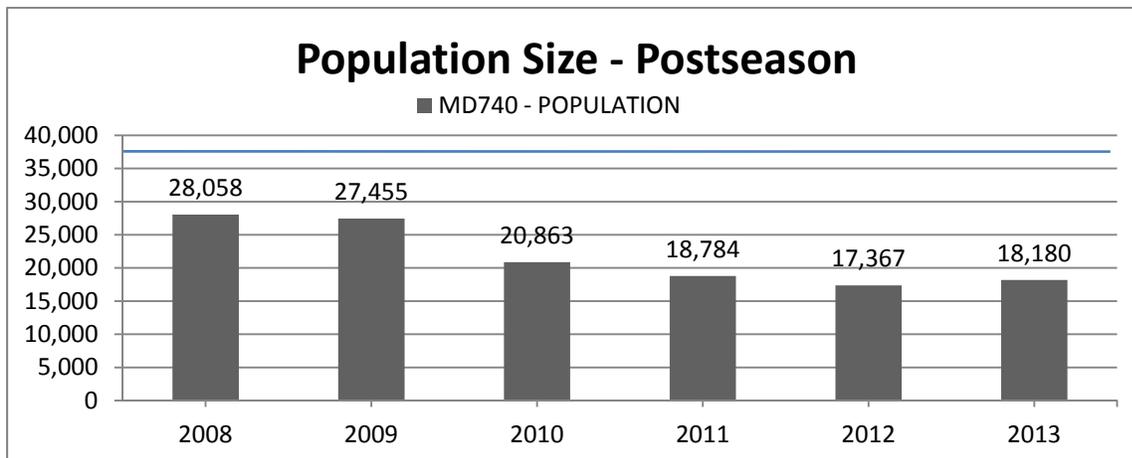
Prepared By: JOE SANDRINI

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

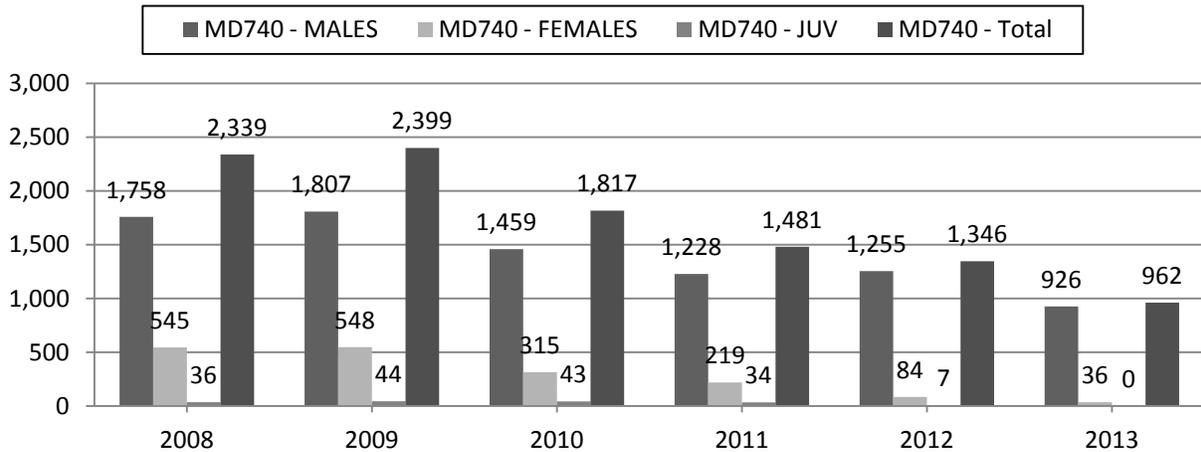
Population Objective:	38,000
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-52.2%
Number of years population has been + or - objective in recent trend:	13
Model Date:	02/20/2014

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

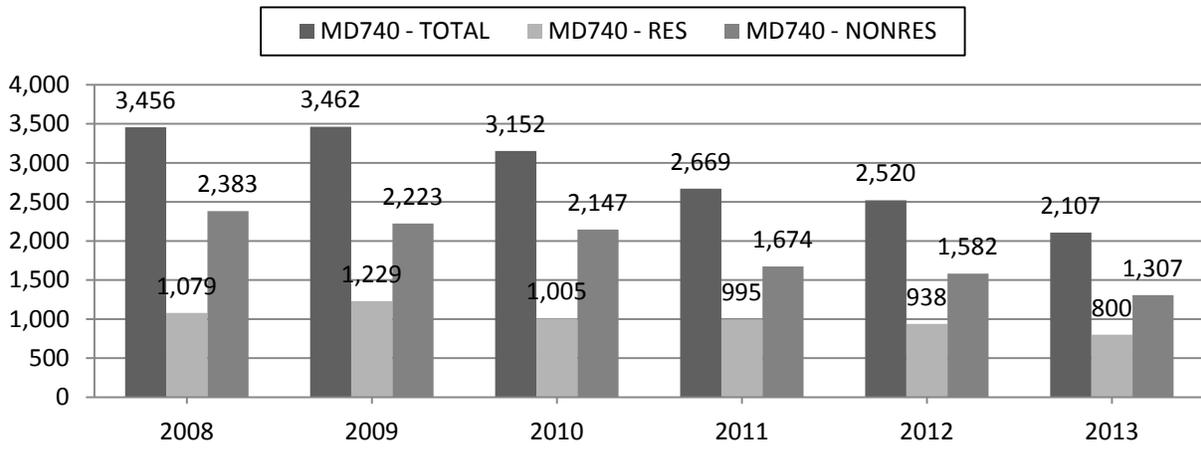
	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0.4%	0.4%
Males ≥ 1 year old:	24.4%	16.8%
Juveniles (< 1 year old):	0%	0.01%
Total:	5.5%	4.1%
Projected change in post-season population:	+4.7%	+3.2%



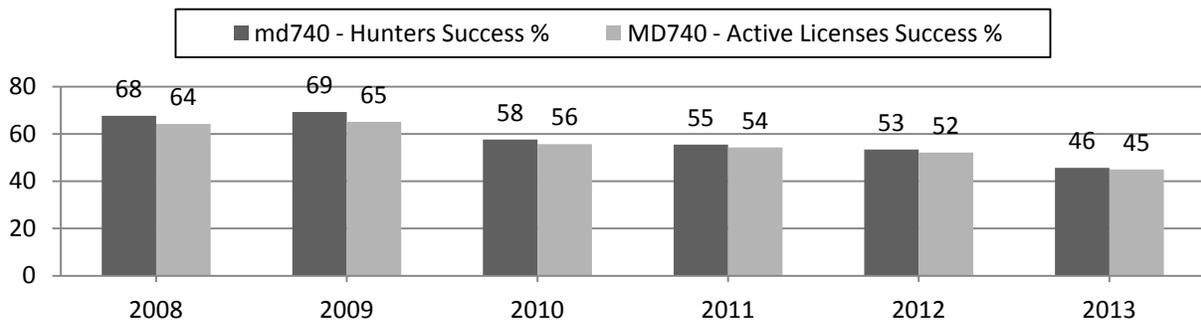
## Harvest

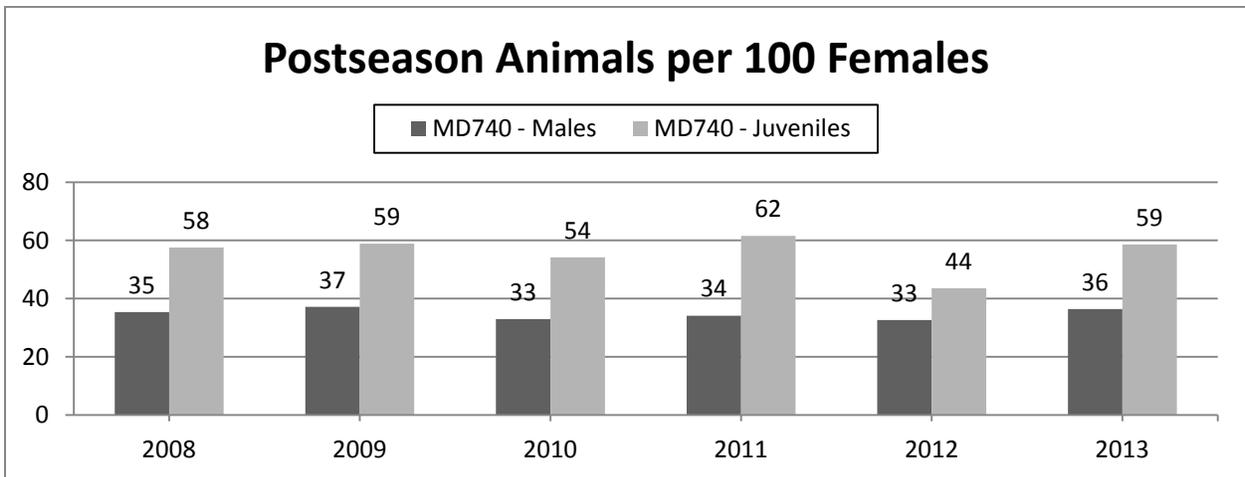
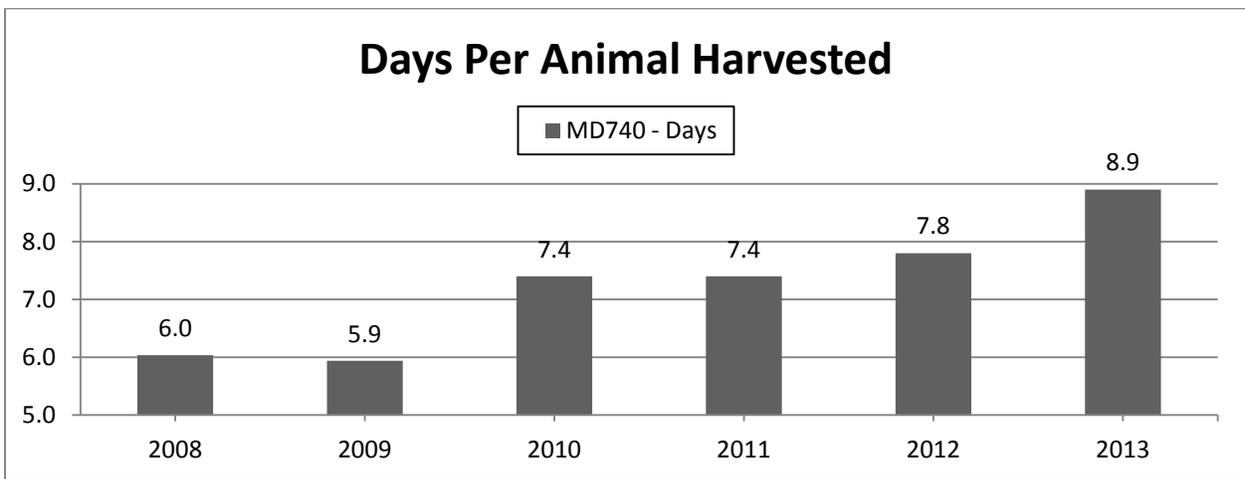
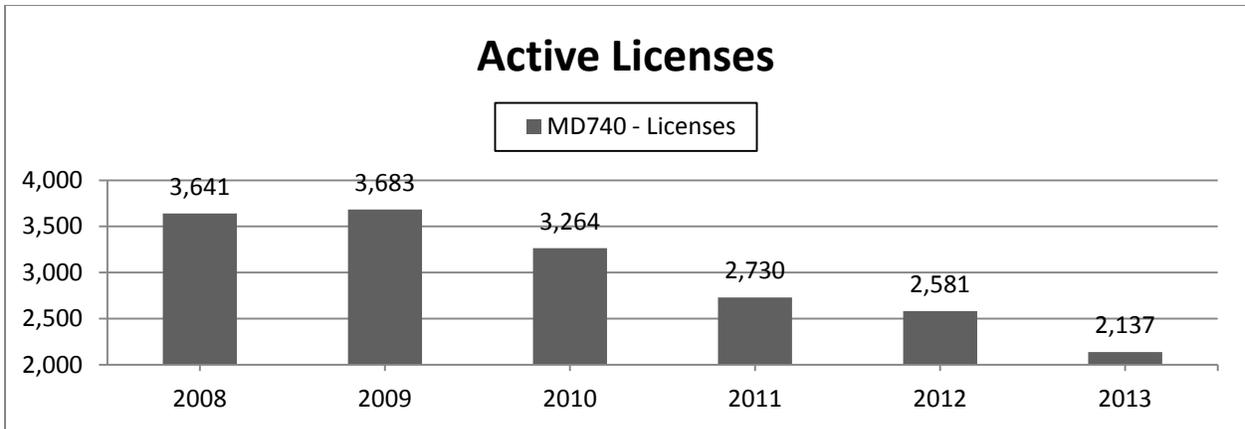


## Number of Hunters



## Harvest Success





## 2008 - 2013 Postseason Classification Summary

for Mule Deer Herd MD740 - CHEYENNE RIVER

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

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

**2014 HUNTING SEASONS  
CHEYENNE RIVER MULE DEER HERD (MD740)**

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

**Region B Nonresident Quota: 1,000**

**SUMMARY OF CHANGES IN LICENSE NUMBER**

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

## **Management Evaluation**

**Current Management Objective:** 38,000

**Management Strategy:** Recreational

**2012 Postseason Population Estimate:** ~ 17,400

**2013 Proposed Postseason Population Estimate:** ~ 18,200

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

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

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

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

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

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

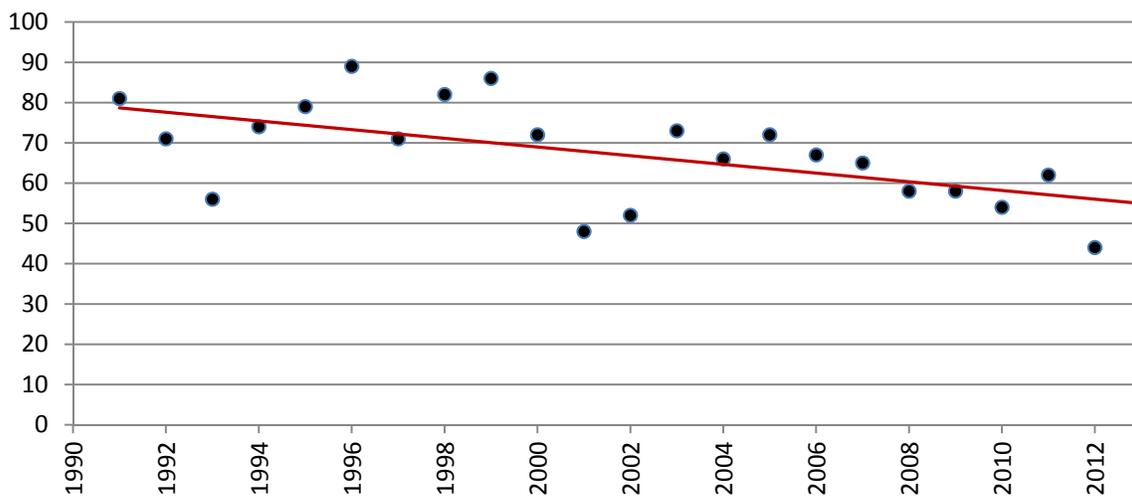
Several major cottonwood riparian drainages traverse the herd unit including the Belle Fourche River and Cheyenne Rivers and many of their tributary creeks such as Beaver Creek, Lightning Creek, Twenty-Mile Creek, Lance Creek, and Old Woman Creek. Overstory canopy along these drainages is dominated by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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

Clear form

MODELS SUMMARY			Relative AICc	Notes
	Fit	Check best model to create report		
C,J,CA	124	<input type="checkbox"/> C,J,CA Model	133	
SC,J,SCA	33	<input checked="" type="checkbox"/> SC,J,SCA	73	
TS,J,CA	11	<input type="checkbox"/> TS,J,CA Model	104	

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

Survival and Initial Population Estimates

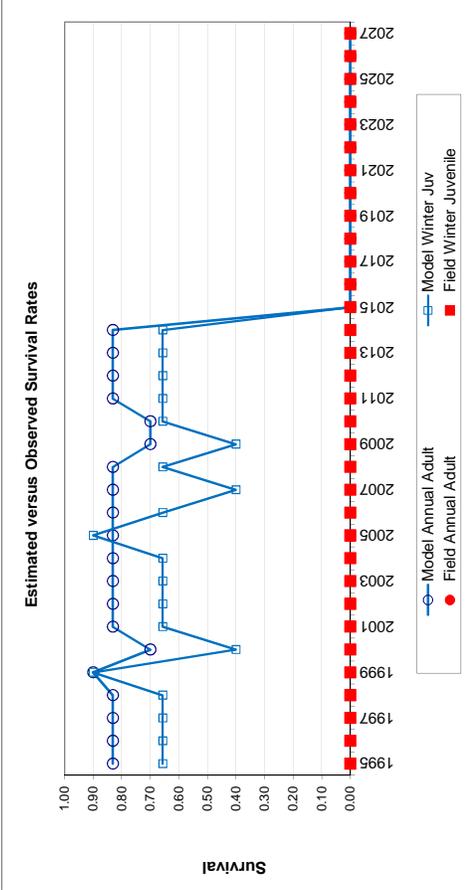
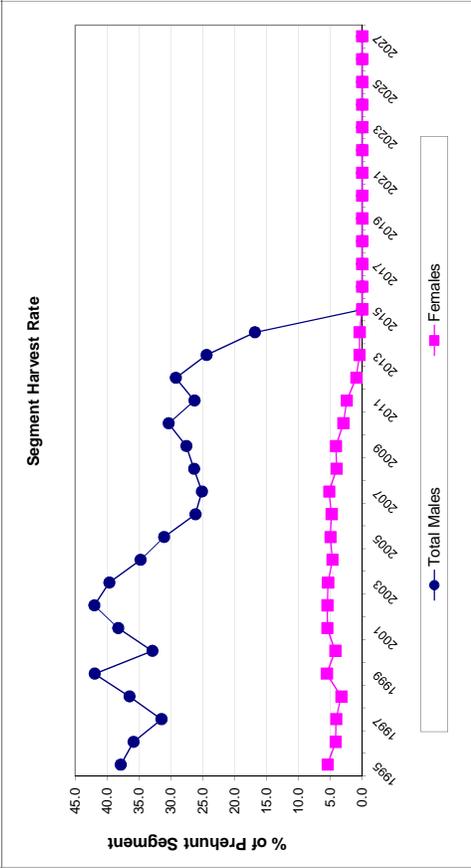
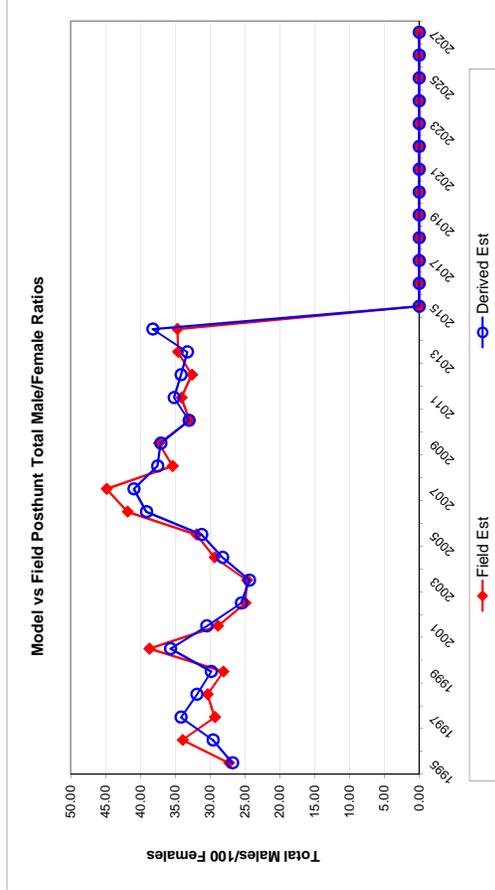
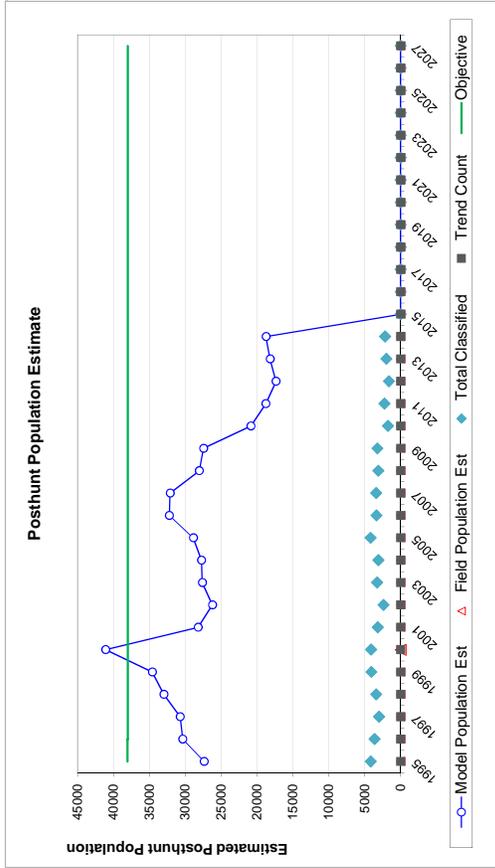
Year	Annual Juvenile Survival Rates		Annual Adult Survival Rates	
	Model Est	Field Est	Model Est	Field Est
1995	0.66		0.83	
1996	0.66		0.83	
1997	0.66		0.83	
1998	0.66		0.83	
1999	0.90		0.90	
2000	0.40		0.70	
2001	0.66		0.83	
2002	0.66		0.83	
2003	0.66		0.83	
2004	0.66		0.83	
2005	0.90		0.83	
2006	0.66		0.83	
2007	0.40		0.83	
2008	0.66		0.83	
2009	0.40		0.70	
2010	0.66		0.70	
2011	0.66		0.83	
2012	0.66		0.83	
2013	0.66		0.83	
2014	0.66		0.83	
2015				
2016				
2017				
2018				
2019				
2020				
2021				
2022				
2023				
2024				
2025				
2026				
2027				

Parameters:		Optim cells
Juvenile Survival =		0.656
Adult Survival =		0.831
Initial Total Male Pop/10,000 =		0.366
Initial Female Pop/10,000 =		1.329

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

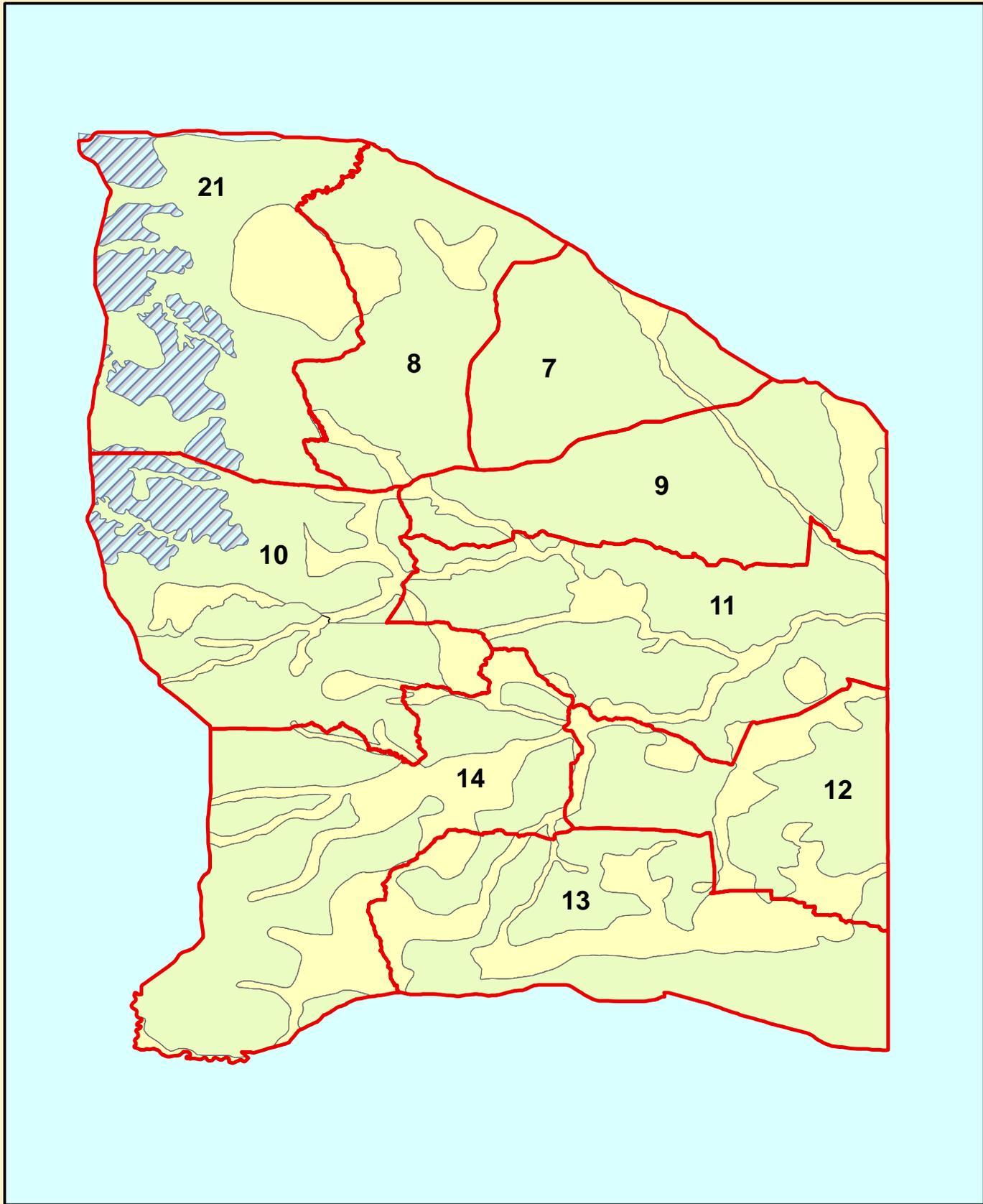
Year	Classification Counts						Harvest						
	Juvenile/Female Ratio			Total Male/Female Ratio			Juv	Males	Females	Total Harvest	Segment Harvest Rate (% of		
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE					Total Males	Females	
1995		79.28	2.65	26.78	27.32	1.31	82	1973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

FIGURES



Comments:

END



**Legend**

- Hunt\_Areas
- OUT
- YLG
- WYL

# MD 740

0 4.25 8.5 17 25.5 34 Miles

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

## 2013 - JCR Evaluation Form

SPECIES: Mule Deer

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

HERD: MD751 - BLACK HILLS

HUNT AREAS: 1-6

PREPARED BY: JOE SANDRINI

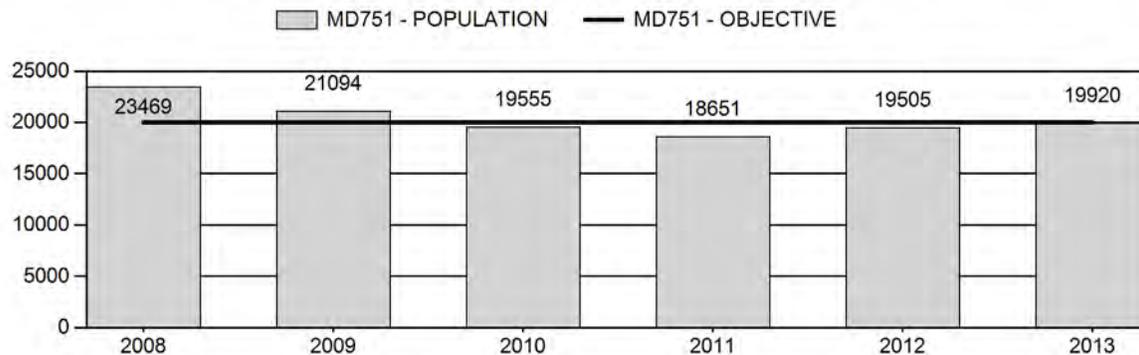
	<u>2008 - 2012 Average</u>	<u>2013</u>	<u>2014 Proposed</u>
Population:	20,455	19,920	21,525
Harvest:	2,061	1,548	1,555
Hunters:	5,055	3,719	3,740
Hunter Success:	41%	42%	42 %
Active Licenses:	5,251	3,767	3,790
Active License Percent:	39%	41%	41 %
Recreation Days:	16,104	11,324	11,665
Days Per Animal: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

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

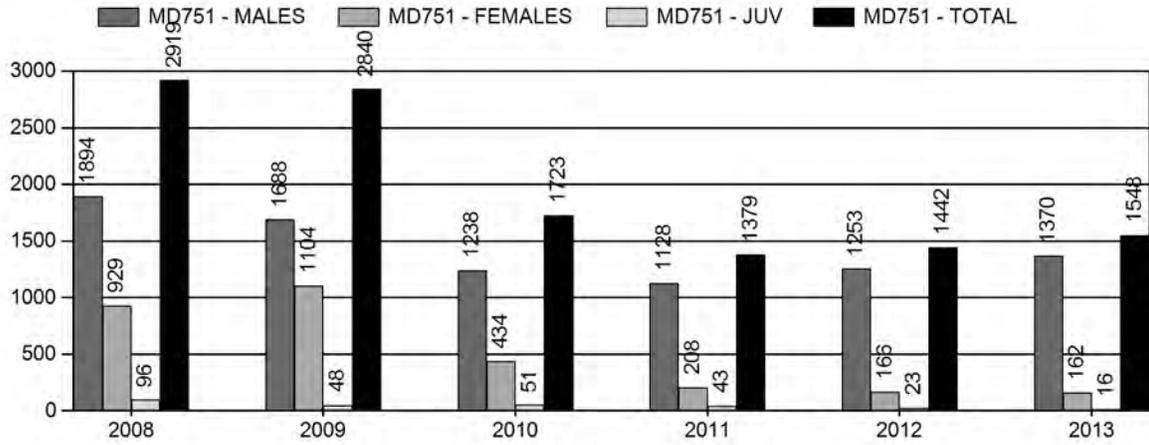
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

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

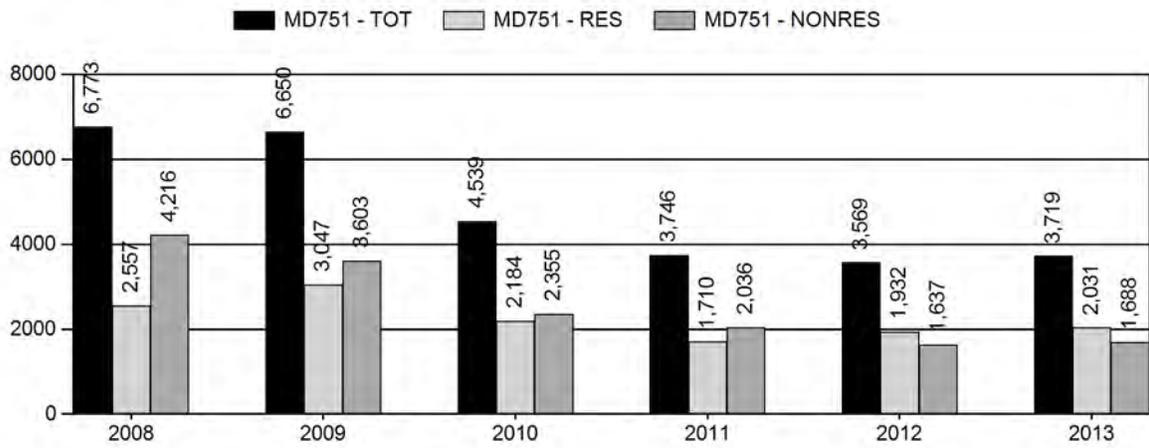
## Population Size - Postseason



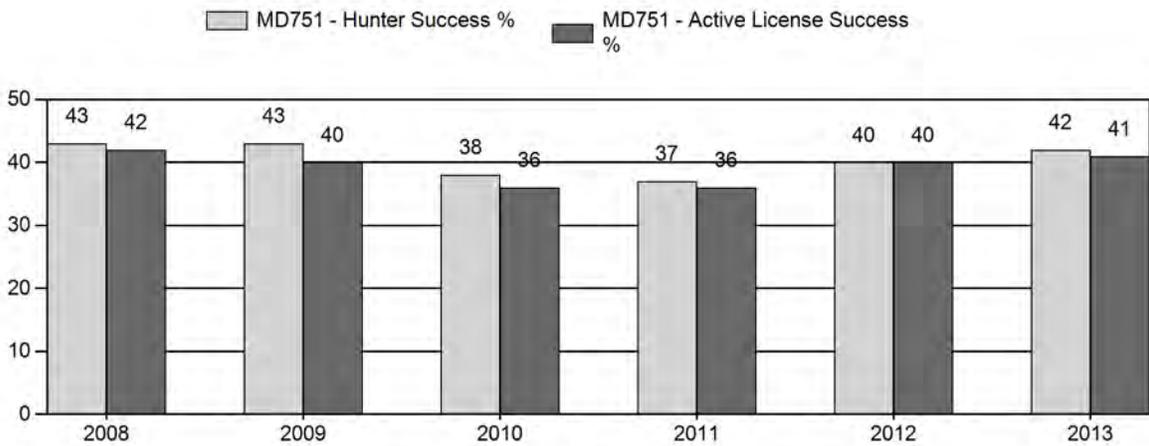
# Harvest



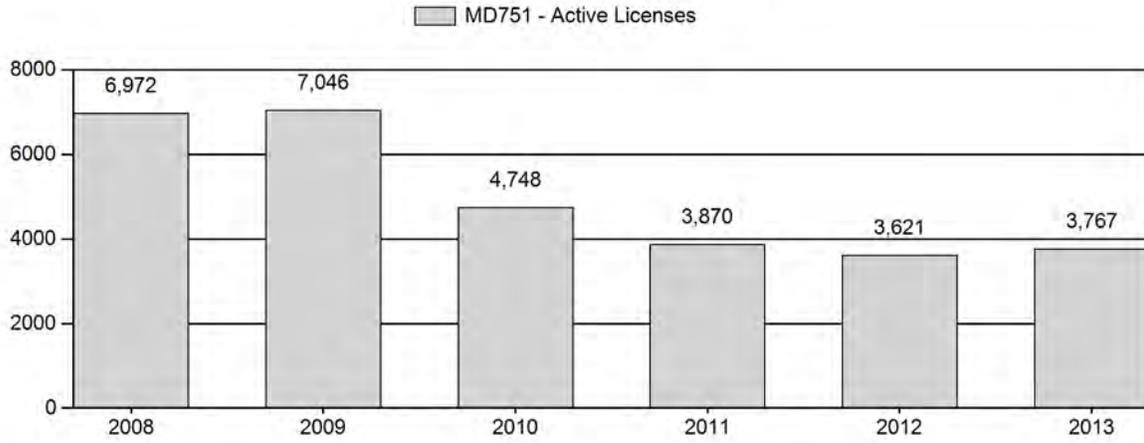
# Number of Hunters



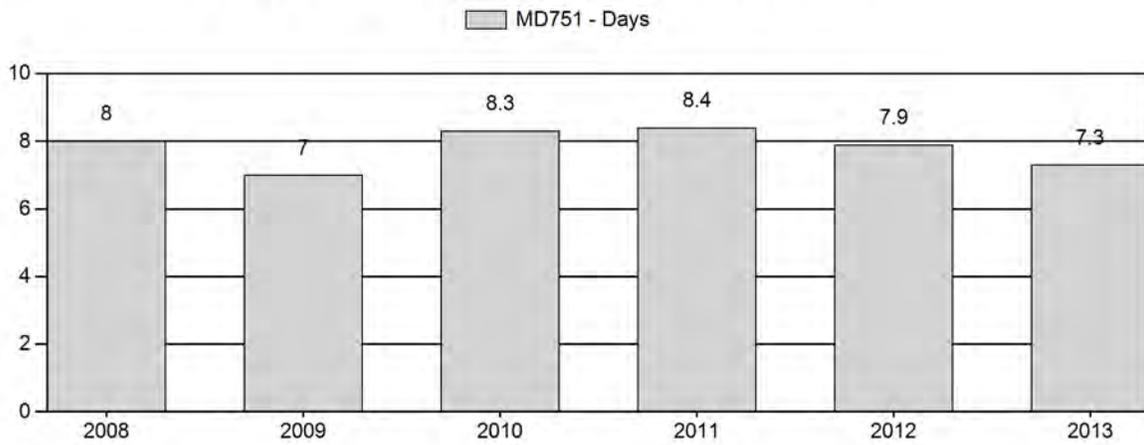
# Harvest Success



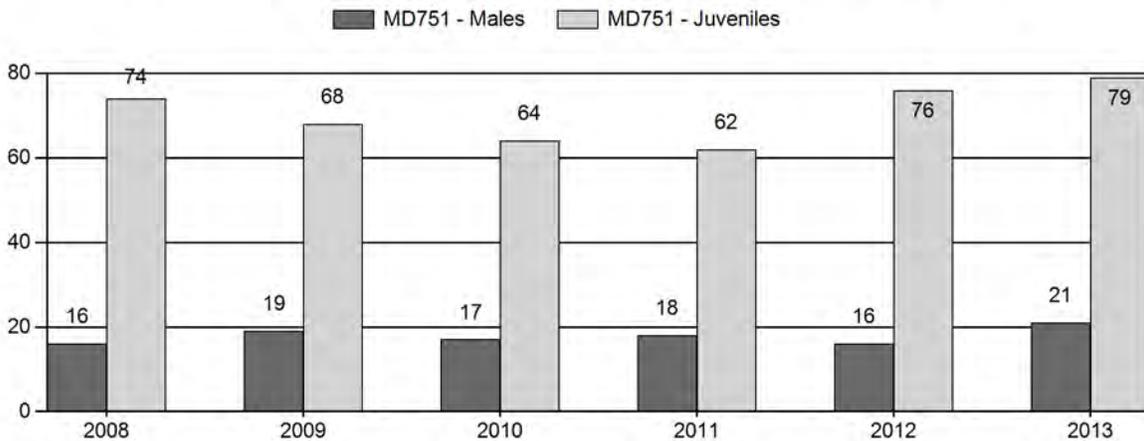
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



## 2008 - 2013 Postseason Classification Summary

for Mule Deer Herd MD751 - BLACK HILLS

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

**2014 HUNTING SEASONS  
BLACK HILLS MULE DEER HERD (MD751)**

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

**Region A Nonresident Quota: 2,750**

**SUMMARY OF CHANGES IN LICENSE NUMBER**

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

## **Management Evaluation**

**Current Postseason Population Management Objective:** 20,000

**Management Strategy:** Recreational

**2013 Postseason Population Estimate:** ~ 19,900

**2014 Proposed Postseason Population Estimate:** ~ 21,500

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

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

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

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

Drought returned to the Black Hills in 2012, with well above normal summer temperatures and little rainfall during the growing season. Forage production that year was very poor, and the dry conditions and led to several large wildfires in the southern half of the herd unit. These warm and dry conditions that beset the area in April of 2012 continued through the 2012-13 winter (<http://www.ncdc.noaa.gov/cag/time-series/us>). April of 2013 finally saw a break in this pattern when temperatures dropped well below normal for the entire month and good precipitation was again received. Through the remainder of the growing season, temperatures were slightly above average and precipitation well above normal. This resulted in excellent forage growth. In early October, 2013 winter storm Atlas blanketed the Black Hills with anywhere from about a foot of wet heavy snow near Newcastle, to three feet on the Bearlodge, and over five feet near Cement Ridge. This single storm event significantly hampered access for hunters on to the BHNF

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

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

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

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

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

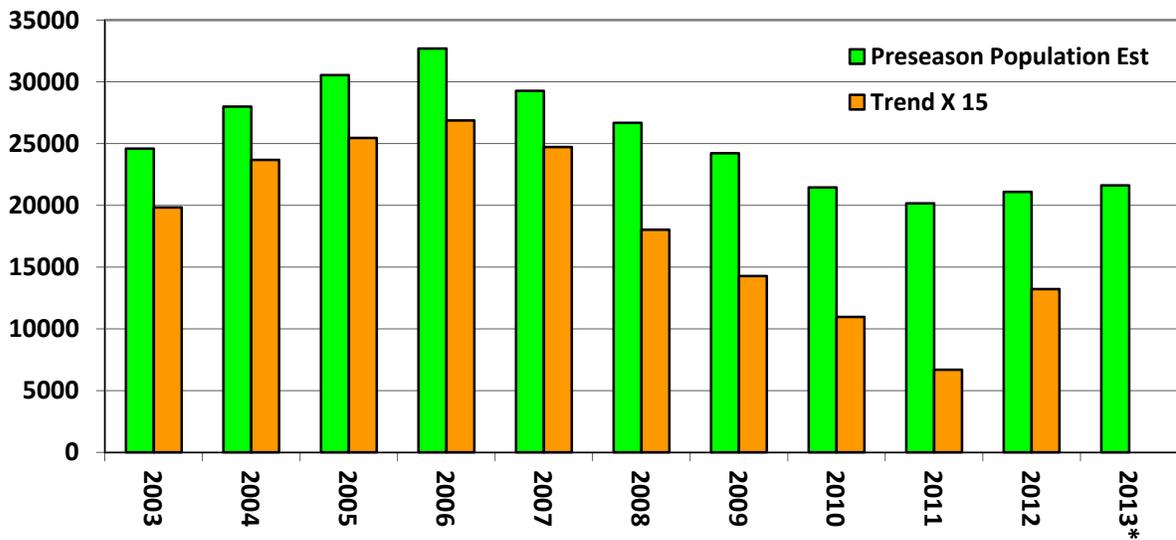


Figure 1. 2003 – 2013 pre-season population estimates produced by TSJ CA model, and mule deer observed pre-season along trend count routes (increased by a factor of 15).

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

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

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

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

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

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

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

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

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<sup>1</sup> Trend counts not conducted in 2013 due to winter storm Atlas.

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

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

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

MODELS SUMMARY			Relative AICc	Notes
	Fit			
C,J,CA	Constant Juvenile & Adult Survival	276	285	<input type="checkbox"/> C,J,CA Model
SC,J,SCA	Semi-Constant Juvenile & Semi-Constant Adult Survival	134	195	<input type="checkbox"/> SC,J,SCA
TS,J,CA	Time-Specific Juvenile & Constant Adult Survival	25	119	<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		Objective		
	Field Est	Field SE		Juveniles	Total	Juveniles	Total			
1995				6573	3900	8723	19197	6511	16885	20000
1996			9750	6570	3521	8844	18936	6549	16912	20000
1997			6750	4092	2817	8672	15581	4057	13651	20000
1998			8835	7241	2907	8956	19104	7208	17299	20000
1999			13530	8751	4411	10713	23874	8738	21777	20000
2000			15780	8331	6097	12927	27355	8310	25023	20000
2001			9225	6659	5184	12473	24316	6611	21747	20000
2002			14715	8300	4648	12462	25411	8263	23010	20000
2003			19830	7892	4396	12503	24592	7619	21524	20000
2004			23685	9234	5115	13643	27992	9172	24413	20000
2005			25455	9490	6031	15026	30547	9421	26877	20000
2006			26880	11825	5800	15079	32704	11726	29133	20000
2007			24720	9678	5113	14476	29267	9611	25558	20000
2008			18030	9184	4251	13242	26677	9078	23466	20000
2009			14280	7784	3914	12518	24216	7731	21092	20000
2010			10965	6920	3307	11221	21447	6863	19552	20000
2011			6690	6458	3088	10619	20166	6411	18649	20000
2012			13215	7719	3031	10342	21091	7694	19505	20000
2013				8075	3134	10415	21623	8057	19820	20000
2014				7845	4011	11380	23235	7828	21525	20000
2015										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

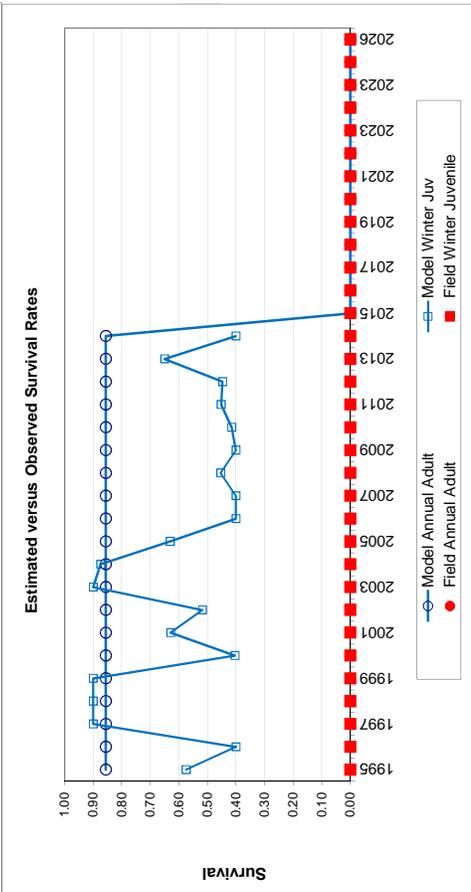
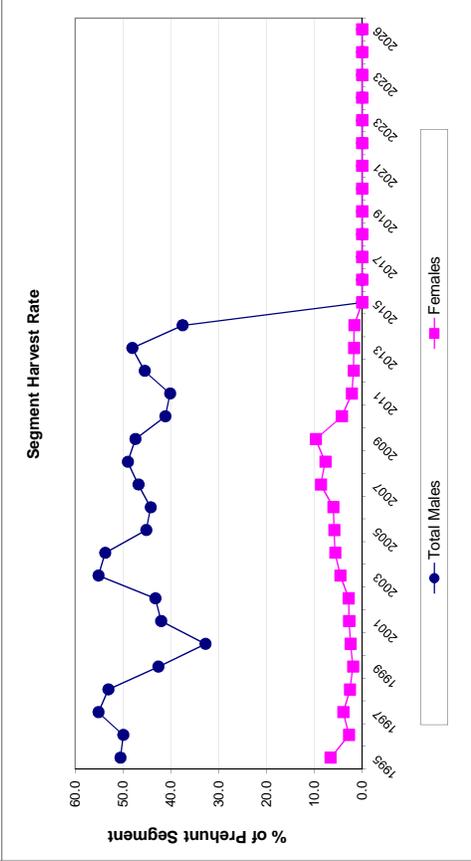
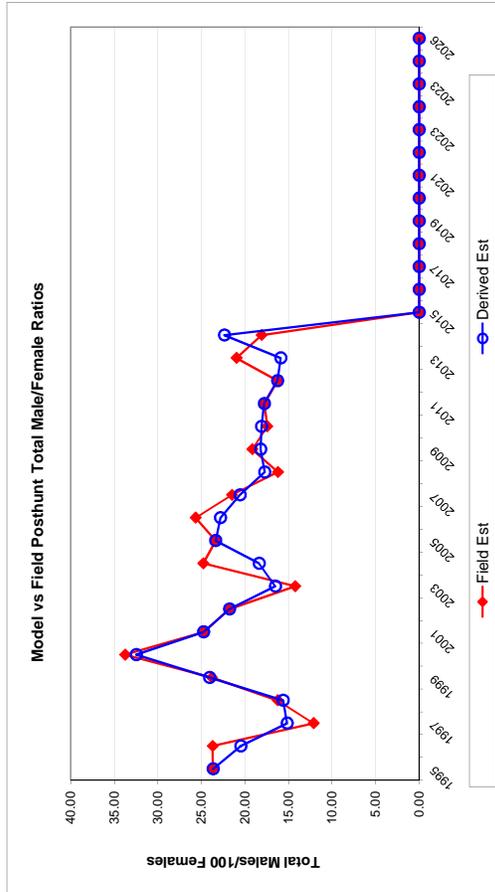
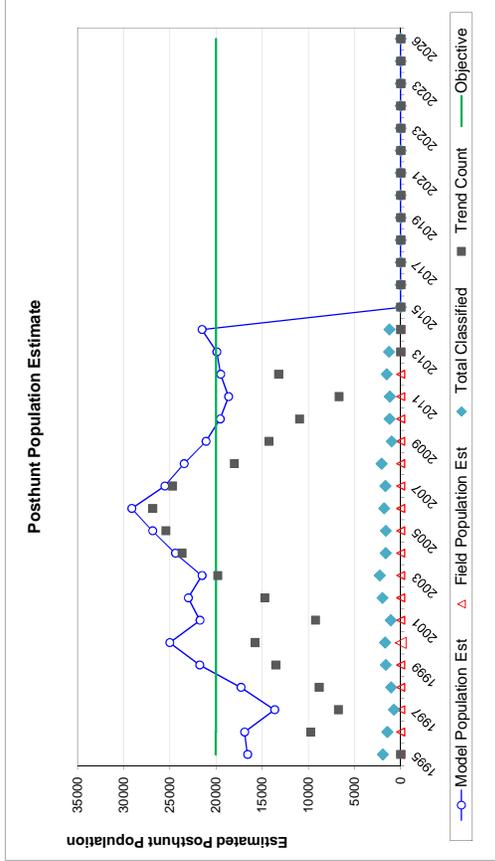
Year	Annual Juvenile Survival Rates		Annual Adult Survival Rates	
	Model Est	Field Est SE	Model Est	Field Est SE
1995	0.57		0.86	
1996	0.40		0.86	
1997	0.90		0.86	
1998	0.90		0.86	
1999	0.90		0.86	
2000	0.40		0.86	
2001	0.63		0.86	
2002	0.52		0.86	
2003	0.90		0.86	
2004	0.87		0.86	
2005	0.63		0.86	
2006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

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

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

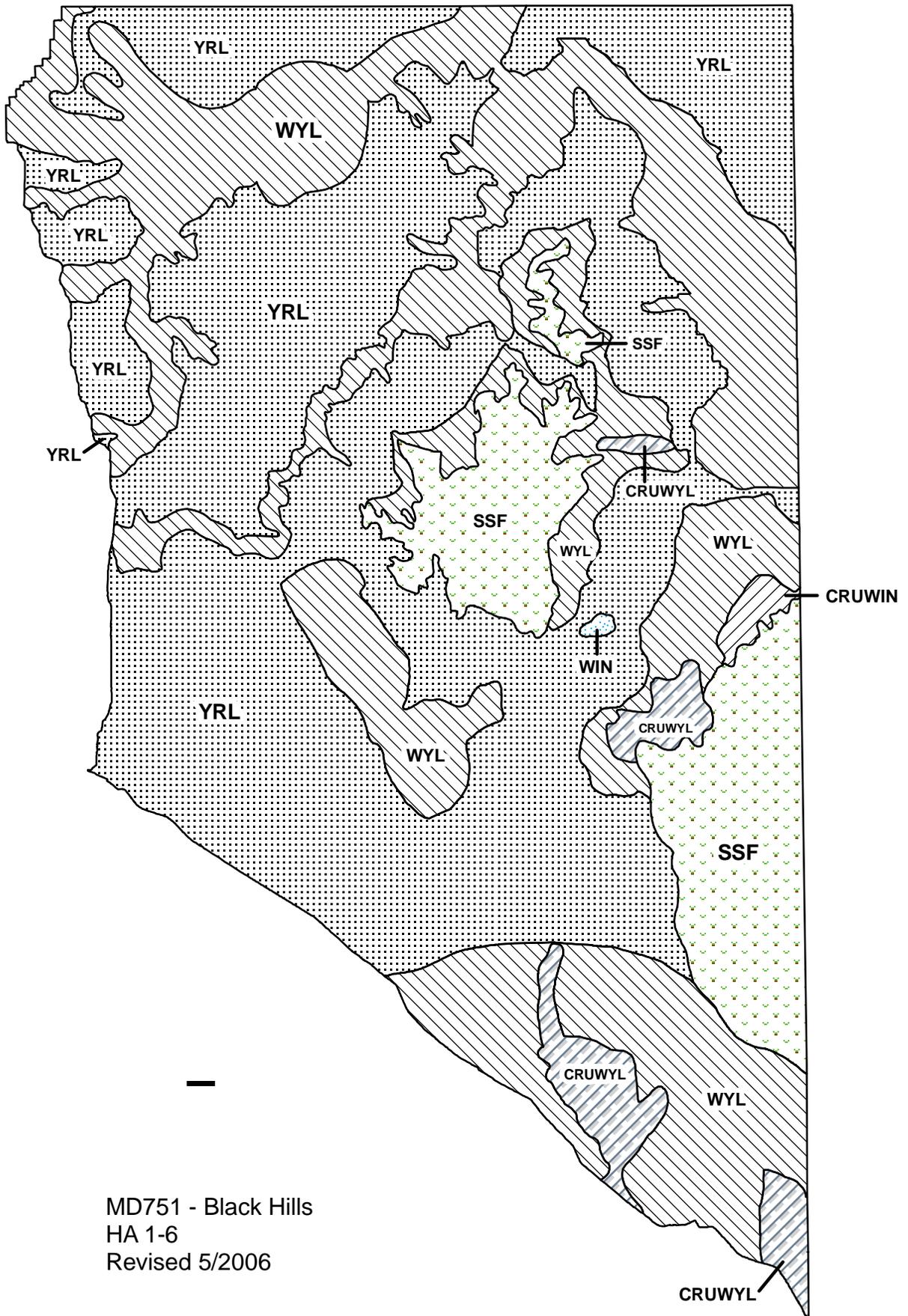
Year	Classification Counts						Harvest						
	Juvenile/Female Ratio			Total Male/Female Ratio			Juv	Males	Females	Total Harvest	Segment Harvest Rate (% of		
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE					Total Males	Females	
1995		79.92	3.89	23.66	23.66	1.75	57	1793	524	2374	50.6	6.6	
1996		76.14	4.31	20.48	23.72	2.02	19	1600	221	1840	50.0	2.7	
1997		48.70	3.96	15.16	12.12	1.72	32	1413	310	1755	55.2	3.9	
1998		82.60	5.37	15.62	16.25	1.90	30	1403	208	1641	53.1	2.6	
1999		83.14	4.43	24.07	23.81	1.95	12	1710	185	1907	42.6	1.9	
2000		65.88	3.60	32.49	33.77	2.31	19	1817	284	2120	32.8	2.4	
2001		54.49	3.74	24.76	24.75	2.26	44	1982	309	2335	42.1	2.7	
2002		68.23	3.32	21.78	21.79	1.60	34	1828	320	2182	43.3	2.8	
2003		63.84	2.87	16.51	14.23	1.13	67	2205	517	2789	55.2	4.5	
2004		71.24	3.83	18.37	24.79	1.93	56	2500	698	3254	53.8	5.6	
2005		66.59	3.62	23.38	23.38	1.85	63	2476	798	3337	45.2	5.8	
2006		82.73	4.20	22.82	25.67	1.94	90	2333	823	3246	44.2	6.0	
2007		72.66	3.83	20.57	21.50	1.75	61	2175	1136	3372	46.8	8.6	
2008		74.29	3.45	17.73	16.22	1.32	96	1894	929	2919	49.0	7.7	
2009		68.39	4.70	18.20	19.16	2.09	48	1688	1104	2840	47.4	9.7	
2010		63.88	3.99	18.10	17.45	1.76	51	1238	434	1723	41.2	4.3	
2011		61.70	3.89	17.78	17.78	1.78	43	1128	208	1379	40.2	2.2	
2012		75.73	4.11	16.26	16.26	1.55	23	1253	166	1442	45.5	1.8	
2013		78.71	4.71	15.89	20.98	2.00	16	1370	162	1548	48.1	1.7	
2014		69.94	4.27	22.37	18.10	1.81	15	1370	170	1555	37.6	1.6	
2015													
2016													
2017													
2018													
2019													
2020													
2021													
2022													
2023													
2024													
2025													
2026													

FIGURES



Comments:

END



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



## 2013 - JCR Evaluation Form

SPECIES: Mule Deer

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

HERD: MD755 - NORTH CONVERSE

HUNT AREAS: 22

PREPARED BY: ERIKA PECKHAM

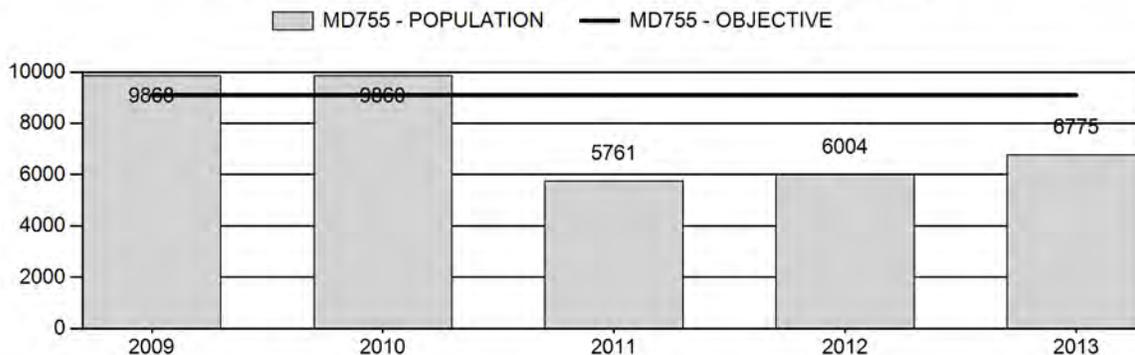
	<u>2008 - 2012 Average</u>	<u>2013</u>	<u>2014 Proposed</u>
Population:	8,383	6,775	6,946
Harvest:	715	323	240
Hunters:	839	498	350
Hunter Success:	85%	65%	69 %
Active Licenses:	896	528	325
Active License Percent:	80%	61%	74 %
Recreation Days:	3,340	2,237	1,300
Days Per Animal:	4.7	6.9	5.4
Males per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

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

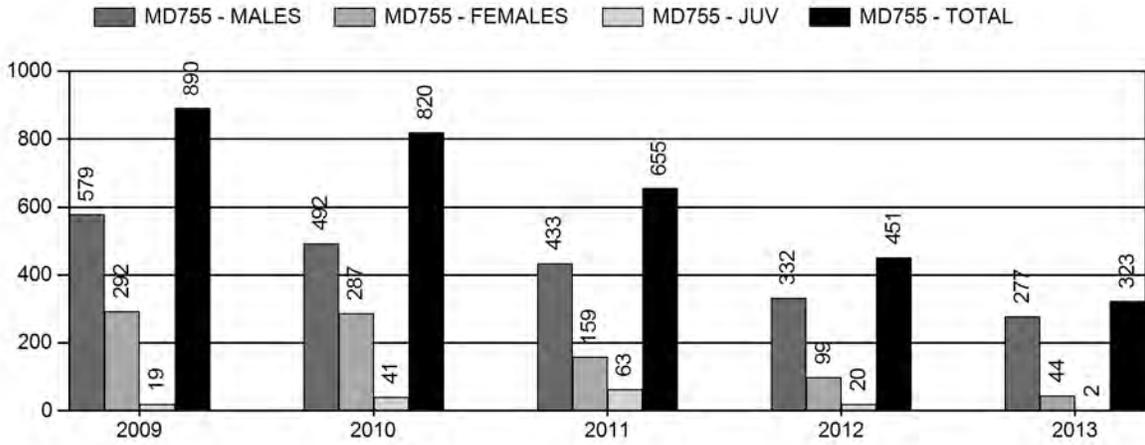
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

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

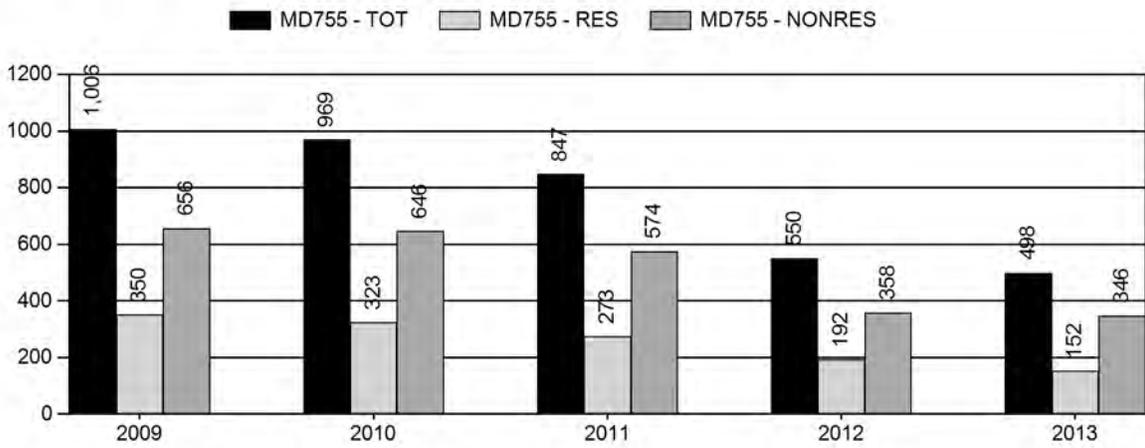
## Population Size - Postseason



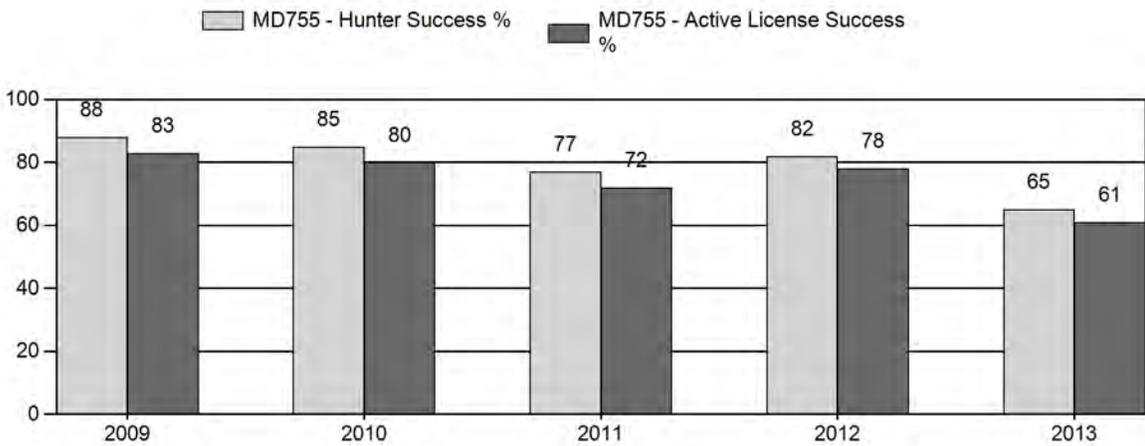
# Harvest



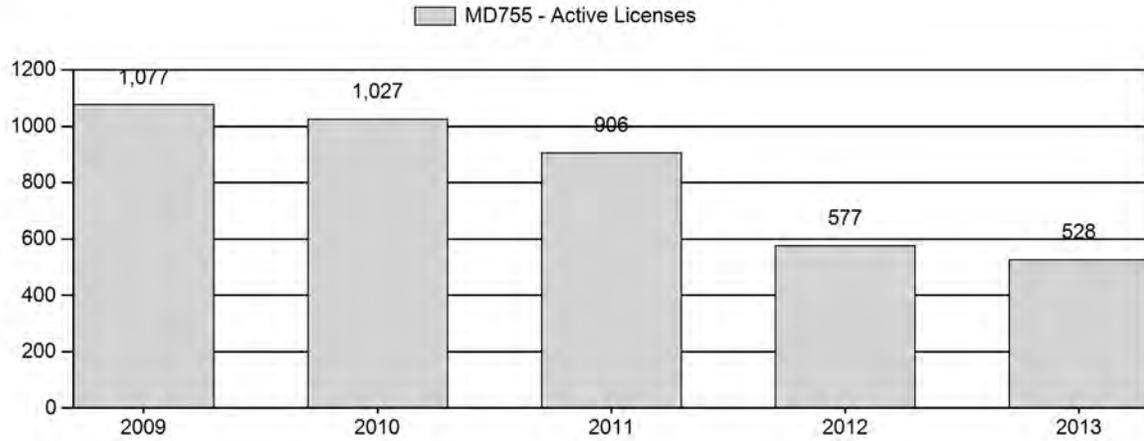
# Number of Hunters



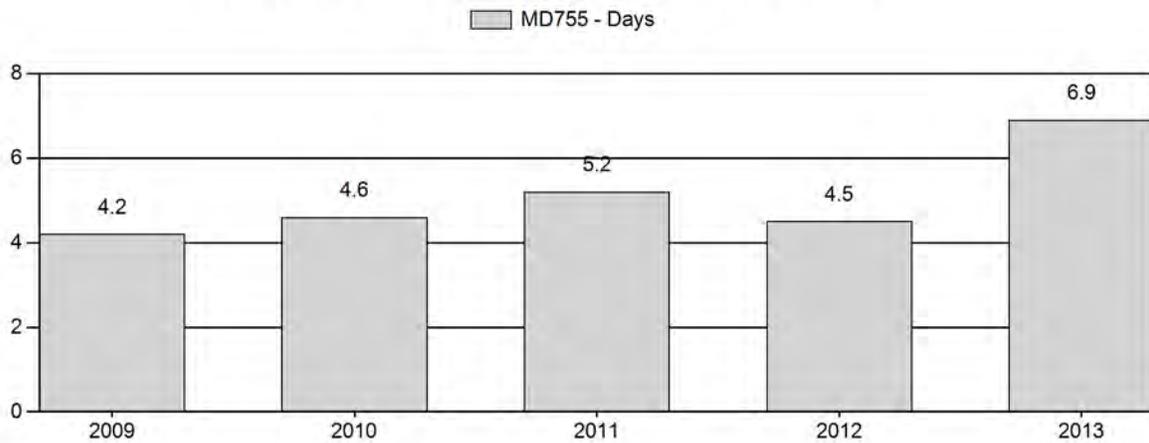
# Harvest Success



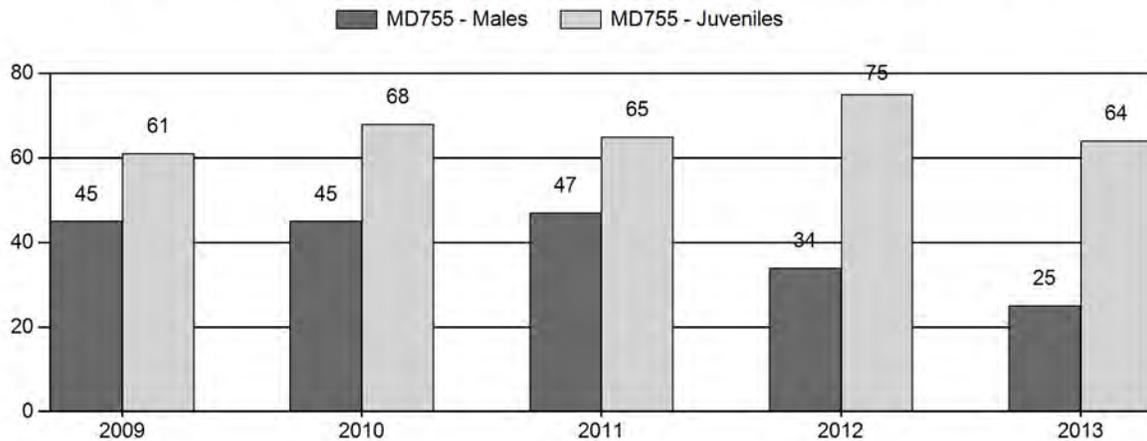
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



## 2008 - 2013 Postseason Classification Summary

### for Mule Deer Herd MD755 - NORTH CONVERSE

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

**2014 HUNTING SEASONS  
NORTH CONVERSE MULE DEER HERD (MD755)**

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

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

**Management Evaluation**

**Current Postseason Population Management Objective:** 9,100

**Management Strategy:** Special

**2013 Postseason Population Estimate:** ~6,800

**2014 Proposed Postseason Population Estimate:** ~6,900

**Herd Unit Issues**

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

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

## **Weather**

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

## **Habitat**

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

## **Field Data**

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

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

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

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

## **Harvest**

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

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

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

## **Population**

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

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

## **Management Summary**

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

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

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

MODELS SUMMARY			Relative AICc	Notes
CJ,CA	Constant Juvenile & Adult Survival	Fit	89	
SC,J,SCA	Semi-Constant Juvenile & Semi-Constant Adult Survival	80		
TS,J,CA	Time-Specific Juvenile & Constant Adult Survival	75	84	
		9	461	

Check best model to create report

- CJ,CA Model  
 SC,J,SCA Model  
 TS,J,CA Model

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	Females
1993			2727	2753	5103	10584	2716	2143	4866	9725	9100
1994			3432	2513	4845	10790	3402	1868	4555	9625	9100
1995			3620	2449	4750	10820	3595	1879	4535	10008	9100
1996			4229	2507	4781	11517	4219	2016	4568	10803	9100
1997			3591	2781	4965	11337	3532	2182	4730	10443	9100
1998			4536	2751	4932	12218	4481	2121	4712	11314	9100
1999			4211	2936	5154	12301	4190	2253	4888	11331	9100
2000			3273	2976	5232	11481	3245	2276	4972	10493	9100
2001			2889	2760	5088	10717	2874	2136	4849	9859	9100
2002			2468	2547	4870	9884	2448	2001	4624	9073	9100
2003			2747	2325	4570	9642	2726	1802	4361	8889	9100
2004			2911	2224	4415	9550	2902	1671	4174	8747	9100
2005			3306	2156	4299	9760	3289	1617	4031	8936	9100
2006			2573	2206	4273	9052	2567	1588	3996	8150	9100
2007			3410	2001	4062	9473	3395	1445	3858	8698	9100
2008			2676	2086	4151	8913	2658	1507	3912	8076	9100
2009			2266	1955	4013	8234	2245	1318	3692	7255	9100
2010			2358	1689	3722	7770	2313	1148	3406	6868	9100
2011			2213	1561	3494	7269	2144	1085	3320	6549	9100
2012			2484	1465	3378	7326	2462	1100	3271	6832	9100
2013			2157	1557	3416	7130	2155	1252	3367	6775	9100
2014			2177	1611	3422	7210	2177	1347	3422	6946	9100
2015											9100
2016											9100
2017											9100
2018											9100
2019											9100
2020											9100
2021											9100
2022											9100
2023											9100
2024											9100
2025											9100

Survival and Initial Population Estimates

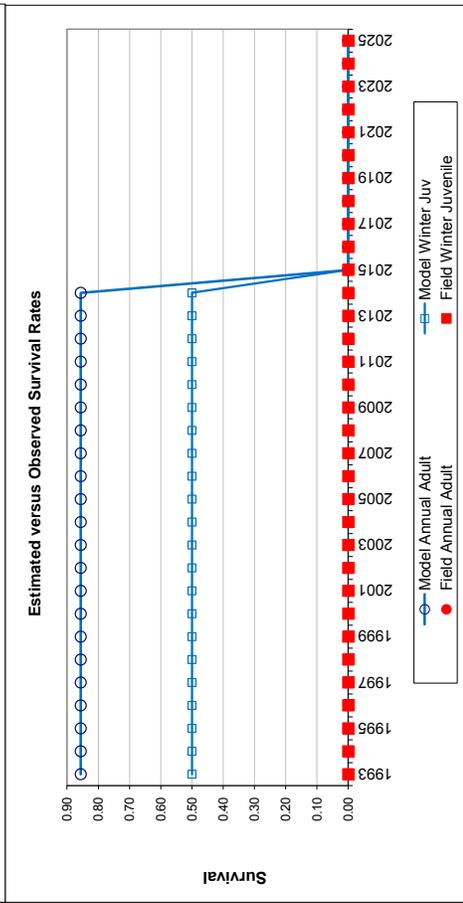
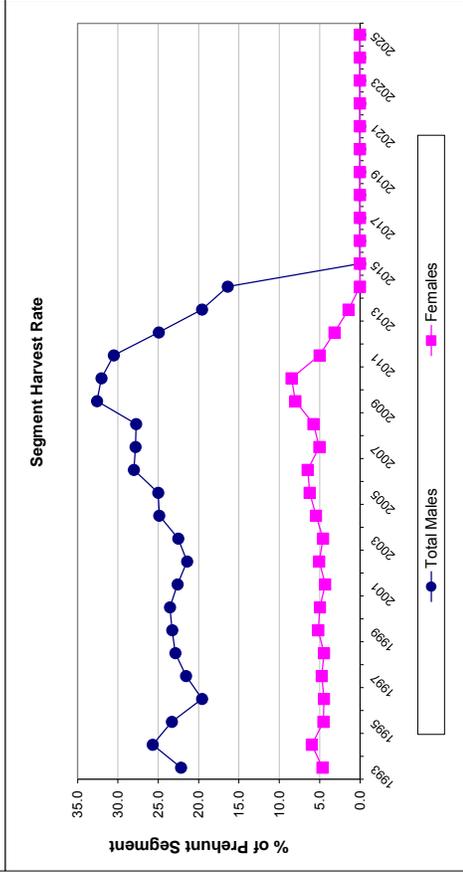
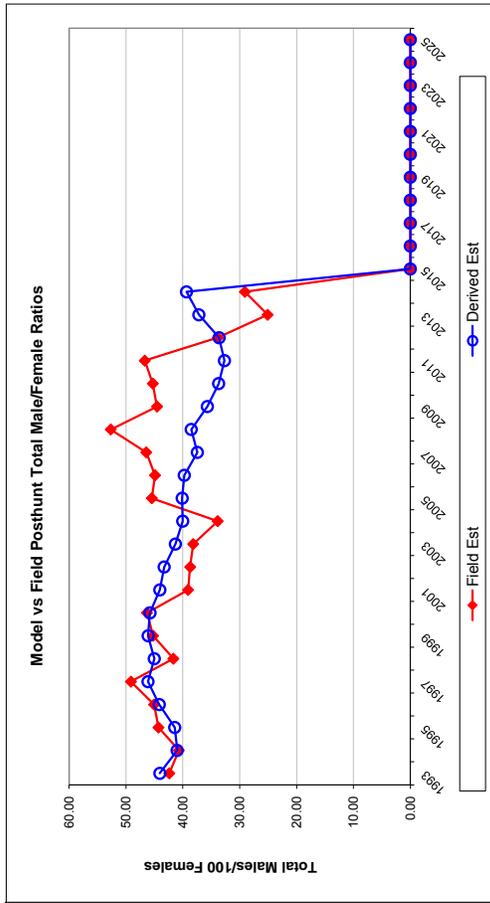
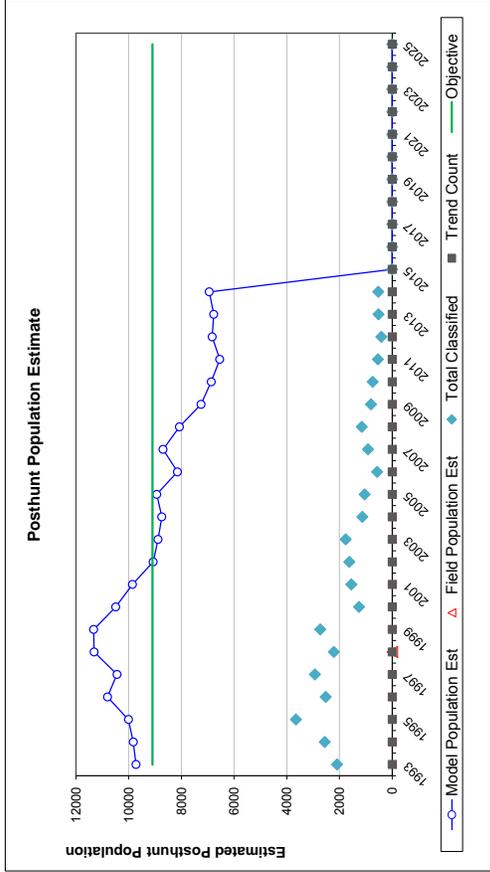
Year	Annual Juvenile Survival Rates		Annual Adult Survival Rates	
	Model Est	Field Est SE	Model Est	Field Est SE
1993	0.50		0.86	
1994	0.50		0.86	
1995	0.50		0.86	
1996	0.50		0.86	
1997	0.50		0.86	
1998	0.50		0.86	
1999	0.50		0.86	
2000	0.50		0.86	
2001	0.50		0.86	
2002	0.50		0.86	
2003	0.50		0.86	
2004	0.50		0.86	
2005	0.50		0.86	
2006	0.50		0.86	
2007	0.50		0.86	
2008	0.50		0.86	
2009	0.50		0.86	
2010	0.50		0.86	
2011	0.50		0.86	
2012	0.50		0.86	
2013	0.50		0.86	
2014	0.50		0.86	
2015				
2016				
2017				
2018				
2019				
2020				
2021				
2022				
2023				
2024				
2025				

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

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

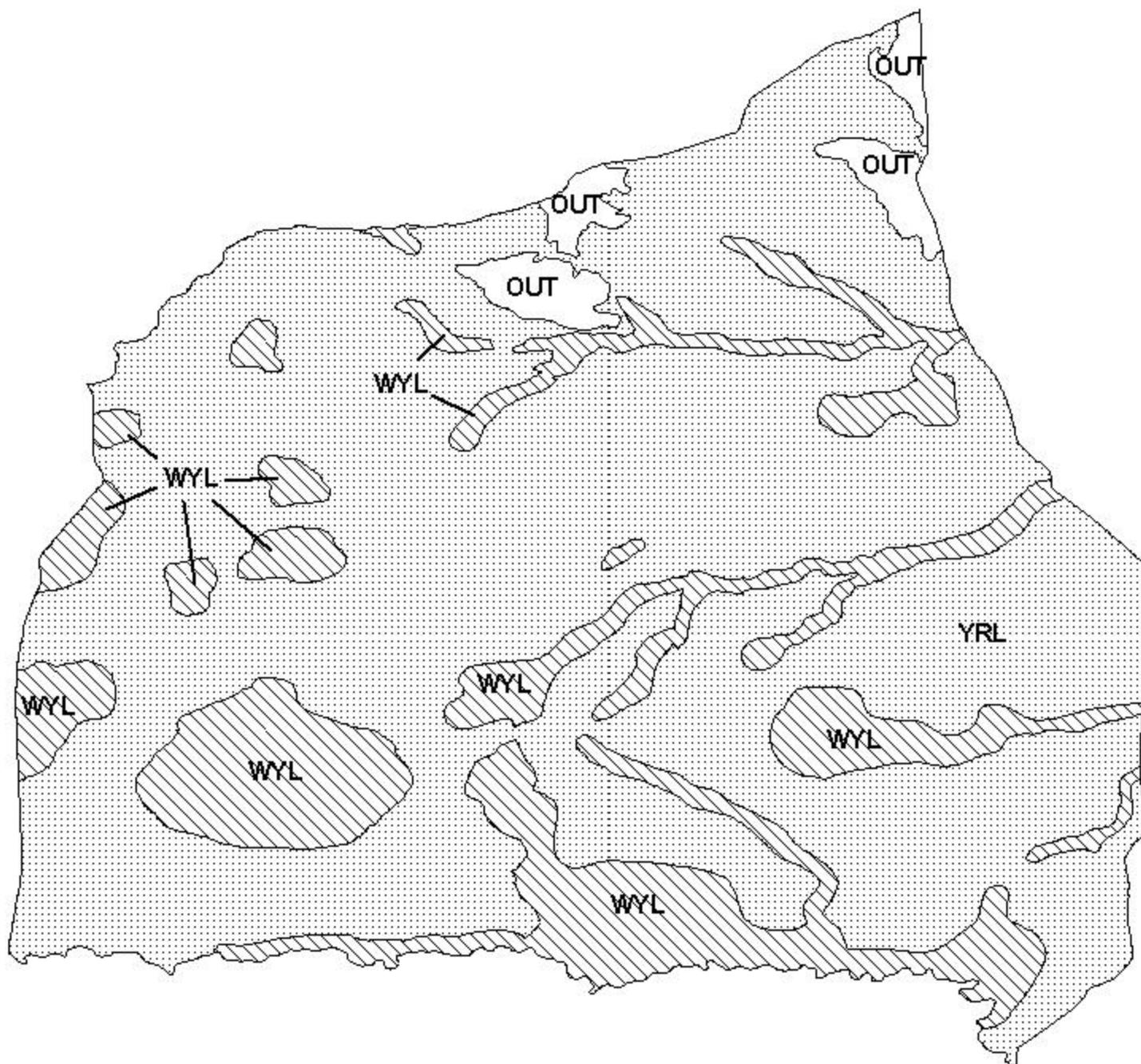
Year	Classification Counts						Harvest						
	Juvenile/Female Ratio			Total Male/Female Ratio			Juv	Males	Females	Total Harvest	Segment Harvest Rate (% of		
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE					Total Males	Females	
1993		55.82	2.87	44.04	42.38	2.39	10	555	216	781	22.2	4.7	
1994		74.68	3.31	41.00	40.71	2.19	27	587	263	877	25.7	6.0	
1995		79.27	2.95	41.43	44.28	1.98	23	519	196	738	23.3	4.5	
1996		92.38	4.09	44.14	45.06	2.48	9	446	194	649	19.6	4.5	
1997		74.68	3.15	46.12	49.12	2.36	54	545	214	813	21.6	4.7	
1998		95.09	4.45	45.02	41.67	2.51	50	572	200	822	22.9	4.5	
1999		85.71	3.67	46.10	45.22	2.36	19	621	242	862	23.3	5.2	
2000		65.27	4.25	45.77	46.31	3.37	25	637	236	898	23.5	5.0	
2001		59.26	3.47	44.04	39.08	2.63	14	567	199	780	22.6	4.3	
2002		52.94	3.09	43.29	38.71	2.51	18	496	224	738	21.4	5.1	
2003		62.50	3.40	41.31	38.18	2.45	19	476	190	685	22.5	4.6	
2004		69.53	4.60	40.02	33.87	2.85	8	503	219	730	24.9	5.5	
2005		81.60	5.66	40.11	45.45	3.78	15	490	244	749	25.0	6.2	
2006		64.23	6.20	39.75	44.89	4.87	6	562	252	820	28.0	6.5	
2007		88.01	6.50	37.45	46.43	4.16	13	506	186	705	27.8	5.0	
2008		67.94	4.67	38.53	52.67	3.92	17	526	218	761	27.7	5.8	
2009		60.81	4.99	35.69	44.53	4.05	19	579	292	890	32.6	8.0	
2010		67.91	5.72	33.71	45.27	4.34	41	492	287	820	32.0	8.5	
2011		64.59	6.43	32.68	46.69	5.16	63	433	159	655	30.5	5.0	
2012		75.25	8.16	33.62	33.84	4.78	20	332	97	449	24.9	3.2	
2013		64.00	6.18	37.18	25.09	3.38	2	277	44	323	19.6	1.4	
2014		63.64	6.15	39.36	29.09	3.70	0	240	0	240	16.4	0.0	
2015													
2016													
2017													
2018													
2019													
2020													
2021													
2022													
2023													
2024													
2025													

FIGURES



Comments:

END



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





## 2013 - JCR Evaluation Form

SPECIES: Mule Deer

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

HERD: MD756 - SOUTH CONVERSE

HUNT AREAS: 65

PREPARED BY: HEATHER O'BRIEN

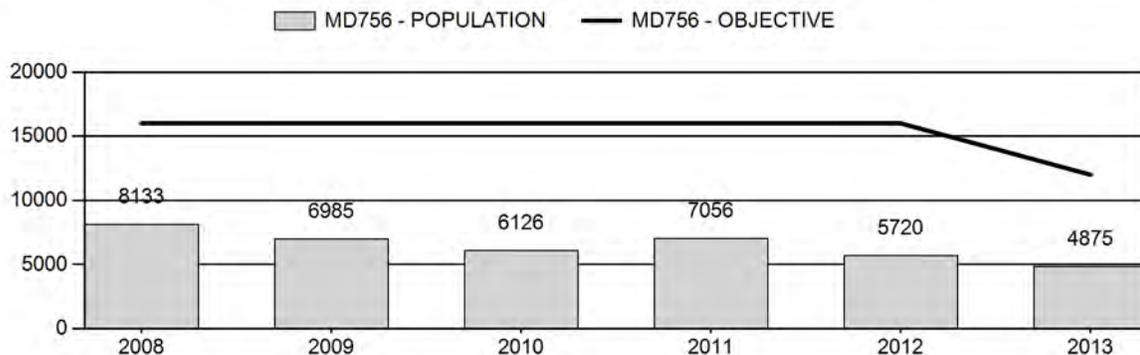
	<u>2008 - 2012 Average</u>	<u>2013</u>	<u>2014 Proposed</u>
Population:	6,804	4,875	4,963
Harvest:	432	252	255
Hunters:	1,022	700	850
Hunter Success:	42%	36%	30%
Active Licenses:	1,036	700	850
Active License Percent:	42%	36%	30%
Recreation Days:	3,978	2,538	2,600
Days Per Animal:	9.2	10.1	10.2
Males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

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

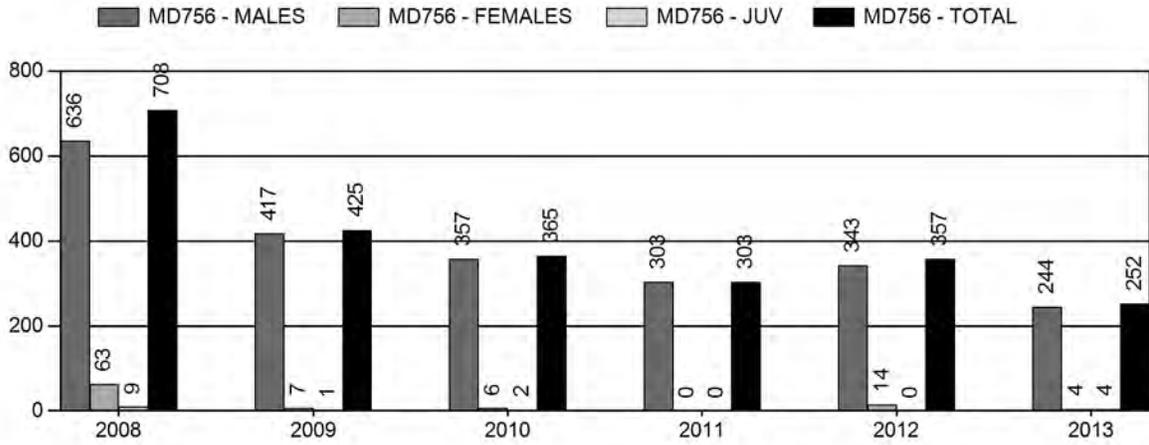
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

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

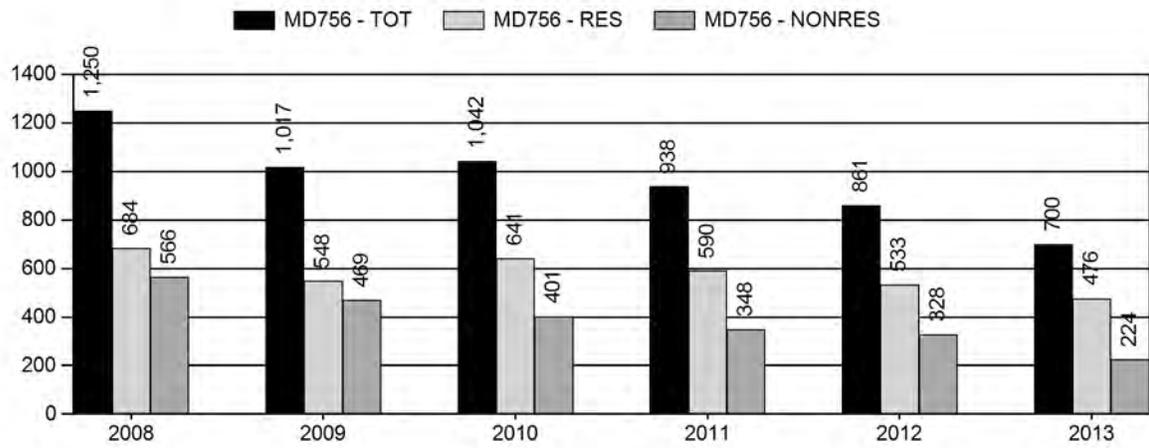
## Population Size - Postseason



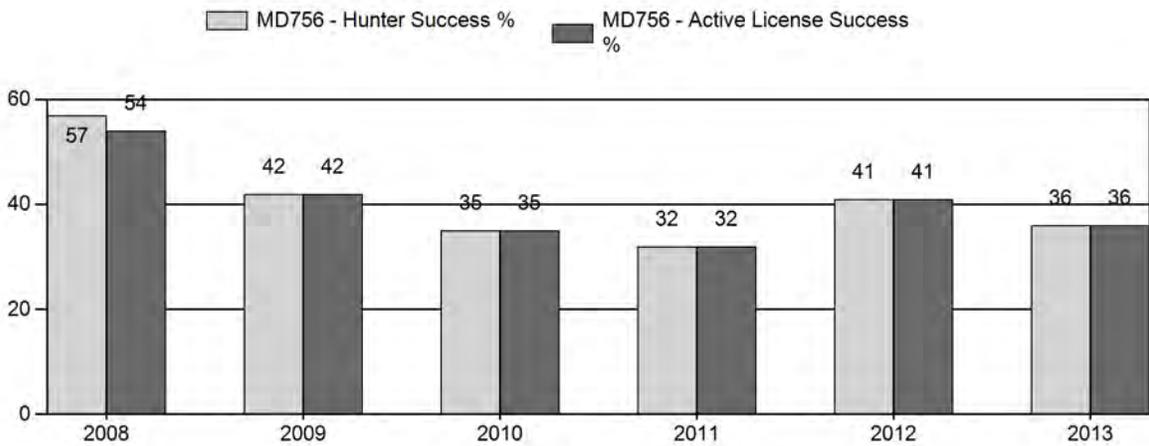
# Harvest



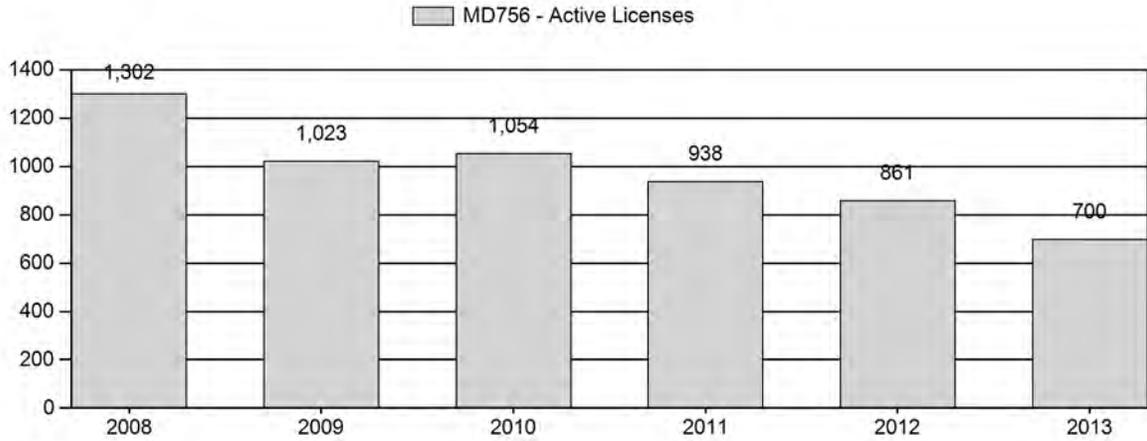
# Number of Hunters



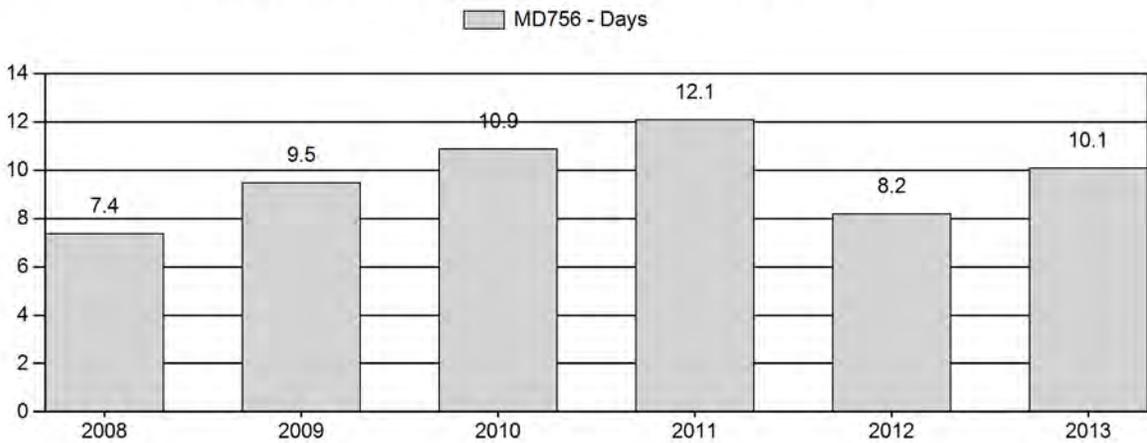
# Harvest Success



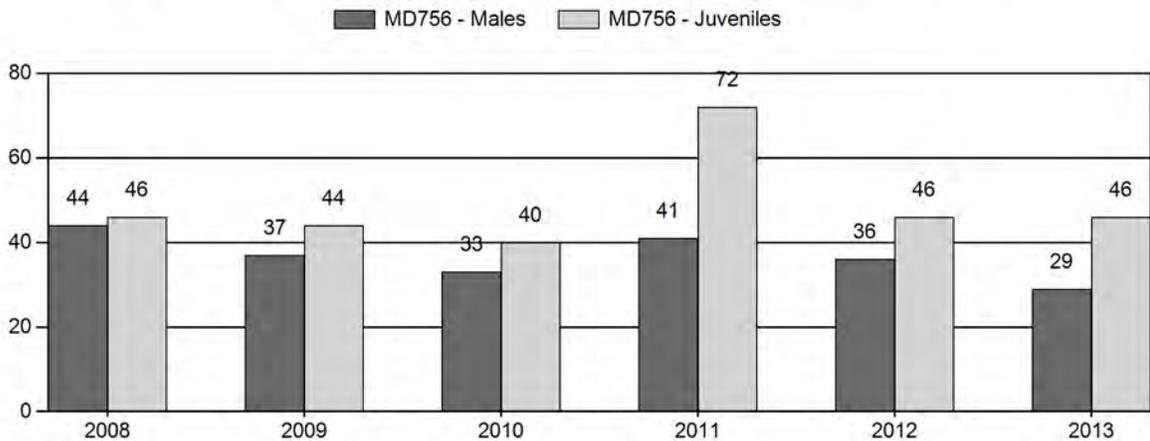
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



2008 - 2013 Postseason Classification Summary

for Mule Deer Herd MD756 - SOUTH CONVERSE

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

**2014 HUNTING SEASONS  
SOUTH CONVERSE MULE DEER (MD756)**

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

**Region J Nonresident Quota: 900**

**Management Evaluation**

**Current Postseason Population Management Objective: 12,000**

**Management Strategy: Private Land**

**2013 Postseason Population Estimate: 4,900**

**2014 Proposed Postseason Population Estimate: 4,900**

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

**Herd Unit Issues**

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

**Weather**

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

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

### **Habitat**

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

### **Field Data**

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

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

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

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

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

### Harvest Data

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

## **Population**

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

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

## **Management Summary**

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

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

## **Citations**

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

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

MODELS SUMMARY			Relative AICc	Check best model to create report	Notes
CJ,CA	Constant Juvenile & Adult Survival	Fit	124	<input type="checkbox"/> CJ,CA Model	
SCJ,SCA	Semi-Constant Juvenile & Semi-Constant Adult Survival	Fit	81	<input type="checkbox"/> SCJ,SCA Model	
TSJ,CA	Time-Specific Juvenile & Constant Adult Survival	Fit	125	<input checked="" type="checkbox"/> TSJ,CA Model	

Year	Posthunt Population Est.		Population Estimates from Top Model				Predicted Posthunt Population			Total	Objective	
	Field Est	Field SE	Trend Count	Juveniles	Total Males	Females	Juveniles	Total Males	Females			
1993				3462	2531	7934	13928	3431	1224	7303	11959	16000
1994				3158	1644	6398	11199	3151	983	6128	10262	16000
1995				3728	1519	5543	10789	3728	931	5543	10201	16000
1996				5030	2406	6012	13448	5030	1775	6012	12818	16000
1997				5269	2594	5907	13769	5269	1795	5907	12971	16000
1998				7134	2458	5674	15266	7134	1748	5674	14556	16000
1999				5469	2794	5864	14127	5454	1763	5895	12912	16000
2000				3919	2712	5786	12417	3902	1833	5520	11255	16000
2001				2497	2565	5449	10511	2474	1846	5218	9538	16000
2002				2457	1938	4576	8971	2416	1326	4321	8063	16000
2003				2249	1606	3949	7804	2214	1116	3667	6997	16000
2004				2580	1869	3864	8313	2574	1316	3837	7727	16000
2005				2627	2098	4069	8794	2625	1635	4027	8287	16000
2006				2268	2261	4132	8661	2266	1694	4090	8050	16000
2007				2659	2345	4218	9222	2651	1667	4102	8420	16000
2008				1997	2497	4401	8895	1987	1797	4332	8116	16000
2009				1886	1887	3869	7441	1885	1428	3861	6974	16000
2010				1399	1608	3511	6518	1397	1215	3504	6116	16000
2011				2428	1579	3369	7376	2428	1246	3369	7042	16000
2012				1519	1460	3120	6099	1519	1082	3105	5706	16000
2013				1270	1150	2732	5152	1266	882	2728	4875	12000
2014				1336	1232	2676	5244	1336	952	2676	4963	12000
2015												12000
2016												12000
2017												12000
2018												12000
2019												12000
2020												12000
2021												12000
2022												12000
2023												12000
2024												12000
2025												12000

Survival and Initial Population Estimates

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

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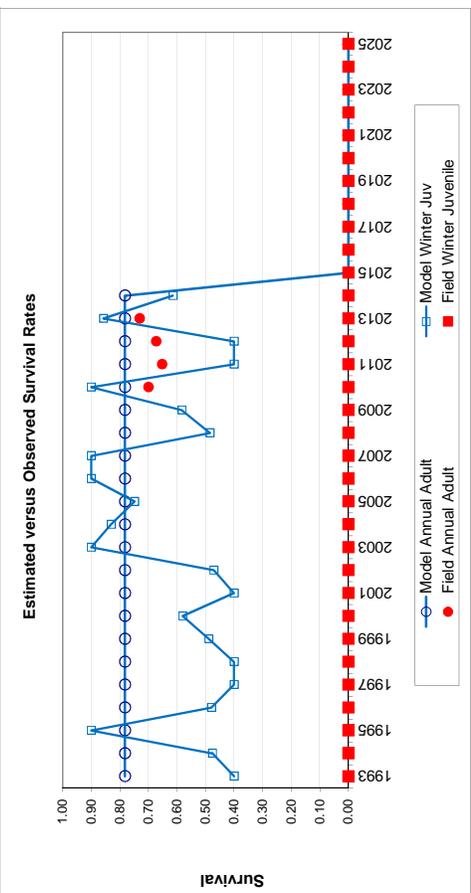
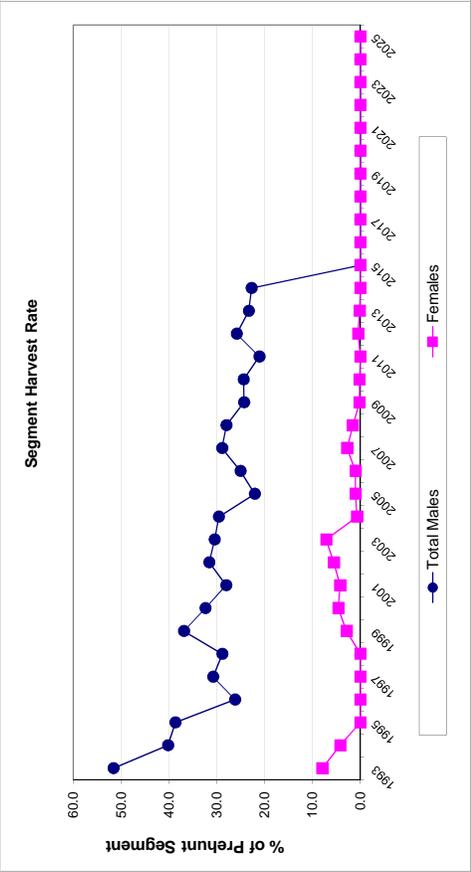
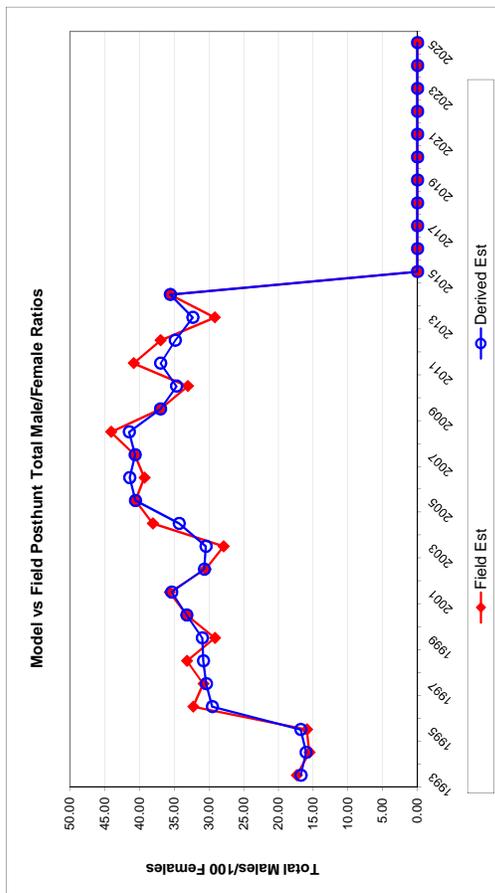
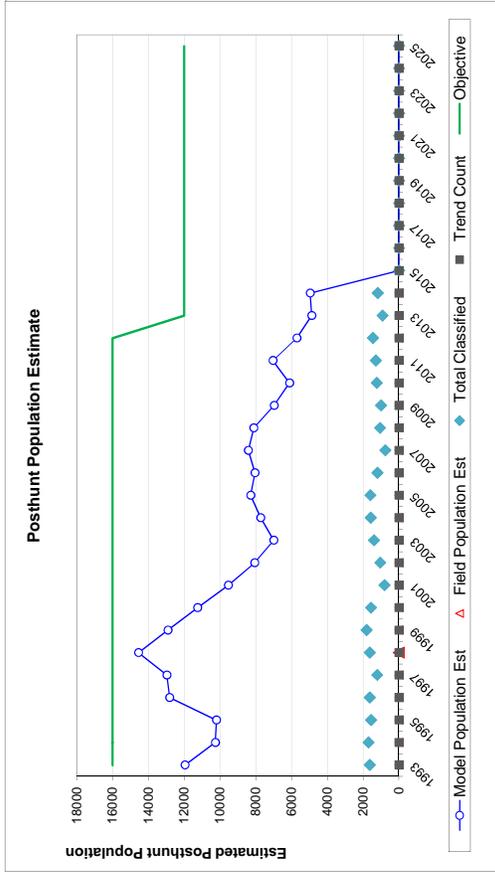
Adult Survival =	Optim cells
Initial Total Male Pop/10,000 =	0.782
Initial Female Pop/10,000 =	0.122
	0.730

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

FIGURES



Comments:

## **APPENDIX A**

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

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

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

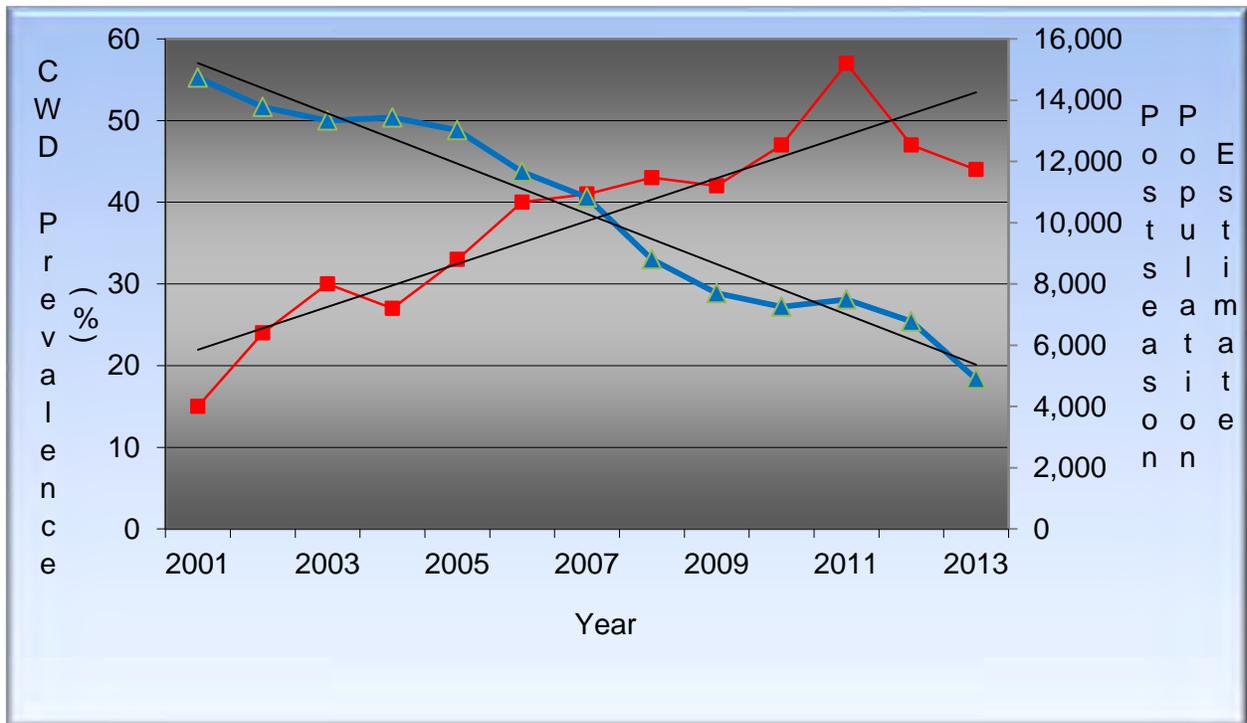
Since 2001, prevalence of CWD in hunter-harvested mule deer has increased significantly in the South Converse Mule Deer Herd, while the population has concurrently decreased (Table 1, Figure 1). Considering CWD is ultimately fatal in cervids, higher prevalence is suspected of having more adverse and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

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

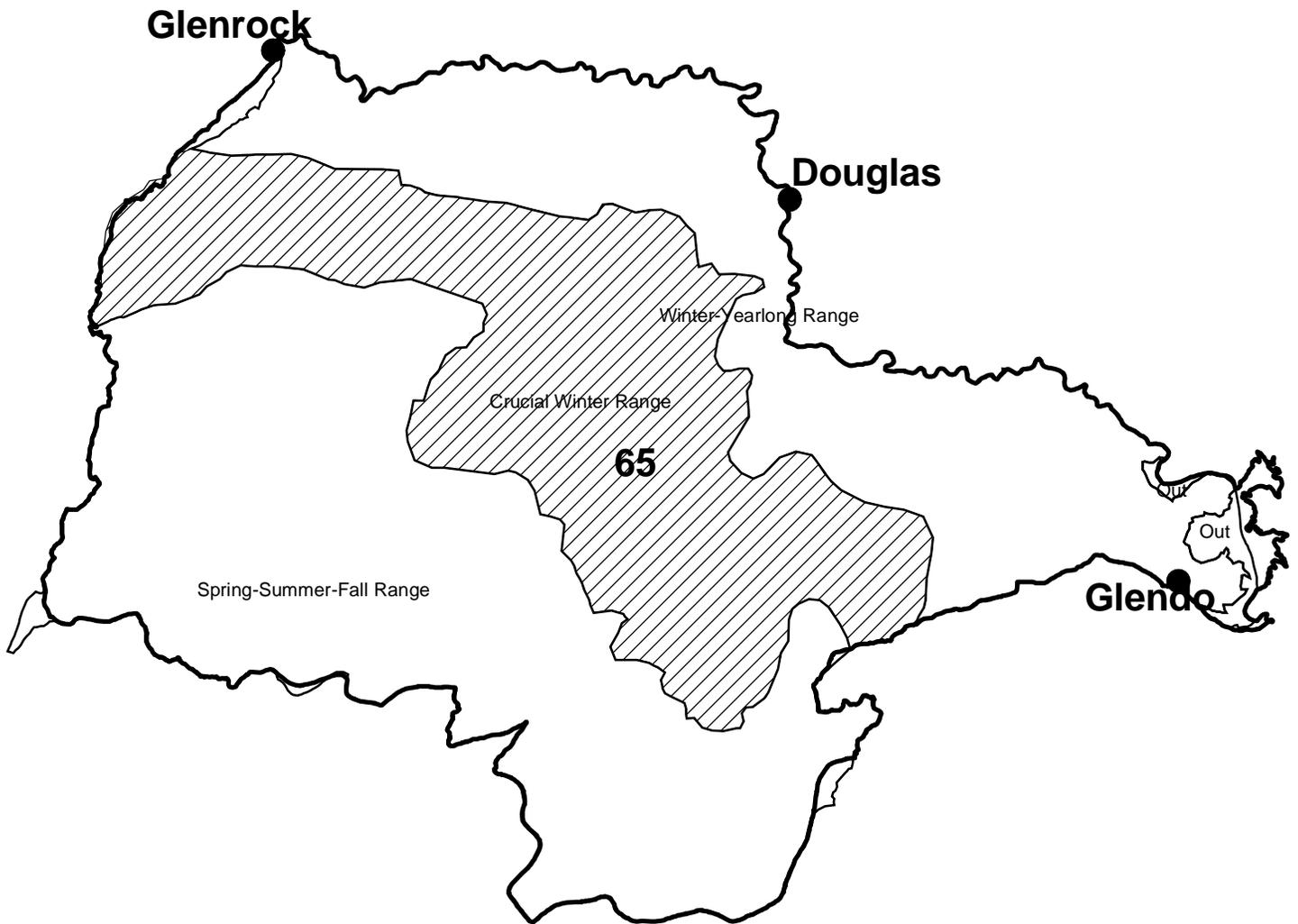
**Table 1.** CWD surveillance in hunter-harvested mule deer in the South Converse Herd Unit, 2001-2013.

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

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



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



## 2013 - JCR Evaluation Form

SPECIES: Mule Deer

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

HERD: MD757 - BATES HOLE/HAT SIX

HUNT AREAS: 66-67

PREPARED BY: HEATHER O'BRIEN

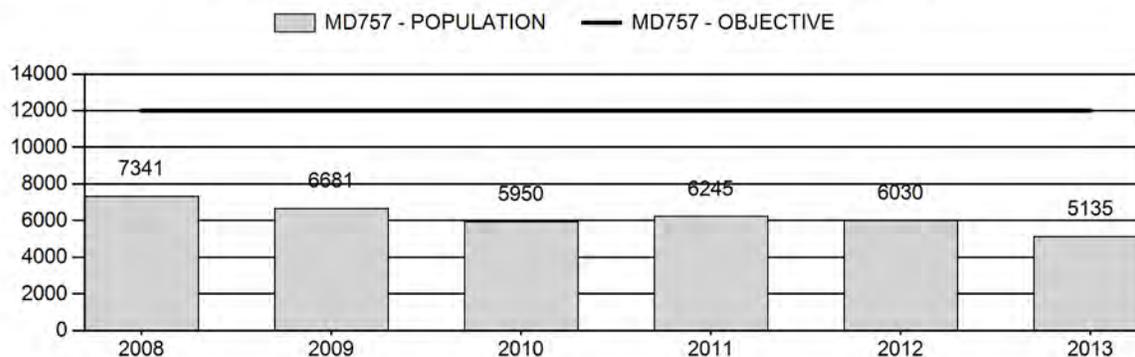
	<u>2008 - 2012 Average</u>	<u>2013</u>	<u>2014 Proposed</u>
Population:	6,449	5,135	4,954
Harvest:	389	165	175
Hunters:	1,001	671	700
Hunter Success:	39%	25%	25%
Active Licenses:	1,005	671	700
Active License Percent:	39%	25%	25%
Recreation Days:	3,493	2,228	2,000
Days Per Animal:	9.0	13.5	11.4
Males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

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

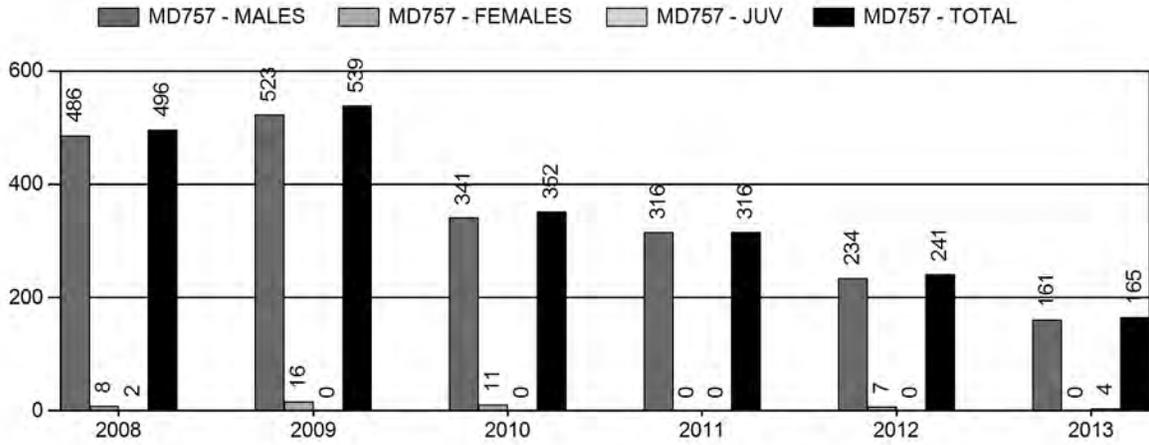
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

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

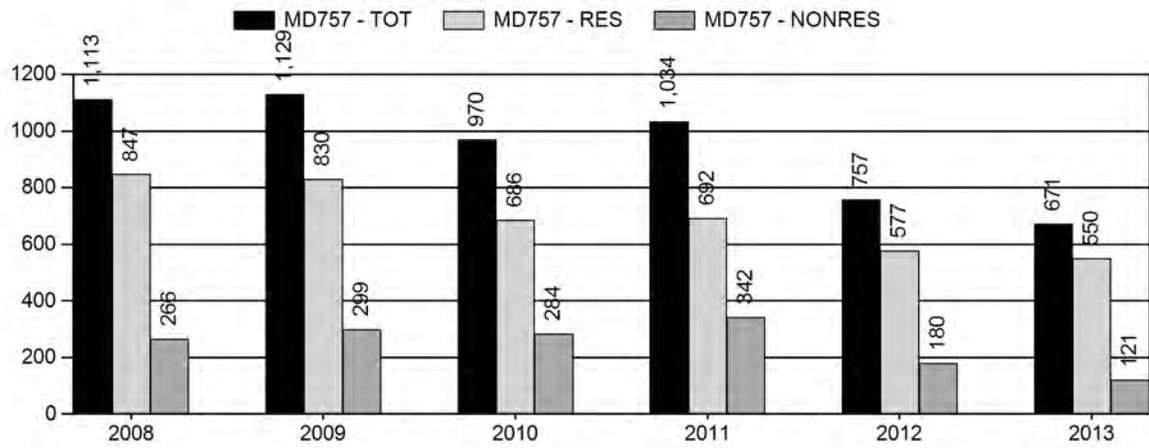
## Population Size - Postseason



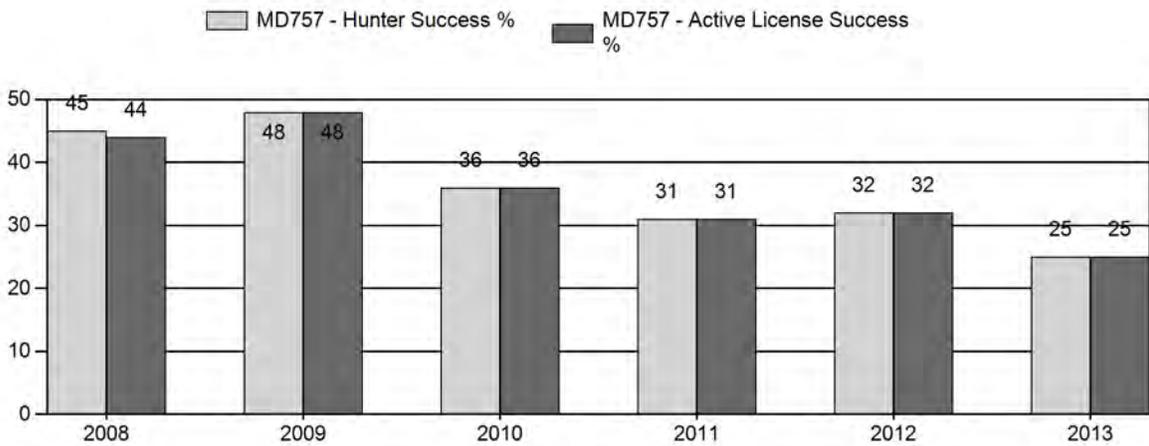
# Harvest



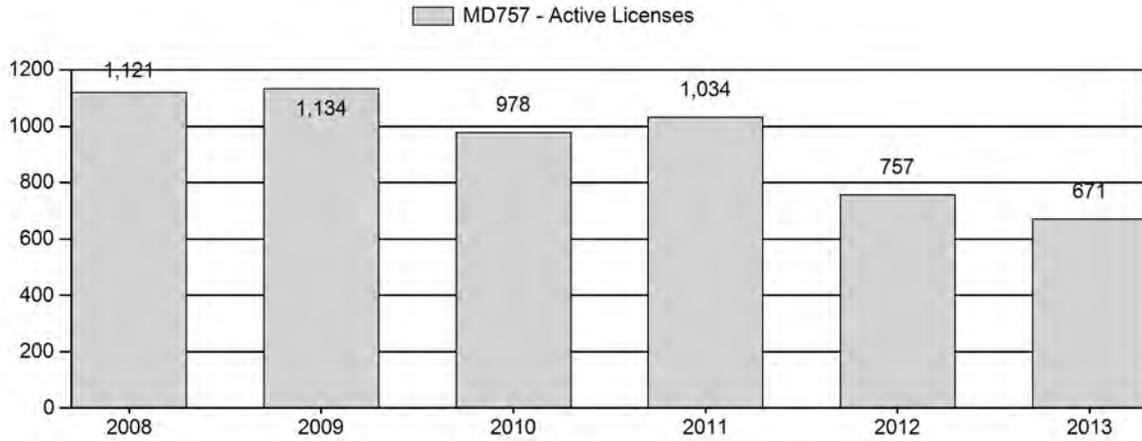
# Number of Hunters



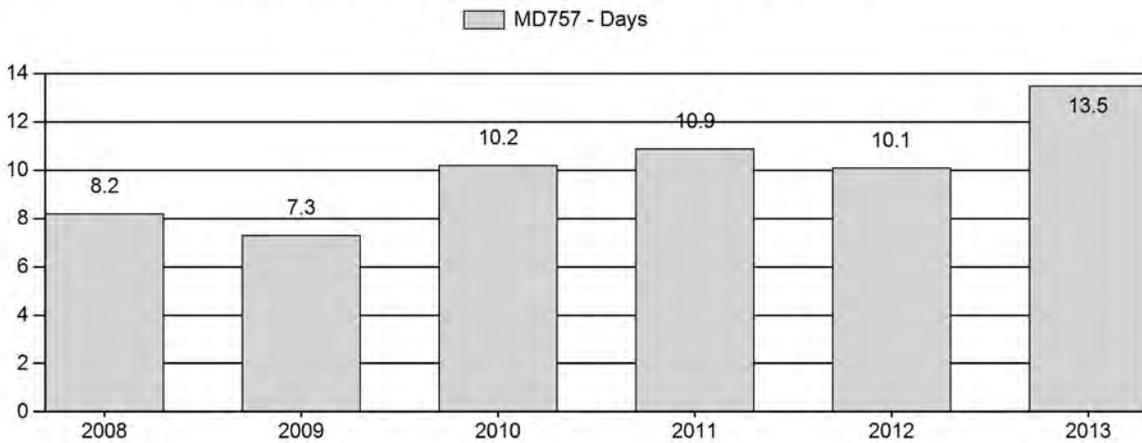
# Harvest Success



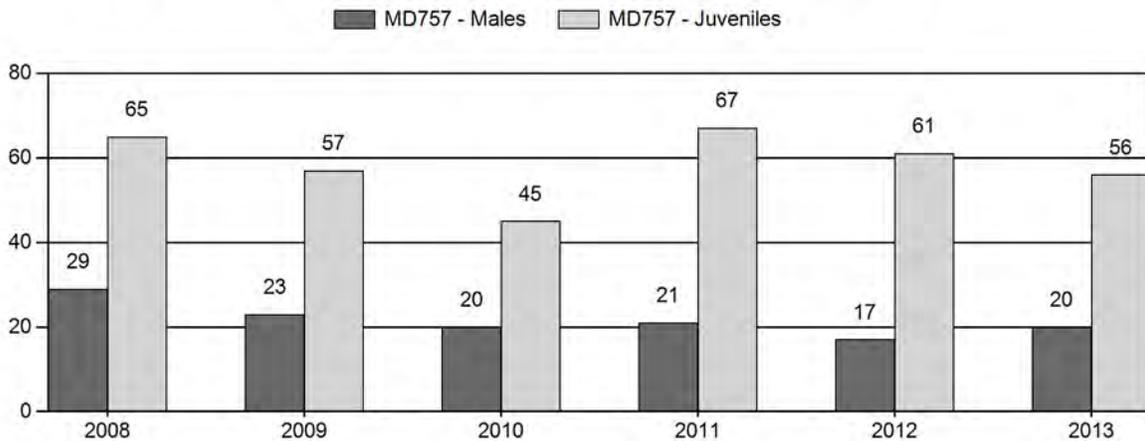
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



2008 - 2013 Postseason Classification Summary

for Mule Deer Herd MD757 - BATES HOLE/HAT SIX

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

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

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

**Management Evaluation**

**Current Postseason Population Management Objective:** 12,000

**Management Strategy:** Recreational

**2013 Postseason Population Estimate:** 5,100

**2014 Proposed Postseason Population Estimate:** 5,000

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

**Herd Unit Issues**

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

**Weather**

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

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

## **Habitat**

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

## **Field Data**

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

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

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

Bio-Year	Total Class N for HA	# Bucks Classified					Buck Ratios per 100 Females					
		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

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

### Harvest Data

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

### Population

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

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

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

### **Management Summary**

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

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

**INPUT**  
 Species: Deer  
 Biologist: Heather O'Brien  
 Herd Unit & No.: MID757 Bates Hole-Hat Six  
 Model date: 03/05/14

Clear form

**MODELS SUMMARY**

	Fit	Relative AICc	Notes
CJ,CA Constant Juvenile & Adult Survival	155	164	
SCJ,SCA Semi-Constant Juvenile & Semi-Constant Adult Survival	82	97	<input type="checkbox"/> CJ,CA Model <input type="checkbox"/> SCJ,SCA Model
TSJ,CA Time-Specific Juvenile & Constant Adult Survival	13	136	<input checked="" type="checkbox"/> TSJ,CA Model

**Population Estimates from Top Model**

Year	Posthunt Population Est.		Trend Count		Predicted Prehunt Population				Predicted Posthunt Population				Objective
	Field Est	Field SE	Juveniles	Females	Juveniles	Total Males	Females	Total	Juveniles	Total Males	Females	Total	
1993			1140	839	2090	1747	3193	12000					
1994			997	508	1706	302	2867	12000					
1995			1161	697	1775	417	3353	12000					
1996			1922	873	2018	536	4476	12000					
1997			1703	836	2085	534	4322	12000					
1998			1857	1217	2523	756	5129	12000					
1999			2231	1278	2762	668	5660	12000					
2000			1979	1566	3331	969	6279	12000					
2001			2274	1468	3458	948	6635	12000					
2002			2768	1284	3367	805	6861	12000					
2003			2454	1230	3331	771	6380	12000					
2004			2186	1485	3508	719	6374	12000					
2005			2248	1262	3204	785	5936	12000					
2006			1556	1655	3473	1055	5912	12000					
2007			1971	1583	3487	1020	6317	12000					
2008			2276	1562	3528	1027	6820	12000					
2009			1973	1355	3455	779	6190	12000					
2010			1478	1051	3291	676	5433	12000					
2011			2034	865	3058	529	5621	12000					
2012			1790	852	2984	595	5361	12000					
2013			1591	859	2865	682	5135	12000					
2014			1525	893	2729	701	4954	12000					
2015								12000					
2016								12000					
2017								12000					
2018								12000					
2019								12000					
2020								12000					
2021								12000					
2022								12000					
2023								12000					
2024								12000					
2025								12000					

Survival and Initial Population Estimates

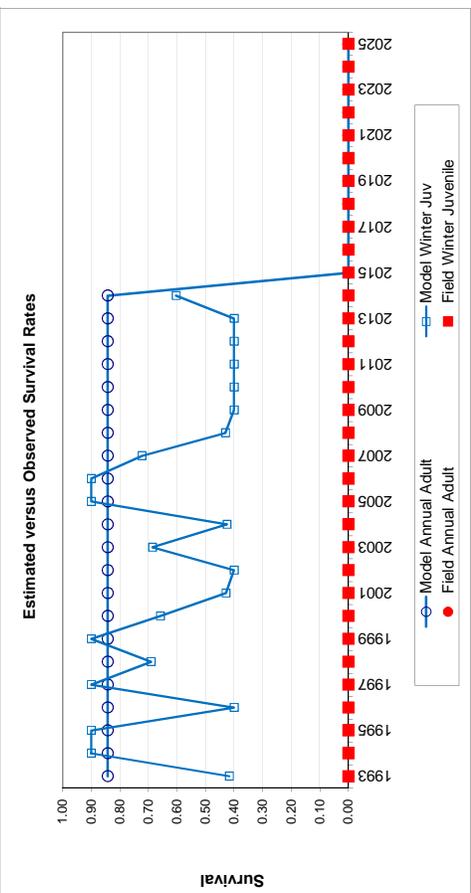
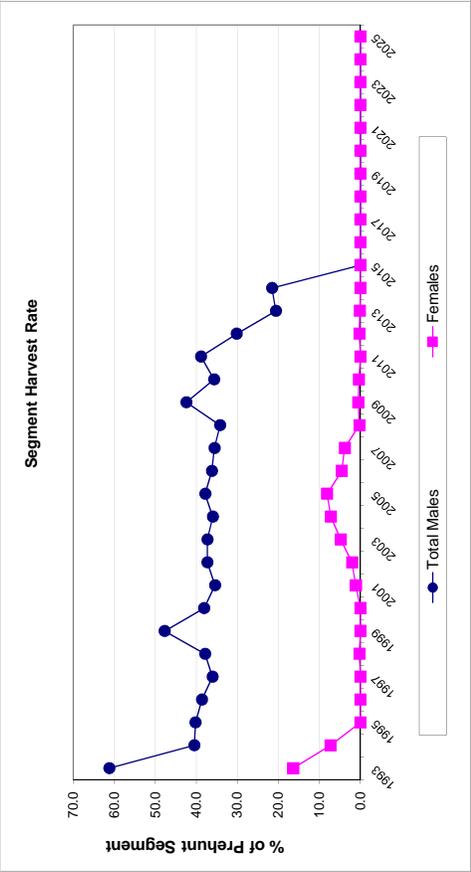
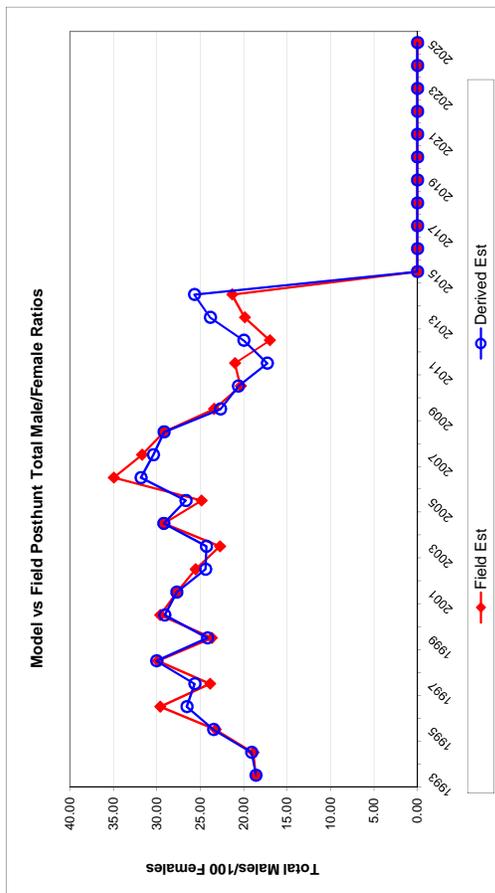
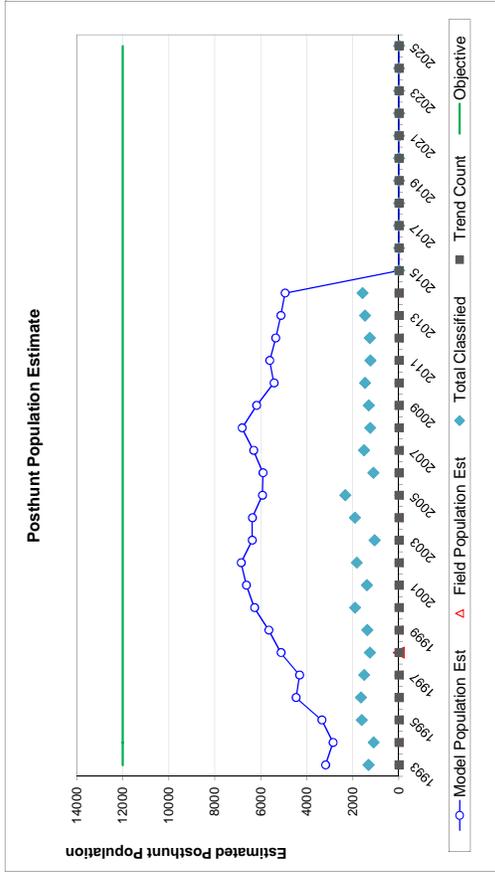
Year	Annual Juvenile Survival Rates		Annual Adult Survival Rates	
	Model Est	Field Est SE	Model Est	Field Est SE
1993	0.42		0.84	
1994	0.90		0.84	
1995	0.90		0.84	
1996	0.40		0.84	
1997	0.90		0.84	
1998	0.69		0.84	
1999	0.90		0.84	
2000	0.66		0.84	
2001	0.43		0.84	
2002	0.40		0.84	
2003	0.69		0.84	
2004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

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

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

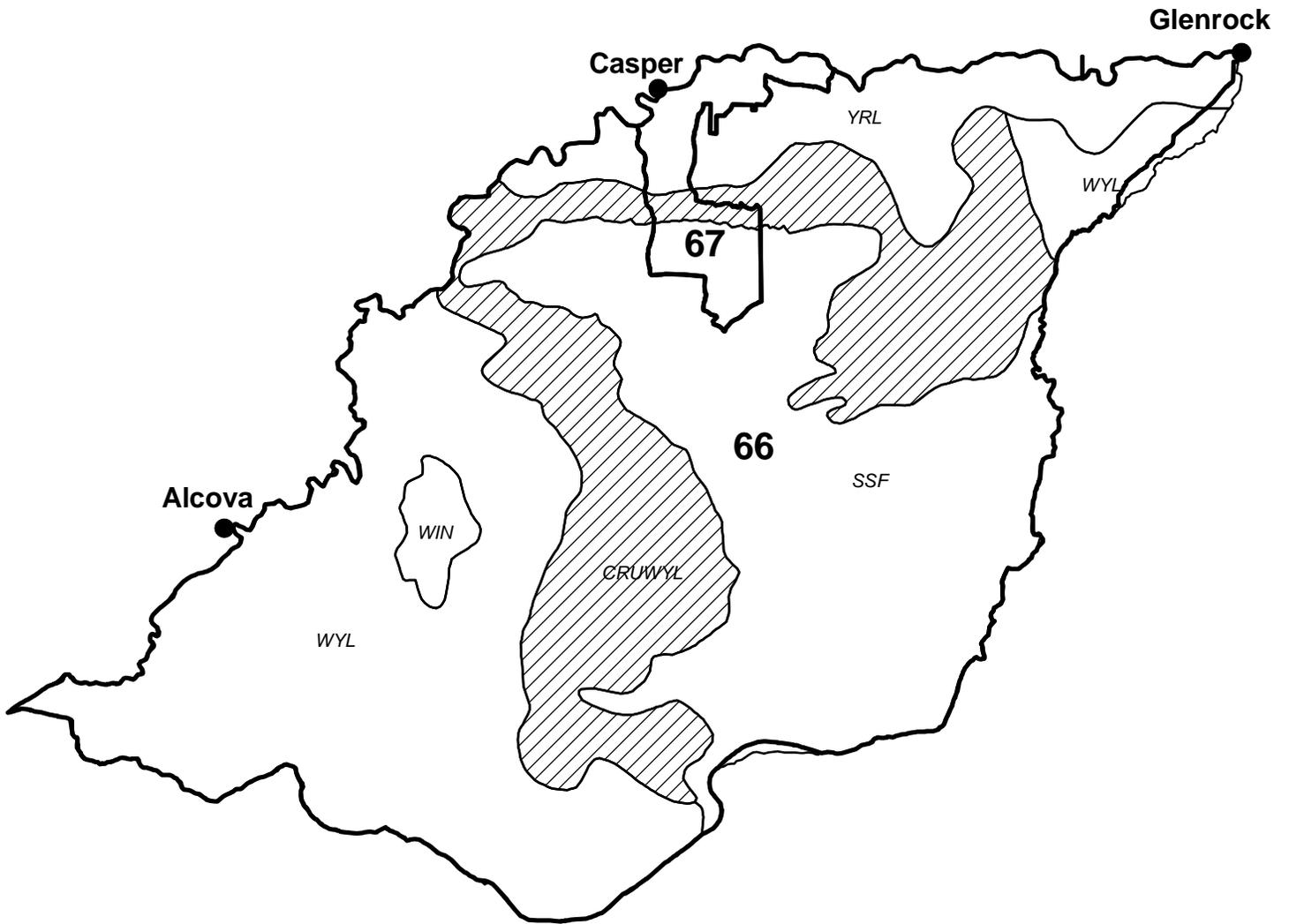
Year	Classification Counts										Harvest	
	Juvenile/Female Ratio					Total Male/Female Ratio					Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		64.19	3.81	18.60	18.60	1.74	17	467	312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

FIGURES



Comments:

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



## 2013 - JCR Evaluation Form

SPECIES: Mule Deer

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

HERD: MD758 - RATTLESNAKE

HUNT AREAS: 88-89

PREPARED BY: HEATHER O'BRIEN

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

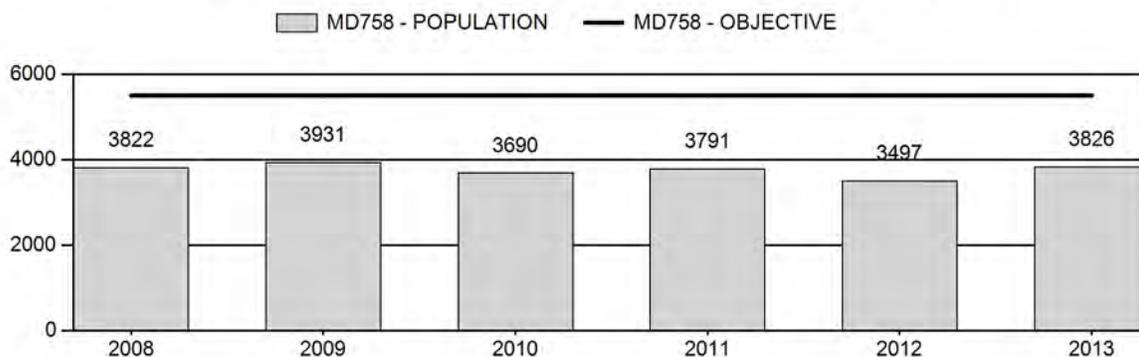
Population Objective:	5,500
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-30.4%
Number of years population has been + or - objective in recent trend:	20
Model Date:	3/3/2014

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

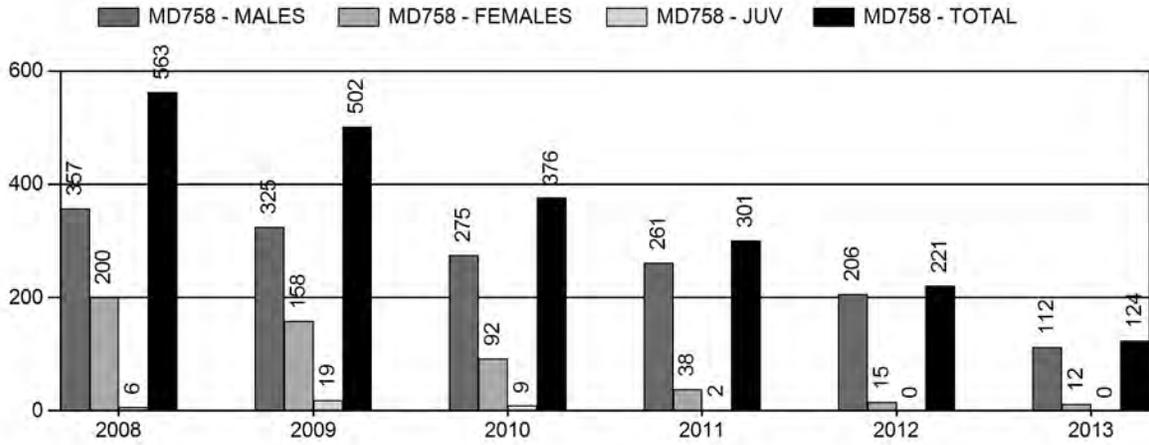
	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0.6%	.7%
Males ≥ 1 year old:	16.8%	15.4%
Juveniles (< 1 year old):	0%	0%
Total:	3.1%	3.02%

Proposed change in post-season population:	-3.4%	-3.3%
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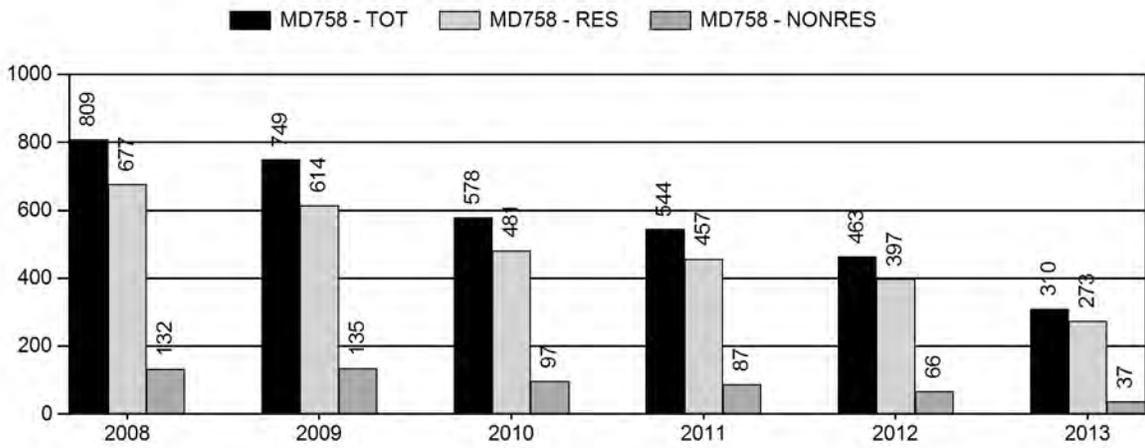
## Population Size - Postseason



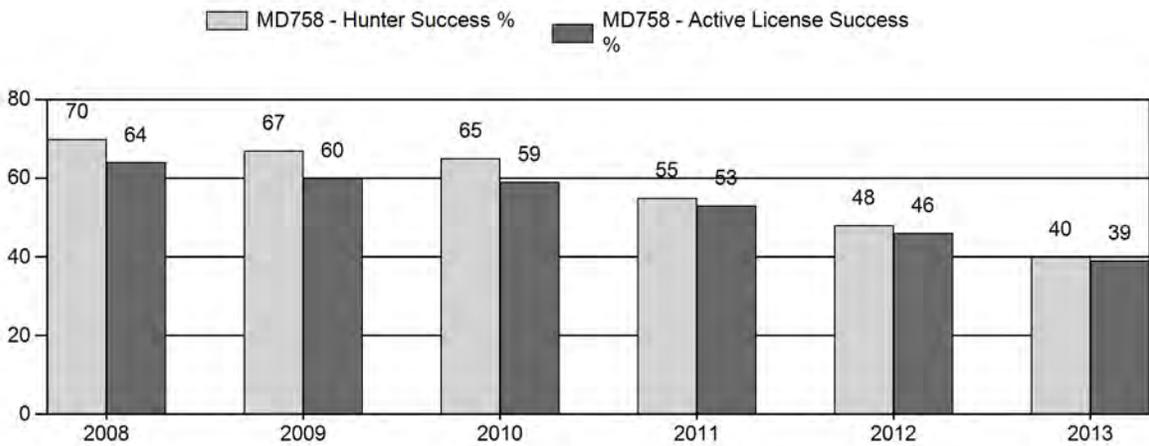
# Harvest



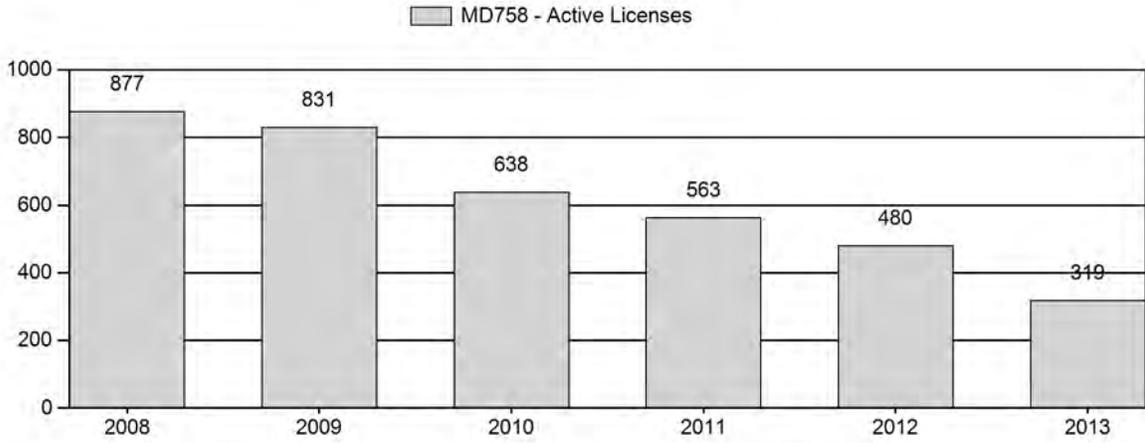
# Number of Hunters



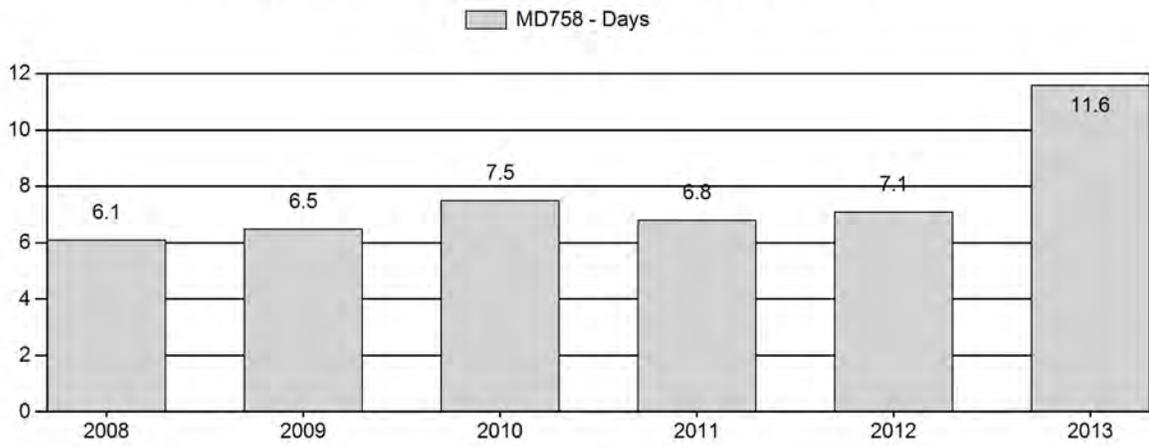
# Harvest Success



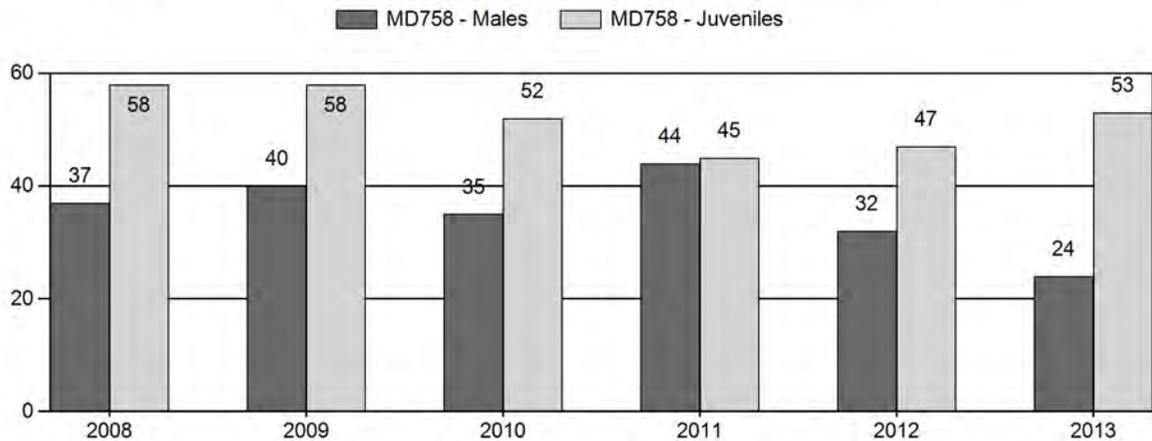
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



## 2008 - 2013 Postseason Classification Summary

for Mule Deer Herd MD758 - RATTLESNAKE

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

**2014 HUNTING SEASONS  
RATTLESNAKE MULE DEER (MD758)**

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

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

**Management Evaluation**

**Current Postseason Population Management Objective: 5,500**

**Management Strategy: Special**

**2013 Postseason Population Estimate: 3,800**

**2014 Proposed Postseason Population Estimate: 3,700**

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

**Herd Unit Issues**

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

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

## **Weather**

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

## **Habitat**

This herd unit has no established habitat transects that measure production and/or utilization on shrub species that are preferred browse of mule deer. Additionally, there are no comparable habitat transects in neighboring herd units to reference. Anecdotal observations and discussions with landowners in the region indicate that summer and winter forage availability was fairly average in 2013. Herbaceous forage species were observed to be in good condition compared to the very poor growth year of 2012. Improved range conditions may have contributed to better fawn ratios observed in late summer 2013, though they were still poor compared to historic trends.

## Field Data

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

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

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

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

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

### Harvest Data

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

### Population

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

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

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

### **Management Summary**

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

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

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

MODELS SUMMARY			Relative AICc	Fit	Notes
CJ,CA	Constant Juvenile & Adult Survival		80	71	
SCJ,SCA	Semi-Constant Juvenile & Semi-Constant Adult Survival		93	76	
TSJ,CA	Time-Specific Juvenile & Constant Adult Survival		124	13	

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population				Predicted Posthunt Population				Objective
	Field Est	Field SE		Juveniles	Total Males	Females	Total	Juveniles	Total Males	Females	Total	
1993				1549	762	2836	5148	1527	358	2620	4504	5500
1994				1116	655	2657	4428	1079	476	2438	3993	5500
1995				1291	660	2397	4349	1277	506	2324	4108	5500
1996				2306	731	2340	5377	2306	645	2340	5292	5500
1997				2268	1083	2583	5933	2248	847	2491	5587	5500
1998				1890	1248	2703	5842	1884	903	2637	5424	5500
1999				2136	1217	2752	6105	2127	934	2637	5699	5500
2000				1675	1299	2806	5779	1657	1009	2860	5326	5500
2001				1888	1261	2721	5870	1888	1021	2630	5539	5500
2002				2109	1322	2746	6178	2086	1088	2634	5808	5500
2003				2194	1426	2794	6414	2189	1200	2884	6073	5500
2004				2376	1547	2861	6784	2362	1264	2761	6386	5500
2005				2545	1642	2967	7154	2534	1310	2864	6707	5500
2006				1757	1721	3096	6574	1752	1362	2853	6067	5500
2007				1767	1594	3002	6362	1752	1178	2779	5709	5500
2008				1529	1431	2848	5808	1523	1038	2628	5189	5500
2009				1459	1257	2663	5379	1439	899	2490	4827	5500
2010				1263	1115	2522	4900	1253	812	2421	4486	5500
2011				1078	997	2421	4496	1076	700	2378	4154	5500
2012				1092	793	2278	4162	1092	566	2261	3919	5500
2013				1133	665	2165	3962	1133	541	2152	3826	5500
2014				1084	649	2074	3807	1084	539	2058	3680	5500
2015												5500
2016												5500
2017												5500
2018												5500
2019												5500
2020												5500
2021												5500
2022												5500
2023												5500
2024												5500
2025												5500

Survival and Initial Population Estimates

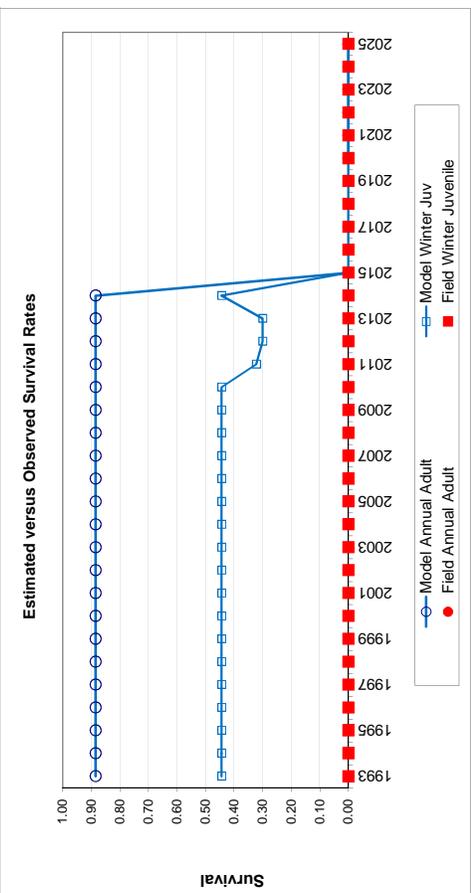
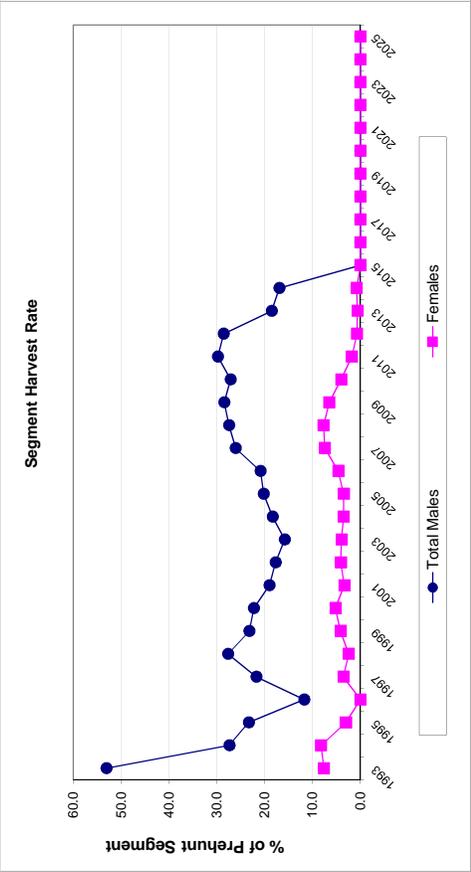
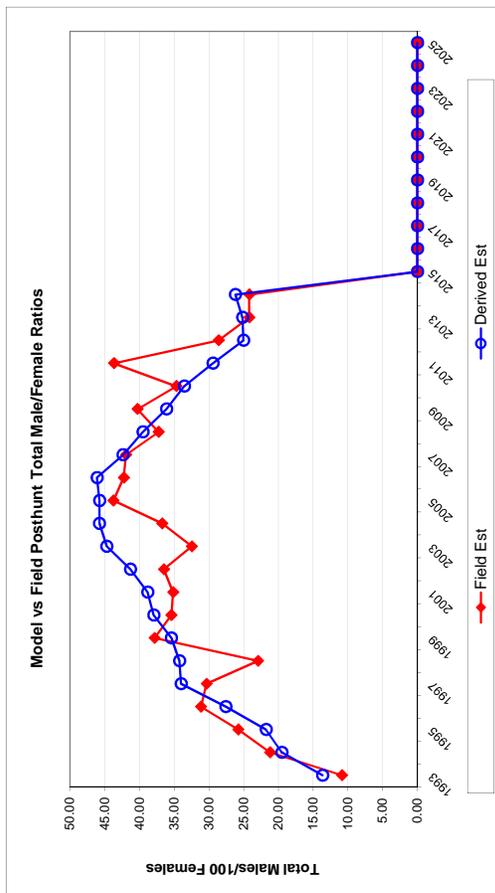
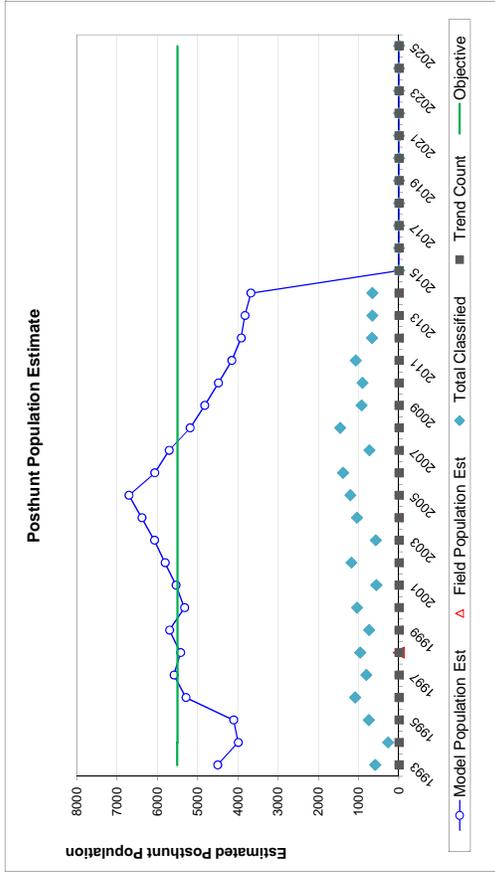
Year	Annual Juvenile Survival Rates		Annual Adult Survival Rates	
	Model Est	Field Est SE	Model Est	Field Est SE
1993	0.44		0.89	
1994	0.44		0.89	
1995	0.44		0.89	
1996	0.44		0.89	
1997	0.44		0.89	
1998	0.44		0.89	
1999	0.44		0.89	
2000	0.44		0.89	
2001	0.44		0.89	
2002	0.44		0.89	
2003	0.44		0.89	
2004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

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

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

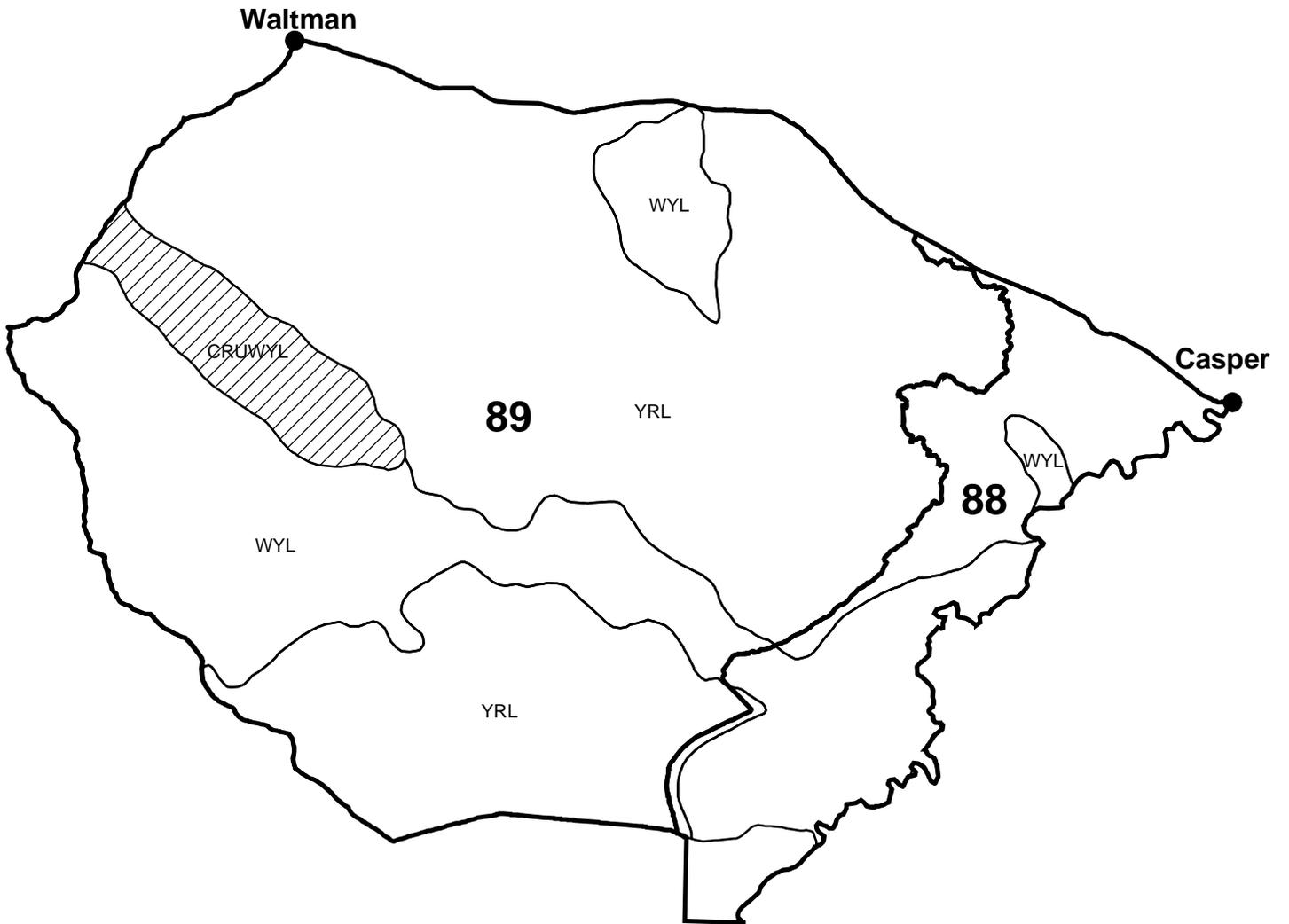
Year	Classification Counts										Harvest		
	Juvenile/Female Ratio					Total Male/Female Ratio					Segment Harvest Rate (% of		
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females	
1993		58.29	5.13	13.65	10.86	1.85	20	368	197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

FIGURES



Comments:

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



## 2013 - JCR Evaluation Form

SPECIES: Mule Deer

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

HERD: MD759 - NORTH NATRONA

HUNT AREAS: 34

PREPARED BY: HEATHER O'BRIEN

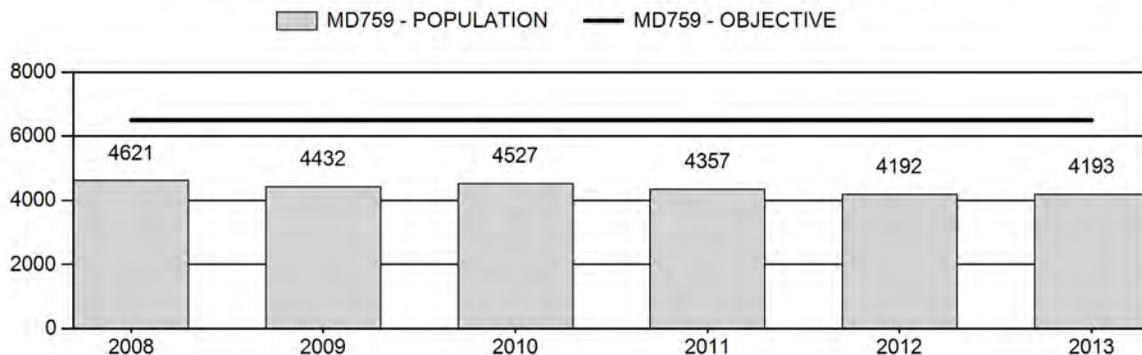
	<u>2008 - 2012 Average</u>	<u>2013</u>	<u>2014 Proposed</u>
Population:	4,426	4,193	4,181
Harvest:	257	192	142
Hunters:	336	259	200
Hunter Success:	76%	74%	71%
Active Licenses:	353	267	225
Active License Percent:	73%	72%	63%
Recreation Days:	1,431	1,257	850
Days Per Animal:	5.6	6.5	6.0
Males per 100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

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

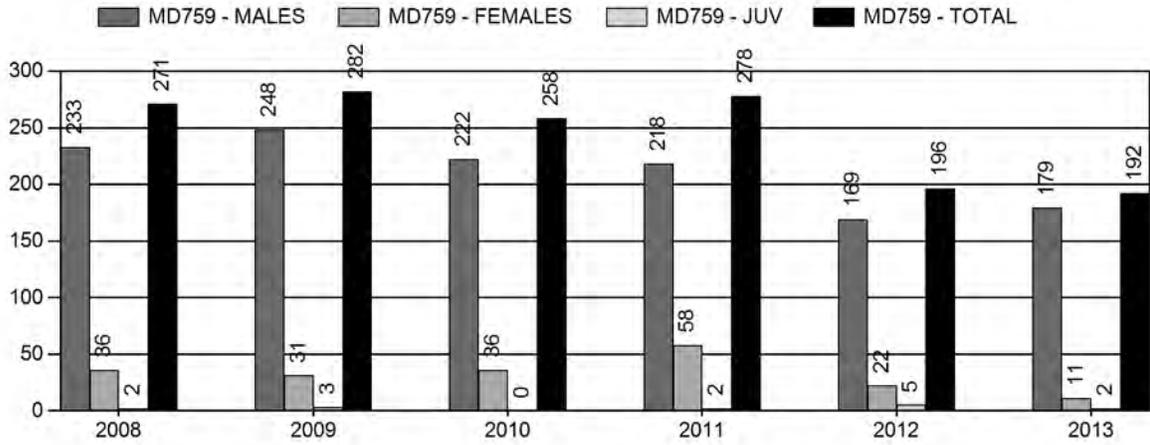
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

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

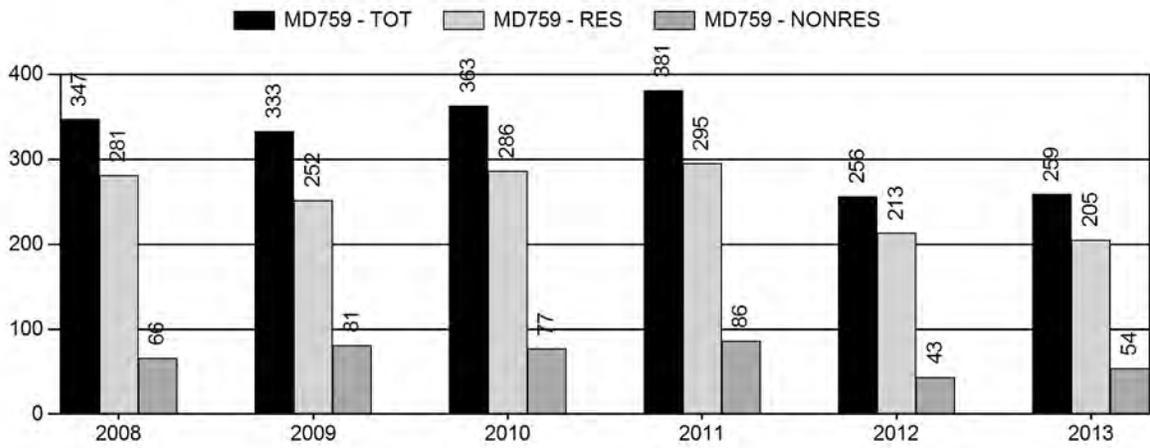
## Population Size - Postseason



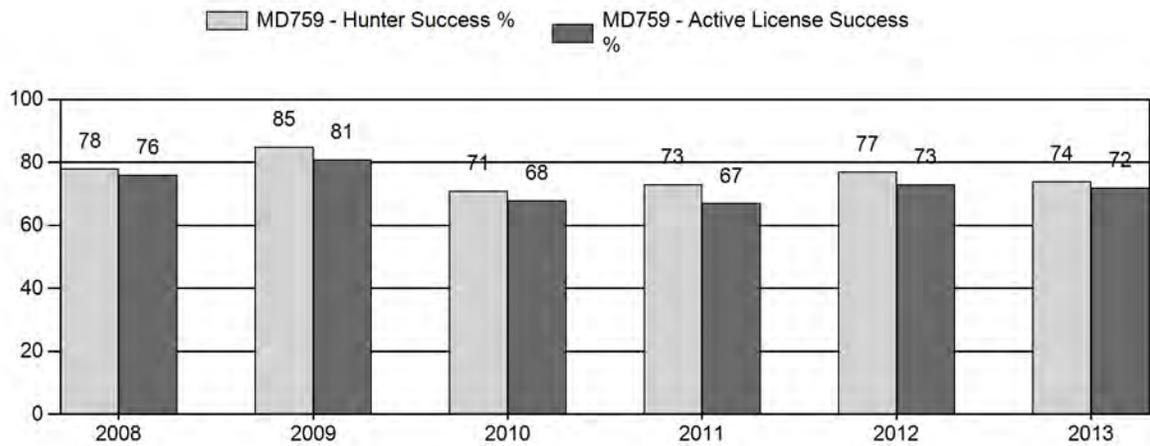
# Harvest



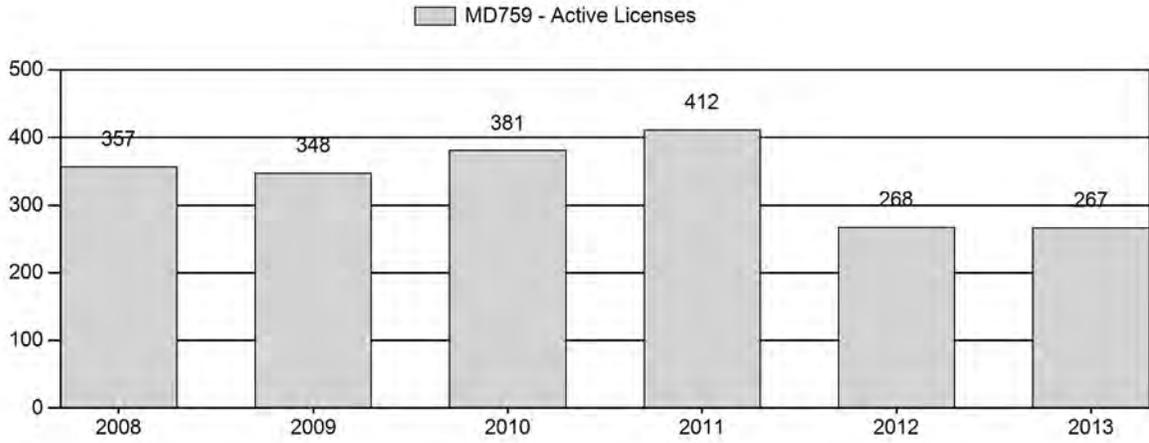
# Number of Hunters



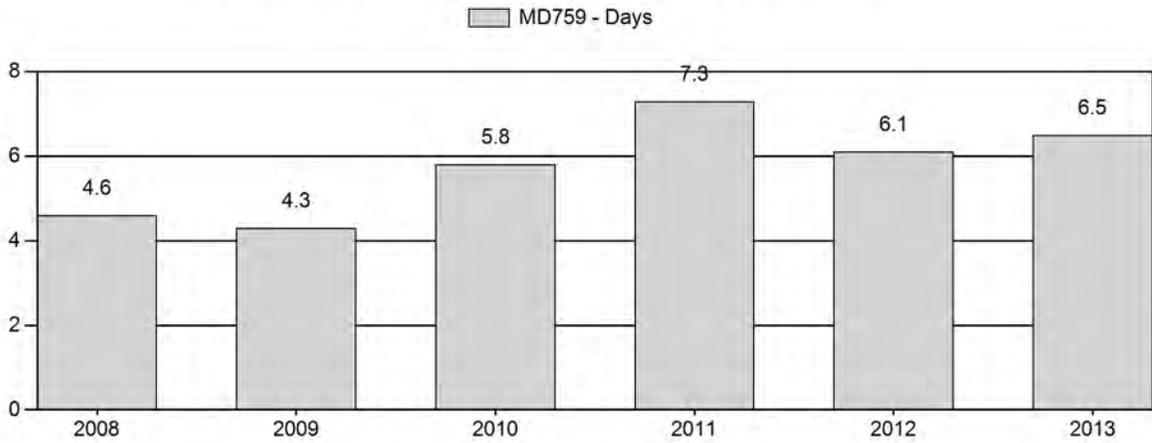
# Harvest Success



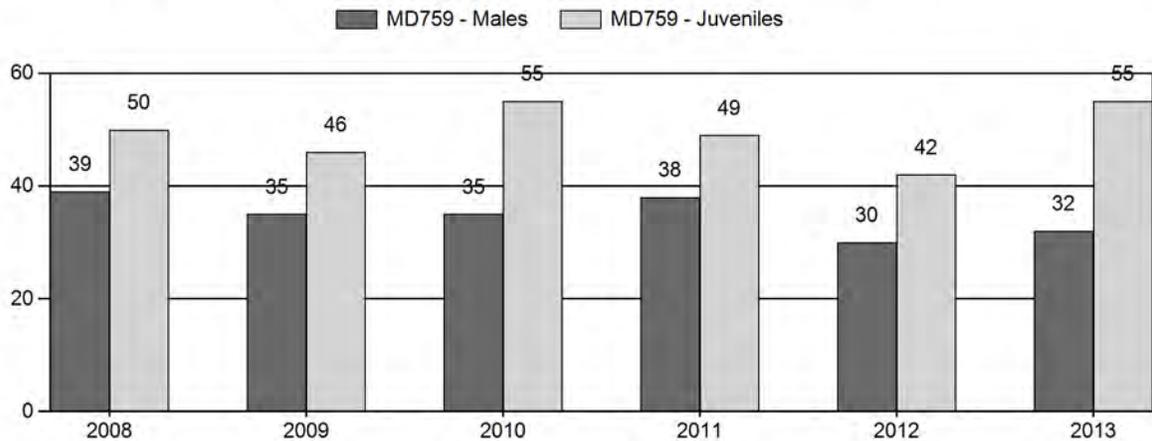
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



2008 - 2013 Postseason Classification Summary

for Mule Deer Herd MD759 - NORTH NATRONA

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

**2014 HUNTING SEASONS  
NORTH NATRONA MULE DEER HERD (MD759)**

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

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

**Management Evaluation**

**Current Postseason Population Management Objective:** 6,500

**Management Strategy:** Special

**2013 Postseason Population Estimate:** 4,200

**2014 Proposed Postseason Population Estimate:** 4,200

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

**Herd Unit Issues**

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

## **Weather**

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

## **Habitat**

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

## **Field Data**

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

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

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

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

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

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

## **Harvest Data**

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

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

## **Population**

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

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

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

### **Management Summary**

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

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

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

MODELS SUMMARY			Relative AICc	Fit	Notes
CJ,CA	Constant Juvenile & Adult Survival		37	28	
SCJ,SCA	Semi-Constant Juvenile & Semi-Constant Adult Survival		38	24	
TSJ,CA	Time-Specific Juvenile & Constant Adult Survival		127	4	

Year	Posthunt Population Est.		Trend Count		Predicted Prehunt Population				Predicted Posthunt Population				Objective
	Field Est	Field SE	Juveniles	Total	Juveniles	Total Males	Females	Total	Juveniles	Total Males	Females	Total	
1993			919	882	2471	4272	901	541	2270	3712	6500	6500	
1994			1219	702	2225	4146	1214	474	2123	3811	6500	6500	
1995			1446	721	2174	4341	1435	482	2062	3979	6500	6500	
1996			1701	784	2175	4660	1701	580	2116	4387	6500	6500	
1997			1496	936	2290	4723	1484	664	2238	4386	6500	6500	
1998			1273	956	2343	4572	1273	704	2297	4273	6500	6500	
1999			1353	938	2342	4634	1349	671	2236	4256	6500	6500	
2000			1225	929	2308	4461	1210	545	2225	3980	6500	6500	
2001			1444	782	2263	4489	1434	599	2159	4191	6500	6500	
2002			1228	886	2260	4374	1225	646	2192	4064	6500	6500	
2003			1655	876	2238	4768	1645	677	2191	4512	6500	6500	
2004			2012	1007	2341	5361	2010	740	2264	5014	6500	6500	
2005			1750	1154	2498	5402	1746	905	2397	5048	6500	6500	
2006			1111	1234	2549	4894	1109	947	2459	4514	6500	6500	
2007			1591	1111	2444	5146	1583	863	2330	4776	6500	6500	
2008			1196	1156	2449	4801	1194	900	2409	4503	6500	6500	
2009			1099	1091	2421	4611	1095	818	2387	4301	6500	6500	
2010			1287	995	2377	4659	1287	751	2338	4375	6500	6500	
2011			1140	983	2381	4504	1137	745	2309	4192	6500	6500	
2012			973	941	2319	4232	967	755	2294	4017	6500	6500	
2013			1233	907	2263	4404	1231	710	2251	4193	6500	6500	
2014			1112	934	2291	4337	1110	796	2275	4181	6500	6500	
2015											6500	6500	
2016											6500	6500	
2017											6500	6500	
2018											6500	6500	
2019											6500	6500	
2020											6500	6500	
2021											6500	6500	
2022											6500	6500	
2023											6500	6500	
2024											6500	6500	
2025											6500	6500	

Survival and Initial Population Estimates

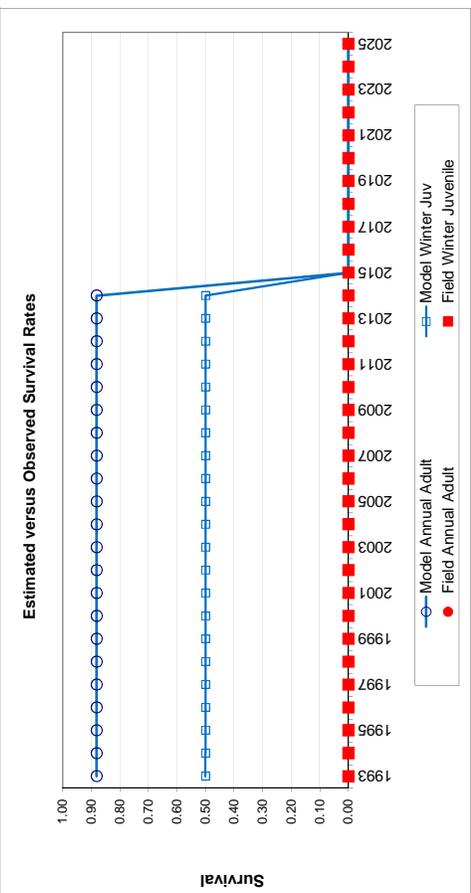
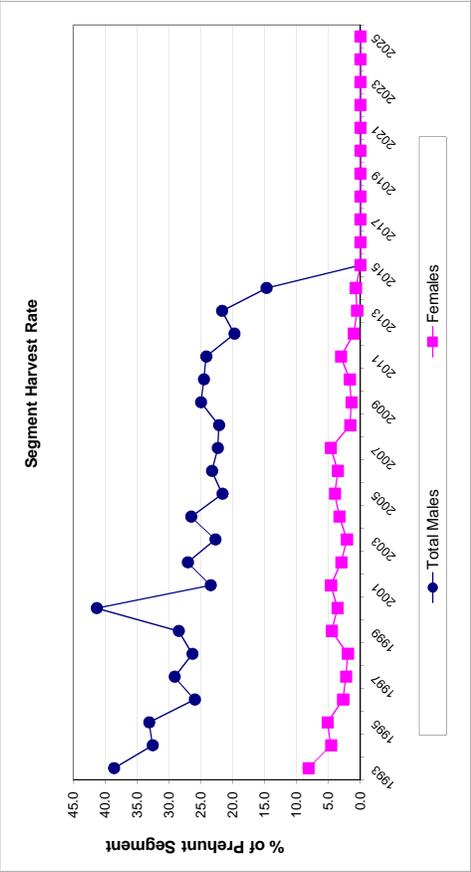
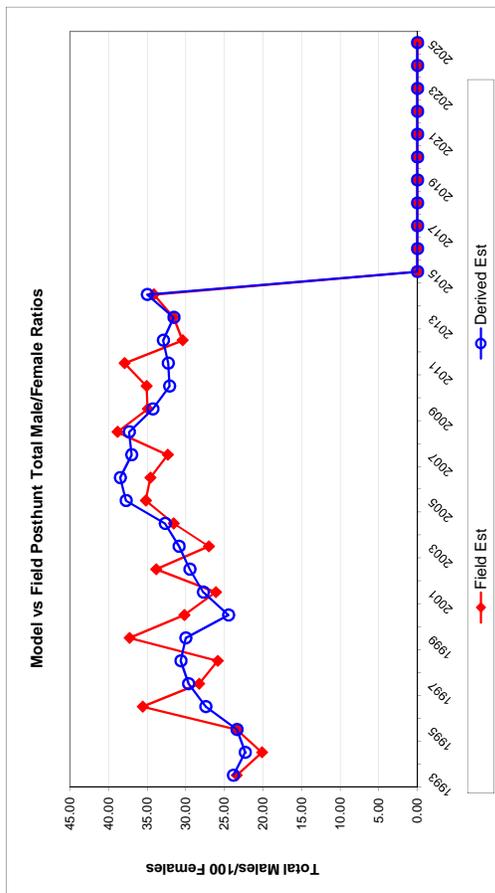
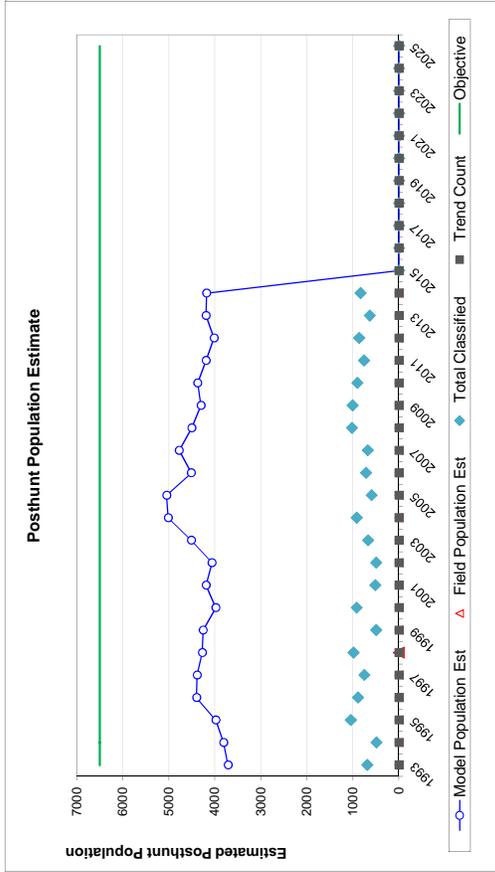
Year	Annual Juvenile Survival Rates		Annual Adult Survival Rates	
	Model Est	Field Est SE	Model Est	Field Est SE
1993	0.50		0.88	
1994	0.50		0.88	
1995	0.50		0.88	
1996	0.50		0.88	
1997	0.50		0.88	
1998	0.50		0.88	
1999	0.50		0.88	
2000	0.50		0.88	
2001	0.50		0.88	
2002	0.50		0.88	
2003	0.50		0.88	
2004	0.50		0.88	
2005	0.50		0.88	
2006	0.50		0.88	
2007	0.50		0.88	
2008	0.50		0.88	
2009	0.50		0.88	
2010	0.50		0.88	
2011	0.50		0.88	
2012	0.50		0.88	
2013	0.50		0.88	
2014	0.50		0.88	
2015	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					Segment Harvest Rate (% of		
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females	
1993		39.72	3.62	23.85	23.40	2.61	16	310	183	509	38.6	8.1	
1994		57.19	5.69	22.31	20.14	2.95	4	208	93	305	32.6	4.6	
1995		69.61	4.66	23.38	23.39	2.31	10	217	102	329	33.1	5.2	
1996		80.39	5.93	27.42	35.59	3.42	0	185	54	239	26.0	2.7	
1997		66.32	5.33	29.65	28.28	3.05	11	248	47	306	29.1	2.3	
1998		55.41	3.98	30.65	25.87	2.44	0	229	42	271	26.4	2.0	
1999		60.32	6.19	30.01	37.30	4.51	4	243	96	343	28.5	4.5	
2000		54.40	4.10	24.48	30.20	2.80	13	349	75	437	41.3	3.6	
2001		66.42	6.42	27.74	26.12	3.51	9	167	95	271	23.5	4.6	
2002		55.89	5.76	29.48	33.84	4.15	2	218	62	282	27.1	3.0	
2003		75.08	6.28	30.89	27.03	3.21	9	181	43	233	22.7	2.1	
2004		88.76	6.33	32.68	31.58	3.15	2	243	70	315	26.5	3.3	
2005		72.82	6.62	37.74	35.19	4.07	4	227	91	322	21.6	4.0	
2006		45.11	4.05	38.50	34.59	3.42	2	261	82	345	23.3	3.5	
2007		67.94	5.79	37.02	32.35	3.55	7	226	103	336	22.4	4.6	
2008		49.54	3.69	37.34	38.86	3.15	2	233	36	271	22.2	1.6	
2009		45.88	3.46	34.28	34.95	2.91	3	248	31	282	25.0	1.4	
2010		55.04	4.23	32.11	35.08	3.16	0	222	36	258	24.5	1.7	
2011		49.26	4.26	32.29	37.93	3.59	2	216	66	284	24.2	3.0	
2012		42.15	3.45	32.92	30.42	2.81	5	169	22	196	19.8	1.0	
2013		54.68	4.97	31.55	31.58	3.49	2	179	11	192	21.7	0.5	
2014		48.80	3.99	35.00	34.14	3.17	2	125	15	142	14.7	0.7	
2015													
2016													
2017													
2018													
2019													
2020													
2021													
2022													
2023													
2024													
2025													

FIGURES



Comments:

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

