

# TABLE OF CONTENTS

<b>Acknowledgement</b>	ii
<b>Antelope</b>	
Rattlesnake (745) - Areas 70-72	1
North Natrona (746) - Area 73	11
North Converse (748) - Areas 25, 26	21
Black Thunder (750) - Areas 4-9, 24, 27, 29	31
<b>Mule Deer</b>	
Cheyenne River (740) - Areas 7-14, 21	45
Black Hills (751) - Areas 1-6	57
North Converse (755) - Area 22	69
South Converse (756) - Area 65	77
Bates Hole - Hat Six (757) - Areas 66, 67	89
Rattlesnake (758) - Areas 88, 89	117
North Natrona (759) - Area 34	127
<b>White-tailed Deer</b>	
Black Hills (706) - Areas 1-6	137
Central (707) - Areas 7-15, 21, 22, 34, 65-67, 88, 89	151
<b>Elk</b>	
Black Hills (740) - Areas 1, 116, 117	161
Laramie Peak / Muddy Mountain (741) - Areas 7, 19	177
Rattlesnake (742) - Area 23	193
Pine Ridge (743) - Area 122	203

## **Acknowledgement**

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

## 2015 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2015 - 5/31/2016

HERD: PR745 - RATTLESNAKE

HUNT AREAS: 70-72

PREPARED BY: HEATHER O'BRIEN

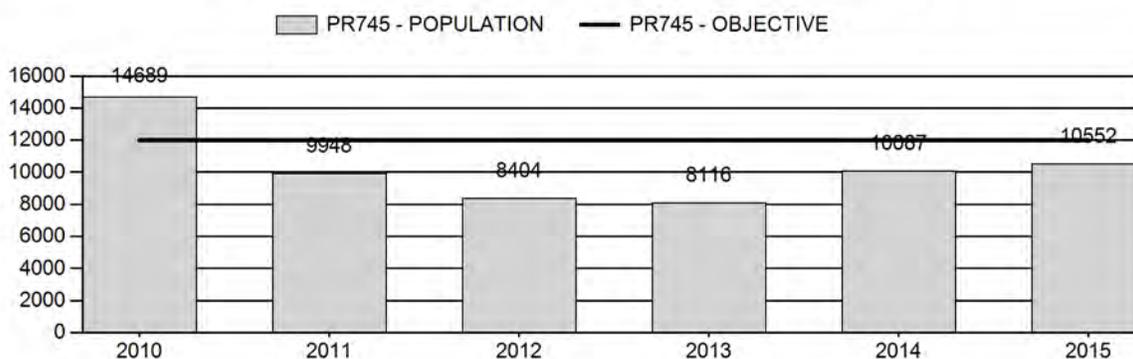
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	10,249	10,552	10,469
Harvest:	1,825	328	330
Hunters:	1,945	358	360
Hunter Success:	94%	92%	92 %
Active Licenses:	2,140	395	390
Active License Success:	85%	83%	85 %
Recreation Days:	6,497	1,090	1,200
Days Per Animal:	3.6	3.3	3.6
Males per 100 Females	57	43	
Juveniles per 100 Females	54	84	

Population Objective (± 20%) :	12000 (9600 - 14400)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-12.1%
Number of years population has been + or - objective in recent trend:	5
Model Date:	02/08/2016

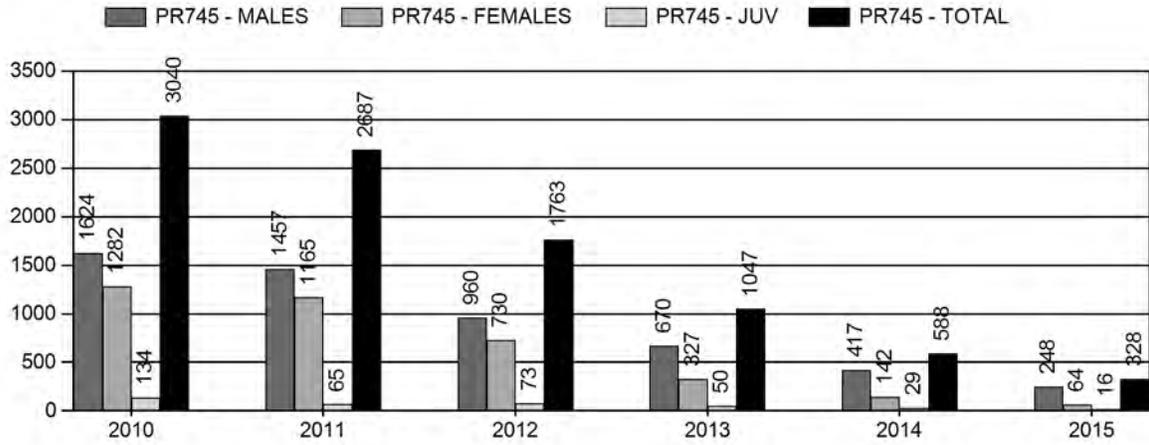
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	1.5%	1.5%
Males ≥ 1 year old:	13.1%	11.7%
Juveniles (< 1 year old):	0.4%	0.4%
Total:	3.1%	3.0%
Proposed change in post-season population:	+14.9%	-0.8%

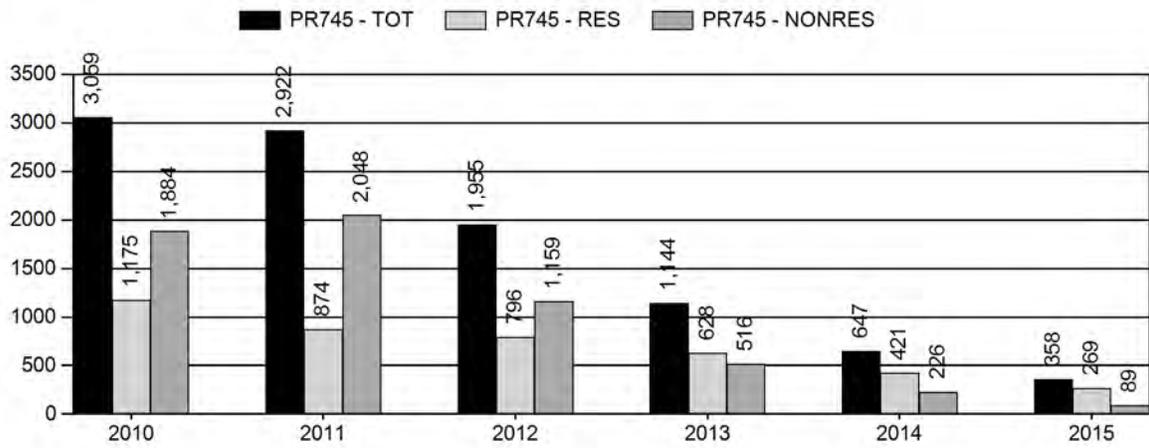
## Population Size - Postseason



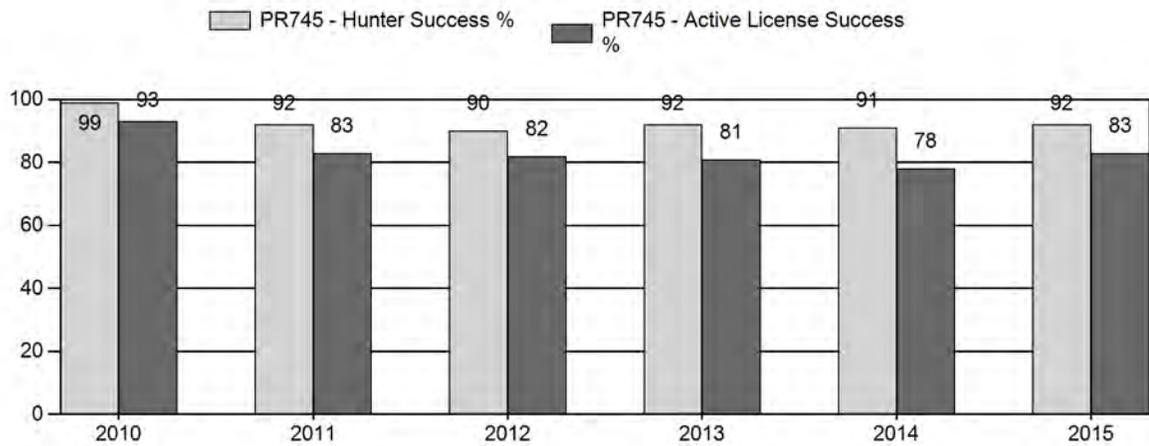
# Harvest



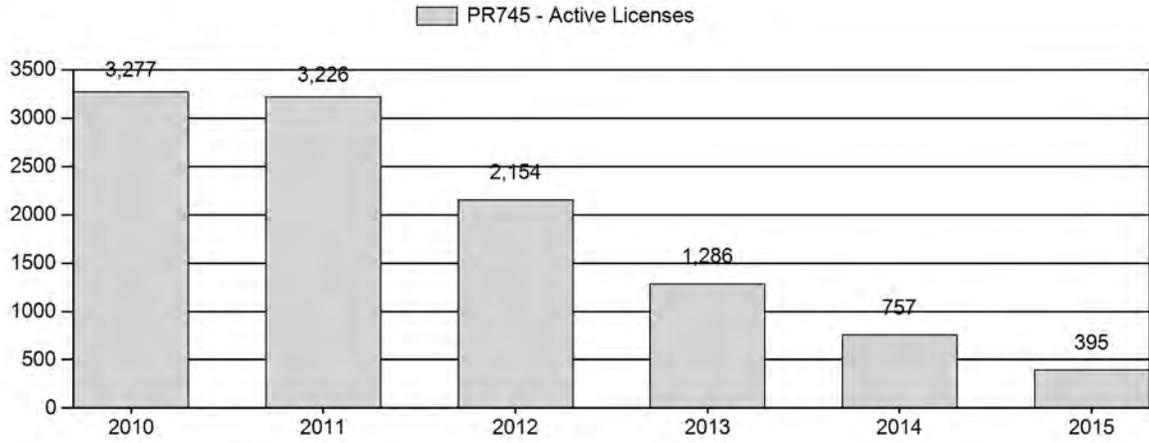
# Number of Hunters



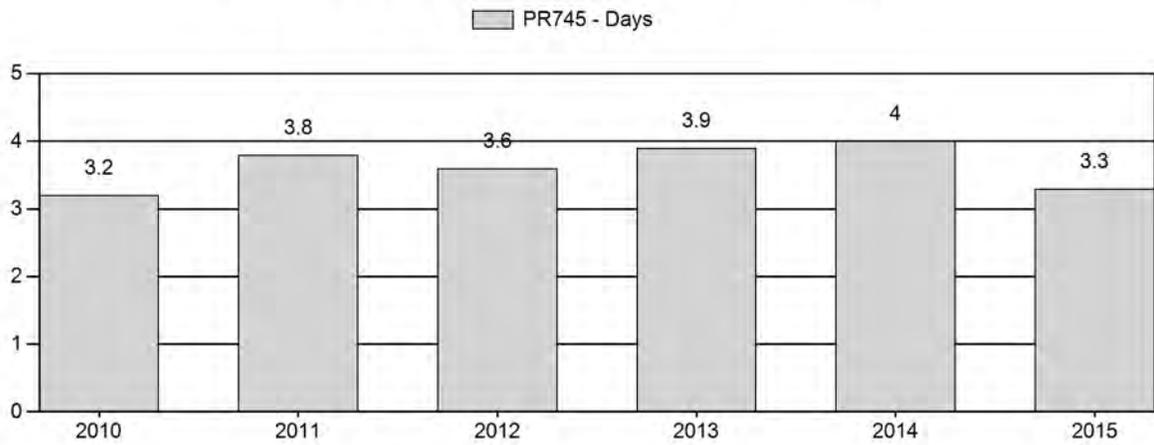
# Harvest Success



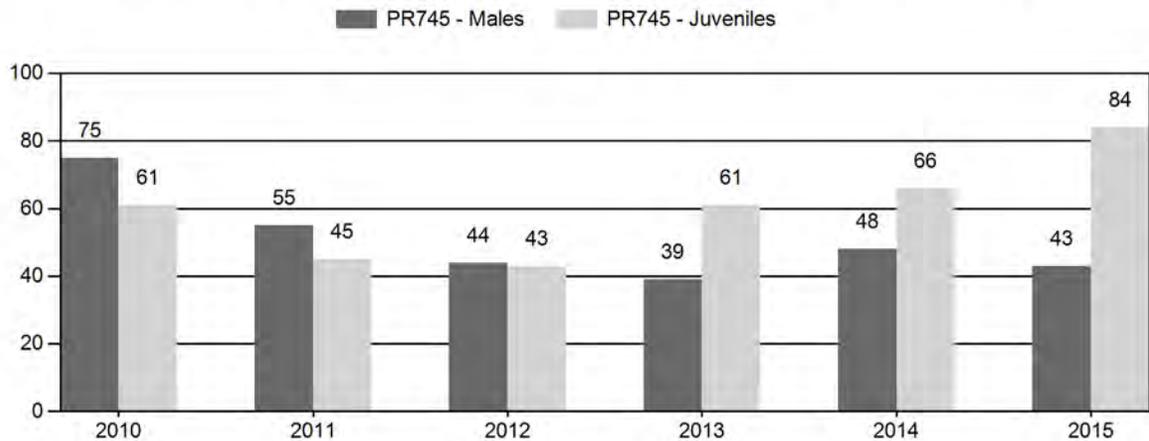
# Active Licenses



# Days Per Animal Harvested



# Preseason Animals per 100 Females



## 2010 - 2015 Preseason Classification Summary

## for Pronghorn Herd PR745 - RATTLESNAKE

Year	Pre 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
2010	18,033	271	933	1,204	32%	1,599	42%	970	26%	3,773	2,827	17	58	75	± 4	61	± 4	35
2011	12,938	195	683	878	27%	1,607	50%	721	22%	3,206	1,616	12	43	55	± 3	45	± 3	29
2012	10,343	82	209	291	24%	662	53%	285	23%	1,238	1,140	12	32	44	± 5	43	± 5	30
2013	9,268	45	199	244	20%	624	50%	381	31%	1,249	1,901	7	32	39	± 5	61	± 6	44
2014	10,921	111	191	302	22%	634	47%	416	31%	1,352	1,734	18	30	48	± 5	66	± 6	44
2015	10,913	160	243	403	19%	947	44%	796	37%	2,146	2,231	17	26	43	± 4	84	± 6	59

**2016 HUNTING SEASONS  
RATTLESNAKE PRONGHORN HERD (PR745)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
70	1	Sep. 15	Oct. 31	25	Limited quota	Any antelope
	2	Sep. 15	Oct. 31	25	Limited quota	Any antelope valid on private land
	7	Sep. 15	Oct. 31	25	Limited quota	Doe or fawn antelope valid on private land
71	1	Sep. 15	Oct. 31	75	Limited quota	Any antelope
	6	Sep. 15	Oct. 31	25	Limited quota	Doe or fawn antelope
72	1	Sep. 15	Oct. 31	250	Limited quota	Any antelope
	6	Sep. 15	Oct. 31	25	Limited quota	Doe or fawn antelope
Archery		Aug. 15	Sep. 14			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2015
70	1	-25
	2	+25
	6	-25
	7	+25
71	1	no change
	6	no change
72	1	no change
	6	no change
Total	1	-25
	2	+25
	6	-25
	7	+25

**Management Evaluation**

**Current Management Objective:** 12,000

**Management Strategy:** Special

**2015 Postseason Population Estimate:** ~10,500

**2016 Proposed Postseason Population Estimate:** ~10,500

**2015 Hunter Satisfaction:** 90.6% Satisfied, 8.0% Neutral, 1.4% Dissatisfied

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

### **Herd Unit Issues**

Hunting access within the herd unit is moderate, having some large tracts of public land as well as Walk-In Areas and a Hunter Management Area. Traditional ranching and grazing are the primary land use over the whole herd unit, with scattered areas of oil and gas development. Hunt Areas 70 & 71 are dominated by private lands. License issuance is typically maintained at a higher level relative to pronghorn densities in Area 70 to address damage issues on irrigated agricultural fields. Periodic disease outbreaks (i.e. hemorrhagic diseases, *Clostridium spp.* infections) are possible in this herd and can contribute to population declines when environmental conditions are suitable. However, there were no reported or confirmed cases of disease outbreak in pronghorn within the Rattlesnake Herd during 2015.

### **Weather**

The winter of 2010-2011 was severe throughout the herd unit, resulting in very high mortality of pronghorn across all age classes. Severe drought conditions persisted from spring 2011 through winter 2012, which had a negative impact on pronghorn reproductive success and fawn survival. The spring and summer of 2013 were cool with significant precipitation, yet habitat conditions appeared to remain poor for much of the growing season. Fawn production was also lagged behind and remained poor, as doe pronghorn nutritional condition was slow to recover from the effects of the 2012 drought. Heavy precipitation during the fall of 2013 caused a beneficial late green-up that provided improved forage for pronghorn entering the winter season. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. The spring and summer of 2014 produced much-improved range conditions that benefitted pronghorn, and fawn production began to improve. The winter of 2014-2015 was mild with good overwinter survival of pronghorn, while the spring and summer of 2015 were slightly above average in terms of precipitation and range condition. Fawn production finally increased to above average in 2015, as range conditions and nutritional status of does were much improved. The fall of 2015 was very dry, but winter thus far has had the potential to be hard on pronghorn. Deep persistent snow with hard crusting is likely to impact overwinter survival of pronghorn in some areas within this herd unit, particularly in areas where lighter winds do not consistently move and drift snow to expose forage. For detailed weather data see <http://www.ncdc.noaa.gov/gac/time-series/us>.

## **Habitat**

This herd unit has no established habitat transects to measure production and/or utilization on shrub species that are preferred browse for pronghorn. Anecdotal observations and discussions with landowners in the region indicate that summer and winter forage availability for pronghorn was good in 2015. Herbaceous forage species were observed to be in good condition in 2015 compared to previous years, and pronghorn appeared to be more widely distributed across suitable habitat.

## **Field Data**

The Rattlesnake Pronghorn Herd grew rapidly from 1998-2005 and was well above objective prior to the winter of 2010-2011. Harsh winter conditions in 2010-2011 combined with severe drought dropped this herd unit below management objective, and license issuance since then has become extremely conservative. Improved moisture and favorable weather conditions appeared to have helped fawn production and survival the past three years, as the fawn ratio improved from 2013-2015. Still, fawn production for the Rattlesnake Herd did not improve in 2013 & 2014 as much as in adjacent herds. This suggests the carrying capacity for the herd unit was still suppressed despite improved precipitation. Native habitats were likely still recovering from the very high pronghorn numbers of 2004 to 2011 and prolonged drought conditions. Fawn ratios finally increased in 2015 to 84:100 does – a level of production which has not been observed within the herd unit since 2005.

Buck ratios for the Rattlesnake herd historically range from the mid 40s to mid 70s per 100 does. Buck ratios are most commonly in the upper 50s, just below the lower limit for special management. In more recent years, buck ratios have dropped to the mid-40s as a result of low fawn recruitment and high harvest pressure on a diminishing population. In 2013, the buck ratio for the Rattlesnake Pronghorn Herd reached a 22-year low of 39:100 does. Since then buck ratios have improved. In 2014 the buck ratio was 48:100 does - a result of reduced harvest pressure and improved overwinter survival. The buck ratio dropped slightly in 2015 to 43:100 does despite very conservative hunting seasons. Harvest pressure on bucks combined with mediocre recruitment of fawns may have contributed to this stagnating buck ratio. While it can be difficult to maintain buck ratios in this herd within the range of special management due to differing management strategies for Area 70 versus Areas 71 and 72, hunters have developed high expectations for buck numbers and quality within this herd. This population will thus be managed conservatively to increase buck ratios within special management parameters while also increasing the overall population toward objective.

The 2015 post-season population estimate was approximately 10,500 and trending slightly upward from 2014 estimates. This herd unit did not have a functional population model until 2012, when a spreadsheet-based modeling system replaced the program POP-II to simulate herd dynamics. Prior management decisions for this herd were made using a combination of classification data, harvest statistics, observations of field personnel, and comments from hunters and landowners regarding pronghorn numbers. Line transect surveys were also conducted in 1998, 2000, 2003, 2007, and 2014 to provide end-of-year population estimates. The 2014 survey yielded good results with a reasonable standard error which aligns well with the population model. The current population model is considered to be of fair quality, as personnel believe there is significant interchange with the adjacent Beaver Rim Herd Unit that is not accounted for in the model. Managers evaluated a merged dataset of the Rattlesnake and Beaver Rim Herds in 2015. However, the combined model did not show adequate enough improvements in predicting population size or trend to merit combining the two herds.

### **Harvest Data**

License success in this herd unit is typically in the 90<sup>th</sup> percentile. Despite drastic reductions in license issuance, success declined from 2011-2014 to near the 80<sup>th</sup> percentile. At the same time hunter days increased, indicating pronghorn were more difficult for hunters to find and harvest. In 2014, active license success reached a 12-year low of 78%, hunter days reached a 17-year high, and reported hunter satisfaction for the Rattlesnake Herd Unit was the lowest in the state. Following further reductions in license issuance in 2015, harvest success for active licenses improved back to the 80<sup>th</sup> percentile and harvest days dropped to 3.2, which is more typical for this herd unit. Hunter satisfaction also improved markedly, from 68% in 2014 to 91% in 2015. Despite improved fawn production, managers will again recommend a very conservative harvest prescription in 2015 with the goal of maintaining hunter satisfaction while increasing buck ratios, harvest success, and the overall population.

### **Population**

The “Time-Specific Juvenile Survival – Constant Adult Survival” (TSJ,CA) spreadsheet model was chosen for the post-season population estimate of this herd. This model seemed most representative of the herd, as it selects for low juvenile survival in the years when managers agree that overwinter fawn survival was very poor – particularly in 2010-2012. The simpler models (CJ,CA and SCA,CA) select for higher juvenile survival rates across years, which does not seem feasible for this herd given its very slow rate of growth. All three models follow a trend that is plausible; however the CJ,CA model shows an extremely high buck harvest percentage in 2011, and the SCA,CA model shows a 2006 population peak that seems unrealistic. None of the models track very well with the three early line transect estimates, but all three models align very well with the 2013 line transect estimate. While the AIC for the TSJ,CA

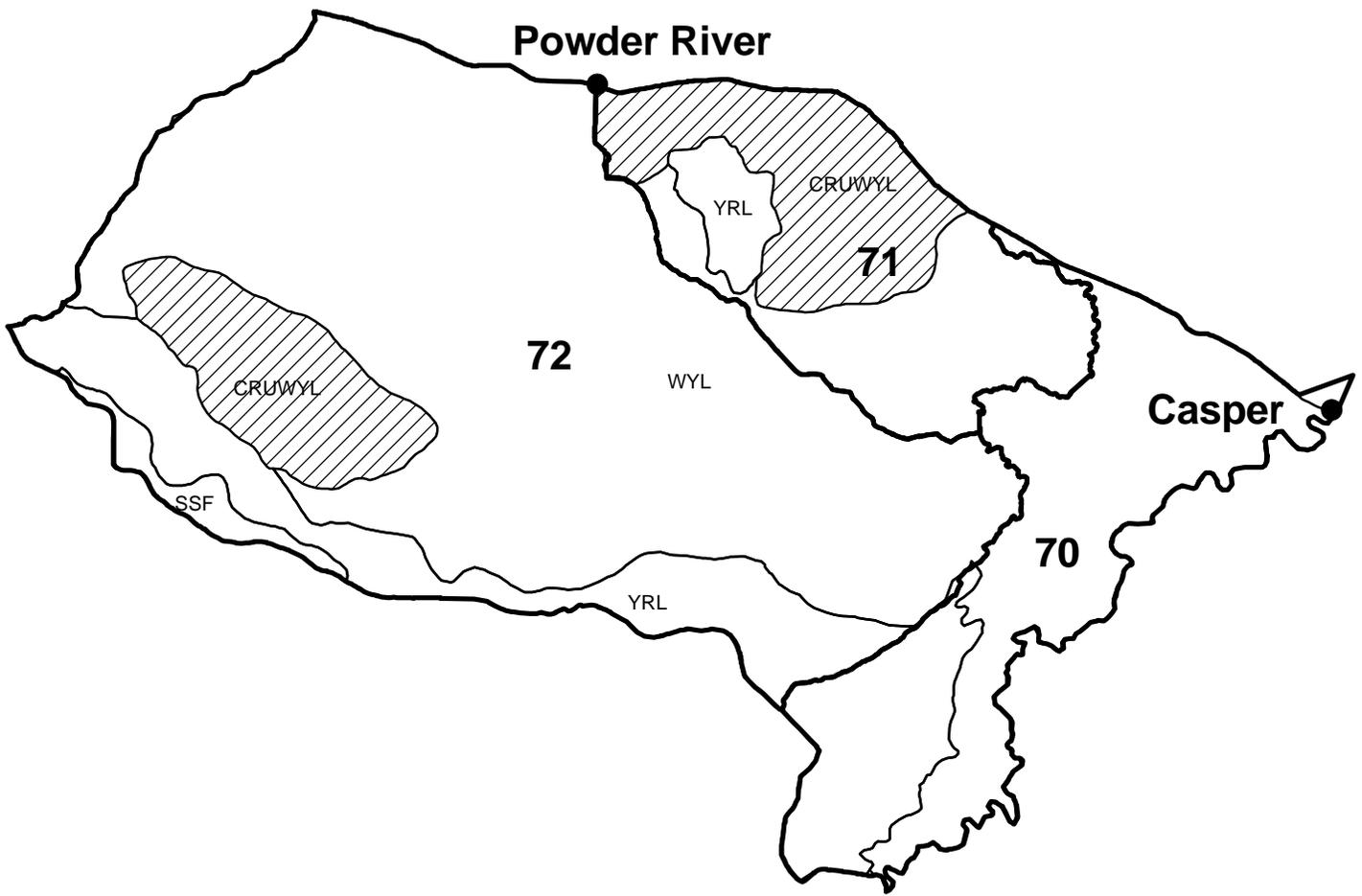
model is the highest of the three, it is only due to year-by-year penalties on juvenile survival and is still well within one level of power in comparison to the AICs of the simpler models. The TSJ,CA model appears to be the best representation relative to the perceptions of managers on the ground and follows trends with license issuance and harvest success. Overall the current model is considered fair in quality as a representation of herd dynamics.

### **Management Summary**

Traditional season dates in this herd unit run from September 15<sup>th</sup> through October 31<sup>st</sup>. We recommend the same season dates for 2016, maintaining extremely conservative license issuance in all hunt areas to. Area 70 doe/fawn licenses formerly ran through November 30<sup>th</sup> when license issuance was much higher. Doe/fawn licenses in Area 70 Type 6 licenses will be valid through October 31<sup>st</sup> to coincide with all other season dates in the herd unit, since license numbers are low and November seasons are not currently warranted. Hunters in Area 70 have also voiced concerns regarding an imbalance of harvest pressure on public lands in Area 70. To address this matter, license issuance will be divided into Type 1, 2, and 7 licenses, with Type 2 and 7 licenses valid on private land only. The 2016 season includes a total of 375 any-antelope and 75 doe/fawn licenses. Goals for 2016 are to maintain or increase pronghorn numbers towards objective, improve buck ratios consistent with special management strategy, and maintain or increase hunter success.

If the projected harvest of 330 pronghorn is achieved and fawn production/survival is moderate in 2016, this herd should remain near its current population size. If fawn production/survival is good or excellent, this herd should increase. The predicted 2016 post-season population estimate for the Rattlesnake Pronghorn Herd size assuming moderate fawn production/survival is approximately 10,500 animals, which is 12% below objective.

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



## 2015 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2015 - 5/31/2016

HERD: PR746 - NORTH NATRONA

HUNT AREAS: 73

PREPARED BY: HEATHER O'BRIEN

	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	11,363	15,422	13,796
Harvest:	929	779	1,350
Hunters:	1,077	846	1,500
Hunter Success:	86%	92%	90 %
Active Licenses:	1,132	859	1,500
Active License Success:	82%	91%	90 %
Recreation Days:	3,588	4,328	5,500
Days Per Animal:	3.9	5.6	4.1
Males per 100 Females	50	52	
Juveniles per 100 Females	58	89	

Population Objective (± 20%) : 11000 (8800 - 13200)

Management Strategy: Recreational

Percent population is above (+) or below (-) objective: 40%

Number of years population has been + or - objective in recent trend: 3

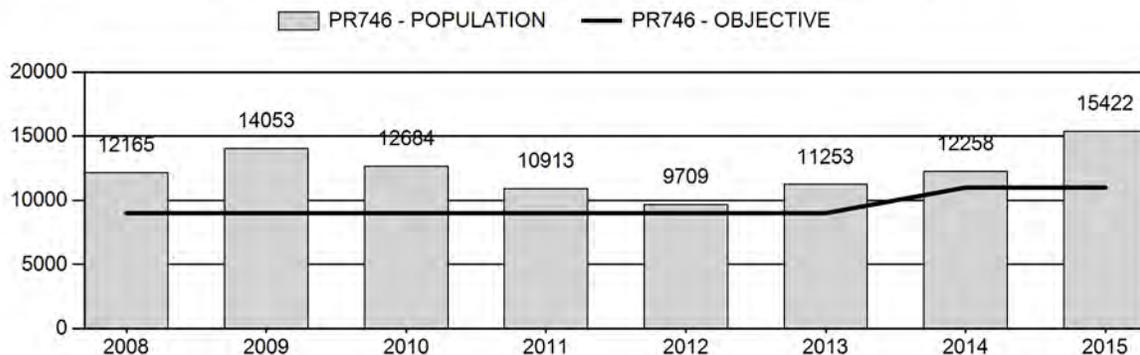
Model Date: 02/17/2016

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

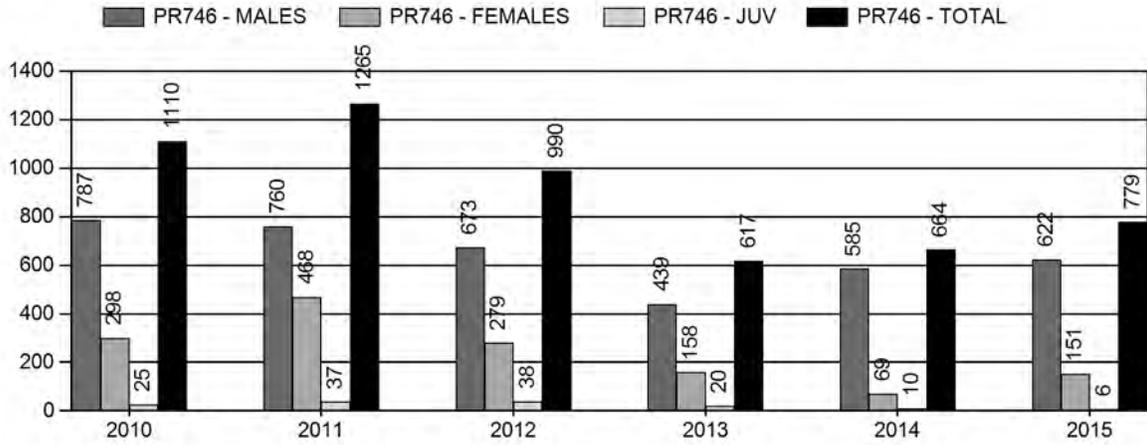
	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	2.5%	8.5%
Males ≥ 1 year old:	19.6%	24.3%
Juveniles (< 1 year old):	0.1%	0.5%
Total:	4.8%	8.8%

Proposed change in post-season population: 25.8%      -10.5%

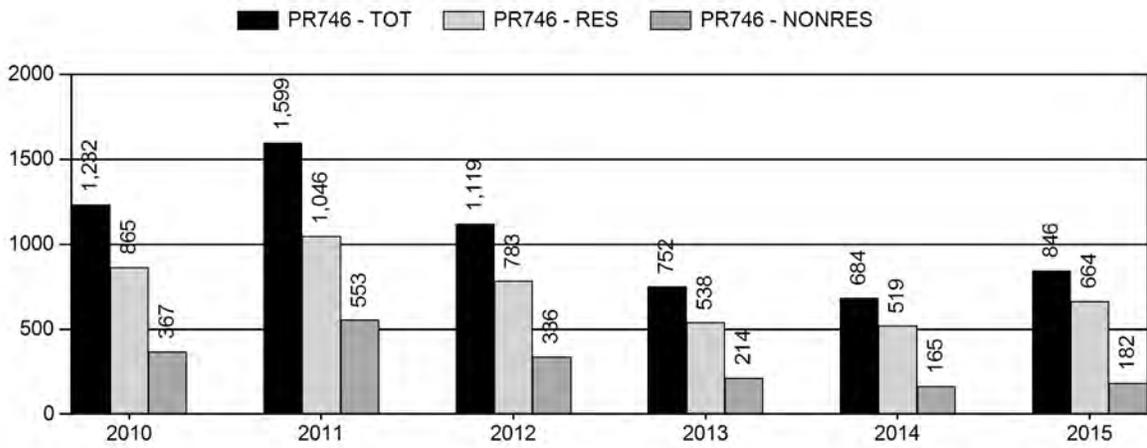
## Population Size - Postseason



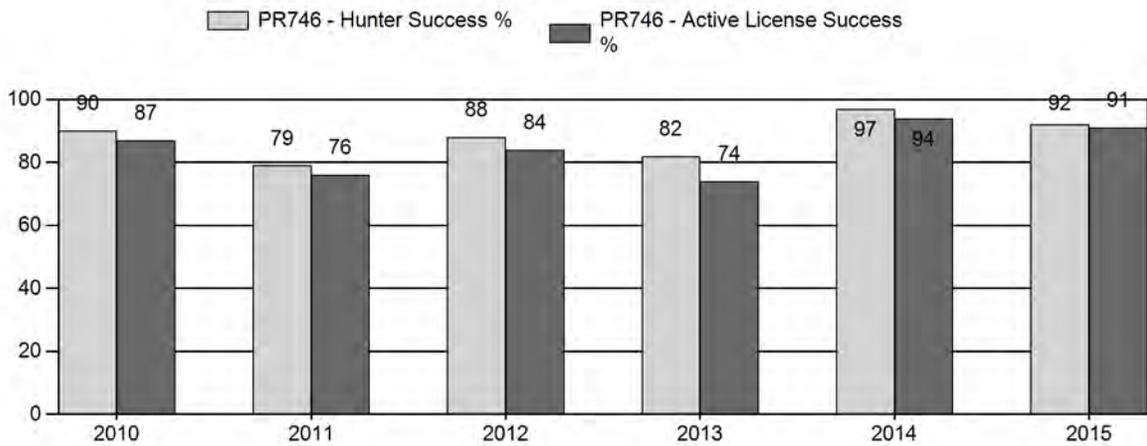
# Harvest



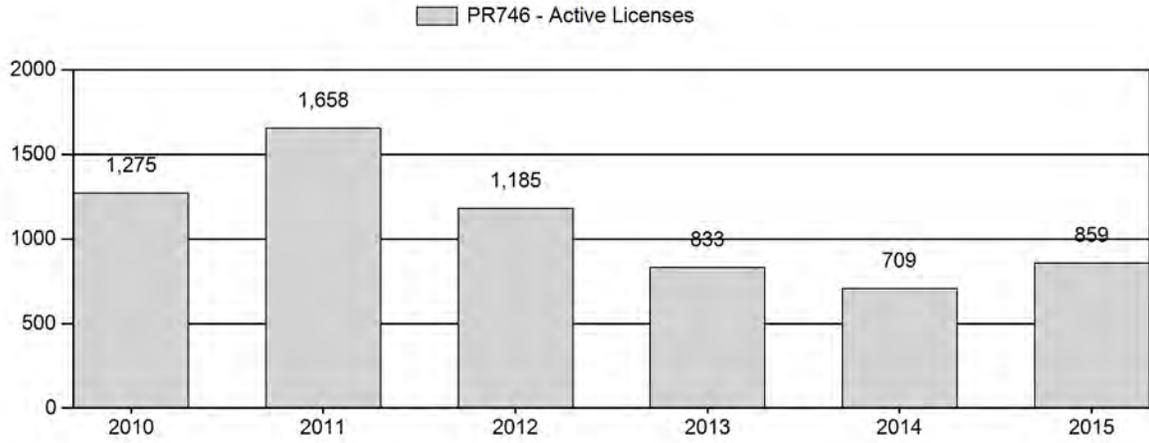
# Number of Hunters



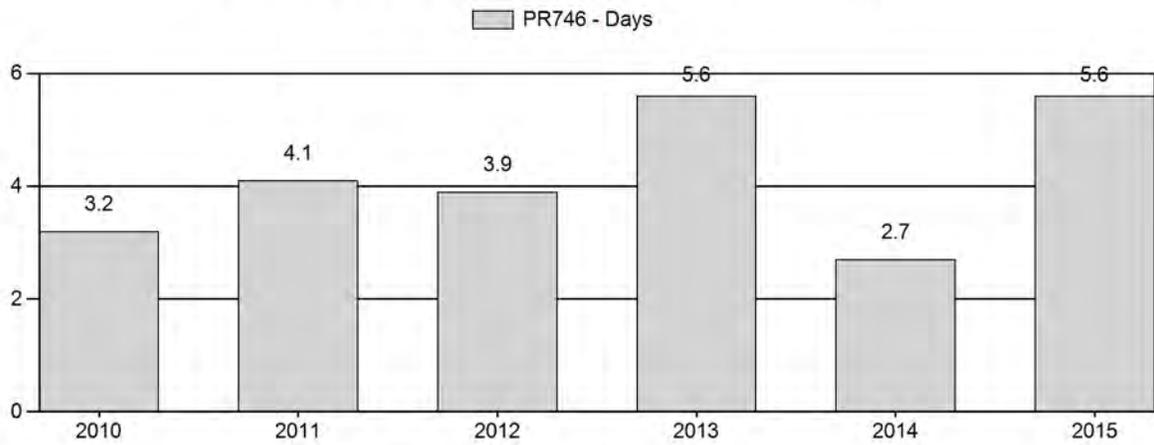
# Harvest Success



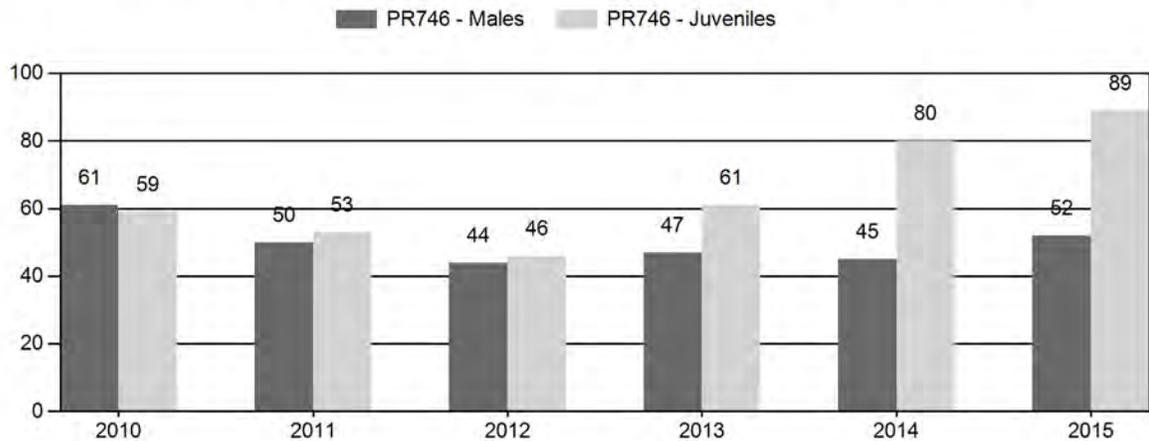
# Active Licenses



# Days Per Animal Harvested



# Preseason Animals per 100 Females



## 2010 - 2015 Preseason Classification Summary

## for Pronghorn Herd PR746 - NORTH NATRONA

Year	Pre Pop	MALES				FEMALES		JUVENILES		Tot Cls	Cls Obj	Males to 100 Females				Young to		
		Ylg	Adult	Total	%	Total	%	Total	%			Ylg	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2010	13,905	172	392	564	28%	932	46%	552	27%	2,048	1,988	18	42	61	± 5	59	± 5	37
2011	12,323	119	540	659	25%	1,322	49%	697	26%	2,678	2,129	9	41	50	± 3	53	± 4	35
2012	10,798	127	190	317	23%	713	53%	327	24%	1,357	1,843	18	27	44	± 5	46	± 5	32
2013	11,932	69	318	387	23%	817	48%	497	29%	1,701	1,832	8	39	47	± 4	61	± 5	41
2014	12,988	85	210	295	20%	650	44%	520	35%	1,465	1,915	13	32	45	± 5	80	± 7	55
2015	16,279	215	268	483	21%	936	42%	835	37%	2,254	2,729	23	29	52	± 4	89	± 6	59

**2016 HUNTING SEASONS  
NORTH NATRONA PRONGHORN HERD (PR746)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
73	1	Sep. 15	Oct. 31	900	Limited quota	Any antelope
	6	Sep. 15	Oct. 31	600	Limited quota	Doe or fawn antelope
Archery		Aug. 15	Sep. 14			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2015
73	1	+100
	6	+350

**Management Evaluation**

**Current Postseason Population Management Objective:** 11,000

**Management Strategy:** Recreational

**2015 Postseason Population Estimate:** ~15,400

**2016 Proposed Postseason Population Estimate:** ~13,700

**2015 Hunter Satisfaction:** 91% Satisfied, 8% Neutral, 1% Dissatisfied

The North Natrona Pronghorn Herd Unit has a post-season population management objective of 11,000 pronghorn. The herd is managed using the recreational management strategy, with a goal of maintaining preseason buck ratios between 30-59 bucks per 100 does. The objective and management strategy were formally reviewed and updated in 2014. Prior to 2014, the herd objective was set at 9,000 pronghorn.

**Herd Unit Issues**

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

suitable, though there were no reported or confirmed cases of disease outbreak within the North Natrona Herd in 2015.

## Weather

The winter of 2010-2011 was severe throughout the herd unit, resulting in high mortality of pronghorn. Severe drought conditions persisted from spring 2011 through winter 2012, which had a negative impact on pronghorn reproductive success and fawn survival. The spring of 2013 was cool with significant precipitation, with average rains over the summer as well. Still, habitat conditions remained poor in portions of the herd that received less spring and summer rain. Heavy precipitation during the fall of 2013 caused a beneficial late green-up that provided improved forage for pronghorn entering the winter season. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. The spring and summer of 2014 undeniably produced improved range conditions that benefitted pronghorn, and fawn production improved drastically. The winter of 2014-2015 was relatively mild with good overwinter survival of pronghorn, while the spring and summer of 2015 were slightly above average in terms of precipitation and range conditions improved once again. Fawn production was excellent in 2015, and nutritional status of does seemed to be much improved. The fall of 2015 was very dry, but winter thus far has had the potential to be hard on pronghorn in some areas. Deep persistent snow with hard crusting is likely to impact overwinter survival of pronghorn in some portions of the herd unit; particularly in the eastern and northeastern regions of the herd unit. For detailed weather data see <http://www.ncdc.noaa.gov/gac/time-series/us>.

## Habitat

Eight sagebrush transects were established within this herd in 2014 as part of the population objective review. These transects were measured for utilization in spring 2014 and 2015 (see Table 1). Utilization was light to moderate on all eight transects in 2014. In 2015, average utilization was even lighter. Anecdotal observations and discussions with landowners in the region confirm summer and winter forage availability for pronghorn was very good in 2014, and excellent in 2015. Additionally, pronghorn appeared to be widely distributed across suitable habitat in both years. This suggests current pronghorn population size and the revised objective are sustainable given available habitat.

Year	Average Utilization
2014	15.38%
2015	9.50%

**Table 1.** Average utilization of big sagebrush (*Artemisia tridentata* Nutt. Subsp. *wyomingensis*) for eight transects within the North Natrona Pronghorn Herd unit, 2014-2015.

## **Field Data**

The North Natrona Pronghorn Herd grew rapidly from 1998-2005 and was well above objective prior to the winter of 2010-2011. The severe winter of 2011 resulted in above average mortality and severe drought slowed population growth significantly. By 2012, higher license issuance was no longer necessary to control growth of the herd, and licenses were reduced. Hunter harvest, mortality from harsh winter conditions in 2010-2011, poor fawn production/survival, and severe drought subsequently reduced this herd. Mild winter weather followed by an excellent growing season helped to improve conditions for fawns and lactating does in 2013, 2014, and 2015. Overall precipitation and resulting forage growth were exceptional in 2014 and 2015, and fawn ratios reached a 17-year high in 2015. Overwinter survival of fawns appeared to improve from 2014 to 2015 as well, as evidenced by high yearling buck ratios. As a result, this population has grown rapidly the past three years. Managers have observed higher densities of pronghorn throughout the herd unit, and in 2015 ground-classifications were the highest on record since 2011.

Buck ratios for the North Natrona Herd historically average in the mid-50s:100 does. Buck ratios dropped markedly in 2011 and reached a 15-year low of 44 bucks per 100 does in 2012. The buck ratio held steady in the mid-40s per 100 does for 2013 and 2014 and was 52:100 does in 2015 thanks to high yearling buck recruitment. Typically buck ratios for the herd unit are easily maintained within the target range for recreational management. Ultimate management goals are to maintain buck ratios within this range to sustain high hunter satisfaction, while continuing to offer exceptional opportunity and good drawing odds via recreational management.

## **Harvest Data**

License success in this herd unit is typically in the 80-90<sup>th</sup> percentile. Harvest success was lower from 2011-2013 as population size dropped. License issuance was also reduced during the same time period, but did not keep pace with declining pronghorn numbers. In 2014, license issuance was at a 10-year low, but pronghorn numbers also began to recover. Thus, hunters enjoyed much improved harvest success in the 90<sup>th</sup> percentile, and low average hunter days. As a result, North Natrona hunters expressed the highest percentage of satisfaction in the state for pronghorn in 2014. Hunter satisfaction was also very high in 2015, as harvest success was near 90%, weather conditions were excellent, and hunter crowding was low.

## **Population**

The “Time-Specific Juvenile Survival - Constant Adult Survival” (TSJ,CA) spreadsheet model was chosen to use for the post-season population estimate of this herd. This model seemed the

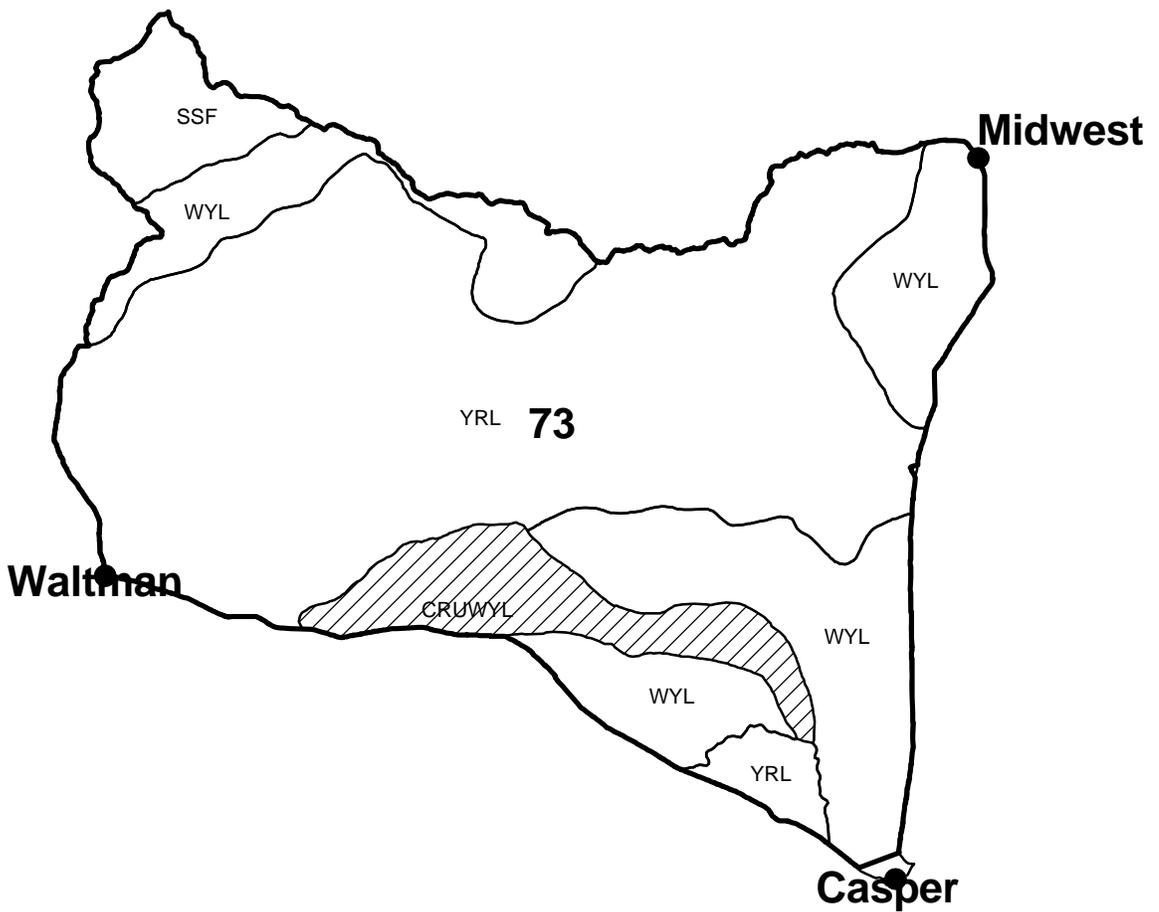
most representative of the herd, as it selects for higher juvenile survival during the years when field personnel observed mild winter conditions, particularly from 2003-2008 when drought conditions persisted and overwinter precipitation was minimal. The simpler models (CJ,CA and SCJ,CA) select for a very low juvenile survival rate and a very high adult survival rate across years, which does not seem feasible for this herd. All three models follow a trend that seems representative for this herd unit. The three models each align partially to four line-transect estimates – each model aligning through some but not all line-transect estimate confidence intervals. However, the CJ,CA and SCJ,CA models estimate population peaks in 2009 that are unrealistically high compared to the perceptions of field personnel and landowners at that time. While the AIC for the TSJ,CA model is the highest of the three, it is only due to year-by-year penalties and is still well within one level of power in comparison to the AICs of the simpler models. The TSJ, CA model aligns with two of four line transect estimates, and is very close to the confidence intervals for the remaining two. The 2012 line transect had a wide standard error, and is considered to be an overestimate of population size for that year. However, its addition in the model only changes the current population estimate by about 100 animals. Thus, it was left in the model as it provides an additional estimation point for the model to utilize. While the model does select upper and lower constraints for juvenile survival for several years of simulation, The TSJ,CA model still appears to be the best representation relative to the perceptions of managers on the ground while following trends with license issuance and harvest success. Overall the model is considered to be good in representing dynamics of the herd.

## **Management Summary**

Traditional season dates in this herd run from September 15<sup>th</sup> through October 31<sup>st</sup>. Season dates will remain the same for 2016, with increases in Type 1 and Type 6 license issuance to provide additional hunting opportunity and address rapid population growth above objective in the herd. The 2016 season includes 900 Type 1 licenses and 600 Type 6 licenses. The Type 7 licenses specific to private agricultural lands are still unnecessary in 2016, as damage has not been an issue and access on private lands in the southeast portion of the herd unit has been poor. Landowners that normally utilize the Type 7 license can still take hunters with a Type 6 license, should they have a need to control for agricultural damage. Population growth rates increased markedly in 2014 and 2015, and managers need to reduce the herd toward the new objective of 11,000 rather than allowing further growth. Goals for 2016 are to reduce the pronghorn population toward objective, increase opportunity particularly for doe/fawn harvest, and to maintain current buck ratios, hunter success, and hunter satisfaction.

If we attain the projected harvest of 1,350 pronghorn with average fawn production, this herd will be reduced from 40% to 25% above the objective. The predicted 2016 post-season population size of the North Natrona Pronghorn Herd is approximately 13,700 animals.

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





## 2015 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2015 - 5/31/2016

HERD: PR748 - NORTH CONVERSE

HUNT AREAS: 25-26

PREPARED BY: WILLOW STEEN

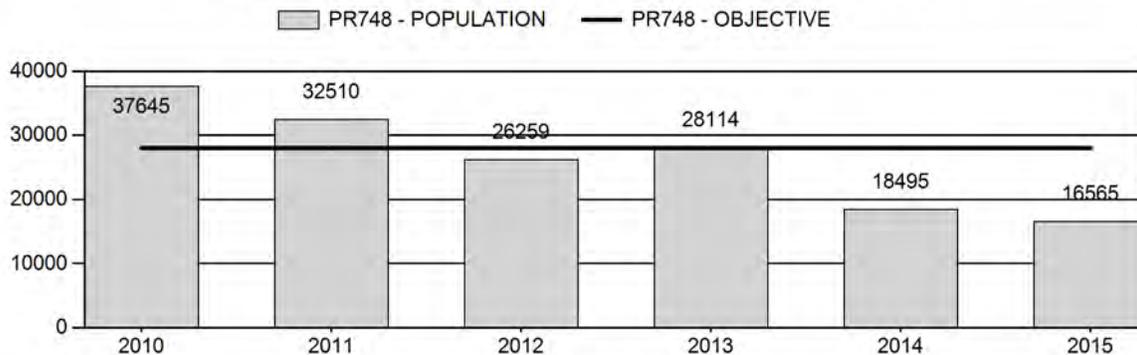
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	28,605	16,565	18,661
Harvest:	2,704	1,652	1,475
Hunters:	3,063	1,734	1,600
Hunter Success:	88%	95%	92%
Active Licenses:	3,216	1,861	1,700
Active License Success:	84%	89%	87%
Recreation Days:	9,863	6,828	6,200
Days Per Animal:	3.6	4.1	4.2
Males per 100 Females	64	50	
Juveniles per 100 Females	70	92	

Population Objective ( $\pm$ 20%) :	28000 (22400 - 33600)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-40.8%
Number of years population has been + or - objective in recent trend:	5
Model Date:	02/09/2016

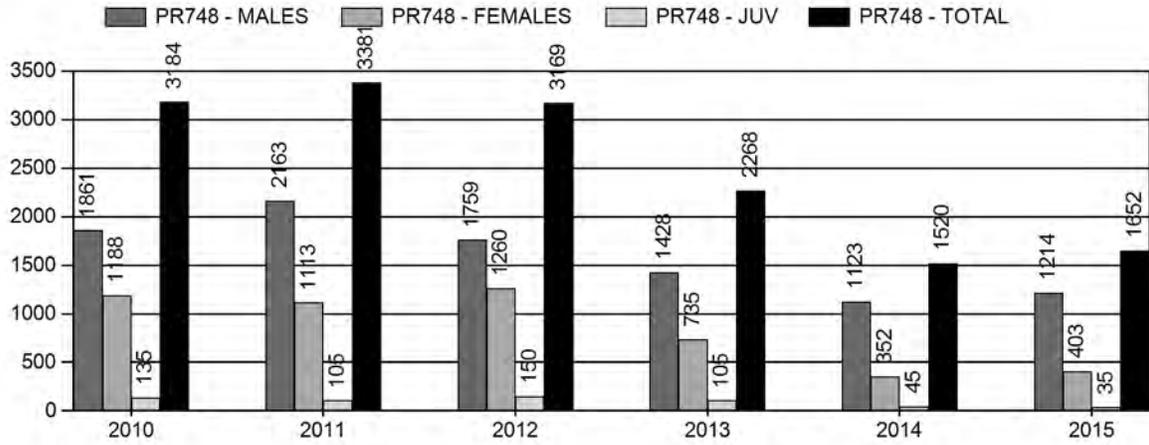
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

	<u>JCR Year</u>	<u>Proposed</u>
Females $\geq$ 1 year old:	5.3%	2.8%
Males $\geq$ 1 year old:	31.7%	25.0%
Juveniles (< 1 year old):	.5%	.3%
Total:	9.0%	7.3%
Proposed change in post-season population:	-9.9%	-8.0%

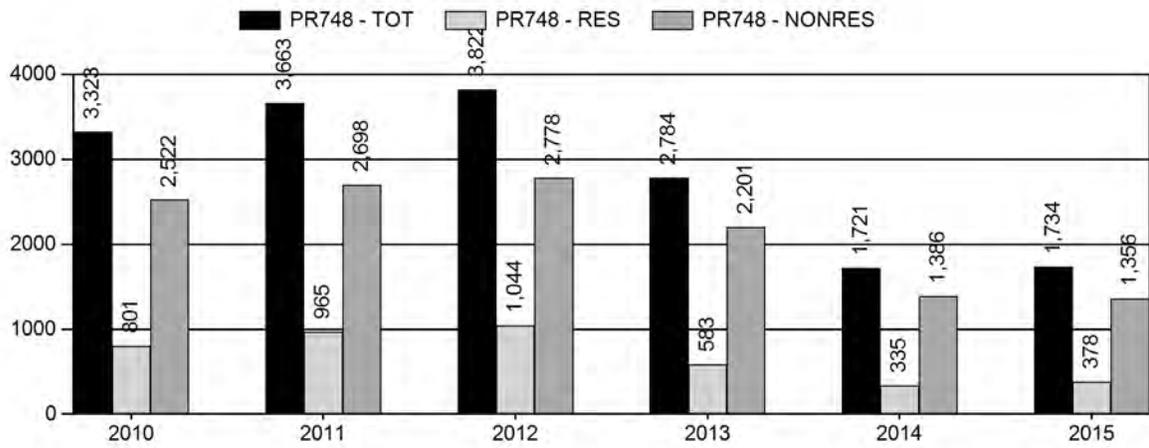
## Population Size - Postseason



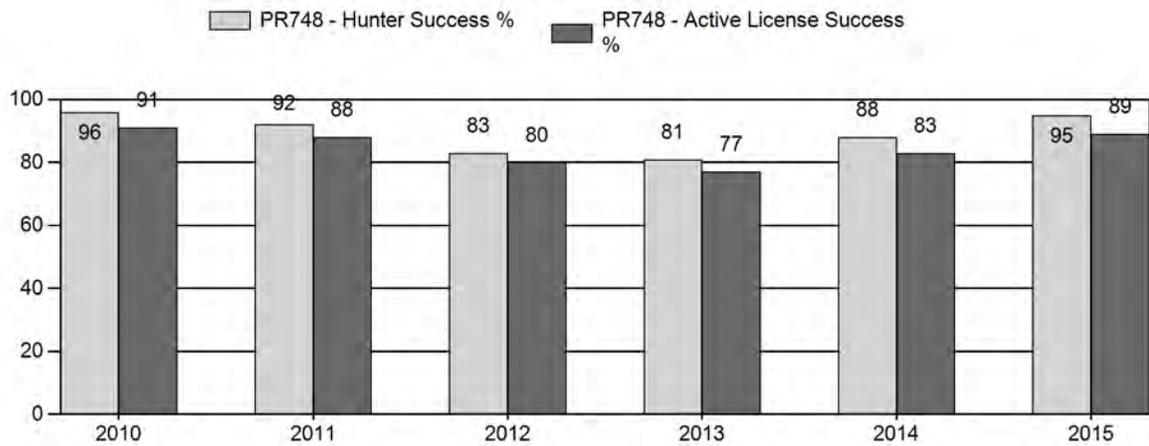
# Harvest



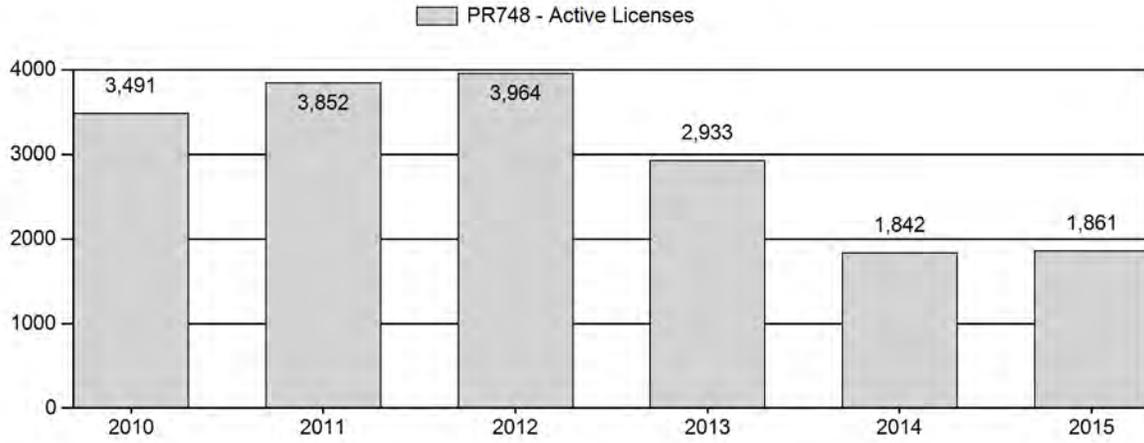
# Number of Hunters



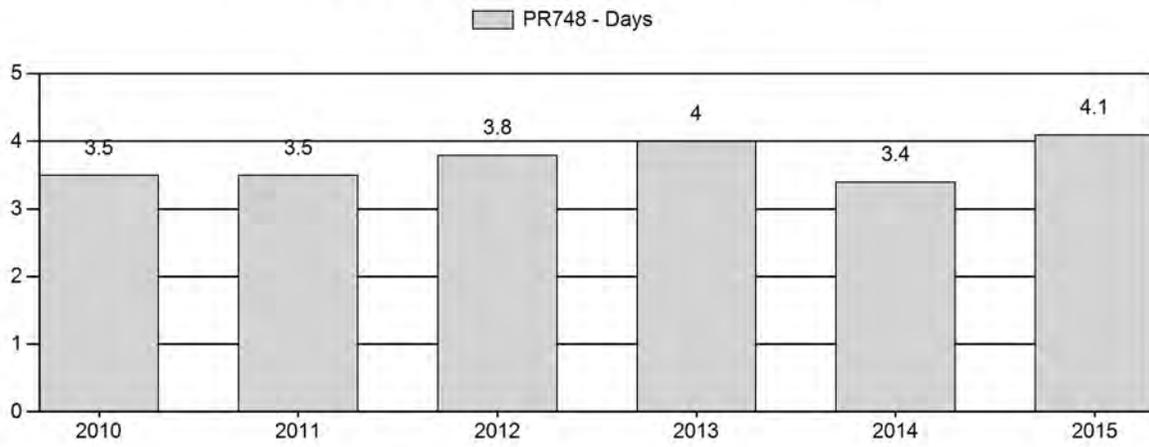
# Harvest Success



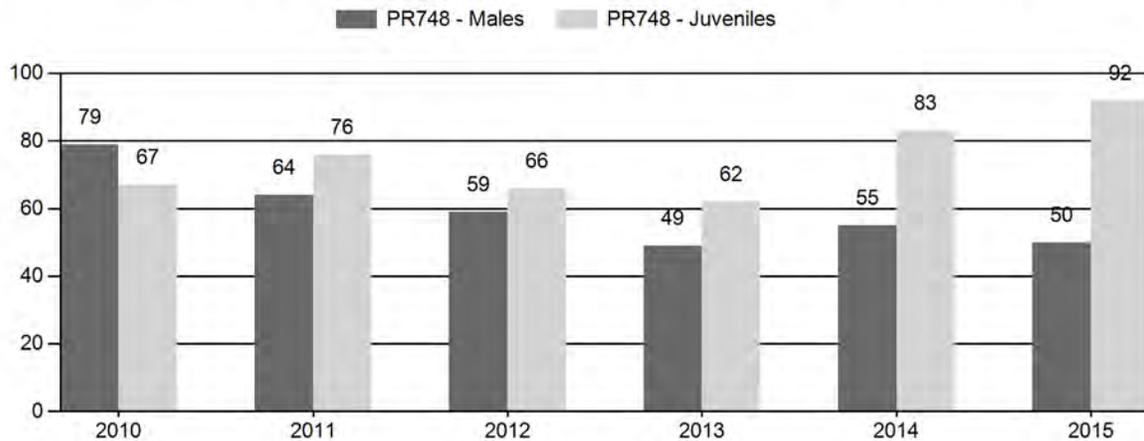
# Active Licenses



# Days Per Animal Harvested



# Preseason Animals per 100 Females



2010 - 2015 Preseason Classification Summary

for Pronghorn Herd PR748 - NORTH CONVERSE

Year	Pre Pop	MALES				FEMALES		JUVENILES		Tot Cls Cls Obj	Males to 100 Females				Young to			
		Ylg	Adult	Total	%	Total	%	Total	%		Ylg	Adult	Total	Int	100 Fem	100 Int	100 Adult	
2010	41,148	373	807	1,180	32%	1,490	41%	999	27%	3,669	3,160	25	54	79	± 5	67	± 4	37
2011	36,229	93	480	573	27%	895	42%	683	32%	2,151	3,105	10	54	64	± 5	76	± 6	47
2012	29,745	82	253	335	26%	567	44%	376	29%	1,278	3,040	14	45	59	± 7	66	± 7	42
2013	30,608	101	294	395	23%	803	47%	498	29%	1,696	2,059	13	37	49	± 5	62	± 6	42
2014	20,167	121	249	370	23%	669	42%	554	35%	1,593	3,415	18	37	55	± 6	83	± 8	53
2015	18,382	196	251	447	21%	896	41%	820	38%	2,163	3,717	22	28	50	± 4	92	± 7	61

**2016 HUNTING SEASONS  
NORTH CONVERSE PRONGHORN HERD (PR748)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
25	1	Oct. 1	Oct. 14	600	Limited quota	Any antelope
	6	Oct. 1	Oct. 14	150	Limited quota	Doe or fawn
26	1	Sep. 24	Oct. 14	900	Limited quota	Any antelope
	6	Sep. 24	Oct. 14	150	Limited quota	Doe or fawn
Archery		Aug. 15	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2015
25	6	-50
26	6	-150

**Management Evaluation**

**Current Postseason Population Management Objective:** 28,000

**Management Strategy:** Recreational

**2015 Postseason Population Estimate:** ~16,600

**2016 Proposed Postseason Population Estimate:** ~ 18,700

**2015 Hunter Satisfaction:** 90% Satisfied, 6% Neutral, 3% Dissatisfied

**Herd Unit Issues**

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

Hunting access on public lands is poor within this herd unit, with only small tracts of accessible public land interspersed within predominantly private lands. Two Walk-In Areas provide some additional hunting opportunity, although they are relatively small in size. Primary land uses in this herd unit include extensive oil and gas production, large-scale industrial wind generation, In-Situ uranium production, and traditional cattle and sheep grazing. In recent years, expansion of oil shale development has dramatically escalated anthropogenic disturbance throughout this herd unit. In addition to current development, two large-scale Environmental Impact Statements are currently being developed that are partially within this herd unit. The Converse County and

Crossbow Oil and Gas EIS's combined propose to develop up to 6,000 wells on 1,600 pads over the next 10 years. The cumulative impacts on pronghorn in this herd from the present and planned natural resource development are potentially significant.

### **Weather**

Weather conditions throughout 2015 produced above average precipitation, especially during the growing season, which resulted in excellent forage production for the second consecutive year. These conditions again yielded high fawn production and also likely contributed to good body condition of pronghorn going into winter. The 2015-2016 winter has been moderate to date, with above average precipitation and consistently cold temperatures which have maintained snow cover throughout most of the winter. However, snow accumulations were most likely not significant enough to limit accessibility to forage and therefore pronghorn should exhibit normal over-winter survival this winter.

### **Habitat**

Although there are no habitat transects in this herd unit, habitat conditions were generally excellent throughout 2015 due to above average precipitation and good residual rangeland conditions from 2013 and 2014. This level of precipitation was necessary to rejuvenate habitats and provide better conditions for the long-term productivity of this pronghorn herd following the extreme drought of 2012. Given the relatively low density of pronghorn currently in this herd unit, there may be reduced herbivory pressure, which should also assist in yielding desirable range conditions.

### **Field Data**

It has been increasingly difficult to meet classification sample sizes in this herd unit as aerial surveys have been abandoned for safety reasons and budgetary constraints. The total number of animals classified has markedly decreased since aerial surveys were eliminated in 2011. In 2015, the adequate sample size was 3,200 animals, yet only about 2,200 pronghorn were classified despite intensive ground coverage. However, more pronghorn were classified in 2015 than in several previous years.

Fawn production was significantly improved over the previous 5-year average (70 per 100 does) in both 2014 and 2015 with ratios of 83 and 92, respectively. It should be noted that pre-season 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 pre-season fawn ratios being observed in this herd unit, overall population trend declined through 2010-2013 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. Several consecutive years of average to above average fawn production and survival will be needed for this population to increase toward objective.

Pre-season buck ratios decreased in 2015 (50 per 100 does) compared to the 5-year average of 61, but are currently in line with management strategy criteria. Historically this herd has retained

high buck ratios exceeding the management strategy maximum due to limited access because of the preponderance of private land and widespread outfitting. Therefore, managers are content with current buck ratios given past challenges with remaining within management criteria. The 2015 yearling buck ratio is 22, which is higher than the 5-year average of 16, as a result of the high fawn productivity and recruitment from 2014. This indicates that there will be a relatively high proportion of adult bucks available for harvest in the near future.

## **Harvest**

Overall harvest has declined in this herd unit as license issuance has decreased in lieu of population decline. The 2015 total harvest of 1,652 was the 2<sup>nd</sup> lowest total pronghorn harvest obtained in this herd unit over the last 25 years, with the lowest harvest year in 2014 at 1,520 pronghorn harvested. Due to the appropriate adjustments in license issuance according to population size, the 2015 license success was (89%) which is improved over the 5-year average of 84%, and increased for the second consecutive year. The number of days per animal (4.1) in 2015 is comparable to the previous 5-year average of 3.6.

In 2015, 90% of hunters reported being either satisfied or very satisfied with their hunt, indicating a remarkably high level of satisfaction given the lack of public access and population decline. It should be noted that most hunters who speak to Game and Fish personnel are advised to secure access on private land before purchasing a license in areas that have limited public access, or at least be cognizant of the fact that public land availability is extremely limited.

## **Population**

The 2015 post-season population estimate is approximately 16,600 pronghorn, which is 41% below objective. In years past, high fawn productivity coupled with limited access has allowed this herd to exceed the objective very readily. However, this population dropped below objective due to elevated mortality during the relatively severe 2010-2011 winter, and continued to decrease through 2013. Significant reductions in licenses were made in response to population decrease. Poor fawn production in 2012 and 2013 further suppressed this herd, but a significant improvement was realized in 2014 and 2015. Given high fawn productivity, this population was projected to noticeably increase in 2015. However, field personnel and landowner observations indicate this population has stabilized, but has not appreciably increased. This trend of stagnation has also been simulated within the population model. Some landowners reported observations of late summer/early fall pronghorn mortalities in 2015, however these reports came too late for any diagnostic testing to be conducted. Based on these reports as well as some incidences in neighboring herd units, it is likely that this population experienced a greater degree of hemorrhagic disease than normal. Field personnel do not feel that this was an extreme die-off event that dramatically reduced the population, but rather an event that prevented the population from increasing in 2015 as predicted.

The “Time Specific Juvenile – Constant Adult” (TSJ-CA) spreadsheet model was chosen for the post-season population estimate of this herd. All three models had similar relative AIC values. The TSJ-CA model most accurately represented population trend based on field personnel and landowner perceptions. This model is considered to be of fair quality and tracks well with observed pre-season buck ratios. However, this model has not been anchored to past end-of-year

abundance estimates as multiple past Line Transect surveys have yielded unusable results with widely fluctuating point estimates and high coefficients of variation.

### **Management Strategy**

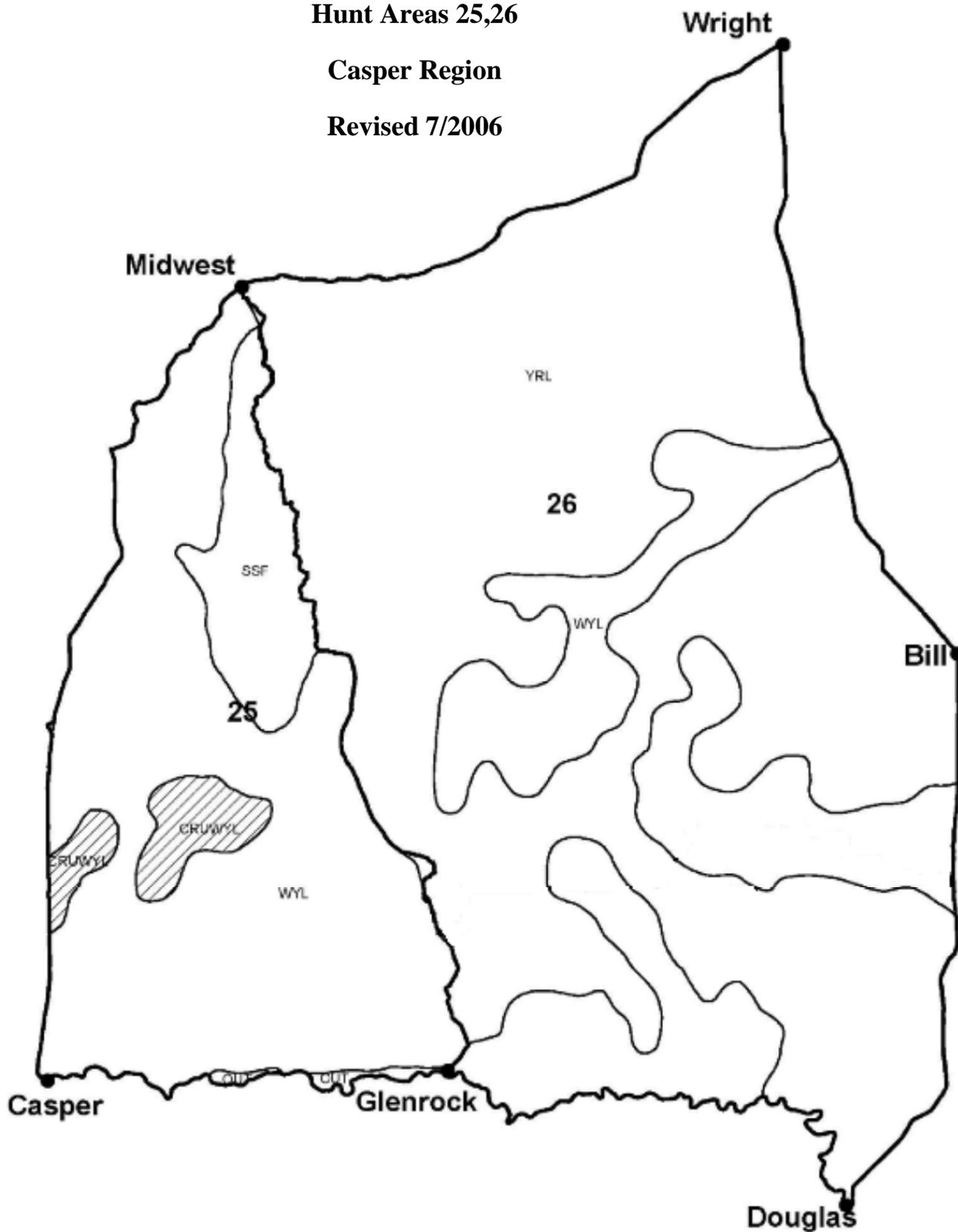
The traditional season dates in this herd unit are from October 1 to October 14 in Hunt Area 25 and from September 24 to October 14 in Hunt Area 26. These season dates have typically been adequate to meet landowner desires while accommodating a reasonable harvest. For 2016, herd unit-wide Type 1 license issuance was maintained at 1,500 licenses, but Type 6 licenses were reduced by 50 in Hunt Area 25 and 150 in Hunt Area 26. Maintaining relatively low harvest pressure on both males and females is warranted given this population is below objective and has stagnated. However, given the current size of this population as well as the size of the herd unit which also includes some high density pronghorn areas along the North Platte River, managers felt pronghorn numbers were sufficiently high to warrant some level of continued doe/fawn harvest. If we attain the projected harvest of ~1,500 pronghorn and realize normal fawn recruitment, this population is projected to increase to about 18,700 pronghorn, which is 33% below objective.

# North Converse Antelope

Hunt Areas 25,26

Casper Region

Revised 7/2006





## 2015 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2015 - 5/31/2016

HERD: PR750 - BLACK THUNDER

HUNT AREAS: 4-9, 24, 27, 29

PREPARED BY: JOE SANDRINI

	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	37,533	37,577	40,250
Harvest:	5,286	3,230	3,900
Hunters:	6,014	3,670	4,430
Hunter Success:	88%	88%	88%
Active Licenses:	6,507	4,029	4,865
Active License Success:	81%	80%	80%
Recreation Days:	20,894	12,538	15,100
Days Per Animal:	4.0	3.9	3.9
Males per 100 Females	52	45	
Juveniles per 100 Females	68	87	

Population Objective ( $\pm$ 20%) :	49000 (39200 - 58800)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-23.3%
Number of years population has been + or - objective in recent trend:	5
Model Date:	02/01/2016

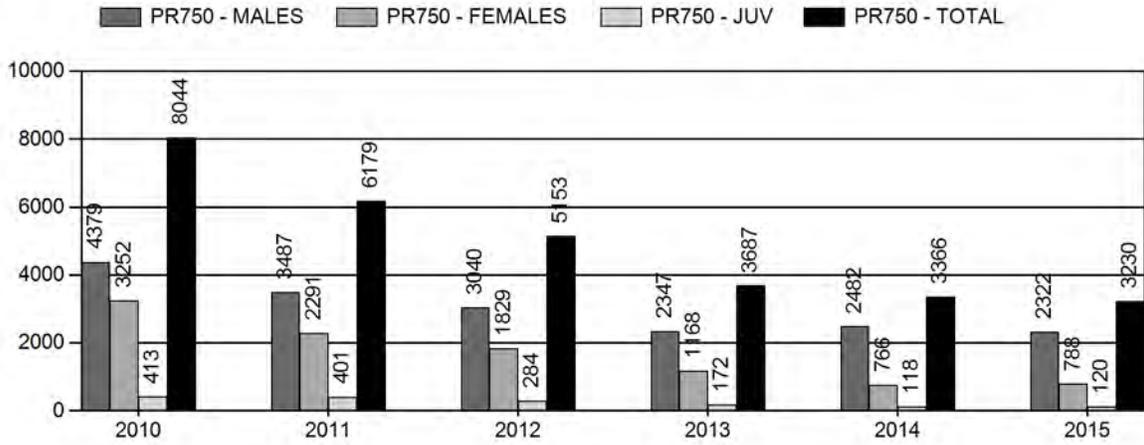
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

	<u>JCR Year</u>	<u>Proposed</u>
Females $\geq$ 1 year old:	4.9%	5.6%
Males $\geq$ 1 year old:	32.2%	31.7%
Juveniles (< 1 year old):	0.9%	1.1%
Total:	8.6%	9.6%
Proposed change in post-season population:	+13.1%	+7.1%

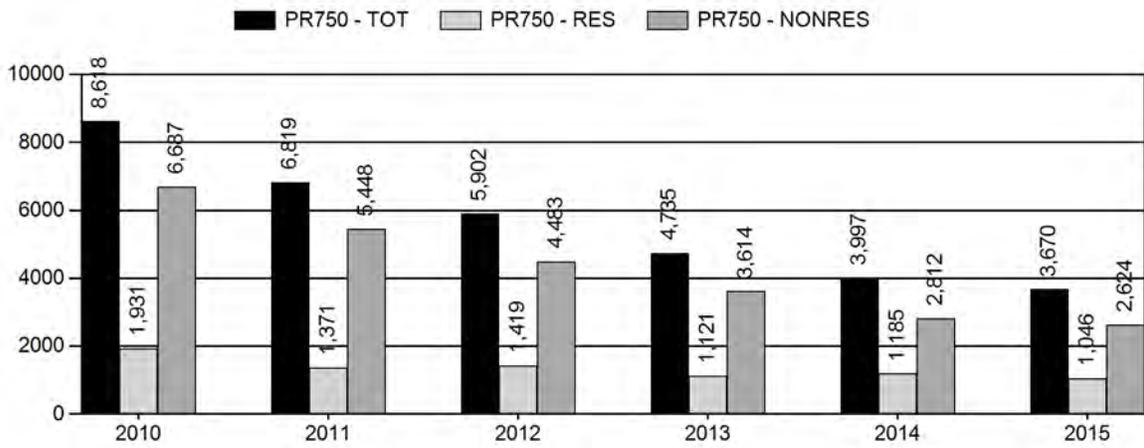
## Population Size - Postseason



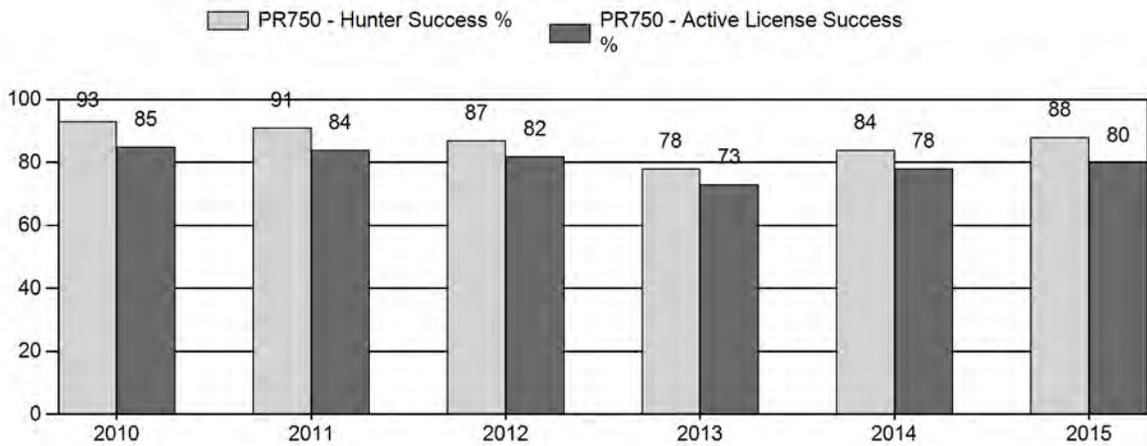
# Harvest



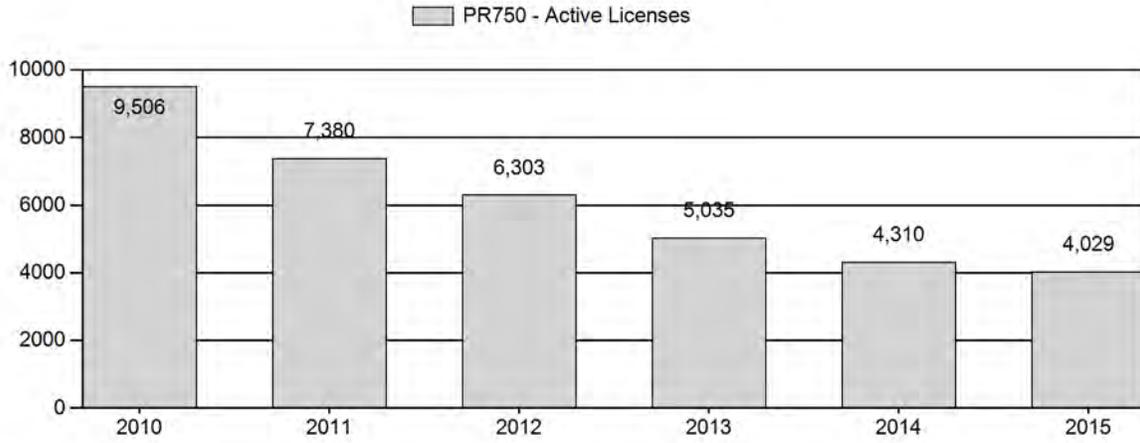
# Number of Hunters



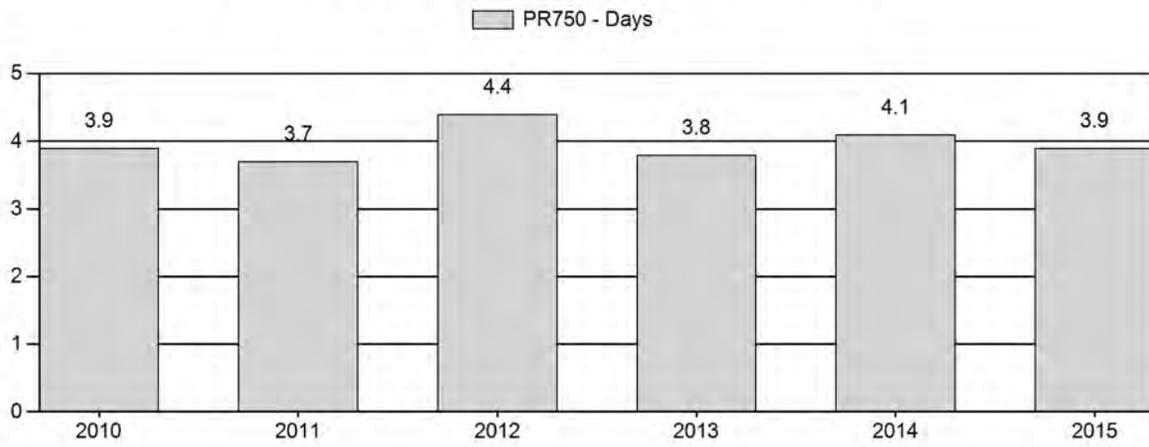
# Harvest Success



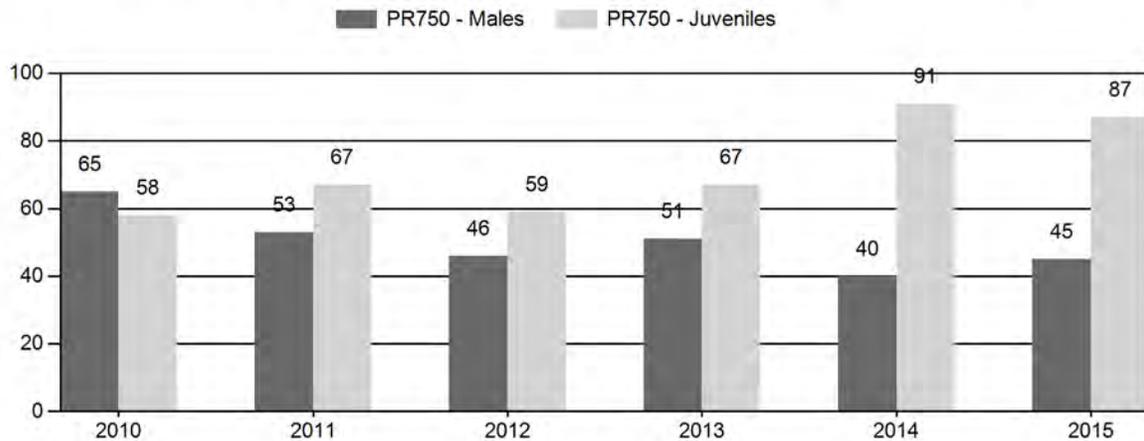
# Active Licenses



# Days Per Animal Harvested



# Preseason Animals per 100 Females



## 2010 - 2015 Preseason Classification Summary

for Pronghorn Herd PR750 - BLACK THUNDER

Year	Pre 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
2010	74,523	579	1,584	2,163	29%	3,326	45%	1,930	26%	7,419	2,502	17	48	65	± 3	58	± 3	35
2011	38,347	309	1,011	1,320	24%	2,477	45%	1,667	31%	5,464	2,490	12	41	53	± 3	67	± 3	44
2012	34,201	318	617	935	23%	2,022	49%	1,198	29%	4,155	1,962	16	31	46	± 3	59	± 3	41
2013	32,729	315	733	1,048	23%	2,067	46%	1,380	31%	4,495	2,444	15	35	51	± 3	67	± 4	44
2014	36,939	288	582	870	17%	2,197	43%	2,008	40%	5,075	3,888	13	26	40	± 2	91	± 4	65
2015	41,130	482	659	1,141	19%	2,558	43%	2,235	38%	5,934	3,717	19	26	45	± 2	87	± 4	60

**2016 HUNTING SEASONS  
BLACK THUNDER PRONGHORN HERD (PR750)**

Hunt Area	Type	Dates of Seasons		Quota	License	Limitations
		Opens	Closes			
4	1	Oct. 1	Nov. 20	200	Limited quota	Any antelope
	6	Oct. 1	Nov. 20	200	Limited quota	Doe or fawn
5	1	Oct. 1	Nov. 20	100	Limited quota	Any antelope
	6	Oct. 1	Nov. 20	50	Limited quota	Doe or fawn valid on private land
6	1	Oct. 1	Oct. 15	350	Limited quota	Any antelope; also valid in that portion of Area 8 in Weston County
	6	Oct. 1	Oct. 15	25	Limited quota	Doe of fawn; also valid in that portion of Area 8 in Weston County
7	1	Oct. 1	Oct. 15	450	Limited quota	Any antelope
	6	Oct. 1	Oct. 15	50	Limited quota	Doe or fawn
	7	Oct. 25	Nov. 15	50	Limited quota	Doe or fawn valid on private land
8	1	Oct. 1	Oct. 15	375	Limited quota	Any antelope
9	1	Oct. 1	Oct. 31	700	Limited quota	Any antelope; also valid in that portion of Area 11 in Converse or Niobrara counties
	6	Oct. 1	Oct. 31	650	Limited quota	Doe or fawn; also valid in that portion of Area 11 in Converse or Niobrara counties
24	1	Oct. 1	Oct. 31	700	Limited quota	Any antelope
	6	Oct. 1	Oct. 31	350	Limited quota	Doe or fawn
27	1	Oct. 1	Oct. 15	275	Limited quota	Any antelope
	7	Oct. 1	Oct. 15	50	Limited quota	Doe or fawn valid on private land

*(cont. on next page)*

29	1	Oct. 1	Oct. 15	125	Limited quota	Any antelope
	2	Oct. 1	Oct. 15	500	Limited quota	Any antelope off national grasslands
	6	Oct. 1	Oct. 15	150	Limited quota	Doe or fawn valid off national grasslands
	7	Oct. 1	Nov. 15	100	Limited quota	Doe or fawn valid south and west of Interstate Highway 25

Hunt Special Archery Season Hunt Areas	Opening Date	Limitations
4, 5	Sep. 1	Refer to Section 2 of this Chapter
6 - 9, 24, 27, 29	Aug. 15	Refer to Section 2 of this Chapter

#### SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	License Type	Quota change from 2015
4	1	+50
4	6	+125
6	1	+50
6	6	+25
7	1	+100
7	6	+50
7	7	+50
8	1	+75
9	1	+100
27	1	+50
29	1	+25
29	2	+100
29	6	+50
<b>Herd Unit Total</b>	<b>1</b>	<b>+450</b>
	<b>2</b>	<b>+100</b>
	<b>6</b>	<b>+250</b>
	<b>7</b>	<b>+50</b>

## Management Evaluation

**Current Postseason Population Management Objective:** 49,000

**Management Strategy:** Recreational

**2015 Postseason Population Estimate:** ~ 37,600

**2016 Postseason Population Estimate:** ~ 40,300

**2015 Hunter Satisfaction:** 81% Satisfied, 12% Neutral, 7% Dissatisfied

**HERD UNIT ISSUES:** The management objective of the Black Thunder Pronghorn Herd Unit is for an estimated, post-season population of 49,000 pronghorn. This herd is managed under the recreational management strategy. The population objective and management strategy were reviewed and adopted in 2014 when this herd was created by combining the Cheyenne River (PR740) and Highlight (PR316) pronghorn herd units. The post-season population objectives of the parent herds were combined to create the current objective for the Black Thunder herd.

The Black Thunder Pronghorn herd unit encompasses much of northeastern Wyoming. Because of the disparity of habitats across the herd unit and the preponderance of private land, this herd unit is managed for recreational hunting. The herd unit encompasses approximately 8,315 mi<sup>2</sup>, of which slightly less than 7,300 mi<sup>2</sup> are currently delineated as occupied pronghorn habitat. This figure was recently re-evaluated using aerial photography and GIS technology to better quantify unsuitable and unoccupied habitat such as towns, ponderosa pine habitat and active coal mine pits. A revised seasonal range map will be available and put to use beginning in bio-year 2016. Currently, most of the delineated, unoccupied habitat is found in Hunt Areas (HA's) 4 and 5 and generally include a portion of the Black Hills having topographical and vegetative features unsuitable for pronghorn.

Approximately 77% of this herd unit is private land. The remaining 23% includes lands managed by the United States Forest Service (USFS), the Bureau of Land Management (BLM), and the State of Wyoming. Most occupied USFS lands that are publically accessible to hunters are part of the Thunder Basin National Grassland (TBNG) located in HA's 5, 6, 7, 27, and 29, with HA 27 containing the largest amount followed by HA's 7 and 29. The State of Wyoming owns a large parcel of land in HA 9. Remaining public lands are scattered throughout the herd unit, and many are not accessible to the public. Access fees for hunting are common on private land, and many landowners have leased their property to outfitters. Therefore, accessible public lands are subjected to disproportionately heavy hunting pressure.

Major land uses in this herd unit include livestock grazing, oil and gas production, timber harvest, and farming. There are several oil and gas fields which occur primarily in HA's 6, 7, 8, 24 and 29, and development pressure has increased in recent years in HA's 8 and 29. Several large surface coal mines represent a substantial land use within HA's 24 & 27. Farming generally occurs in the southern most portion of the herd unit; but there are a number of wheat, oat, and alfalfa fields near Sundance, Upton, and Gillette. When pronghorn numbers are high, damage to growing alfalfa can become an issue, especially near Sundance and Lusk.

**WEATHER:** Harsh 2010-11 winter conditions resulted in significant pronghorn over-winter and spring mortality. Subsequent drought through 2012 then contributed to depressed fawn

recruitment and elevated levels of hemorrhagic disease. However, weather conditions in this herd unit have been generally favorable for antelope over the past two years. Spring and summer temperatures were very near long-term averages in 2014 and slightly above average in 2015; while the precipitation received during these same timeframes was just a bit above the long-term average in 2014 and well above normal in 2015. In fact, there was significant flooding along some drainages due to thunderstorms in June of 2015. But, these weather events did not seem to affect pronghorn much. Overall, winter conditions in 2014 and 2015 favored pronghorn. Daily winter temperatures were very close to average in 2014 and above average in 2015. Total precipitation between October and March was above average in 2014 and a bit below normal in 2015 (see <http://www.ncdc.noaa.gov/cag/> for details). In summary, the weather conditions experienced by this herd the past two years resulted in abundant forage and high over-winter survival.

**HABITAT:** This wide ranging herd unit is largely characterized by stands of Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) and silver sagebrush (*Artemisia cana*) interspersed with mid-prairie grasses such as wheatgrasses (*Agropyron* spp.), grama grasses (*Bouteloua* spp.), and needle grasses (*Stipa* spp.). Other areas are dominated by grasslands with less sage influence and more agricultural croplands, notably near the towns of Douglas, Lusk, Gillette, Newcastle, Upton, and Sundance. In addition, there are several major drainages throughout the herd unit dominated by plains cottonwood (*Populus deltoides*) and greasewood (*Sarcobatus vermiculatus*). These drainages include the head waters of the Belle Fourche River in the north and those of the Niobrara River in the south; while most of the Cheyenne River drainage, including Beaver Creek, Black Thunder Creek, Antelope Creek, Old Woman Creek, Hat Creek, Lance Creek, and Lightning Creek, make up the bulk of the herd unit. Steep canyons of the southern and central Black Hills are found in the northeast corner of the herd unit, where vegetation consists of ponderosa pine (*Pinus ponderosa*) and its associated savannah.

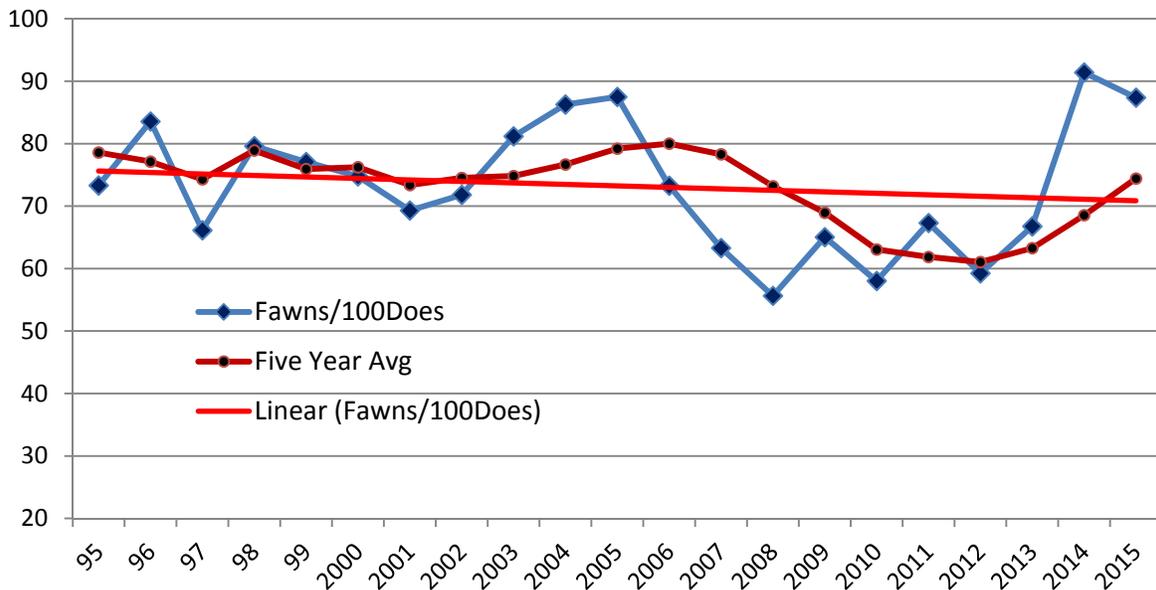
Habitat suitability for pronghorn varies greatly throughout the herd unit. Much of the habitat in the northeast portion of the herd unit is marginal, consisting of topography and vegetation not particularly favorable for pronghorn. The west-central portions of the herd unit represent the largest block of contiguous sagebrush habitat. While the eastern and southern sections of the herd unit are dominated more by mid-grass prairie and agricultural lands, but locally do support good numbers of pronghorn.

Habitat disturbance throughout the herd unit is generally high. There are a number of developed oil fields and areas impacted by bentonite and coal mining. In areas dominated by irrigated and dry land farming, historic sagebrush control projects have decreased the amount of sagebrush available for wintering pronghorn. In addition to sagebrush control, livestock grazing practices and wildfires have converted areas once thought to be dominated by Wyoming big sagebrush to more grass, prickly pear and silver sage dominated communities. Yet, pronghorn still winter in some of these locations. Habitat loss and fragmentation is expected to continue and negatively impact this herd. Based upon current exploration and leasing trends, the amount of disturbance caused by mining, and oil & gas activities will continue to increase in HA's 8, 24, 27 and 29. In addition, a large wind farm is planned in HA 29.

After about a decade of collecting annual Wyoming big sagebrush leader growth and utilization data in this herd unit, the Department suspended these efforts. This was because it had been demonstrated annual leader production was generally proportional to the amount of spring and early summer moisture received; while use could be fairly well gauged through causal observation. Over the past two years essentially wet spring and summer conditions have persisted together with low numbers of pronghorn and mule deer on the range. Consequently, observations have shown excellent leader growth and reduced winter use, indicating this population is currently well below carrying capacity and should be permitted to continue to grow towards objective.

**FIELD DATA:** This population declined significantly between 2010 and 2012, and remained depressed in 2013 before beginning to rebound in 2014. The decline was accentuated by the winter of 2010-2011 and subsequent drought of 2012. Following the severe 2010-11 winter, fawn:doe ratios remained lower than average. This trend in low fawn:doe ratios persisted even with substantially lower populations, which was likely due to drought in 2012 and Epizootic Hemorrhagic Disease (EHDV) in 2013. In 2014, fawn production and survival increased substantially as demonstrated by an observed, pre-season fawn:doe ratio of 91:100, a value of magnitude not seen in a decade. This was followed by a second year of great fawn production and survival in 2015 when the observed fawn:doe ratio was 87:100, even with significant numbers of yearling does in the population. Consequently, the population model for this herd indicates the post-season population increased about 16% in 2014 and 13% in 2015.

Over the last 20<sup>+</sup> years, annual productivity of this herd, as measured by pre-season fawn:doe ratios (while experiencing cyclic fluctuations) has generally declined (Figure 1). This is thought to be the result of a reduction in habitat quantity and quality intensified by long-term drought, plant succession, aging of sagebrush, and over-browsing by both domestic livestock and wildlife. Between 2008 and 2013 the herd's pre-season fawn:doe ratio trended upwards slightly, but averaged only 62 fawns per 100 does (*std. dev 5.0*). This resulted in a continued population decline, even as hunting seasons became more conservative. As previously mentioned, thanks to excellent fawn production in 2014 and 2015, this population has begun to increase once again.



**Figure 1: Observed Annual, and Five-Year Average Fawn:Doe Ratios (1991-2015).**

As this population grew during the early and mid 2000's, preseason buck:doe ratios generally rose. Then as this population dropped and the percentage of bucks harvested from the population increased each year, preseason buck:doe ratios declined - dropping to a low of about 40:100 in 2014. However, the observed preseason buck:doe ratio increased to 45:100 in 2015. Given excellent reproduction the past two years and the conservative hunting seasons in place (even with increases in 2016 Type 1 license issuance), the preseason buck:doe ratio is projected to again rise in 2016 to about 48:100, a value near the mid-point of the Department's recreational management criteria.

**HARVEST DATA:** Hunter success dropped while effort remained fairly consistent between 2010 and 2013 as this population declined. In both 2014 and 2015, with conservative hunting seasons in place and a growing pronghorn population, hunter success improved each year while hunter effort continued to fluctuate near 4 days per animal harvested. Consequently, after several years of hunter success below that normally observed for pronghorn in the state, in 2015 most hunt areas in the herd unit witnessed a return to hunter success on par with historic levels. Hunter success on doe/fawn licenses ranged from a low of 65% (HA 24 & HA 29 Type 7) to a high of 91% (HA 4). However, hunter success on doe/fawn licenses was still relatively low at 73% in both HA 5 and HA 9. Hunter success on Type 1 and 2 licenses ranged from 71% (HA 5) to 93% (HA 27); and while hunter success was also lower than desired in HA 9 (76%) and HA 24 (73%), it was excellent (87% or above) in the remaining hunt areas.

Although hunter success dropped steadily between 2010 and 2013, the 2014 hunter satisfaction survey revealed herd unit-wide 39% of hunters were very satisfied, and 37% satisfied with their hunt in 2014 - values basically identical to those reported 2012 and 2013. In 2015, hunter satisfaction rose with 45% of the hunters reporting they were very satisfied and 36% stating they were satisfied. The vast majority of hunters in this herd unit are non-residents from states

without pronghorn who, despite what Department personnel consider low pronghorn numbers, are still amazed at the numbers of pronghorn they see and level of success they experience compared to hunting other big game species in their home states.

**POPULATION:** Following approval of the herd unit combination that created this herd, an official population model was constructed in February, 2015 (see 2015 PR750 JCR for details). The model was then updated with 2015 classification and harvest data. Once again the “Semi Constant Juvenile & Semi Constant Adult” (SCJ SCA) spreadsheet model was chosen to estimate this herd’s population. All three competing models generally simulate a population rise between 2000 and 2006, followed by a decline through 2012 or 2013 and an increase in 2014 and 2015. All three competing models also produce post-season population estimates for 2012 within about 5% of each other and within 10% in 2014 and 2015. The SCJ SCA model exhibited the lowest AICc value, and good fit compared to competing models - with modeled buck:doe ratios not appearing to be over parameterized. As a result, the SCJ SCA model was selected as the preferred model. The magnitude of population trends produced by SCJ SCA model dovetail well with general trends in harvest statistics and the perceptions of local game managers, landowners, and hunters.

Amongst competing models the SCJ SCA model more substantially fits LT estimates. However, it should be noted that while an LT survey was flown in this herd unit during June, 2015, the end of bio-year population estimate produced by that effort (~49,700) was 66% above the currently modeled end of bio-year population estimate, exceeded the post-season population objective of the herd, and was completely unreasonable in relation to historic data. In addition, none of the available models were even able to come close to intercepting the confidence intervals of the estimate. But, supporting model choice, the SCJ SCA model does yield the highest end of bio-year 2015 estimate of all three models. Post hoc revisions to the 2015 LT estimate are planned to be attempted this spring to determine if post survey stratification of observed data and a revised estimate of occupied habitat may render use of these survey data reasonable. It is unknown why the 2015 LT estimate was so high, but it is suspected that it may have something to do with very high densities of antelope being encountered on most lines in the northern one-third and near the southern border of the herd unit, while very low densities were encountered between these areas. This may have been a result of the weather experienced in May and June of 2015, or simple a result of the redistribution of survey lines from previous surveys.

The current model seems to function well because it allows for modeling the increased mortality observed during the severe winter of 2010-2011; and (although it lacks herd specific survival data) estimated juvenile and adult survival rates are reasonable. Consequently, the model is considered fair to good overall because it has 15-20 years of data; ratio data available for all years in the model; at least one sample-based population estimate with standard error; aligns fairly well with observed data; and is biologically defensible.

The Black Thunder pronghorn population is projected to have increased steadily from the late 1990’s through 2006, when it peaked about 60% above objective at ~72,000 pronghorn. During this timeframe, fawn survival was very good with above average fawn:doe ratios observed, while doe/fawn harvest was limited by our inability to sell all available licenses. After its peak in 2006 & 2007, the postseason population declined steadily through 2012 and remained essentially unchanged in 2013, about 42% below objective. Some of this decline was due to increased

harvest following regulatory and license issuance changes that increased doe/fawn licenses sales and acted in concert with enrollment of private lands in our walk-in hunting program to increase hunter access. But more ostensibly, the drop resulted from reduced fawn recruitment due to drought, significant mortality during and following the 2010-11 winter; and increased summer mortality of all age classes due to Epizootic Hemorrhagic Disease (EHDV), and perhaps even some unknown density dependent factor(s).

**MANAGEMENT SUMMARY:** Hunting seasons since 2012 have been quite conservative in this herd unit, but the 2016 season entails beginning to reverse this strategy as the herd rebounds. Doe/fawn harvest will remain significantly reduced, but continue at a moderate level in several hunt areas. Additionally, any-antelope license issuance is being liberalized in 7 of the 9 hunt areas to allow increased hunting opportunity as the buck:doe ratios rises. In 2016, total harvest in this herd unit should increase about 20% from the levels witnessed over the past two years. With no reductions prescribed in any license types and an increasing population, harvest in all hunt areas should increase to some degree, with the total increase being fairly proportionate to the increase in license issuance.

In HA 9, claims for damage from pronghorn are no longer being submitted, landowners have noted a drop in pronghorn numbers, and harvest success has remained lower than most of the remainder of the herd unit. However, harvest pressure will be maintained here despite being below objective in an effort to continue to limit damage. Similarly, in HA 7 a new, “late season” Type 7 is being introduced to address a specific damage complaint, where migrating pronghorn congregate on irrigated hayfields. In HA 29, as a response to complaints from landowners and hunters about low pronghorn numbers and hunter success on public lands, the bulk of any-antelope licenses will continue to be issued as Type 2, which are valid off national grasslands. Changes made in this hunt area over the past several years have been well received by many landowners and have significantly reduced harvest pressure on public lands in the northern part of HA 29. Following two years of excellent reproduction and survival, plus the high buck:doe ratio observed in this hunt area this past year, the prescribed 25% increase in the number of Type 1 & 2 licenses here is warranted, as is the slight increase in doe/fawn tags valid on private land.

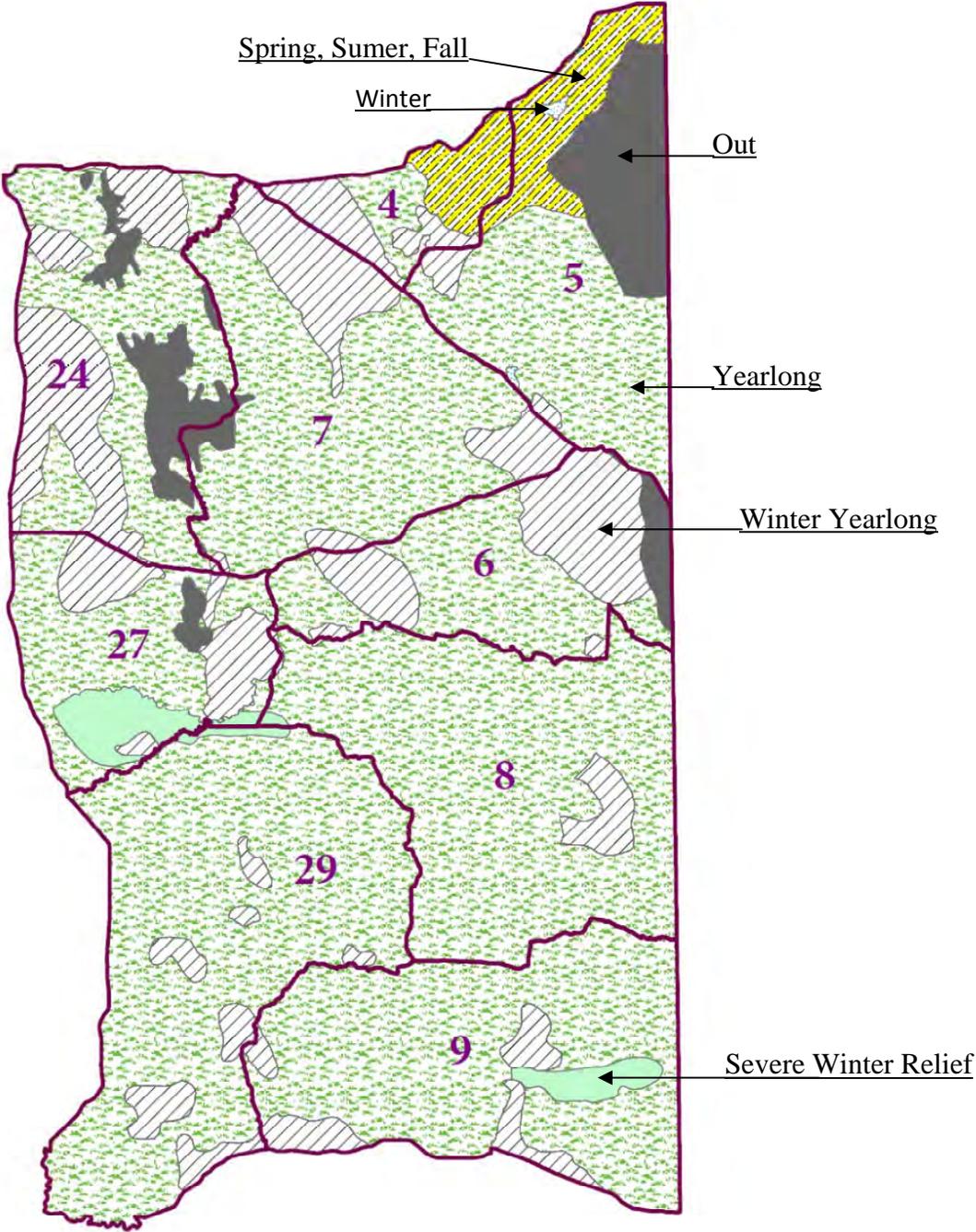
Concerns remain about low pronghorn numbers on public lands, notably on the TBNG in both HA’s 27 and 29. In addition, expansion of the coal mines in HA 27 has recently blocked hunter access to a significant amount of public land in this unit. To address this situation, doe/fawn license issuance in HA 27 will continue to be restricted, and their use limited to private lands. However, Type 1 license issuance has been increased by 50 to allow some increased opportunity with improved buck:doe ratios. In this HA 27, residents hold 80% of the licenses and draw odds for non-residents are some of the most difficult in the state. Active Type 1 license success in HA 27 increased substantially in 2015 after three years in a row of relatively low success, and the percentage of residents reporting they were satisfied or very satisfied returned to 88%, a level not seen since 2011.

Finally, to address landowner concerns along the boundary of HA’s 6 and 8 a change in license limitations allowed hunters with HA 6 licenses to hunt in HA 8 and vice versa the past two years. The boundary between these hunt areas consists of county roads, which antelope frequently

cross. Consequently, over the years some landowners whose properties straddle this boundary requested the ability for hunters to hunt both sides of these roads on a single license. After evaluating the success of this strategy and visiting with effected landowners, this approach is being altered for 2016. HA 8 licenses holders will again be restricted to hunting HA 8 only, while HA 6 licenses holders will be permitted to hunt that portion of HA 8 within Weston County. This alteration will allow some increased harvest in that portion of HA 8 with the highest pronghorn densities (a hunt area without any doe/fawn license issuance) while addressing the desires of specific landowners.

Given average fawn:doe and buck:doe ratios observed over the past 5-years and consistent survival rates combined with a predicted harvest of ~3,900 pronghorn, the 2016 hunting season should allow the post-season population of this herd to grow around 7%, to ~ 40,250 pronghorn, which is 18% below objective.

# Black Thunder Pronghorn PR750



## 2015 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2015 - 5/31/2016

HERD: MD740 - CHEYENNE RIVER

HUNT AREAS: 7-14, 21

PREPARED BY: JOE SANDRINI

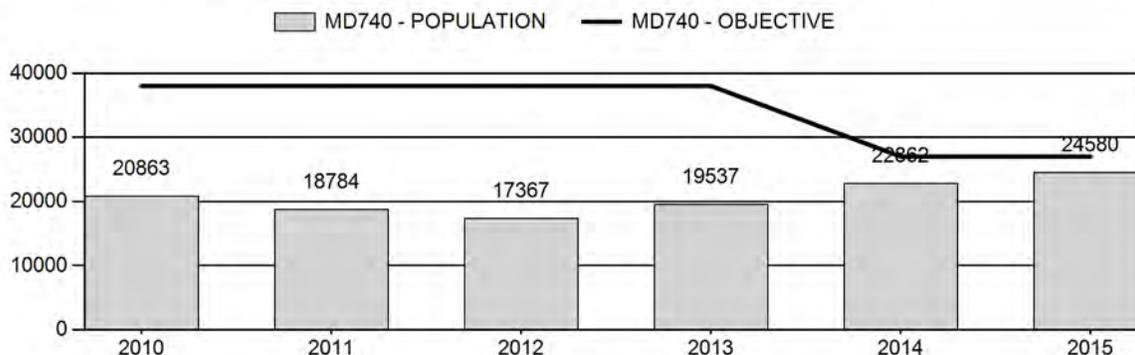
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	19,883	24,580	25,803
Harvest:	1,297	961	1,176
Hunters:	2,441	1,606	1,825
Hunter Success:	53%	60%	64%
Active Licenses:	2,498	1,626	1,850
Active License Success:	52%	59%	64%
Recreation Days:	10,205	6,046	6,900
Days Per Animal:	7.9	6.3	5.9
Males per 100 Females	35	43	
Juveniles per 100 Females	62	73	

Population Objective (± 20%) :	27000 (21600 - 32400)
Management Strategy:	Private Land
Percent population is above (+) or below (-) objective:	-9.0%
Number of years population has been + or - objective in recent trend:	7
Model Date:	02/18/2016

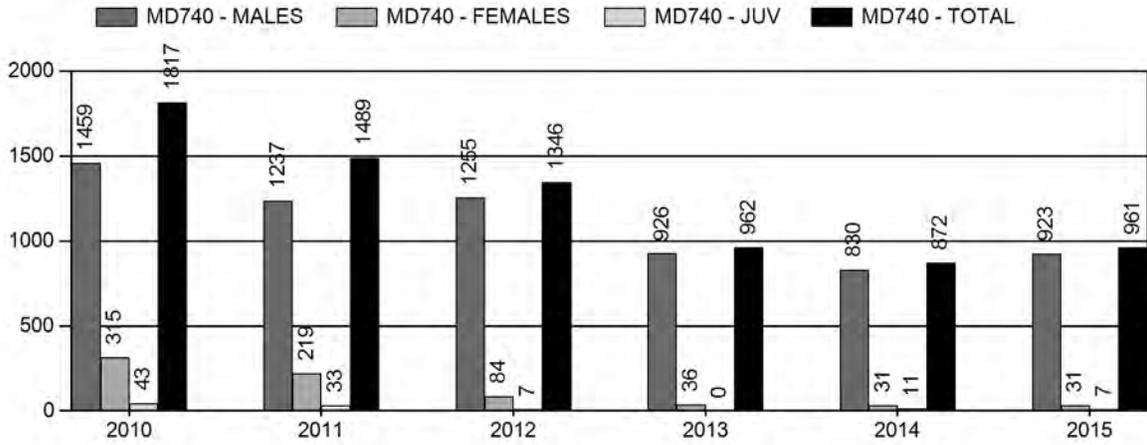
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0.3%	0.5%
Males ≥ 1 year old:	17.1%	18.0%
Juveniles (< 1 year old):	0.1%	0.1%
Total:	4.1%	4.8%
Proposed change in post-season population:	+7.5%	+5.0%

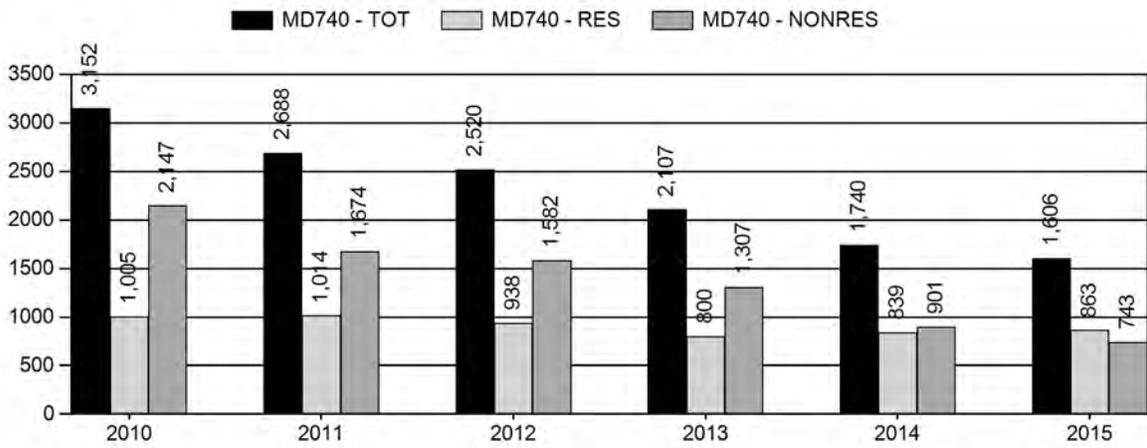
## Population Size - Postseason



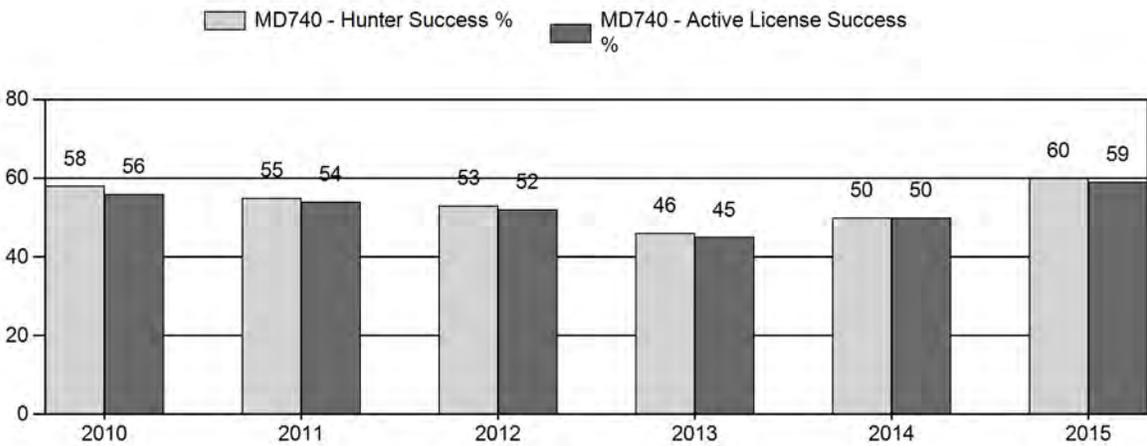
# Harvest



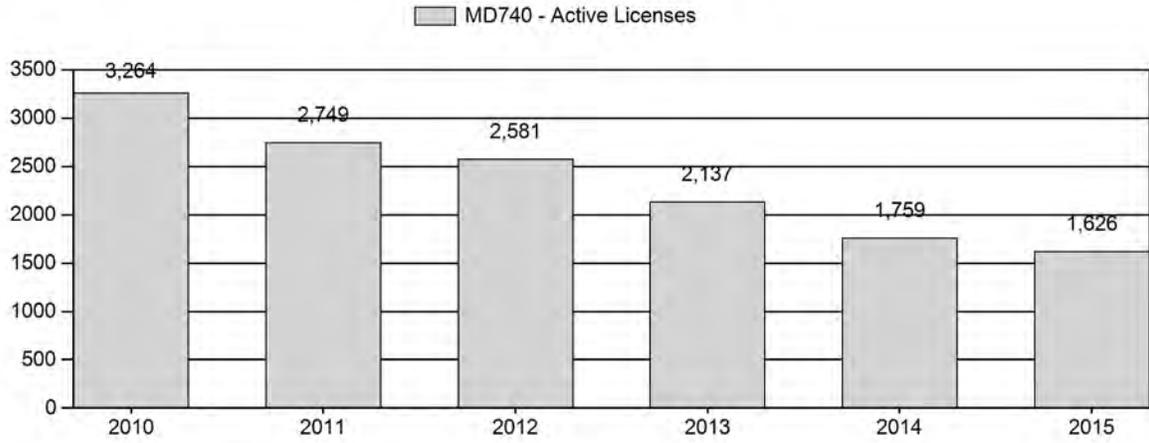
# Number of Hunters



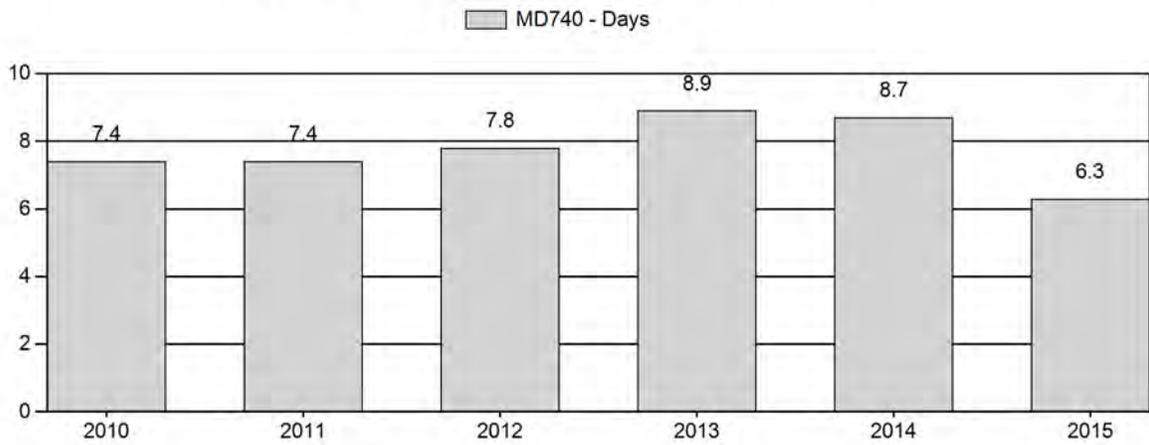
# Harvest Success



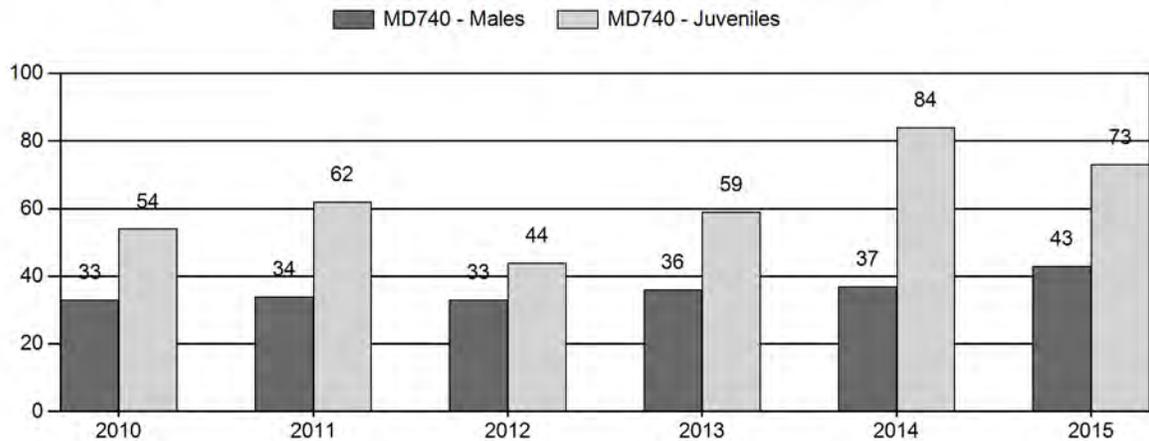
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



### 2010 - 2015 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	2+ CIs 1	2+ CIs 2	2+ CIs 3	2+ UnCIs	Total	%	Total	%	Total	%	YIng			Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult	
2010	20,863	89	0	0	0	223	312	18%	947	53%	513	29%	1,772	974	9	24	33	± 3	54	± 4	41	
2011	18,784	113	0	0	0	281	394	17%	1,155	51%	711	31%	2,260	1,211	10	24	34	± 2	62	± 4	46	
2012	17,367	119	0	0	0	185	304	19%	932	57%	406	25%	1,642	708	13	20	33	± 3	44	± 3	33	
2013	19,537	114	0	0	0	302	416	19%	1,142	51%	669	30%	2,227	1,137	10	26	36	± 3	59	± 3	43	
2014	22,862	186	0	0	0	336	522	17%	1,426	45%	1,198	38%	3,146	2,044	13	24	37	± 2	84	± 4	61	
2015	24,580	268	193	76	15	43	595	20%	1,373	46%	1,009	34%	2,977	1,672	20	24	43	± 3	73	± 4	51	

**2016 HUNTING SEASONS  
CHEYENNE RIVER MULE DEER HERD (MD740)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
7		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
8		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
9		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
10	1	Oct. 1	Oct. 15	100	Limited quota	Antlered deer
11		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
11		Oct. 16	Nov. 30		General	Any white-tailed deer
12		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
12		Oct. 16	Nov. 30		General	Any white-tailed deer
12	6	Oct. 1	Nov. 30	50	Limited quota	Doe or fawn
13		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
13		Oct. 16	Nov. 30		General	Any white-tailed deer
14		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
14		Oct. 16	Nov. 30		General	Any white-tailed deer
21		Oct. 1	Oct. 15		General	Antlered mule deer or any white-tailed deer
21	7	Oct. 1	Oct. 31	50	Limited quota	Doe or fawn valid on private land

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

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

**SUMMARY OF CHANGES IN LICENSE NUMBER**

Hunt Area	License Type	Quota change from 2015
<b>Herd Unit</b>	7	+50
<b>Totals</b>	Region B	+200

## **Management Evaluation**

**Current Management Objective:** 27,000

**Management Strategy:** Private Land Management

**2015 Postseason Population Estimate:** ~ 24,600

**2016 Proposed Postseason Population Estimate:** ~ 25,800

**2015 Hunter Satisfaction:** 71% Satisfied, 17% Neutral, 12% Dissatisfied

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

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 being administered by the United States Forest Service, Bureau of Land Management, or the State of Wyoming. As a result, hunter access is largely controlled by private landowners. Access fees along with outfitted hunting are common. Consequently, hunting pressure can be heavy on lands legally accessible to the general public. Historically, two-thirds or more of the hunters pursuing mule deer in this herd unit have been non-residents. In recent years, due to reductions in the Region B quota, nonresident hunter numbers have more closely approximated that of the 900 to 1,000 residents who hunt here annually. Compared to residents, these non-residents typically are more willing to pay trespass or access fees for hunting privileges or hire an outfitter. Consequently, many resident hunters and a significant number of non-residents, pursue mule deer in Hunt Areas (HA's) 8, 10, and 13 where the largest blocks of accessible public lands occur.

Primary land uses within the herd unit include livestock grazing, oil and gas production, and some crop production. By far, the dominant land use is livestock grazing. The majority of oil and gas development occurs in the western and north central portions of the herd unit. However, substantial new oil and gas development is occurring in northern Niobrara County (HA's 9 & 11) and near Douglas (HA 14). In addition, horizontal oil well development over a large portion of hunt areas 11, 14 and 21 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 and limit access to public lands for hunting. Cultivation of alfalfa, grass hay, oats, and wheat occur mostly in the southern and eastern portions of the herd unit.

**WEATHER:** Between 2006 and 2012 drought combined with poor habitat condition and more normal winter weather patterns to reduce recruitment of fawns into the adult segment of this herd. The winter of 2010-11 was very harsh and over-winter mortality high. Generally warm and dry late summer conditions between 2009 and 2012 fostered outbreaks of Epizootic Hemorrhagic Disease (EHD). As such, weather patterns observed between 2006 and 2012 are

thought to be the remote cause for the population drop during this time, differentially affecting various proximate mortality factors.

April of 2013 saw a break in drought conditions. Daily temperatures returned to near long-term averages along with the amount of precipitation received. This helped increase forage production, but fawn survival and recruitment remained suppressed, probably due to the poor body condition of does resulting from the extreme 2012 drought, and/or persistence of EHD or adenovirus increasing fawn mortality. Throughout much of 2014 daily temperatures remained near average, and the herd unit received good spring and early summer precipitation. During 2015 temperatures were generally above average, and average to above average precipitation was received during the much of growing season. In fact, there was significant flooding in some drainages due to thunderstorms during June, 2015. But, these weather events did not seem to negatively affect mule deer. Instead, good soil moisture and warm summer temperatures resulted in excellent forage production. Overall, weather conditions the past two years have favored mule deer by contributing to excellent forage production and over-winter survival, which have translated into an increasing population. See <http://www.ncdc.noaa.gov/cag/> for weather details.

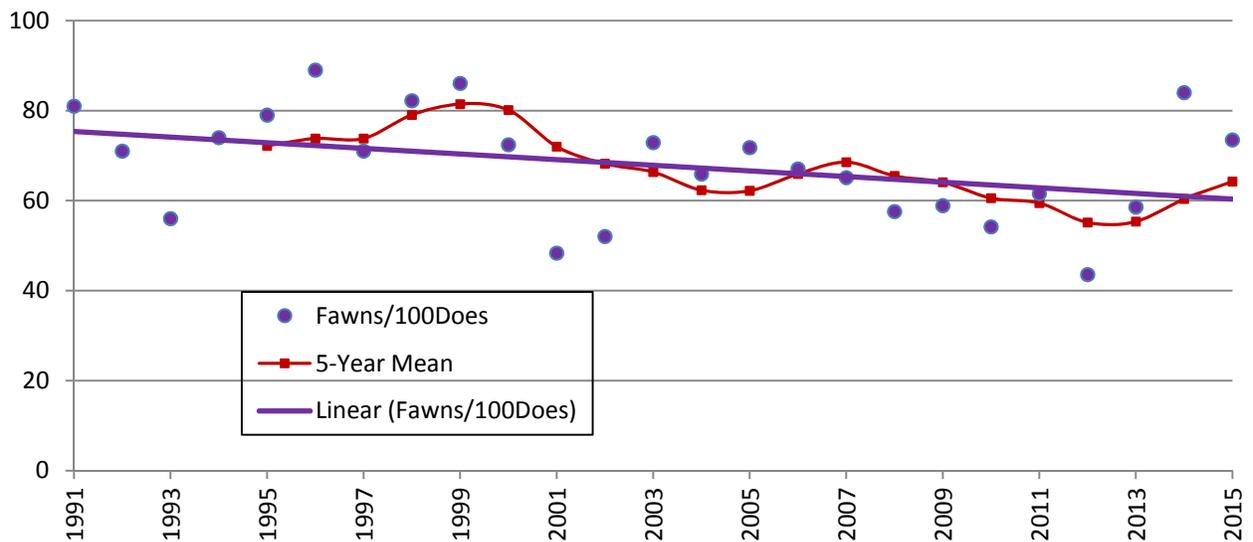
**HABITAT:** Sagebrush (*Artemisia ssp.*) steppe and sagebrush grasslands with scattered hills dominated by ponderosa pine (*Pinus ponderosa*) comprise most of the western, central, and northern segments of the herd unit. The eastern most lands in the herd unit are comprised of short grass prairie punctuated by pine breaks, and there is a small area (about 30 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 drainages traverse the herd unit including the headwaters of the Belle Fourche River and the Niobrara River in the north and south, respectively. Additionally, the Cheyenne River and many of its tributary creeks such as Beaver Creek, Lightning Creek, Twenty-Mile Creek, Lance Creek, and Old Woman Creek make up the bulk of the herd unit. 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. The general lack of woody understory species is a concern. 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.

After about a decade of collecting annual Wyoming big sagebrush leader growth and utilization data in this herd unit, the Department suspended these efforts. This was because it had been demonstrated annual leader production was generally proportional to the amount of spring and early summer moisture received; while use could be fairly well gauged through causal

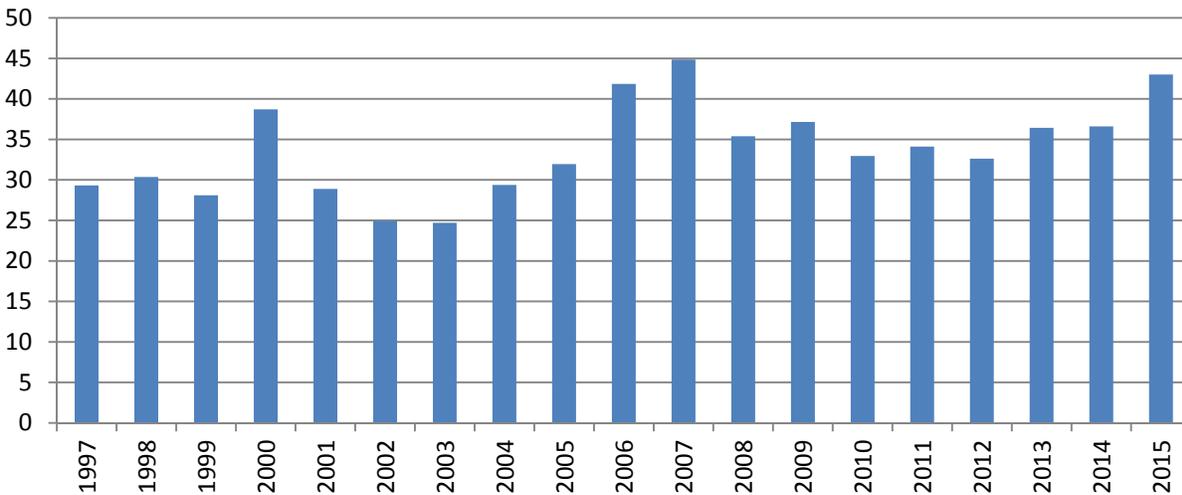
observation. Over the past two years, essentially wet spring and summer conditions have persisted together with low numbers of pronghorn and mule deer on the range. Consequently, observations have shown excellent leader growth and reduced winter use, indicating this population is currently below carrying capacity and should be permitted to continue to grow towards objective.

**FIELD DATA:** While postseason fawn:doe ratios have undergone cyclic fluctuations, they have generally trended downward (Figure 1). In 2015, the observed, post-season fawn:doe ratio was 73:100, which was a drop of about 13% from the recent high of 84:100 observed the previous year. The drop in the 2015 observed fawn:doe ratio is thought to be an artifact of high numbers of yearling does without fawns in the population rather than reduced productivity compared to the previous year. At any rate, the fawn:doe ratios observed in 2014 & 2015 were markedly improved over those observed during this herd’s decline (2006 – 2012), when an average of only 58 fawns per 100 does was observed. Overall, suppressed fawn:doe ratios witnessed between 2000 and 2013 were thought to have been a result of generally poor range conditions due to protracted drought coupled with significant use by domestic and wild ungulates. In fact, with extreme drought in 2012 the lowest fawn:doe ratio in recent history was observed. Following that nadir, excellent moisture and forage production has allowed doe body condition to improve each year, resulting in a spike in fawn production and survival.



**Figure 1. Post-Season Fawn:Doer Ratios (1991 – 2015) with 5-year mean values in the Cheyenne River Mule Deer Herd.**

Post-season buck:doe ratios have fluctuated cyclically in 6-7 year intervals (Figure 2). Prior to 2008, moderate productivity coupled with limited access for hunters to private land yielded an increasing buck:doe ratio despite enhanced license issuance. Then, as fawn production and survival dropped, buck:doe ratios declined. Region B license issuance was lowered during this time and buck:doe ratios stabilized. Then, excellent fawn production and over-winter survival in 2014 caused the total buck:doe ratio to jump to 43:100 in 2015. This was mainly the result of a yearling buck:doe ratio of 20:100, one of the highest on record, and a value 66% above the average detected over the previous two decades.



**Figure 2. Post-Season Buck:Doe Ratios, Cheyenne River Mule Deer Herd (1997-2015).**

**HARVEST DATA:** In this herd unit, 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. This was part of the reason for altering the post-season population objective in 2014.

Access to private lands for deer hunting continues to decrease due to leasing by outfitters and landowners limiting hunting in the wake of a mule deer population decline. Many landowners have stated they are still not willing to host increased numbers of hunters, or tolerate much in the way of doe/fawn hunting. Consequently, we have basically reached access saturation at this time on much of the private land within the herd unit. Compounding this situation, outfitter control has significantly curtailed public hunting access to buck deer, and harvest of bucks has dropped, even when seasons were liberalized. The reduced access to private land for deer hunters has also increased hunting pressure on bucks on accessible public lands, and resulted in lower numbers of bucks there. This was one of the reasons HA 10 was changed to limited quota hunting in 2015.

Between 2006 and 2014, hunter numbers and harvest declined steadily, while hunter effort increased. The trend in hunter effort was slightly ameliorated in 2014, as the population began to increase and hunter participation declined. Non-resident hunter participation has dropped steadily since 2006, with the Region B quota being successively lowered most years, while resident hunter numbers declined steadily through 2013 before increasing about 5% in 2014 and 3% in 2015. Further, during each of past six hunting seasons, complaints have been received from both hunters and landowners throughout the herd unit with regard to the low number of deer seen and harvested.

It was evident from the reduced number of deer found during classification efforts between 2010 and 2013, changes in harvest statistics, and landowner comments that this herd had declined substantially. So, it is notable that the modeled, preseason population estimate for this herd

increased 2% between 2012 and 2013, while hunter success dropped precipitously and effort increased substantially, even with fewer hunters afield. It is most likely the 2013 harvest statistics were influenced in part by the poor weather and road conditions caused by winter storm Atlas. In addition, nearly 20% of the available Region B tags did not sell in the regular drawing that year, but were purchased after the draw. It was apparent from field contacts that many of the hunters purchasing leftover license were forced to hunt already overcrowded public land; and more than a few landowners turned hunters away whom they previously granted permission to hunt. In 2014, harvest statistics indicate preseason mule deer numbers were improved and more deer were classified post-season, particulars that dovetail with model projections. This same scenario played out in 2015 as reduced numbers of hunters combined with an increasing mule deer population to yield increased hunter success and reduced effort.

**POPULATION:** The 2015 post-season population estimate for this herd is ~24,600. This represents an increase of approximately 26% since 2013 and is a result of excellent reproduction and survival during 2014 and 2015. This represents a reverse in course, as this herd had declined significantly between 2007 and 2012 when it bottomed out 31% below its current objective. However, it should be noted the inherent constraints in the spreadsheet models make population estimates at the extremes of the years modeled the most tenuous.

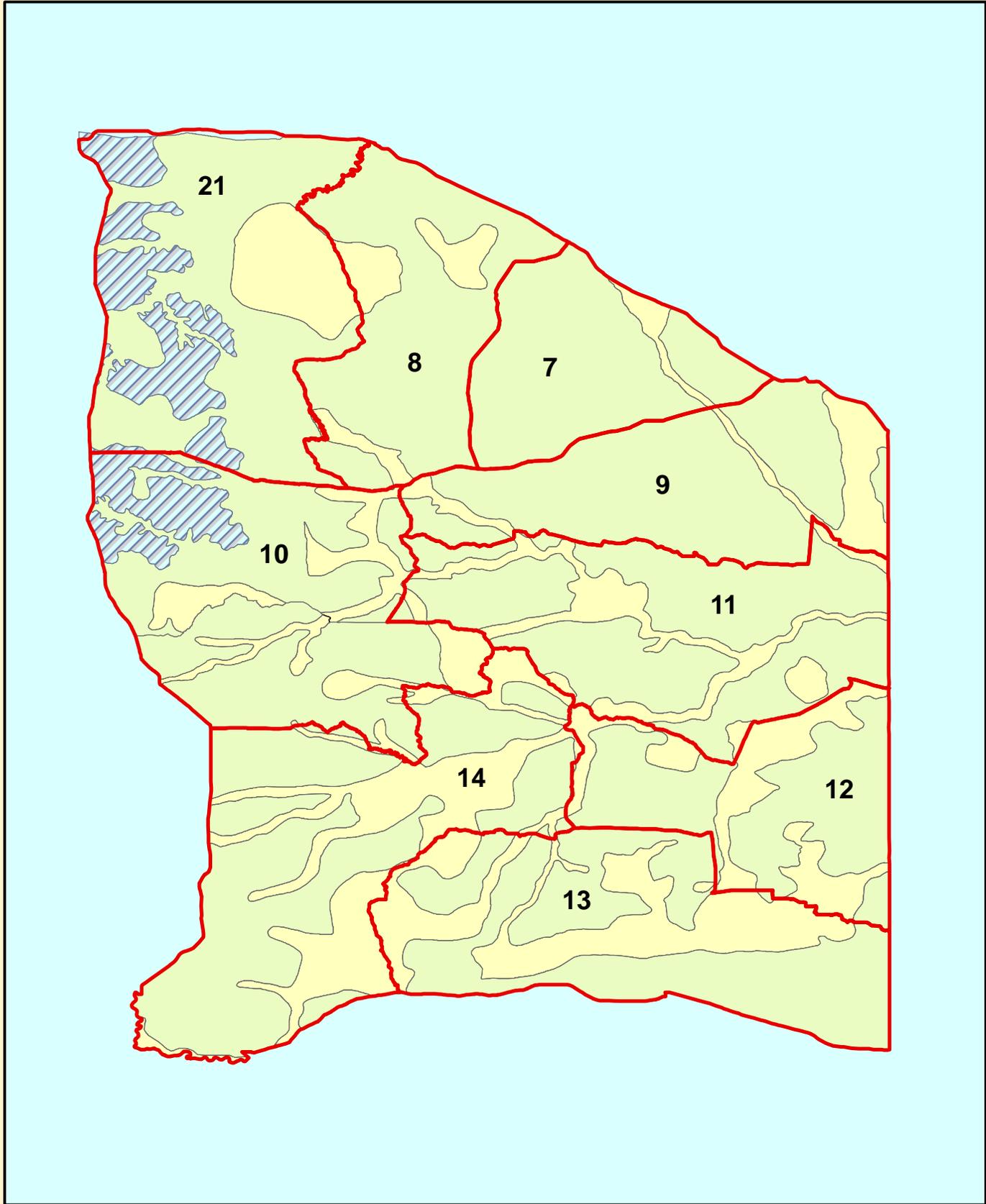
The Semi-Constant Juvenile / Semi-Constant Adult (SCJ SCA) model was chosen to estimate this herd's population. It was selected over competing models because it had the lowest relative AICc and fit observed buck ratios relatively well without being overly parameterized. The selected model aligns well with observed buck:doe ratios, and changes in preseason population estimates are about 50% correlated with changes in hunter success, and inversely correlated 85% with changes in hunter effort between 2006 and 2015. However, modeled changes in population size do not seem to be of the magnitude field personnel and many landowners report, as there seemed to be more of a peak in deer numbers about 2006 or 2007 with a steeper increase preceding this and more abrupt decline following. Consequently, the model is considered to be of fair quality because it has 15-20 years of data; ratio data available for all years in model; the juvenile and adult survival estimates are reasonable; it exhibits modest fit; and results are generally defensible. But, we do not have any specific survival rates or independent population estimates for this herd.

**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 are proposing to continue with very little doe/fawn harvest and 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. In addition, 50 Type 7 licenses valid on private land will be issued in HA 21, where there are some localized concentrations of mule deer around cultivated and landscaped areas.

Due to heavy hunting pressure on accessible public land there is a major discrepancy in deer numbers and densities between these areas and surrounding private lands. Historically, this has been best exemplified in HA 10, which contains the highest proportion of public land in the herd unit. To address low buck numbers and hunter crowding in this area, we steadily reduced the Region B quota for many years, decreased season length, and finally implemented a 3-point restriction in 2012. These strategies helped improved the HA 10 buck:doe ratio to the herd-wide

average in 2009 and 2010, but deer densities remained depressed; and the observed buck:doe ratio dropped to 16:100 in 2011 with only 11 total bucks being found. With the 3-point restriction in place during 2012, the post-season buck:doe ratio improved to 42:100, with 27 bucks observed in about 4 hours of helicopter flight time. The same classification effort in 2013 & 2014 detected more bucks each year, and the buck:doe ratio remained near 36:100. Following the inaugural limited quota season in 2015, similar classification efforts found a total of 60 adult bucks and yielded a buck:doe ratio of 51:100. However 30% of the bucks observed were yearling bucks. Thus, it is likely we can begin to liberalize license issuance here in the next couple of years barring a significant mortality event. Further, the inaugural year of limited quota hunting in this hunt area was well received by those who hunted here, as 83% reported being satisfied or very satisfied with their hunt, while only 2% reported any measure of dissatisfaction.

Even as this population begins to recover, many landowners have continued to state they are not willing to host increased numbers of deer hunters. In addition, during the past couple of years several ranches that normally hosted several hundred deer hunters have turned these hunters away due to low deer numbers. Due to these concerns and displacement of about 200 hunters from HA 10 as it went to limited quota, Region B licenses issuance was cut to 800 in 2015. Now that HA 10 has been limited quota for a year, nonresident license demand is strong, and the buck:doe ratio has steadily increased the past three years we believe increasing the Region B quota to 1,000 is warranted. The 2016 hunting season should result in harvest of about 1,100 bucks and 70 antlerless mule 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 5% in 2016 to a point 4% below objective.



**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:

## 2015 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2015 - 5/31/2016

HERD: MD751 - BLACK HILLS

HUNT AREAS: 1-6

PREPARED BY: JOE SANDRINI

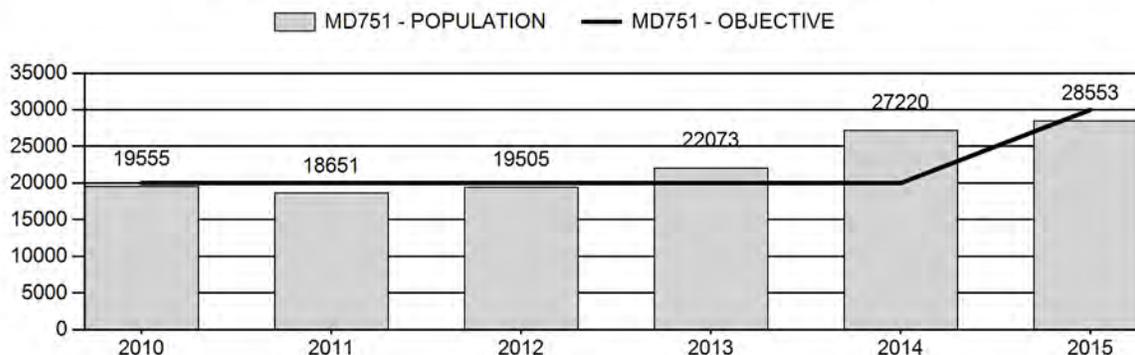
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	21,401	28,553	30,142
Harvest:	1,591	2,213	2,630
Hunters:	3,880	4,687	5,600
Hunter Success:	41%	47%	47%
Active Licenses:	3,975	4,820	5,800
Active License Success:	40%	46%	45%
Recreation Days:	12,400	13,825	16,500
Days Per Animal:	7.8	6.2	6.3
Males per 100 Females	19	29	
Juveniles per 100 Females	77	79	

Population Objective (± 20%) :	30000 (24000 - 36000)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-4.8%
Number of years population has been + or - objective in recent trend:	9
Model Date:	02/18/2016

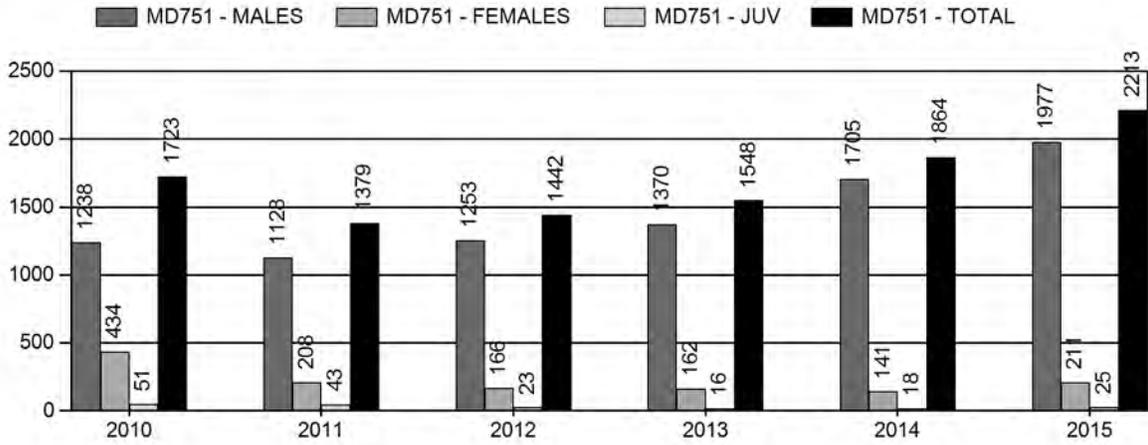
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	1.7%	2.5%
Males ≥ 1 year old:	35.3%	35.8%
Juveniles (< 1 year old):	0.3%	0.3%
Total:	7.9%	8.8%
Proposed change in post-season population:	+4.8%	+5.6%

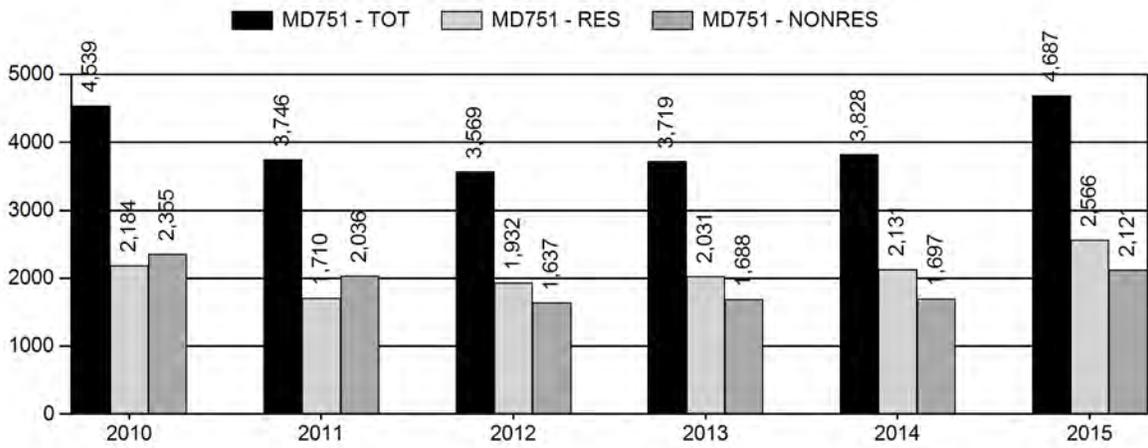
## Population Size - Postseason



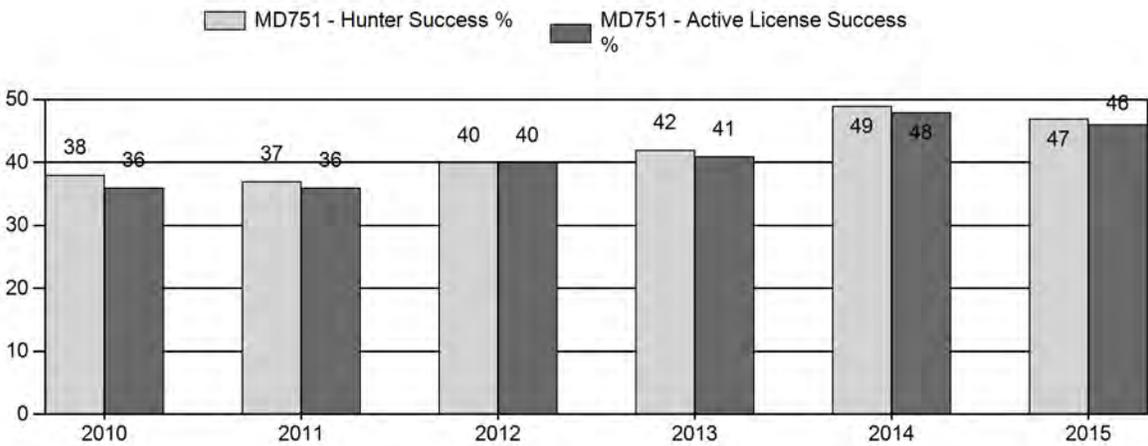
# Harvest



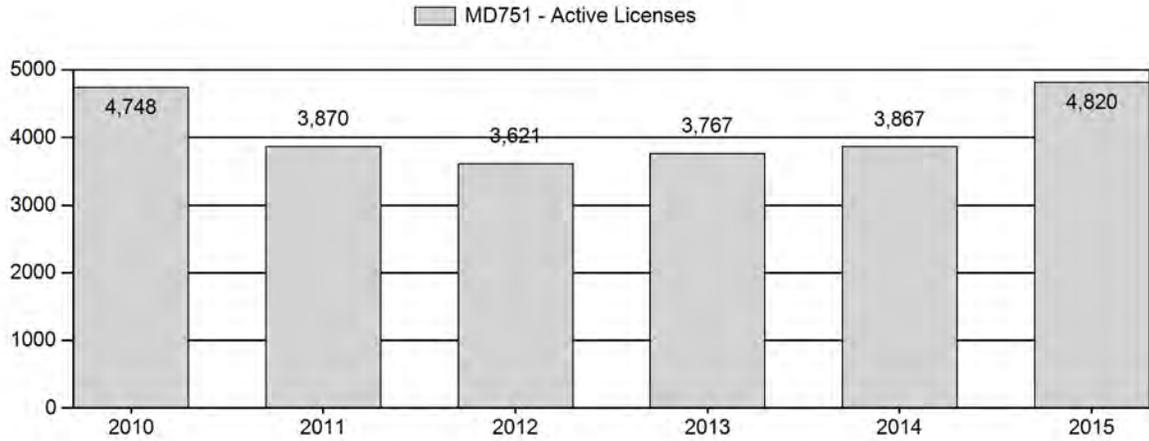
# Number of Hunters



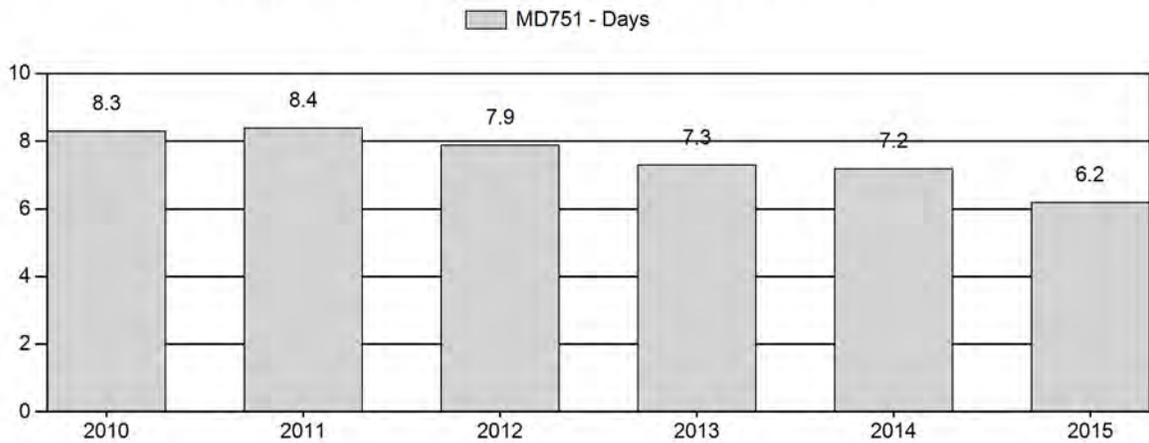
# Harvest Success



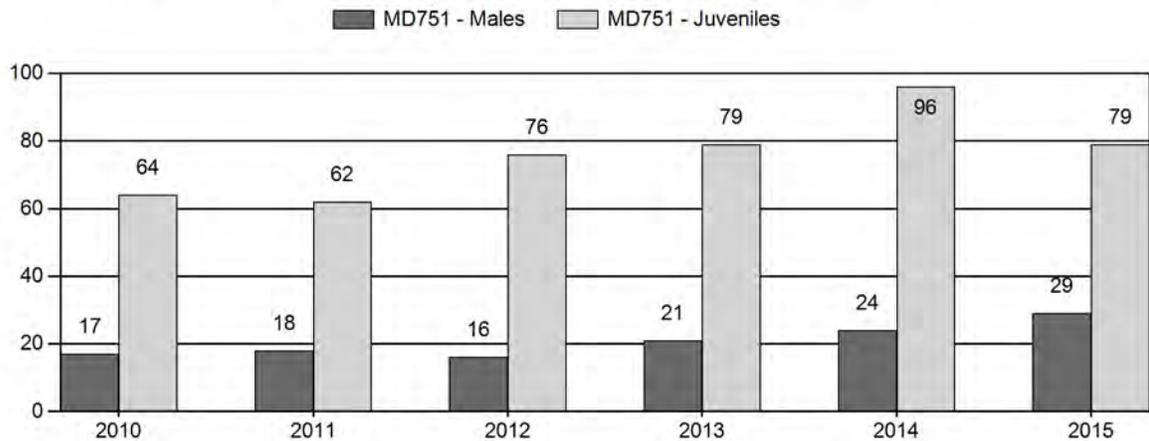
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



## 2010 - 2015 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	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Yng			Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult	
2010	19,555	44	0	0	0	71	115	10%	659	55%	421	35%	1,195	1,174	7	11	17	± 2	64	± 5	54	
2011	18,651	41	0	0	0	76	117	10%	658	56%	406	34%	1,181	1,118	6	12	18	± 2	62	± 5	52	
2012	19,505	58	0	0	0	70	128	8%	787	52%	596	39%	1,511	1,553	7	9	16	± 2	76	± 5	65	
2013	22,073	71	0	0	0	62	133	11%	634	50%	499	39%	1,266	1,714	11	10	21	± 2	79	± 6	65	
2014	27,220	98	0	0	0	113	211	11%	880	45%	847	44%	1,938	2,466	11	13	24	± 2	96	± 6	78	
2015	28,553	158	90	16	0	9	273	14%	939	48%	746	38%	1,958	1,812	17	12	29	± 2	79	± 5	62	

**2016 HUNTING SEASONS  
BLACK HILLS MULE DEER HERD (MD751)**

Hunt Area	Type	Dates of Seasons		Quota	License	Limitations
		Opens	Closes			
1		Nov. 1	Nov. 20		General	Antlered mule deer off private land; any mule deer on private land
1	7	Nov. 1	Nov. 20	100	Limited quota	Doe or fawn valid on private land
2		Nov. 1	Nov. 30		General	Antlered deer off private land; any deer on private land
2	6	Nov. 1	Nov. 30	500	Limited quota	Doe or fawn valid on private land
3		Nov. 1	Nov. 30		General	Antlered deer off private land; any deer on private land
4		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land except the lands of the State of Wyoming's Ranch A property shall be closed
4	6	Nov. 1	Nov. 20	300	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	150	Limited quota	Doe or fawn
6		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

**Region A Nonresident Quota: 4,500**

**SUMMARY OF CHANGES IN LICENSE NUMBER**

Hunt Area	License Type	Quota change from 2015
1	7	+ 100
2	6	+ 250
4	6	+ 100
5	6	+ 150
<b>Herd</b>	<b>6</b>	<b>+ 500</b>
<b>Unit</b>	<b>7</b>	<b>+ 100</b>
<b>Totals</b>	<b>Region A</b>	<b>+ 1,000</b>

## **Management Evaluation**

**Current Postseason Population Management Objective:** 30,000

**Management Strategy:** Recreational

**2015 Postseason Population Estimate:** ~ 28,500

**2016 Proposed Postseason Population Estimate:** ~ 30,100

**2015 Hunter Satisfaction:** 81% Satisfied, 12% Neutral, 7% Dissatisfied

**HERD UNIT ISSUES:** In 2015, the management objective of the Black Hills Mule Deer Herd Unit was revised to a post-season population of 30,000 mule deer. Prior to this revision, an objective of 20,000 had been in place since 1986. The herd continues to be managed under the Department's "Recreational Management Strategy," which calls for 20 to 29 bucks per 100 does post-season.

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

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

White-tailed deer are the more numerous deer species in HA's 2 and 4, whereas more equal proportions or greater numbers of mule deer occupy HA's 1, 3, 5, and 6, depending upon habitat type. The vast majority of mule deer in the herd unit reside on private land. This results in their management being strongly influenced by landowner sentiments. Field personnel report mule deer numbers continue to improve and are nearing tolerance levels in some locations; but many landowners, especially those near Newcastle, desire to see more mule deer.

**WEATHER:** The second half of the last decade saw a transition from persistent drought to decent growing season moisture, while about average winter conditions persisted most years. This mule deer population peaked during that time and then began to decline. The weather may have contributed to the decline as peak populations coincided with the last two years of an eight year drought, sending high populations into poor forage winters. This resulted in some detected mortality in late winter and early spring each year, most notably during the 2010-11 winter, which was severe. Drought returned to the Black Hills in 2012, with well above normal summer temperatures and little rainfall during the growing season. Forage production was very poor, and the dry conditions led to several large wildfires in the southern half of the herd unit. These warm and dry conditions continued until the spring of 2013 when temperatures dropped below normal and good precipitation was again received. As the growing season progressed, temperatures remained above average and precipitation above normal. This same pattern generally followed

in 2014 and 2015, resulting in good to excellent forage growth each year. Fall and winter weather over the 2013-2015 timeframe was essentially characterized by normal to above average temperatures and average to below normal precipitation (<http://www.ncdc.noaa.gov/cag/>). The only outstanding weather event of this period being winter storm “Atlas” experienced in October, 2013. This storm blanketed the Black Hills with anywhere from about a foot of wet heavy snow near Newcastle, to three feet on the Bearlodge, and over five feet near Cement Ridge. No large scale die-offs of mule deer were witnessed after this storm, but a few mule deer mortalities on the National Forest were discovered.

Based upon weather, habitat conditions and deer numbers the past three years, it is likely mule deer have entered winters in good to excellent condition. Something reflected in the improved post-season fawn:doe ratios. In addition, winter weather conditions, aside from the early part of 2013, have yielded good to excellent over-winter survival as indicated by robust post-season yearling buck ratios. This has been a reversal of what was experienced as this herd declined from 2007 to 2011 and remained suppressed in 2012. As such, with favorable weather conditions the past three years this herd has grown.

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

Currently, no quantification of mule deer habitat quality or quantity is being conducted within this herd unit. A single true mountain mahogany and two bur oak production and utilization transects were established in the past. The true mountain mahogany transect is located on mule deer transitional and winter range typical of the southern Black Hills, and the bur oak transects are in winter range more typical of white-tailed deer habitat in the northern hills. While little habitat data have been collected, it appears past drought conditions negatively affected shrub production, and peak mule deer numbers several years ago may have exceeded what the forage conditions could sustain given the lack of precipitation at the time. The past three years have seen excellent forage production, and browse on winter and transitional ranges has appeared to be in generally good to excellent condition.

**FIELD DATA:** Between 2009 and 2011 fawn productivity and survival was persistently low, with a mean observed, post-season fawn:doe ratio of 65:100 (std. dev.=3). In 2012, this situation reversed itself as the observed fawn:doe ratio improved to 76:100; and then between 2013 and 2015 it averaged 85:100, peaking at 96:100 in 2014. This population has 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, 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. Consequently, as a result of harvest, weather, disease, and increased predation the estimated post-season population

fell substantially between 2006 and 2011<sup>1</sup>. This same period witnessed a similar decline in the estimated preseason population, as preseason trend counts dropped 75% (Figure 1). With better fawn production and survival since 2012, the declining trend has been reversed.

As this population declined, so did post-season buck:doe ratios, averaging 17:100 (std. dev.=1) between 2008 and 2012. With better fawn production and survival since 2012, yearling buck numbers have improved, driving an increase in the total observed buck:doe ratio from 16:100 in 2012 to 29:100 in 2015. However, adult buck:doe ratios observed during this time period remained fairly constant around 12:100 (std. dev.=2). Over the past five years, post-season total buck:doe ratios have averaged 22:100 with some variability (std. dev.= 5.1) due to recently increased numbers of yearling bucks entering the population. As such, this herd has improved from exhibiting buck:doe ratios below the Department’s minimum management criteria for recreational hunting to its upper end. Provided non-hunting mortality remains consistent and fawn survival is average, we anticipate the liberalization of hunting seasons in 2016 will reduce this herd’s buck:doe ratio to the midrange of the Department’s recreational management criteria.

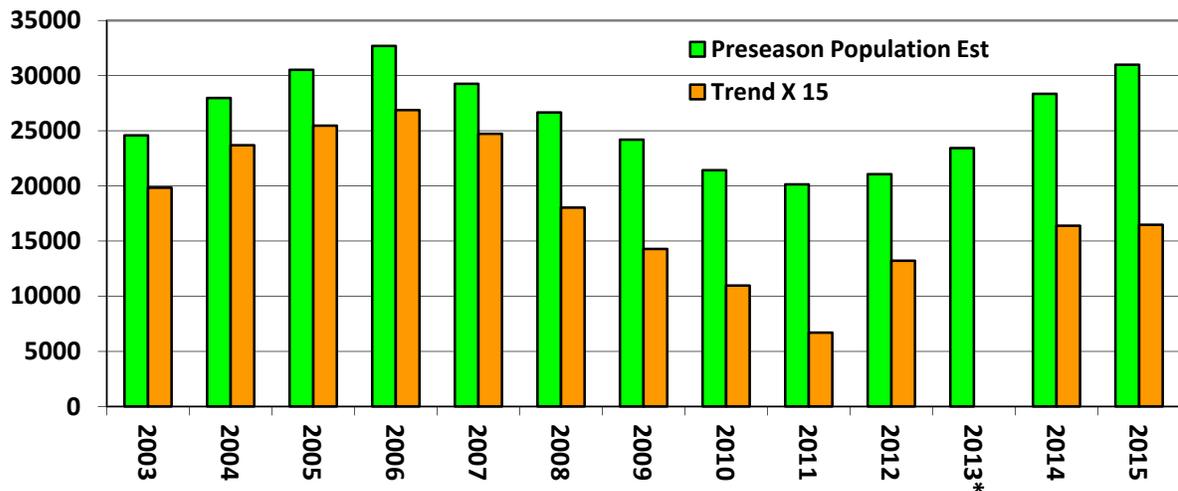


Figure 1. 2003 – 2015 pre-season population estimates produced by the current TSJ CA model, and mule deer observed preseason along trend count routes (increased by a factor of 15). \* Trend counts were not conducted in 2013 due to winter storm Atlas.

**HARVEST DATA:** Deer hunting seasons in the Black Hills have been traditionally structured to address white-tailed deer management. Consequently, harvest of mule deer bucks has been generally managed by balancing white-tailed deer seasons and landowner tolerance for deer (both species) with recreational opportunity; whereas antlerless harvest has been regulated more through doe/fawn license issuance. An analysis of historic General License 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

<sup>1</sup> 54% based upon SCJ/SCA model dated 02/20/2015 and used for 2015 season setting; revised, current TSJ/CA model suggest 34% decline.

following in November. Department surveys and contacts with non-resident hunters indicate most non-residents want to harvest mule deer. This fact, combined with a hunting season that targets bucks during the rut, results in very heavy hunting pressure on buck mule deer. Considering this and the drop in total buck numbers between 2007 and 2011, it was prudent to substantially limit harvest of buck mule deer through 2014. We are now at a point following 4-years of good fawn production and survival, especially in 2014, that harvest of mule deer can continue to be liberalized.

With conservative hunting season structures in place between 2010 and 2014, mule deer harvest dropped about 40% from the level experienced when this population peaked, although reported harvest increased substantially in 2014 without concomitant increases in license issuance<sup>2</sup>. In 2015, Region A license issuance was liberalized by 27%, doe/fawn license issuance more than doubled, and HA's 2 and 3 returned to 30-day seasons. As a result, reported harvest climbed another ~19%.

Overall, hunting seasons between 2010 and 2014 reduced harvest of mule deer bucks about 37% from that experienced during the immediately preceding 5-year period with the traditional 30-day November season north of I-90. Comparing these same time periods, resident harvest of mule deer bucks dropped a bit more than 20%, while non-resident harvest of mule deer bucks dropped closer to 50%. During this period of conservative season structures, harvest of white-tailed deer bucks declined less (see WD706). As a result, post-season mule deer buck:doe ratios held fairly stable and then began to improve. Meanwhile, hunter satisfaction remained basically unchanged between 2011 and 2013, with about 68% of hunters of both deer species reporting they were either satisfied or very satisfied with their Black Hills deer hunt; and only around 15% indicating they were either dissatisfied or very dissatisfied – regardless of species. Satisfaction measures then improved in 2014 with 75% of both mule deer and white-tailed deer hunters reporting they were satisfied with their Black Hills deer hunt, and only 10% reporting negative satisfaction – again regardless of species. Hunter satisfaction increased again in 2015, with just over 80% of both mule deer and white-tailed deer hunters reporting they were satisfied with their Black Hills deer hunt, and about 7% or less reporting dissatisfaction. It can be inferred that increases in deer hunter success and declines in the effort required to harvest a deer since 2013 have influenced changes in hunter satisfaction.

**POPULATION:** Population modeling of this herd has always been difficult. The population violates the closed population assumption due to significant interstate movement of deer combined with interchange between adjacent mule deer herds in Wyoming. In addition, changes in doe harvest rates, outbreaks of EHDV, possible adenovirus mortalities, increased predation, a high level of vehicle-deer collisions, occasional severe weather events, and inadequate classification sample sizes at times make constructing a reliable population model questionable at best. In 2014, the spreadsheet model for this herd was reconstructed and re-initiated after correcting errors detected in the previous model. Of the competing models, the SCJ/SCA model was used during the herd unit objective review process and season setting in 2015.

The 2015 modeled, post-season population of Black Hills mule deer is about 28,500. This value may be somewhat inflated due to significantly increased reported harvest in 2014 without

---

<sup>2</sup> 2014 harvest survey statistics indicate mule deer buck harvest increased about 36% in 2014, something that appears very incongruent with no significant changes in hunter number or season structure given population trends and field observations.

commensurate changes in season structure or perceived population size. With this year's change in model selection and updated data, the population is now projected to have peaked in 2006 at an estimated postseason population of around 32,700 mule deer (versus the 36,000 reported in 2015), and then declined to near 20,100 in 2011 (versus 16,500 reported in 2015). It is then estimated to have begun to rebound, growing about 54% into post-season 2015 (a level commensurate with that reported in 2015). Because the models we use to simulate populations produce their most unreliable estimates in the first and last few years of model construction, we question whether this population has grown as much as indicated over the past three or four years. This is asserted because recent trend counts are about 50% below those found in years contained in the middle of the model at a time when this population is projected to have been at a similar level (Figure 1). At any rate, this herd has definitely begun to rebound after a substantial decline and its growth may now need to be tempered in some locations.

As mentioned above, population modeling of this herd is difficult; and use of the Semi Constant Juvenile / Semi Constant Adult (SCJ SCA) model was replaced with the Time Sensitive Juvenile / Constant Adult (TSJ CA) model this year. This was done because both models exhibited nearly identical AICc values (SCJ SCA = 142 and TSJ CA = 144) and both are 90% correlated with preseason trend counts, but the TSJ CA model fits observed data much better with a fit value of 25 versus 76. Additionally, the TSJ CA model does not reach the upper constraint on adult survival (0.9) that the SCJ SCA model does in all years not allowed to vary independently. The TSJ CA model on the other hand, does produce a nearly equivalent adult survival rate of 0.856, but an average juvenile survival rate of 0.606 that is slightly higher than that of 0.565 produced by the SCJ SCA model. Overall, we consider the selected 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 in some years, and aerial classifications in terrain that makes classifying yearling bucks difficult.

**MANAGEMENT SUMMARY:** The spreadsheet model used for the herd suggests it is nearing the new management objective of 30,000 mule deer. If the herd actually numbers close to 30,000, then the current objective may be below some landowner's and hunter wishes, especially south of I-90. Based upon habitat conditions, the desires of hunters, and landowner sentiments a season designed to allow this herd to increase is warranted. However, given the increased productivity and survival witnessed the past couple of years, especially north of I-90, growth in the northern portion of this herd needs to be tempered. Therefore, the 2015 hunting season is designed to allow increased buck hunting opportunity and to further increase harvest of antlerless deer in HA's 1 & 2, and to a lesser extent, in HA's 4 & 5. This prescription should keep buck:doe ratios in the middle of the recreational management range and foster some herd growth.

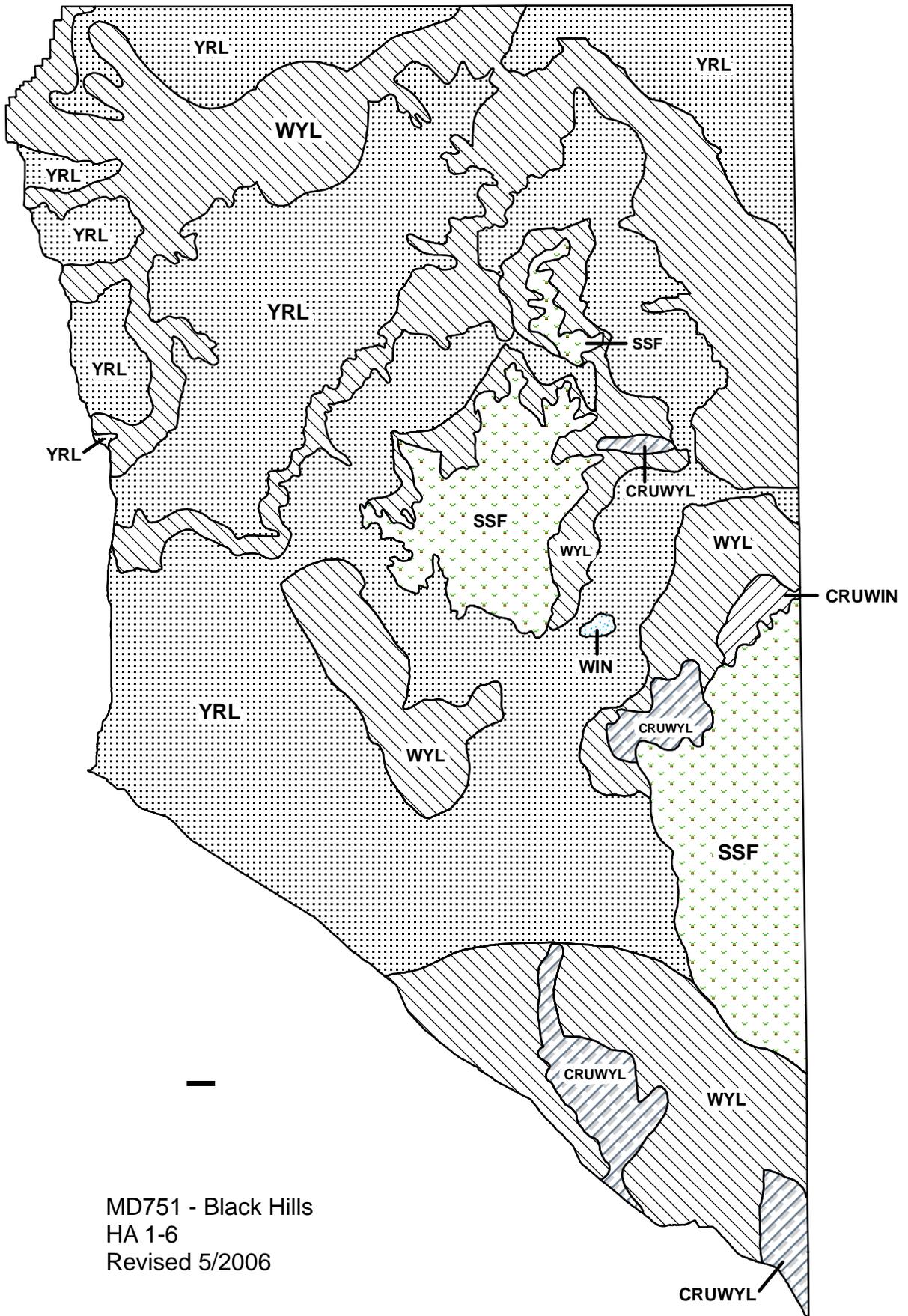
Changes to the 2016 mule deer hunting season in the Black Hills include introduction of a Type 7 license valid on private land in HA 1 along with increases in Type 6 license issuance in HA's 2, 4 and 5. These increases in doe/fawn license issuance are intended to slow the growth of this herd. Based upon historical harvest survey data, it is estimated about 15% of these licenses will be used to harvest a doe or fawn mule deer. The Region A quota has also been increased from 3,500 to 4,500 to allow for more buck hunting opportunity as this herd approaches objective.

Mule deer buck numbers have substantially improved in this herd unit in recent years. Based upon classification data and population estimates, there should be strong cohorts of 1, 2 and 3 year-old bucks available for hunters in 2016, while 4 & 5 year-old bucks will be harder to come

by. As such, it seems reasonable to liberalize buck harvest, something that attracts more hunters into the area, many of whom will harvest whitetail does – something needed to slow the growth of the sympatric whitetail population. The 2016 hunting season should result in a mule deer buck harvest about 80% above that witnessed during the very conservative hunting seasons when this population hit its recent nadir. Despite this increase in buck harvest, the post-season buck:doe ratio in 2016 should remain near the midpoint of the Department's management criteria as this population continues to grow.

Issuance of Type 6 & 7 doe/fawn tags has been increased in HA's 1, 2, 4 and 5 to allow landowners to control deer of either species. Because we believe resident General License hunter numbers will not change significantly in 2016 and most non-residents don't harvest antlerless deer on their Region A License, it is anticipated doe/fawn harvest on General Licenses will not change much. Overall, we believe antlerless mule deer harvest will increase from about 235 deer to 375 deer given changes in doe/fawn license numbers. This relatively low level of female and juvenile mule deer harvest does not warrant complicating the regulations further by segregating mule deer and white-tailed deer harvest more than we already have on General Licenses, a notion being championed by some individuals.

The 2016 hunting season is expected to yield a postseason population of about 30,100 mule deer, which represents about a 6% increase in the post-season population. Such a change in the population would put this herd at its current objective.



## 2015 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2015 - 5/31/2016

HERD: MD755 - NORTH CONVERSE

HUNT AREAS: 22

PREPARED BY: WILLOW STEEN

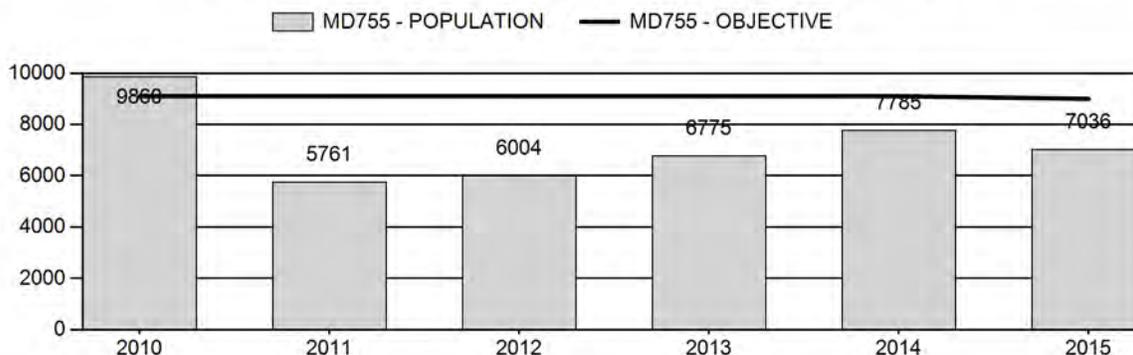
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	7,237	7,036	7,272
Harvest:	501	174	175
Hunters:	645	246	250
Hunter Success:	78%	71%	70 %
Active Licenses:	679	246	230
Active License Success:	74%	71%	76 %
Recreation Days:	2,553	794	775
Days Per Animal:	5.1	4.6	4.4
Males per 100 Females	37	42	
Juveniles per 100 Females	72	89	

Population Objective (± 20%) :	9000 (7200 - 10800)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-21.8%
Number of years population has been + or - objective in recent trend:	6
Model Date:	02/24/2016

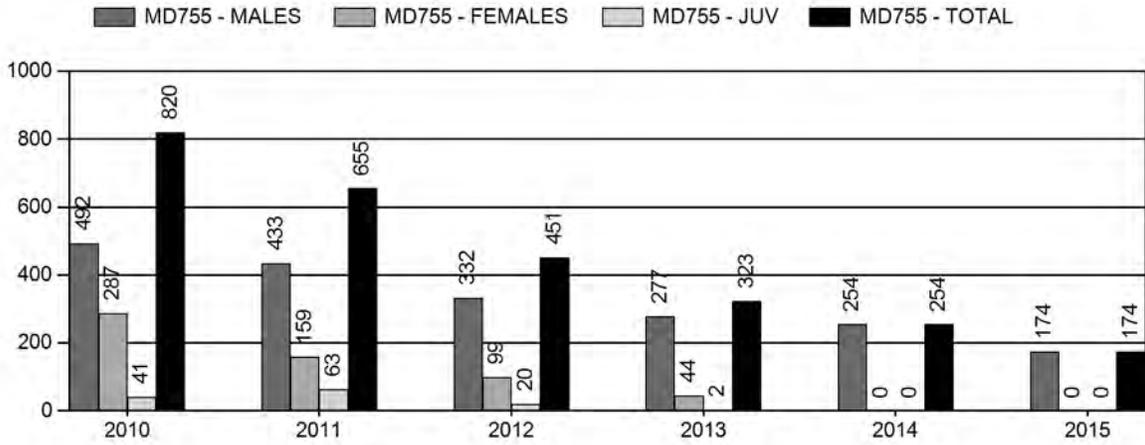
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0%	0%
Males ≥ 1 year old:	14.1%	12.1%
Juveniles (< 1 year old):	0%	0%
Total:	2.4%	2.3%
Proposed change in post-season population:	-2.6%	-2.6%

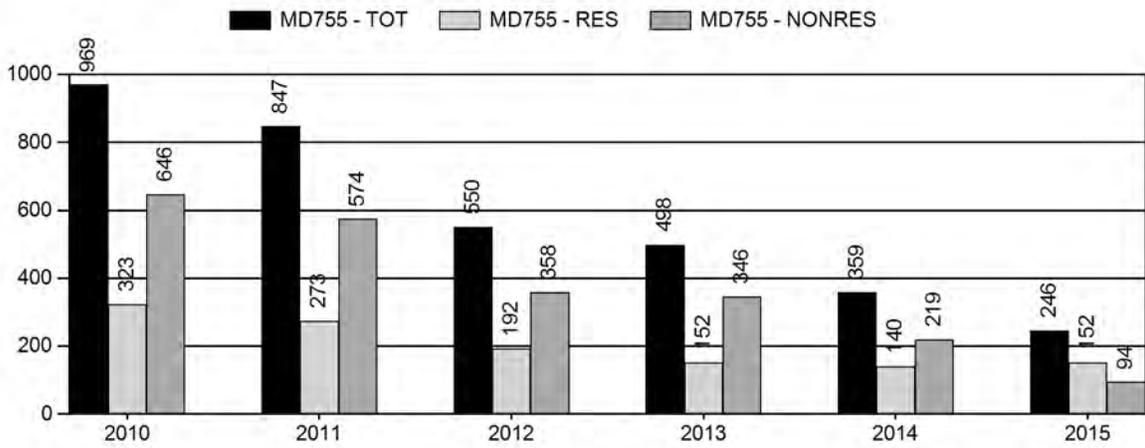
## Population Size - Postseason



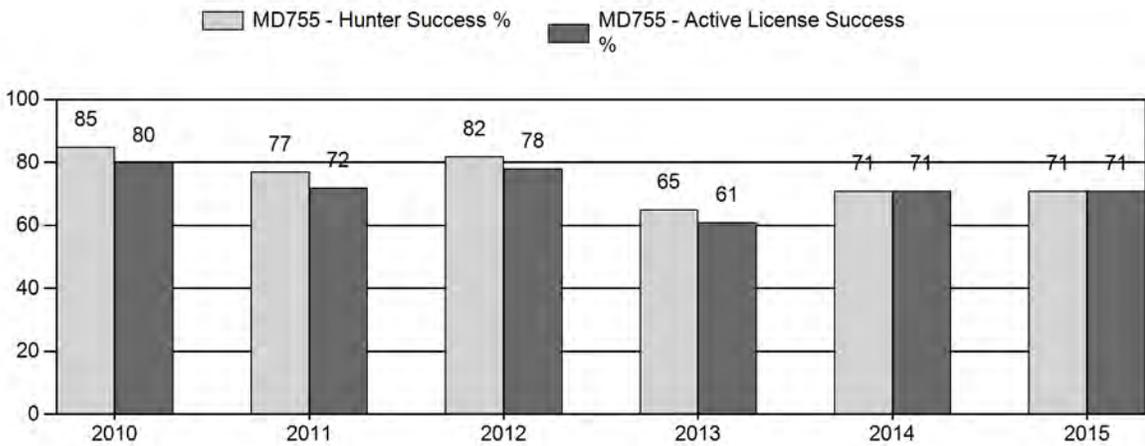
# Harvest



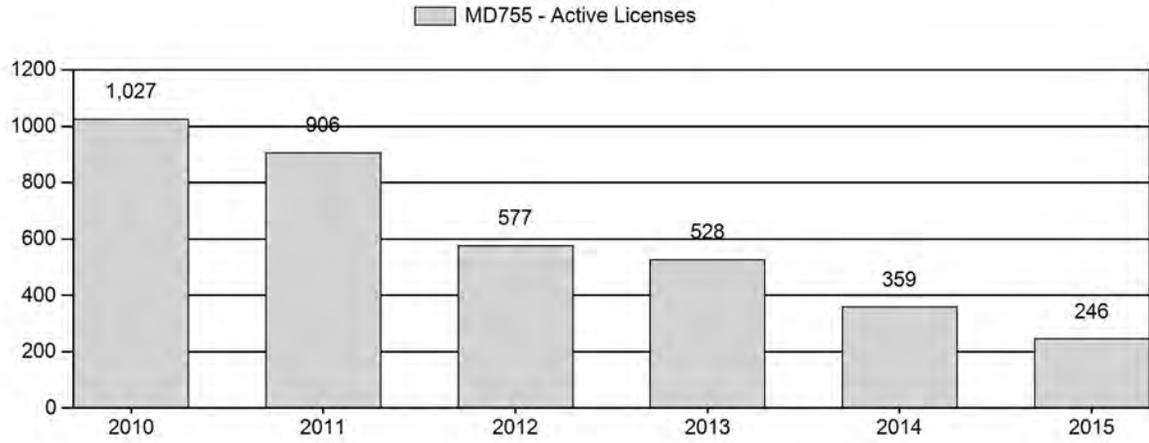
# Number of Hunters



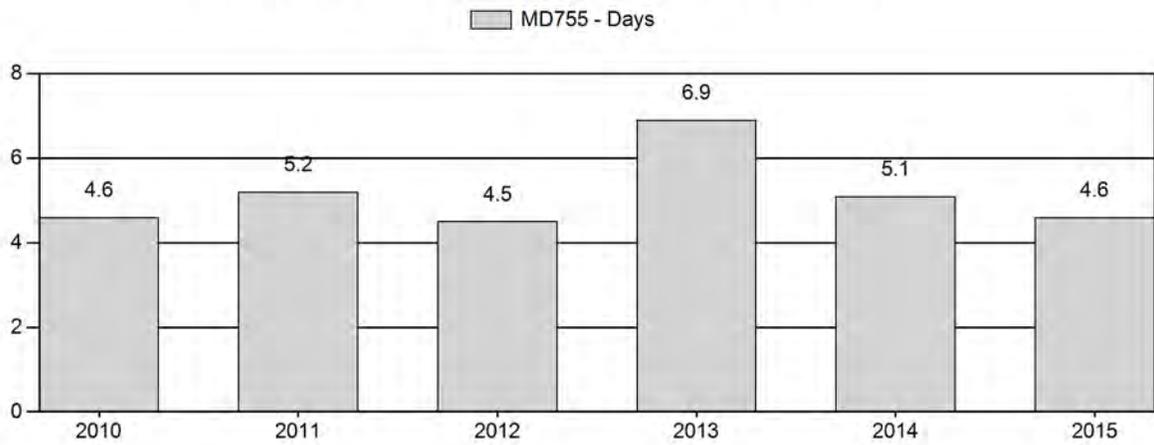
# Harvest Success



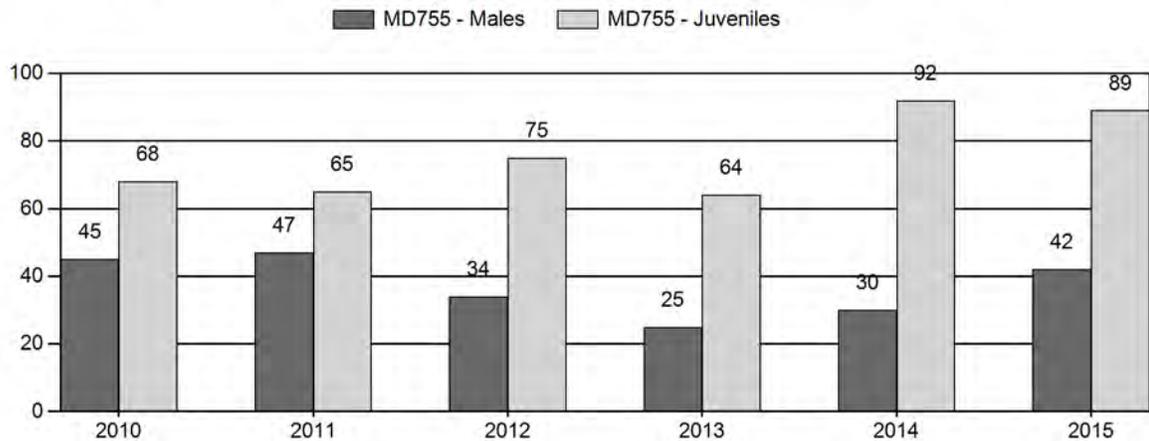
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



**2010 - 2015 Postseason Classification Summary**

for Mule Deer Herd MD755 - NORTH CONVERSE

Year	Post Pop	MALES							FEMALES		JUVENILES		Tot CIs	CIs Obj	Males to 100 Females				Young to		
		Ylg	2+ CIs 1	2+ CIs 2	2+ CIs 3	UnCIs	Total	%	Total	%	Total	%			Yng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2010	9,860	39	0	0	0	119	158	21%	349	47%	237	32%	744	850	11	34	45	± 5	68	± 7	47
2011	5,761	26	0	0	0	94	120	22%	257	47%	166	31%	543	1,276	10	37	47	± 6	65	± 8	44
2012	6,004	23	0	0	0	44	67	16%	198	48%	149	36%	414	1,216	12	22	34	± 6	75	± 10	56
2013	6,775	30	0	0	0	39	69	13%	275	53%	176	34%	520	1,095	11	14	25	± 4	64	± 8	51
2014	7,785	23	26	14	3	0	66	14%	220	45%	202	41%	488	1,936	10	20	30	± 5	92	± 11	71
2015	7,036	65	54	35	10	0	164	18%	393	43%	351	39%	908	0	17	25	42	± 5	89	± 8	63

**2016 HUNTING SEASONS  
NORTH CONVERSE MULE DEER HERD (MD755)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
22	1	Oct. 1	Oct. 14	300	Limited quota	Antlered mule deer or any white-tailed deer
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2015
22	1	No Changes

**Management Evaluation**

**Current Postseason Population Management Objective:** 9,000

**Management Strategy:** Special

**2015 Postseason Population Estimate:** ~7,000

**2016 Proposed Postseason Population Estimate:** ~7,300

**2015 Hunter Satisfaction:** 75% Satisfied, 16% Neutral, 9% Dissatisfied

**Herd Unit Issues**

The North Converse Mule Deer herd has a postseason population objective of 9,000 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 2015.

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

**Weather**

Weather conditions throughout 2015 produced above average precipitation, especially during the growing season, which resulted in excellent forage production for the second consecutive year. These conditions again yielded high fawn production and also likely contributed to good body condition of mule deer going into winter. The 2015-2016 winter has been moderate to date, with above average precipitation and consistently cold temperatures which have maintained snow cover throughout most of the winter. However, snow accumulations were most likely not significant enough to limit access to forage and therefore mule deer should exhibit normal over-winter survival this winter. The most recent extreme weather event to cause over-winter

mortality was in 2010/2011. Survival was impacted significantly enough that reduced survival values were used for modeling this population.

### **Habitat**

Although there are no habitat transects in this herd unit, habitat conditions were generally excellent throughout 2015 due to above average precipitation and good residual rangeland conditions from 2013 and 2014. This level of precipitation was necessary to rejuvenate habitats and provide better conditions for the long-term productivity of this mule deer herd following the extreme drought of 2012. Given the relatively low density of mule deer and pronghorn currently in this herd unit, herbivory pressure should continue to be a relatively low impact, which should also assist in yielding desirable range conditions. However, shrub condition and in some portions of this herd unit is poor due to long-term drought, domestic sheep grazing, and multiple wildfires that have removed sagebrush cover resulting in long-term reductions in habitat quality.

### **Field Data**

Total number of mule deer classified has steadily decreased in this herd unit and classification sample sizes have been difficult to meet since this herd has not been a budget priority. Given the potential level of oil and gas disturbance that may be forthcoming, managers prioritized this herd unit for aerial flights in 2015 in order to collect more representative baseline pre-disturbance information. The bulk of aerial survey time was spent classifying mule deer along the Pine Ridge where limited road densities and difficult access preclude ground classifications. Increased classification efforts resulted in 908 mule deer classified which is the highest since 2008. However, the sample size goal for 90% confidence was 1,400 mule deer.

Fawn production was significantly improved over the previous 5-year average (67 per 100 does) in both 2014 and 2015 with ratios of 92 and 89, respectively. Several consecutive years of average to above average fawn production and survival will be needed to continue trending towards the population objective.

Postseason buck ratios increased in 2015 (42), which is well over the previous 5-year average of 36. Although this could be due to the 2015 classification effort being primarily aerial vs. ground, the ratio was bolstered by a high yearling buck ratio (17 per 100 does) given high fawn production/recruitment the previous year. This indicates there will be a relatively high proportion of adult bucks available for harvest in the near future.

### **Harvest**

Overall harvest has declined in this herd unit as license issuance has decreased to address population decline. The 2015 harvest of 174 bucks 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. License success in 2015 (71%) is comparable to the previous 5-year average of 73%. This is also reflected in the number of days per animal in 2015 (4.6), which is slightly lower but still comparable to the previous 5-year average of 5.5. License success and days per animal have most likely stabilized as a result of reductions in licenses accordance with decreased population size.

In 2015, 75% of hunters reported being either satisfied or very satisfied with their hunt, indicating a remarkably high level of satisfaction given the lack of public access and population decline. It should be noted that most hunters whom speak to Game and Fish personnel are advised to secure access on private land before purchasing a license in areas that have limited public access, or at least be aware of the limited availability of accessible public land.

## **Population**

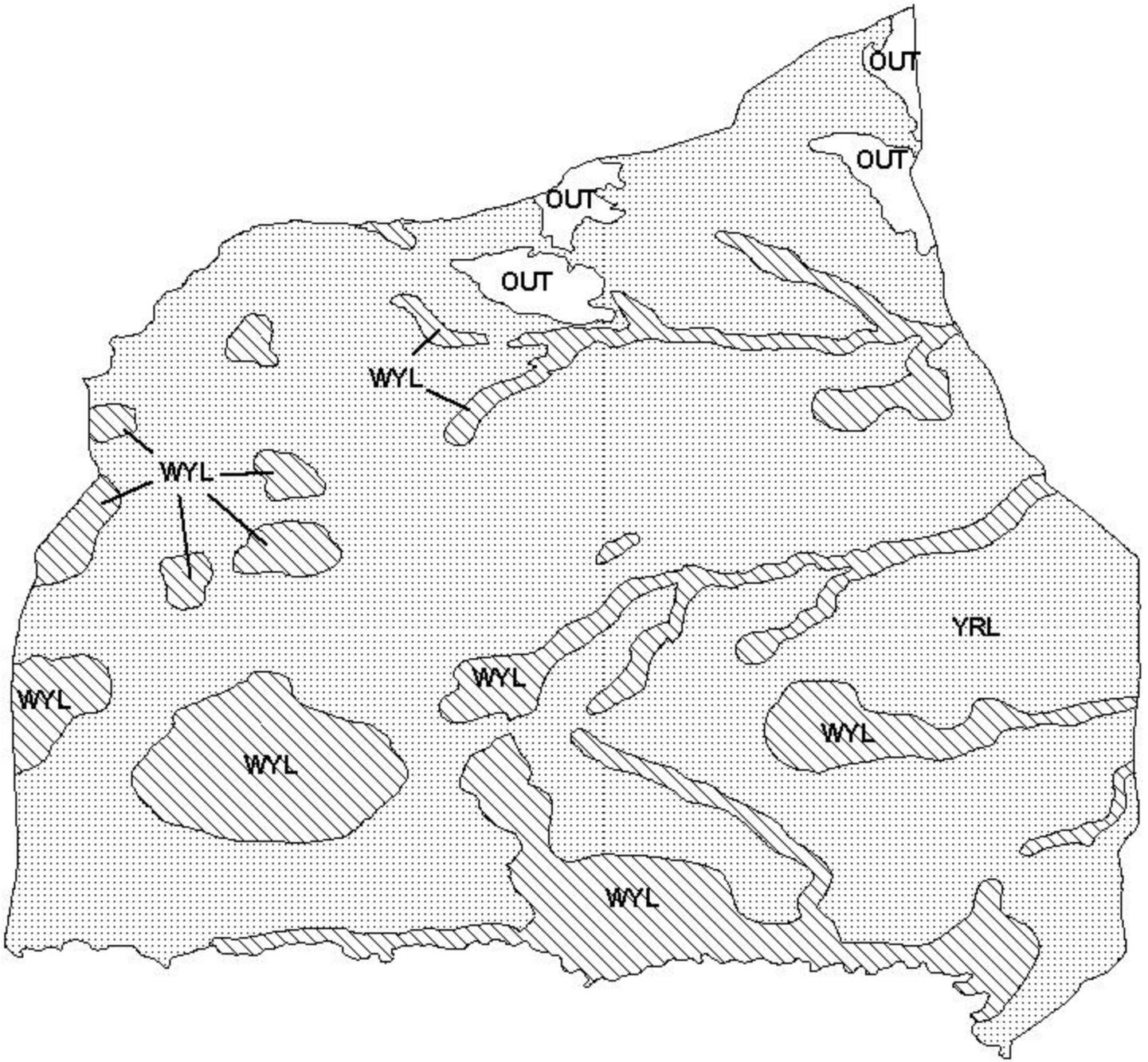
The 2015 postseason population estimate was about 7,000 mule deer. After population decline following substantial winter mortality in bio-year 2010, this herd is beginning to trend toward objective due to increased fawn production.

The “Semi-Constant Juvenile & Semi-Constant Adult Survival” (SCJ-SCA) spreadsheet model was chosen for the post-season population estimate of this herd. This model had a low relative AIC (63) and most accurately depicted population trend and size based on field personnel perceptions and landowner input. Adult survival was constrained between 0.5 and 0.7 for 2010 as a result of high winter mortality that year. This model is considered to be of fair quality based on model fit and simulated population trend. Given consistently inadequate classification sample sizes, observed buck ratios may not be accurate, rendering population estimates simulated by the model somewhat questionable.

## **Management Summary**

The hunting season in this area has traditionally run from October 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 2016, the Department is maintaining the Type 1 quota at 300 licenses. The license reduction in previous years allowed buck ratios to increase back within special management criteria. Doe/fawn license issuance was considerable in recent years, but was eliminated in 2014 due to population concerns. Continued conservative hunting seasons including relatively low Type 1 license issuance and no doe/fawn licenses is warranted until this population increases and more mature bucks are available for harvest. In this herd unit, the Department gives considerable deference to landowner input regarding mule deer management given the high percentage of private land. There is broad landowner support for current management direction.

If we attain the projected harvest of 175 bucks and experience normal fawn productivity, the predicted 2016 postseason population will likely increase slightly to 7,300 mule deer, which is 19% below objective.



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



## 2015 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2015 - 5/31/2016

HERD: MD756 - SOUTH CONVERSE

HUNT AREAS: 65

PREPARED BY: WILLOW STEEN

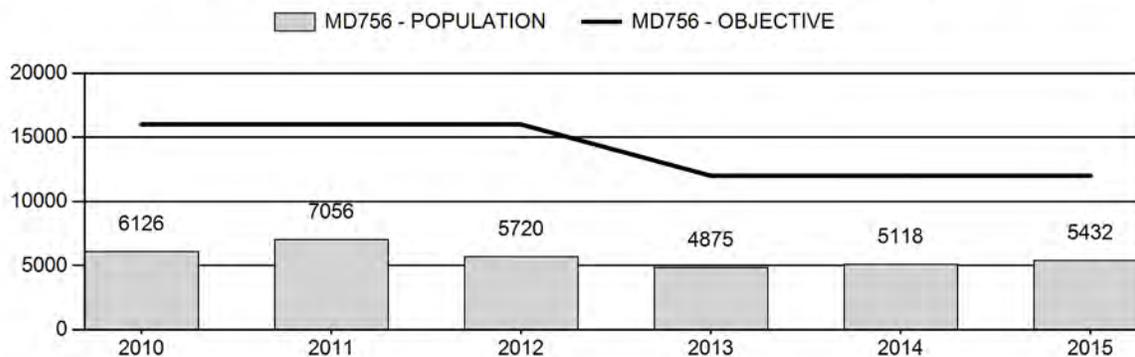
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	5,779	5,432	4,735
Harvest:	306	237	250
Hunters:	852	595	600
Hunter Success:	36%	40%	42%
Active Licenses:	854	595	600
Active License Success:	36%	40%	42%
Recreation Days:	3,230	2,178	2,200
Days Per Animal:	10.6	9.2	8.8
Males per 100 Females	35	40	
Juveniles per 100 Females	54	67	

Population Objective ( $\pm$ 20%) :	12000 (9600 - 14400)
Management Strategy:	Private Land
Percent population is above (+) or below (-) objective:	-54.7%
Number of years population has been + or - objective in recent trend:	16
Model Date:	02/18/2016

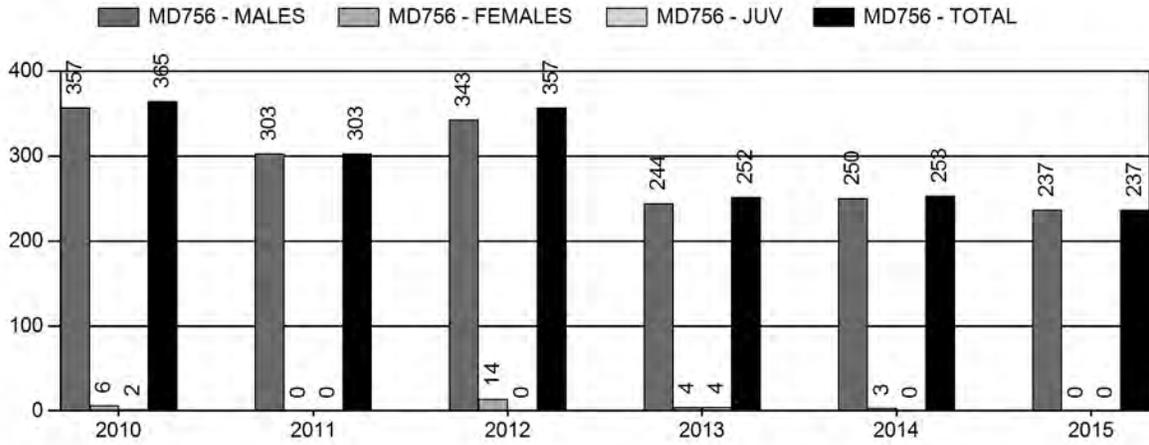
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

	<u>JCR Year</u>	<u>Proposed</u>
Females $\geq$ 1 year old:	0.1%	0.0%
Males $\geq$ 1 year old:	20.1%	23.6%
Juveniles (< 1 year old):	0%	0%
Total:	4.2%	5.0%
Proposed change in post-season population:	4.6%	5.5%

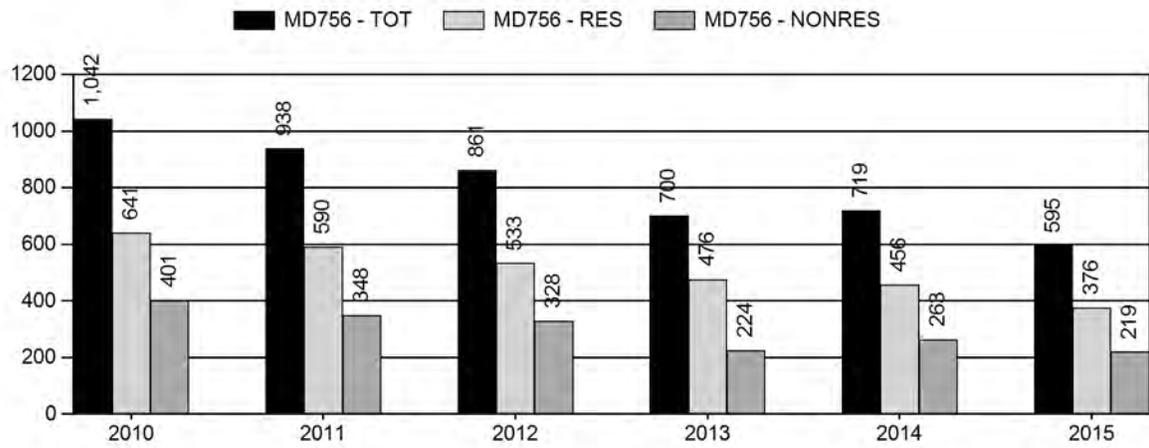
### Population Size - Postseason



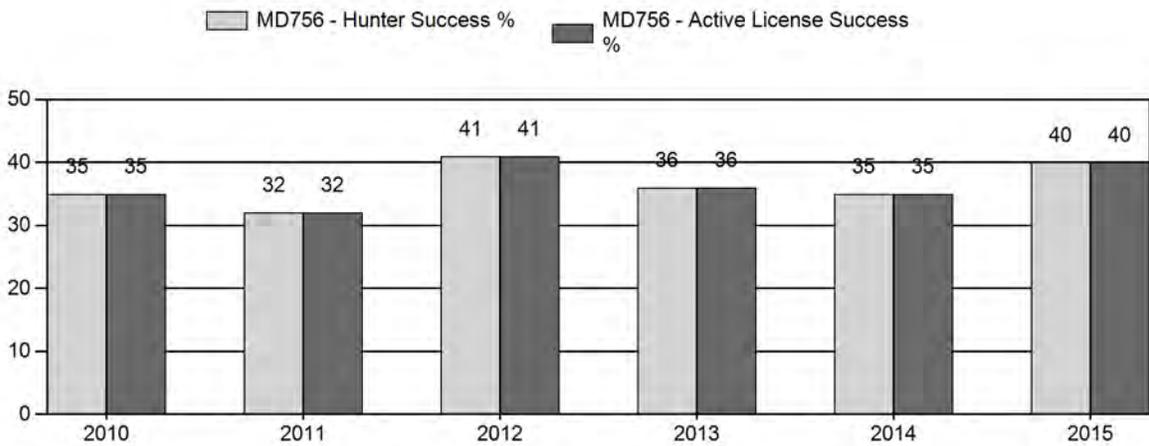
# Harvest



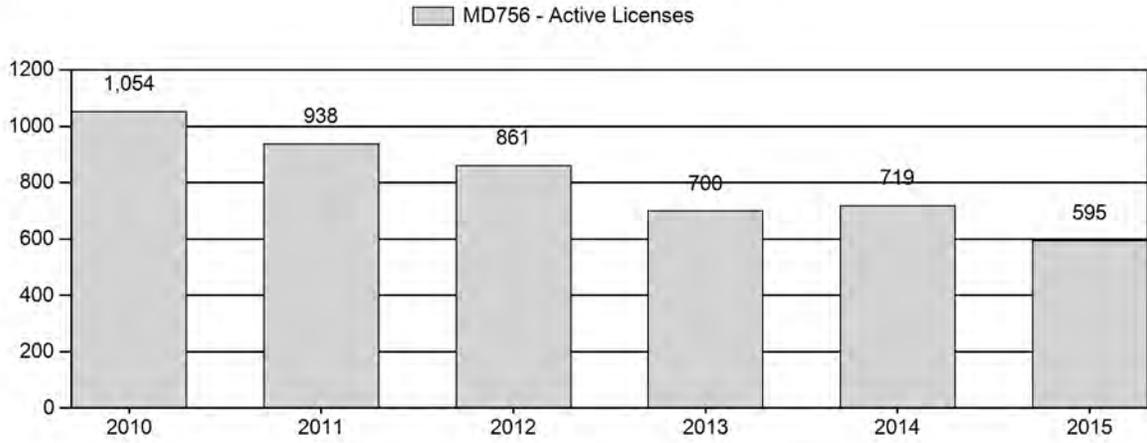
# Number of Hunters



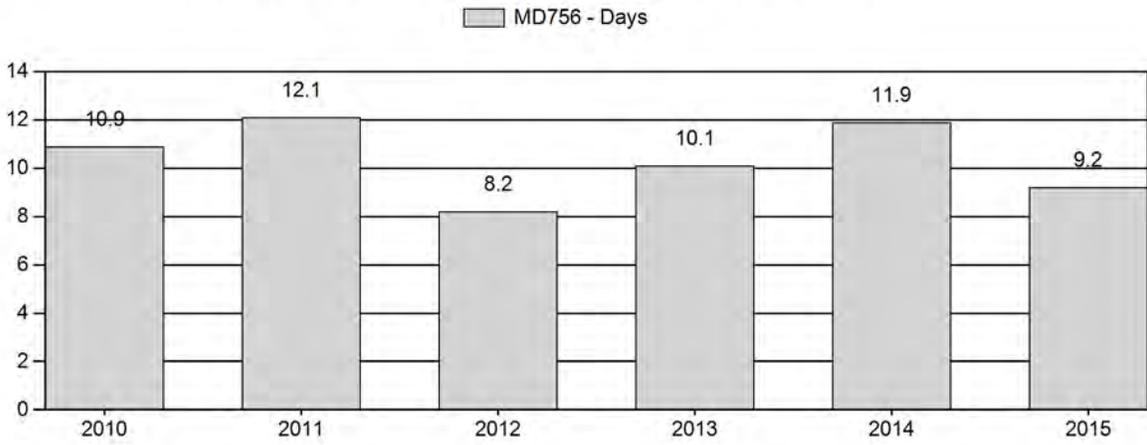
# Harvest Success



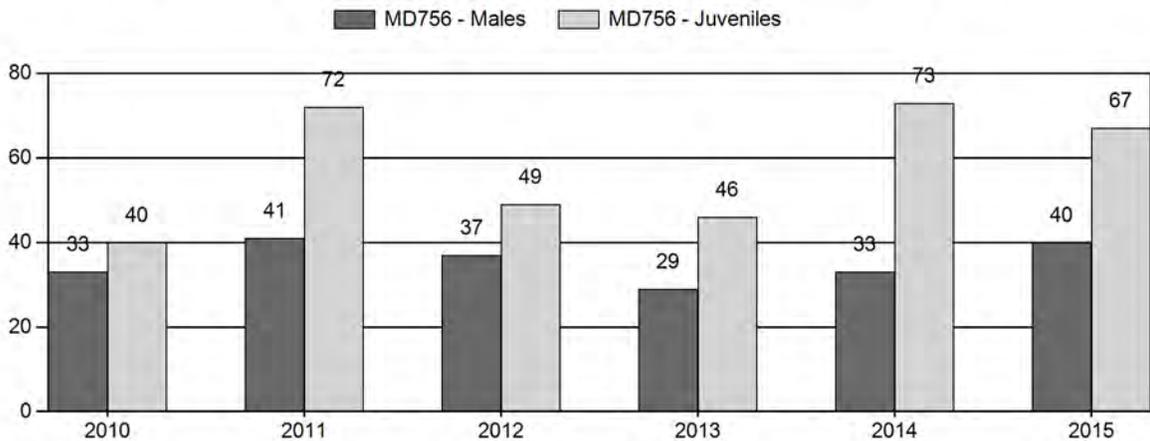
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



## 2010 - 2015 Postseason Classification Summary

for Mule Deer Herd MD756 - SOUTH CONVERSE

Year	Post Pop	MALES								FEMALES		JUVENILES		Males to 100 Females				Young to			
		Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	YIng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2010	6,126	84	89	51	14	0	238	19%	720	58%	287	23%	1,245	585	12	21	33	± 3	40	± 3	30
2011	7,056	83	99	57	11	0	250	19%	612	47%	441	34%	1,303	778	14	27	41	± 4	72	± 5	51
2012	5,720	111	124	36	20	0	291	20%	787	54%	385	26%	1,463	720	14	23	37	± 3	49	± 3	36
2013	4,875	64	65	17	8	0	154	17%	528	57%	245	26%	927	719	12	17	29	± 3	46	± 4	36
2014	5,118	30	56	24	19	0	129	16%	393	49%	286	35%	808	1,281	8	25	33	± 4	73	± 7	55
2015	5,432	81	68	29	7	0	185	19%	458	48%	308	32%	951	0	18	23	40	± 4	67	± 6	48

**2016 HUNTING SEASONS  
SOUTH CONVERSE MULE DEER (MD756)**

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

**Management Evaluation**

**Current Management Objective:** 12,000

**Management Strategy:** Private Land

**2015 Postseason Population Estimate:** ~ 5,400

**2016 Proposed Postseason Population Estimate:** ~ 4,700

**2015 Hunter Satisfaction:** 59% Satisfied, 23% Neutral, 18% Dissatisfied

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

**Herd Unit Issues**

Hunting access within the herd unit is marginal, with tracts of public land and national forest interspersed with predominantly private lands. The main land use is traditional ranching and grazing of livestock, with agricultural fields that have the potential for damage issues when big game are abundant. Doe/fawn licenses have historically been issued to address damage, but are not currently necessary for mule deer. Disease issues are a concern within this herd unit in particular, as the prevalence of Chronic Wasting Disease (CWD) is higher here than any other area in Wyoming or adjacent states. Research investigating population-level effects of CWD was concluded in 2014, with publications pending. Please refer to Appendix A of this report for further information regarding CWD and recently completed research in the South Converse Herd Unit. It should be noted that only 4 CWD samples were taken from hunter-harvested mule deer in 2015 since there was not a technician available during hunting season. The Department plans to hire a technician for the 2016 hunting season in order to continue to monitor CWD in this herd unit.

## **Weather**

This herd was impacted by the harsh winter conditions of 2010-2011 and the 2012 drought. Conditions improved in 2013 with adequate precipitation throughout the growing season and moderate winter conditions. Weather conditions throughout 2014 and 2015 produced above average precipitation, especially during the growing season, which resulted in excellent forage production throughout the herd unit. Such improved forage yielded good fawn production and excellent body condition of mule deer going into winter. The 2015-2016 winter has been moderate to date, with above average precipitation and consistently cold temperatures which have maintained snow cover throughout most of the winter. However, snow accumulations were most likely not significant enough to limit access to forage and therefore mule deer should exhibit normal over-winter survival this winter.

## **Habitat**

This herd unit has several established habitat transects that measure production and utilization on True Mountain Mahogany (*Cercocarpus montanus*) stands in crucial winter range; however no data were collected in 2015. Given high precipitation and informal assessments of habitat condition throughout this herd unit, forage production and quality were relatively high in 2015 based on field personnel observations. Hunter harvested deer were in good body condition, further indicating improved habitat conditions as a result of high moisture availability throughout the year. However, a significant portion of mule deer habitat in this herd unit is comprised of decadent shrubs with lower palatability and available nutrition. The poor condition of these decadent shrub stands throughout the herd unit may be one of the primary limiting factors on this deer herd. In Fall of 2015, the Department treated 310 acres of True Mountain Mahogany with the goal of rejuvenating stands in order to provide more nutritious forage for mule deer.

## **Field Data**

Fawn production/survival was moderate in this herd through the mid-2000's, and the population fluctuated between approximately 8,000 and 12,000 deer during this time period. The general license season during this time period was 11 days (except in 2008 when it was extended to 17 days), and issuance of doe/fawn licenses ranged from 50 to 400 licenses. From 2008-2013, fawn production/survival was extremely poor, with fawn ratios averaging 50 per 100 does. The population has declined significantly 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 diminished and subsequently eliminated from the 2011-2015 hunting seasons. In 2014 and 2015, fawn production improved (ratios of 73 and 67, respectively), and the population appears to have stabilized near 5,000 mule deer. Several more years of improved fawn production will be needed for this herd to increase toward objective.

While fawn production improved in this herd over the past two years, fawn ratios remain well below adjacent mule deer herds. From 2006 – 2015, postseason fawn ratios averaged 56 (per 100 does) in the South Converse Herd Unit. Over the same time frame, fawn ratios averaged 61 in the Bates Hole / Hat Six Herd (Hunt Area 66) and 63 in the Laramie Mountains Herd (Hunt Areas 59, 60, & 64). Such relatively low fawn production/survival in the South Converse Herd was thought to be partially attributed to the extraordinarily high prevalence of CWD. However, recently concluded research within this herd unit suggests neither fawn production nor recruitment were significantly affected in CWD-positive radio-marked adult females (M. DeVivo, personal communication, Feb 2016). Regardless, the high prevalence of CWD in this herd has the potential to reduce overall fawn production and recruitment over the long term as infected deer exhibit far lower survival rates than uninfected deer due to deaths from clinical CWD as well as increased vulnerability to predation, winter loss, vehicular strikes, etc. Although climatic and habitat conditions have the largest influence on the nutritional condition of does, and therefore fawn production and survival, long-term fawn production may be impacted in areas with high prevalence of CWD. Given diminished survival rates of marked CWD-positive deer in this study, endemic CWD may contribute to substantial population decline over the long term.

Buck ratios within the South Converse Herd historically average in the 30s-40s. These ratios seem counterintuitive, as CWD research references higher prevalence in males than females (Farnsworth et al, 2005). Despite the general season structure, higher buck ratios in this unit are a function of limited access to hunting on private lands, where minimal harvest pressure on bucks is typical. In 2013, the buck ratio dropped to a 15-year low of 29, but increased to 33 in 2014, and increased again in 2015 to 40. The yearling buck ratio was 18, indicating good recruitment from 2014, which may result in good availability of adult bucks in the population in the coming years.

Since 2008, bucks classified in the South Converse Mule Deer Herd Unit have been further categorized based on antler size. Classification efforts in 2014 showed the highest availability of Class III bucks (19%), while data collected in 2015 resulted in antler classifications more in line with the average with 65% Class I (small), 28% Class II (medium), and 7% Class III (large) bucks. Class III bucks may have experienced a high harvest rate in 2015 resulting in the decrease, although observation conditions during classification efforts were poor resulting in lower detection of large mature bucks.

## **Harvest Data**

Harvest success was 40% in 2015, which is comparable to the previous 5-year average of 35%. However, there has been a steady decrease in active licenses and buck harvest, with 595 active

licenses and 237 harvested bucks in 2015, which is less than the previous 5-year average of 852 active licenses and 300 harvested bucks. Reductions in nonresident hunting pressure can most likely be attributed to nonresident Region J quota reductions (50% since 2011). However, resident hunting pressure has also decreased with 376 resident hunters in 2015, as compared to the previous 5-year average of 539. Given this herd unit has a general season structure, the reduction in resident hunting pressure is most likely attributable to fewer deer, reduced private land hunting permission, and some level of hunter self-regulation as many hunters have expressed dissatisfaction with availability of mule deer on the few parcels of publicly accessible land in the herd unit. Given decreased hunter numbers, harvest success has remained relatively constant throughout the past few years despite population decline. Harvest success is not expected to improve in this herd unit until fawn production/survival improves and enhances the growth rate of this herd.

## **Population**

The 2015 postseason population estimate was approximately 5,400 mule deer. This population has stabilized following a downward trend from an estimated high of 14,600 deer in 1998. Population decline in this herd is thought to be a combination of multiple limiting factors including poor habitat condition, lower fawn productivity/survival, and high prevalence of CWD.

The “Time-Specific Juvenile Survival – Constant Adult Survival” (TSJ,CA) spreadsheet model was chosen for the postseason population estimate of this herd. This model seemed the most representative of the herd, as it selects for higher juvenile survival during years when field personnel observed more favorable environmental and habitat conditions. The simpler models (CJ,CA and SCJ,CA) select for a very low juvenile survival rate, which does not seem feasible for this herd. All three models simulate population trends that seem representative for the herd. 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. Rates of adult survival were added to the model for 2010-2013 utilizing data collected as part of the aforementioned CWD research project. These data helped refine the model, making confidence in population estimates stronger. With the addition of survival data from collared deer, coupled with adequate classification data in all years, the model is considered to be of good quality.

## **Management Summary**

Opening day for hunting the South Converse Mule Deer Herd Unit has traditionally been October 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. The 2016 hunting season will consist of a short, seven-day season with no doe/fawn licenses, as the population is considerably below objective. Until habitat conditions and weather allow for higher fawn production and survival, this population will likely remain low and seasons will remain conservative. Again, the impacts of such a high prevalence of CWD on this herd are unknown but potentially significant.

If we attain the projected harvest of 250 bucks and fawn production remains average, this herd will likely remain relatively stable but low. The predicted 2016 postseason population size of the South Converse Herd is approximately 4,700 mule deer which is a slight decline since the previous 5-year average fawn production (60 fawns per 100 does) was used, which is less than the past two years. Given poor habitat conditions may be limiting population growth with continual low fawn production/ recruitment, management goals for 2016 include maintaining a conservative hunting season framework to allow for population growth should environmental conditions allow. In addition, managers intend to implement prescriptive treatments in key habitats to benefit mule deer in this herd unit as opportunities arise.

### **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.

## **APPENDIX A**

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

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

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

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

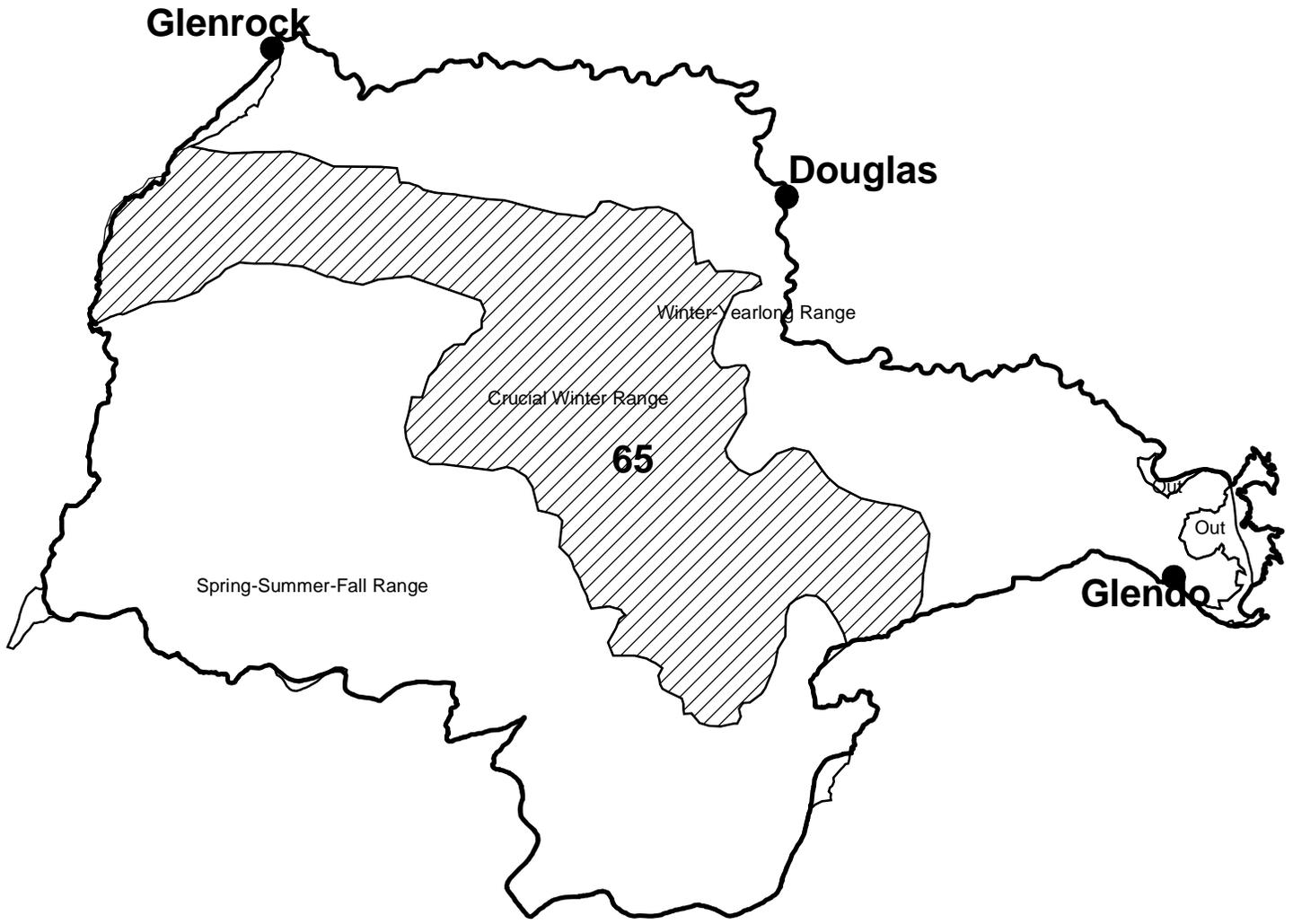
A collaborative research project was initiated in 2010 to investigate the effects of CWD on the South Converse Mule Deer Herd. Using GPS-collared deer, a number of variables were explored to better understand the relationship between CWD and the dynamics of the population. This research was a cooperative effort of the United States Geological Survey, the University of Wyoming, and the Wyoming Game and Fish Department, and was concluded in 2014, with publication pending.

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

---

Year	Total Harvest	N Tested	N Positive	<b>CWD Prevalence</b>
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	345	30	14	<b>47%</b>
2013	252	41	18	<b>44%</b>
2014	253	38	12	<b>32%</b>
2015	237	4	3	<b>75%</b>

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



## 2015 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2015 - 5/31/2016

HERD: MD757 - BATES HOLE/HAT SIX

HUNT AREAS: 66-67

PREPARED BY: HEATHER O'BRIEN

	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	5,788	5,890	6,005
Harvest:	263	279	280
Hunters:	830	832	830
Hunter Success:	32%	34%	34%
Active Licenses:	831	832	830
Active License Success:	32%	34%	34%
Recreation Days:	2,994	3,511	3,200
Days Per Animal:	11.4	12.6	11.4
Males per 100 Females	21	29	
Juveniles per 100 Females	60	69	

Population Objective (± 20%) : 8000 (6400 - 9600)

Management Strategy: Special

Percent population is above (+) or below (-) objective: -26.4%

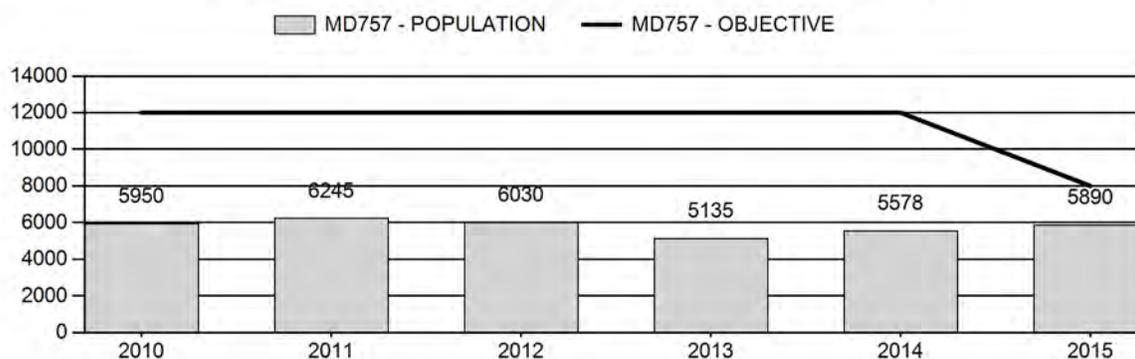
Number of years population has been + or - objective in recent trend: 23

Model Date: 02/21/2016

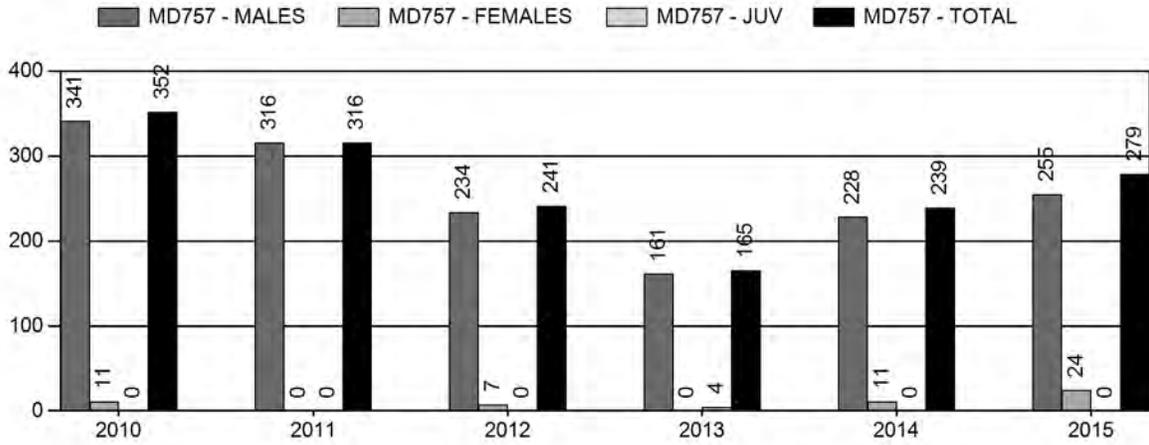
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0.9%	0.2%
Males ≥ 1 year old:	23.2%	25.4%
Juveniles (< 1 year old):	0%	0%
Total:	4.5%	4.4%
Proposed change in post-season population:	+5.60%	+1.95%

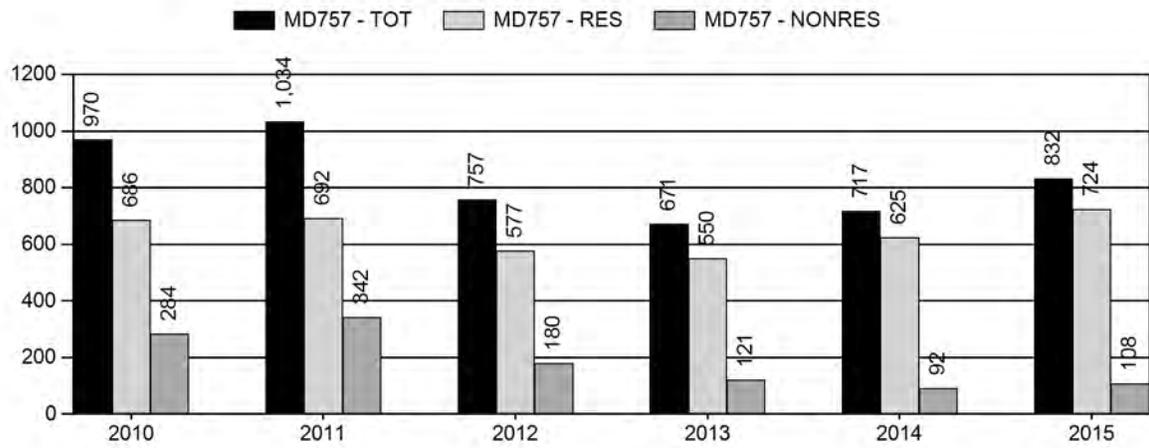
## Population Size - Postseason



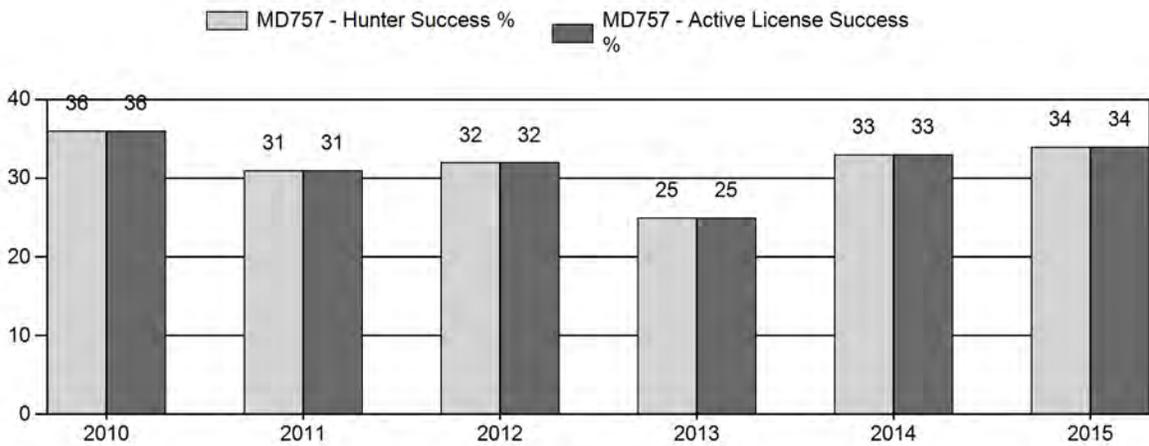
# Harvest



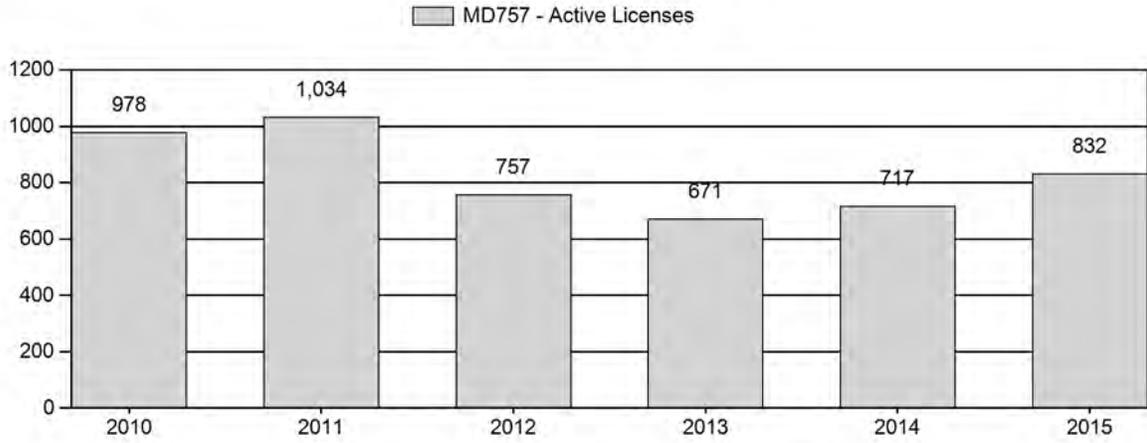
# Number of Hunters



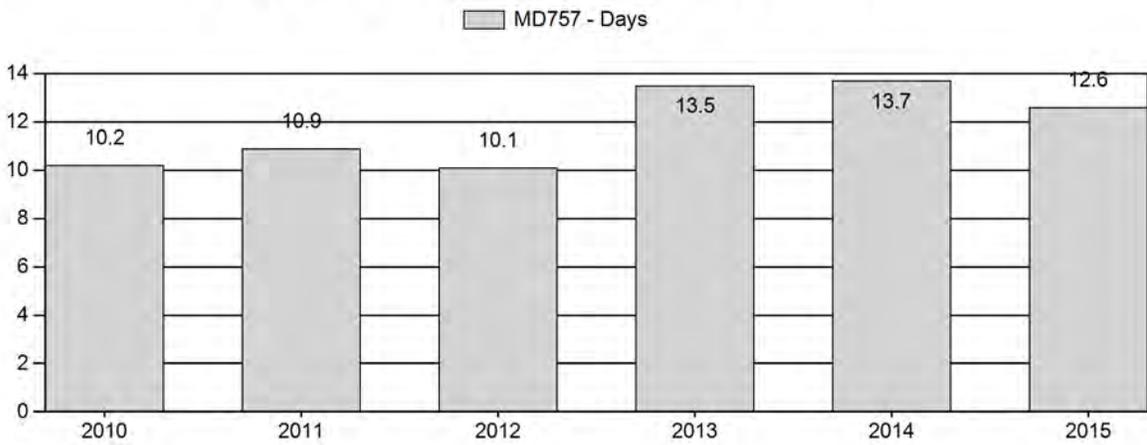
# Harvest Success



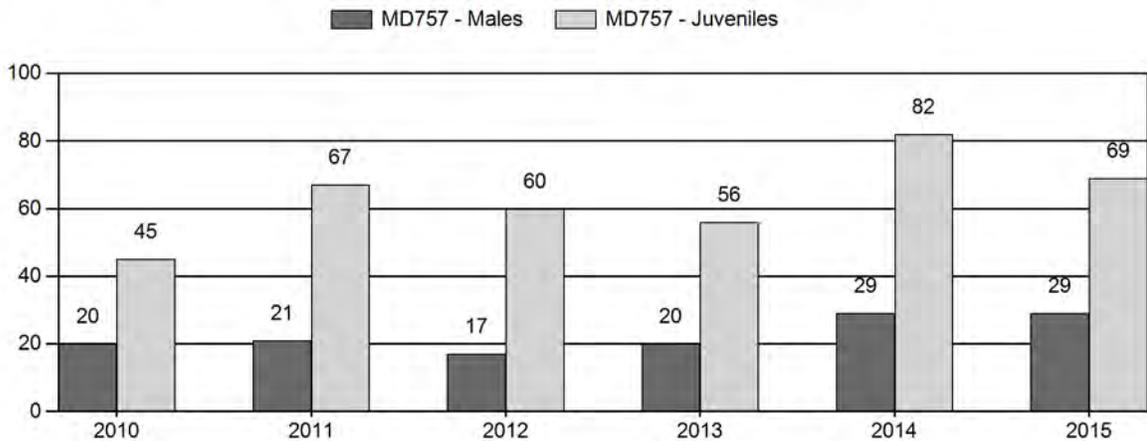
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



## 2010 - 2015 Postseason Classification Summary

## for Mule Deer Herd MD757 - BATES HOLE/HAT SIX

Year	Post Pop	MALES								FEMALES		JUVENILES		Tot Cls	Cls Obj	Males to 100 Females				Young to		
		Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Yng			Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult	
2010	5,950	82	49	42	9	0	182	12%	894	60%	403	27%	1,479	642	9	11	20	± 2	45	± 3	37	
2011	6,245	47	52	33	7	0	139	11%	666	53%	443	35%	1,248	698	7	14	21	± 2	67	± 5	55	
2012	6,030	28	55	30	9	0	122	10%	718	56%	432	34%	1,272	650	4	13	17	± 2	60	± 4	51	
2013	5,135	86	50	25	7	0	168	11%	845	57%	470	32%	1,483	959	10	10	20	± 2	56	± 3	46	
2014	5,578	83	79	26	7	0	195	14%	665	47%	543	39%	1,403	1,464	12	17	29	± 3	82	± 5	63	
2015	5,890	164	97	29	13	0	303	15%	1,039	50%	719	35%	2,061	1,208	16	13	29	± 2	69	± 3	54	

**2016 HUNTING SEASONS  
BATES HOLE / HAT SIX MULE DEER (MD757)**

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

**Management Evaluation**

**Current Postseason Population Management Objective:** 8,000

**Management Strategy:** Special

**2015 Postseason Population Estimate:** 5,900

**2016 Proposed Postseason Population Estimate:** 6,000

**2015 Hunter Satisfaction:** 59% Satisfied, 23% Neutral, 17% Dissatisfied

The Bates Hole / Hat Six Mule Deer Herd Unit has a postseason management objective of 8,000 deer. The herd is managed using the special management strategy, with a goal of maintaining postseason buck ratios between 30-45 bucks per 100 does. As part of the statewide Mule Deer Initiative, a citizen working group was formed in 2014 to discuss issues in the Bates Hole Hat / Six Mule Deer Herd Unit. The group developed a management plan and formal recommendations to Department managers in summer 2015 (Appendix A). These recommendations, along with the objective and management strategy, were formally reviewed in 2015.

**Herd Unit Issues**

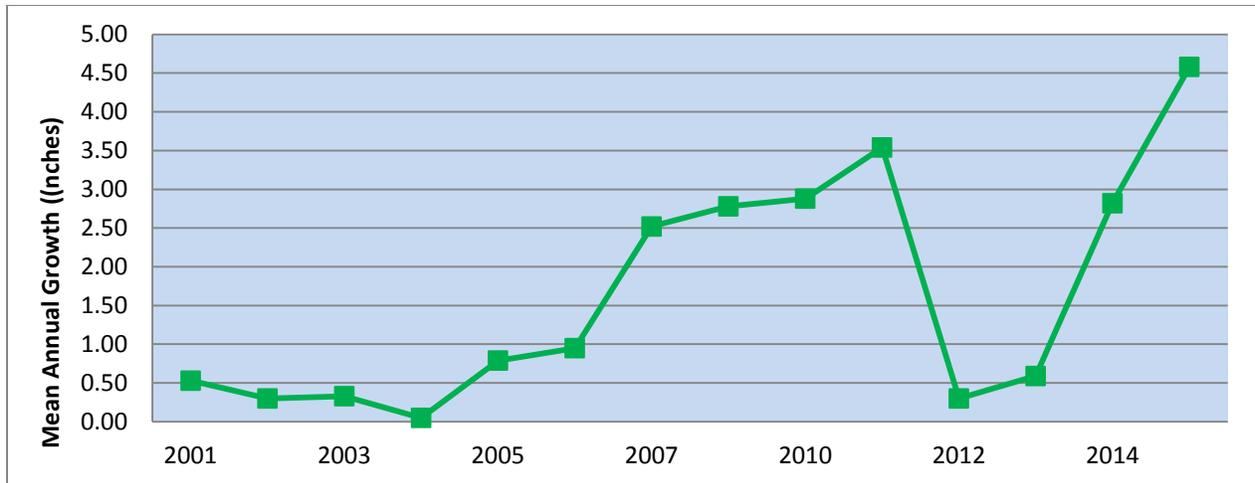
In Hunt Area 66, hunting access is very good, with large tracts of public land as well as a sizeable Hunter Management Area. The main land use within the herd unit is traditional ranching and grazing of livestock. Very little industrial or energy development exists in this herd unit. Hunt Area 67, which includes the north-central portion of Casper Mountain, remains closed to hunting. Residents with small properties that dominate the hunt area are strongly opposed to hunting in their portion of the herd unit.

## **Weather**

The winter of 2010-2011 was severe throughout the herd unit, resulting in above average mortality of mule deer. Severe drought conditions persisted from spring 2011 through winter 2012, which had a negative impact on deer reproductive success and fawn survival. The spring and summer of 2013 were cool with significant precipitation, and habitat conditions appeared to improve slowly over the growing season. Heavy precipitation during the fall of 2013 caused a beneficial late green-up that provided improved forage for mule deer entering the winter season. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. The spring and summer of 2014 undeniably produced improved range conditions that benefitted deer, and fawn production improved significantly. The winter of 2014-2015 was relatively mild with good overwinter survival of mule deer, while the spring and summer of 2015 were again above average in terms of precipitation and range condition. Fawn production was also above average in 2015, as range conditions and nutritional status of does were improved for the second year in a row. For more detailed weather data and analysis see Appendix B and <http://www.ncdc.noaa.gov/gac/time-series/us>.

## **Habitat**

This herd unit has eight established transects that measure production and utilization on True Mountain Mahogany (*Cercocarpus montanus*). Utilization data were not collected in 2015. Average leader growth on mahogany in 2015 was 4.58 inches (116.3 mm), and represents a significant increase in production from the previous three years (see Figure 1). It should be noted this increase in average growth is in part due to data collected on a transect that burned in 2012. Average growth on this transect alone was 7.11 inches in 2015, which increased the overall average on transects. Even so, average production was 4.22 inches with this transect excluded, which is still significantly higher than the previous three years. Above-average herbaceous plant production also occurred throughout the herd unit due to good moisture during the growing season. Better habitat conditions in the herd unit in 2014 & 2015 contributed to improved spring and summer fawn survival compared to previous years.



**Figure 1.** Mean annual growth of true mountain mahogany (*Cercocarpus montanus*) in the Bates Hole / Hat Six Mule Deer Herd Unit, 2001-2015.

### Field Data

For most of the past 15 years, fawn production/survival in this herd was moderate to poor. Fawn production/survival reached a 25-year low in 2010, with 45 fawns per 100 does postseason. Fawn ratios improved modestly from 2011-2013, and the population was slow to recover despite the elimination of doe/fawn hunting and restrictions placed on buck harvest. Fawn ratios finally improved in 2014 to 82 per 100 does. Winter conditions from 2013-2015 were mild for pregnant does, and were followed by spring weather and range conditions that were much improved throughout the herd unit. However, fawn production seemed to decline in 2015, with 69 fawns per 100 does observed postseason. Conversely, the total number of deer surveyed was higher than it has been since 2005, suggesting an increase in population size. Lower fawn ratios may have been due in part to a high proportion of yearling does in the population, which tend to have lower reproductive success compared to older age-class females. Additional years of improved fawn production and survival will be necessary for this herd to grow in future years.

Buck ratios for the Bates Hole / Hat Six Herd historically average in the mid-20s per 100 does, 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 and reached a low of 17 per 100 does in 2012, due to a combination of consistent harvest pressure and declining fawn production. In an attempt to improve yearling buck survival, an antler-point restriction was added in 2013, requiring harvested bucks to have three points or better on one side. The antler-point restriction has allowed higher yearling buck recruitment into adult age classes, while reducing overall harvest pressure on the male segment of the herd. Yearling buck ratios have increased noticeably since the addition of the antler point restriction despite mediocre fawn production in some years.

Overall buck ratios have also improved from 20 bucks per 100 does in 2013, to 29 bucks per 100 does in 2014 and 2015. In 2015, the Area 66 Mule Deer Initiative Working Group recommended maintaining antler point restrictions in the herd until the overall buck ratio reaches 35 per 100 does. At that point, restrictions will be removed unless the buck ratio drops below 25 per 100 does. This recommendation stemmed from a public desire to improve hunting quality and overall buck numbers while maintaining a general license season structure. In conjunction with this recommendation, the Department will maintain antler point restrictions on buck harvest for the 2016 hunting season.

Since 2008, bucks classified in Area 66 have been categorized based on antler size (Table 1). The best distribution of mature buck classes was observed in 2008, with 50% Class I (small), 36% Class II (medium), and 14% Class III (large) bucks. Bucks classified from 2010-2015 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 2015 with the addition of antler-point restrictions. The proportion of Class III bucks has consistently remained just under 10% in all years other than 2014. It should be noted as well that the total number of bucks surveyed in 2015 was at a 25-year high. The consistent number of Class III bucks surveyed across years is perhaps surprising at first glance - considering surveys occur post-season, that Area 66 is a general license hunt area, and that hunting pressure is assumed to be high. However, many deer also occupy private lands or rough terrain with conifer cover which allows for good buck escapement. Class III bucks, despite their discovery during post-season surveys, are more difficult for hunters to find during hunting season. In addition, many general license hunters may be simply hunting for meat without regard to trophy quality, or may feel a sense of urgency given the short season length, and are thus more likely to harvest smaller bucks as the opportunity arises.

Bio-Year	Total Class N for HA	# Bucks Classified					Buck Ratios per 100 Females					
		Ylng	Class I	Class II	Class III	Total	Ylng	Class I	Class II	Class III	All Adult	Total
2008	1,254	75	57 (50%)	41 (36%)	16 (14%)	189	12	9	6	2	18	29
2009	1,320	59	61 (54%)	41 (37%)	10 (9%)	171	8	8	6	1	15	23
2010	1,479	82	49 (49%)	42 (42%)	9 (9%)	182	9	5	5	1	11	20
2011	1,248	47	52 (56%)	33 (36%)	7 (8%)	139	7	8	5	1	14	21
2012	1,272	28	55 (59%)	30 (32%)	9 (9%)	122	4	8	4	1	13	17
2013	1,483	86	50 (61%)	25 (30%)	7 (9%)	168	10	6	3	1	10	20
2014	1,403	83	79 (71%)	26 (23%)	7 (6%)	195	12	12	4	1	17	29
2015	2,061	164	97 (70%)	29 (21%)	13 (9%)	303	16	9	3	1	13	29

**Table 1.** Antler classification analysis for **Area 66** within the Bates Hole/Hat Six Mule Deer Herd Unit, 2008 – 2015.

### Harvest Data

Hunter success in this herd has fluctuated as a function of population size and season length. Harvest success has decreased in recent years and hunter days have increased, as the population declined, the season was shortened, and antler point restrictions were added. Hunter satisfaction has been low in this herd, which may be a function of hunter crowding and a perceived lack of deer. No significant female harvest has been prescribed since 2007. Hunter participation and overall harvest declined when antler point restrictions were added – from around 1,000 total hunters in 2011 to about 800 hunters in 2015. At the same time, Region D non-resident license issuance was reduced significantly from 2,100 licenses in 2011 to only 400 licenses in 2014 & 2015. In Area 66, only 13% of hunters were non-residents during the 2015 season. Harvest success was 33% in 2015, which is near the five-year average. Total harvest improved in 2015 compared to the previous three years, despite the antler-point restriction and virtually no harvest of does or fawns. This is another indication that this population has grown, resulting in increased buck numbers. In addition, hunters and landowners commented on seeing more mule deer in the field, especially younger age-class bucks and does with fawns.

### Population

The 2015 postseason population estimate was approximately 5,900 and has increased after reaching a low of about 5,100 deer in 2013. No sightability or separate population estimate data are currently available to further align the model in conjunction with postseason classification

and harvest data. This herd has had poor fawn production/survival and thus poor population growth since 2006. The herd has grown more modestly in recent years as a result of conservative hunting, improved weather and range conditions, and improved fawn production/survival. Some areas of the herd unit that previously contained higher densities of deer have been slower to recover, as forage was likely over-utilized when the population was higher. Still, landowners, hunters, and managers have observed higher numbers of deer overall, especially does and fawns in healthier condition during 2014 & 2015. Field personnel have observed higher total deer numbers during survey flights the past two years without additional effort, indicating this herd has begun to grow more noticeably.

The “Time-Specific Juvenile, Constant Adult (TSJ,CA) spreadsheet model was chosen for the postseason population estimate of this herd. This model seems the most representative of the herd in terms of recent trends, though some earlier years in the model is 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, 2014). 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 was rejected, as it depicts a herd that is much 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. While the TSJ,CA model seems to best represent trends for this herd, managers believe the population has grown more in the last three years than is depicted in the model. All of the models also assume harvest is proportional across age and sex classes, and rely heavily on male ratios and harvest. Thus, harvest regimes that are specific to one sex or age class (as they are in Area 66) make it difficult for the model to simulate true population dynamics. Regardless, 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**

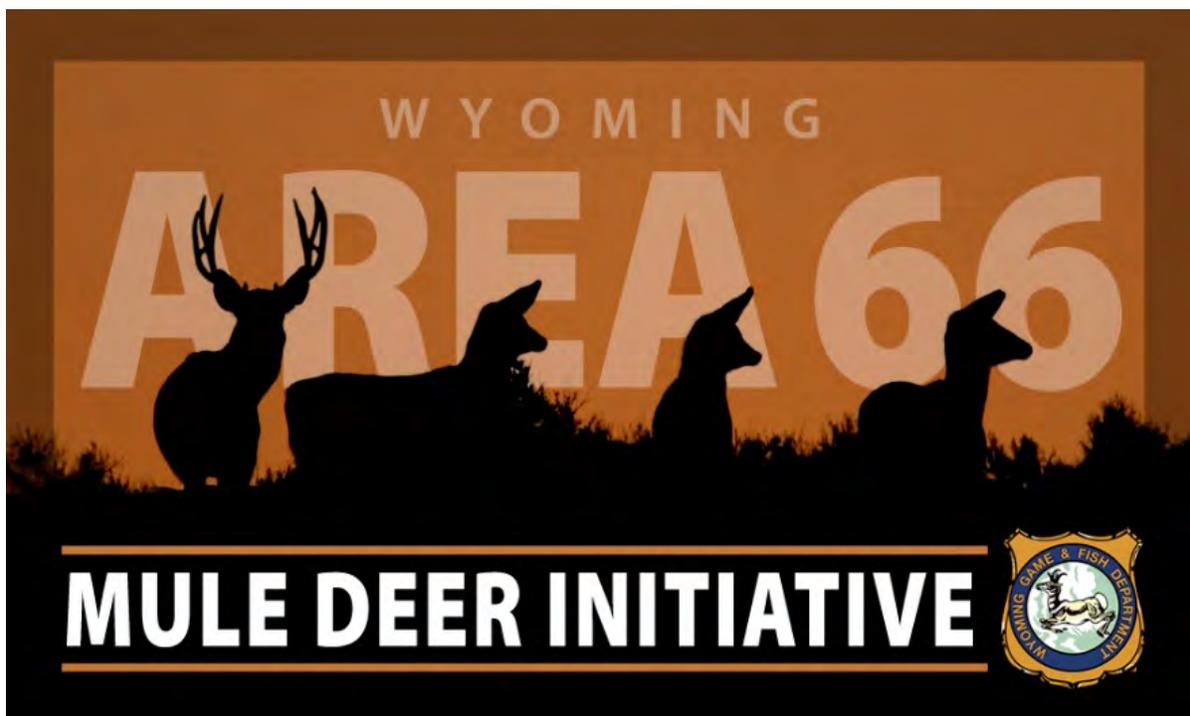
Opening day for hunting in Area 66 has traditionally been October 15<sup>th</sup>, with closing dates that have changed to offer greater or lesser opportunity depending on the management direction desired. General licenses have been valid only for antlered mule deer since 2000. Doe/fawn licenses have been offered in years when winter range shrub utilization has been excessive, although no meaningful doe harvest has been prescribed since 2007. A short, seven-day season with no doe/fawn licenses will be sustained for 2016. The 2016 season will be the fourth consecutive 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 continue to improve for this herd to grow as a whole.

If we attain the projected harvest of 280 deer with fawn ratios similar to the last five years, this herd will grow slightly. The predicted 2016 postseason estimate for the Bates Hole / Hat Six Herd is approximately 6,000 animals, which is 26% below objective.

# APPENDIX A

## Wyoming Mule Deer Initiative Bates Hole (Area 66)



July 28<sup>th</sup>, 2015

# TABLE OF CONTENTS

From the Department	3
Introduction of Group and Members	4
Map of Mule Deer Hunt Area 66	5
Mission Statement and Objectives	6
Materials Reference	6
Management Recommendations	
Predation	7
Disease	8
Habitat	8
Roads and Access	9
Competition	10
Population Objective	11
Hunting Season Structure	11
Miscellaneous	12
Conclusion	13
Implementation & Accountability	14

# FROM THE DEPARTMENT



The Wyoming Game and Fish Department (WGFD) convened the Area 66 Mule Deer Initiative (MDI) and resulting citizen working group in July of 2014. The Area 66 MDI was established as an extension of the statewide MDI in concert with direction from WGFD Administration to establish various initiatives throughout the state. This initiative required 13 working group meetings, a formal public meeting, substantial public outreach using various media, and has culminated in this suite of management recommendations from the working group to Casper WGFD staff. The Department, and specifically the Wildlife Division personnel in the Casper Region, sincerely and whole-heartedly appreciate the tremendous time, effort and thought put into this initiative by all the working group members. The Casper WGFD staff will therefore strongly consider and attempt to implement these recommendations where and whenever possible to the best of our ability, recognizing that many recommendations must still be routed through the proper Department channels and ultimately the Wyoming Game and Fish Commission (WGFC). Both mule deer and Wyoming's hunting heritage have been very well served by this dedicated group of sportsmen who so generously volunteered their time and perspective in helping to solve such complex management challenges. The Department sincerely appreciates their commitment.

# INTRODUCTION OF GROUP

The Area 66 Mule Deer Working Group (MDWG) was established by the Casper Region of the Wyoming Game and Fish Department (WGFD). The MDWG is comprised of a wide variety of persons with various interests in this local deer herd. The working group includes landowners, an outfitter, hunters, a sporting goods store manager, a BLM representative, and representatives from a variety of wildlife interest groups. Collectively, group members share over 350 combined years of living, working and recreating in this area. All members share similar concerns regarding the recent decline in the overall population and health of this mule deer herd as well as an interest in deriving potential solutions.

MDWG members include:

- **Miles Bundy**
- **Jeff Muratore**
- **Chris Mikels**
- **Rhen Etzelmiller**
- **Steve Garrett**
- **Dusty Porter**
- **Paul Threlkeld**
- **Pete Garrett**
- **Ryan Kaiser**
- **Randy Morrison**
- **Jim Wetzel**

Over the course of the last 12 months, the MDWG committed countless hours to this Mule Deer Initiative learning about the deer herd, gathering public opinion, and deriving the recommendation that follow within this report. The group recognizes that these recommendations may not be without controversy from some. However, a direct approach has been taken that we feel best encompasses the input we have gathered based primarily on public comments throughout this process, science-based information, and our own knowledge of the area. Additionally, there are certain factors affecting mule deer that are well outside of our or the Department's control that we do not have the ability to impact. It is our hope that the implementation of these ideas will have an overall positive impact and promote a healthy mule deer herd into the future for sustainable public opportunities.

The MDWG would also like to acknowledge various Department personnel who have been equally committed to this Initiative and instrumental to our process:

- **Justin Binfet**
- **Heather O'Brien**
- **Brian Olsen**
- **Keith Schoup**
- **Janet Milek**
- **Cody Bish**
- **Matt Withroder**

The above mentioned have provided the MDWG with critical information regarding the various issues impacting mule deer. The group is appreciative of the help and guidance we have received along the way.

# MAP OF AREA MULE DEER AREA 66



# MISSION STATEMENT & OBJECTIVES

**Mission Statement:** It is the mission of the Area 66 Mule Deer Working Group to provide recommendations through discussion, public forum and science-based information to the Wyoming Game and Fish Department to manage and improve mule deer populations and habitat in Area 66 for sustainable hunting opportunities into the future.

**Purpose:** The working group was tasked with assisting the Wyoming Game & Fish Department (Casper Region) with efforts in conducting a Mule Deer Initiative (MDI) for the Bates Hole / Hat Six Mule Deer Herd. The group engaged in collaborative process to ultimately provide the Department with recommendations to consider for improving mule deer populations and their habitat in Area 66 for sustainable opportunities into the future.

## **Goals of the Group:**

- Understand critical issues that mule deer are facing in Area 66
- Gather public input through various avenues (Facebook page, public meetings, postcards, emails, surveys, booths, banquets etc.)
  - In addition to the group's interactions with the public, additional efforts were undertaken throughout the process to solicit comments to the best of our ability. A few of the resources used to gather comments included the establishment of a Facebook page which asked weekly questions, postcards being handed out during hunting season and at game check stations, various email correspondence, and attendance at numerous wildlife banquets and public meetings. In spite of all efforts, public comments received were relatively limited in number.
- Derive a consensus recommendation to the Department for future management of the herd with focus to ultimately improve overall mule deer numbers

# MATERIALS & REFERENCE

All materials, presentations, meeting agendas and meeting minutes from the Area 66 MDI have been compiled and are available for reference at the following link:

<https://wgfd.wyo.gov/Habitat/Statewide-Mule-Deer-Initiatives/Mule-Deer-Public-Working-Groups/Casper-Hunt-Area-66>

# MANAGEMENT RECOMENDATIONS

Management recommendations from the MDWG to the Casper WGFD are presented below to address the various factors affecting mule deer in Area 66.

## **PREDATION**

Overall, the general consensus of the group concluded that existing predator control on coyotes in the area is working very well with strong localized efforts to reduce coyote numbers fueled primarily by an active Natrona County Predator Board. Existing management techniques seem to be very effective.

- **Support cooperation with the Department, the Natrona County Predator Management District (PMD), and the Animal Damage Management Board (ADMB)**
  - The MDWG is interested in helping the Natrona County PMD improve the bounty/rewards program for coyotes to make it easier to turn in ears and better market the program to the public. The current redemption process appears to be restricting participation and could be simplified.
  - Either an MDWG representative, Department representative, or both should attend the annual May ADMB meeting and voice support for the existing programs.
  - Support maintaining or increasing the existing funding model for the Natrona County PMD given the apparent need for a local helicopter and pilot. They are currently utilizing services out of the area which are cost prohibitive.
  - Explore ways to help the PMD maintain a “full time” trapper in Bates Hole Area. This has been done for the last four years as funding has allowed and has had a positive impact.
  - The MDWG recommends the Department continue cooperation with the Natrona County PMD to address predator control in important mule deer habitats.

Although not specifically supported by data, the group expressed concern that mountain lion predation has a significant impact on this mule deer herd. Currently, there appears to be very little pressure on mountain lions in this area for a variety of reasons. Although the group recognizes there would be opposition from various organizations, a focus on increasing mountain lion harvest is a critical issue that should be addressed.

- **Maintain liberal mountain lion seasons with an emphasis on increased harvest in Mountain Lion Hunt Area 27 with an emphasis on female harvest**
  - The MDWG acknowledges this may be controversial and conflict with other groups.
  - Create an annual mountain lion “contest” similar to existing “big buck” contests in hopes that this will lead to an increase in overall harvest.
  - The MDWG would like to explore the possibility of legalizing trapping of mountain lions and encourage the Natrona County PMD and other trappers to participate.
  - Open key roads in winter months to access areas with high mountain lion densities to increase mountain lion harvest (see Roads & Access Section).

## **DISEASE**

The MDWG recognizes Chronic Wasting Disease (CWD) and other diseases may be having a negative impact on the Area 66 mule deer herd. We support the continual CWD monitoring and research the Department is committed to. However, we have no new recommendations at this time to address concerns with respect to disease and its control.

- **At minimum, we recommend the Department conduct CWD surveillance of hunter-killed mule deer on an annual or periodic basis**

## **HABITAT**

The group recognizes that prolonged drought and degraded habitats are having a significant negative impact on the ability of mule deer habitats to hold and support this herd. Although wintering grounds are important, the group feels the largest improvement we can make in mule deer habitat is on traditional summer ranges deer utilize to get them in better condition entering the winter. The group supports continued and future efforts to improve various habitats as identified and recommended by local biologists.

- **Continue to promote habitat projects that will increase the carrying capacity of the land to support a healthy mule deer herd**
  - Rejuvenate mountain mahogany (burning or chemical treatments).
  - Remove conifers and over-mature aspen from aspen stands (cutting or chipping).
  - Thin junipers where encroaching is occurring.
  - Sagebrush thinning – re-establishment of varying age classes, removal or thinning of decadent stands, promote more herbaceous vegetation growth in key areas.
  - Continual monitoring and mitigation for noxious weeds.
  - Improve water storage and retention.
  - Pursue NEPA and other necessary permitting for state and federal land treatments.

Local biologists appear to be working diligently and are starting to see early signs of success in the areas they have been able to work on. Although we cannot alter the limited time frame in which these treatments can be applied, efforts must be made to increase man power on a much larger scale to be able to treat more acres each year in order to see any meaningful results on a landscape scale.

- **Increase involvement in habitat projects to treat more acres per year**
  - Establish a citizen working group or volunteer opportunities which enable people to assist with mule deer habitat treatment projects with the Department.
  - Explore the possibility of allowing commercial harvest of conifer trees in need of removal. Identify those persons who may have an interest in this and may even pay to do so.
  - Consider creating a summer internship program (possible partnership with the University of Wyoming Ag College, Casper College, or students looking to get into

wildlife management) to assist with conducting habitat treatment projects. *Explore the possible use of WGFC seed money for this project.*

- Consider hiring seasonal at-will Department contract employees to assist with habitat restoration efforts.

- **Secure adequate funding for habitat projects while being cost effective**

- Continue to support cooperation with agencies and Non-Governmental Organizations such as the WGFD Trust Fund, WWNRT, Mule Deer Foundation, Muley Fanatics, RMEF, and other entities / NGOs to maximize matching funds for habitat treatment projects.
- Utilize non-contractors when possible to stretch dollars further (volunteers or interns may be most cost effective but there may be a learning curve).
- Partner with state and federal agencies to treat identified projects regardless of ownership - potentially spreading costs (i.e. cost-sharing).

## **ROADS & ACCESS**

The MDWG recognizes that road and public access issues need to be addressed at several locations within Area 66. The MDWG feels there are motorized roads and trails in critical mule deer habitat that put unnecessary pressure on deer year-round while other areas are in need of better or improved access to promote proper use of public lands as recommended by the State, BLM and WGFD. *It should be noted that Rhen Etzelmiller abstained from offering recommendations, voting on recommendations, or influencing recommendations within this section due to his role and employment with the BLM, and the ongoing Travel Management Plan. Any discussion was strictly in an informational or advisory capacity.*

- **Submit recommendations to the Bureau of Land Management's ongoing Bates Hole Travel Management Plan**

- Work with BLM to continue to provide input into the ongoing Bates Hole Travel Management Plan. The plan appears to still be 6-12 months from completion.
- Support opening access to Muddy Mountain (BLM) and Circle Drive (Natrona County Road 505) in winter months to extend the timeframe for recreational access on Muddy Mountain. Although this area is utilized by mule deer, these road closures also inhibit the ability to harvest elk and mountain lions.
- Support the closure of roads in the Bates Hole Stock Trail area that traverse many ridgetops while maintaining main arterial access roads. Specific areas of concern include Lone Tree, Lawn Creek and Sand Draw. The current road system does not allow mule deer any remote areas of security or escapement.
- Voice opposition to existing or new dirt bike trails in the Twin Buttes Area which is also key mule deer crucial winter range.
- The Area 66 MDWG may also consider similar recommendations for areas outside the existing Bates Hole Travel Management Planning Area in Area 66 that may also potentially encompass State lands.

The group also recognized there are stretches of State highway within Area 66 that see a high level of mule deer mortality. There are currently no mitigating factors or proposals to help alleviate this concern.

- **The Department should cooperate with WYDOT to address concerns of deer mortality along state highways**
  - Gather information from WYDOT to identify specific stretches of HWY 487 that experience the highest collision rates.
  - Explore potential funding from WYDOT for highway over and under passes.
  - Work with the Department to identify priority areas for potential over/under passes and high-fence areas to reduce deer-vehicle collisions. *Explore the possible use of WGFC seed money for this project.*

## **COMPETITION**

Although the impacts of elk competition on this mule deer herd cannot be quantified, the MDWG generally considers the over-objective elk population (in Elk Hunt Area 19) is having an overall negative impact on mule deer and their habitats. Better efforts should be made to increase elk harvest in this area to reduce impacts to mule deer. The group recognizes that significant attempts have been made by the Department but are complicated by landowners who restrict hunting access and create elk refuges.

- **Maintain liberal cow elk hunting seasons and access to maximize harvest and curb expansion of elk in Area 19**
  - Continue efforts to work with local landowners to open up access for hunting after bull seasons. Consider additional access to existing areas and promote use of motorized vehicles for retrieval purposes.
  - The MDWG urges the Department/WGFC to consider implementing a “*Bonus Cow Tag*” that would accompany any successful draw of a Full Price Type 1 or 2 License to increase cow harvest without increasing hunter densities.
  - The MDWG urges the Department/WGFC to consider allowing hunters to obtain multiple Full Price Type 4 and 5 Antlerless Elk Licenses (efforts are already underway for the 2016 season) to improve cow elk harvest.
  - The MDWG and/or the Department should work to establish a donation program for elk meat to community organizations or persons in need that would fund the cost of elk processing. This would potentially entice more hunters to harvest cows and donate the meat without incurring processing costs. On a limited scale, establish and maintain a list of persons or organizations that would be willing to pay for processing. Having a place to donate elk meat may increase hunter willingness to harvest an extra elk. *Explore the possible use of WGFC seed money for this project.*
  - There are concerns regarding elk use of traditional mule deer habitats with respect to the Lone Tree and Spruce Canyon areas as they have also become popular with hunters. Even with modified season structure, the group does not see the ability to remove elk from these areas entirely.

Although white-tailed deer are present in Area 66, the MDWG has minimal concern with respect to white-tailed deer encroaching on mule deer habitats. White-tailed deer are generally confined to private lands along riparian areas and do not often occupy uplands. White-tailed deer are already managed liberally by the Department with general and limited quota seasons.

- **The MDWG recommends the Department continue liberal harvest of white-tailed deer within this area**
  - Maintain existing hunting structure to curb potential expansion of white-tailed deer into mule deer habitat.

### **POPULATION OBJECTIVE**

Since 1988, the WGFC defined population objective for Areas 66 & 67 (Bates Hole / Hat Six Mule Deer Herd) was to manage for 12,000 mule deer postseason while maintaining buck ratios between 20-29 per 100 does (“Recreational” management strategy). Because this herd had not reached this objective since the late 1980’s, the Department and the MDWG considered it to be unrealistic, with the current population estimate being ~5,600 mule deer. As a result, the MDWG concurred with the Department’s recommendation to revise the postseason objective to 8,000 mule deer. In addition, the MDWG recommended the Department ask the WGFC to change the management strategy to manage this herd for postseason buck ratios between 30-45 bucks per 100 does (“Special” management strategy). Specifically, the MDWG recommended the Department attempt to manage for 35 bucks per 100 does postseason. Based on this recommendation, the Department asked the WGFD to adopt the special management strategy for this herd. In July 2015, the WGFC formally adopted the recommendations from the Department, which entails for managing for 8,000 mule deer and 30-45 bucks per 100 does postseason. See the “Season Structure” section for management trigger recommendations to help achieve these management goals.

### **SEASON STRUCTURE**

It was the general consensus of the group, as well as the public, that the existing hunting season structure is placing too much pressure on the Area 66 mule deer herd. Although opinions were split in all forums, the group’s ultimate recommendation was to maintain the existing general license season structure as opposed to converting Area 66 to a limited quota area. This recommendation was unanimous. The key factors that contributed to this recommendation were the need to maintain adequate public opportunity for deer hunting as well as an understanding that a shift to limited quota only impacts hunter perception and hunting quality and ultimately has no impact on improving overall deer numbers. With the recommendation for the Department to keep Area 66 as a general area, the group still hopes to significantly improve the existing structure and overall quality of the hunting experience in Area 66. As a result, the MDWG recommended the WGFC change the management strategy from recreational to special to manage for higher buck ratios. The MDWG feels this is justified based on the general season structure recommendation and the popularity of Area 66 with hunters.

- **Maintain conservative seasons and harvest until herd numbers rebound**
  - We recommend the Department remove the ability of hunters to harvest “any deer” during archery season to mirror that of the rifle season.
  - Although the group recognizes the need for youth to have opportunity advantages, we recommend the Department modify the season structure from “any deer” to “any buck” for general youth licenses in Area 66.

- The Department should continue to restrict doe harvest, which should only be considered to address specific damage concerns in a localized area (although there are not any damage concerns noted at this time).
- The Department should maintain Antler Point Restrictions (APRs) of 3 points or better which have already been in place for two years. The herd has begun to show a positive response to these APRs with a shift toward higher buck quality and an increase of buck ratios (see below for management triggers). It is further recognized by the group that maintaining APR's for an extended period of time goes against traditional thinking and should be monitored closely for adverse effects.

The MDWG hopes these recommendations will be implemented and will have a positive impact on the ability to grow and maintain a quality deer herd. If mule deer numbers rebound, opportunities should be extended to allow for a more liberal hunting experience while maintaining herd objectives.

- **The MDWG recommends the Department consider the following management triggers to adjust hunting season structure for Deer Area 66:**
  - Maintain the existing 7-day season until the population objective has been reached.
  - Increase the season length to 10 days after the herd objective has been reached.
  - As of the 2015 season, maintain APRs until the buck: doe ratio reaches 35:100 per post-hunt surveys.
  - Eliminate APR's whenever postseason buck ratios are between 25 and 35, but not until buck ratios have reached 35 per 100 following the completion of this plan.
  - Implement APRs whenever the postseason buck ratio drops below 25:100.

The group recommends these parameters be closely monitored for adverse and unforeseen effects over the next 3-5 years. The MDWG will likely request future follow-up from the Department with respect to post-hunt population counts and survey information. This will help determine current status and whether any changes need to be made should these parameters become unattainable.

### **MISCELLANEOUS**

The group recognizes that with increasing frequency, rural landscapes are being impacted by urban sprawl and various forms of development. Although the necessity of change and growth is certainly recognized, it is our hope that future expansion into critical habitats will continue to be monitored with concerns being raised accordingly. These concerns extend specifically to proposed wind power development and transmission.

Some discussion was also had regarding the increase in popularity of shed hunting and its potential impact on mule deer on winter ranges. Although this can be a concern, it was agreed that it is not the actual act of shed hunting (hiking) but rather the continual harassment and disturbance that is placed on animals with various forms of motorized vehicles. The group would be in favor of finding common ground to curb this issue while still allowing for responsible recreational opportunities.

# CONCLUSION OF PLAN

Given the above management recommendations developed by the MDWG, it is prudent to recap the process that led to these decisions. The commitment of the MDWG members also cannot go unrecognized. This group devoted countless hours to this Initiative and put aside personal biases to develop a suite of recommendations that were derived from both data and public input.

Overall public support and comments given to the group were very limited in spite of significant efforts that were undertaken to ensure everyone had an opportunity to voice their concerns. The group drew on years of personal experience in the area and information from the Department to formulate the above recommendations. In addition, a broad overview of identified negative impacts to mule deer in Area 66 is provided below in no particular order:

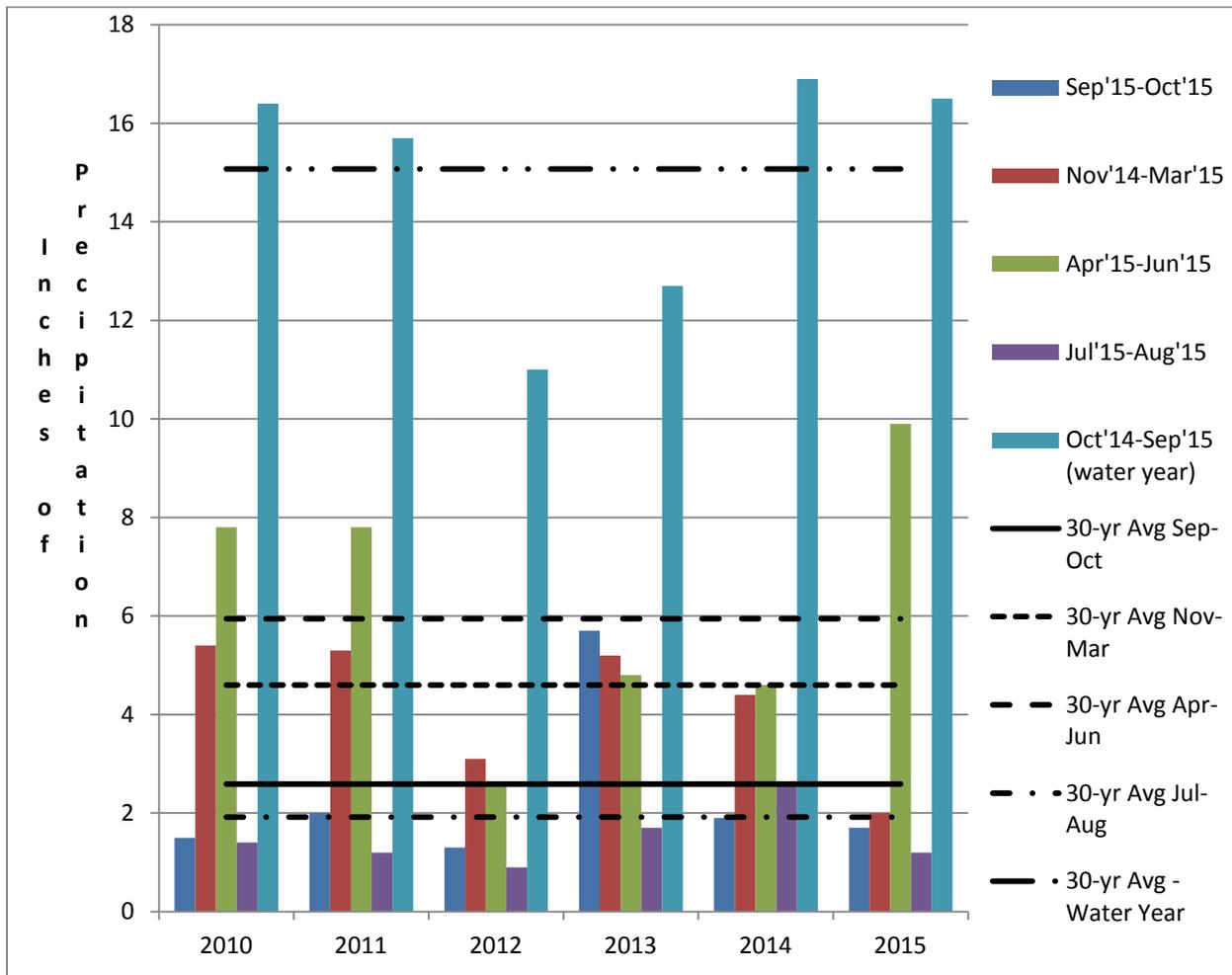
- Years of prolonged drought conditions, over utilization/mismanagement of habitat and a general “no burn” policy are all having a negative impact on the land and its ability to support a healthy mule deer population.
- Although local efforts to reduce coyotes are substantial, mountain lions are having a significant impact on mule deer. Cultural shifts toward favoring predators have allowed increased numbers to be prevalent in recent years.
- Diseases (specifically CWD) may be having a significant impact on mule deer. With this disease being 100% fatal when contracted and our local herd having high prevalence, the group believes this is contributing to the lack of older age class deer as well as overall population decline. Even if a vaccine were to be developed, distribution would prove difficult to administer to a wild population. Research shows that a natural selection process may be starting to take place, although it is unknown if this disease will ever be eradicated.
- As with many areas around the state, an overabundance of elk within this area appears to be crowding out mule deer on traditional habitats. A lack of access to private lands to control the elk population and increase harvest is a leading cause of the problem.
- Although certainly the most tenuous topic of discussion, the ongoing debate of General vs. Limited Quota hunting season structure will continue. Most group members went into the Initiative leaning towards converting Area 66 to limited quota. However, after reviewing data (experiencing same problems in LQ Areas as General) from other areas/herds, an educated decision was made to recommend maintaining a general license season structure in Area 66 to allow for good hunting opportunity. The group recognizes that changing season structure does not contribute to the ultimate goal of increasing deer numbers. Converting to limited quota appears to be strictly a shift of hunting quality and influence on hunter perceptions.
- Outside forces such as urban sprawl and energy development in certain areas continue to change our landscape.
- Finally, it should be noted that declining mule deer numbers are not specific to this particular herd or Wyoming, as this trend is occurring throughout the American West.

## Appendix B

### Weather Data for the Bates Hole / Hat Six Mule Deer Herd Unit

#### Precipitation

From October 2014 through September 2015 (Water Year 2015), precipitation in the Bates Hole / Hat Six Mule Deer Herd Unit was higher than the 30-year average for the same water year timeframe (Figure 1). The 2014-2015 winter experienced precipitation levels that were far below normal, resulting in extremely mild winter conditions that year. Precipitation was much improved during the following spring growing season (April-June 2015), which was well above the 30-year average. Following this very wet spring, summer conditions were relatively dry, and were below the 30-year average. This decreased summer precipitation was well below the 30-year average for July and August. Fall 2015 precipitation was also well below the 30-year average.



**Figure 1.** Seasonal precipitation received compared to 30-year averages within the Bates Hole / Hat Six Mule Deer Herd Unit.

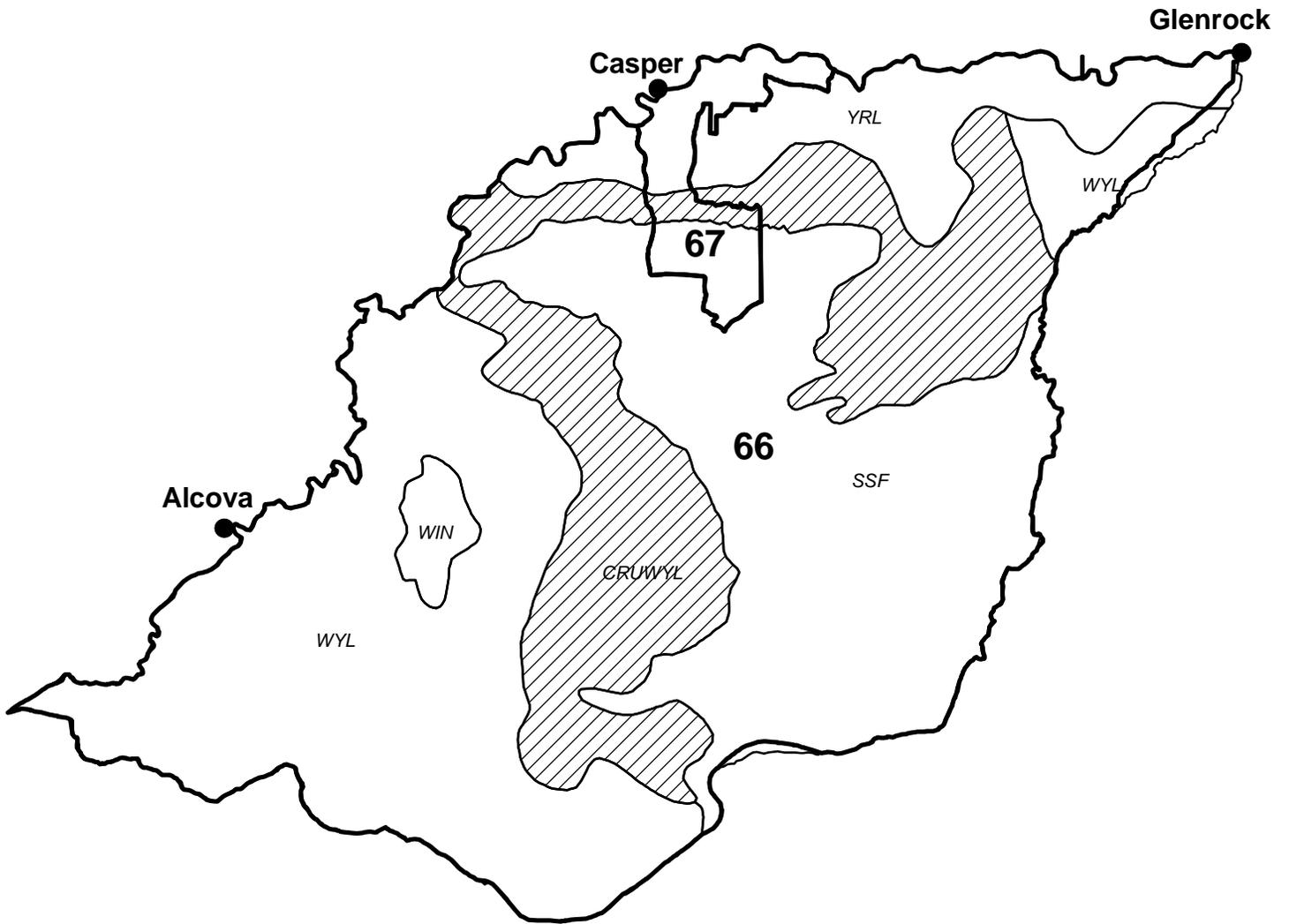
### **Winter Severity**

Within this herd unit, the 2014-2015 winter was fairly mild with precipitation levels well below average. The 2015-2016 winter started out mild with very little snowfall until a winter storm in mid-December brought several inches of wet snow. That snowstorm was followed by several additional snowstorms that added a few inches of base during each storm. This period was accompanied by persistent cold temperatures that resulted in a substantial layer of hard crusted snow. The crusted snow created relatively harsh winter conditions for big game during January and early February as access to forage and daily movements were impeded for a substantial period of time. Thankfully, a period of warmer air temperatures and windy conditions melted the majority of the snow beginning in mid-February. From late February to May 2016, air temperatures fluctuated between above normal and cooler periods, producing several timely precipitation events with modest snow accumulations. However, snowfall did not last for more than a few days following each precipitation event from mid-February on.

### **Habitat and Mule Deer Body Condition**

Following favorable weather and habitat conditions during the spring and summer of 2014, mule deer nutritional condition was very good entering the 2014-2015 winter. This, coupled with mild winter conditions, resulted in excellent mule deer fawn production and survival during bio-year 2014. Substantial precipitation was received during the growing season (April – June) of 2015, resulting in good herbaceous forage production and mixed-mountain shrub leader growth. Although the summer of 2015 was relatively dry, mild temperatures and good forage production again enabled mule deer to enter the 2015-2016 winter in fairly good nutritional condition. Despite moderately harsh conditions prevailing within this herd unit during the 2015-2016 winter (precipitation data not yet available), over-winter survival of mule deer was thought to be good across all age classes based on spring mule deer observations. The good body condition of mule deer entering the 2015-2016 winter undoubtedly improved fawn production and annual survival in this herd during bio-year 2015. Although data is not yet available, substantial precipitation has been received during the growing season of 2016, which should result in another year of good to excellent forage production for mule deer in the coming year.

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





## 2015 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2015 - 5/31/2016

HERD: MD758 - RATTLESNAKE

HUNT AREAS: 88-89

PREPARED BY: HEATHER  
O'BRIEN

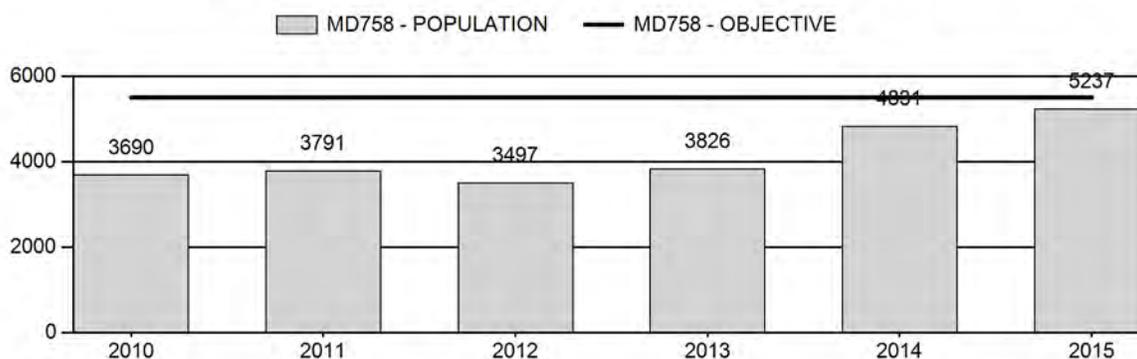
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	3,927	5,237	5,543
Harvest:	229	112	135
Hunters:	441	243	275
Hunter Success:	52%	46%	49 %
Active Licenses:	462	243	275
Active License Success:	50%	46%	49 %
Recreation Days:	1,789	955	1,100
Days Per Animal:	7.8	8.5	8.1
Males per 100 Females	36	48	
Juveniles per 100 Females	55	76	

Population Objective (± 20%) :	5500 (4400 - 6600)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-4.8%
Number of years population has been + or - objective in recent trend:	8
Model Date:	02/22/2016

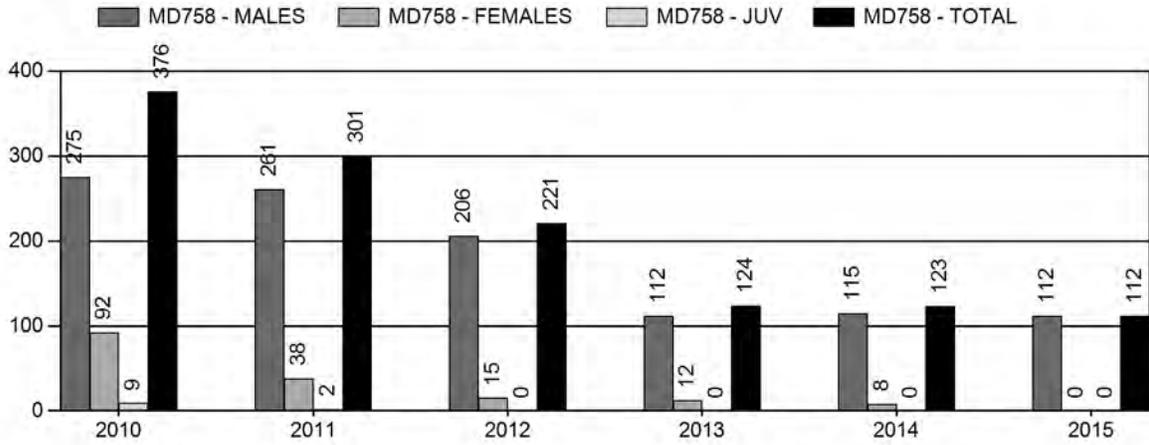
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0%	0%
Males ≥ 1 year old:	11.5%	11.8%
Juveniles (< 1 year old):	0%	0%
Total:	2.1%	2.4%
Proposed change in post-season population:	+6.43%	+5.84%

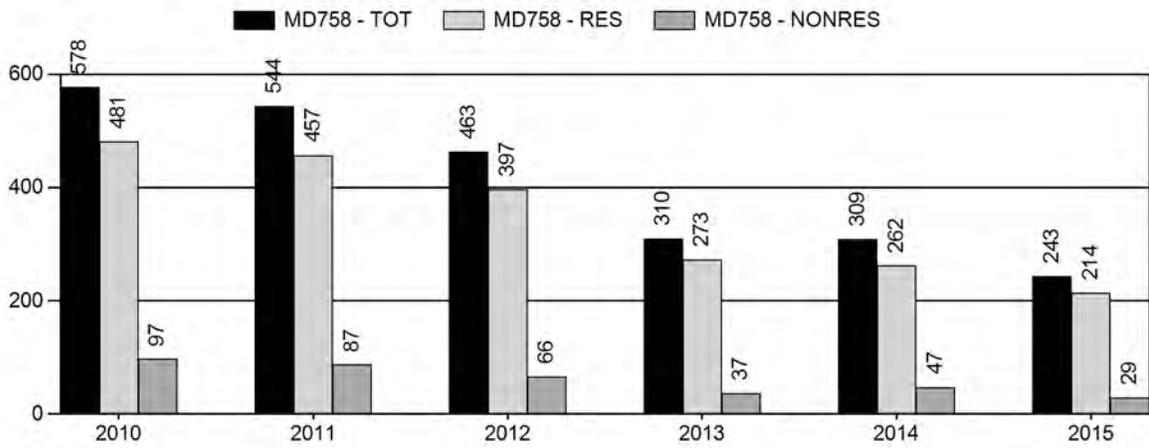
## Population Size - Postseason



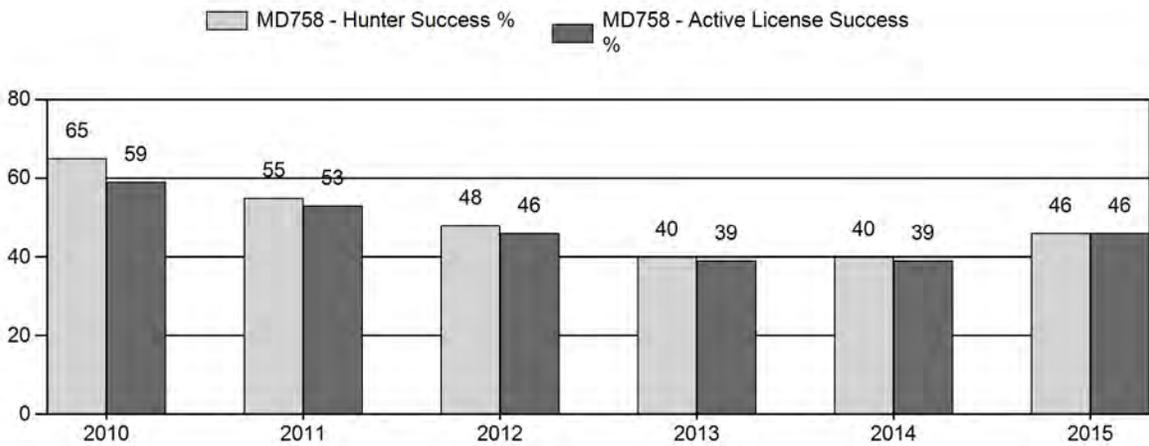
# Harvest



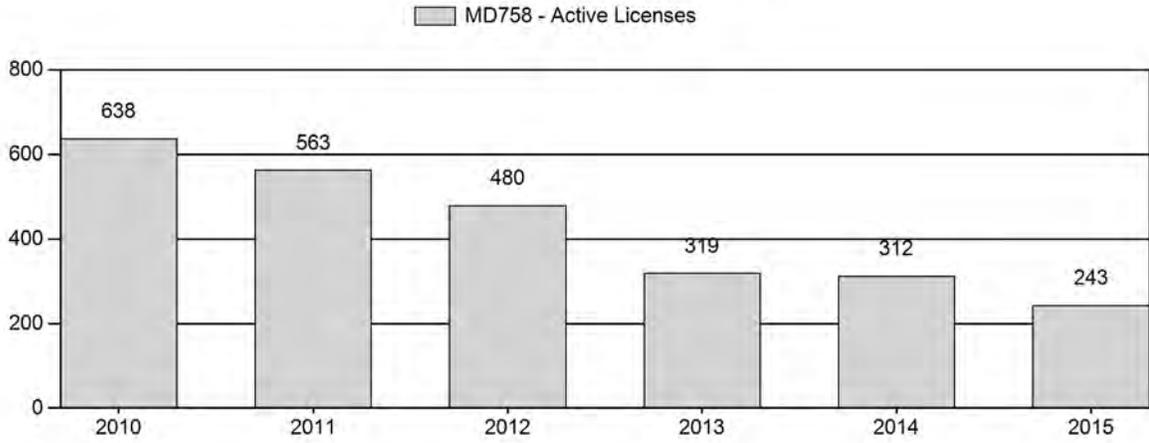
# Number of Hunters



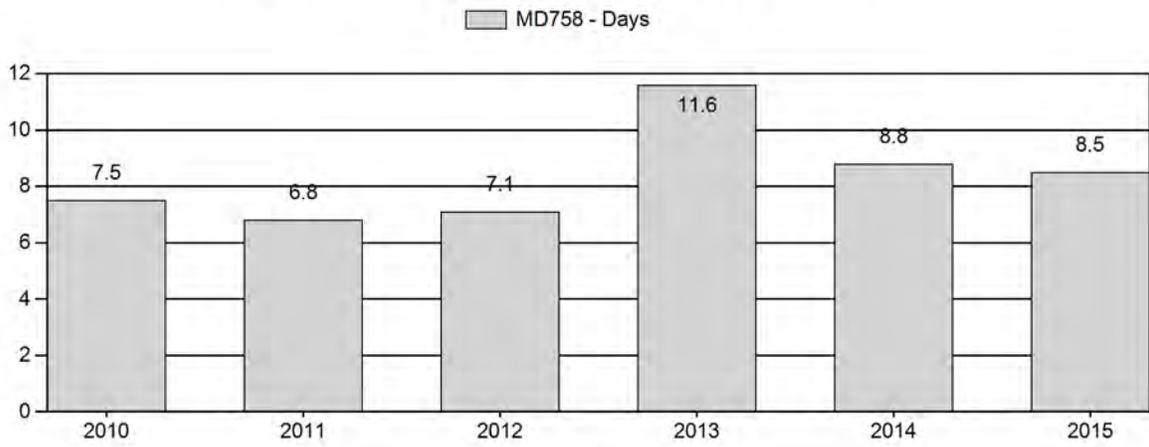
# Harvest Success



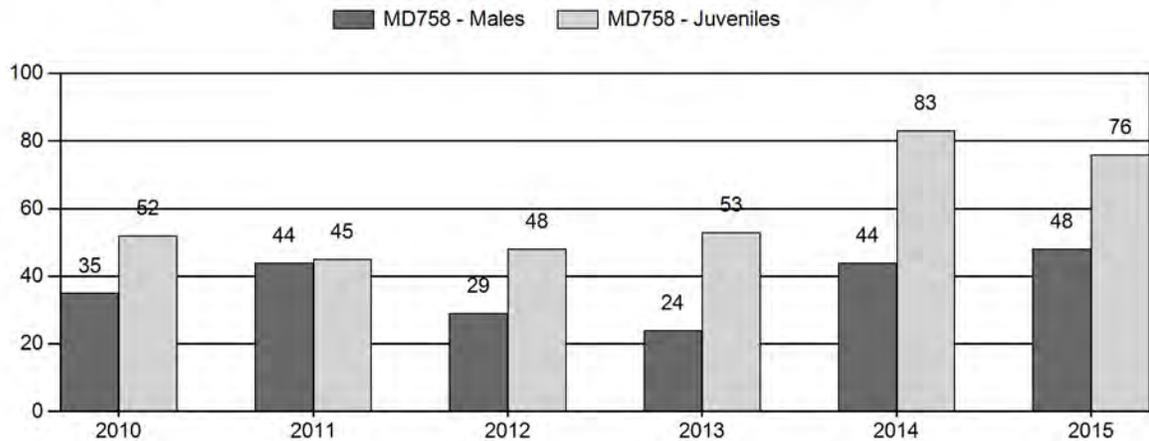
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



## 2010 - 2015 Postseason Classification Summary

## for Mule Deer Herd MD758 - RATTLESNAKE

Year	Post Pop	MALES								FEMALES		JUVENILES		Tot Cls	Cls Obj	Males to 100 Females				Young to		
		Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Yng			Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult	
2010	3,690	49	73	51	6	0	169	19%	487	54%	252	28%	908	797	10	25	35	± 3	52	± 4	38	
2011	3,791	53	136	63	9	0	249	23%	570	53%	258	24%	1,077	781	9	34	44	± 4	45	± 4	32	
2012	3,497	25	83	10	2	0	109	16%	381	57%	184	27%	674	830	7	22	29	± 4	48	± 5	38	
2013	3,826	14	61	20	1	0	91	14%	376	57%	198	30%	665	671	4	20	24	± 3	53	± 5	42	
2014	4,831	47	84	36	6	0	161	19%	368	44%	304	36%	833	1,446	13	31	44	± 5	83	± 7	57	
2015	5,242	96	97	41	3	0	237	22%	491	45%	371	34%	1,099	1,209	20	29	48	± 4	76	± 6	51	

**2016 HUNTING SEASONS  
RATTLESNAKE MULE DEER (MD758)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
88		Oct. 15	Oct. 21		General	Antlered mule deer or any white-tailed deer
89	1	Oct. 15	Oct. 31	100	Limited quota	Antlered deer
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2015
88	6	No Change
89	1	+25
Total	1	+25

**Management Evaluation**

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

**Management Strategy:** Special

**2015 Postseason Population Estimate:** 5,200

**2016 Proposed Postseason Population Estimate:** 5,500

**2015 Hunter Satisfaction:** 58% Satisfied, 21% Neutral, 20% Dissatisfied

The Rattlesnake Mule Deer Herd Unit has a postseason population objective of 5,500 deer. The herd is managed using the special management strategy, with the goal of maintaining postseason buck ratios between 30-45 bucks per 100 does. Management of this herd unit and interpretation of harvest data can be perplexing, with different management strategies for Area 88 versus Area 89. The objective and management strategy were last revised 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, 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 on females was previously maintained in Area 88 to address potential damage issues on irrigated agricultural fields, but has not been necessary in recent years. General license hunting

pressure has become disproportionately high on public lands within Area 88. Consequently, managers plan to modify hunt area boundaries in 2016, moving public lands in the southern portion of Area 88 into Area 89. Traditional ranching and grazing are the primary land use over the whole unit, with scattered areas of oil and gas development and bentonite mining. Periodic disease outbreaks (i.e. hemorrhagic diseases) are possible in this herd and can contribute to population declines when environmental conditions are suitable.

## **Weather**

The winter of 2010-2011 was severe throughout the herd unit, resulting in above average mortality of mule deer. Severe drought conditions persisted from spring 2011 through winter 2012, which had a negative impact on deer reproductive success and fawn survival. The spring and summer of 2013 were cool with significant precipitation, yet habitat conditions appeared to remain poor for much of the growing season. Heavy precipitation during the fall of 2013 caused a beneficial late green-up that provided improved forage for mule deer entering the winter season. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. The spring and summer of 2014 undeniably produced improved range conditions that benefitted deer, and fawn production reached a 9-year high of 83 fawns per 100 does. The winter of 2014-2015 was relatively mild with good overwinter survival of mule deer, while the spring and summer of 2015 were slightly above average in terms of precipitation and range condition. Fawn production was again above average in 2015, as range conditions and nutritional status of does were improved for the second year in a row. For detailed weather data see <http://www.ncdc.noaa.gov/gac/time-series/us>.

## **Habitat**

This herd unit has no established habitat transects that measure production and/or utilization on shrub species that are preferred browse of mule deer. Anecdotal observations and discussions with landowners in the region indicate that summer and winter forage availability for mule deer was very good in 2015. Herbaceous forage species were observed to be in very good condition in both 2014 and 2015 compared to previous years, and mule deer appeared to be in excellent body condition by winter 2015.

## **Field Data**

The Rattlesnake Mule Deer Herd typically has moderate fawn production, with a long-term average of 67 fawns per 100 does. Harsh winter conditions in 2010-11 combined with severe drought in 2012 produced the lowest fawn ratios (in the mid-40s) in over 15 years for the herd

unit. Issuance of doe/fawn licenses was reduced incrementally in accordance with this decline until being eliminated in 2015. Fawn ratios recovered significantly in 2014 with 83 per 100 does and were again above average in 2015. Still, doe/fawn licenses are not yet warranted, as the population is just reaching its objective and there are no complaints of damage to agriculture from any landowners within the herd unit.

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 trophy quality within this herd unit. 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. While this herd has dropped in overall numbers over the past six years, higher buck ratios have been maintained by adjusting Area 89 license issuance accordingly. However, the buck ratio dropped below special management range to 24:100 does in 2013 following several years of very poor yearling buck recruitment. After a reduction in license issuance in 2013, buck ratios recovered significantly in 2014, with 44 bucks per 100 does observed postseason. Following another mild weather in 2015 with excellent yearling recruitment, the buck ratio exceeded the high end of special management at 48 bucks per 100 does. However, the high yearling buck ratio (20:100 does) accounted for most of this increase. Since this population has also increased in size, managers feel a conservative increase in Area 89 licenses is warranted. An increase of 25 licenses will provide additional hunting opportunity while still maintaining the buck ratio within special management parameters and assuring 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). In 2009, the best distribution of mature buck classes was observed, with 53% Class I (small), 39% Class II (medium), and 9% Class III (large) bucks. The proportion of bucks in larger (Class II & III) antler classes was low in 2012 but has steadily increased since then. In 2015, 69% of bucks were categorized as Class I, with 29% Class II and 2% Class III bucks. Despite a buck ratio that exceeds special management criteria, overall distribution of bucks remains weighted toward smaller antler classes. With hunter expectations high for trophy-quality hunting, managers consider this further justification to increase Type 1 license numbers conservatively for the 2016 hunting season.

Bio-Year	Total Class N for HA	# Bucks Classified					Buck Ratios per 100 Females					
		Ylng	Class I	Class II	Class III	Total	Ylng	Class I	Class II	Class III	All Adult	Total
2008	1,220	71	126 (74%)	40 (23%)	5 (3%)	242	11	20	6	1	27	38
2009	848	31	74 (53%)	54 (39%)	12 (9%)	171	7	17	13	3	33	40
2010	778	38	59 (54%)	45 (41%)	6 (5%)	148	9	14	11	1	26	35
2011	1,009	48	114 (62%)	61 (33%)	9 (5%)	232	9	21	11	2	34	43
2012	503	17	61 (84%)	10 (14%)	2 (3%)	90	6	22	4	1	26	32
2013	548	11	53 (74%)	18 (25%)	1 (1%)	83	4	17	6	0	24	27
2014	684	37	66 (65%)	30 (29%)	6 (6%)	139	12	22	10	2	34	46
2015	896	80	90 (69%)	38 (29%)	3 (2%)	211	20	22	9	1	28	48

**Figure 1.** Antler classification analysis for Area 89 within the Rattlesnake Mule Deer Herd Unit, 2008-2015.

### Harvest Data

License success in this herd unit is typically in the 60-70<sup>th</sup> percentile. Overall harvest success declined from 2010-2014, and days per animal generally increased. In 2015, total deer harvested was the lowest recorded since 1996, due to low license issuance in Area 89 and removal of Type 6 licenses in Area 88. However, harvest success in 2015 improved to 46%, compared to 39% in both 2013 and 2014. Harvest success improved in Area 89 and hunter days declined as well, with 74% success over an average of 7.4 days. 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. It can also be difficult to interpret hunter satisfaction at the herd unit level, as hunters in Area 89 are typically more satisfied due to low hunter crowding and better access, while Area 88 hunters are less satisfied due to higher crowding and less hunting access. Hunter satisfaction at the herd unit level has been low (55-58%) the past three consecutive years. While hunter satisfaction remains high in Area 89, low satisfaction in Area 88 is further justification for modifying the hunt area boundary to alleviate crowding on public lands. Although this herd has grown and current high buck ratios can support increased harvest, liberal increases in license are not yet warranted. A large proportion of bucks in the herd are in younger age classes and will need several more years to mature. Managers thus plan to conservatively increase license issuance in an effort to provide increased hunting opportunity while maintaining special management buck ratios in the herd unit.

## **Population**

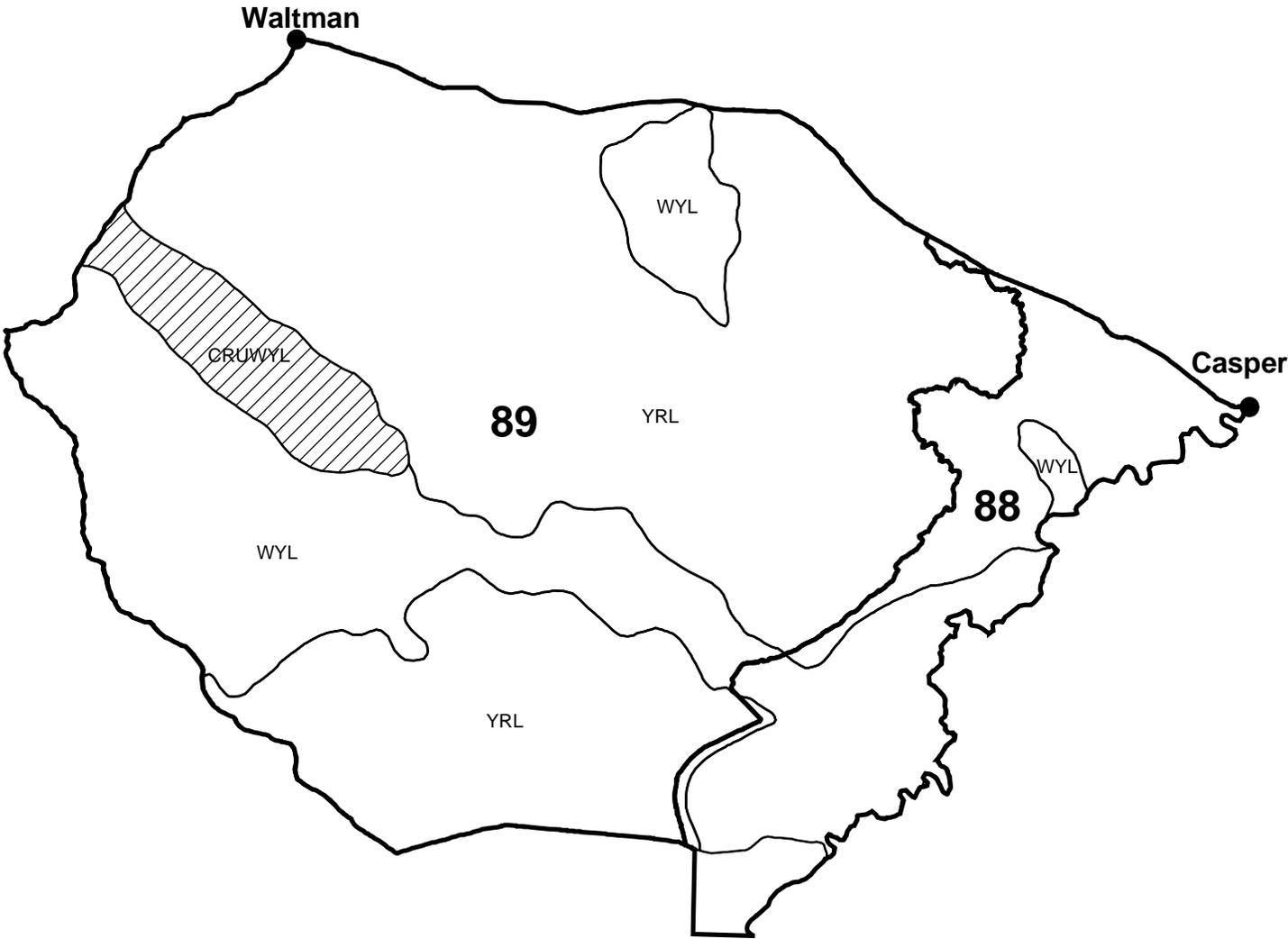
The 2015 postseason population estimate was approximately 5,200 mule deer and trending suddenly upward from an estimated low of 4,200 deer in 2012. The “Semi-Constant Juvenile, Constant Adult” (SCJ,CA) spreadsheet model was selected for the postseason population estimate of this herd. This model seemed most representative of the herd, as it mirrors fluctuations in herd size observed by field personnel in previous years. The simpler model (CJ,CA) overestimates herd size while the more complicated (TSJ,CA) model underestimated herd size and displays some trends that do not match with field observations. The SCJ,CA model was used to apply lower constraints on juvenile survival from 2010-2012. These constraints match observed trends of low fawn ratios followed by very poor yearling buck ratios, implying over-winter fawn survival was poor. The AIC for the SCJ,CA model is the higher than the CJ,CA model due only to penalties incurred from constraining juvenile survival in these three years. The SCJ,CA model appears to be the best representation relative to the perceptions of managers on the ground and follows trends with license issuance and harvest success. However, since managers believe the herd unit boundaries to be highly permeable, and because there are no additional survival or population estimate data to augment the model, it is only considered to be fair in quality.

## **Management Summary**

Traditional season dates in this herd run from October 15<sup>th</sup> through October 31<sup>st</sup> for limited quota licenses in Area 89, and October 15<sup>th</sup> through October 21<sup>st</sup> for general licenses in Area 88. The same season dates will be applied to the 2016 hunting season. There will be an addition of 25 Type 1 licenses to Area 89 to provide additional hunting opportunity, while allowing a high number of young age-class bucks another season to mature. Area 88-Type 6 licenses remain unnecessary, as there are currently no concerns regarding damage and few access opportunities on private lands. The 2016 season thus includes a total of 100 Type 1 licenses in Area 89, and a general season in Area 88 for antlered mule deer or any white-tailed deer. Goals for 2016 are to manage buck ratios within special management, and increase hunter success and satisfaction.

If we attain the projected harvest of 135 deer with fawn production similar to the five-year average, this herd will increase slightly. The predicted 2016 postseason population size for the Rattlesnake Mule Deer Herd Unit is approximately 5,500 deer, which is at objective.

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



## 2015 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2015 - 5/31/2016

HERD: MD759 - NORTH NATRONA

HUNT AREAS: 34

PREPARED BY: HEATHER O'BRIEN

	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	4,520	3,734	3,781
Harvest:	206	112	140
Hunters:	278	142	200
Hunter Success:	74%	79%	70%
Active Licenses:	292	142	190
Active License Success:	71%	79%	74%
Recreation Days:	1,336	716	900
Days Per Animal:	6.5	6.4	6.4
Males per 100 Females	35	43	
Juveniles per 100 Females	59	93	

Population Objective (± 20%) : 4700 (3760 - 5640)

Management Strategy: Special

Percent population is above (+) or below (-) objective: -20.6%

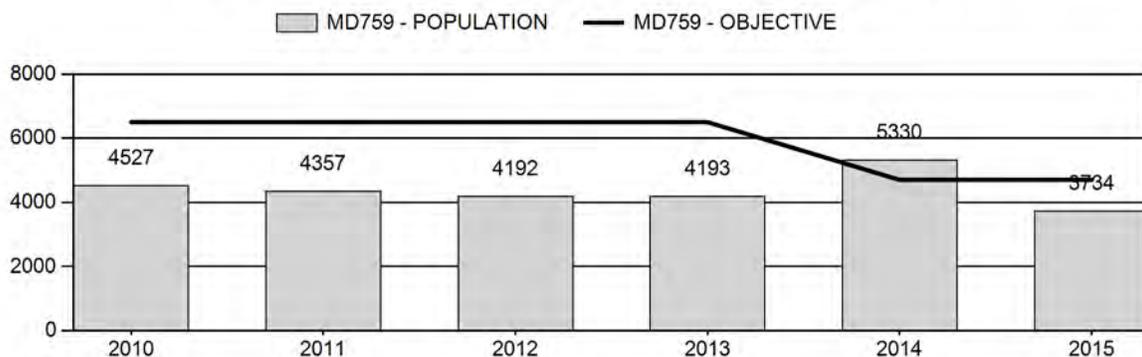
Number of years population has been + or - objective in recent trend: 2

Model Date: 2/25/2016

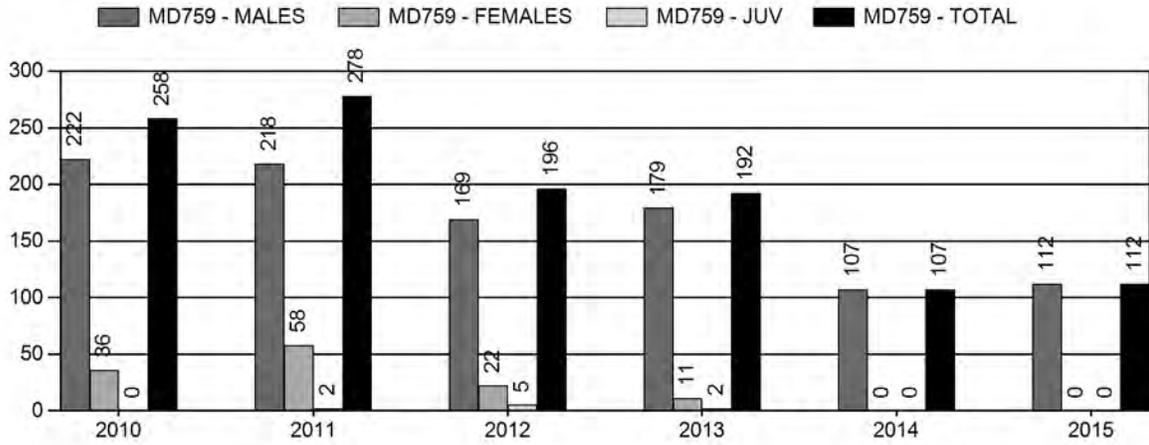
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0%	0%
Males ≥ 1 year old:	15.3%	16.6%
Juveniles (< 1 year old):	0%	0%
Total:	2.9%	3.6%
Proposed change in post-season population:	+7.4%	+1.3%

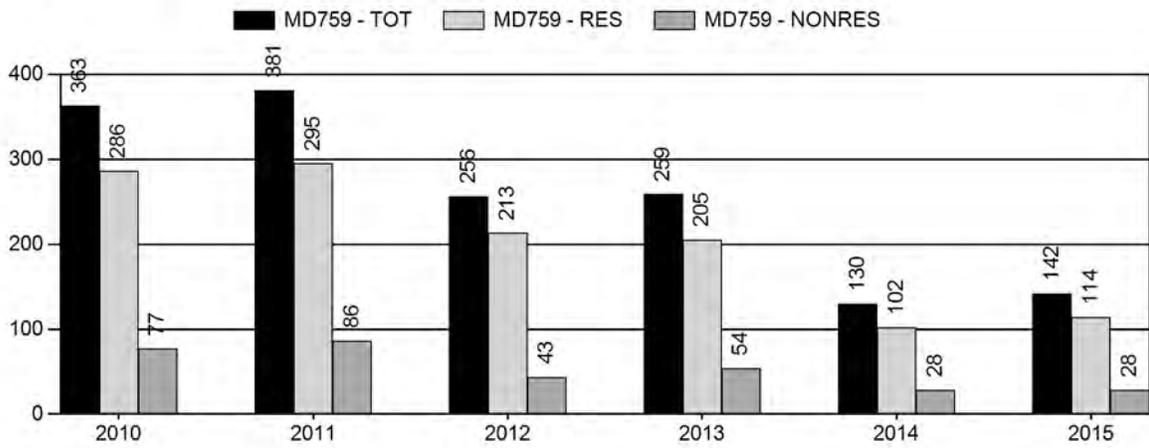
## Population Size - Postseason



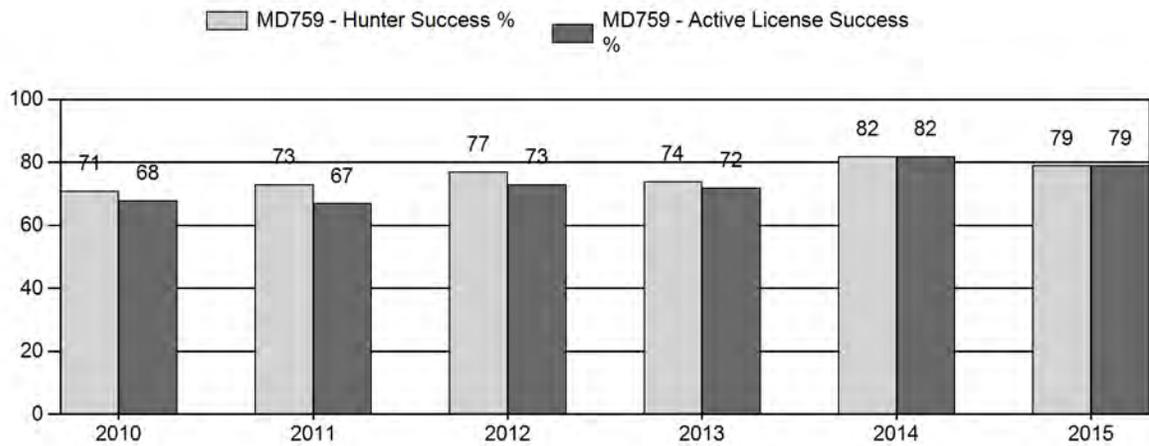
# Harvest



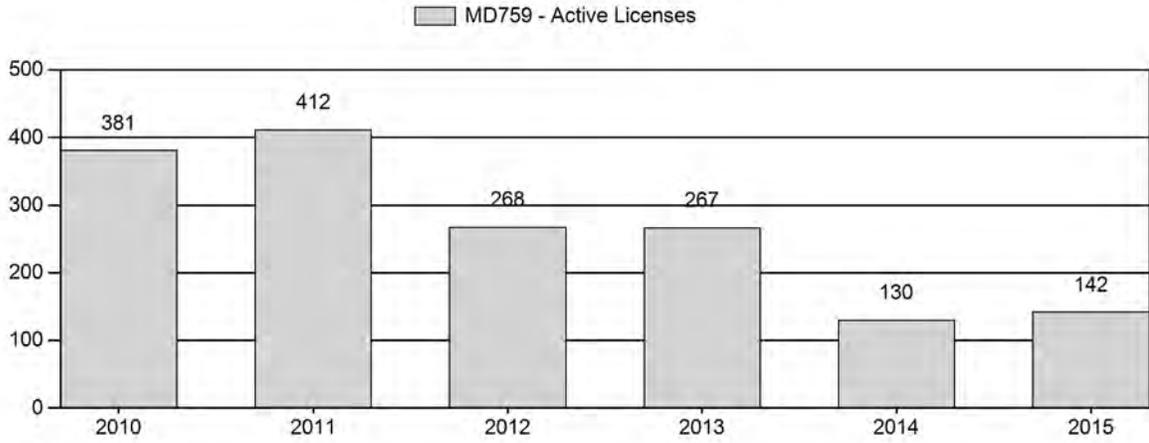
# Number of Hunters



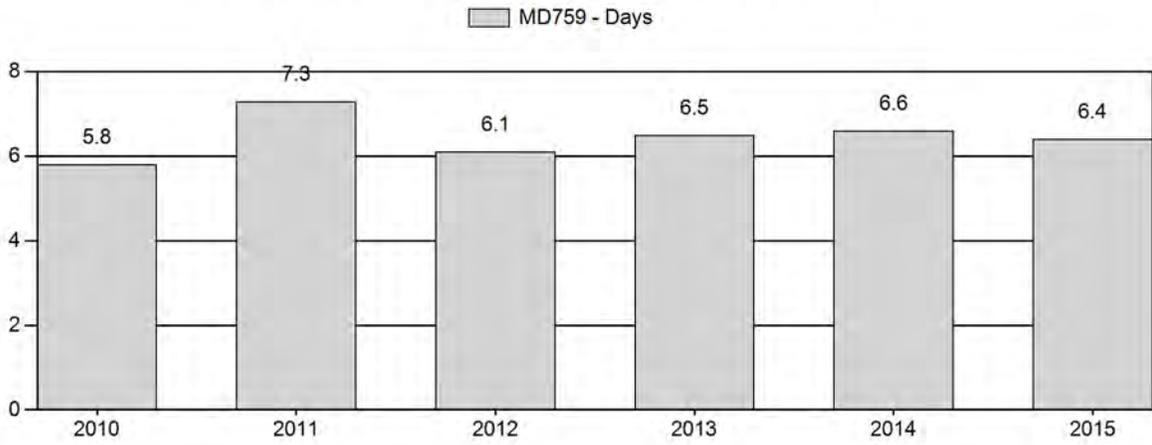
# Harvest Success



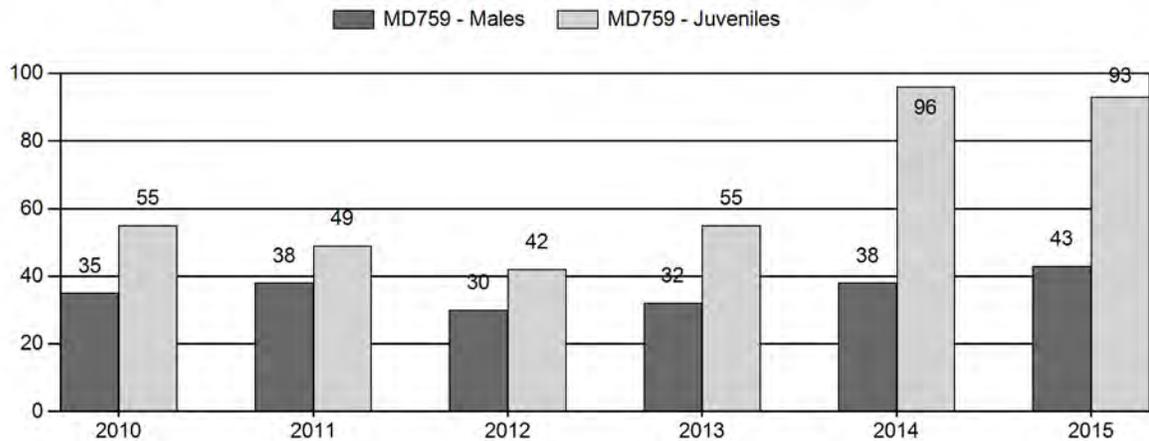
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



2010 - 2015 Postseason Classification Summary

for Mule Deer Herd MD759 - NORTH NATRONA

Year	Post Pop	MALES								FEMALES		JUVENILES		Tot CIs	CIs Obj	Males to 100 Females				Young to		
		Ylg	2+ CIs 1	2+ CIs 2	2+ CIs 3	2+ UnCIs	Total	%	Total	%	Total	%	Yng			Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult	
2010	4,527	47	55	44	21	0	167	18%	476	53%	262	29%	905	830	10	25	35	± 4	55	± 5	41	
2011	4,357	52	64	34	4	0	154	20%	406	53%	200	26%	760	851	13	25	38	± 4	49	± 5	36	
2012	4,192	36	91	20	6	0	153	18%	503	58%	212	24%	868	760	7	23	30	± 3	42	± 4	32	
2013	4,193	28	60	19	1	0	108	17%	342	54%	187	29%	637	580	8	23	32	± 4	55	± 6	42	
2014	5,330	51	84	30	2	0	167	16%	441	43%	425	41%	1,033	1,713	12	26	38	± 4	96	± 8	70	
2015	5,930	78	93	22	1	0	194	18%	452	42%	419	39%	1,065	1,236	17	26	43	± 4	93	± 7	65	

**2016 HUNTING SEASONS  
NORTH NATRONA MULE DEER HERD (MD759)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
34	1	Oct. 15	Oct. 31	200	Limited quota	Antlered deer
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2015
34	1	+50

**Management Evaluation**

**Current Postseason Population Management Objective:** 4,700

**Management Strategy:** Special

**2015 Postseason Population Estimate:** 3,700

**2016 Proposed Postseason Population Estimate:** 3,800

**2015 Hunter Satisfaction:** 77% Satisfied, 14% Neutral, 9% Dissatisfied

The North Natrona Mule Deer Herd Unit has a postseason population management objective of 4,700 mule deer. The herd is managed using the special management strategy, with the goal of maintaining postseason buck ratios between 30-45 bucks per 100 does. The objective and management strategy was formerly reviewed and revised in 2014. Prior to this review, the population objective was 6,500.

**Herd Unit Issues**

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

## **Weather**

The winter of 2010-2011 was severe throughout the herd unit, resulting in above average mortality of mule deer. Severe drought conditions persisted from spring 2011 through winter 2012, which had a negative impact on deer reproductive success and fawn survival. The spring and summer of 2013 were cool with significant precipitation, but habitat conditions remained poor in portions of the herd that received less spring and summer rain. Heavy precipitation during the fall of 2013 caused a beneficial late green-up that provided improved forage for mule deer entering the winter season. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. The spring and summer of 2014 undeniably produced improved range conditions that benefitted deer, and fawn production reached a historic high. The winter of 2014-2015 was relatively mild with good overwinter survival of mule deer, while the spring and summer of 2015 remained above average in terms of precipitation and range condition. Fawn production was again high in 2015, as range conditions and nutritional status of does were improved for the second year in a row. 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 2015. Anecdotal observations during the summer 2014 & 2015 growing seasons suggest range conditions were above average, following extremely poor conditions that prevailed in 2012-2013. Herbaceous forage species were observed to be in very good condition in 2015 compared to previous years, and mule deer appeared to be in excellent body condition by winter 2015.

## **Field Data**

From 2006-2013, fawn production/survival was moderate to poor, and reached a 15-year low in 2012. Fawn production improved strikingly in 2014, reaching a historic high of 96 per 100 does. Fawn production was quite high again in 2015, with an observed fawn ratio of 93 per 100 does. Mild winter weather and excellent growing seasons helped to improve conditions for fawns and lactating does both years. Overwinter survival of fawns appeared to improve in 2014 & 2015 as well, as evidenced by higher yearling buck ratios.

Buck ratios for the North Natrona Herd historically average in the mid 30s per 100 does. However, buck ratios declined in 2012-2013 to the lower cusp of special management. Yearling buck ratios were extremely poor during the same period, indicating poor recruitment and slowing

the recovery of mature buck ratios. Hunter satisfaction was also relatively low for this herd unit in 2012 to 2013 (~68%), as hunters have high expectations of buck quality and availability within this special management area. Managers reduced Type 1 licenses in 2014 & 2015 to improve hunt quality and reduce pressure on mature bucks. As a result, buck ratios rebounded to 38 per 100 does in 2014 and 43 per 100 does in 2015. Harvest success increased into the 80<sup>th</sup> percentile in both years, and hunter satisfaction increased to the 80<sup>th</sup> percentile as well. Management goals for 2016 are to maintain buck ratios within the range of special management while conservatively increasing license opportunity.

Since 2008, classified bucks have been further categorized based on antler size (see Table 1). The best distribution of mature buck classes was observed in 2010, with 46% Class I (small), 37% Class II (medium), and 18% Class III (large) bucks. Bucks classified in 2013 showed a marked decrease in antler quality compared to previous years. Bucks classified in 2014 showed similar distribution, with a slight shift from Class I to Class II. In 2015, increased recruitment within younger age classes increased the proportion of Class I bucks within the herd. While this herd has increased in size substantially due to high fawn production, there are two large cohorts of younger age-class bucks which will require a few years to mature to the point where most Type 1 license holders will pursue them. With hunter expectations high for trophy-quality hunting, managers view the current availability of trophy class bucks as further justification to maintain relatively low issuance of Type 1 licenses for the 2016 hunting season.

Bio-Year	Total Class N for HA	# Bucks Classified					Buck Ratios per 100 Females					
		Ylng	Class I	Class II	Class III	Total	Ylng	Class I	Class II	Class III	All Adult	Total
2008	1,023	59	111 (73%)	36 (24%)	5 (3%)	211	11	20	7	1	28	39
2009	1,009	51	87 (60%)	44 (31%)	13 (9%)	195	9	16	8	2	26	35
2010	905	47	55 (46%)	44 (37%)	21 (18%)	167	10	12	9	4	25	35
2011	760	52	64 (63%)	34 (33%)	4 (4%)	154	13	16	8	1	25	38
2012	868	36	91 (78%)	20 (17%)	6 (5%)	153	7	18	4	1	23	30
2013	637	28	60 (75%)	19 (24%)	1 (1%)	108	8	18	6	0	23	32
2014	1,033	51	84 (72%)	30 (26%)	2 (2%)	167	12	19	7	1	26	38
2015	1,065	78	93 (80%)	22 (19%)	1 (1%)	194	17	21	5	0	26	43

**Table 1.** Antler classification analysis for the North Natrona Mule Deer Herd Unit, 2008-2015.

## Harvest Data

Hunter success in the North Natrona Mule Deer Herd Unit is typically in the 70-80<sup>th</sup> percentile, and was 79% in 2015. Hunter days remained fairly average for this herd unit, at 6.4 days per animal, despite very low issuance of Type 1 licenses. Survey totals, comments from hunters and landowners, and population modeling all indicate this herd has grown modestly from 2013-present due to improved fawn production and lack of doe harvest. Thus, managers suspect hunters are being selective, as the herd has developed a reputation of having high quality mature bucks.

Tooth age data were collected from harvested bucks in the North Natrona Mule Deer Herd Unit in 2010 and 2013-2015 (see Table 2). It should be noted that changes in overall sample size between years are in part due to reductions in license issuance between sample years. Comparing data between years shows a consistency of hunter selection for mature bucks, with the average and median age remaining within prime age classes for mule deer. Average antler spread reported by hunters has also remained relatively consistent across sample years. Relatively static results for average and median age of harvested bucks suggests availability of mature bucks has remained constant due to adjustments in license issuance. Therefore, these tooth-age data indicate past and current management prescription has resulted in most hunters harvesting prime-age bucks, which is consistent with management strategy.

	2010	2013	2014	2015
<b>Average Age</b>	4.44	5.4	5.27	5.27
<b>Median Age</b>	4.5	5.5	4.5	4.5
<b>Average Antler Spread</b>	21.2	21.2	20	20.9
<b>Sample Size (N) =</b>	68	52	44	32

**Table 2.** Lab tooth age and antler spread data from Hunt Area 34 harvested mule deer, 2010, 2013-2015.

## Population

The 2015 postseason population estimate was approximately 3,700, which represents an increase of approximately 300 deer since postseason 2014. No sightability or other population estimate data are currently available to further align the model in conjunction with postseason classification and harvest data. This herd does not typically exhibit abrupt changes in population size. It tends instead to remain relatively stagnant over the long term due to moderate fawn production, conservative license issuance, and fair habitat and weather conditions. Managers, hunters, and landowners believe this herd has grown at a quicker pace in the last two years due to improved fawn production.

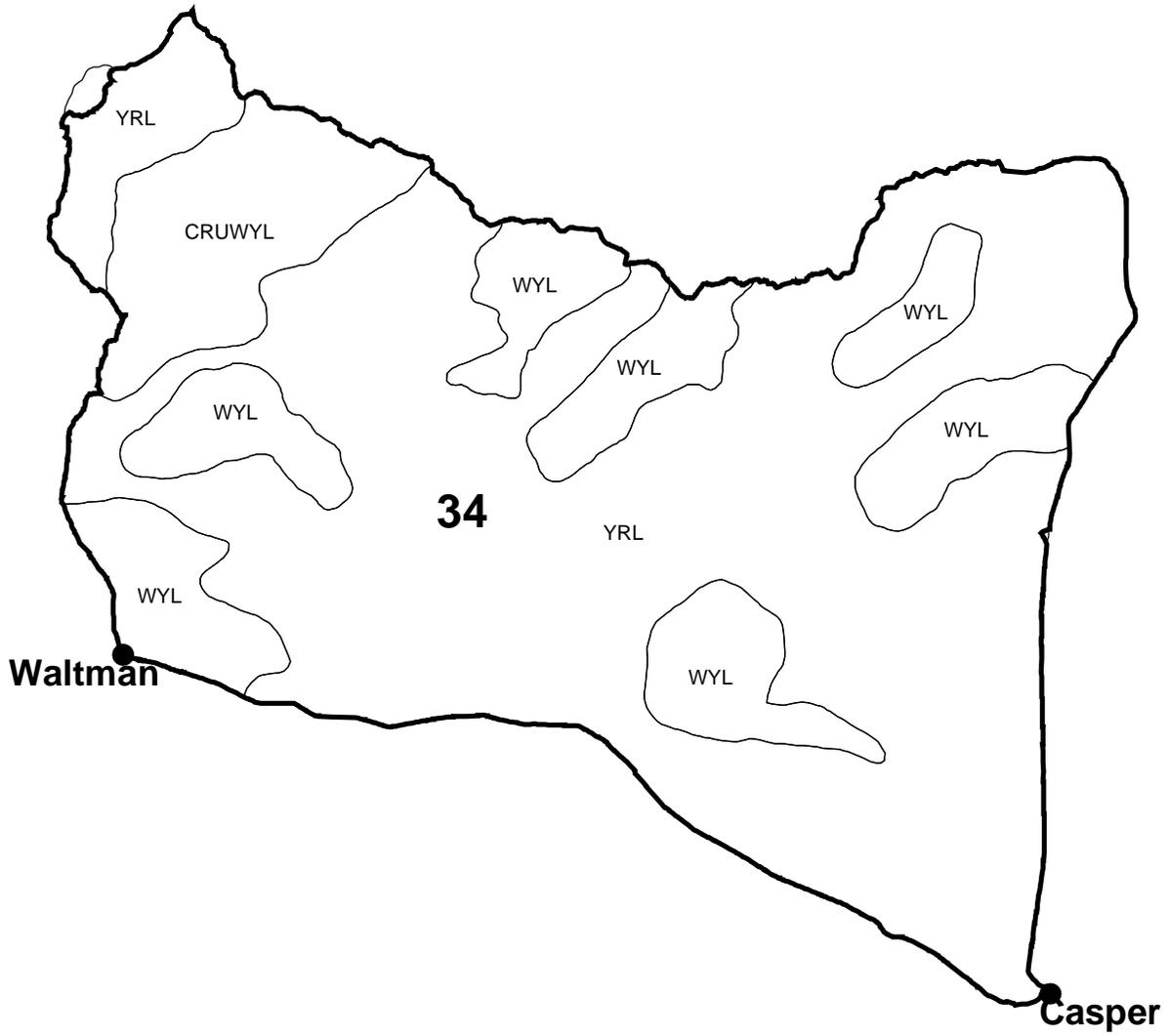
The “Time-Specific Juvenile Survival – Constant Adult Survival” (TSJ,CA) spreadsheet model was chosen for the postseason population estimate of this herd. This model appears to be most representative of trends within the herd, especially during the years represented in middle portions of the model. More current years in the model may predict population size with less accuracy, as they need additional years of data to attenuate. Modeling this herd can be difficult, as harvest regimes are biased toward bucks and the model assumes unbiased harvest across age and gender as well as consistent hunter effort. The TSJ,CA model selects an adult survival rate that is very reasonable for this herd, but only if the juvenile survival rate is increased slightly. The lower constraint for juvenile survival was thus increased from 0.4 to 0.5. Managers believe this to be an acceptable adjustment, as it is small and accounts for slightly milder habitat and winter conditions, and produces a trend that tracks with observed trends. The CJ,CA and SCJ,SCA models both predict an exponential rate of population growth in the herd from 2013-2016 that does not correspond to observations in the field. While fawn ratios have been quite high in the herd for the past two years, managers have observed moderate population growth rather than an exponential increase in the total number of deer. Though it is certainly possible this herd is larger than the TSJ,CA model estimates, it is unlikely to have reached totals estimated by the CJ,CA and SCJ, SCA models. 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 TSJ,CA model is considered to be of fair quality in representing population trends and estimates for this herd based on established model criteria.

### **Management Summary**

Traditional season dates in this herd run for two weeks from October 15<sup>th</sup> through October 31<sup>st</sup>. The 2016 season follows the same season dates with 200 Type 1 licenses. While population size and buck ratios have improved, distribution of mature bucks across antler classes is still mediocre. Thus, larger increases in license issuance are not yet warranted. Managers will moderately increase opportunity while maintaining high harvest success and hunter satisfaction. This prescription should also allow an additional year for bucks to progress into older age classes. Type 6 licenses were eliminated in 2014, as there are currently no complaints of damage from mule deer.

If we attain the projected harvest of 140 mule deer with fawn ratios similar to a 5-year average, this herd will increase slightly in size. The predicted 2016 postseason population size of the North Natrona Mule Deer Herd is approximately 3,800 animals, or 21% below objective.

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



## 2015 - JCR Evaluation Form

SPECIES: White tailed Deer  
 HERD: WD706 - BLACK HILLS  
 HUNT AREAS: 1-6

PERIOD: 6/1/2015 - 5/31/2016  
 PREPARED BY: JOE SANDRINI

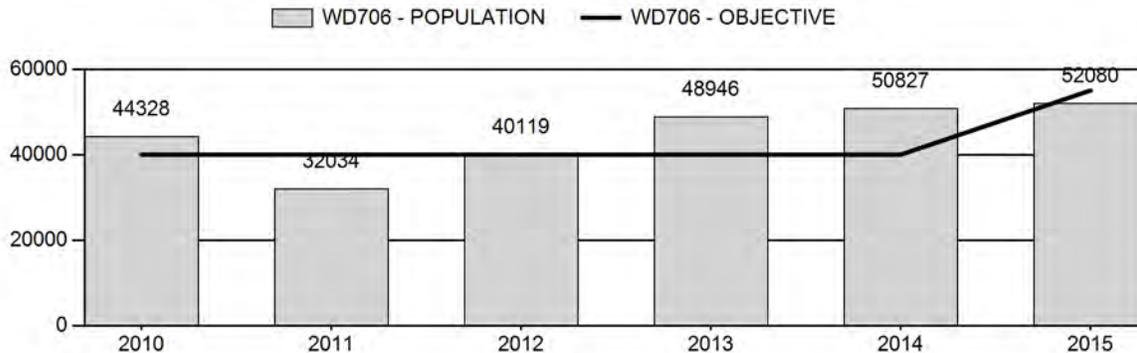
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	43,251	52,080	53,100
Harvest:	3,891	6,001	7,800
Hunters:	6,701	8,474	10,850
Hunter Success:	58%	71%	72 %
Active Licenses:	7,088	9,057	11,700
Active License Success:	55%	66%	67 %
Recreation Days:	29,019	34,231	44,200
Days Per Animal:	7.5	5.7	5.7
Males per 100 Females	25	29	
Juveniles per 100 Females	71	85	

Population Objective (± 20%) : 55000 (44000 - 66000)  
 Management Strategy: Recreational  
 Percent population is above (+) or below (-) objective: -5.3%  
 Number of years population has been + or - objective in recent trend: 0  
 Model Date: 02/18/2016

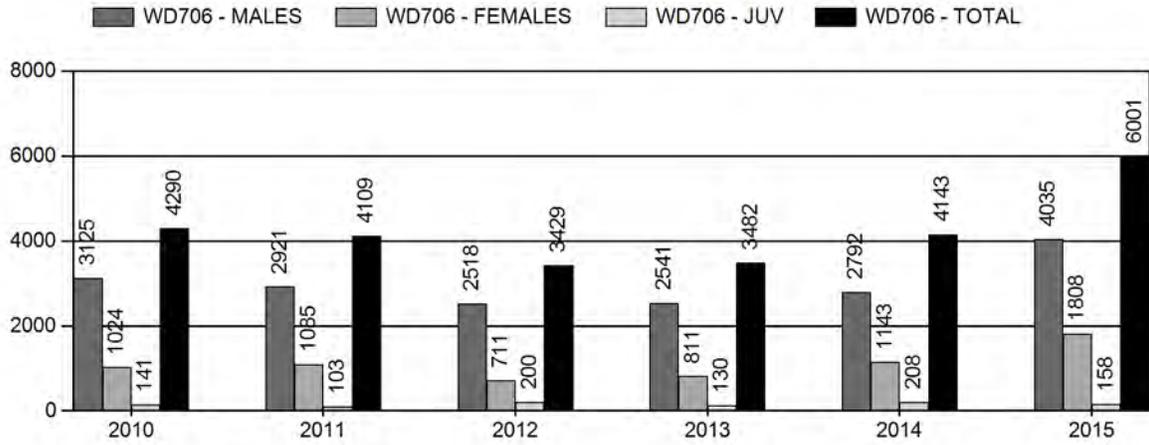
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	7.7%	11.5%
Males ≥ 1 year old:	39.4%	37.9%
Juveniles (< 1 year old):	0.8%	1.4%
Total:	11.2%	13.9%
Proposed change in post-season population:	+2.5%	+1.9%

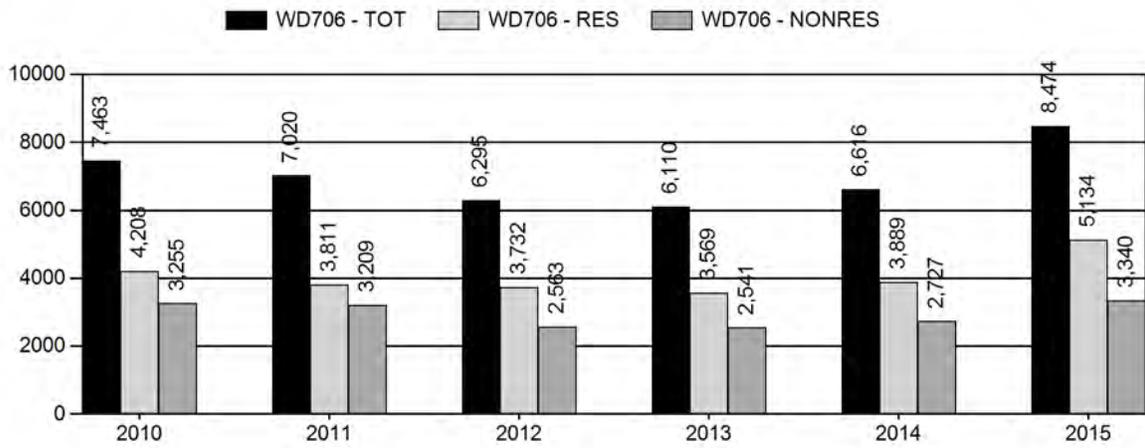
## Population Size - Postseason



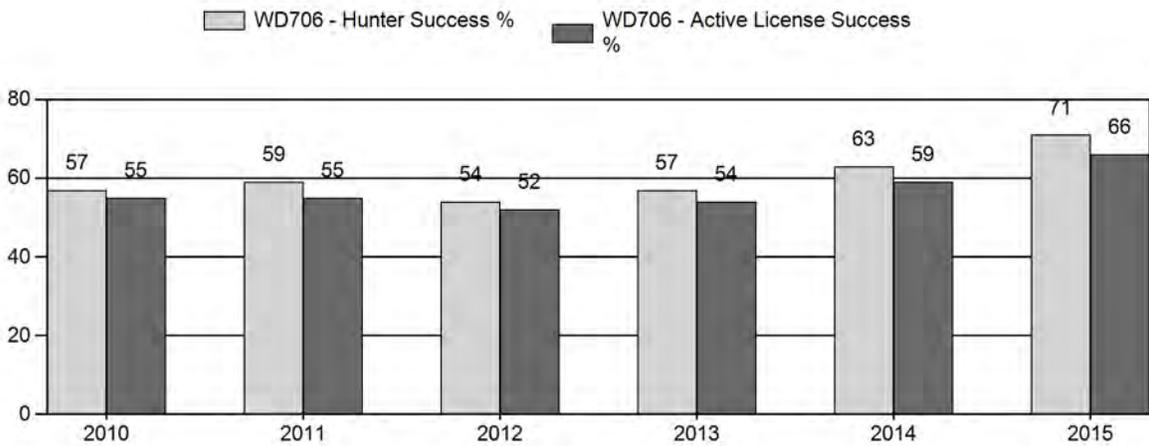
# Harvest



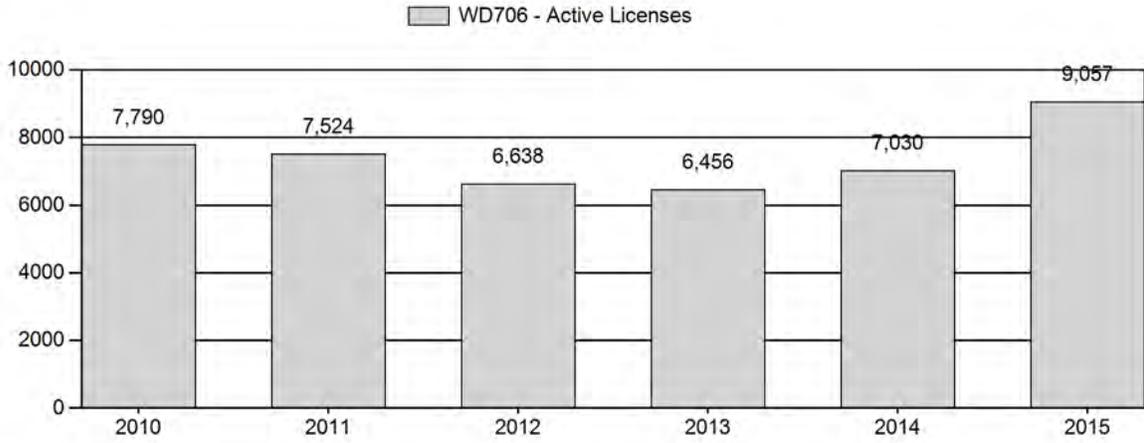
# Number of Hunters



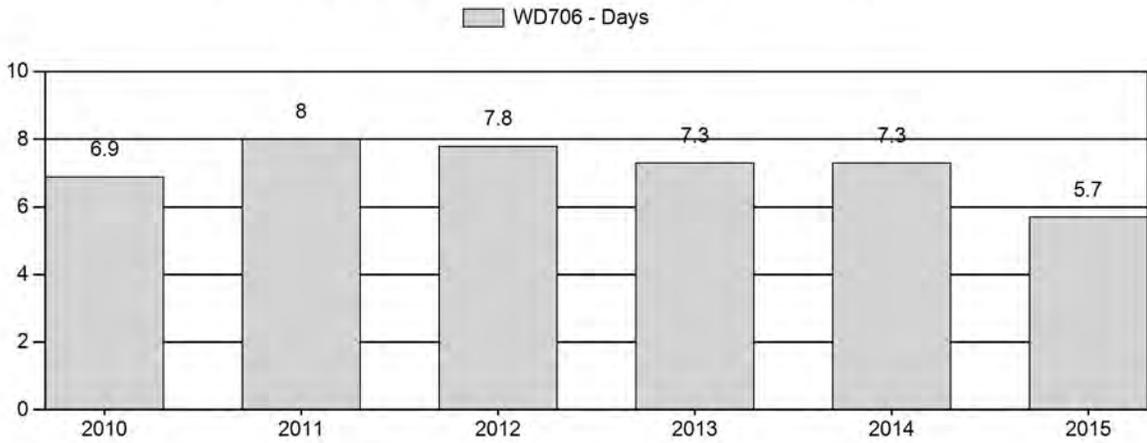
# Harvest Success



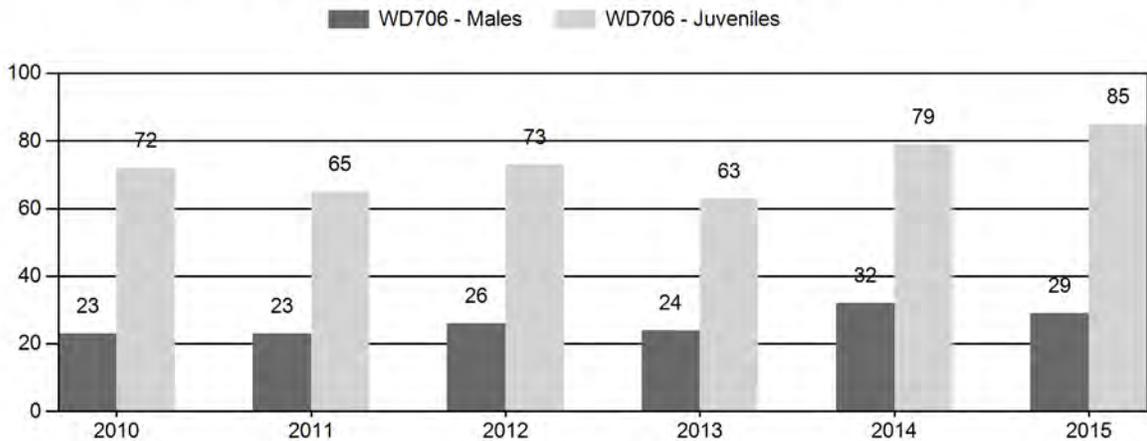
# Active Licenses



# Days Per Animal Harvested



# Preseason Animals per 100 Females



## 2010 - 2015 Preseason Classification Summary

for White tailed Deer Herd WD706 - BLACK HILLS

Year	Pre 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
2010	49,047	93	232	325	12%	1,407	51%	1,016	37%	2,748	1,536	7	16	23	± 0	72	± 0	59
2011	36,554	48	149	197	12%	856	53%	559	35%	1,612	1,278	6	17	23	± 0	65	± 0	53
2012	43,891	93	143	236	13%	919	50%	675	37%	1,830	1,590	10	16	26	± 0	73	± 0	58
2013	52,709	163	153	316	13%	1,303	53%	827	34%	2,446	1,232	13	12	24	± 0	63	± 0	51
2014	55,385	111	198	309	15%	980	47%	778	38%	2,067	1,888	11	20	32	± 0	79	± 0	60
2015	58,681	157	212	369	14%	1,276	47%	1,079	40%	2,724	2,132	12	17	29	± 0	85	± 0	66

**2016 HUNTING SEASONS  
BLACK HILLS WHITE-TAILED DEER HERD (WD706)**

Hunt Area	Type	Dates of Seasons		Quota	License	Limitations
		Opens	Closes			
1		Nov. 1	Nov. 30		General	Antlered white-tailed deer off private land; any white-tailed deer on private land
1	7	Nov. 1	Nov. 20	100	Limited quota	Doe or fawn valid on private land
1, 2, 3	8	Nov. 1	Nov. 30	3,500		Doe or fawn white-tailed deer valid on private land
2		Nov. 1	Nov. 30		General	Antlered deer off private land; any deer on private land
2	6	Nov. 1	Nov. 30	500	Limited quota	Doe or fawn valid on private land
3		Nov. 1	Nov. 30		General	Antlered deer off private land; any deer on private land
4		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land, except the lands of the State of Wyoming's Ranch A property shall be closed
4	6	Nov. 1	Nov. 20	300	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	150	Limited quota	Doe or fawn
6		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

**Region A Nonresident Quota: 4,500**

## SUMMARY OF CHANGES IN LICENSE NUMBER<sup>1</sup>

Hunt Area	License Type	Quota change from 2015
1	7	<i>see MD751</i>
1,2,3	8	+ 1,500
2	6	<i>see MD751</i>
4	6	<i>see MD751</i>
5	6	<i>see MD751</i>
<b>Herd Unit Totals</b>	<b>6</b>	<i>See MD751</i>
	<b>7</b>	<i>See MD751</i>
	<b>8</b>	<b>+ 1,500</b>
	<b>Region A</b>	<i>See MD751</i>

### Management Evaluation

**Current Management Objective:** 55,000

**Management Strategy:** Recreational

**2015 Postseason Population Estimate:** ~ 52,000

**2016 Proposed Postseason Population Estimate:** ~ 53,100

**2015 Hunter Satisfaction:** 82% Satisfied, 12% Neutral, 6% Dissatisfied

**HERD UNIT ISSUES:** In 2015, the management objective of the Black Hills White-Tailed Deer Herd Unit was revised to a post-season population of 55,000 white-tailed deer. Prior to this revision, an objective of 40,000 had been in place since 1983. The herd continues to be managed under the Department’s “Recreational Management Strategy,” which calls for 24 to 44 bucks per 100 does pre-season.

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

The Black Hills White-Tailed Deer Herd unit is located primarily within Crook and Weston Counties in northeastern Wyoming and encompasses about 3,140 mi<sup>2</sup> of occupied habitat. Seasonal range maps for this herd were updated in 2004, and currently 335 mi<sup>2</sup> are delineated as crucial winter range. Dominant land uses in the herd unit include livestock grazing and forage crop production. Most forested lands are actively managed for timber production and harvest. There is some extraction of minerals, primarily bentonite and oil. The majority of white-tailed

---

<sup>1</sup> Type 6 and Region A quota changes for Hunt Areas 1-6 are captured in the MD751 JCR.

deer are found in the eastern two-thirds of this herd unit and within the Belle Fourche River drainage where habitat is most favorable.

Approximately 79% of the land within this herd unit is privately owned. The largest blocks of accessible public land are found on the Black Hills National Forest in Hunt Areas (HA) 2 and 4, Thunder Basin National Grasslands in HA 6, and BLM lands in HA 1. Due to the late timing of deer hunting season in the Black Hills relative to other areas in Wyoming and the potential to harvest a whitetail on public land, this herd unit is extremely popular with resident hunters (hosting over 5,100 resident hunters in 2015). Its proximity to the upper Midwestern United States and availability of sympatric mule deer hunted concurrently also make it very popular with non-residents as well. Access fees for hunting are very common on private land, and many holdings have been leased to outfitters. Consequently, accessible public lands are subject to very heavy hunting pressure, probably the highest in the State. Due to limited access for hunters to private land, keeping the growth of this herd in check is difficult when habitat and weather conditions are favorable.

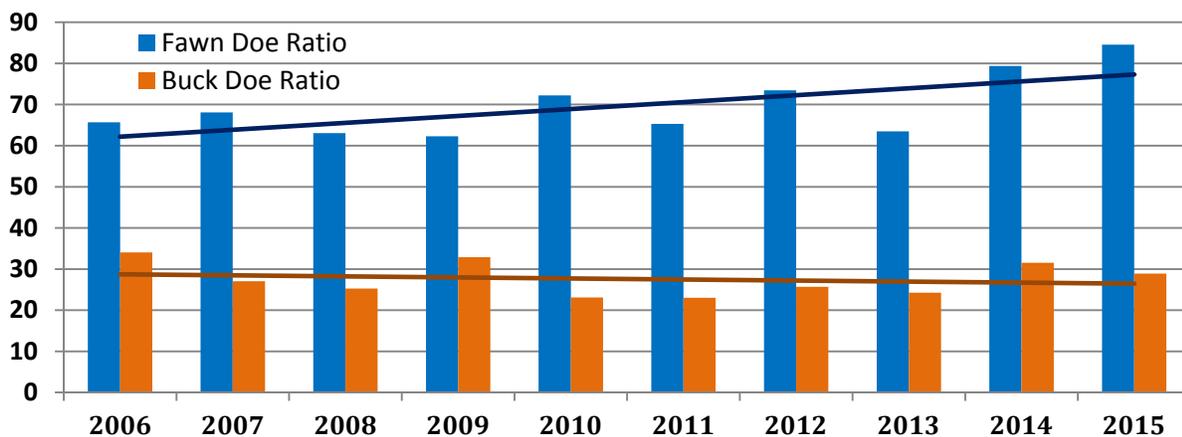
Whitetails are the most numerous deer species in HA's 2 and 4, whereas more equal proportions or greater numbers of mule deer occupy HA's 1, 3, 5, and 6 depending upon habitat type. A high proportion of white-tailed deer in the herd unit reside on private land. This results in their management being strongly influenced by landowner sentiments. Field personnel report white-tailed deer numbers (primarily north of I-90) are now growing close to local tolerance. A survey of about 450 Black Hills landowners at the end of 2014 revealed half of the respondents (52%) having whitetails on their property believed their numbers to be "about right;" while just over a third (35%) reported their numbers to be "too low;" and only 13% felt whitetail numbers were "too high." More recently, as this population has rebounded, fewer landowners are asking to see more deer on the landscape, hunter satisfaction has increased, and more landowners would like to reduce white-tailed deer numbers.

**WEATHER:** The second half of the last decade saw a transition from persistent drought to decent growing season moisture, while about average winter conditions persisted most years. This deer population peaked during that time and then began to decline. The weather may have contributed to the decline as peak populations coincided with the last couple years of an eight year drought, sending high populations into poor forage winters. This resulted in some detected mortality in late winter and early spring each year, most notably during the 2010-11 winter, which was severe. Drought returned to the Black Hills in 2012, with well above normal summer temperatures and little rainfall during the growing season. Forage production was very poor, and the dry conditions led to several large wildfires in the southern half of the herd unit. These warm and dry conditions continued until the spring of 2013 when temperatures dropped below normal and good precipitation was again received. As the growing season progressed, temperatures remained above average and precipitation above normal. This same pattern generally followed in 2014 and 2015, resulting in good to excellent forage growth each year. Fall and winter weather over the 2013-2015 timeframe was essentially characterized by normal to above average temperatures and average to below normal precipitation (<http://www.ncdc.noaa.gov/cag/>). The only outstanding weather event of this period being winter storm "Atlas" experienced in October, 2013. This storm blanketed the Black Hills with anywhere from about a foot of wet heavy snow near Newcastle, to three feet on the Bearlodge, and over five feet near Cement Ridge. No large scale die-offs of mule deer were witnessed after this storm, but a few white-tailed deer mortalities on the National Forest were discovered.

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

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

**FIELD DATA:** Preseason age and sex classifications are conducted in this herd unit during the second half of October each year along standardized routes. Most of these routes have been used for over 40 years. Since the 1980's, fawn production and survival has been generally below that observed in most white-tailed deer herds, and at times fluctuated dramatically. The underlying cause is thought to be related to nutrition and body condition of does. However, over the last 10-years observed fawn:doe ratios have generally trended towards improvement (Figure 1), likely a result of vegetative responses to fire enhancing forage conditions. Further, observed fawn:doe ratios during this time did not fluctuate as drastically as during the previous decade and a half.



**Figure 1. Observed, preseason fawn:doe and buck:doe ratios in the Black Hills White-Tailed Deer Herd (2006-2015).**

This herd's observed, preseason buck:doe ratios are at the lower end of the Department's recreational management criteria. It should be noted, however, that classifications are made

outside the rut, and because whitetails are secretive we have always modeled this herd's preseason buck:doe ratio about 30% above observed values. This corrective factor was determined from historical modeling efforts with POP-II and the inflation in buck:doe ratios needed to get those models to run given harvest levels of bucks. Additionally, there have been occasional years when observed buck ratios inexplicably jumped about 30% (something attributed to intermittently enhanced visibility of bucks). Overall, preseason buck:doe ratios the past ten years have been generally stable ( $\text{mean}_{(06-15)} = 28:100$ ;  $\text{std. dev} = 4.1$ ), but do exhibit a slightly declining trend (Figure 1). General stability in the buck:doe ratio between 2010 and 2013 is thought to have been the result of substantial reductions in buck hunting pressure while this population declined and non-hunting mortality increased. The recent, observed increases in the preseason buck:doe ratio have probably been due to a combination of transient, enhanced visibility (2014) and increased fawn production and survival (2015).

**HARVEST DATA:** In the Black Hills, deer management entails regulating both mule deer and whitetail harvest under General License season structures across a variety of habitats and habitat conditions, and with serious deference given to landowner desires. Historical analysis of harvest information suggests hunter number has the greatest impact on buck harvest. Therefore, buck harvest has been regulated by altering non-resident hunter participation 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 in HA's 1, 2, & 3. This alteration of season length impacts resident hunter participation by encouraging or curtailing the late season influx of hunters during a period when buck deer are highly vulnerable to harvest. For example, when the 30-day white-tailed deer hunting season was reinstated in these hunt areas during 2015, resident hunter numbers increased 34% above the average number witnessed the five preceding years when shorter seasons were in place.

When conservative hunting season structures were in place between 2010 and 2013, harvest of both antlered and antlerless whitetails dropped. In 2014 and 2015, as this herd began to recover, doe/fawn license issuance was increased and buck harvest climbed with increases in the Region A quota and resident hunter participation. As a result, the total harvest in 2014 was about 8% above that of 2013; and the 2015 harvest 45% greater than 2014. Additionally, after a five year period of fairly consistent harvest success, both hunter success and active license success climbed in 2014, and again in 2015. Overall, harvest statistics strongly support the current population model's projection that this population peaked in 2007, declined substantially into 2011, and has since increased.

Hunting seasons between 2010 and 2014 reduced harvest of whitetail bucks on average about 30% from that experienced during the traditional November season the preceding four years. Comparing these time periods, resident harvest of white-tailed bucks dropped about 20%, while non-resident harvest of white-tailed bucks dropped closer to 40%. As mentioned above, resident hunter number increased by about 34% (1,250 hunters) in 2015 as the white-tailed deer hunting season was extended to the entire month of November in HA's 1, 2, & 3. Likewise, the Region A quota increased 27% in 2015 putting an additional 600<sup>+</sup> General License hunters on the ground. As a result, white-tailed buck harvest rose 45% in 2015 to 4,035.

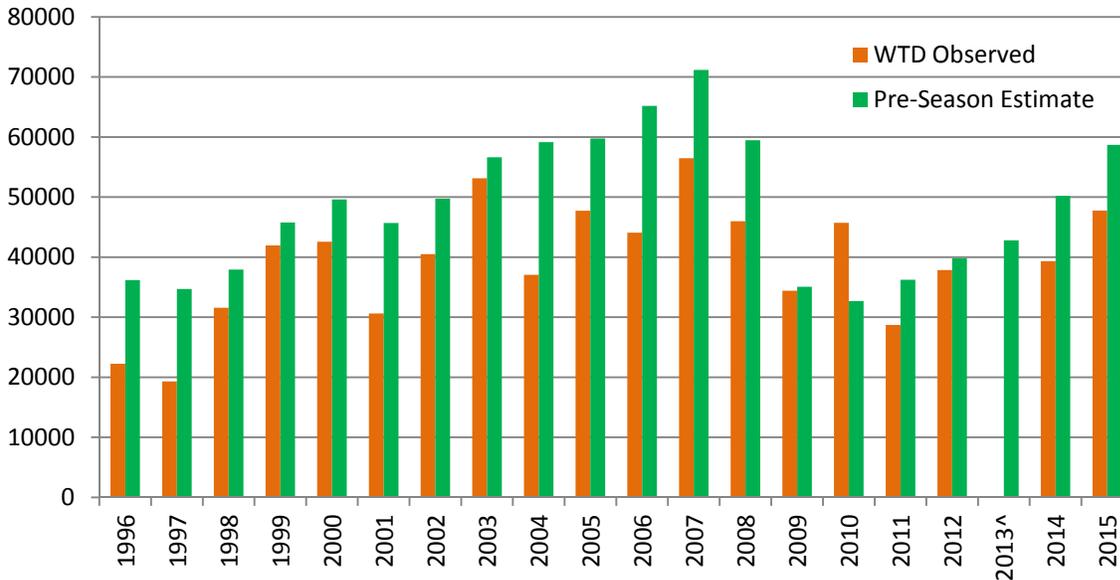
Despite the harvest trends, preseason whitetail buck:doe ratios held fairly stable and deer hunter satisfaction remained essentially unchanged between 2011 and 2013, with about 68% of white-

tailed deer hunters reporting they were either satisfied or very satisfied with their Black Hills deer hunt, and only around 15% indicating they were either dissatisfied or very dissatisfied. Satisfaction improved in 2014 as hunter success climbed and effort dropped, with 75% of the white-tailed deer hunters reporting they were satisfied with their Black Hills deer hunt and only 10% reporting negative satisfaction. With continued good hunter success and declines in the effort required to harvest a deer, improved hunter satisfaction was again exhibited in 2015, as 82% of the white-tailed deer hunters affirmed they were satisfied, while only 6% logged dissatisfaction.

**POPULATION:** As noted above, population modeling of this herd has always been difficult and fraught with problems. In 2014, the spreadsheet model for this herd was reconstructed and re-initiated after correcting errors detected in the previous model and experimenting with models of various constructions. Of the final three competing spreadsheet models, the Semi-Constant Juvenile / Semi-Constant Adult survival (SCJ SCA) model was selected to estimate this population. The present model was set to solve only on years for which field data were available (1993-2015) and used to project 2016 populations.

While the Constant Juvenile / Constant Adult survival (CJ CA) model will function with this herd's observed data set, it produces an essentially stable population of about 85,000 deer since 1993, which does not comport at all with field observations or harvest statistics. The AICc of this model is also about double that of the competing models and it most poorly fits observed data. On the other hand, the Time Sensitive Juvenile / Constant Adult survival model (TSJ CA) yields the lowest AICc value and best fit. However, this model was rejected because in order to get it to function, juvenile survival rates had to be allowed to vary down to 25% in 6 out of 23 years, and it predicts very low (about 33%) survival in five other years. Additionally, this model is not correlated well with trend data or harvest statistics. Instead, the preseason population estimates produced by the SCJ SCA model are much better correlated with hunter success (88% compared to 45% with the TSJ CA model). Similarly, preseason population estimates of the SCJ SCA model exhibit a 68% inverse correlation with hunter effort, while the TSJ CA model predictions are negatively correlated at only 45%. The SCJ SCA model is also about 75% correlated with preseason trend counts while the TSJ CA model is only 60% correlated (Figure 2). Finally, the trends produced by the SCJ SCA model are more congruent with field personnel and landowner perceptions. However, this model does indicate a substantial decline in the population in 2009 that was not actually realized until after the 2010/11 winter. Also on the flip side, the SCJ SCA model estimates a mean buck harvest rate of harvest rate of 40% since 2000, while the TSJ CA model produces a mean buck harvest percentage value of 31% (something more tenable). Therefore, due to the variety of factors identified, we consider the chosen model to be of poor quality, but better than the competing models.

According to the chosen spreadsheet model, this population grew 55% between 2001 and 2007. The population then declined 51% to its low point in 2011, before rebounding 64% through 2015. This projected peak, subsequent decline, and rebound in the population reflects overall field observations. However, as previously noted, by all accounts this population dropped steadily from 2007 through 2010, before dipping significantly in 2011 – a trend shown one year antecedent in the model's projections. If population estimates produced by the spreadsheet model are close to accurate, then our current objective is near landowner and yields excellent hunter satisfaction.



**Figure 2. 1996-2015 white-tailed deer, estimated preseason population and trend count data, increased by a factor of 10. <sup>^</sup> trend count not completed 2013.**

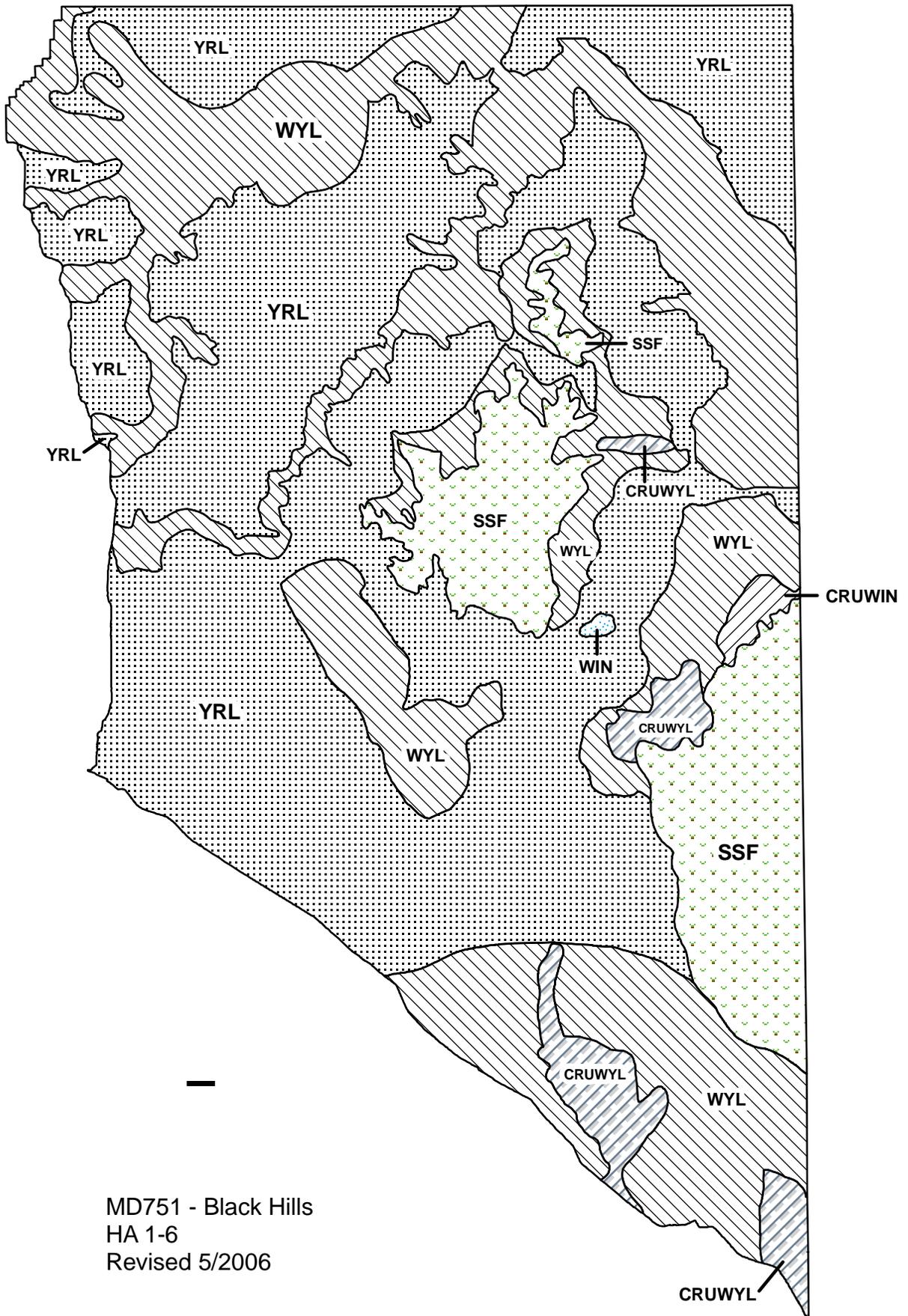
During the last population rise following a significant decline, hunting seasons in this herd unit were structured to retard growth, something that was only mildly successful. Population growth was reversed in 2007, but this directional change was due primarily to increased non-hunting mortality rather than enhanced harvest. Reductions in survival rates being most ostensibly attributed to increased over-winter mortality and EHDV outbreaks. Between 2007 and 2010, evidence also suggests the mountain lion population in the Black Hills reached historically high levels. As a result, elevated harvest, weather conditions, disease and increased predation acted in concert to reduce this population considerably. In response, hunting seasons were very conservative between 2010 and 2013, which allowed this herd to increase as reproduction and survival improved. As this herd has rebounded significantly in the past two years, hunting seasons again have been liberalized.

**MANAGEMENT SUMMARY:** Changes to the 2016 white-tailed deer hunting season in the Black Hills were designed to allow more generous harvest of bucks and increased take of antlerless white-tailed deer. The season structure also maintains the traditional November 30<sup>th</sup> closing date in Hunt Areas 1, 2, and 3, and that of November 20<sup>th</sup> in HA's 4, 5, & 6.

Whitetail buck numbers are improving and, based upon classification data and population estimates, there should be a strong cohorts of 1 and 2 year-old bucks available for hunters in 2016, along with a good contingent of 4 & 5 year-old bucks. As such, it seems prudent to liberalize buck harvest, something that also attracts more hunters into the area, many of whom also harvest does. White-tailed doe harvest needs to be encouraged now as we must stabilize this population. It is projected the increase in Region A license issuance and continuation of a 30-day season north of Interstate Highway 90 will increase buck harvest about 13% above the 2015 figure. But, even with this increase in buck harvest, the preseason buck:doe ratio should remain stable or increase slightly.

In order to help limit herd growth and allow landowners to be proactive in curbing increases in whitetail numbers, issuance of Type 8 doe/fawn white-tailed deer licenses valid on private land in HA's 1, 2, & 3 has been increased 75% for 2016. This follows a 67% increase in 2015 and a 50% increase in 2014. Availability of Type 6 & 7 doe/fawn licenses in HA's 1 & 2, which are valid for both mule deer and white-tailed deer on private land, have also been increased from a total of 250 licenses to 600. South of I-90, Type 6 license issuance in HA's 4 and 5 has been augmented from 250 to 450 total licenses.

The 2016 hunting season is expected to yield an estimated 2016 postseason population of about 53,100 white-tailed deer, which represents about a 2% increase in the current post-season population. These projections assume over-winter survival will be good and summer losses to EHDV minimal. Provided the change in population is reached, this herd would be 3% below objective and hopefully at a number of deer most hunters and landowners would like to see.





## 2015 - JCR Evaluation Form

SPECIES: White tailed Deer

PERIOD: 6/1/2015 - 5/31/2016

HERD: WD707 - CENTRAL

HUNT AREAS: 7-14, 21-22, 34, 65-67, 88-89

PREPARED BY: WILLOW STEEN

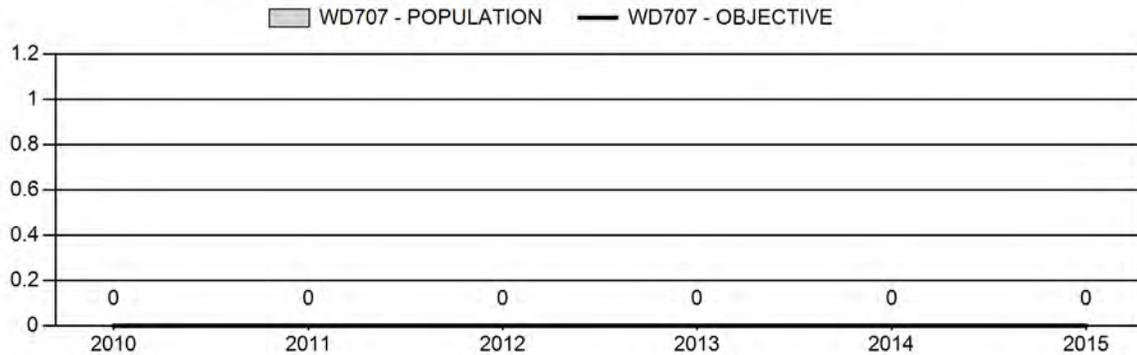
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	0	N/A	N/A
Harvest:	1,277	739	750
Hunters:	2,710	1,650	1,650
Hunter Success:	47%	45%	45 %
Active Licenses:	3,115	1,873	1,900
Active License Success:	41%	39%	39 %
Recreation Days:	13,368	7,074	7,200
Days Per Animal:	10.5	9.6	9.6
Males per 100 Females	34	48	
Juveniles per 100 Females	64	88	

Population Objective (± 20%) :	0 (0 - 0)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	N/A%
Number of years population has been + or - objective in recent trend:	0
Model Date:	None

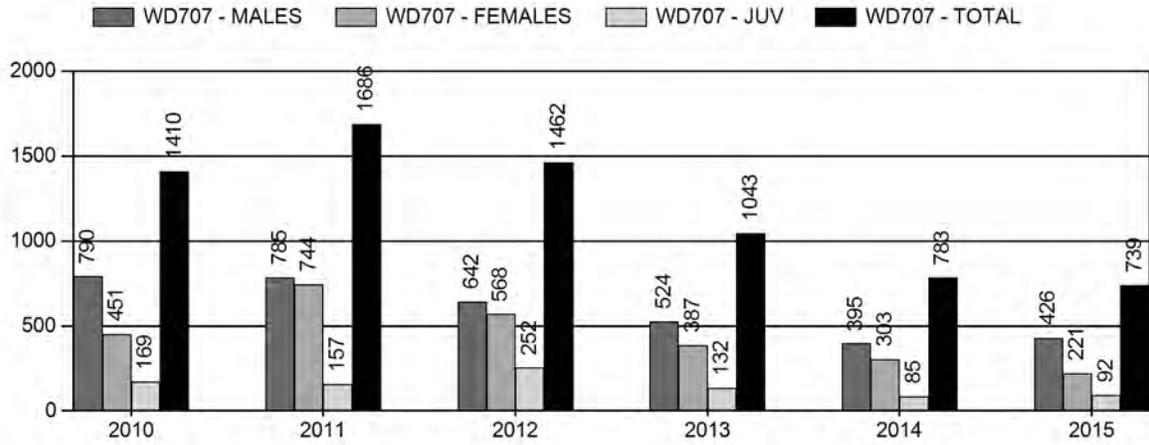
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

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

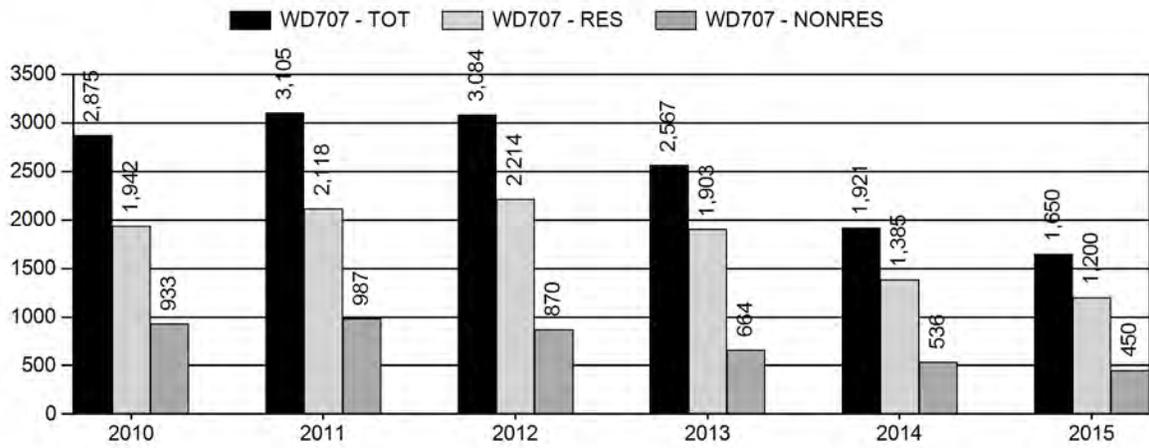
## Population Size - Postseason



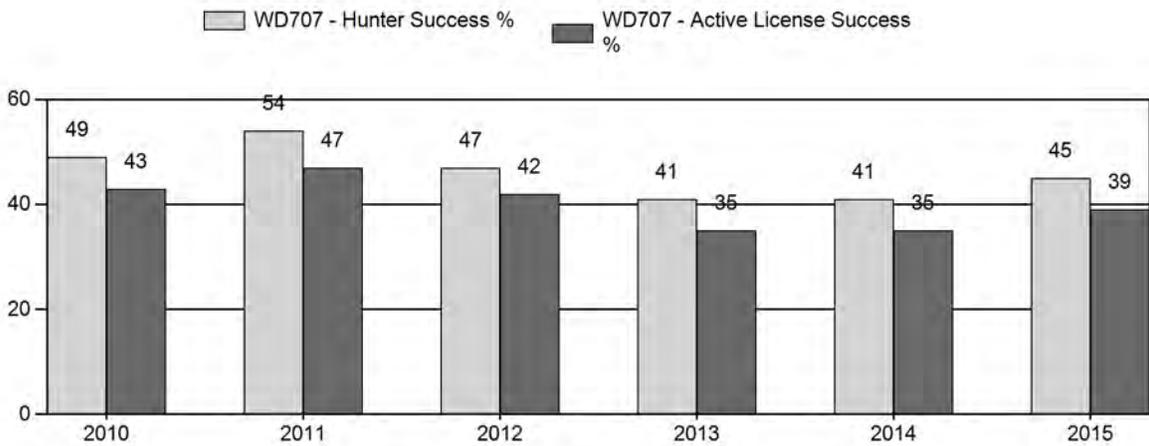
# Harvest



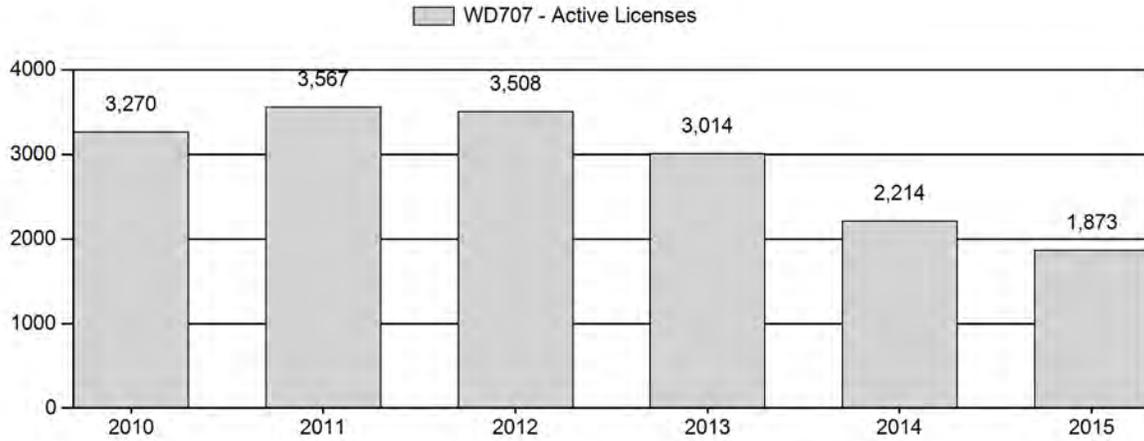
# Number of Hunters



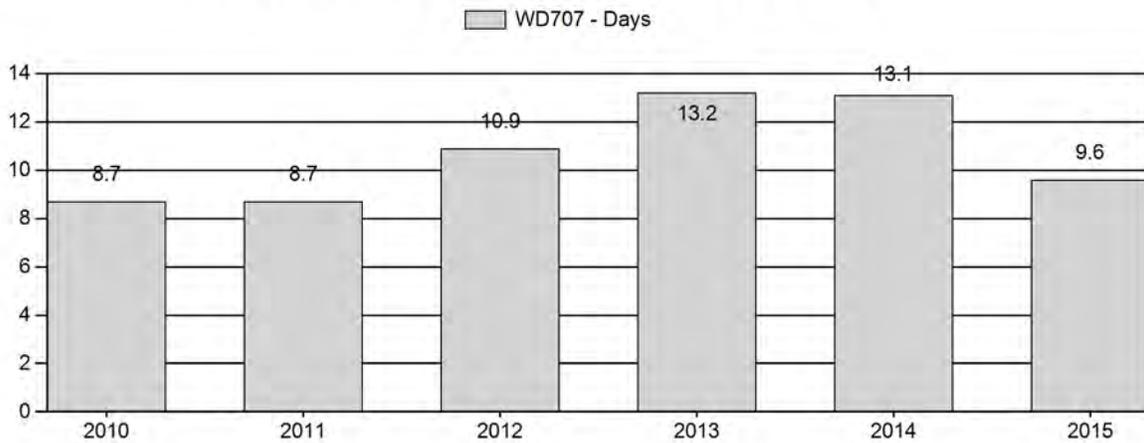
# Harvest Success



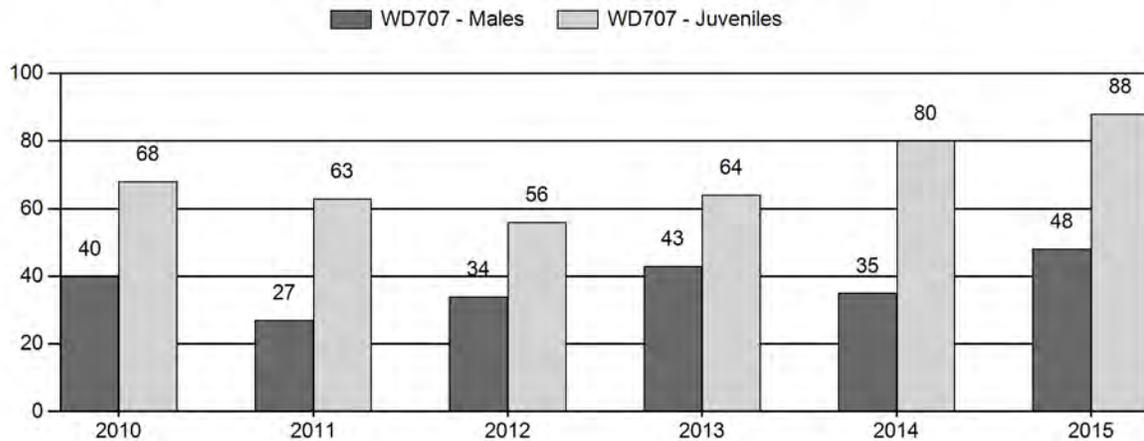
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



**2010 - 2015 Postseason Classification Summary**

for White tailed Deer Herd WD707 - CENTRAL

Year	Post Pop	MALES				FEMALES		JUVENILES		Tot CIs	Cls Obj	Males to 100 Females				Young to		
		Ylg	Adult	Total	%	Total	%	Total	%			YIng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2010	0	60	87	147	19%	372	48%	253	33%	772	0	16	23	40	± 0	68	± 0	49
2011	0	45	81	126	14%	467	53%	292	33%	885	0	10	17	27	± 0	63	± 0	49
2012	0	54	76	130	18%	381	53%	212	29%	723	0	14	20	34	± 0	56	± 0	41
2013	0	19	61	80	21%	188	48%	121	31%	389	0	10	32	43	± 0	64	± 0	45
2014	0	11	24	35	16%	100	47%	80	37%	215	0	11	24	35	± 0	80	± 0	59
2015	0	48	59	107	20%	223	42%	196	37%	526	0	22	26	48	± 0	88	± 0	59

**2016 HUNTING SEASONS  
CENTRAL WHITE-TAILED DEER (WD707)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
10,11,12 13,14	3	Oct. 1	Nov. 30	300	Limited quota	Any white-tailed deer
	8	Oct. 1	Nov. 30	300	Limited quota	Doe or fawn white-tailed deer
		Oct. 16	Nov. 30		General	Any white-tailed deer
22	3	Oct. 1	Nov. 30	50	Limited quota	Any white-tailed deer
	8	Oct. 1	Nov. 30	25	Limited quota	Doe or fawn white-tailed deer
34	3	Oct. 15	Nov. 30	25	Limited quota	Any white-tailed deer
65	3	Oct. 15	Nov. 30	150	Limited quota	Any white-tailed deer, also valid in that portion of Area 66 in Converse County
	8	Oct. 15	Nov. 30	100	Limited quota	Doe or fawn white-tailed deer, also valid in that portion of Area 66 in Converse County
66,88,89	3	Oct. 15	Nov. 30	50	Limited quota	Any white-tailed deer
66,88,89	8	Oct. 15	Nov. 30	25	Limited quota	Doe or fawn white-tailed deer
Archery						Refer to license type and limitations in Section 2

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

Hunt Area	License Type	Quota Change from 2015
65, 66	3	-200
	8	-100
65	3	+150
	8	+100
66, 88, 89	3	+25
<b>Herd Unit</b>	<b>3</b>	<b>-25</b>
<b>Total</b>	<b>8</b>	<b>0</b>

### **Management Evaluation**

**Current Management Objective:**  $\geq 20$  bucks:100 does postseason

**Management Strategy:** Recreational

**2015 Postseason Population Estimate:** NA

**2016 Proposed Postseason Population Estimate:** NA

**2016 Hunter Satisfaction:** 64% Satisfied, 19% Neutral, 17% Dissatisfied

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

### **Herd Unit Issues**

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

## **Weather**

In addition to EHD outbreaks, white-tailed deer likely experienced increased mortality in recent years due to the harsh winter conditions of 2010-2011 and the 2012 drought. In addition, such weather conditions were not conducive to good fawn productivity/survival over this time frame. Conditions improved in 2013 with adequate precipitation throughout the growing season and moderate winter conditions. Weather conditions throughout 2014 and 2015 produced above average precipitation, especially during the growing season, which resulted in excellent forage production throughout the herd unit. Improved forage, coupled with low competition for resources due to low white-tailed deer densities, yielded good fawn production and excellent body condition of white-tailed deer going into winter. The 2015-2016 winter has been moderate to date in the western portion of the herd unit, with above average precipitation and consistently cold temperatures which have maintained snow cover throughout most of the winter. However, snow accumulations were most likely not significant enough to limit access to forage. The eastern portion of the herd unit experienced mild winter conditions. Therefore white-tail deer should exhibit normal over-winter survival this winter.

## **Habitat**

This herd unit has no established habitat transects that measure growth and/or utilization on shrub species that are preferred browse of white-tailed deer. However, browse quality and availability were relatively high along riparian corridors as substantial moisture was received in 2014 and 2015. Anecdotal observations from field personnel noted above-average moisture conditions resulting in good browse and herbaceous forb conditions throughout the herd unit. Many landowners also reported improved conditions for irrigation of hay fields during the 2014 and 2015 growing seasons.

## **Field Data**

Fawn production is typically good for this herd, with ratios ranging in the 60-70s per 100 does. Observed fawn ratios were above average in 2014 and 2015 at 80 and 88 per 100 does, respectively. Still, this herd appears to be at a low point due to disease outbreak, harsh winters in 2010 and 2011, and the severe drought of 2012. This herd unit will require several more years of improved fawn production and survival before managers can expect any significant increase in population size.

Buck ratios for the Central White-tailed Deer Herd historically average in the mid 30s per 100 does, but occasionally swell into the 40s or drop into the 20s. In 2015 the observed buck ratio was 48 per 100 does, with 22 of those being yearling bucks. Observed ratios may vary from year to year due to differing levels of effort or success in sampling white-tailed deer during post-

season classification surveys. Buck ratios vary widely across the large variety of habitats in this herd unit as well. Additionally, white-tailed deer can be difficult to classify on private lands and in riparian cover, particularly bucks that may be solitary and elusive. Still, observed buck ratios have always met management objectives for this herd by remaining at or above 20 bucks per 100 does. However, postseason classification ratios in this herd should be viewed with caution as sample sizes are typically small and are not well stratified throughout the herd unit.

## **Harvest Data**

License success in this herd unit is typically in the 40-50<sup>th</sup> percentile, and was 39 percent in 2014. License issuance varies greatly between the many hunt areas contained within the herd unit. Hunters can typically take white-tailed deer on general licenses and also purchase additional limited quota licenses valid for any white-tailed deer or doe/fawn white-tailed deer. In recent years, reductions in limited quota white-tailed deer licenses have been made due to low deer densities, declining hunter success, and few complaints regarding damage on private lands.

White-tailed deer hunting opportunity peaked in 2011 with a total of over 3,100 hunters afield. Since then license issuance has been gradually reduced as the population and hunting access have decreased resulting in only 1,650 hunters afield in 2015. From 2011-2014, harvest success declined 26% while hunter effort increased 50%, although this trend is beginning to reverse in 2015 as harvest success and hunter effort were improved by 11% and 27%, respectively since 2014. Hunter comments in recent years reflect reduced access resulting from declining numbers of white-tailed deer in the herd unit. Many phone calls were received by Casper Region personnel from hunters seeking access for white-tailed deer hunting, as landowners with fewer deer turned hunters away. Additional comments were received via harvest surveys from hunters expressing their dissatisfaction as opportunity to hunt white-tails on private lands was low. Observations from field personnel, landowners, harvest statistics, and hunter comments all indicate this herd has declined considerably. As a result, licenses were cut significantly in recent years. While buck availability showed an increase in 2015, especially for yearling bucks, the overall population still appears to be low. Consequently, Type 3 and 8 license issuance will remain relatively conservative within this herd unit for 2016.

## **Population**

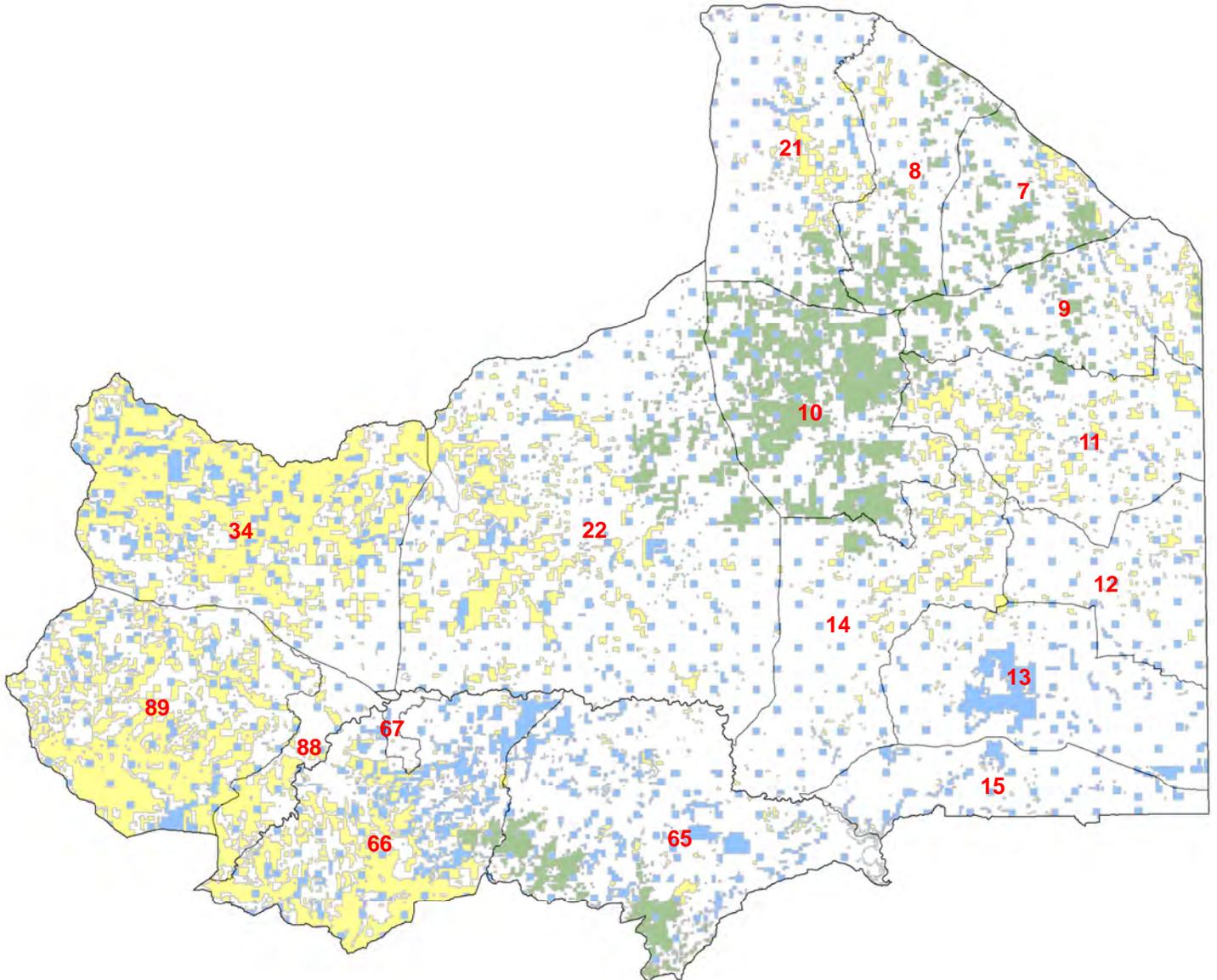
Currently there is no population model that accurately represents this herd. Therefore, management is based on maintaining postseason buck ratios with a goal of  $\geq 20$  bucks per 100 does. While field data indicates that buck ratios exceed this goal, this population has experienced significant decline in the past 5 years. However, this population has the potential to rebound rapidly when environmental conditions are favorable and presence of EHD is minimal.

## **Management Summary**

Traditional season dates in this herd vary from one hunt area to the next. Generally, white-tailed deer seasons run concurrently with October mule deer seasons, and are extended into November to maximize hunter opportunity and harvest. The 2016 season includes 575 Type 3 licenses, 450 Type 8 licenses, and additional opportunities to harvest white-tailed deer on General, Type 1, and Type 6 licenses. Some sportsmen have been expressing concern over white-tail numbers in Hunt Area 88. Since the bulk of whitetail licenses were used in Hunt Area 65 when it was combined with Areas 66, 88, and 89, this area was split off in order to manage slightly more conservatively in less populated white-tail areas. Area 65 Type 3 and 8 licenses were made valid for that portion of Area 66 in Converse County in order to allow sportsmen the ability to hunt both sides of Deer Creek. Areas 66, 88, and 89 are now hunted with one set of Type 3 and 8 licenses. Goals for 2016 are to maintain buck ratios, improve hunter opportunity, afford landowners the opportunity to address agricultural damage on private lands if necessary, and generally allow for population increase.

If we attain the projected harvest of 750 white-tailed deer with fawn production/survival similar to the five-year average, buck ratios should be maintained above 20 per 100 does.

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



## 2015 - JCR Evaluation Form

SPECIES: EIK

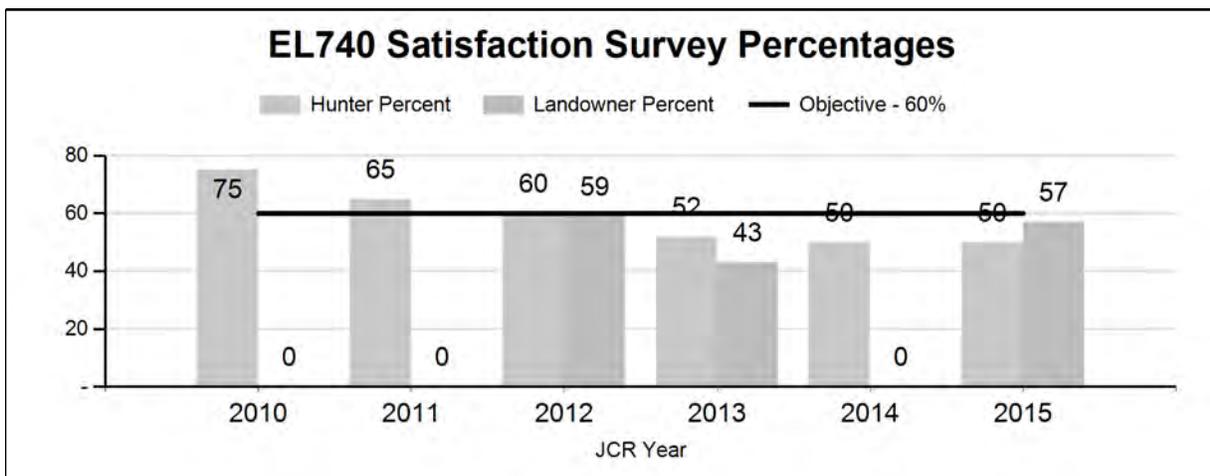
PERIOD: 6/1/2015 - 5/31/2016

HERD: EL740 - BLACK HILLS

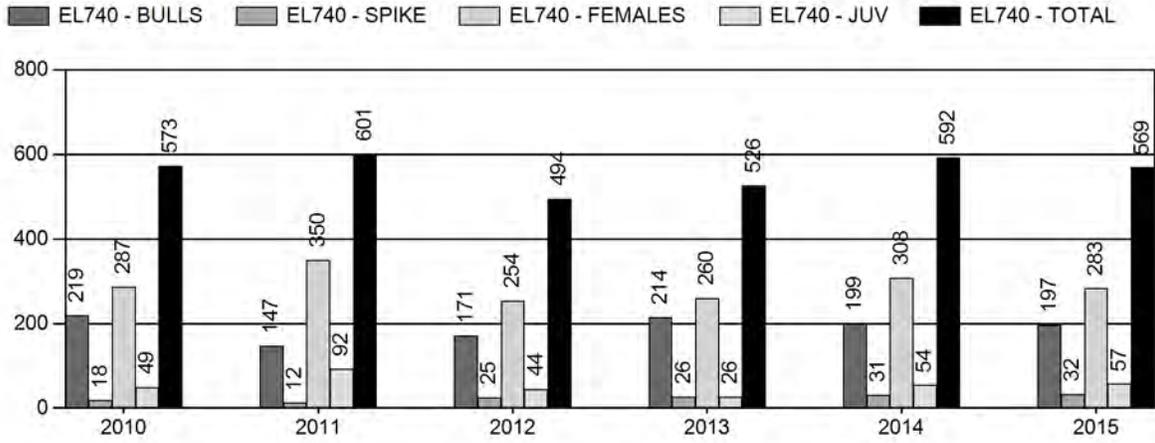
HUNT AREAS: 1, 116-117

PREPARED BY: JOE SANDRINI

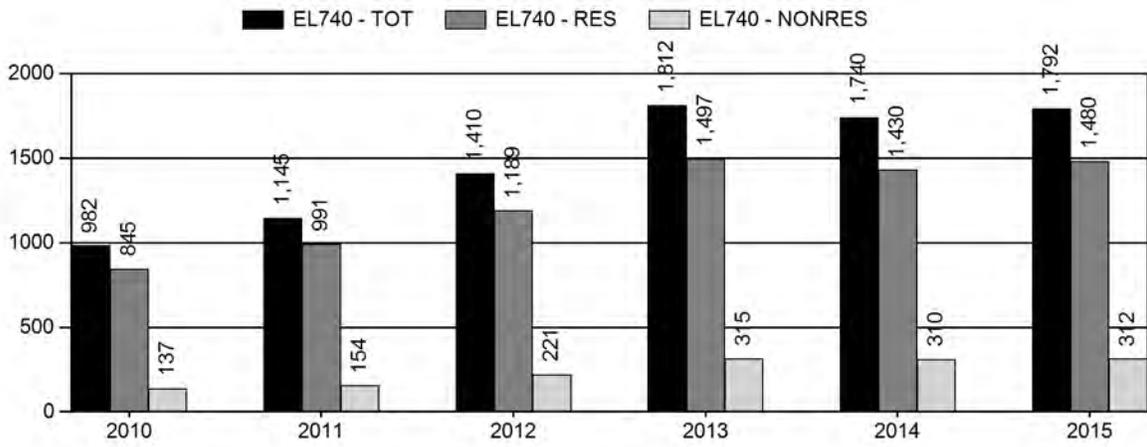
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Hunter Satisfaction Percent	58%	50%	60%
Landowner Satisfaction Percent	55%	57%	60%
Harvest:	557	569	565
Hunters:	1,418	1,792	1,775
Hunter Success:	39%	32%	32%
Active Licenses:	1,487	1,900	1,890
Active License Success:	37%	30%	30%
Recreation Days:	15,376	19,833	18,900
Days Per Animal:	27.6	34.9	33.5
Males per 100 Females:	29	0	
Juveniles per 100 Females	33	0	
Satisfaction Based Objective			60%
Management Strategy:			Private Land
Percent population is above (+) or (-) objective:			-6%
Number of years population has been + or - objective in recent trend:			3



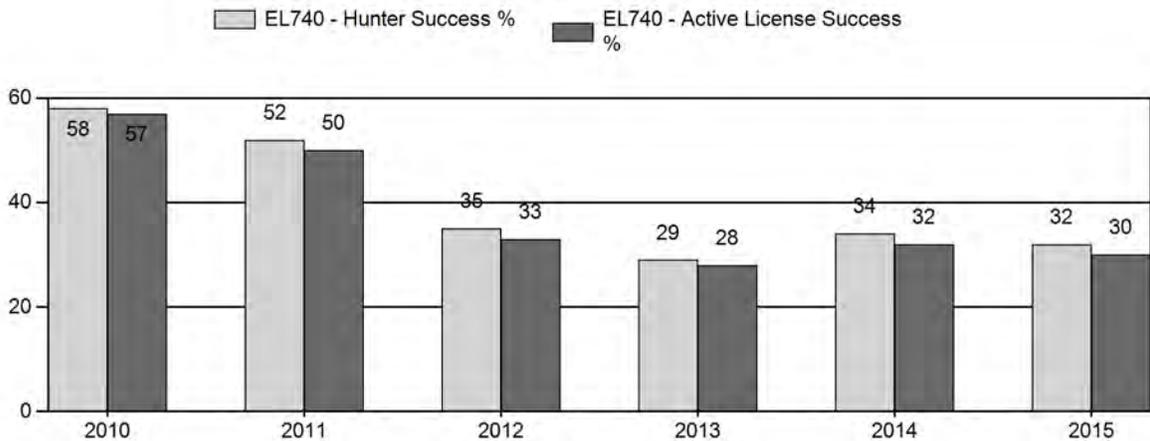
# Harvest



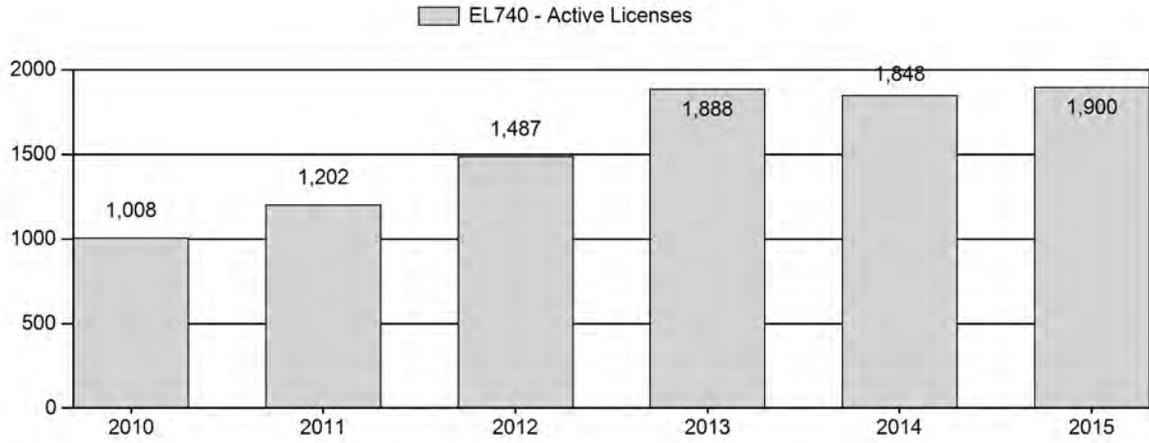
# Number of Hunters



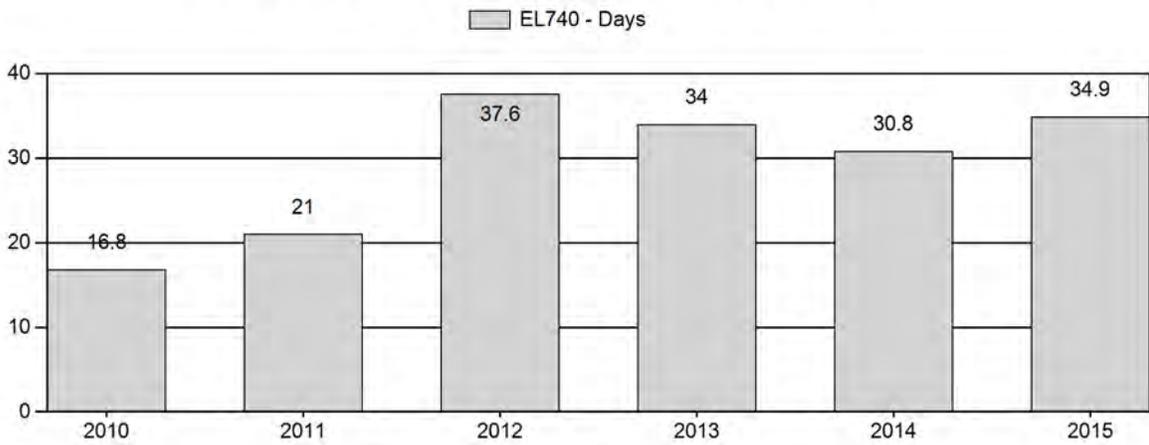
# Harvest Success



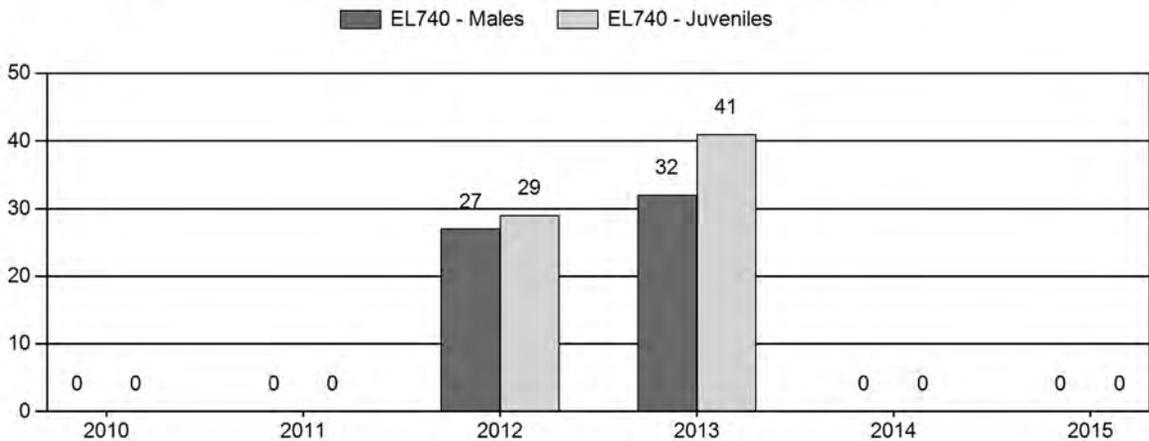
# Active Licenses



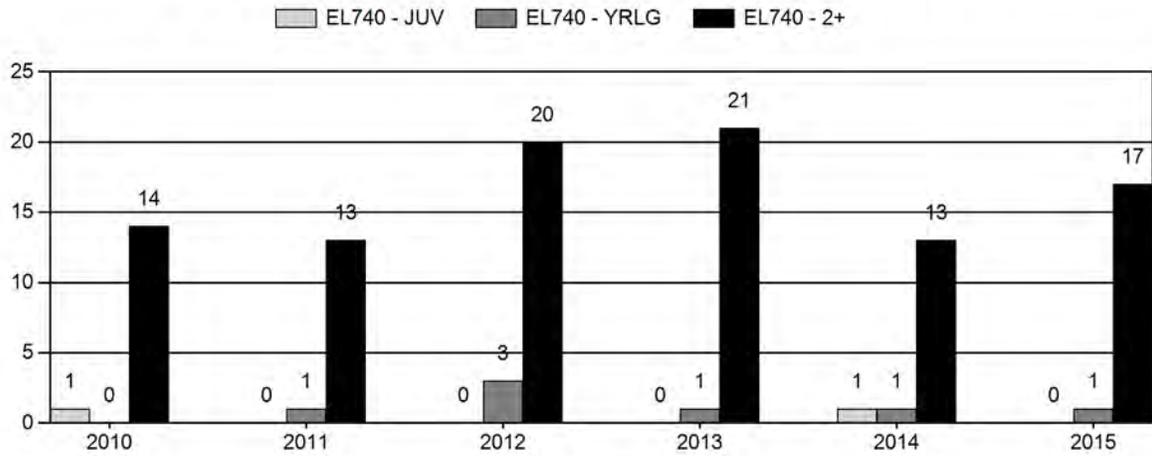
# Days per Animal Harvested



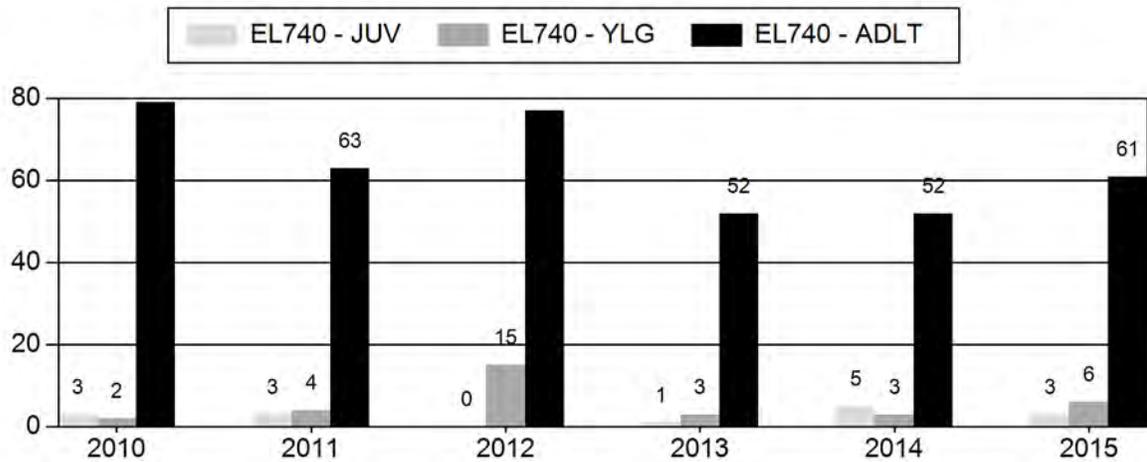
# Postseason Animals per 100 Females



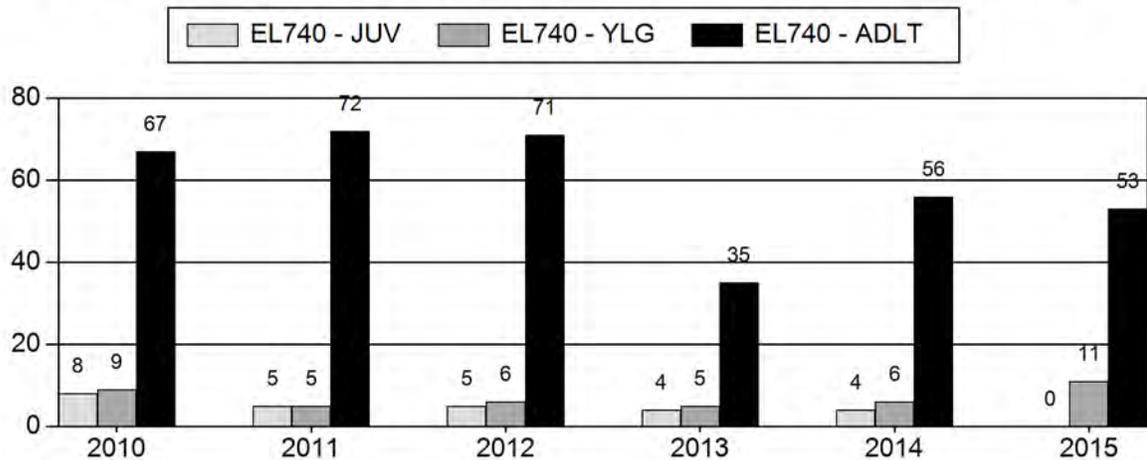
## Age Structure of Field Checked Males



## Age Structure Data (Field and Laboratory) - Male



## Age Structure Data (Field and Laboratory) - Female



### 2010 - 2015 Postseason Classification Summary

for Elk Herd EL740 - BLACK HILLS

Year	Post Pop	MALES				FEMALES		JUVENILES		Tot CIs	Cls Obj	Males to 100 Females				Young to		
		Ylg	Adult	Total	%	Total	%	Total	%			Ylg	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2010	0	0	0	0	0%	0	0%	0	0%	0	0	0	0	0	± 0	0	± 0	0
2011	0	0	0	0	0%	0	0%	0	0%	0	0	0	0	0	± 0	0	± 0	0
2012	0	32	32	64	17%	239	64%	69	19%	372	0	13	13	27	± 0	29	± 0	23
2013	0	19	24	43	19%	133	58%	54	23%	230	0	14	18	32	± 0	41	± 0	31
2014	0	0	0	0	0%	0	0%	0	0%	0	0	0	0	0	± 0	0	± 0	0
2015	0	0	0	0	0%	0	0%	0	0%	0	0	0	0	0	± 0	0	± 0	0

**2016 HUNTING SEASONS  
BLACK HILLS ELK HERD (EL740)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
1	1	Oct. 15	Nov. 30	100	Limited quota	Any elk
1	4	Oct. 15	Nov. 30	75	Limited quota	Antlerless elk
116		Oct. 15	Nov. 10		General	Any elk
116		Nov. 11	Nov. 30		General	Antlerless elk
116	6	Oct. 15	Jan. 31	250	Limited quota	Cow or calf
116	8	Aug. 15	Oct. 14	50	Limited quota	Cow or calf valid off national forest
117	1	Oct. 15	Nov. 30	275	Limited quota	Any elk
117	1	Dec. 1	Jan. 31			Antlerless elk
117	4	Oct. 15	Jan. 31	250	Limited quota	Antlerless elk
117	6	Oct. 15	Jan. 31	250	Limited quota	Cow or calf
117	8	Aug. 15	Oct. 14	50	Limited quota	Cow or calf valid off national forest

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

**SUMMARY OF CHANGES IN LICENSE NUMBER**

Hunt Area	Type	Change from 2015
<b>Herd Unit Totals</b>	1	none
	4	none
	6	none
	8	none

## **Management Evaluation**

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

**Management Strategy:** Private Land

**Secondary Management Strategy:** Age distribution of harvested bulls

**2015 Hunter Satisfaction Estimate:** 50%

**2015 Landowner Satisfaction Estimate:** 57%

**Most Recent 3-year Running Average Hunter Satisfaction Estimate:** 51%

**Most Recent 3-year Running Average Landowner Satisfaction Estimate<sup>1</sup>:** 50%

**2015 Postseason Population Estimate:** ~ 2,500 (*Field Estimate*)

**2016 Proposed Postseason Population Estimate:** ~ 2,500 (*Field Estimate*)

**HERD UNIT ISSUES:** The Black Hills Elk Herd Unit is managed for 60% or greater self reported landowner and hunter satisfaction. The management strategy is private land, with a secondary management objective seeking an annual bull harvest (based upon tooth age data) comprised of 20% aged ½ to 2 years old; 60% aged 3 to 5 years old; and 20% aged 6 years old, or older ( $\pm 5\%$  *in all categories*). These management objectives and strategies were adopted in 2013. Field personnel anecdotally estimated Wyoming's Black Hills elk population to number about 2,500 at the close of the 2015 hunting season.

It is neither possible to construct a population model, nor generate a population estimate for this herd as the Department has never been able to collect adequate classification data. Additionally, historic and more recent radio collar data show substantial numbers of elk regularly cross the Wyoming / South Dakota Stateline violating the closed population assumption of models (Simpson, 2015). Consequently, no attempts have been made to model this population since 1996. Instead, this herd was managed in an ad hoc fashion for two decades to provide ample recreational opportunity and address depredation complaints, as active elk management has been continually hampered due to constrained access to private land for hunting. As a result, the aforementioned non-numerical management objectives were adopted.

The Black Hills Elk Herd Unit is comprised of Hunt Areas (HA's) 1, 116, & 117. It is located in the northeast corner of Wyoming and encompasses approximately 3,270 mi<sup>2</sup>, of which 1,920 mi<sup>2</sup> are considered occupied habitat. Elk are not ubiquitous across occupied habitat either in time or space. Rather, they move about in relation to range conditions, snow depth and human activity, with some areas seeing regular elk use and others very infrequent use. Approximately 73% of the occupied habitat is private land, with the single largest block of public land being found on the Black Hills National Forest (BHNF), which contributes 14% of the occupied habitat. HA 1 is 95% public land, and represents the largest contiguous block of public land extensively inhabited by elk. Elk do occur on other portions of the Black Hills National Forest and dispersed sections of State and other federally owned lands. However, elk use and harvest in those areas are not consistent.

<sup>1</sup> Includes only data for bio-years 2013 & 2015 (see notes in text regarding 2013 value).

The adopted management framework for this herd states all landowners receiving landowner elk licenses and other landowners whose property see regular elk use, or have expressed an interest in elk management will receive a mail survey with prepaid response envelopes every three years; and annual, documented one on one visits (or an annual meeting with “key” landowners) will be conducted on non-survey years.<sup>2</sup> Landowner satisfaction with elk numbers was first quantified in the early spring of 2013 with the proposal to move to a non-numerical objective. At that time, 167 Black Hills landowners were mailed a short survey to gauge their satisfaction with elk numbers and quantify support for a non-numerical objective. A total of 71 landowners responded, and slightly more than 60% of these noted they were satisfied, very satisfied, or neutral with respect to elk numbers in the Black Hills. During bio-year 2013, 30 large landowners who regularly harbor elk, allow some level of hunting and often experience conflict with elk were individually contacted. 48% of these landowners reported being satisfied or very satisfied; one landowner reported “no opinion” - neutral responses were not solicited.

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

At the beginning of 2016, a mail survey was again sent to 167 landowners. Eighteen surveys were returned “undeliverable” and 75 completed surveys were received yielding an effective response rate of 50%. Of the responding landowners, 19% reported elk numbers were below, 56% at, and 25% above desired levels. However, when specifically asked about satisfaction, 44% reported being satisfied or very satisfied, 21% neutral, and 37% dissatisfied or very dissatisfied.<sup>3</sup> The reasons for dissatisfaction were: 44% felt elk numbers were “too low;” 22% thought elk numbers were “too high;” another 15% indicated elk causing damage (or a combination of damage and too many elk); and 11% indicated “other” reasons for dissatisfaction, such as not qualifying for landowner licenses. The majority of neutral respondents (60%) stated they had no strong feelings about elk numbers, and 33% were “happy the way things are,” while the remaining 7% were “unsure.” In summary, 64% of survey respondents were not specifically dissatisfied with elk numbers or management. Something that suggests we are closer to our management objective than the Department mandated satisfaction criteria indicate.

Landowner survey data demonstrate how difficult it is to broadly quantify landowner satisfaction in the Black Hills. Most of the properties are relatively small by typical Wyoming ranch standards, and many are not dependent on agriculture for profit. A significant portion of these of landowners enjoy having elk around and would like to see more, as would other non-traditional landowners who have purchased property for hunting. On the other hand, there are traditional

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

<sup>3</sup> Reported values rounded.

ranching landowners negatively impacted by elk and frustrated with the damage they cause. As such, these two contingents are diametrically opposed in what they desire in the way of elk numbers. The end result is conflict between the disparate positions, with both contributing to dissatisfaction.

In the normal course of duties, Department field personnel contact landowners on an almost daily basis. While these visits were not used to quantify satisfaction criteria during bio-years 2014 and 2015, consistently strong feelings relative to changing elk management have not been expressed. Occasional complaints about elk numbers were received from some landowners experiencing damage. However, no elk damage claims were made in the Moorcroft game warden district; while two claims were submitted in the Sundance district, resulting in payments totaling about \$2,100.00 for damage to growing alfalfa and wheat. In the Newcastle game warden district, a total of approximately \$7,400.00 was paid to two claimants for elk damage to growing crops. One of these was a continuation of previous, similar claims spawned in retaliation for law enforcement actions, and the other was to a landowner who also submitted one of the claims in the Sundance district. Overall, field personnel report ambivalence among the majority of landowners regarding elk management over the past two years, with some noting occasional conflicts and dissatisfaction with elk numbers, while others expressed real satisfaction with numbers or even a desire for more elk. To sum it up, the Department did not get consistent, serious complaints from landowners about the elk numbers or season structure. Given landownership patterns and cultural attitudes, annual damage claims will likely persist. However, with elk moving onto un-hunted private land adjacent to areas of depredation or into South Dakota, the situation is likely to remain unchanged no matter what is done to alter hunting season structure.

**WEATHER:** For the most part, winter weather and growing season conditions over most of the past decade seemed to have been neither detrimental, nor beneficial for Black Hills elk; but did result in occasional, localized depredation complaints in late December and early January some years. Severe drought did plague the Black Hills in 2012, and this resulted in very poor forage production and the led to several large wildfires. These warm and dry conditions continued through the 2012-13 winter. Spring of 2013 finally saw a break in this pattern when temperatures dropped below normal and good precipitation was again received. As the growing season progressed, temperatures were above average and precipitation well above normal. This same pattern was basically followed in 2014 and 2015, resulting in good to excellent forage growth each year. Fall and winter weather over the 2013-2015 timeframe was characterized by normal to above average temperatures, and average to below normal precipitation (<http://www.ncdc.noaa.gov/cag/>).

Based upon weather and habitat conditions observed over the past eight years, elk have likely entered most winters in good condition, except following the summer drought of 2012. Impacts of drought that year were revealed in data collected from radio collared cow elk along the Wyoming / South Dakota Stateline showing calf survival was lower in 2012 (0.65,  $n = 37$ , SE = 0.04) compared to 2013 (0.76,  $n = 34$ , SE = 0.08); and pregnancy rates of cow elk were significantly reduced in 2013 compared to 2012 [0.93 ( $n=40$ ) in 2012 and 0.66 ( $n=43$ ) in 2013] (Simpson, 2015). In summary, recent weather patterns have been generally favorable for elk.

However, fluctuations in weather patterns such as the 2012 drought and a few significant snow events have likely impacted herd demographics and exacerbated damage at times.

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

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

**FIELD DATA:** Collection of classification data was suspended in 1996, and only occasionally have limited classification data been garnered during other field activities. The limited data that have been collected over the years have generally mirrored larger samples collected in the Black Hills of South Dakota by SDGF&P. SDGF&P collects preseason classification data on elk every year, and since 2003 these data consistently yielded calf:cow ratios near 50:100, but more variable bull:cow ratios, which have averaged near 30:100 (South Dakota Department of Game, Fish and Parks, 2015). In 2015, no specific efforts were made by the WGFD to classify elk. However, the WGFD did partially fund SDGF&P's helicopter based late winter, hills-wide elk survey and population estimation efforts. This funding was used pay for SDGF&P's efforts that covered good portion of the occupied habitat south of Interstate Highway 90 (I-90) in Wyoming's HA's 1 & 117. This work detected a total of 923 elk in the portion of Wyoming surveyed. Of the elk observed, SDGF&P personnel were able to classify 516 (262 cows, 52 calves, and 202 bulls). The 407 unclassified elk were primarily large groups of cows and calves. SDGF&P also provided a population estimate of 1,091 elk with a 95% confidence interval of 988 to 1,521 in the portion of Wyoming they surveyed. It is hoped the data collected can eventually be used in future years to regularly estimate elk numbers in that portion of Wyoming south of I-90 harboring wintering elk, or at least provide good trend data.

While classification data are lacking, tooth age data have been collected from harvested elk most years since 1987.<sup>4</sup> Tooth age data can estimate annual recruitment by considering the percentage of yearlings in the female segment of the harvest (Figure 1). Since 1987, this figure has averaged<sup>5</sup> 16.2% (std. dev. 7.8%) suggesting annually between 8 and 24 yearling cows (and about the same number of yearling bulls) are added per 100 adult cows into this population. However, recruitment of yearling elk appears to have declined after 2000. Between 1987 and 1999, as this herd grew rapidly, older age classes of female elk were well distributed throughout the harvest and there was an increasing percentage of yearling cows represented in the harvest. This trend reversed itself beginning in 2000 (Figure 1). A Student's T-Test indicates yearling recruitment was significantly higher between 1987 and 1999 when there were an average of 20% yearlings in the female harvest, versus an average of 11% after 2000 ( $p=0.0003$ ).<sup>6</sup> Since 2000, with significantly increased license issuance and extended hunting seasons, there has been a general increase in the percentage of harvested female elk over age 5 and a decline in the percentage of young ( $\leq 2$  years old) females taken, while the relative percentage of mid-aged cows has remained fairly stable (Figure 2). This trend by and large has continued until this past year when the percentage of yearling cows in the female harvest jumped to 19% and the relative percentage of older cows ( $6^+$  years old) dropped. Similarly, the yearling buck:doe ratios of the deer herds in the Black Hills increased significantly in 2015 following excellent fawn production in 2014 and very high survival into 2015. Something similar might be inferred with regards to yearling recruitment into this elk population as well.

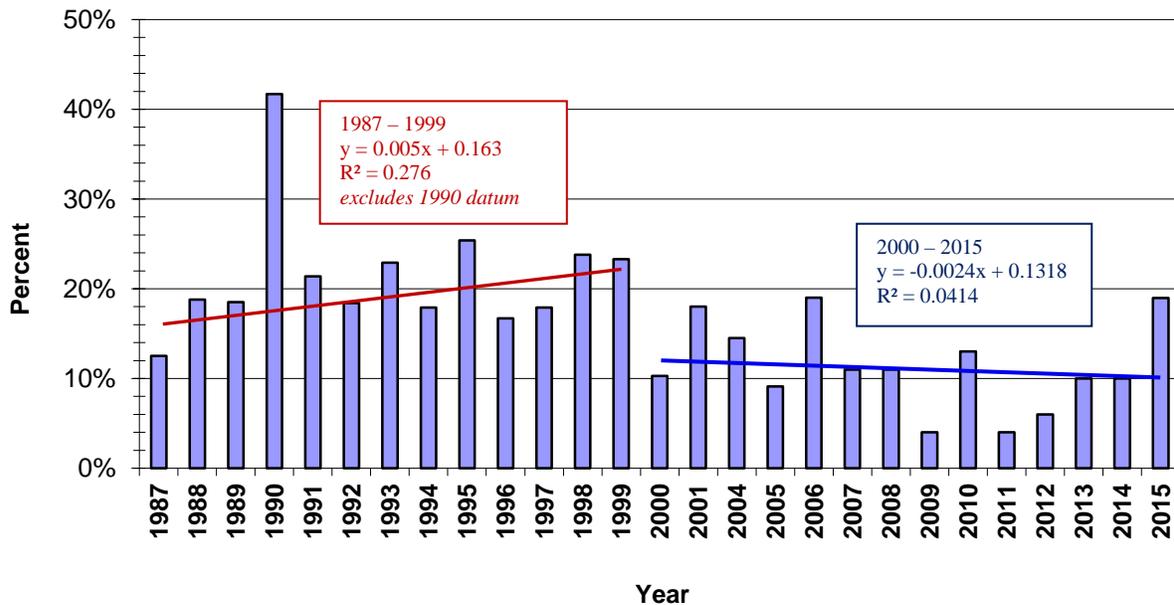


Figure 1. Percentage of yearlings in the female segment of the elk harvest (1987 – 2015).

<sup>4</sup> Budgetary constraints prevented tooth age data collection in 2002 & 2003.

<sup>5</sup> Omitting 1990 data reduces this average to 15.3% with a std. dev. 6.1%.

<sup>6</sup> Including 1990 data in T-test yields a significant difference ( $P=0.0006$ ) with  $Mean_{(1987-1990)}$  of 22%.

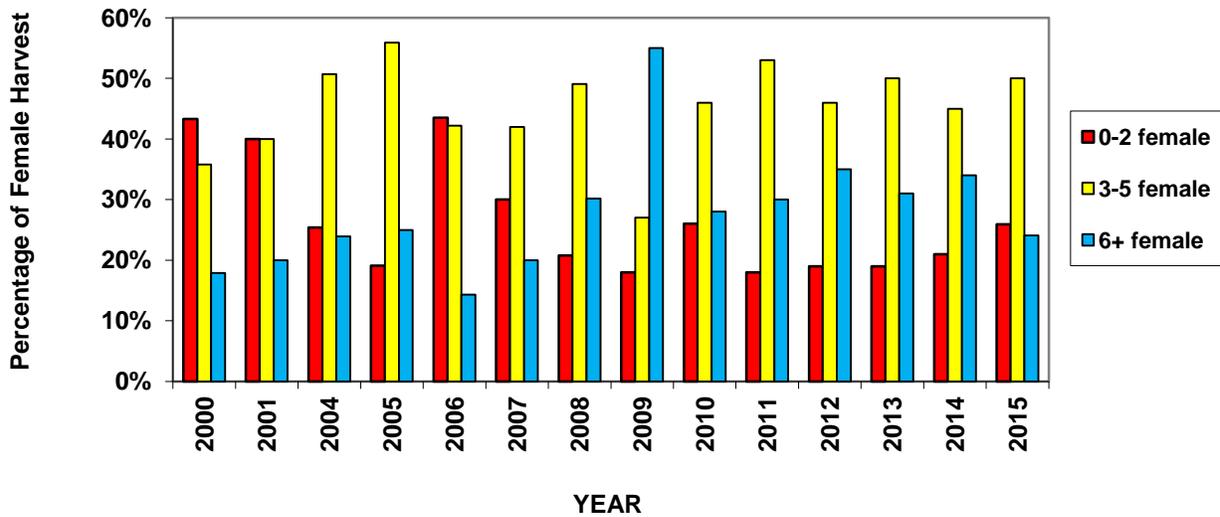


Figure 2. Relative percentages of various age classes of female elk harvested (2000 – 2015).

Of course there is greater hunter selectivity when it comes to take of bulls. Between 2000 and about 2009, tooth age data seem to suggest a bit of a decline in the relative percentages of both middle-aged (3-5 year old) and young ( $\leq 2$  years old) males in the bull harvest, with a slight increase in the percentage of older bulls ( $6^+$  years old) harvested (Figure 3). However, since then this trend may have reversed itself as it appears a greater proportion of younger bulls ( $\leq 5$  years old) have been harvested more recently (Figure 3). Over the past 10 years, Type 1 license success has averaged about 60% in HA 117, where the bulk of the tooth age data are returned, while antlerless hunter success has generally increased. Taken with changes in any elk versus antlerless elk license issuance until a couple of years ago, it makes sense that we have impacted the antlerless segment of the herd more than the bull segment. Something also reflected in the increasing percentage of female elk in the total harvest. If this population has stabilized or is declining and average recruitment dropped, one would expect to see an increase in the percentage of younger aged bulls harvested, as availability of older bulls declines.

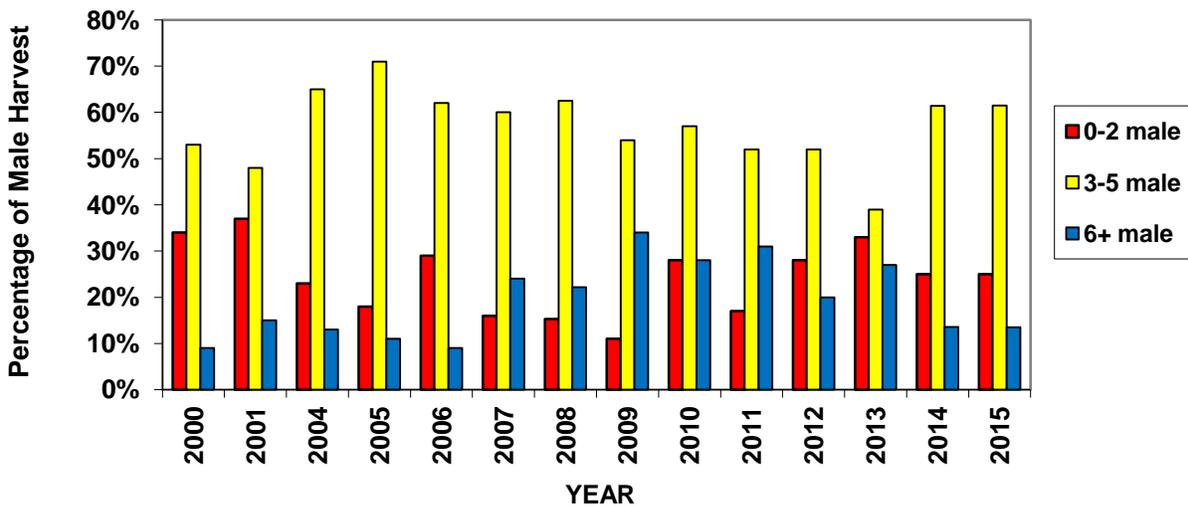


Figure 3. Relative percentages of various age classes of male elk harvested (2000 – 2015).

It does appear we may be shifting harvest pressure on to younger-aged bulls (Figure 3 & Table 1). If these recent trends continue, our ability to meet our secondary objective may become difficult without reductions in Type 1 license issuance.

Segment of Bull Harvest	Objective	2013	2014	2015
Bulls 0-2 yrs. old	20%	33%	25%	24%
		3 yr. mean		27%
Bulls 3-5 yrs. old	60%	39%	61%	63%
		3 yr. mean		55%
Bulls 6+ yrs. old	20%	27%	14%	13%
		3 yr. mean		18%

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

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

Elk harvest bounced back to predicted levels in 2014, as weather conditions allowed hunters easier access to elk compared to 2013 when access to elk was severely hindered by winter storm “Atlas.” We believe the approximately 25% relative increase in hunter success in 2014 compared to 2013 was due more this storm effect than any changes in elk number. Notably, in 2015 with the same hunting season structure in place as the previous two years, total harvest fell midway between that experienced in 2013 and 2014. Field personnel also reported that hunters seemed to struggle a bit more to find and harvest elk in 2015.

At the herd unit level, elk hunter success is highly correlated with reported hunter satisfaction (~84% in 2015, and over 90% in some previous years). Beginning in 2013, HA 116 moved from limited quota license hunting to a liberal general license season combined with a significant number of reduced priced cow/calf licenses, which have never sold out through the regular license draw. Due to very limited access to elk hunting on private land, this has resulted in a large number of license holders hunting the BHNF north of Sundance where few elk reside or are harvested. Consequently, since 2013 hunter success on general licenses has been low, averaging only 15% (std. dev. 1.5%); while active license success on cow/calf licenses has averaged only ~31% (std. dev. 10%) and that of total active licenses ~26% (std. dev. 12%). These poor success

rates are reflected in low hunter satisfaction in HA 116, where it has averaged 43% during this same timeframe. That figure biases the herd unit hunter satisfaction numbers low, since an average of 55% of the hunters at the herd unit level are sampled each year from HA 116. In contrast, since 2013, hunter satisfaction in HA 1 and HA 117 has averaged 65% and 58%, respectively.

Given an average annual recruitment of 30 yearling elk per 100 cows (based upon 15% yearling cows in total cow elk harvest) and assuming a pre-season herd composition of 40 bulls per 100 cows and 47 calves per 100 cows (SDGF&P long-term data), the 2015 estimated harvest of 512 adult elk would have removed the annual recruitment of yearlings from a total population of just under 3,200 elk. Alternatively, if the value of 19% cow harvest being yearlings found in 2015 is used in these same calculations, the 2015 harvest of adult elk would only have been sufficient to control the growth of a herd of about 2,500 elk. Thus, (based upon our anecdotal population estimate of 2,500) the 2015 harvest should have about kept the estimated number of elk in this herd at its current level. However, several hundred elk (perhaps nearly 1,000 head) regularly cross the Stateline and winter in South Dakota making it difficult to determine the net effect harvest is having on our post-season population.

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

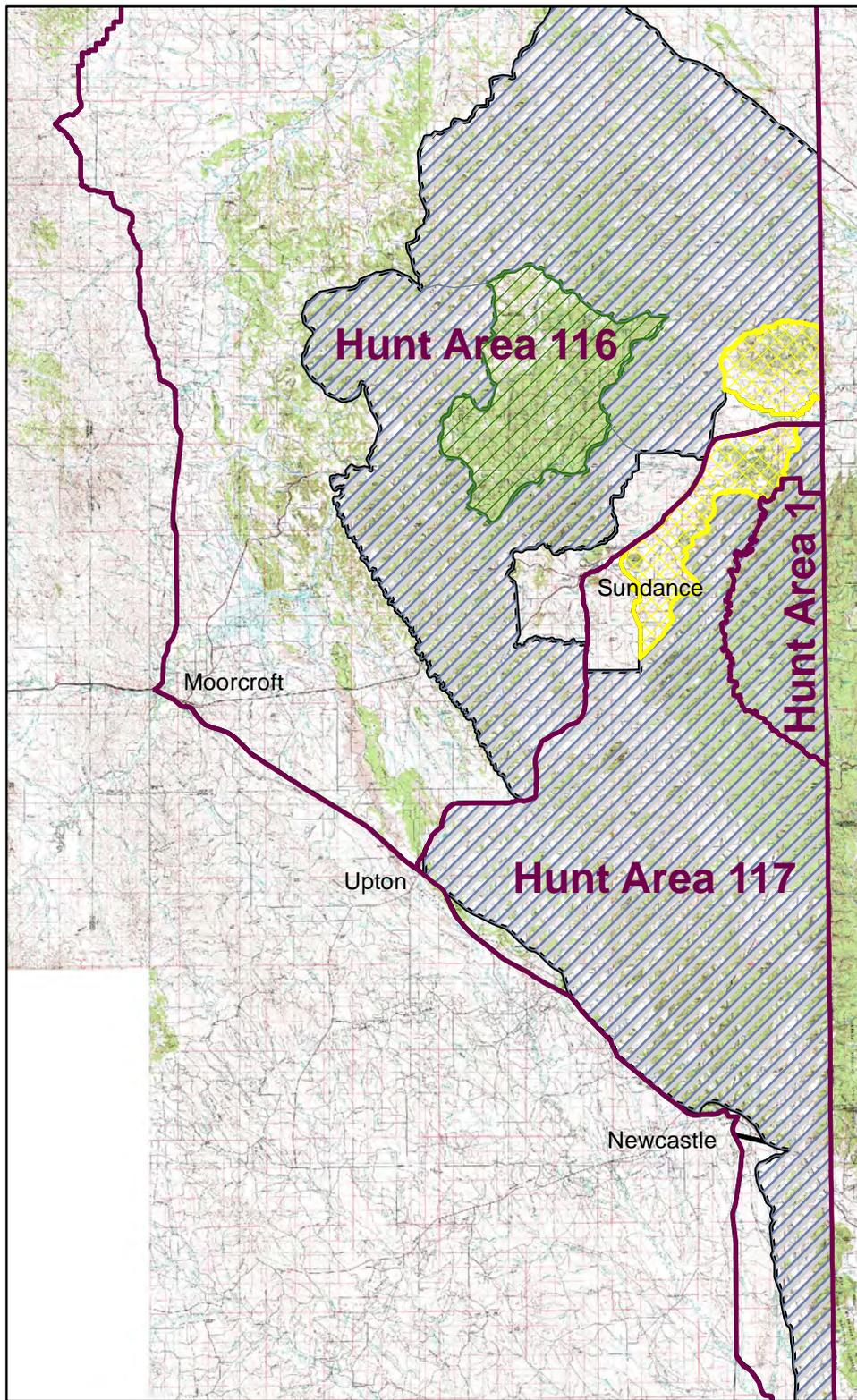
**MANAGEMENT SUMMARY:** Changes implemented to the 2013 Black Hills elk hunting season included expanding HA 116 to include all of the lands within Wyoming's Black Hills ecosystem previously enrolled in HA 129, and hunting this area under a combination of General and Type 6 and 8 cow/calf licenses. Also, because hunter success and satisfaction had dropped south of I-90, issuance of all license types in HA 1 and HA 117 were reduced as well. It is also important to note that contacts with landowners in 2014 indicated 82% of them did not want a change in license numbers, and several expressed dissatisfaction with the long hunting season. This statistic bears out the fact that while some traditional landowners complain about elk numbers, few are willing to allow hunting at the levels needed to significantly reduce this population. As a result, no changes to the hunting season structure have been implemented since 2013. This strategy seems to be reducing or holding elk numbers in check where there is adequate access for hunting, but may be allowing sub-herds to grow in areas without adequate hunter access.

Given mean hunter participation and success rates over the past decade and a half, the 2015 harvest should result in about 565 elk. This harvest estimate is predicated on a similar number of elk being harvested from HA 116 on General Licenses and continued average success rates in other hunt areas. However, the long season for antlerless elk hunting in HA's 116 and 117 (five

and a half months) could increase antlerless harvest above predicted values if access to elk improves. If projected harvest levels are reached, elk numbers should decline slightly south of I-90, while elk numbers north of the Interstate will likely continue to increase. Based upon an estimated pre-season herd composition of 47:100:40 (calf:cow:bull) and a recruitment rate of 30 yearling elk per 100 cows, a harvest of about 500 adult elk would remove the annual yearling recruitment from a herd of ~ 3,100 elk (all age classes), a number above what field personnel believe to be present at this time.

### **Literature Cited**

- Simpson, Benjamin, D. 2015. *Ecology of Rocky Mountain Elk in the Black Hills of South Dakota and Wyoming*. A Thesis Submitted in Partial Fulfillment of the Requirements for the Master of Science Major in Wildlife and Fisheries Science South Dakota State University, Brookings, SD. 169 pgs.
- South Dakota Department of Game, Fish and Parks. 2015. *South Dakota Elk Management Plan 2015-2019. Completion Report 2015-01*. South Dakota Department of Game, Fish and Parks, Pierre, South Dakota, USA.



**Legend**

-  E740\_Revised\_WINYLG
-  E740\_Revised\_YLG
-  E740Revised\_out
-  E740 ssf <sup>176</sup>

## 2015 - JCR Evaluation Form

SPECIES: Elk

PERIOD: 6/1/2015 - 5/31/2016

HERD: EL741 - LARAMIE PEAK/MUDDY MOUNTAIN

HUNT AREAS: 7, 19

PREPARED BY: HEATHER O'BRIEN

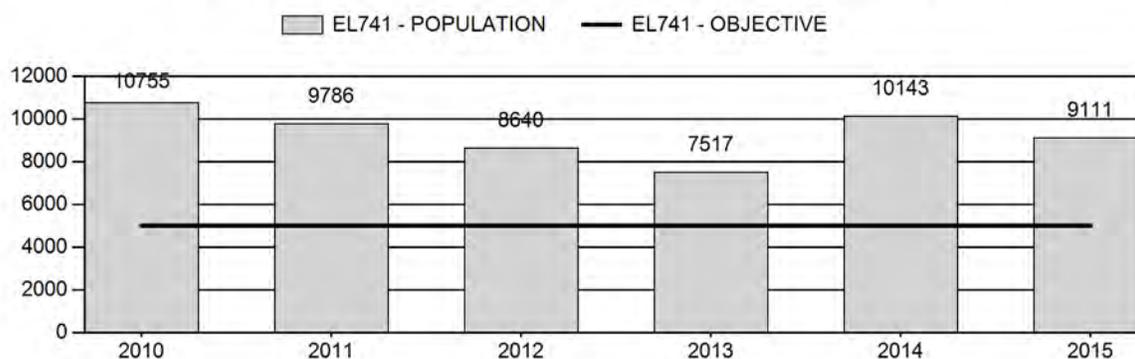
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	9,368	9,111	7,899
Harvest:	2,357	2,663	2,513
Hunters:	4,608	4,864	4,700
Hunter Success:	51%	55%	53%
Active Licenses:	4,686	5,019	4,850
Active License Success:	50%	53%	52%
Recreation Days:	36,933	34,059	35,000
Days Per Animal:	15.7	12.8	13.9
Males per 100 Females	31	31	
Juveniles per 100 Females	37	39	

Population Objective ( $\pm 20\%$ ) :	5000 (4000 - 6000)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	82%
Number of years population has been + or - objective in recent trend:	15
Model Date:	5/23/2016

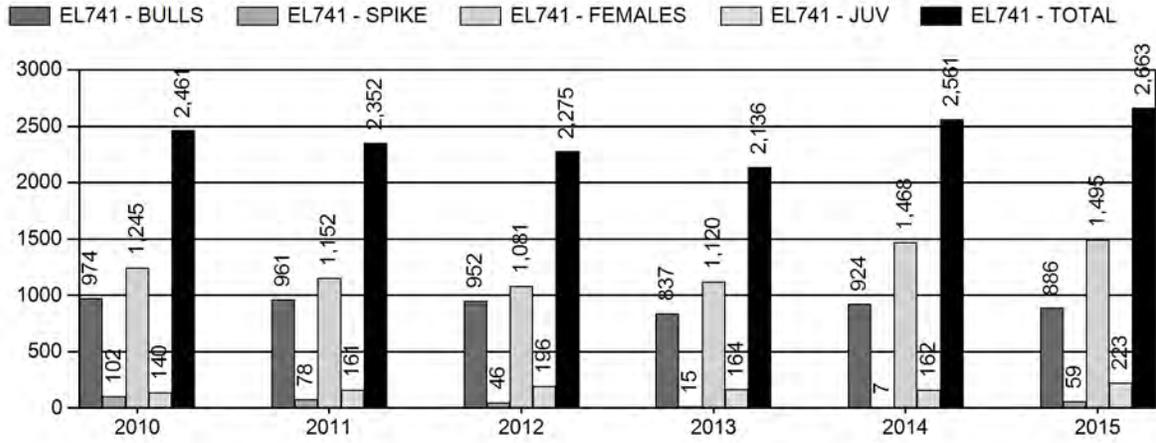
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

	<u>JCR Year</u>	<u>Proposed</u>
Females $\geq 1$ year old:	23.7%	24.9%
Males $\geq 1$ year old:	33.7%	36.5%
Juveniles (< 1 year old):	2.5%	2.0%
Total:	28.5%	30.1%
Proposed change in post-season population:	-9.9%	-12.5%

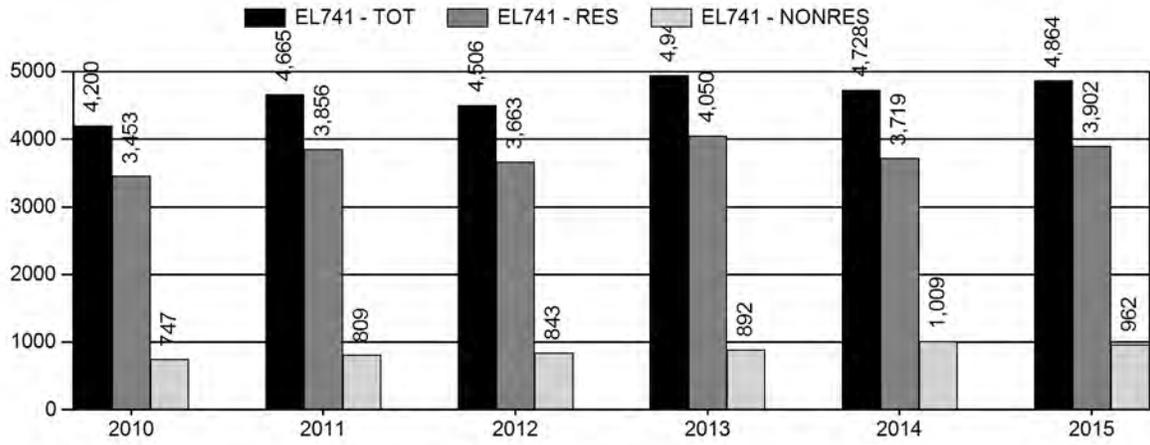
### Population Size - Postseason



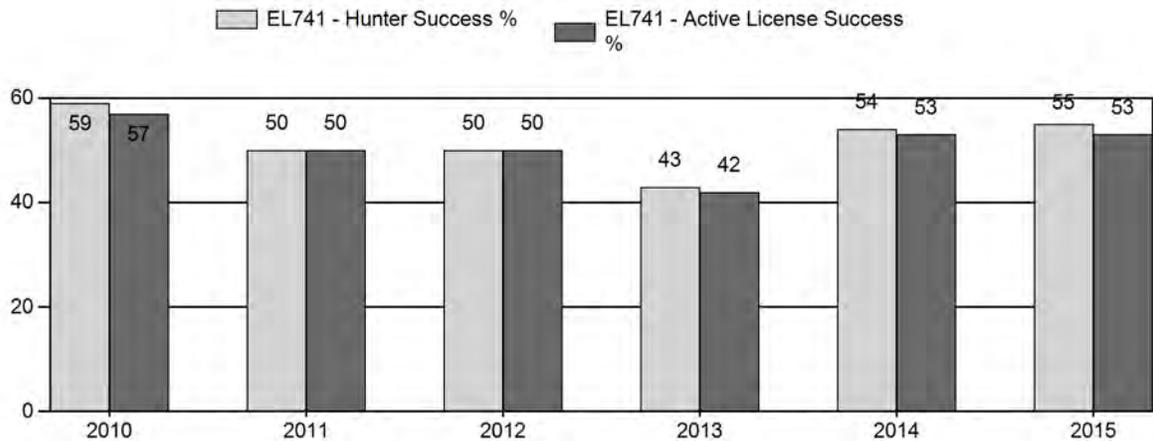
# Harvest



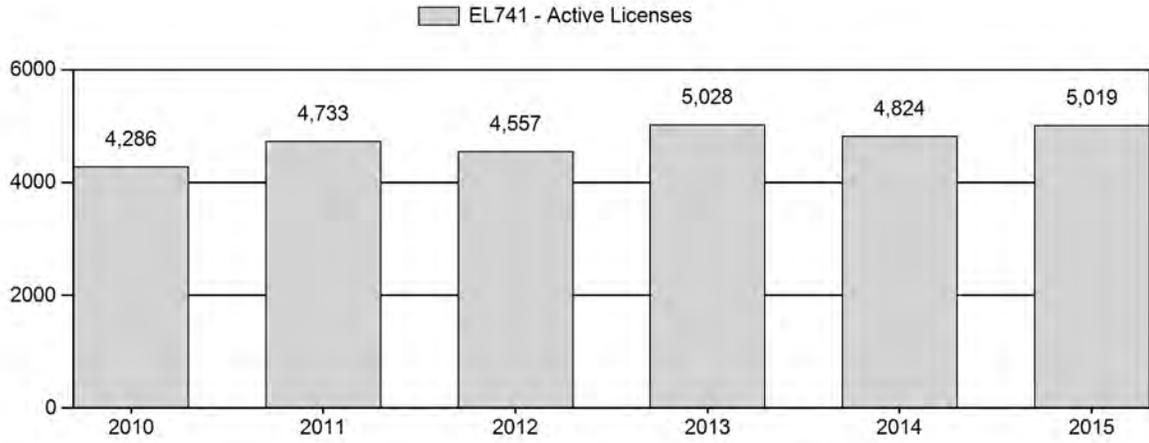
# Number of Hunters



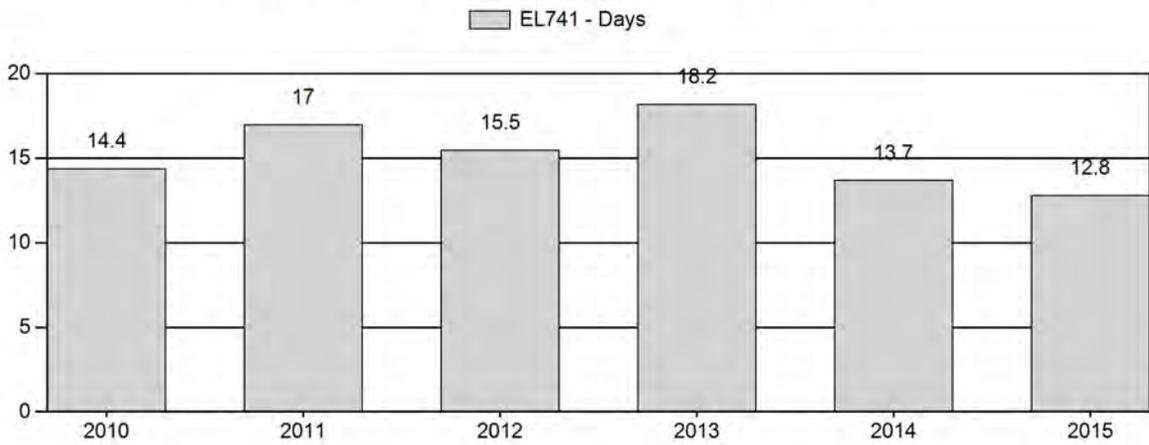
# Harvest Success



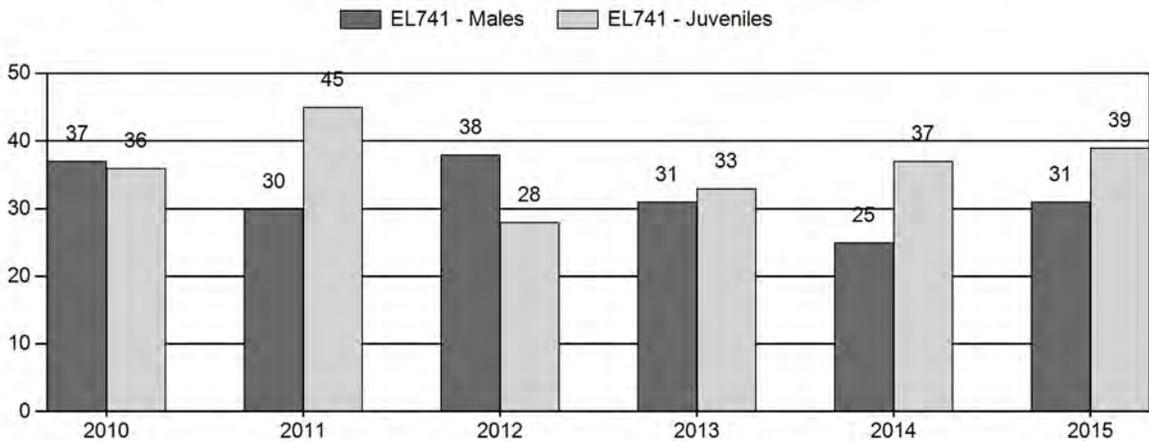
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



2010 - 2015 Postseason Classification Summary  
for Elk Herd EL741 - LARAMIE PEAK/MUDDY MOUNTAIN

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
2010	10,755	475	639	1,114	21%	3,020	58%	1,094	21%	5,228	545	16	21	37	± 1	36	± 1	26
2011	9,786	324	548	872	17%	2,890	57%	1,298	26%	5,060	539	11	19	30	± 1	45	± 1	35
2012	8,640	143	362	505	23%	1,334	60%	379	17%	2,218	617	11	27	38	± 2	28	± 2	21
2013	7,517	328	487	815	19%	2,605	61%	869	20%	4,289	535	13	19	31	± 1	33	± 1	25
2014	10,143	383	468	851	15%	3,454	62%	1,270	23%	5,575	592	11	14	25	± 1	37	± 1	30
2015	9,312	404	485	889	18%	2,882	59%	1,116	23%	4,887	504	14	17	31	± 1	39	± 1	30

**2016 HUNTING SEASONS**  
**LARAMIE PEAK MUDDY MOUNTAIN ELK (EL741)**

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

Hunt Area	Type	Quota change from 2015
7	1	0
	4	+400
	6	-400
	7	0
19	1	0
	2	0
	4	0
	5	0
	6	0
<b>Total</b>	<b>1</b>	<b>0</b>
	4/5	<b>+400</b>
	6	<b>-400</b>
	7	<b>0</b>

### **Management Evaluation**

**Current Postseason Population Management Objective:** 5,000

**Management Strategy:** Special

**2015 Postseason Population Estimate:** 9,100

**2016 Proposed Postseason Population Estimate:** 7,900

**2015 Hunter Satisfaction:** 74% Satisfied, 14% Neutral, 12% Dissatisfied

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

### **Herd Unit Issues**

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

there is potential for the expansion of wind energy development. Chronic Wasting Disease is present in this herd at low prevalence (typically 6-8% of hunter-harvested elk).

## **Weather & Habitat**

The summer of 2012 was the driest on record since 1904 in much of Wyoming. Extensive wildfires displaced and redistributed elk, especially in the east-central portion of the herd unit. The severe drought and resulting wildfires likely impacted calf survival, as post-season ratios were low at 28 calves per 100 cows. The winter of 2012 continued to be dry, with very low snow accumulation, allowing wide distribution of elk at higher elevations. April of 2013 finally saw a break in the drought, when temperatures dropped below normal for the entire month and significant precipitation was received. This cooler and wetter pattern continued through the summer of 2013 in much of the herd unit. In early October 2013, winter storm “Atlas” blanketed the area with 12-36” of wet snow, with greater depths at higher elevations. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. Grass and forb growth were excellent, making 2014 the best growing season the region had seen in years. Winter 2014-2015 was generally mild, and the 2015 growing season was just above average for the region. Fall of 2015 was relatively dry, and much of the herd unit remained accessible for hunting for the majority of the hunting season. For detailed weather data see <http://www.ncdc.noaa.gov/gac/time-series/us>.

## **Field Data**

Calf ratios are typically in the 40s per 100 cows for the Laramie Peak / Muddy Mountain Elk Herd. While calf survival can vary from year to year, adult elk in this herd are thought to have rather high rates of survival as predation pressure is likely low and there is little mortality from disease and winter weather. Prior to 2005, antlerless license issuance was not adequate to keep up with the production of this herd. Since then, antlerless license issuance has continued to increase, and the population has stabilized or begun to decrease as harvest pressure on cows has greatly intensified. In 2012, the calf ratio reached a historic low of 28 calves per 100 cows. Since then, calf production has increased slowly and was 39 calves per 100 cows in 2015. Calf ratios over the previous 5 years (average = 36) have been much lower than the long-term average of 43 (1991-2015). This may be due to a number of factors including stress on pregnant cows from January hunting seasons, changes in habitat quality, or increased competition due to higher elk densities. Cow harvest continues to remain high, and late-season access to hunt was very good in the herd unit for 2015. While lower calf production/survival from 2012-2015 may slow population growth, continued high license issuance and harvest of cows will be necessary to reduce this herd toward objective.

Bull ratios for the Laramie Peak / Muddy Mountain Herd historically average in the mid-30s per 100 cows, though there have been years where the ratio has dropped below special management limits into the 20s. It should be noted that the accuracy of bull ratios can be questionable from year to year in this herd. While post-season classification samples are well distributed within this herd unit, changes in distribution of elk, ability to locate large cow/calf groups, and concealment of bulls in timber during January can influence results from year to year. From 2010-present, Type 1 licenses have fluctuated between 1,500 and 1,750 licenses in Area 7, depending upon hunter, landowner, and manager perceptions of bull quality. While annual tooth-age data illustrate hunters are consistently harvesting prime age-class bulls over the past three years, antler-class data show a slight decrease in the percentage of Class-II antlered bulls (see Appendix A). Hunters have more frequently communicated concern about declines in trophy quality within this herd in recent years as well. While consistent harvest pressure on trophy-class bulls may be one contributing factor, other influences including competition for key resources may also be influencing antler quality in this herd. Managers regularly observed 800-1,100 bulls during postseason helicopter surveys from 2007-2015. While a higher number of bulls implies more hunting opportunity, it also signifies a higher potential for competition for forage and other resources. It should also be noted that expectations of hunters for increasingly larger bulls in a prized hunt area may also be influencing perceptions of bull quality. Regardless, hunters, landowners, and managers seem to be satisfied with current bull ratios and the opportunity is still readily available for a quality hunt in this herd unit. Consequently, any-elk license issuance will be maintained in Areas 7 and 19 at 1,800 licenses, which is considered conservative for this herd unit.

## **Harvest Data**

License success in this herd unit is typically in the 50<sup>th</sup> percentile. It should also be noted that days per animal can be high in this herd unit compared to others, as hunters have high expectations regarding bull quality and will exert more effort in finding a mature bull. Archery hunting has also become more popular in the herd unit, as hunters want to maximize their time in the field to harvest a mature bull. Despite this, days per animal was 12.8 in 2015, which is low compared to the 10-year average of 14.3 days. Weather and access conditions were both excellent during much of the 2015 hunting season. Overall harvest success in 2015 (53%) was on par with the ten-year average (54%). Total harvest improved in 2015, with the highest cow harvest (1,495) and overall harvest (2,663) on record for the herd unit. Total harvest of cows and calves was exceptional in both hunt areas for 2015. In Area 19, an estimated 211 cows and calves were harvested, while in Area 7 over 1,500 were harvested. Both totals represent the highest cow/calf harvests on record for each hunt area, and may be attributed to good weather, improved access, and increased availability of elk on public lands in 2015.

## Population

The 2015 postseason population estimate was approximately 9,100 and is either stable or slowly trending downward. No sightability or other population estimate data are currently available to further align the model. Between 2,000 and 2,500 elk have been harvested annually since 2007, with harvest success remaining above 50% in all but one year (when weather conditions greatly restricted hunting access). Though the model illustrates a declining population, the ability of this herd to support a consistently high level of harvest without declines in harvest success suggests this herd is more likely stable than declining. Observations from managers, landowners, and hunters are also not consistent with a growing population. Total elk observed during postseason classification surveys has consistently ranged between 4,000 and 6,300 elk since 2007.

The “Time-Specific Juvenile Survival, Constant Adult Survival, Male Survival Coefficient” (TSJ,CA,MSC) spreadsheet model was selected to represent the Laramie Peak / Muddy Mountain Herd Unit for 2015. In previous years the TSJ,CA and CJ,CA models were both used. Shifting to a new model in 2015 will result in inconsistent data between previous years and 2015. However, the TSJ,CA,MSC model is currently the only model that seems representative of the herd without unwarranted manipulation. The three remaining models predict precipitous declines and/or population crashes that are improbable. All three remaining models also predict unrealistically high harvest segments for bulls that range from 45 to 60% and for cows that range from 30 to 50%. Ultimately, all three of the remaining models produce population estimates that are unrealistically low based on observed numbers of elk. The TSJ,CA,MSC model seems more representative of herd trends, though it selects the upper constraint for adult cow survival and frequently hits the lower constraint for calf survival. While the Laramie Peak / Muddy Mountain Herd does not have a high level of natural predation, a lower survival rate for bulls seems reasonable. Bulls in the herd unit are aggressively pursued by hunters during both archery and rifle seasons, in addition to suffering increased stress during the rut. The TSJ,CA,MSC model also scores the lowest AIC, though it is by less than a power of one compared to the other models. The TSJ,CA,MSC model is currently the best representation of the herd, and follows trends with license issuance and harvest success. Additional population estimate and/or survival data would help to better align this model. Variations in classification survey methodology might also help strengthen the model for this herd. A stratified quadrat sampling method is being evaluated in 2016, with the goal of refining survey methods and acquiring age and sex ratios that are more accurate for this herd. Without more accurate bull ratio data or other population estimates to anchor the model, it is considered of poor quality.

## **Management Summary**

Season dates for this herd have changed from year to year, and in general have been liberalized over time to maximize harvest and reduce damage on agricultural fields. Meetings with landowners were held to discuss ideas to maximize female harvest and maintain bull quality. Season dates and limitations will be similar for the 2016 season, with two minor changes. Since hunters can now purchase full price antlerless licenses as an additional license, Type 4 and Type 6 licenses in Area 7 will be shifted back to reflect traditional license allocation. A total of 400 Type 6 licenses will be converted back to Type 4 licenses in Area 7. In addition, language in the limitations for unused licenses valid for antlerless or cow/calf elk will be simplified for added clarity in the regulation. Area 19 unused licenses will continue to be valid for antlerless elk through January in 2016 to extend hunter opportunity and maximize cow harvest. All other license types will be maintained with the same season dates and quotas as in 2015. Currently, access is predicted to be similar in 2016 compared to previous years. If additional access is secured in Area 19, increased license issuance will be considered by managers for future seasons. Goals for 2016 are to continue reduction of the herd toward objective, maintain bull ratios within special management limits, maintain good harvest success, and reduce elk damage to agricultural fields. Since managers and the public remain satisfied with current bull ratios and numbers in the herd, any-elk 1 license issuance will not change in either Area 7 or 19.

If we attain the projected harvest of 2,500 elk with average calf ratios, this herd will decline further toward objective. The predicted 2016 postseason population size of the Laramie Peak / Muddy Mountain Elk Herd is approximately 7,900 animals, which is 82% above objective.

## **APPENDIX A:**

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

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

Tooth age data from the Laramie Peak / Muddy Mountain herd have been collected in nearly all years from 1997-2015. Tooth samples are solicited from both bull and cow elk hunters, as female age data is more representative of a random sample across age classes, while bull age data is potentially biased towards hunter preferences for more mature age classes. Sample size has varied from year to year depending upon hunter response rates. In 2015, a total of 800 “any-elk” hunters and 975 antlerless elk hunters in the herd unit were solicited for tooth samples. Of those solicited, 139 returned teeth from bulls and 102 returned teeth from cows. Samples received from calf elk were removed from resulting totals so as not to skew statistics on adult age classes.

Average tooth age of harvested adult males slowly increased from 1999-2015, while average tooth age of harvested female elk has been more variable over time (Tables 1 & 2). Since 2012, average tooth age of both bulls and cows has gradually increased. Median age of males increased from 5.5 to 6.5 years old in 2015, while median age of females dropped from 5.5 to 4.5 years old. This slight divergence between harvested bull and cow ages suggests that hunter selectivity is for larger, older age class bulls; while the younger age class of harvested cows is likely to represent the most abundant age class in this herd.

The percentage of harvested bulls aged 6-10 gradually increased from 2001-2015, indicating that older age-class bulls were increasingly available for harvest. This contradicts some years of observed antler class data during the same time period that shows a decline of Class II (6 points on a side or better) bulls in the herd (Table 3). This disparity may be due to increased selectivity of hunters for older age-class bulls, compared to the more random sample of bulls surveyed during postseason classification flights. In addition, hunters submitting teeth may be biased towards older age class bulls, as hunters who are pleased with the quality of their animals may be more likely to submit samples.

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

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

Trends in antler class of classified bull elk are more difficult to interpret on their own. Class I bulls are mature bulls that have  $< 6$  points on both antlers, while Class II bulls have  $\geq 6$  points on either antler. The percentage of Class II bulls declined from 2008-2011, but then increased and seemed to stabilize from 2012-2015. During the same time period, average tooth-age of harvested bulls increased steadily from 5.01 to 6.40. The divergence between the two data sets in 2012-2013 suggests antler quality is not always correlated positively with bull age for this herd. Factors such as nutrition, genetics, or classification biases may also be contributing to antler quality. In 2014 & 2015, percentage of Class II bulls observed declined slightly, while average tooth-age of harvested bulls increased. Harvest success and hunter days for any-elk licenses remained similar to 5-year averages over both years, indicating hunters did not have difficulty finding mature bulls. Studies of the tooth-age dataset certainly temper any assumptions made regarding changes in the antler class dataset and aid in making sound management decisions for this herd. Collectively, these data indicate this herd can continue to support the current number of any-elk licenses for the 2016 season without compromising bull ratios or bull quality. Managers must continue to scrutinize harvest data and hunter feedback, and perhaps begin to reduce issuance of any-elk licenses if the percentage of Class II bulls observed during classification surveys continues to decline.

**Table 1.** Tooth-age data analysis for adult bull elk harvested within the Laramie Peak/Muddy Mountain Herd Unit, 1997 - 2015.

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

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

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

**Table 2.** Tooth-age data analysis for adult female elk harvested within the Laramie Peak/Muddy Mountain Herd Unit, 1997 - 2015.

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

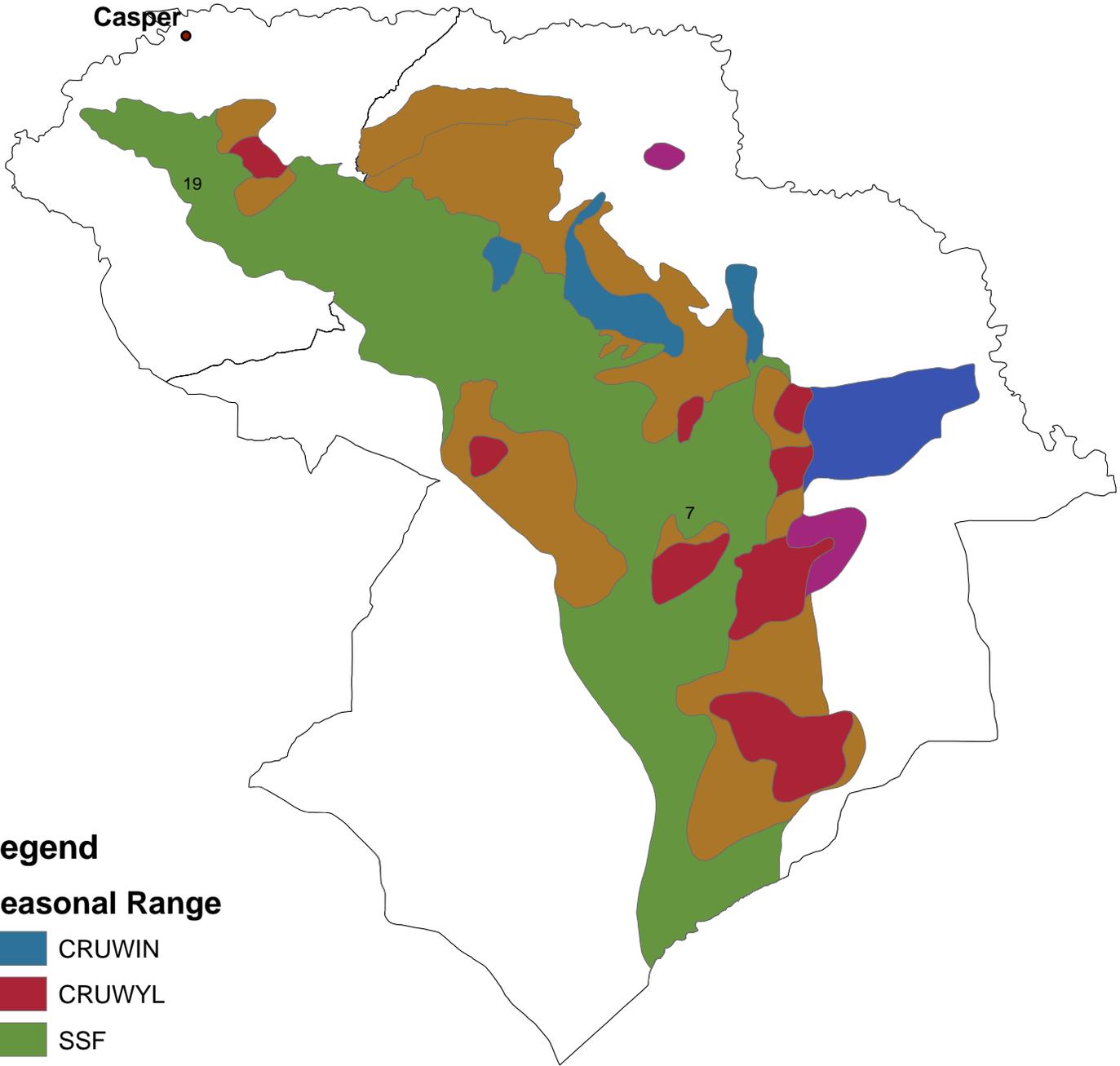
Year	Percentages					
	1	2-5	6-10	11-12	13+	
1997	21%	56%	15%	8%	0%	
1998	5%	60%	28%	3%	3%	
1999	12%	55%	21%	9%	4%	
2000	14%	57%	20%	5%	4%	
2001	10%	57%	28%	5%	1%	
2004	14%	59%	25%	2%	0%	
2005	13%	52%	26%	5%	4%	
2007	4%	53%	31%	6%	6%	
2008	8%	53%	28%	3%	9%	
2010	6%	54%	32%	3%	5%	
2011	6%	57%	32%	0%	4%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

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

**Table 3.** Antler classification of bull elk from the Laramie Peak/Muddy Mountain Herd Unit, 2008-2015.

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

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



**Legend**

**Seasonal Range**

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

## 2015 - JCR Evaluation Form

SPECIES: Elk

PERIOD: 6/1/2015 - 5/31/2016

HERD: EL742 - RATTLESNAKE

HUNT AREAS: 23

PREPARED BY: HEATHER O'BRIEN

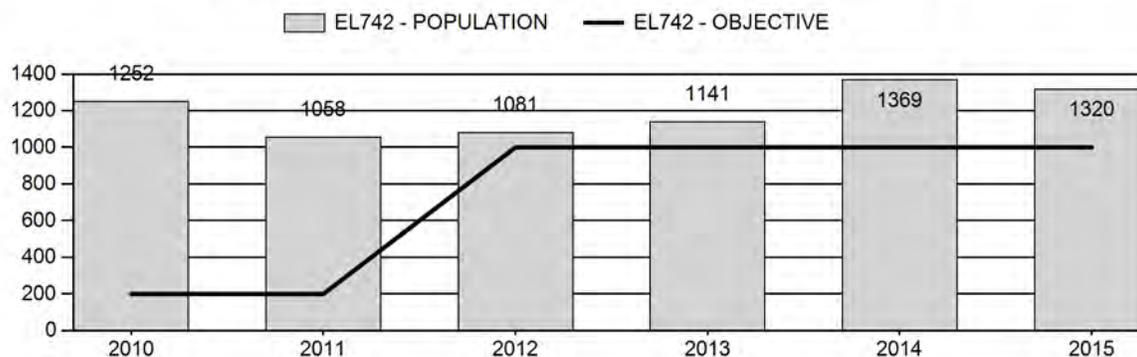
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Population:	1,180	1,320	1,182
Harvest:	169	196	195
Hunters:	370	395	400
Hunter Success:	46%	50%	49%
Active Licenses:	393	413	450
Active License Success:	43%	47%	43%
Recreation Days:	3,350	3,058	3,200
Days Per Animal:	19.8	15.6	16.4
Males per 100 Females	50	200	
Juveniles per 100 Females	37	48	

Population Objective (± 20%) :	1000 (800 - 1200)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	32%
Number of years population has been + or - objective in recent trend:	24
Model Date:	5/24/2016

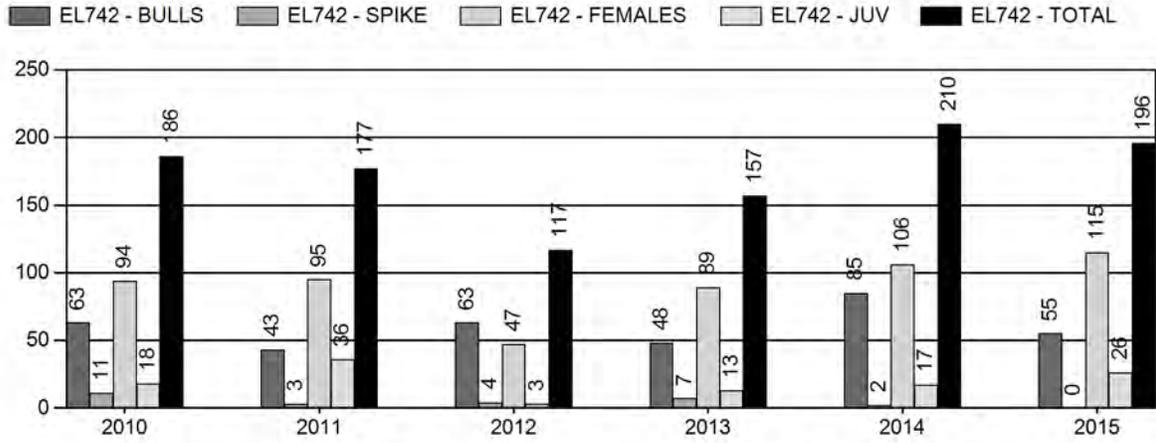
**Proposed harvest rates (percent of pre-season estimate for each sex/age group):**

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	15.2%	16.2%
Males ≥ 1 year old:	15.5%	18.5%
Juveniles (< 1 year old):	1.7%	1.4%
Total:	12.9%	14.0%
Proposed change in post-season population:	-8.6%	-10.6%

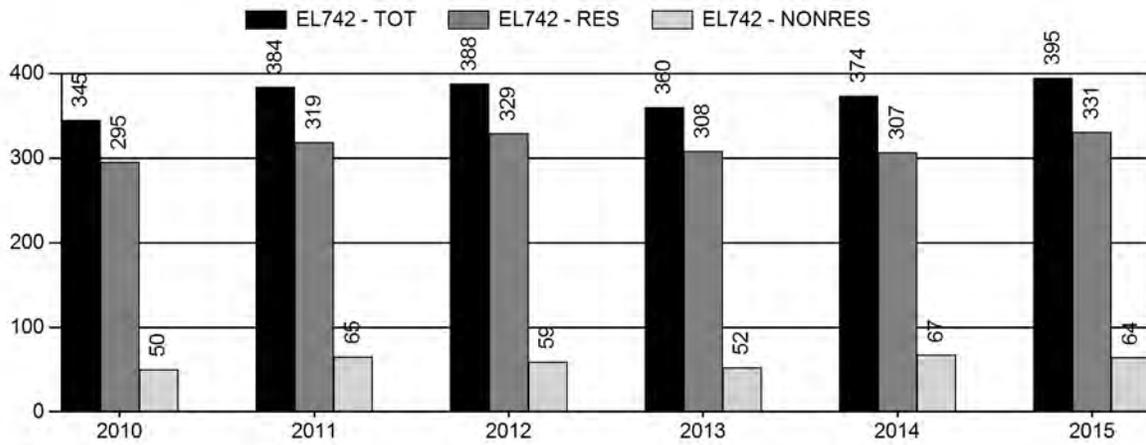
### Population Size - Postseason



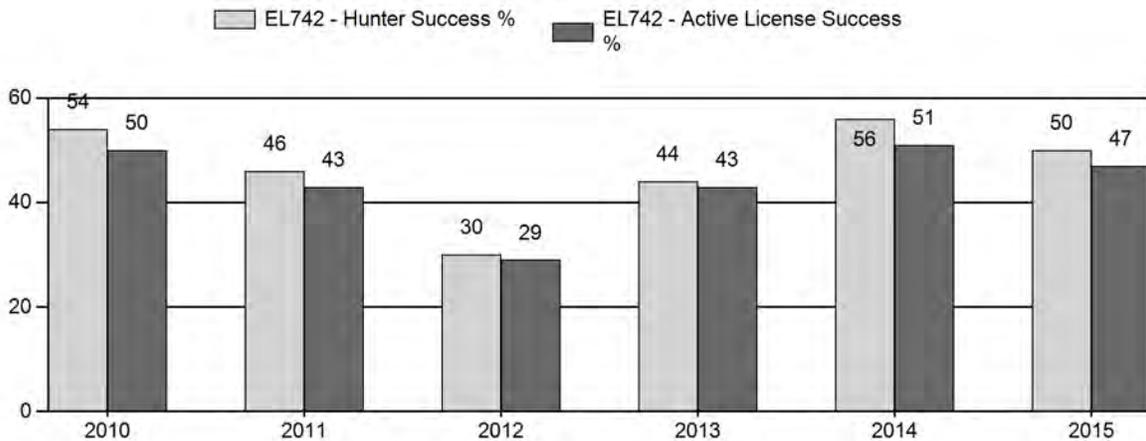
# Harvest



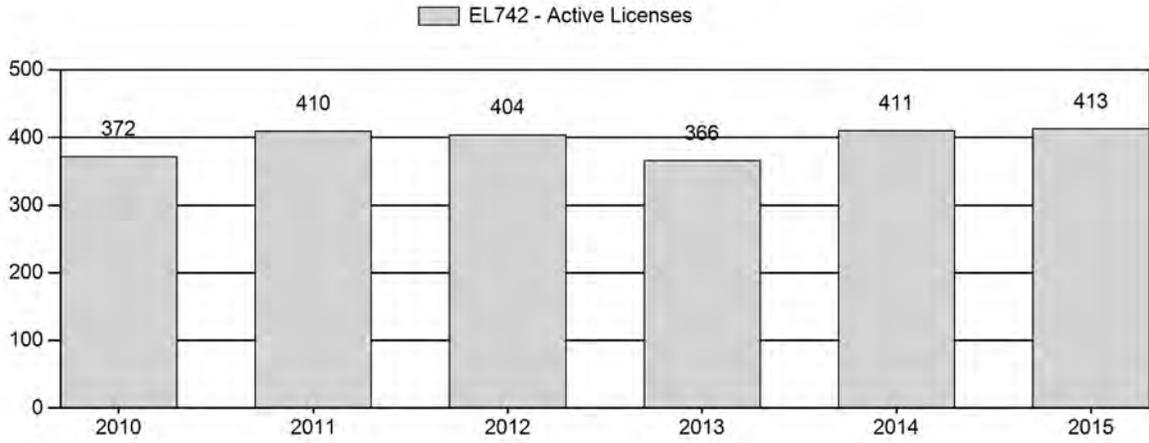
# Number of Hunters



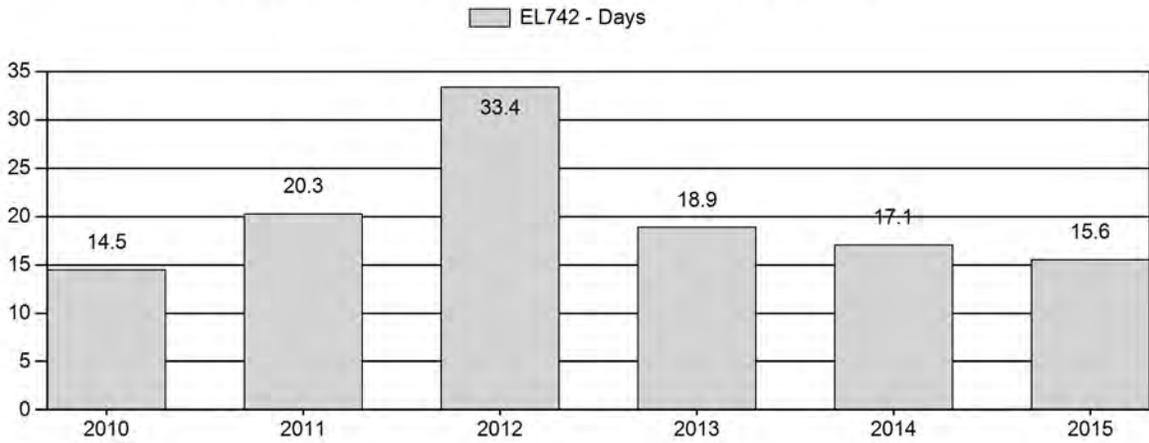
# Harvest Success



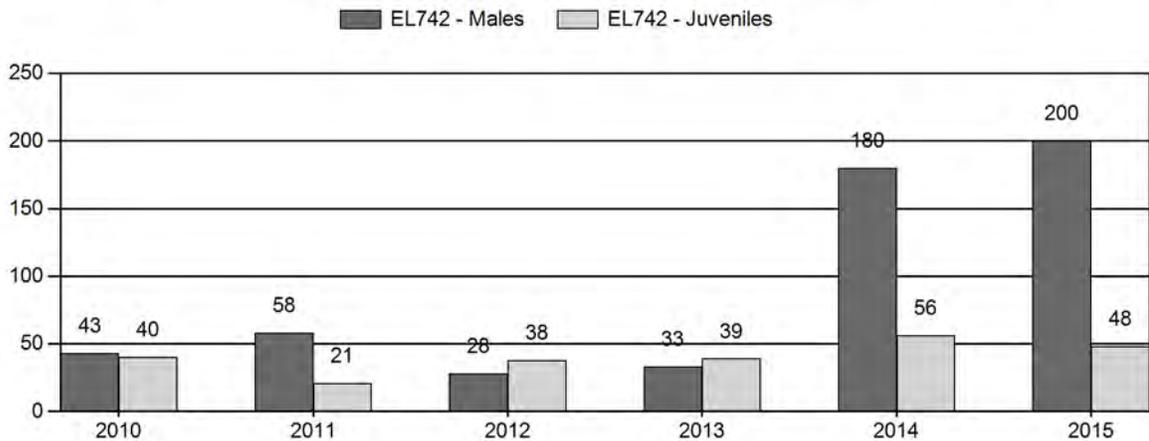
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



## 2010 - 2015 Postseason Classification Summary

## for Elk Herd EL742 - RATTLESNAKE

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
2010	1,252	24	47	71	23%	166	55%	66	22%	303	415	14	28	43	± 7	40	± 6	28
2011	1,058	17	90	107	32%	185	56%	38	12%	330	443	9	49	58	± 7	21	± 4	13
2012	1,081	26	32	58	17%	204	60%	77	23%	339	384	13	16	28	± 4	38	± 5	29
2013	1,141	26	102	128	19%	390	58%	153	23%	671	479	7	26	33	± 3	39	± 3	30
2014	1,369	35	113	148	54%	82	30%	46	17%	276	406	43	138	180	± 28	56	± 12	20
2015	1,315	10	86	96	57%	48	29%	23	14%	167	390	21	179	200	± 42	48	± 15	16

**2016 HUNTING SEASONS  
RATTLESNAKE ELK (EL742)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
23	1	Oct. 1	Oct. 31	125	Limited quota	Any elk
		Nov. 15	Dec. 15			Any elk
	4	Oct. 1	Oct. 31	125	Limited quota	Antlerless elk
		Nov. 15	Dec. 15			Antlerless elk, also valid in Area 128
6	Oct. 1	Oct. 31	175	Limited quota	Cow or calf	
	Nov. 15	Dec. 15			Cow or calf, also valid in Area 128	
	7	Nov. 15	Dec. 15	50	Limited quota	Cow or calf, also valid in Area 128
Archery						Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2015
23	1	No changes
	4	No changes
	6	-25
	7	+25

**Management Evaluation**

**Current Postseason Population Management Objective:** 1,000

**Management Strategy:** Recreational

**2015 Postseason Population Estimate:** 1,300

**2016 Proposed Postseason Population Estimate:** 1,200

**2015 Hunter Satisfaction:** 59% Satisfied, 27% Neutral, 15% Dissatisfied

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

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

### **Herd Unit Issues**

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

### **Weather**

The winter of 2010-2011 was severe throughout the herd unit, although no significant elk mortality was detected. Drought conditions persisted until spring 2013, which was cool with significant precipitation. Rainfall was average over the summer of 2013, but habitat conditions appeared to be poor for much of the growing season. Heavy precipitation during the fall of 2013 caused a favorable late green-up that was a benefit to big game species going into winter. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. The spring and summer of 2014 undeniably produced improved range conditions that benefitted elk. The winter of 2014-2015 was relatively mild, while the spring and summer of 2015 were slightly above average in terms of precipitation and range condition. For detailed weather data see <http://www.ncdc.noaa.gov/gac/time-series/us>.

### **Habitat**

This herd unit has no established habitat transects that measure production and/or utilization on vegetation that are preferred by elk. Anecdotal observations and discussions with landowners in the region indicate that summer and winter forage availability for elk was good in 2015. Herbaceous forage species were observed to be in good condition in both 2014 & 2015 compared to previous years, and elk appeared to be in excellent body condition by winter 2015.

## **Field Data**

Observed calf ratios are highly erratic in this herd unit due to varying survey conditions and levels of effort across years. Thus it is difficult to correlate changes in population size or make decisions regarding license issuance based on observed calf ratios. Instead managers continue to focus on maximizing cow harvest without over-saturating Hunt Area 23 with hunter pressure. Increases in cow license issuance are not warranted unless access improves and there are no large areas where elk can take refuge from harvest pressure.

Observed bull ratios are also highly erratic as a result of variable survey conditions and levels of effort from year to year. Since 2001, observed bull ratios have ranged from as low as 13 to as high as 58 per 100 cows. Years with low observed bull ratios were followed by years with much higher observed ratios; indicating bulls were likely missed during classification surveys in some years, and/or elk are immigrating/emigrating to and from adjacent hunt areas. 2015 classification results were highly skewed in favor of bulls, as one large cow/calf group could not be classified from video taken during survey flights. Again, license issuance and season structure changes in this herd are not typically made based on observed classification ratios. Instead, seasons are designed to maximize cow harvest and maintain relatively good license success without overcrowding hunters.

## **Harvest Data**

License success in this herd unit is typically in the 40<sup>th</sup> percentile and is fairly consistent given license issuance and hunter opportunity has remained relatively similar across years. Hunter days per animal fluctuate from year to year, but this may be a function of changes in access due to weather and road conditions. The persistence of unattainable elk in the aforementioned private land refugia most certainly contributes to increased hunter days and reduced harvest success in most years. In 2014 & 2015, weather conditions were mostly favorable and access to elk was good. Overall harvest success improved to 56% and 49% respectively, compared to the 25-year average of 48%. The longer, split season in 2013-2015 also facilitated movement of elk off of private refugia. Elk have moved onto accessible hunting areas during the closure in all three years. Late-season licenses were also valid for use in the adjacent Hunt Area 128, where portions of the herd sometimes migrate during the fall and winter months. Field personnel continue to receive positive comments from hunters and landowners who are pleased with both of these changes to the hunting season. In 2015, a late two-week cow season was added in an attempt to maximize female harvest. Success on these appears to have been low however, and some hunters commented that the season was not long enough. Overall however, harvest has increased significantly in the past three years compared to previous years, and cow harvest was the highest on record in 2015.

## **Population**

The 2015 postseason population estimate was approximately 1,300 elk, with a stable to modestly decreasing trend. No sightability or other population estimate data are currently available to further align the model in conjunction with classification and harvest data. There have been no complaints from landowners in recent years with regard to elk numbers or damage. Total number of elk surveyed during aerial classifications has not increased significantly in recent years. Harvest pressure and success have increased with longer seasons since 2013, but have otherwise remained consistent. Elk may emigrate from the herd unit into adjacent areas, but managers believe this herd to be stable or declining slightly.

The “Constant Juvenile Survival – Constant Adult Survival” (CJ,CA) spreadsheet model was selected for the postseason population estimate of this herd. This population is difficult to model as it is small in size and appears to have consistent interchange with an adjacent herd, thus violating the closed population assumption of the model. High variability in observed bull and calf ratios also render this herd challenging to model. Long-term classification averages are used in years when adequate sample sizes are not reached during postseason surveys, to avoid inaccuracies from high variability in the model. Trend count data are also included in the model to document higher numbers of elk that in some years have been seen but could not be classified. The TSJ,CA model was discarded, as it predicts population sizes that are lower than actual observed survey totals. When juvenile survival was increased in years known to have mild winter conditions, the SCJ,CA model also predicted a population size lower than actual numbers of elk observed. The TSJ,CA,MSC model was not used as it does not seem applicable or necessary for this herd, which does not have elevated predation rates from large carnivores. While the CJ,CA model appears to be the best choice to represent the herd, it should be noted that this model selected for the lowest juvenile and the highest adult constraints, indicating that it is of poor quality. If the model continues to be troublesome and inaccurate in reflecting trends and known numbers of elk, managers may consider changing to trend-count based management for this herd.

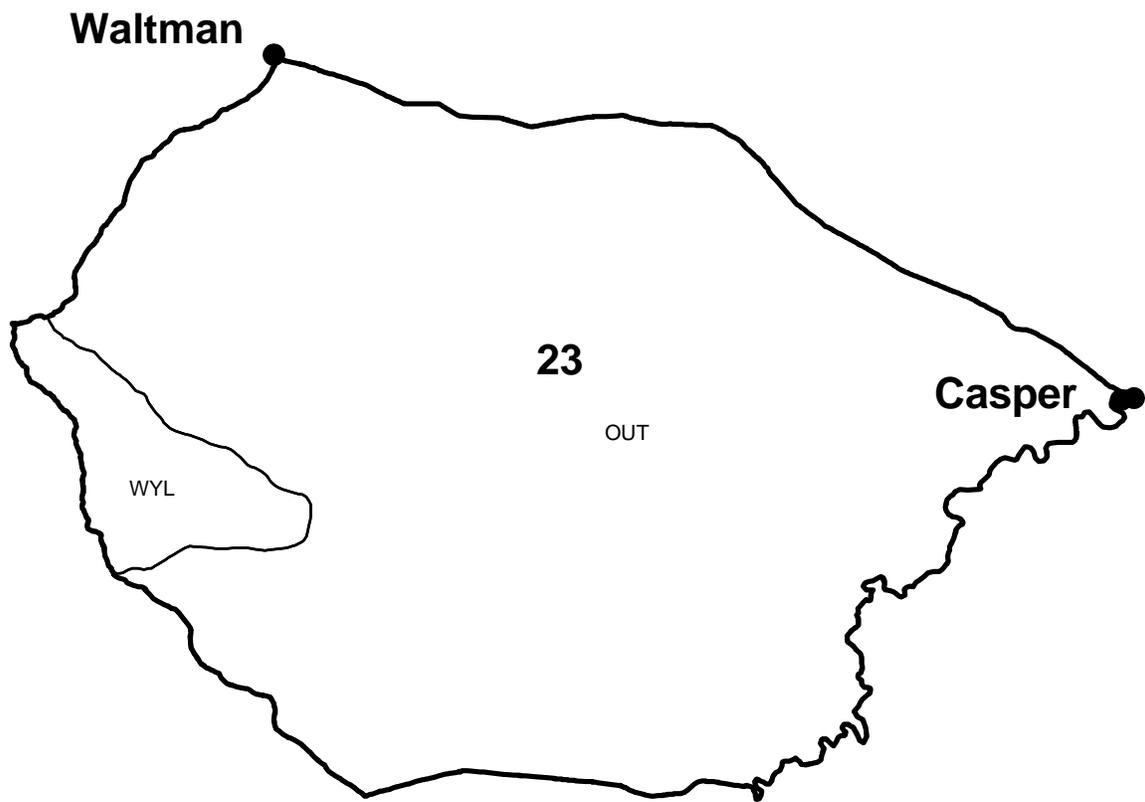
## **Management Summary**

Opening day of hunting season in this herd is traditionally October 1<sup>st</sup>, and closing dates have differed with changing harvest prescriptions from year to year. Season structure has also changed to include a split season in recent years, in an attempt to maximize cow harvest. Longer split season dates with a closure from November 1 – 14 have been well-received the last three years by hunters, and have resulted in record high harvest success and harvest totals. Since this has worked well, the same season is being implemented for 2016. The additional December cow season added in 2015 will be lengthened to four weeks to provide more opportunity for those

license holders. Goals for 2016 are to continue high harvest pressure on cows, maintain extended opportunity to hunt bulls, and maintain/improve overall harvest success.

If we attain the projected harvest of approximately 195 elk and assuming average calf production/survival, this herd will decrease to slightly above objective. The predicted 2015 postseason population estimate for the Rattlesnake Elk Herd is approximately 1,200 animals, or 32% above objective.

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



## 2015 - JCR Evaluation Form

SPECIES: Elk

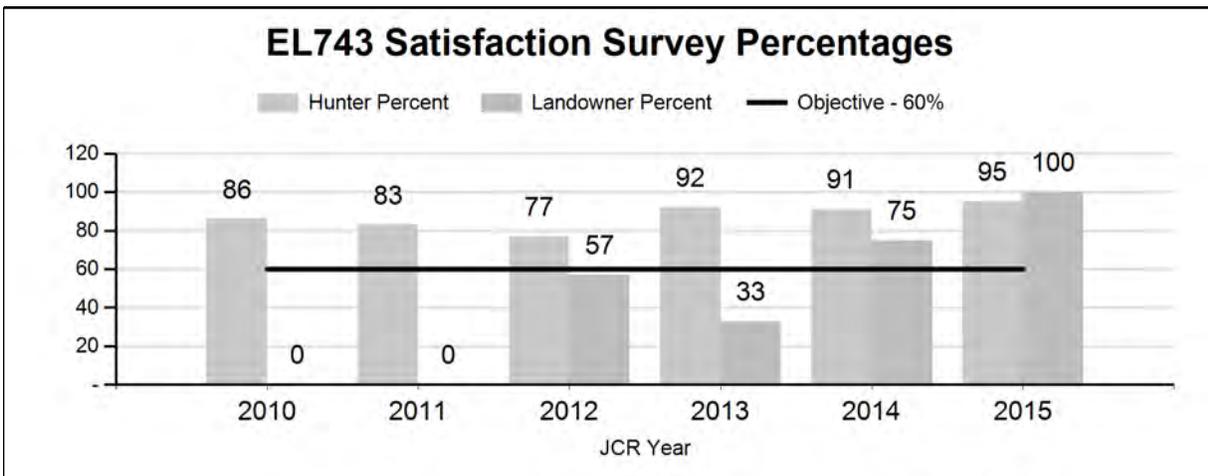
PERIOD: 6/1/2015 - 5/31/2016

HERD: EL743 - PINE RIDGE

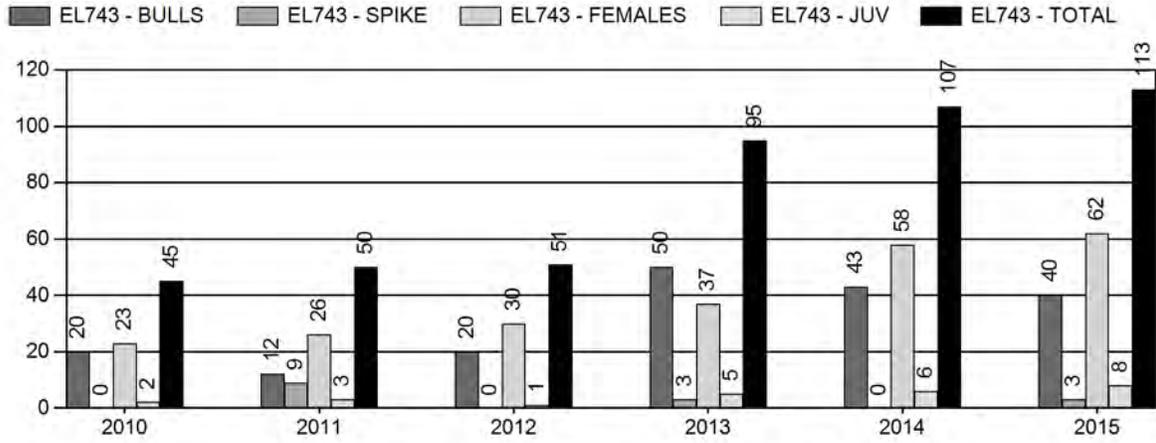
HUNT AREAS: 122

PREPARED BY: WILLOW STEEN

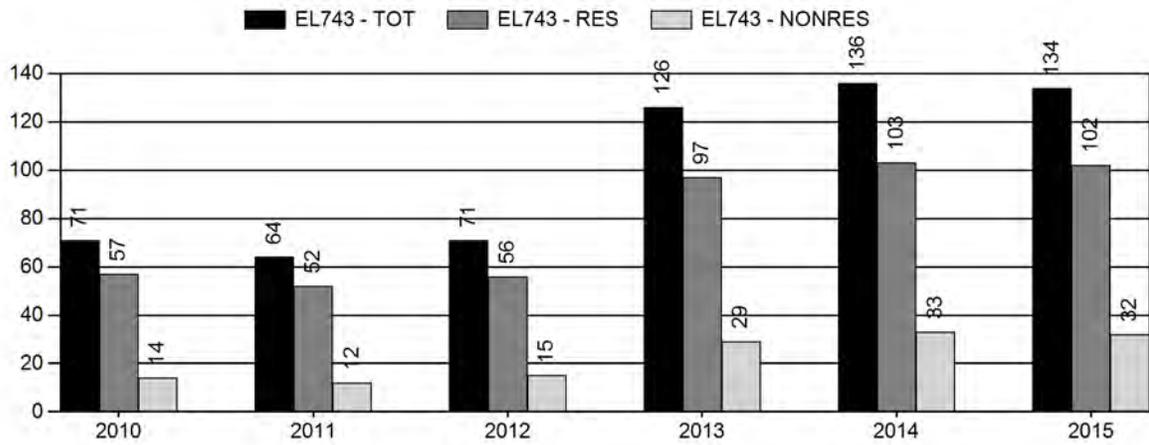
	<u>2010 - 2014 Average</u>	<u>2015</u>	<u>2016 Proposed</u>
Hunter Satisfaction Percent	87%	95%	90%
Landowner Satisfaction Percent	53%	100%	90%
Harvest:	70	113	130
Hunters:	94	134	150
Hunter Success:	74%	84%	87%
Active Licenses:	100	138	160
Active License Success:	70%	82%	81%
Recreation Days:	456	495	520
Days Per Animal:	6.5	4.4	4
Males per 100 Females:	0	0	
Juveniles per 100 Females	0	0	
Satisfaction Based Objective			60%
Management Strategy:			Private Land
Percent population is above (+) or (-) objective:			38%
Number of years population has been + or - objective in recent trend:			2



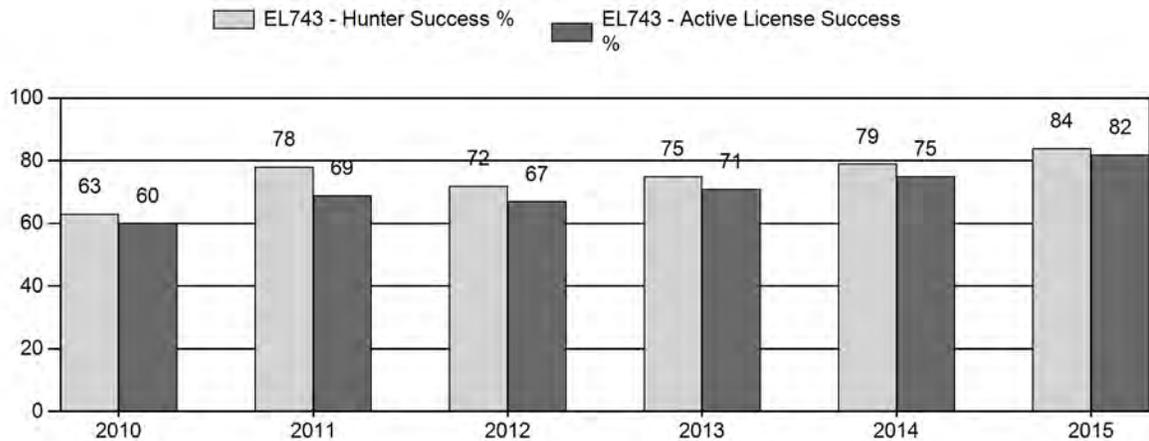
# Harvest



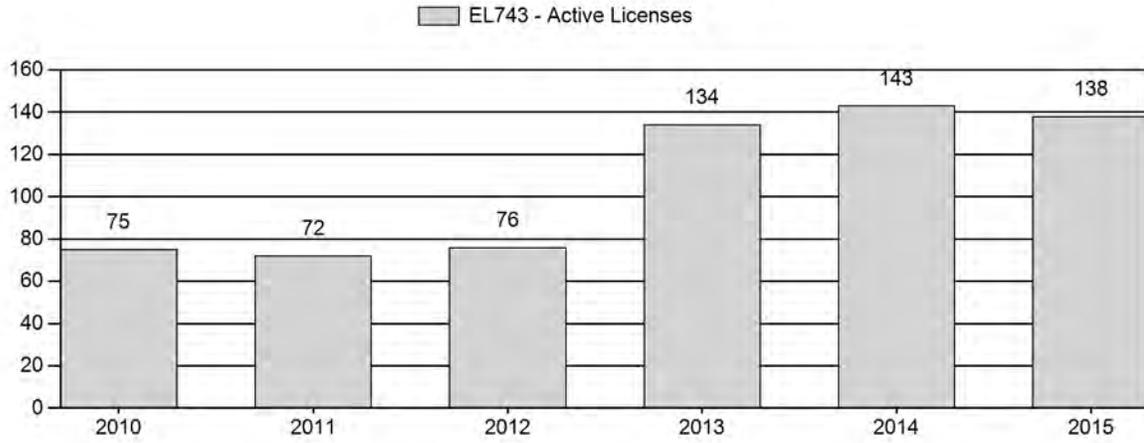
# Number of Hunters



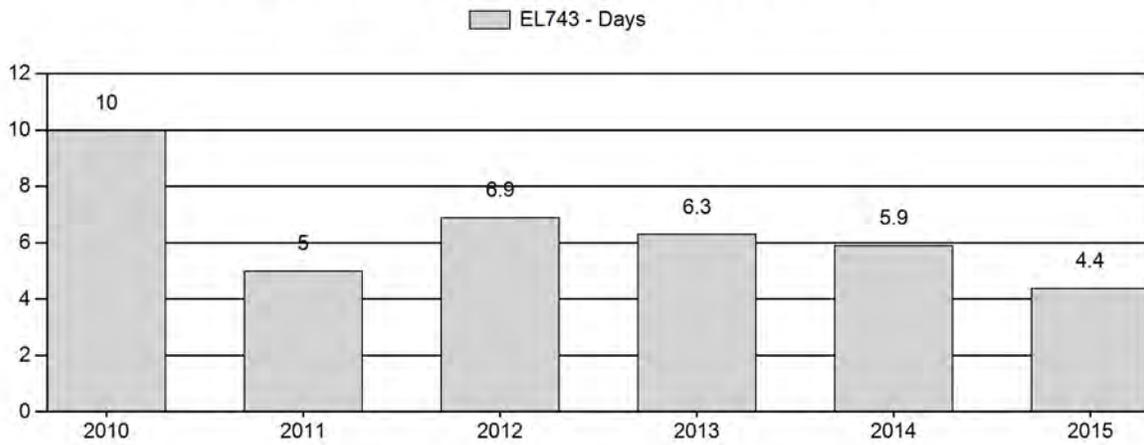
# Harvest Success



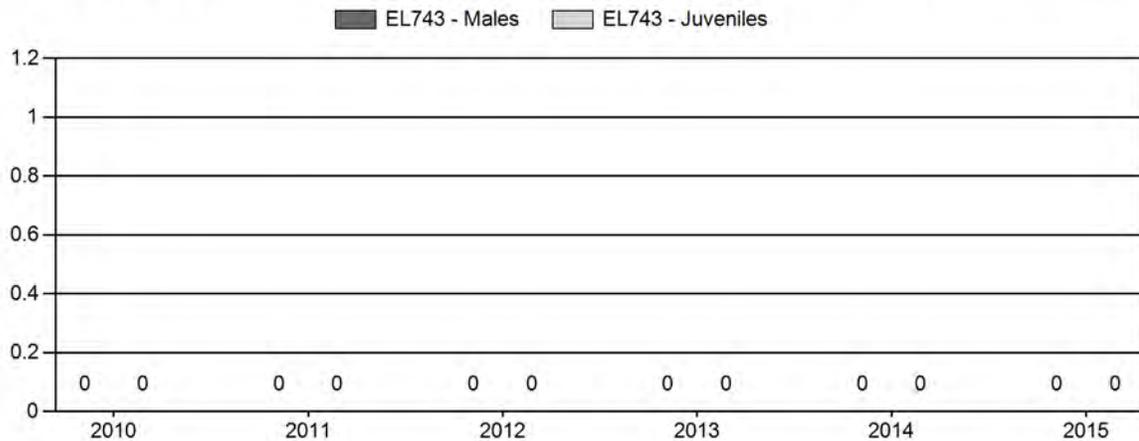
# Active Licenses



# Days per Animal Harvested



# Postseason Animals per 100 Females



**2016 HUNTING SEASONS  
PINE RIDGE ELK HERD (EL743)**

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

Hunt Area	Type	Quota change from 2015
122	6	+25

**Management Evaluation**

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

**Management Strategy:** Private Land

**2015 Hunter Satisfaction Estimate:** 94%

**2015 Landowner Satisfaction Estimate:** 100%

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

**Most Recent 3-year Running Average Landowner Satisfaction Estimate:** 69%

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

**Herd Unit Issues**

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

this herd is very difficult. Given the private-land nature of this elk herd, the Department gives serious deference to landowner desires. In recent years, landowners have expressed dissatisfaction with growing elk numbers. A meeting in February of 2015 that was well-attended by the affected landowners resulted in increased quotas as well as a greater commitment to achieve cow harvest. In lieu of a satisfaction survey which often produces conflicting responses, another meeting was held in February of 2016 to discuss Pine Ridge Elk management. While some landowners still have relatively low tolerances for elk, the majority felt it was desirable to maintain elk numbers at their current levels and that continued harvest pressure, including a slight increase in cow harvest, would be necessary to achieve this objective.

### **Weather & Habitat**

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

### **Field Data**

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

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

percentage of mature branch-antlered bulls in the male portion of the annual harvest is used, with a 3-year trend average of 60% minimum being the threshold for management action.

In 2015, 100% of landowners (N=8) believed the elk herd to be “at or about at desired levels”, while 94% of hunters who returned surveys were “satisfied” or “very satisfied” with their hunting experience in the Pine Ridge Elk Herd Unit. Landowner satisfaction was based on an in-person meeting with the landowners and a “show of hands” regarding satisfaction. These particular landowners have expressed their preference for the Department to hold an in-person meeting every year as opposed to conducting a mailer survey. For the secondary objective, the three-year average for mature bulls in the harvest was 96%. Landowner satisfaction, hunter satisfaction, and the percentage of mature bulls in the harvest all exceeded the 60% threshold for bio-year 2015.

### **Harvest Data**

Hunter success has remained high for the last 5 years (63-84%). In the past, for most of the past, antlerless elk licenses were undersubscribed as landowners have been unwilling to allow access for cow hunters. However, landowners have recently become more willing to allow hunting access and harvest more elk. While a majority of Type 6 licenses were available as leftovers in 2015, only 11 remained unsold. There were 113 elk harvested in 2015, 62% of which were cows or calves which is the most ever recorded. Harvest in 2013 and 2014 were comparable at 95 and 107 total elk, but in years past, harvest was typically somewhere between 40 and 50 elk.

Perceived loss of bull quality was also a concern amongst certain landowners in the past. However, landowners attending the 2016 meeting agreed that bull quality was still high and that a quota of 75 was desirable. Landowner’s perceptions of bull availability are reflected in the harvest results as license success was 79.3% on the Type 1 license with 87% of those being branch-antlered bulls.

### **Management Summary**

The hunting season in this herd unit opens on October 15<sup>th</sup> following the close of deer seasons. In recent years, closing dates have been extended as landowners agreed to liberalize access for cow elk hunting later in the season. Type 1 license issuance will remain at 75 with similar season dates for bull harvest. Landowners requested the season length be extended to the end of December for antlerless elk to provide hunting opportunity for youth through the Christmas break. Since there will be more opportunity for harvest, they also requested an additional 25 Type 6 licenses, therefore, Type 6 license issuance was increased by 25 and the season length will extend through December 31<sup>st</sup> for all antlerless elk licenses.

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

**Midwest**

YRL

**122**

OUT

**Casper**

**Glenrock**