

2016 - JCR Evaluation Form

SPECIES: Mule Deer

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

HERD: MD740 - CHEYENNE RIVER

HUNT AREAS: 7-14, 21

PREPARED BY: JOE SANDRINI

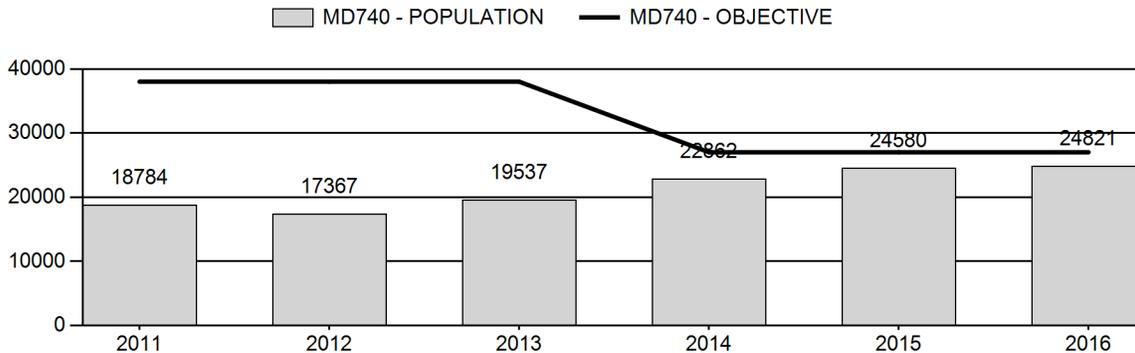
	<u>2011 - 2015 Average</u>	<u>2016</u>	<u>2017 Proposed</u>
Population:	20,626	24,821	25,947
Harvest:	1,126	1,202	1,340
Hunters:	2,132	1,996	2,195
Hunter Success:	53%	60%	61%
Active Licenses:	2,170	2,026	2,230
Active License Success:	52%	59%	60%
Recreation Days:	8,743	7,909	8,750
Days Per Animal:	7.8	6.6	6.5
Males per 100 Females	37	51	
Juveniles per 100 Females	66	67	

Population Objective (± 20%) :	27000 (21600 - 32400)
Management Strategy:	Private Land
Percent population is above (+) or below (-) objective:	-8.1%
Number of years population has been + or - objective in recent trend:	8
Model Date:	02/22/2017

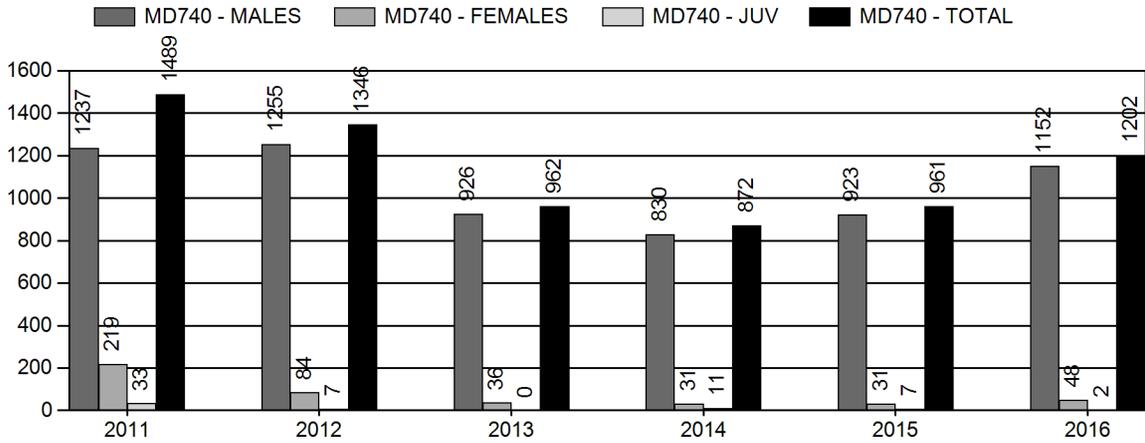
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0.4%	0.4%
Males ≥ 1 year old:	19.3%	20.5%
Total:	5.0%	5.3%
Proposed change in post-season population:	+4.0%	+4.4%

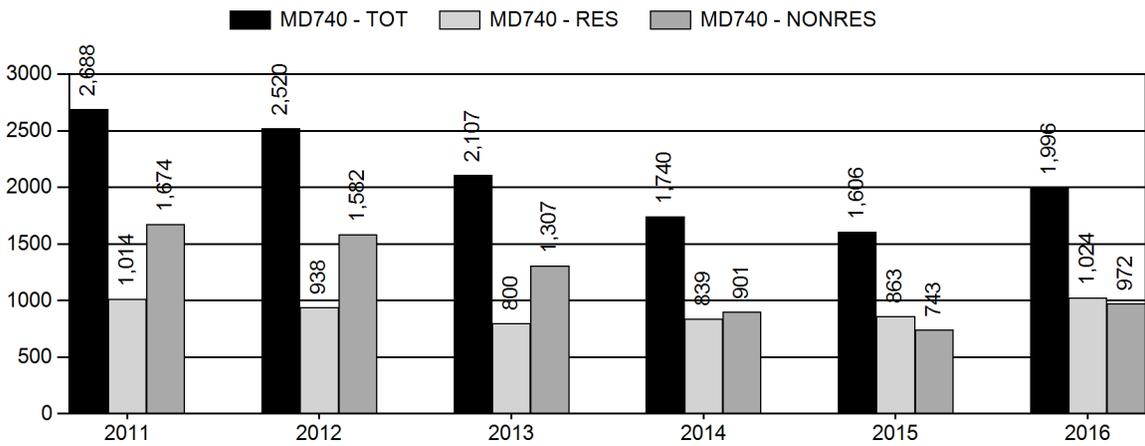
Population Size - Postseason



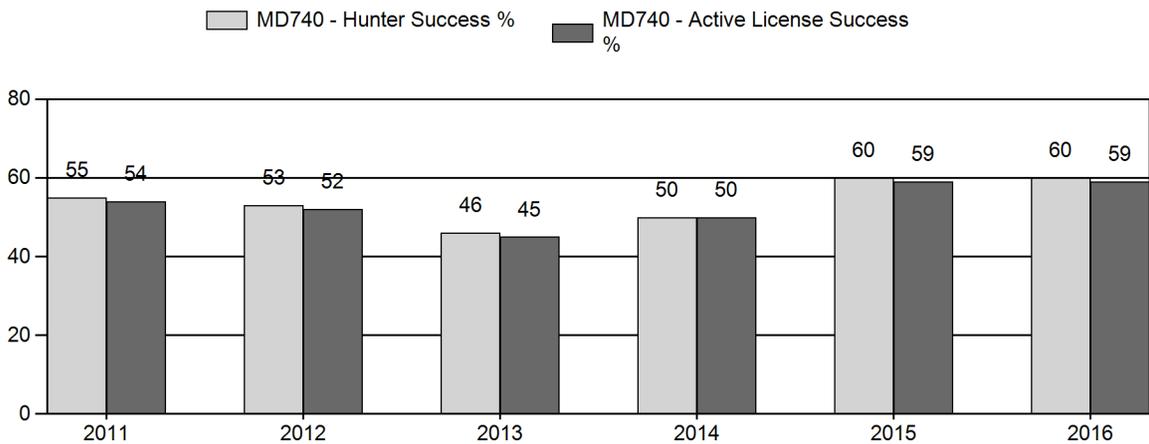
Harvest



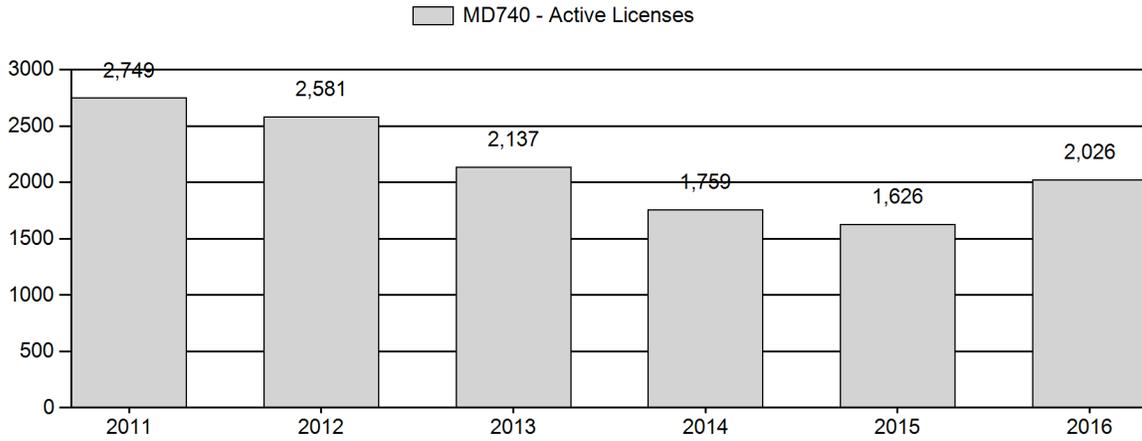
Number of Active Licenses



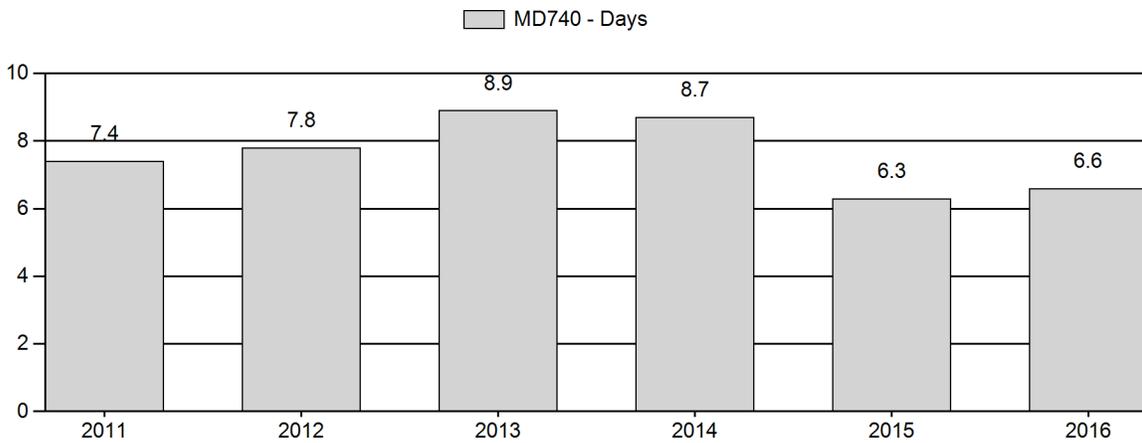
Harvest Success



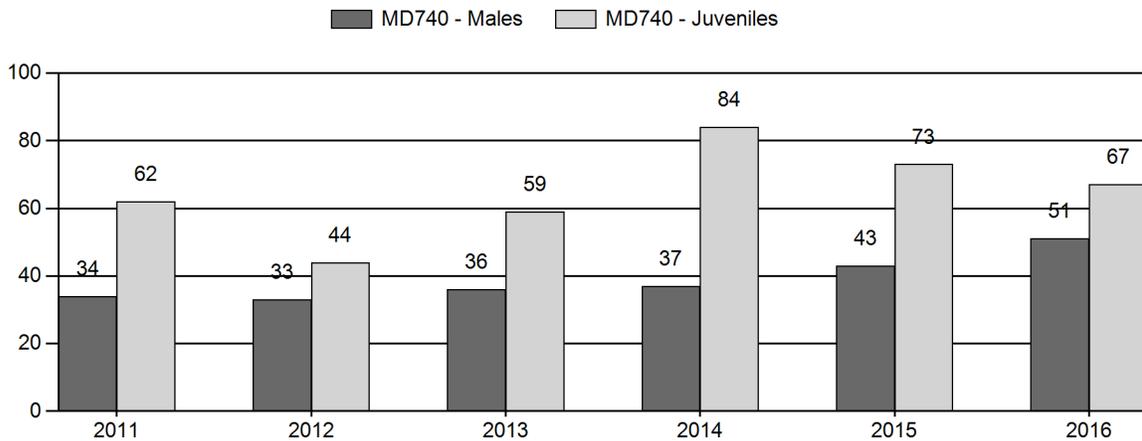
Active Licenses



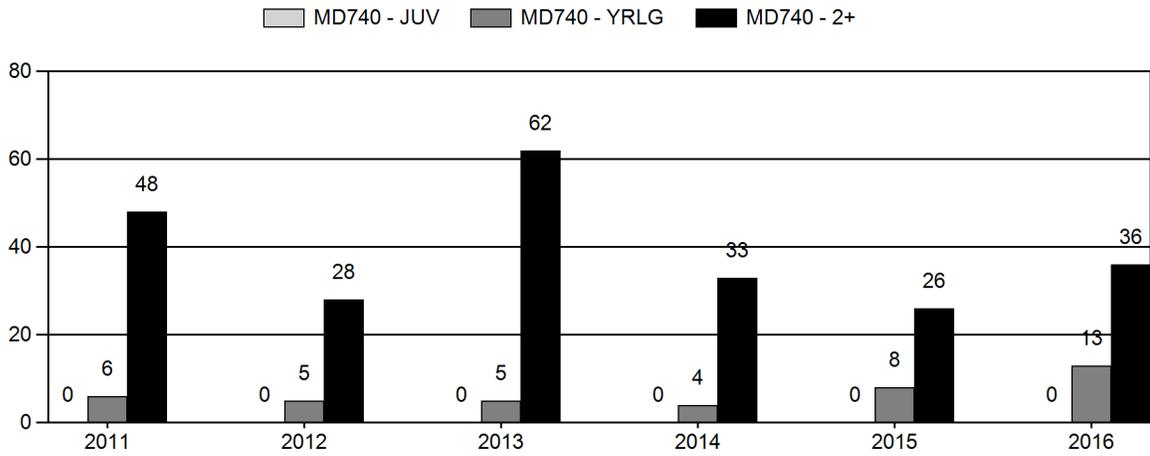
Days per Animal Harvested



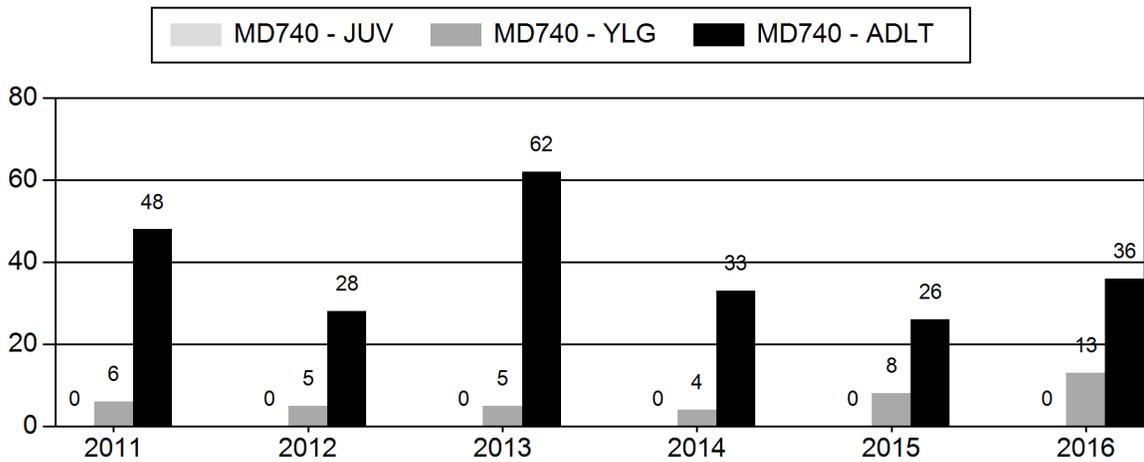
Postseason Animals per 100 Females



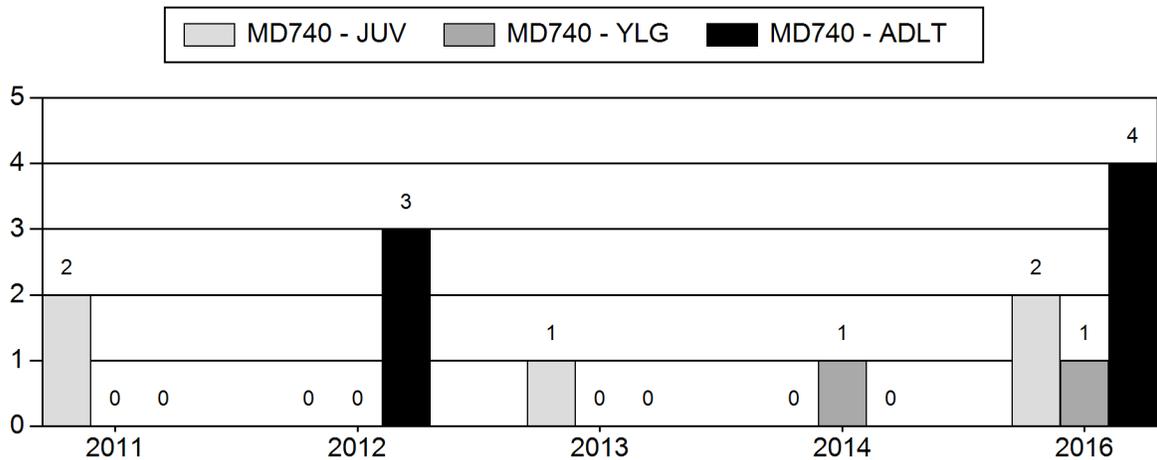
Age Structure of Field Checked Males



Age Structure Data (Field and Laboratory) - Male



Age Structure Data (Field and Laboratory) - Female



2011 - 2016 Postseason Classification Summary

for Mule Deer Herd MD740 - CHEYENNE RIVER

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	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
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	24,821	298	297	90	8	0	693	23%	1,371	46%	916	31%	2,980	1,506	22	29	51	± 3	67	± 3	44

**2017 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: 1,100

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	License Type	Quota change from 2016
	1	none
	6	none
Herd Unit Totals	7	none
	Region B	+100

Management Evaluation

Current Management Objective: 27,000

Management Strategy: Private Land Management

2016 Postseason Population Estimate: ~ 24,800

2017 Proposed Postseason Population Estimate: ~ 25,900

2016 Hunter Satisfaction: 75% Satisfied 16% Neutral 9% 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 mi² in this herd unit, and 5,485 mi² (86%) are considered occupied habitat. Approximately 75% of the land within the herd unit is privately owned, with the remaining lands 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 what lands are legally accessible to the 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 approximately 1,000 residents who hunt here annually. Compared to residents, non-residents typically are more willing to pay trespass or access fees for hunting privileges or hire an outfitter. Consequently, many resident hunters and an increasing percentage of non-residents pursue mule deer with general licenses on accessible on public land, which significantly concentrates hunting pressure there.

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 10, 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 about normal winter weather patterns to reduce recruitment of fawns into the adult segment of this herd. The winter of 2010-11 was fairly severe and over-winter mortality elevated. 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 by differentially affecting various proximate mortality factors.

Weather conditions improved markedly in 2014 and 2015, when spring and summer temperatures were close to average, and precipitation above average. Consequently, forage production during 2014 and 2015 was excellent. Overall, winter conditions in 2014 and 2015 also favored mule deer, with daily winter temperatures hovering close to or above average, and precipitation generally remaining below normal. During the spring of 2016, moderate to mildly severe drought beset much of the herd unit. In many locations, notably in the north half of the herd unit, cool season forage production was nominal and warm season production limited. This drought was somewhat ameliorated between the middle of August and mid-September with regular thunderstorms and rainfall. Overall, mule deer went into the 2016-2017 winter with range conditions in fair to poor shape. The 2016-17 winter also saw a return of more severe winter weather. Consequently, the weather conditions experienced by this herd over the past year resulted in below normal forage production and what will likely be average to slightly elevated over-winter mortality. (Weather summary available at <http://www.ncdc.noaa.gov/cag/>)

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 easternmost lands in the herd unit are comprised of short grass prairie punctuated by pine breaks, and there is a small area (about 30 mi²) of southern Black Hills habitat along the state line near Newcastle. Rolling ponderosa pine and limber pine (*Pinus flexilis*) hills and ridges dominate the southern portions of the herd unit. Major agricultural crops are grass and alfalfa hay and winter wheat. Croplands are localized and found primarily near Gillette, Moorcroft, Upton, Newcastle, Manville, and Lusk. These variations in habitat types and limited riparian areas affect deer densities and distribution. The majority of mule deer are typically found utilizing broken topography characterized by sagebrush, conifer covered hills, or cottonwood and sagebrush dominated riparian communities. Scattered mule deer are found in the open sagebrush-grassland areas.

Several major cottonwood drainages traverse the herd unit including the headwaters of the Belle Fourche River in the north and those of the Niobrara River to the south. 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 along with the general lack of woody understory species. 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 proportional to the amount of spring and early summer moisture received; while over-winter browsing of shrubs could be fairly well gauged through causal observation. During 2014 and 2015, wet spring and summer conditions combined with low numbers of pronghorn and mule deer on the range to yield excellent leader growth and low levels of winter use. Observations in 2016 indicated little in the way of cool season grass and forb production together with reduced leader growth on shrubs. However, fawn production by mature does and subsequent fawn survival was generally good, at least until mid winter, indicating this population was still below carrying capacity and could be permitted to grow even though it is near objective.

FIELD DATA: While postseason fawn:doe ratios have undergone cyclic fluctuations, they have generally trended downward (Figure 1). In 2016, the observed, post-season fawn:doe ratio was 67:100, which was a drop of 8% from 2015 and 20% from the recent high of 84:100 observed in 2014. However, fawn production in both 2015 & 2016 by mature does was likely excellent because removing yearling does from the fawn:doe calculations (based upon numbers of yearling bucks observed) yields fawn to mature doe ratios for 2015 and 2016 of 91:100 and 85:100, respectively. At any rate, the fawn:doe ratios observed the past three years were a marked improvement 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 laid atop habitat fragmentation and loss. 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, resulting in a spike in fawn production and survival.

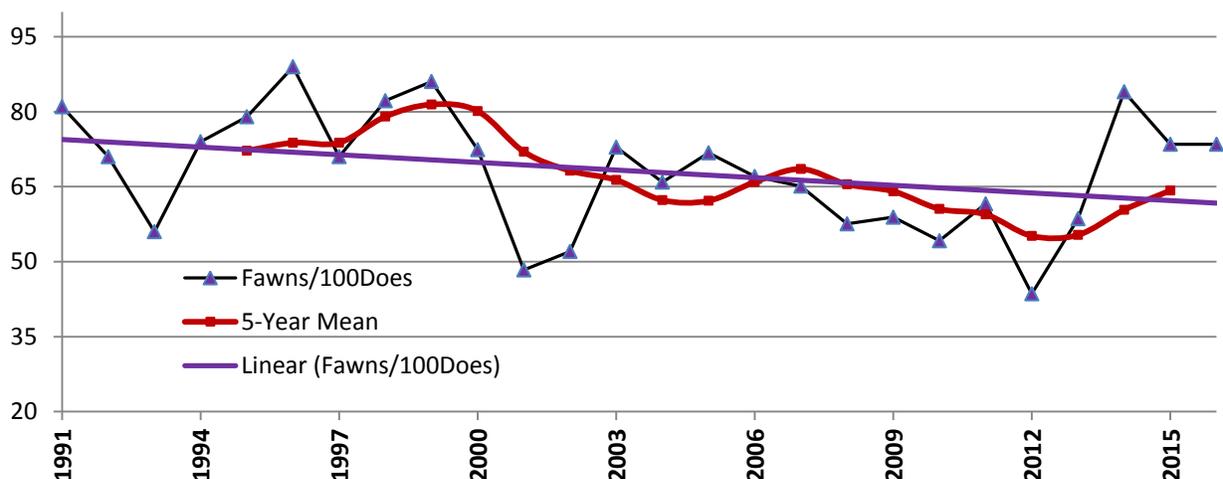


Figure 1. Post-Season Fawn:Doer Ratios (1991 – 2016) with 5-year mean values in the Cheyenne River Mule Deer Herd.

Post-season buck:doe ratios have fluctuated cyclically in this herd (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. Excellent fawn production and over-winter survival beginning in 2014 caused the total buck:doe ratio to jump to 43:100 in 2015 and 51:100 this past year. Driven substantially by the respective 2015 and 2016 yearling buck:doe ratios of 20:100 and 22:100, which were 66% above the average detected over the previous two decades, the relative number of bucks in this herd has become substantial.

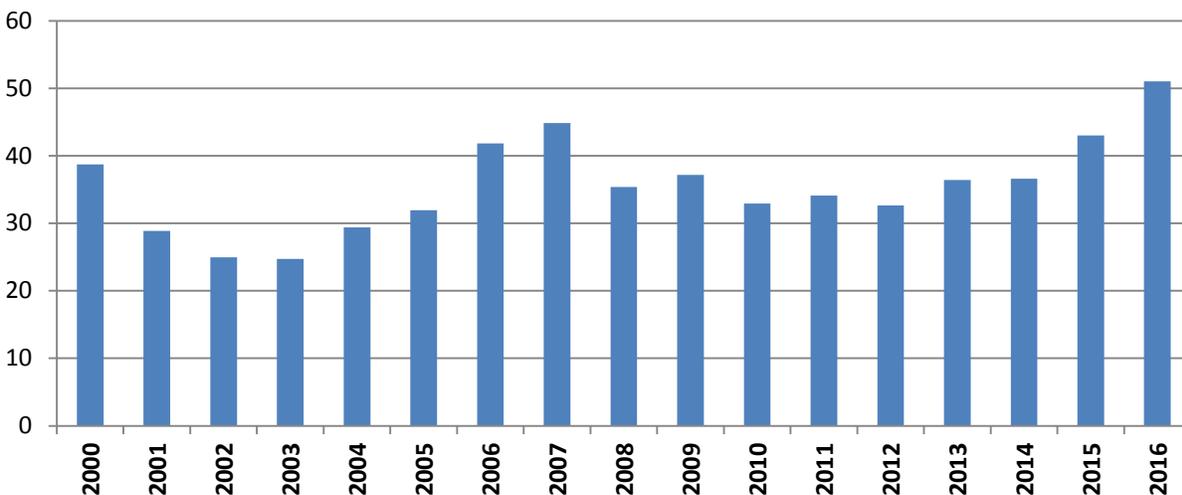


Figure 2. Post-Season Buck:Doe Ratios, Cheyenne River Mule Deer Herd (1997-2015).

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 reducing the post-season population objective in 2014.

Access to private lands for deer hunting continues to remain impoverished due to leasing by outfitters and landowners limiting hunting in the wake of the recent 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 seem to be near access saturation at this time on much of the private land within the herd unit. Compounding this situation, over the past two decades, outfitter control has significantly curtailed public hunting access to buck deer, and harvest of bucks has dropped, even at times when seasons have been liberalized. Continual reductions in access to private land for deer hunters over the past twenty years has steadily increased hunting pressure on accessible public lands and resulted in lower numbers of bucks there. This was a primary reason 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 between 2006 and 2015 as the Region B quota was successively lowered most years. Likely in response to declining deer numbers, resident hunter numbers declined steadily through 2013 before increasing about 5% in 2014 and 3% in 2015 and 18% in 2016. With proportionately greater increases in buck deer numbers relative to total hunter numbers, complaints about the low number of deer seen and harvested have begun to diminish over the past couple of years.

It was evident from the reduced number of deer found during classification efforts between 2010 and 2013, changes in harvest statistics, and landowner contacts that this herd had declined substantially. So, it is notable that the 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 licenses have been forced to hunt already overcrowded public land; and more than a few landowners have turned hunters away whom they previously granted permission to hunt. This situation has ameliorated itself somewhat the past couple of years as demand for Region B licenses exceeded issuance in the initial license draw, deer numbers have improved, and HA 10 converted to limited quota.

Harvest statistics have generally reflected changes in population estimates and license sales. These statistics seem to indicate this population dropped to its low point in 2013, versus 2012 as projected by the model. However, with the vast majority of the harvest being adult bucks, it is likely the harvest statistics more ostensibly reflect changes in mature buck numbers rather than gross population changes. As such, we could expect an offset between harvest statistics and population estimates of a year or two as recruitment fluctuates. In 2014, harvest statistics reversed their course from declining hunter success and increasing effort to improved success and reduced effort. This same scenario continued in 2015, with substantial increases in hunter success and reductions in effort. Hunter success and effort values leveled off in 2016 as hunter numbers increased for the first time in many years and there was less of a projected change in the herd's population size.

POPULATION: This herd's 2016 post-season population estimate of ~24,800 puts it about 8% below objective; and represents an increase of 43% since 2012. This substantial rebound has been a result of good to excellent reproduction and survival since 2014, a considerable course reversal considering this herd declined appreciably between 2007 and 2012 when it bottomed out 31% below objective. However, placing great confidence in these population estimates is cautioned against since the inherent constraints in the spreadsheet models used 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 AICc and fit observed buck ratios well without being overly parameterized. Preseason population estimates of the selected model are also 94% correlated with changes in hunter success, and

inversely correlated 85% with changes in hunter effort between 2006 and 2016. However, modeled changes in population size do not seem to be of the magnitude field personnel and many landowners report. 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. More recently, it does not appear on the ground that the increase in deer numbers has been as great as the model suggests. Consequently, the chosen 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; and the population increases indicated are not totally congruent with field observations.

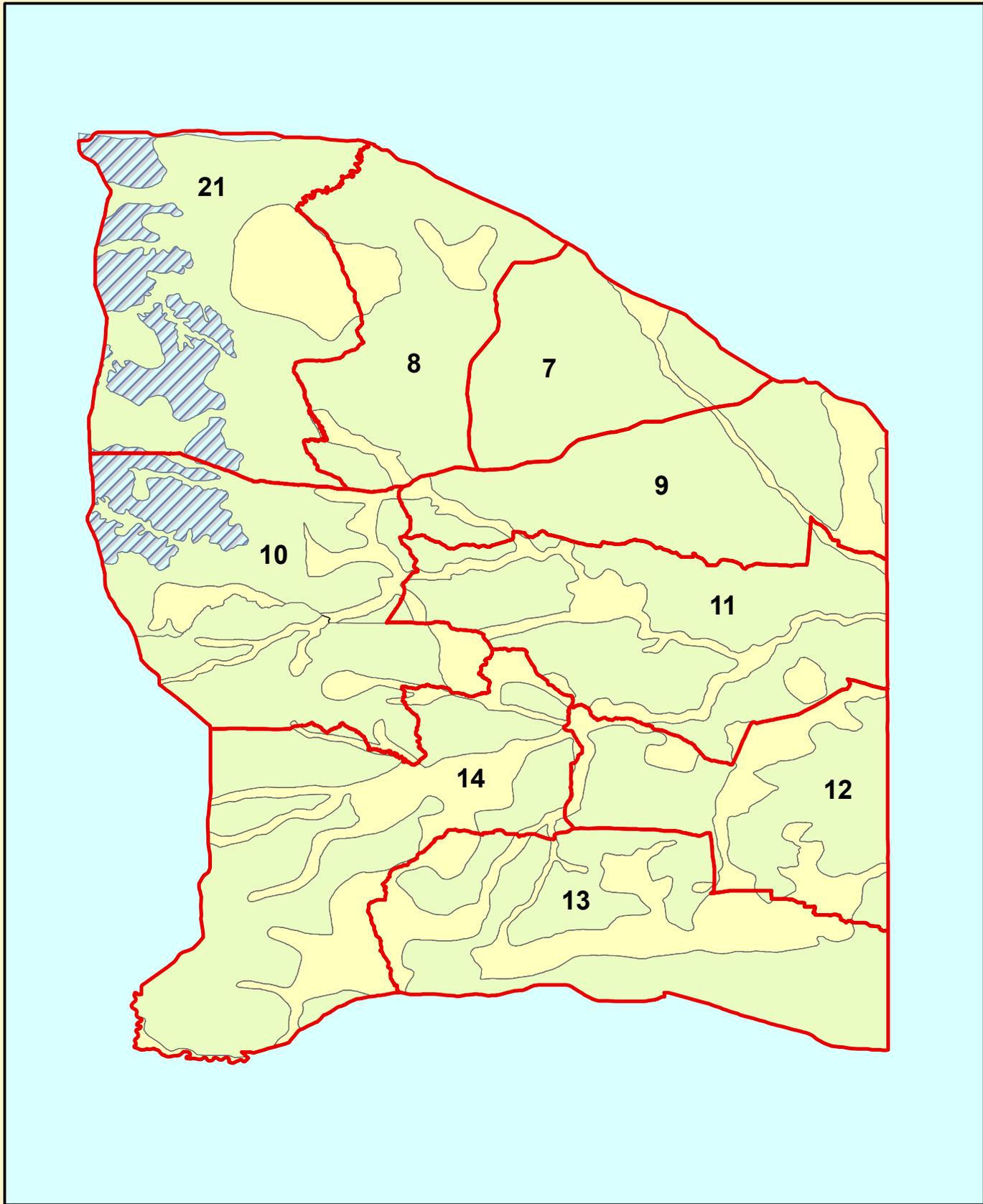
MANAGEMENT SUMMARY: The traditional season dates for this herd unit are Oct. 1-15. In order to facilitate population growth commensurate with landowner and hunter desires, we are proposing to continue with very little doe/fawn harvest and antlered-only general license seasons for mule deer. Limited doe/fawn harvest will continue in HA 12, where a couple landowners are experiencing some damage and want to reduce mule deer numbers, and 50 Type 7 licenses valid on private land will again be issued in HA 21 to address localized concentrations of mule deer around cultivated and landscaped areas.

Due to heavy hunting pressure on accessible public land there is a discrepancy in deer numbers and densities between these areas and surrounding private lands. Historically, this was 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 hunt area we steadily reduced the Region B quota, 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. With the 3-point restriction in place during 2012, the post-season buck:doe ratio improved to 42:100. 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, similar classification efforts found a buck:doe ratio of 51:100 in 2015 and 57:100 in 2016. However 30% of the bucks observed were yearling bucks in 2015 and 43% in 2016. It is likely we can begin to liberalize license issuance in Area 10 over the next couple of years barring a significant mortality event as these younger deer reach trophy class potential ages. Finally, limited quota hunting in this hunt area was initially very well received by those who hunted here, as an average of 83% of these hunters reported being satisfied or very satisfied with their hunt, while only 2% reported any measure of dissatisfaction in 2015. These satisfaction values fell some in 2016, with 78% of the hunters reporting some level of satisfaction and 6% dissatisfaction.

Even as this population has begun to recover, many landowners have continued to state they are not willing to host increased numbers of deer hunters. In addition, since 2013 a number of ranches that would normally host several hundred deer hunters have turned these hunters away, and apparently plan to follow a similar course in 2017. This has resulted in local game wardens being strongly reluctant to increase Region B license issuance due to concerns over nonresident hunters purchasing licenses without securing permission on private lands, resulting in widespread complaints and dissatisfaction from those hunters relegated to hunting isolated parcels of public land. However, now that HA 10 has been limited quota for a couple of years, nonresident license demand is strong, and the buck:doe ratio has steadily increased the past three

years, an increase in the Region B quota is warranted. As such, 1,100 Region B licenses will be issued in 2017, representing a 10% increase.

The 2017 hunting season should result in harvest of about 1,250 bucks and about 50 antlerless deer. Given five-year average postseason classification values and modeled survival rates, this harvest is projected to allow the post-season population to increase about 4% to ~25,900, which would put it at a value 4% below objective. However, given winter weather has been fairly severe at times and considering long-term fawn:doe ratios, this population will more likely level off or could even drop slightly in 2017.



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:

2016 - JCR Evaluation Form

SPECIES: Mule Deer

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

HERD: MD751 - BLACK HILLS

HUNT AREAS: 1-6

PREPARED BY: JOE SANDRINI

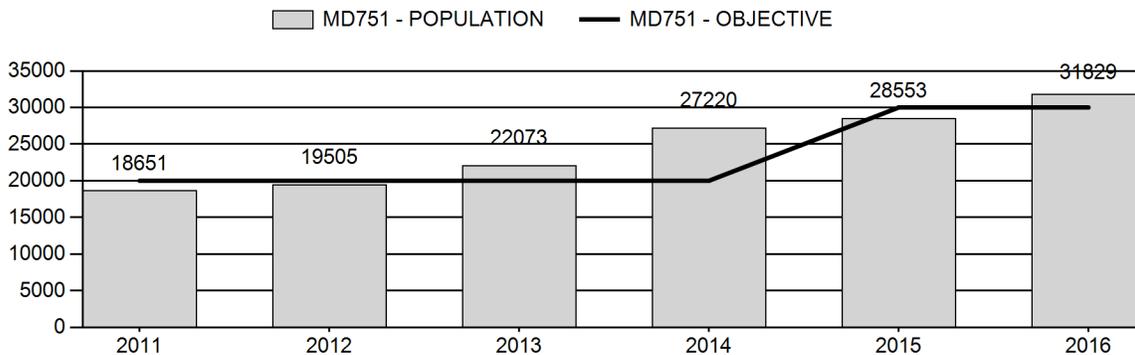
	<u>2011 - 2015 Average</u>	<u>2016</u>	<u>2017 Proposed</u>
Population:	23,200	31,829	31,219
Harvest:	1,689	2,765	2,795
Hunters:	3,910	5,583	5,600
Hunter Success:	43%	50%	50 %
Active Licenses:	3,989	5,831	5,850
Active License Success:	42%	47%	48 %
Recreation Days:	12,302	16,239	16,250
Days Per Animal:	7.3	5.9	5.8
Males per 100 Females	22	36	
Juveniles per 100 Females	79	68	

Population Objective (± 20%) :	30000 (24000 - 36000)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	6%
Number of years population has been + or - objective in recent trend:	1
Model Date:	02/22/2017

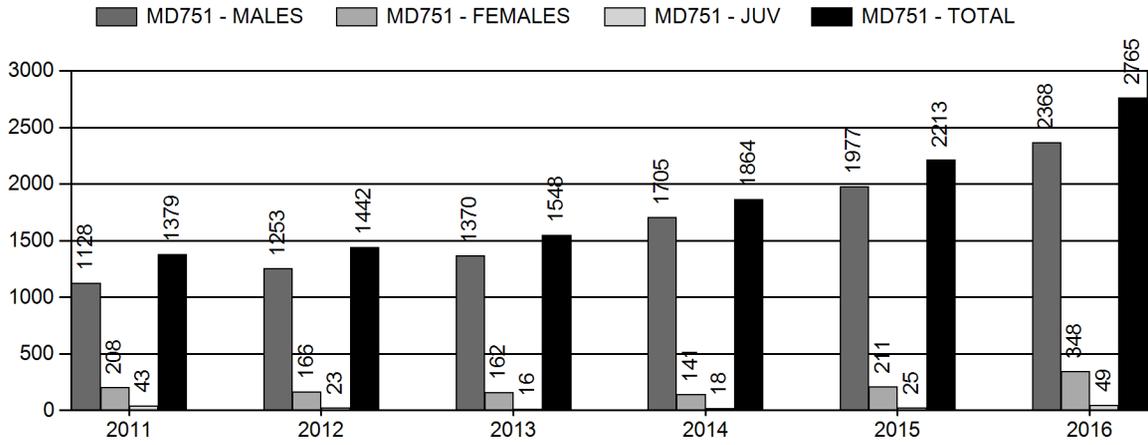
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	2.4%	2.6%
Males ≥ 1 year old:	32.5%	38.6%
Total:	8.7%	9.0%
Proposed change in post-season population:	+12.5%	-2.0%

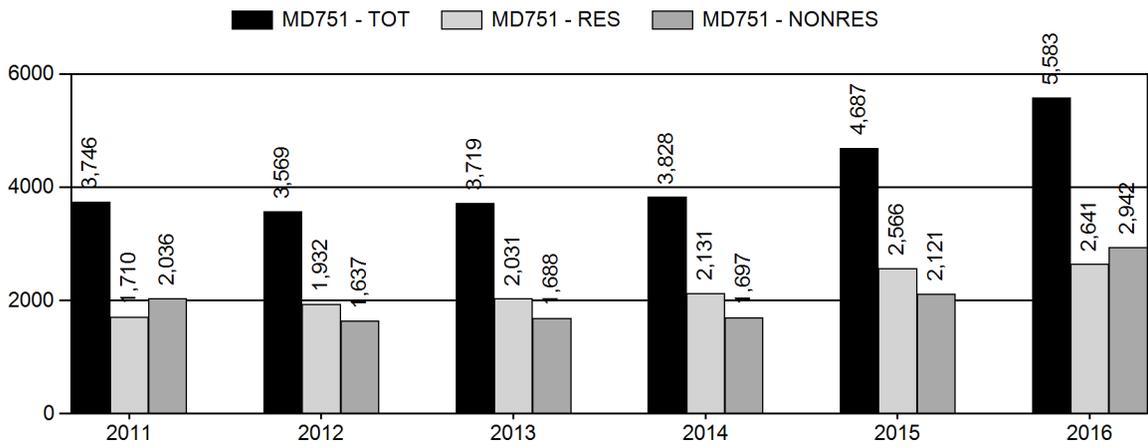
Population Size - Postseason



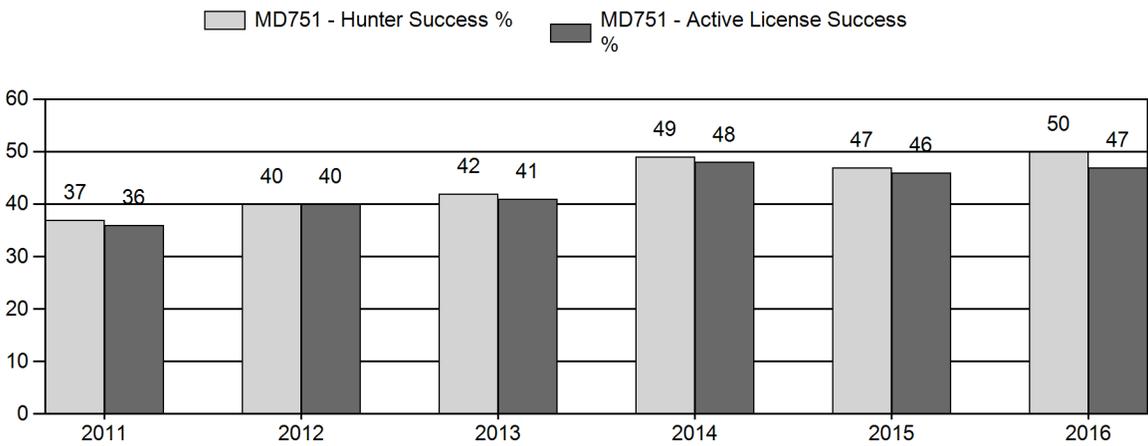
Harvest



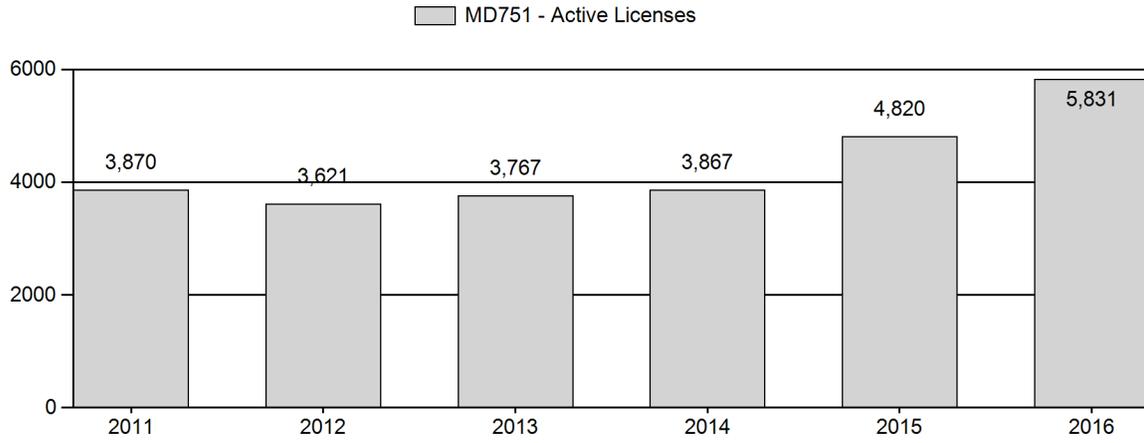
Number of Active Licenses



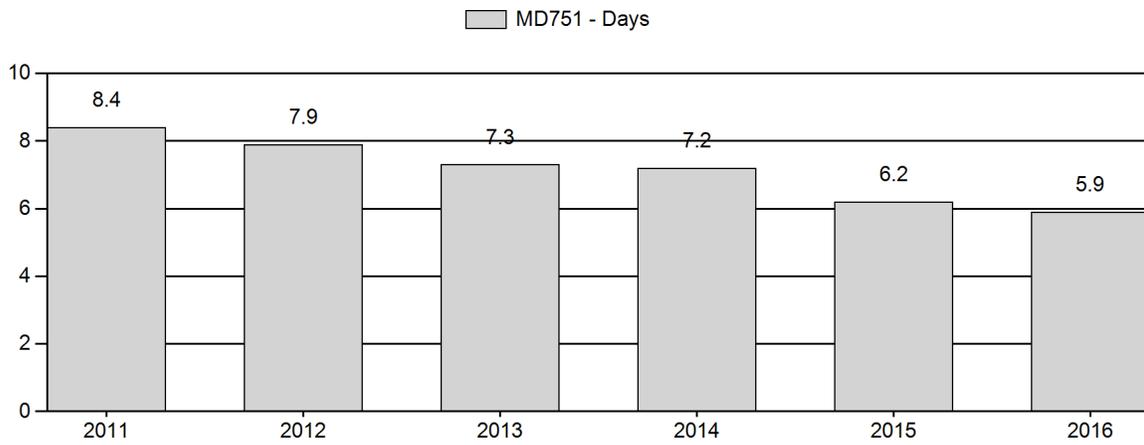
Harvest Success



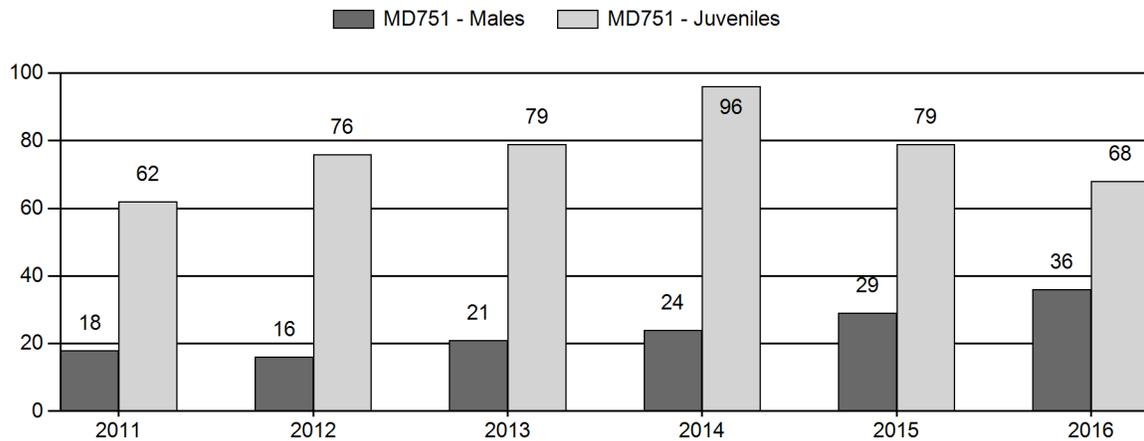
Active Licenses



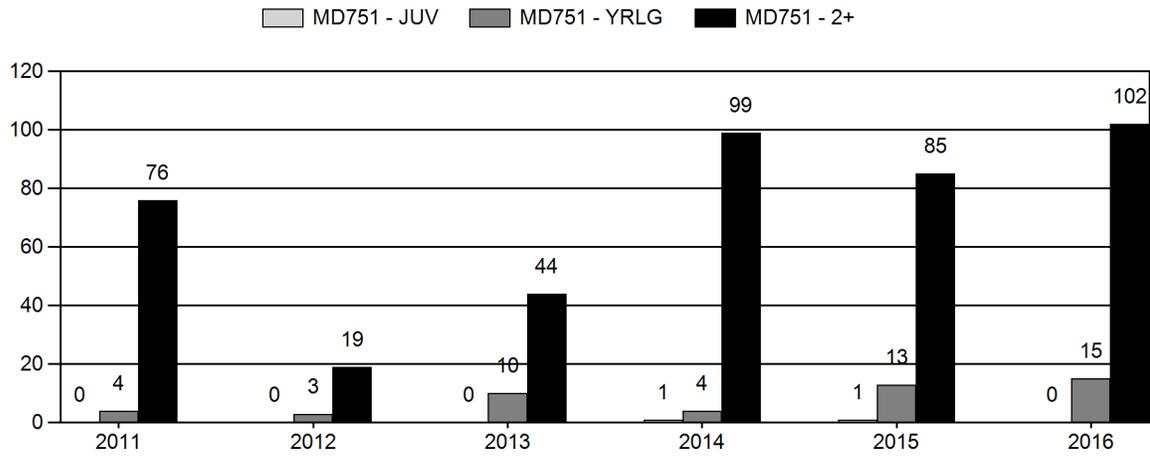
Days per Animal Harvested



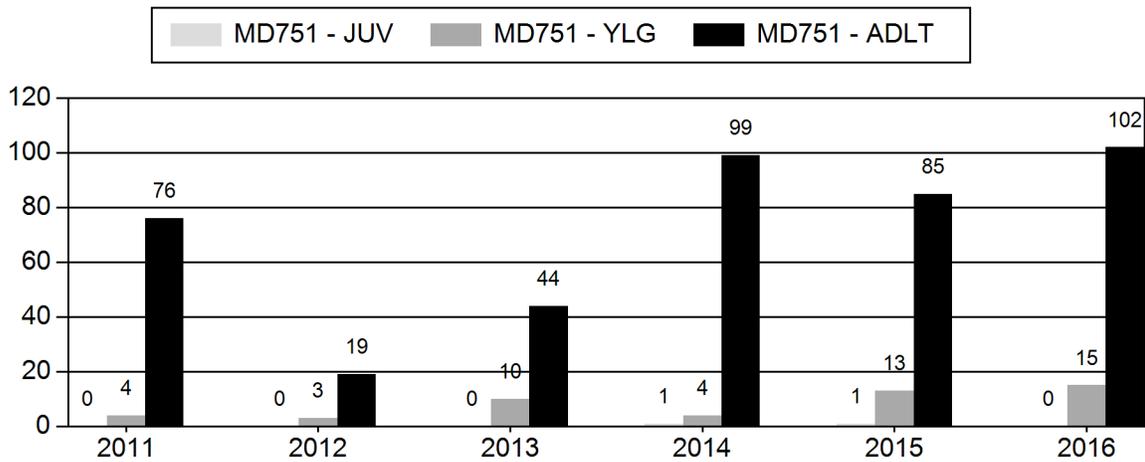
Postseason Animals per 100 Females



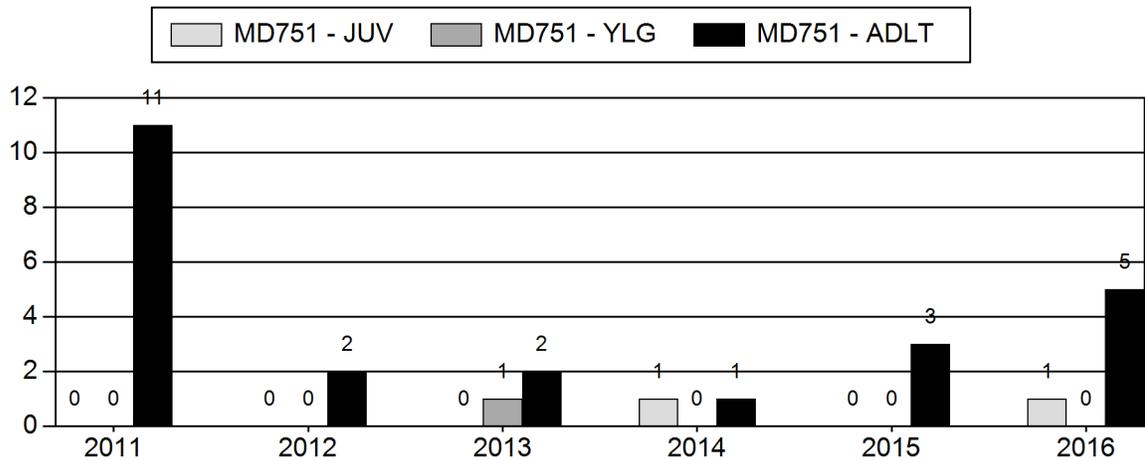
Age Structure of Field Checked Males



Age Structure Data (Field and Laboratory) - Male



Age Structure Data (Field and Laboratory) - Female



2011 - 2016 Postseason Classification Summary

for Mule Deer Herd MD751 - BLACK HILLS

Year	Post Pop	MALES								FEMALES		JUVENILES		Males to 100 Females				Young to			
		Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
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	31,829	182	183	32	0	0	397	17%	1,113	49%	762	34%	2,272	1,467	16	19	36	± 3	68	± 4	50

**2017 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	200	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 2016
Herd Unit Totals	6	none
	7	+100
	Region A	none

Management Evaluation

Current Postseason Population Management Objective: 30,000

Management Strategy: Recreational

2016 Postseason Population Estimate: ~ 31,800

2017 Proposed Postseason Population Estimate: ~ 31,200

2016 Hunter Satisfaction¹: 83% Satisfied 12% Neutral 6% 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 mi² of occupied habitat. Approximately 76% of the land in the herd unit is privately owned. Significant blocks of accessible public land are found on the Black Hills National Forest in Hunt Area (HA) 2 and HA 4, and on the Thunder Basin National Grassland in HA 6. A block of BLM land with a couple of access points is also present in HA 1. Because the majority of private landowners charge access fees for hunting 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 near 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, most notably during the 2010-11 winter, which was harsh. More recently, severe drought plagued the Black Hills throughout 2012, and a class III drought beset the much of the herd unit during the primary growing season in 2016. Both of these transient droughts resulted in very poor forage production and led to several large wildfires. However, the inter-drought period provided growing seasons with temperatures and

¹ Rounding combined values results in total over 100%

rainfall generally above average. This resulted in good to excellent forage growth from 2013 through 2015. Fall and winter weather over that same timeframe was characterized by normal to above average temperatures and average to below normal precipitation. However, coming on the heels of the 2016 drought, more normal to severe winter weather was again experienced. See <http://www.ncdc.noaa.gov/cag/> for detailed weather information.

Based upon weather, habitat conditions and deer numbers, it is likely mule deer entered the 2014-15 and 2015-16 winters in good to excellent condition. In addition, winter weather those years resulted in excellent over-winter survival, as indicated by very robust post-season yearling buck ratios in 2015 and 2016. The changes witnessed in bio-years 2014 & 2015 were a reversal of what had been experienced as this herd declined between 2007 and 2011, and then remained suppressed in 2012. However, with drought last summer and more severe weather this winter, it is likely improvements in this herd's performance may have come to a temporary end.

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. Bio-years 2013 through 2015 resulted in excellent forage production, and browse availability on winter and transitional ranges appeared to be generally good to excellent. However, during the present bio-year (2016), forage conditions were fair to poor in most locations, and winter use subsequently high.

FIELD DATA: Between 2009 and 2011, fawn productivity and survival were suppressed (mean post-season fawn:doe ratio = 65:100, std. dev.=3). In 2012, this situation reversed itself as the observed fawn:doe ratio improved to 76:100. Then between 2013 and 2015 it averaged 85:100, peaking at 96:100 in 2014, before falling to 68:100 in 2016. Consequently, this population has increased significantly since 2012. 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 between 2006 and 2011 was likely due initially to increased harvest rates and a drop in over-winter survival, while increased non-hunting mortality augmented the decline after 2008. This same period witnessed a 75% decline in preseason trend counts (Figure 1). With better fawn production and survival since 2012, this population has grown steadily, something also reflected in trend counts.

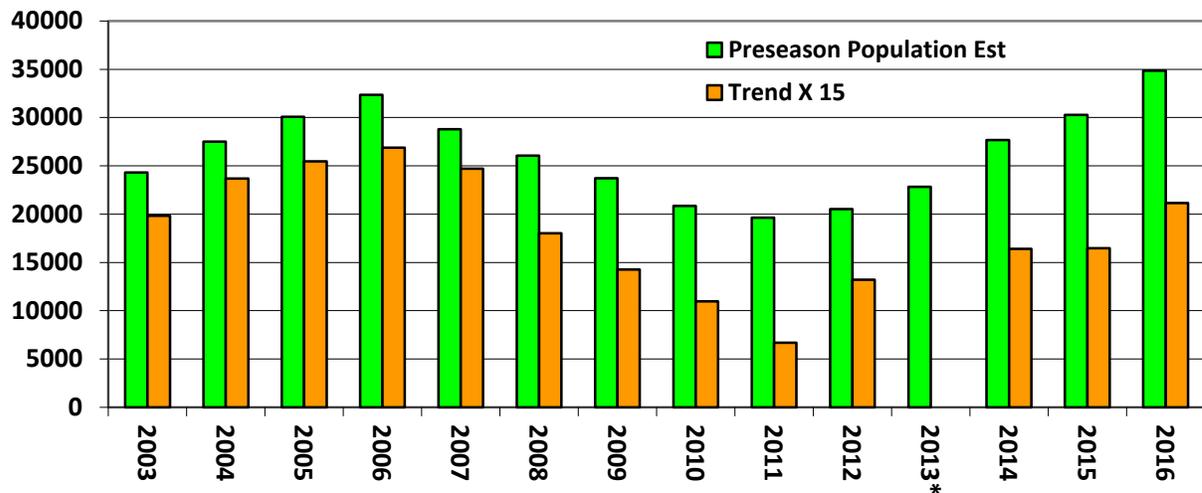


Figure 1. 2003 – 2016 pre-season population estimates produced by the current TSJ CA model, and mule deer observed preseason along trend count routes (increased by a factor of 15). * Trend counts were not conducted in 2013 due to winter storm Atlas.

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 36:100 in 2016. However, adult buck:doe ratios observed during this time period remained fairly constant around 13:100 (std. dev.=4), but did jump to 19:100 in 2016 thanks to a strong class of two-year old bucks. Over the past five years, post-season buck:doe ratios have averaged 25:100 with variability (std. dev.= 7.5) due to increasing 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 exceeding its upper end. Provided non-hunting mortality does not increase significantly and fawn survival is about average, we anticipate the 2017 hunting season will reduce this herd’s buck:doe ratio to near the midrange of the Department’s recreational management criteria.

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 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 on the heels of five years of overall good fawn production and survival and our current level of mule deer harvest

can likely be sustained in 2017, even with lower fawn:doe ratios and increased winter mortality in bio-year 2016.

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.² In 2015, Region A license issuance was liberalized some 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 19%. License issuance was again significantly liberalized in 2016, and total harvest increased another 25%.

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 2015, 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. 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. Hunter satisfaction increased again in 2015, with just over 80% of both mule deer and white-tailed deer hunters reporting they were satisfied, and about 7% or less reporting dissatisfaction. Hunter satisfaction climbed another couple percentage points in 2016. It can be inferred that steady increases in deer hunter success and declines in the effort required to harvest a deer since 2013 have strongly 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, substantial 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. Model choice for this herd has changed each of the past couple of years and did so again in 2016, when the Time Sensitive Juvenile, Constant Adult (TSJ, CA) model was chosen over competing models (see explanation below).

The 2016 modeled, post-season population estimate of Black Hills mule deer is about 31,800. However, this value may be somewhat inflated due to significantly increased reported harvest in 2014 without commensurate changes in season structure or perceived population size. With the 2016 change in model selection and updated data, the population is now projected to have peaked in 2006 at an estimated postseason population of around 28,800 mule deer (versus the 36,000 reported for that year in 2015), and then declined to near 18,100 in 2011 (versus 16,500

² 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.

reported in 2015). It is then estimated to have begun to rebound, growing about 76% into post-season 2016. Because the models we use to simulate populations produce the 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 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 rebounded after a substantial decline and is projected to level off or decline some in 2017.

As mentioned above, population modeling of this herd is difficult; and use of the Time Sensitive Juvenile / Constant Adult (TSJ CA) model this year was reinstated, replacing the Semi Constant Juvenile / Semi Constant Adult (SCJ SCA) model used in 2015. This was done because both models exhibited AICc values within about 20% of each other, and when the data are only modeled through actual data (2016), the TSJ CA model had a slightly lower AICc. Both models are well correlated with preseason trend counts since 2006 (SCJ SCA ~88% and TSJ CA ~84%), but the TSJ CA model fits observed buck:doe ratio data substantially better. Additionally, the TSJ CA model seems to more accurately reflect perceived population changes, and provides for a leveling off or decline into 2017 as is expected. Plus, it does not reach the upper constraint on adult survival (0.9) that the SCJ SCA model does in all years not constrained. The TSJ CA model instead produces a more reasonable adult survival rate of 0.852 and an average juvenile survival rate of 62%, which is slightly higher than that of 57% 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 at times.

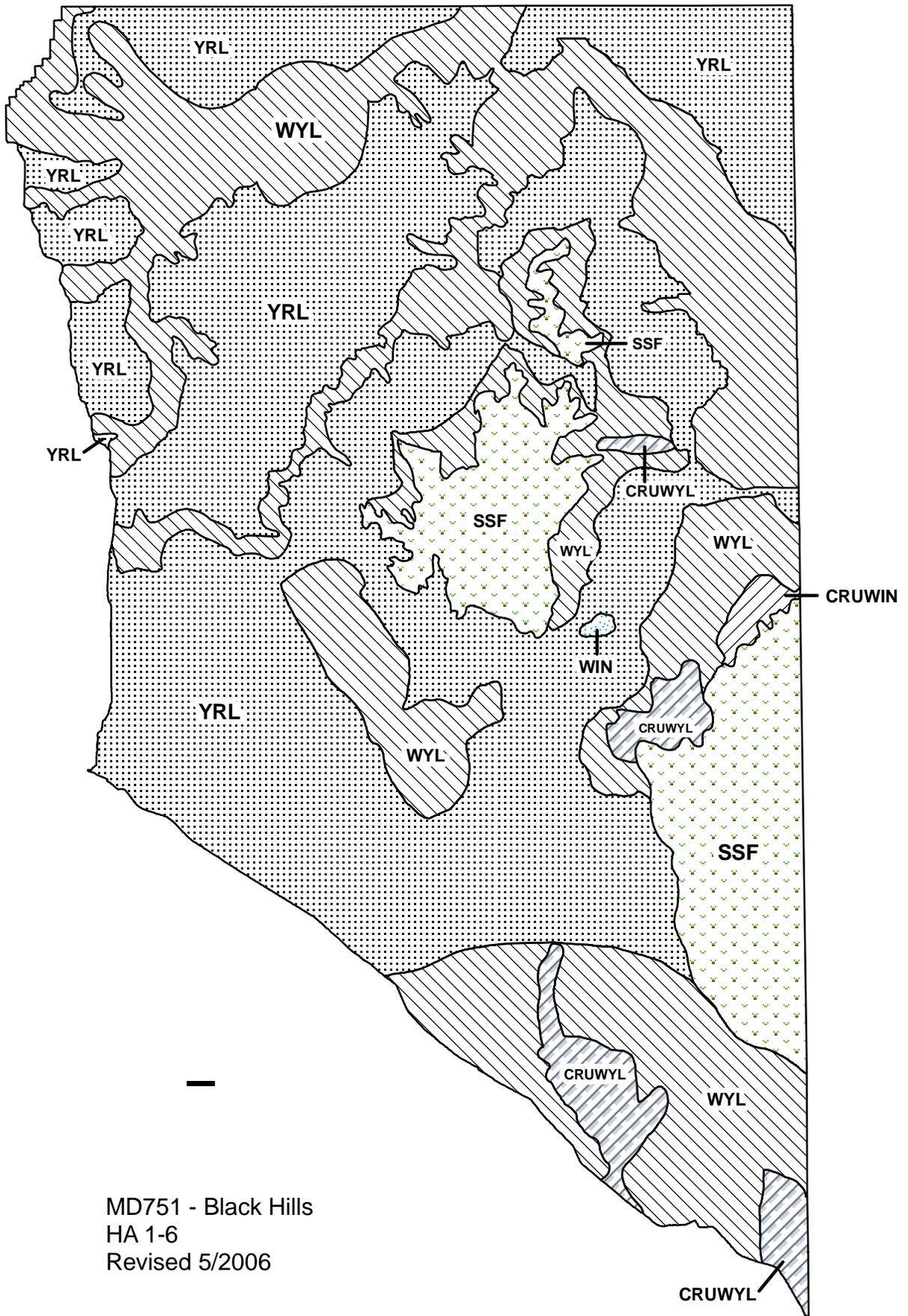
MANAGEMENT SUMMARY: The spreadsheet model used for the herd suggests it is near its management objective of 30,000 mule deer. If the herd actually numbers close to 30,000 mule deer post-season, then the current objective may be below some landowner's and hunter wishes, especially south of I-90. Based upon habitat conditions, the desires of hunters, and landowner sentiments a season designed to allow this herd stabilize or decline slightly is warranted at this time. Therefore, the 2017 hunting season is designed to maintain buck hunting opportunity and harvest of antlerless deer essentially commensurate with 2016 levels. This prescription should keep buck:doe ratios in the mid-range of recreational management range and result in a stable or slightly declining population given the forage conditions and winter weather experienced.

Buck mule deer numbers have substantially improved in this herd unit in recent years. Based upon classification data and population estimates, there should be strong cohorts of 2, 3 and even some 4 year-old bucks available for hunters in 2017, while older bucks will be harder to come by. As such, it seems reasonable to maintain buck harvest, something that attracts more hunters into the area, many of whom will harvest both mule deer and whitetail does, which is needed to slow the growth of both populations. The 2017 hunting season should again result in a mule deer buck harvest about 80% above that witnessed with very conservative hunting seasons in place when this population hit its last nadir.

Issuance of Type 7 doe/fawn tags has been increased slightly in HA 1, while other doe/fawn license types valid for mule deer in this herd unit have not changed. Type 6 & 7 doe/fawn license issuance will enable landowners to control deer of either species. Because we believe

resident general license hunter numbers will not change significantly in 2017 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 about 30 to 50 deer above 2016 levels given changes in doe/fawn license numbers. The relatively low level of female and juvenile mule deer harvest (less than 3%) does not warrant complicating the regulations further by segregating mule deer and white-tailed deer harvest more than we already have on general licenses.

The 2017 hunting season is expected to yield a postseason population of about 31,200 mule deer, which represents about a 2% drop in the post-season population. Such a change in the population will keep this herd within 4% of objective.



2016 - JCR Evaluation Form

SPECIES: Mule Deer

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

HERD: MD755 - NORTH CONVERSE

HUNT AREAS: 22

PREPARED BY: WILLOW STEEN

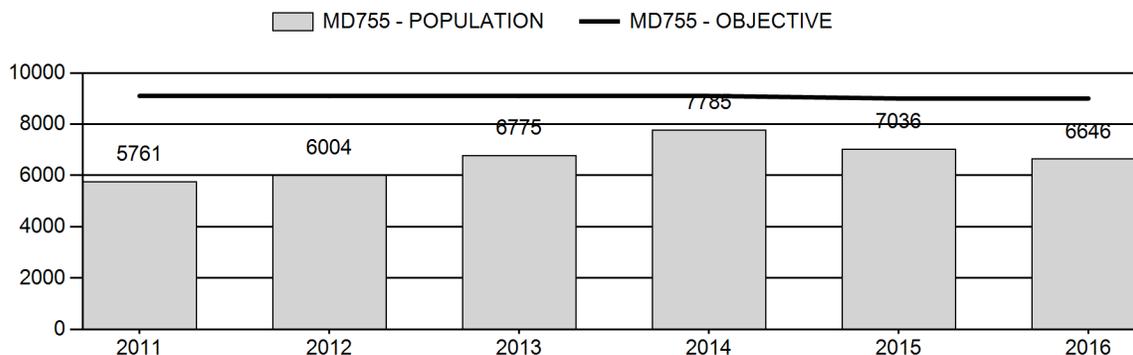
	<u>2011 - 2015 Average</u>	<u>2016</u>	<u>2017 Proposed</u>
Population:	6,672	6,646	7,151
Harvest:	371	213	215
Hunters:	500	247	150
Hunter Success:	74%	86%	143 %
Active Licenses:	523	247	150
Active License Success:	71%	86%	143 %
Recreation Days:	1,955	844	860
Days Per Animal:	5.3	4.0	4
Males per 100 Females	36	37	
Juveniles per 100 Females	78	67	

Population Objective (± 20%) :	9000 (7200 - 10800)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-26.2%
Number of years population has been + or - objective in recent trend:	6
Model Date:	02/16/2017

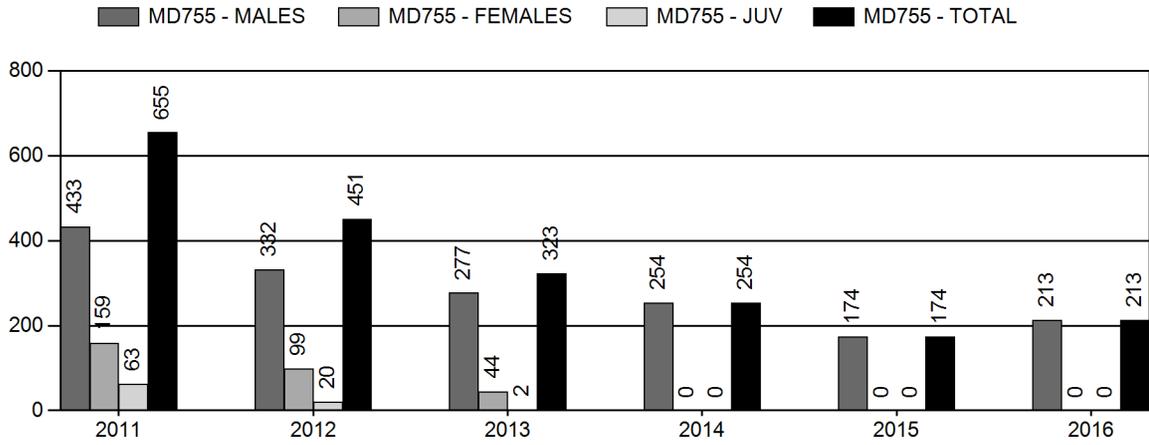
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0%	0%
Males ≥ 1 year old:	14%	15%
Total:	14%	15%
Proposed change in post-season population:	-14%	-15%

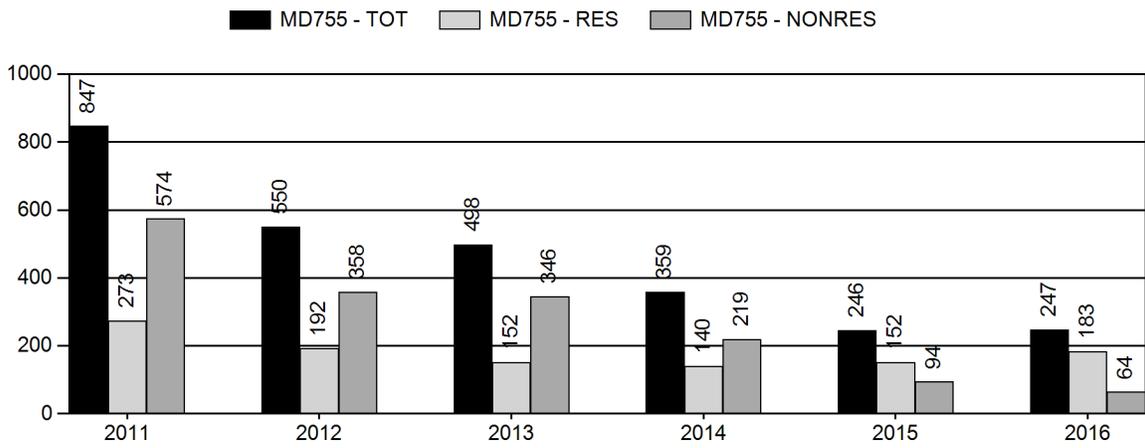
Population Size - Postseason



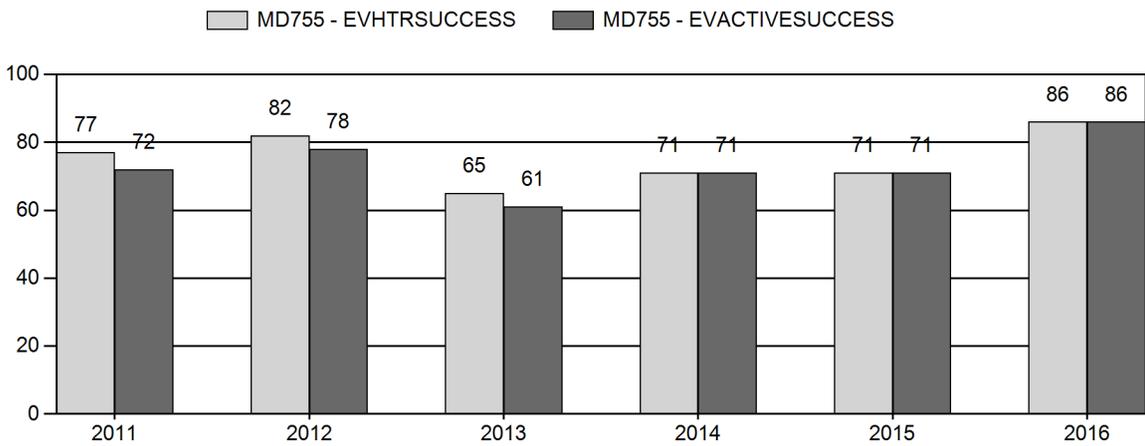
Harvest



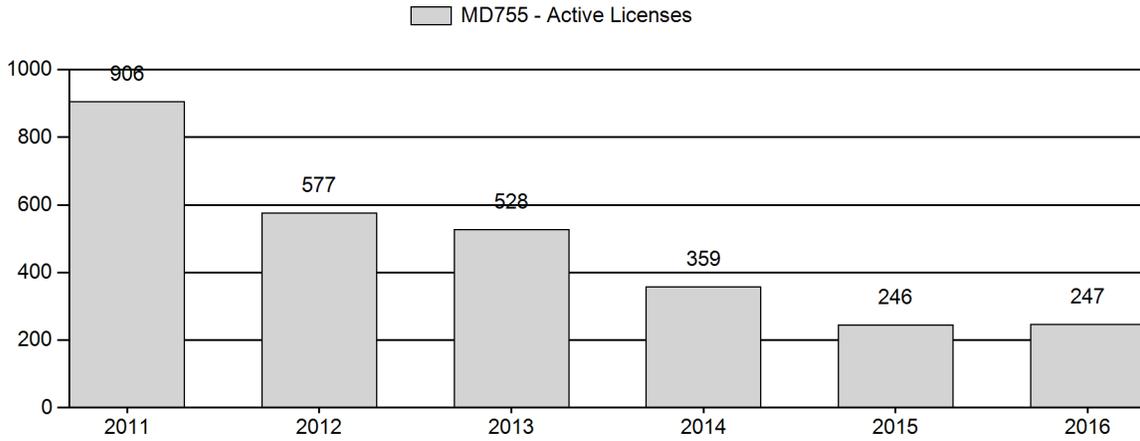
Number of Active Licenses



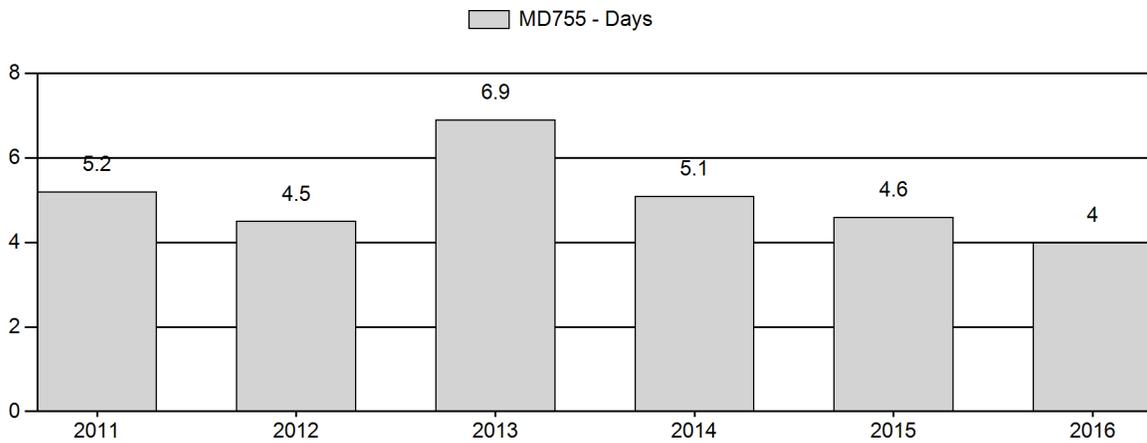
Harvest Success



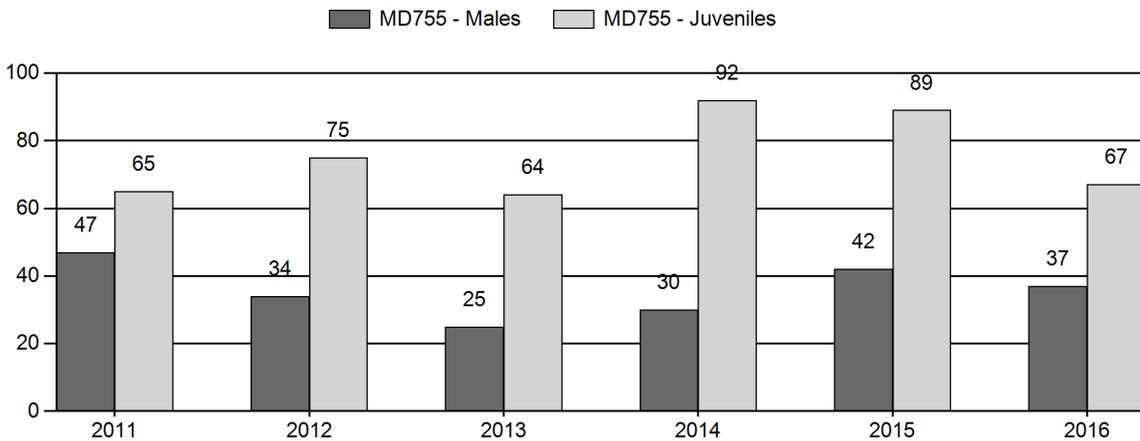
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2011 - 2016 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	2+ UnCIs	Total	%	Total	%	Total	%			YIng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
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	1,858	17	25	42	± 5	89	± 8	63
2016	6,646	37	42	24	2	14	119	18%	324	49%	217	33%	660	1,224	11	25	37	± 5	67	± 7	49

**2017 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

2016 Postseason Population Estimate: ~6,600

2017 Proposed Postseason Population Estimate: ~7,200

2016 Hunter Satisfaction: 95% Satisfied, 5% Neutral, 0% 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

Above average precipitation was received during the early part of the growing season in 2016, leading to good early-season forage production. However, this was followed by hot and dry conditions beginning in June and continuing through the summer and into late fall. Above average precipitation in 2014 and 2015 contributed to increased fawn production and survival in those years. However, the 2016 fawn ratios showed a decrease in production for 2016 which may be a result of the relatively lower amount of precipitation received this year. The 2016-2017 winter has been moderate, with average precipitation and several extreme cold snaps. Snow

events and cold snaps were typically followed by warmer weather which exposed forage for wildlife. Therefore, mule deer likely experienced normal over-winter survival this year.

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

There are no habitat transects in this herd unit due to the preponderance of private land. Habitat conditions are variable in this herd unit due to some past wildfires which have removed portions of sagebrush habitat. Habitat conditions were improved in recent years due to the above average precipitation which was needed to rejuvenate rangelands following the extreme drought of 2012. However, precipitation in 2016 was average, and therefore there was a noticeable reduction in forage production as compared to the past few years. Sagebrush plants are recruiting in some areas of this herd unit, which may lead to higher quality forage availability in the future.

Field Data

The total number of mule deer classified has steadily decreased in this herd unit as 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 and 2016 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. Classification efforts in 2016 resulted in 660 mule deer classified, although the sample size goal for 90% confidence was 1,200 mule deer.

Fawn production decreased from the previous 5-year average (77 per 100 does) in 2016 with a ratio of 67. This could be due to an overall decrease in precipitation resulting in relatively less forage than the previous few years, or due to a higher proportion of does being yearling and two-year old does in the population (from previous years' high fawn recruitment) reproducing at a lower rate. The previous years' fawn and yearling ratios were 89 and 17, respectively which are both high. Several consecutive years of average to above average fawn production and survival will be needed to continue trending toward the population objective.

The 2016 postseason buck ratio (37) was comparable to the previous 5-year average of 37 bucks per 100 does. Yearling buck ratios in 2017 (11) were also comparable to the previous 5-year average of 12 bucks per 100 does. The buck ratios are well within management criteria and 2017 license issuance should allow managers to continue to meet buck ratio goals.

Harvest

Overall harvest has declined in this herd unit as license issuance has decreased to address population decline, although this trend reversed in 2016. From 2011 to 2015, Type 1 quotas were reduced by 63% and buck harvest decreased by 60%. The 2015 harvest of 174 bucks was by far the lowest total deer harvest ever obtained in this herd unit. There were 213 bucks harvested during the 2016 season with 86.2% hunter success despite static license issuance. In 2016, it took

hunters an average of 4 days to harvest an animal, which is an improvement over the previous 5-year average of 5.3 Overall, 2016 harvest statistics suggest increased buck mule deer availability and improved hunting opportunity within this herd unit.

In 2016, 95% 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

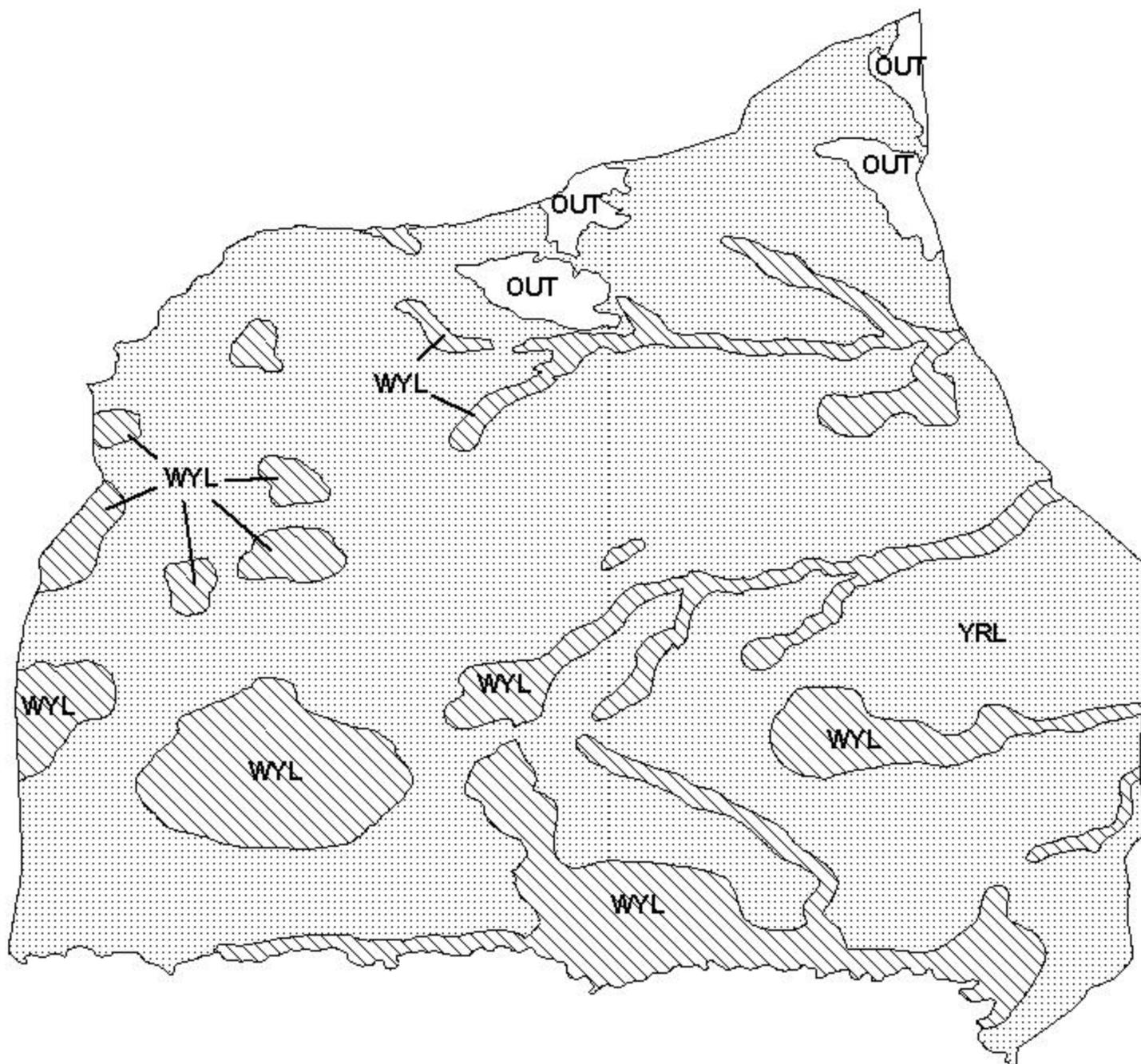
The 2016 postseason population estimate was about 6,600 mule deer. After population decline following substantial winter mortality in bio-year 2010, this herd is beginning to trend toward objective due to increased fawn production.

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 (65) 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 1st to October 14th. These season dates have generally been adequate to meet landowner desires while allowing a reasonable harvest. For 2017, 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 past years, but was eliminated in 2014 due to population concerns. Continued conservative hunting season structure, 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 215 bucks and experience normal fawn productivity, the predicted 2017 postseason population will likely increase slightly to 7,200 mule deer, which is 20% below objective.



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



2016 - JCR Evaluation Form

SPECIES: Mule Deer

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

HERD: MD756 - SOUTH CONVERSE

HUNT AREAS: 65

PREPARED BY: WILLOW STEEN

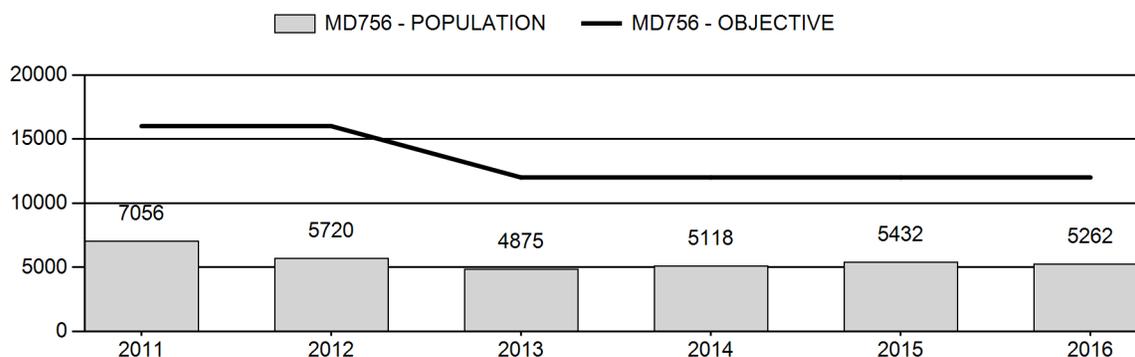
	<u>2011 - 2015 Average</u>	<u>2016</u>	<u>2017 Proposed</u>
Population:	5,640	5,262	5,935
Harvest:	280	285	300
Hunters:	763	730	750
Hunter Success:	37%	39%	40 %
Active Licenses:	763	730	750
Active License Success:	37%	39%	40 %
Recreation Days:	2,868	2,547	2,575
Days Per Animal:	10.2	8.9	8.6
Males per 100 Females	36	39	
Juveniles per 100 Females	60	55	

Population Objective (\pm 20%) :	12000 (9600 - 14400)
Management Strategy:	Private Land
Percent population is above (+) or below (-) objective:	-56.2%
Number of years population has been + or - objective in recent trend:	8
Model Date:	02/28/2017

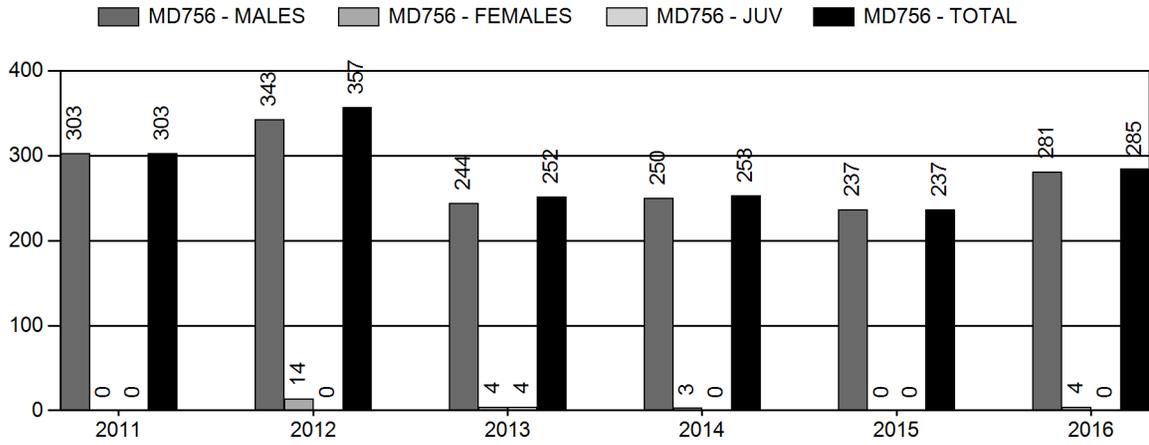
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females \geq 1 year old:	0.0%	0%
Males \geq 1 year old:	22.4%	22.0%
Total:	22.4%	22.0%
Proposed change in post-season population:	-5.6%	-5.4%

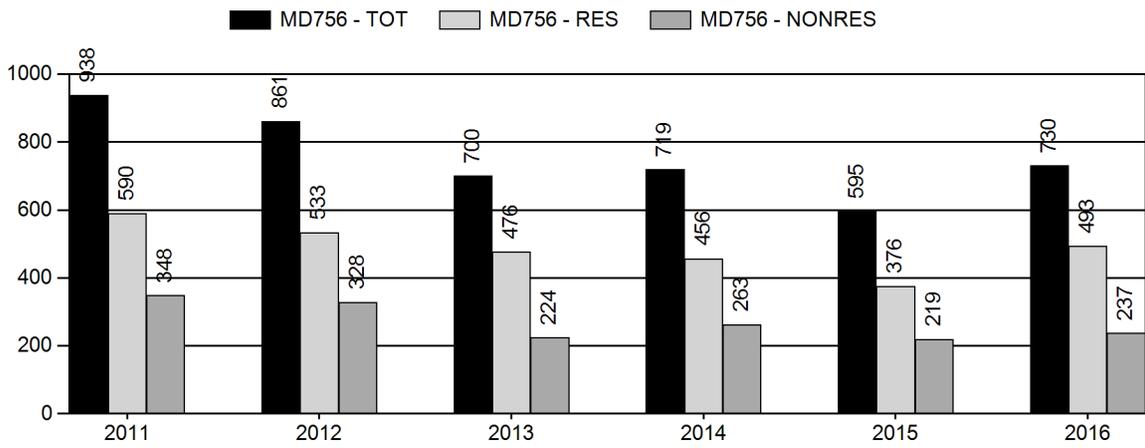
Population Size - Postseason



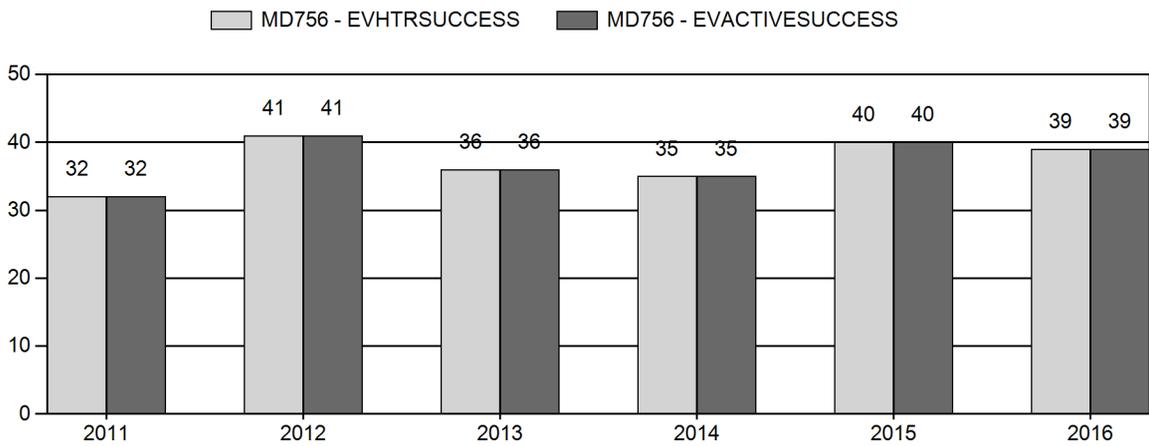
Harvest



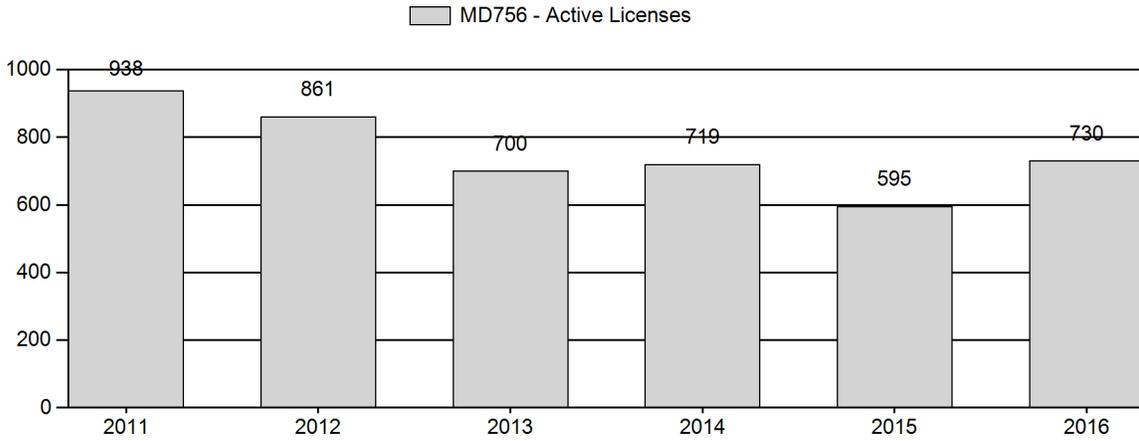
Number of Active Licenses



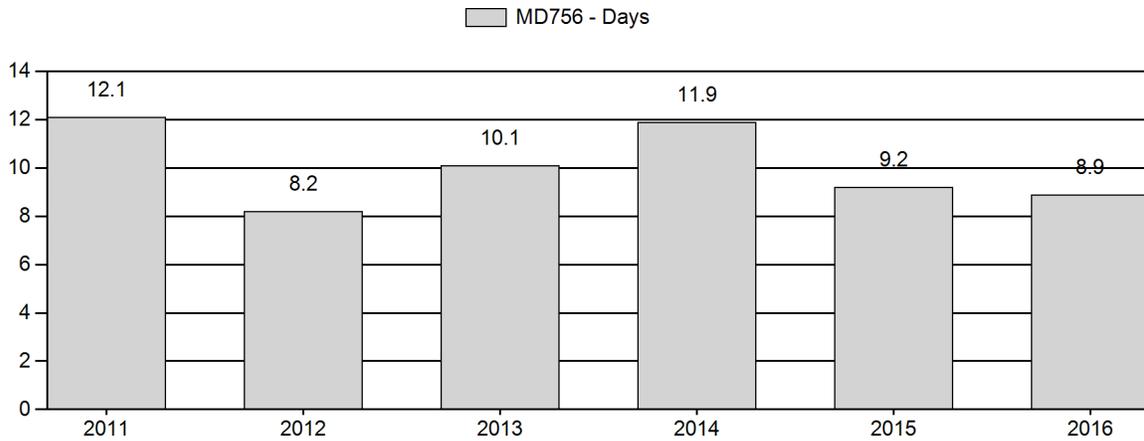
Harvest Success



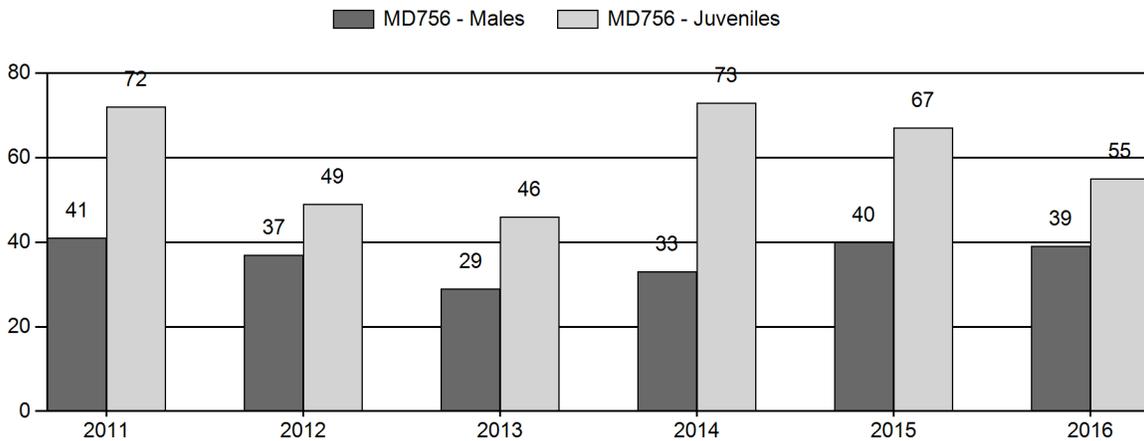
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2011 - 2016 Postseason Classification Summary

for Mule Deer Herd MD756 - SOUTH CONVERSE

Year	Post Pop	MALES							FEMALES		JUVENILES		Tot CIs	CIs Obj	Males to 100 Females			Young to			
		Ylg	2+ CIs 1	2+ CIs 2	2+ CIs 3	2+ UnCIs	Total	%	Total	%	Total	%			YIng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
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	1,164	18	23	40	± 4	67	± 6	48
2016	5,262	137	176	70	20	0	403	20%	1,030	51%	568	28%	2,001	900	13	26	39	± 2	55	± 3	40

**2017 HUNTING SEASONS
SOUTH CONVERSE MULE DEER (MD756)**

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

Management Evaluation

Current Management Objective: 12,000

Management Strategy: Private Land

2016 Postseason Population Estimate: ~ 5,300

2017 Proposed Postseason Population Estimate: ~ 5,900

2016 Hunter Satisfaction: 62% Satisfied, 21% Neutral, 17% 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 a published dissertation and additional publications pending (Devivo, 2015). 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 the CWD prevalence estimate derived from hunter-harvested mule deer in 2015 and 2016 were calculated from low sample sizes. The Department is exploring options for increasing CWD sampling for 2017.

Weather

Above average precipitation was received during the early part of the growing season in 2016, leading to good early-season forage production. However, this was followed by hot and dry conditions beginning in June and continuing through the summer and into late fall. Above average precipitation in 2014 and 2015 contributed to increased fawn production and survival in those years. However, the 2016 fawn ratios showed a decrease in production for 2016 which may be a result of the relatively lower amount of precipitation received this year. The 2016-2017 winter has been moderate, with average precipitation and several extreme cold snaps. Snow events and cold snaps were typically followed by warmer weather which exposed forage for wildlife. Therefore, mule deer likely experienced normal over-winter survival.

Habitat

Given average precipitation and informal assessments of habitat conditions throughout this herd unit, forage production and quality were moderate in 2016. 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. An additional 1,400 acres of treatments are planned for implementation in the next few years.

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 2011-2016 hunting seasons. In 2014 and 2015, fawn production improved (ratios of 73 and 67, respectively). The fawn ratio decreased to 55 in 2016. This could be due to the relatively lower amount of precipitation received in 2016, or the larger proportion of yearling and two-year old does not reproducing in the population as a result of higher fawn recruitment from the previous two years. Since 2013, the population has been trending upward, and the current model estimates a 2016 post-season population of 5,300 mule deer. In 2016, just over 2,000 deer were classified in this herd unit which is the highest sample size acquired since 1992 despite similar levels of effort in other years. The previous 10-year

average classification sample size was 1,074 deer. Although conditions in 2016 were ideal with high visibility, good snow cover, and calm conditions, the sample size supported field managers' perception that deer numbers have been increasing in recent years. Annual survival of mule deer has likely increased over the past three years due to improved habitat conditions, which is also contributing to population increase. Several more years of improved fawn production and survival will be needed for this herd to increase to objective.

While fawn production improved in this herd over the past two years, fawn ratios remain well below adjacent mule deer herds. From 2007 – 2016, postseason fawn ratios averaged 56 (per 100 does) in the South Converse Herd Unit. Over the same time frame, fawn ratios averaged 63 in the Bates Hole / Hat Six Herd (Hunt Area 66) and 64 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 (DeVivo, 2015). 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 and model projections stemming from recent research, endemic CWD at current prevalence levels 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 has since increased back to 39 bucks per 100 does in 2016. The yearling buck ratio was 18 in 2015 and 13 in 2016, indicating good recruitment from previous years, which may result in continued good availability of adult bucks in the population in the coming years despite endemic CWD.

Since 2008, bucks classified in the South Converse Mule Deer Herd Unit have been further categorized based on antler size. Classification efforts in 2016 resulted in antler classifications in line with the long-term average with 66% Class I (small), 26% Class II (medium), and 8% Class III (large) bucks.

Harvest Data

Harvest success was 39% in 2016, which is comparable to the previous 5-year average of 37%. Harvest success is not expected to improve in this herd unit until long-term fawn production/survival improves and enhances the growth rate of this herd. In 2016, there were 730 active licenses and 281 harvested bucks, which is also comparable to the previous 5-year average of 763 active licenses and 278 harvested bucks. While resident hunter numbers dropped in 2015 (376 in 2015 vs. the previous 5-year average of 539), resident hunters increased in 2016 to 493. The 2015 reduction in resident hunting pressure was attributed 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. In addition to poor population performance, such restricted hunting access contributes to relatively low harvest success rates in this herd unit. However, during the 2016 hunting season, many hunters conveyed their perception that there were more deer available as this population has modestly increased in recent years. Therefore, it appears that 2016 resulted in less hunter self-regulation.

Population

The 2016 postseason population estimate was approximately 5,300 mule deer. This population is beginning to recover from a long-term downward trend which began in the late 1990s. 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 “Semi-Constant Juvenile Survival – Semi-Constant Adult Survival” (SCJ,SCA) spreadsheet model was chosen for the postseason population estimate of this herd. Adult female survival estimates from the aforementioned CWD research conducted from 2010 to 2013 were between 0.65 and 0.73, which were very low relative to most published mule deer survival rates. Therefore, survival was constrained between these values for those years. Improved habitat conditions in recent years undoubtedly enhanced fawn survival from 2014-2016, therefore fawn survival was constrained between 0.75 and 0.9 for those years. AIC values between all 3 models were very similar, but the SCJ-SCA model produced the most plausible trend and population estimate. However, the model does estimate adult survival in years other than 2010-2013 to be quite high; much higher than survival estimates from the research study. The model also shows very low fawn survival. Managers believe fawn survival is most likely higher while adult survival is lower than model estimates. Therefore, this model is considered to be of fair quality.

Management Summary

Opening day for hunting the South Converse Mule Deer Herd Unit has traditionally been October 15th, with closing dates that have changed to offer greater or lesser opportunity depending on the management direction desired. In recent years, general licenses have been valid for antlered mule deer only. The 2017 hunting season will consist of a short, seven-day season with no doe/fawn licenses, as the population is considerably below objective.

If we attain the projected harvest of 300 bucks and fawn production remains average, this herd will likely remain relatively stable but low. The predicted 2017 postseason population size of the South Converse Herd is approximately 5,900 mule deer. Given poor habitat conditions may be limiting population growth with continual low fawn production/ recruitment, management goals for 2017 include maintaining a conservative hunting season framework to allow for population growth should environmental conditions allow. Future considerations for this herd may include implementing an antler point restriction and extending season length to provide more opportunity to harvest mature bucks. In addition, managers intend to implement prescriptive treatments in key habitats to benefit mule deer in this herd unit as opportunities arise.

Citations

DeVivo, Melia. Chronic Wasting Disease Ecology and Epidemiology of Mule Deer in Wyoming. Diss. University of Wyoming, 2015.

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 decreasing adult female survival, degrading the health of breeding-age females and affecting health and survival of neonates. Additionally, CWD may be adversely affecting mule 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 for CWD in this herd unit since 2001. It should be noted that hunter-harvested samples do not represent a random sample of this population. Rather, samples are biased towards younger age-class males, as hunting seasons have focused on antlered deer, and hunters who harvest larger mature bucks often decline sampling to preserve their cape for taxidermy purposes. Thus, prevalence in hunter-harvested deer may not be representative of the herd as a whole, but trends are likely to be similar. Additionally, few adult female mule deer have been tested since 2004 due to changes in hunting season structure.

Since 2001, prevalence of CWD in hunter-harvested mule deer increased significantly in the South Converse Mule Deer Herd, while the population concurrently decreased (Table 1). However, this concurrent decrease cannot be solely attributed to CWD as mule deer populations throughout most of Wyoming decreased over this same time frame (due to prolonged drought, deteriorating habitat condition, etc.). Unfortunately, low sample sizes of hunter harvested mule deer preclude rigorous statistical analysis of CWD prevalence for most years. Since 2015, sample sizes have been too low to make any reasonable inference on recent CWD prevalence trend. In addition, there has been a modest increase in this mule deer population over the past three years due to favorable environmental conditions. Despite a recent uptick in the population, such high CWD prevalence levels documented in recent years is extremely concerning, especially considering CWD is ultimately fatal in all cervids.

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. The research was published in a dissertation in 2015 titled “Chronic Wasting Disease Ecology and Epidemiology of Mule Deer in Wyoming”.

The research concluded that CWD is a population limiting disease, and estimated $\lambda_1 = 0.81$, corresponding to a 19% annual decline in the population. Further, males had a high prevalence of CWD (43%) compared to females (18%). They found that infected males showed higher activity levels, but noted that these males may have been more active prior to infection which placed them at a higher risk of encountering infected deer and contaminated environments. Further, infected deer were more likely to be predated upon by mountain lions or harvested by hunters due to their altered behavior. Lastly, the study found reduced incidence of CWD for deer of a certain genotype and documented genetic shift within the population as a result of higher fitness associated with that genotype. Despite selection towards deer with higher fitness (as it pertains to CWD), the study’s population models still predicted severe decline in the next 50 years (Devivo, 2015).

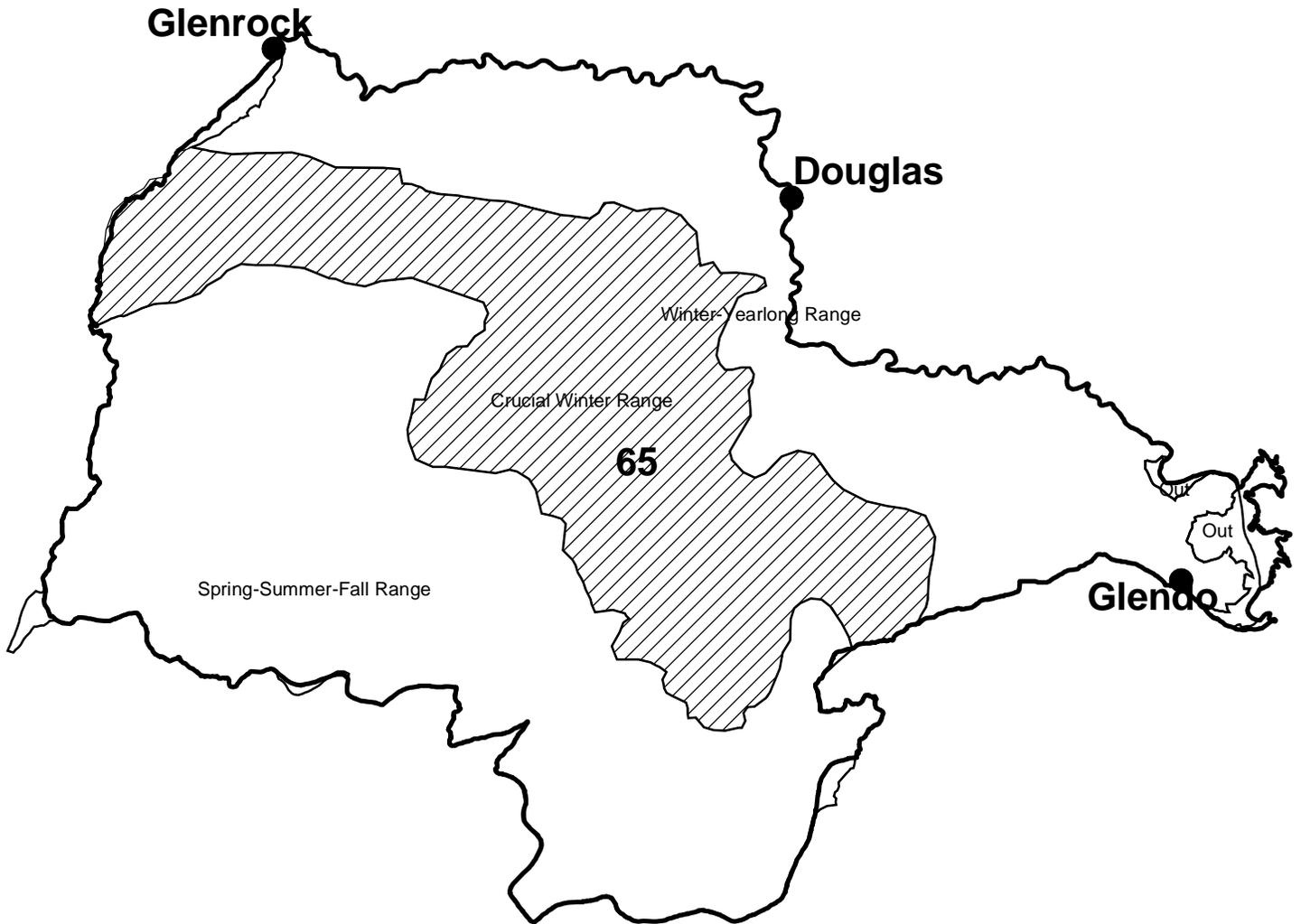
Citations

DeVivo, Melia. Chronic Wasting Disease Ecology and Epidemiology of Mule Deer in Wyoming. Diss. University of Wyoming, 2015.

Table 1. CWD surveillance in hunter-harvested mule deer in the South Converse Herd Unit, 2001-2016.

Year	Total Harvest	N Tested	N Positive	CWD Prevalence
2001	885	81	12	15%
2002	825	98	23	24%
2003	733	155	46	30%
2004	533	52	14	27%
2005	461	88	29	33%
2006	555	81	32	40%
2007	729	74	30	41%
2008	708	44	19	43%
2009	425	48	20	42%
2010	365	42	20	47%
2011	303	35	20	57%
2012	345	30	14	47%
2013	252	41	18	44%
2014	253	38	12	32%
2015	237	4	3	75%
2016	285	14	6	43%

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



2016 - JCR Evaluation Form

SPECIES: Mule Deer

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

HERD: MD757 - BATES HOLE/HAT SIX

HUNT AREAS: 66-67

PREPARED BY: HEATHER O'BRIEN

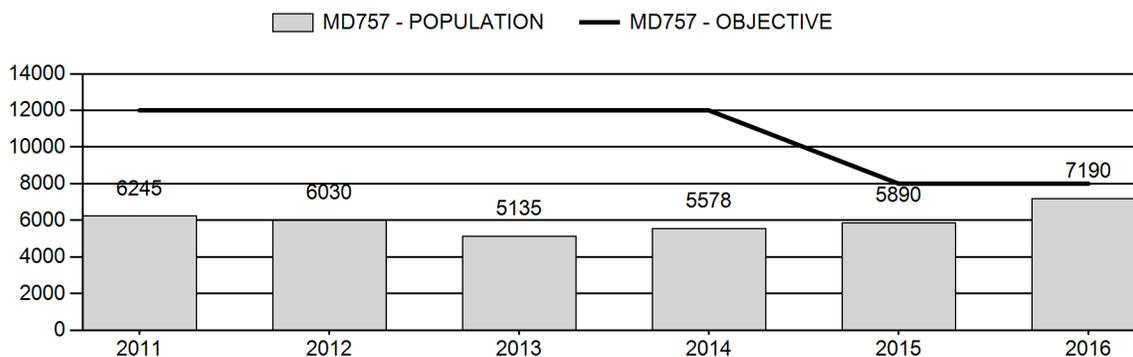
	<u>2011 - 2015 Average</u>	<u>2016</u>	<u>2017 Proposed</u>
Population:	5,776	7,190	7,610
Harvest:	248	392	510
Hunters:	802	944	950
Hunter Success:	31%	42%	54%
Active Licenses:	802	944	950
Active License Success:	31%	42%	54 %
Recreation Days:	2,982	3,714	3,000
Days Per Animal:	12.0	9.5	5.9
Males per 100 Females	24	41	
Juveniles per 100 Females	66	66	

Population Objective (± 20%) :	8000 (6400 - 9600)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-10.1%
Number of years population has been + or - objective in recent trend:	24
Model Date:	02/22/2017

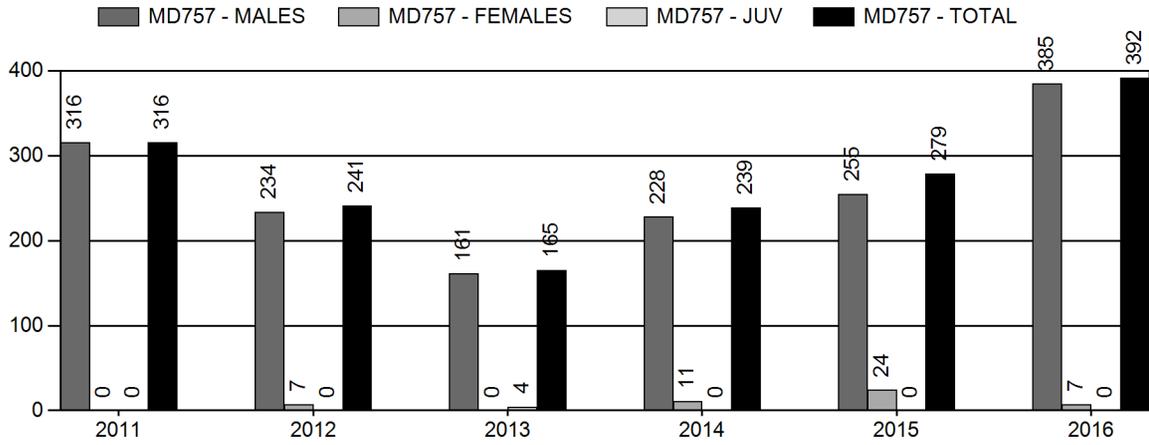
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0.2%	.2%
Males ≥ 1 year old:	25.4%	28.7%
Total:	4.4%	6.2%
Proposed change in post-season population:	+1.95%	+5.5%

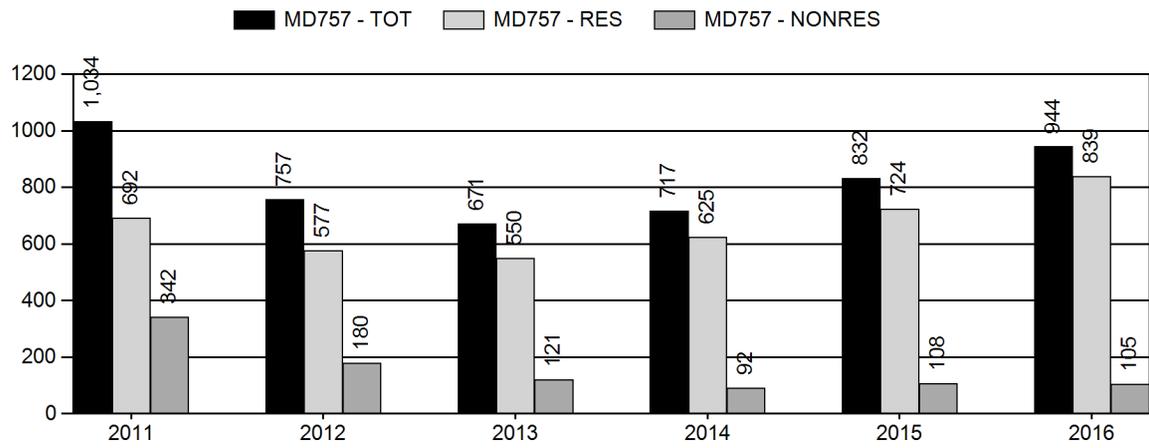
Population Size - Postseason



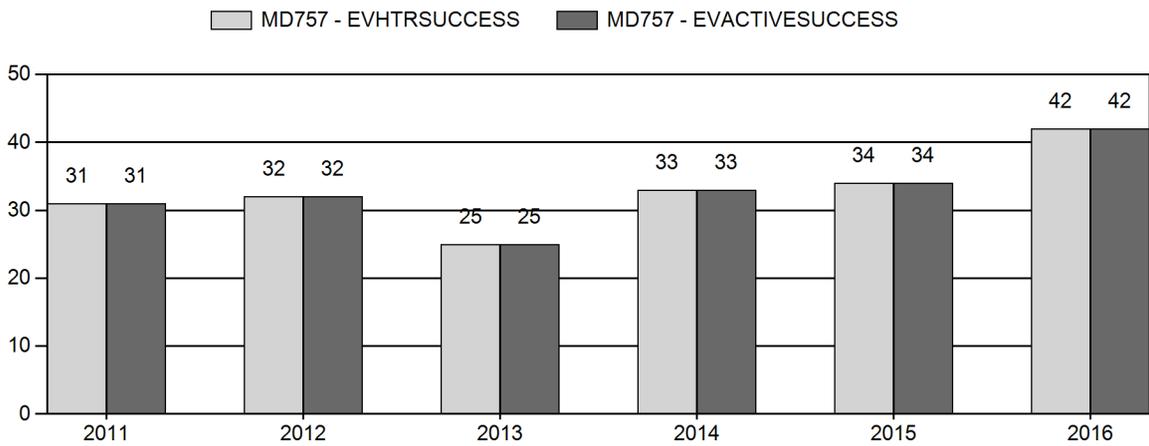
Harvest



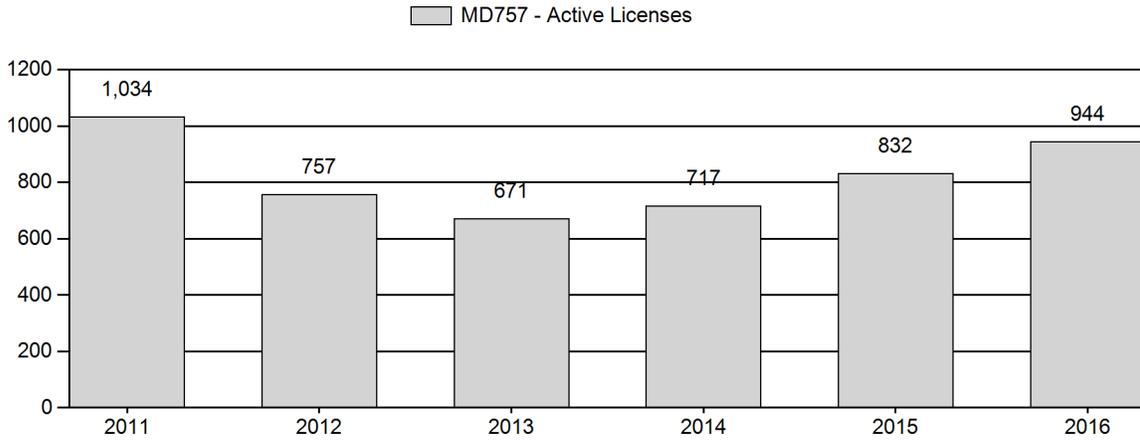
Number of Active Licenses



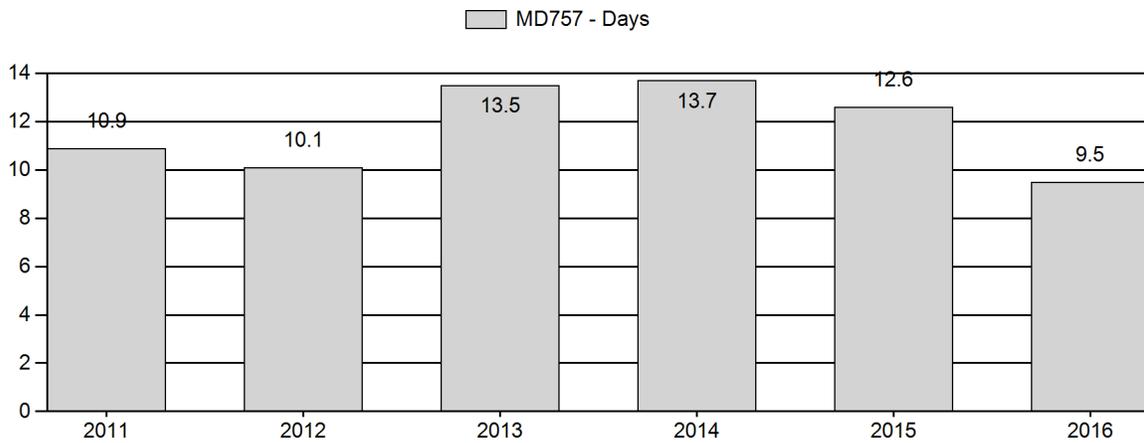
Harvest Success



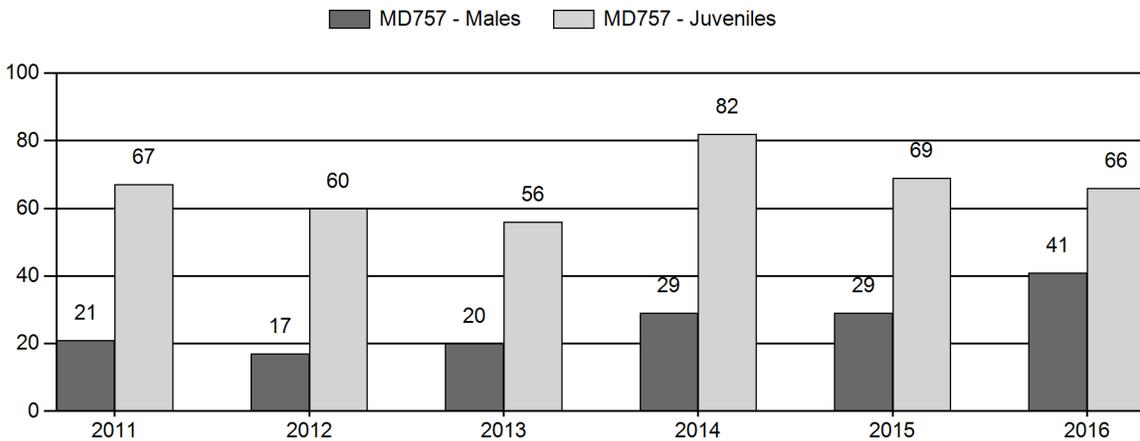
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2011 - 2016 Postseason Classification Summary

for Mule Deer Herd MD757 - BATES HOLE/HAT SIX

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	%	Ylng			Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult	
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	7,190	132	198	31	4	0	365	20%	886	48%	585	32%	1,836	1,236	15	26	41	± 3	66	± 4	47	

**2017 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 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

2016 Postseason Population Estimate: 7,200

2017 Proposed Postseason Population Estimate: 7,600

2016 Hunter Satisfaction: 60% Satisfied, 24% Neutral, 16% 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 (MD757 2015 JCR, 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 severe winter of 2010-2011 and subsequent drought of 2012 resulted in elevated fawn mortality in the Bates Hole / Hat Six Herd Unit. Fawn ratios were also very low during this time period, and the population remained well below objective. From 2013 to the present, weather trends have been more favorable, and mule deer numbers have slowly recovered. Fawn production and survival increased markedly in 2014 & 2015, as range conditions and nutritional status of does began to improve. The winter of 2015 was fairly average, though some areas experienced prolonged periods of persistent snow. The spring of 2016 was very wet, resulting in rapid plant growth and green-up of rangelands. The majority of the summer and fall were extremely dry, causing much of the available forage to cure. Fortunately, precipitation in October resulted in a late surge of plant growth, which may have provided mule deer with a valuable boost in nutrition prior to the winter of 2016-2017. While there were several notable snow storms and cold snaps during the winter of 2016-2017, there were also periods of warm weather and high winds that melted and drifted snow to expose forage. Thus, managers expect fairly average mule deer survival for the winter of 2016-2017. For detailed weather data see Appendix A 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*). Average leader growth on mahogany in 2016 was 4.29 inches (109 mm), and represents only a slight decrease in production from the record high production observed in 2015 (Figure 1). Above-average herbaceous plant production throughout the herd unit in recent years is attributed to good moisture during growing seasons. Average utilization on transects has increased over the past five years, and was 25.9% in 2016 (Table 1). Better habitat conditions in the herd unit in 2014-2016 contributed to improved spring and summer fawn survival compared to previous years, and this herd has grown since 2012. Increased average utilization on shrubs correlates to an increasing mule deer population, although shrub utilization on some transects may also be attributed to other species, such as elk.

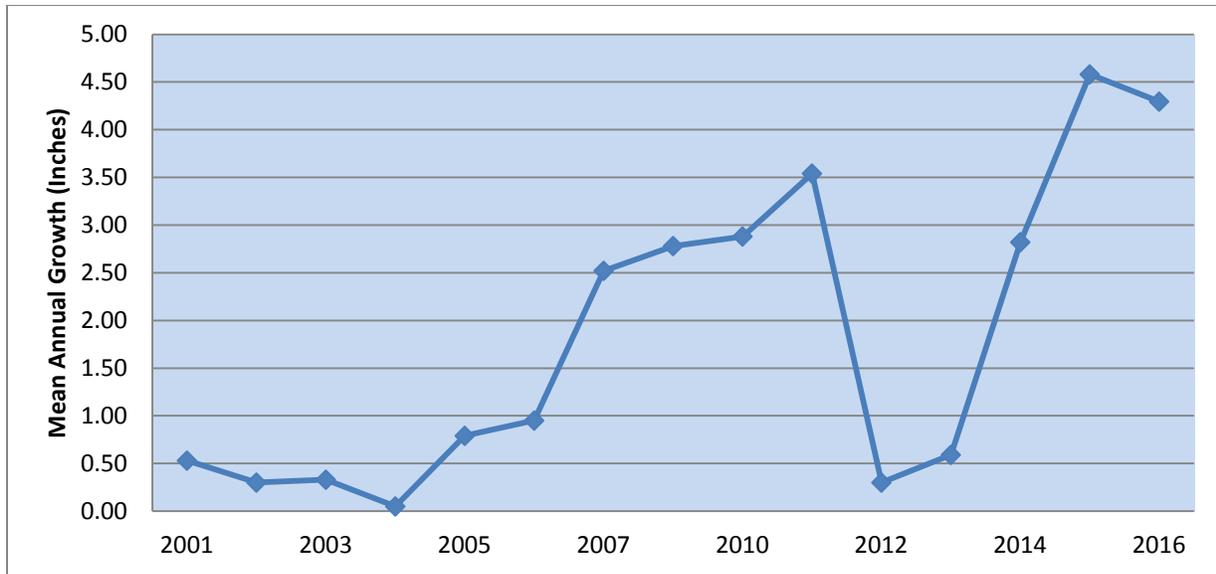


Figure 1. Mean annual growth of true mountain mahogany (*Cercocarpus montanus*) in the Bates Hole / Hat Six Mule Deer Herd Unit, 2001-2016.

Year	01-02	02-03	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	15-16
Mean Utilization	28.9	30.65	23.75	12.27	26.73	15.33	23.33	28.00	13.67	20.29	25.90

Table 1. Mean utilization of true mountain mahogany (*Cercocarpus montanus*) in the Bates Hole / Hat Six Mule Deer Herd Unit, 2001-2016. Note data were not collected or reported in some years.

Field Data

For much 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 increased from 2011-2013, but were still below levels needed to enhance population growth and recovery. Despite the elimination of doe/fawn hunting and restrictions placed on buck harvest, the population was still slow to recover. Fawn ratios finally improved in 2014 to 82 per 100 does as a result of favorable weather and range conditions. Winter conditions from 2014-2016 were also relatively mild, and were followed by spring weather and range conditions that were favorable for pregnant does. As a result, overwinter survival of fawns also improved from 2014-2016. Fawn ratios appeared to be lower in 2015 and 2016, but this data must be tempered with the knowledge that a large proportion of does

surveyed were yearlings and are unable to produce fawns of their own. Thus, the 2015 and 2016 observed fawn ratios were tempered by a higher proportion of younger does in the population.

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 2012, the buck ratio reached a low of 17 per 100 does, 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 more 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. In 2015, the Area 66 Mule Deer Initiative Working Group recommended maintaining antler point restrictions in the herd until the overall buck ratio reaches or exceeds 35 per 100 does. At that time, restrictions would 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 2016, the observed buck ratio was 41 as a result of high fawn production and survival in 2014 and 2015, but also owing to the protection of yearling bucks under the antler point restriction. In 2017 the point restriction will be removed to provide more liberal hunting opportunity, with ample availability of bucks.

Since 2008, bucks classified in Area 66 have been categorized based on antler size (see Table 2). 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 2010-2016 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 2016 with improved fawn production and the addition of antler-point restrictions. The proportion of Class III bucks has consistently remained under 10% in all years. It should be noted as well that the total number of bucks surveyed in 2016 was at a 25-year high (N=365). Only four Class III bucks were observed during 2016 surveys, but a higher number of Class II bucks were observed. This may be due to shifts of available bucks within the older age classes – an artifact from years when fawn production and survival were very low. The consistent number of Class II & 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					
		YIng	Class I	Class II	Class III	Total	YIng	Class I	Class II	Class III	All Adult	Total
2008	1,254	75	57 (50%)	41 (36%)	16 (14%)	189	12	9	6	2	18	29
2009	1,320	59	61 (54%)	41 (37%)	10 (9%)	171	8	8	6	1	15	23
2010	1,479	82	49 (49%)	42 (42%)	9 (9%)	182	9	5	5	1	11	20
2011	1,248	47	52 (56%)	33 (36%)	7 (8%)	139	7	8	5	1	14	21
2012	1,272	28	55 (59%)	30 (32%)	9 (9%)	122	4	8	4	1	13	17
2013	1,483	86	50 (61%)	25 (30%)	7 (9%)	168	10	6	3	1	10	20
2014	1,403	83	79 (71%)	26 (23%)	7 (6%)	195	12	12	4	1	17	29
2015	2,061	164	97 (70%)	29 (21%)	13 (9%)	303	16	9	3	1	13	29
2016	1,836	132	198 (85%)	31 (13%)	4 (2%)	365	15	22	3	1	26	41

Table 2. Antler classification analysis for **Area 66** within the Bates Hole/Hat Six Mule Deer Herd Unit, 2008 – 2016.

Harvest Data

Hunter success in this herd has fluctuated as a function of population size and season length. As this population declined, harvest success has decreased and hunter days have increased as the season was shortened and antler point restrictions were added. No significant female harvest has been prescribed since 2007. Hunter satisfaction has been low in this herd, which may be a function of hunter crowding and a perceived lack of bucks that are of legal harvest size. Hunter participation and overall harvest declined when antler point restrictions were added, but has gradually increased from 2013-2016 as the herd has grown as well. At the same time, Region D non-resident license issuance was reduced significantly from 2,100 licenses in 2011 to only 400 licenses in 2014-2016. In Area 66, only 11% of hunters were non-residents during the 2016 season. Harvest success was 42% in 2016, which is 10 percentage points than the five-year average. Total harvest also increased in 2016 compared to the previous four years, despite the antler-point restriction and virtually no harvest of does or fawns. All of these metrics suggest the 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 2016 postseason population estimate was approximately 7,200 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 had poor fawn production/survival and thus poor population performance since from 2006-2013. The herd has grown 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 mule deer were slower to recover at first, but have rebounded over the past two years. Landowners, hunters, and managers have observed higher numbers of mule deer overall, especially does and fawns in healthier condition. Field personnel have observed higher total mule deer numbers during survey flights the past three years without additional effort, indicating this herd has begun to grow more noticeably.

The “Semi-Constant Juvenile, Semi-Constant Adult” (SCJ,SCA) spreadsheet model was chosen for the postseason population estimate of this herd. 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. However, all of the models 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 have been in Area 66) make it difficult for the model to simulate true population dynamics. The SCJ, SCA 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. Juvenile survival rates were more liberally constrained in years when field observations confirm that overwinter conditions were very mild (i.e. 2005-2006, 2013-2016). More liberalized constraints from 2013-2016 also assist the model in compensating for lower, skewed harvest, as these are years that included the antler point restriction. Without this change in the juvenile survival constraint, the model assumes low male-only harvest is due to lack of animals in the population. The CJ,CA model was rejected, as it depicts a herd that is much larger than managers suspect. The TSJ, CA model predicts a similar population size and trend as the SCJ,SCA model for the most years, but then declines as it assumes a lack of animals in years when the antler point restriction was in place. The SCJ,SCA 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 15th, with closing dates that have changed to offer greater or lesser opportunity depending on the management direction desired. General licenses have been valid only for antlered mule deer since 2000. Doe/fawn

licenses have been offered in years when winter range shrub utilization has been excessive, although no meaningful doe harvest has been prescribed since 2007. A short, seven-day season with no doe/fawn licenses will be sustained for 2017. The 2017 season will no longer include an antler point restriction (APR), as the herd has exceeded the 35 bucks per 100 doe threshold recommended by the Mule Deer Initiative. Hunters will be allowed to harvest any buck mule deer, and harvest should then spread itself more evenly across available age classes. In future years, if the observed buck ratio declines below 25 bucks per 100 does, the antler point restriction will be reinstated.

If we attain the projected harvest of 510 deer with fawn ratios similar to the last five years, this herd will grow slightly. The predicted 2017 postseason estimate for the Bates Hole / Hat Six Herd is approximately 7,600 animals, which is 5% below objective.

Appendix A

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

Precipitation

From October 2015 through September 2016 (water year 2016), precipitation in the Bates Hole/Hat Six Mule Deer Herd Unit was 2.9 inches higher than the 30-year average for the same water year time frame (Figure 1). The 2015-2016 winter experienced precipitation levels that were well above normal, though overall winter severity was considered only slightly above average. While snow persisted at higher elevations, cycles of warm temperatures and winds melted and cleared habitats of deep snow at lower elevations in many places. Precipitation continued well above normal through the spring growing season (April-June 2016), which was one inch above the 30-year average. Following the very wet winter and spring, summer conditions were relatively dry, and the July through August precipitation level fell to near the 30-year average for the same time frame. Fall 2016 precipitation increased and was slightly above the 30-year average.

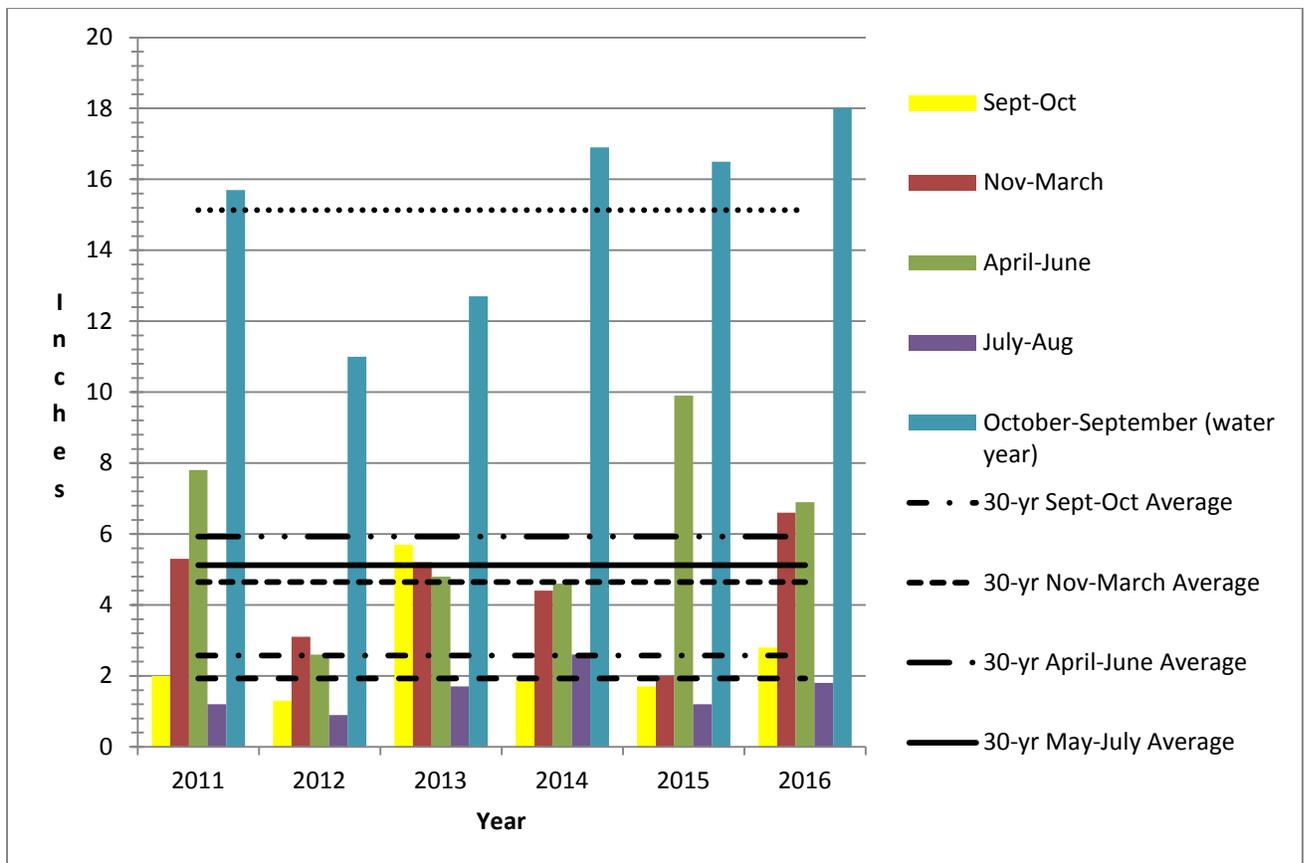


Figure 1. Seasonal precipitation received compared to 30-year averages within the Bates Hole / Hat Six Mule Deer Herd Unit (2011-2016).

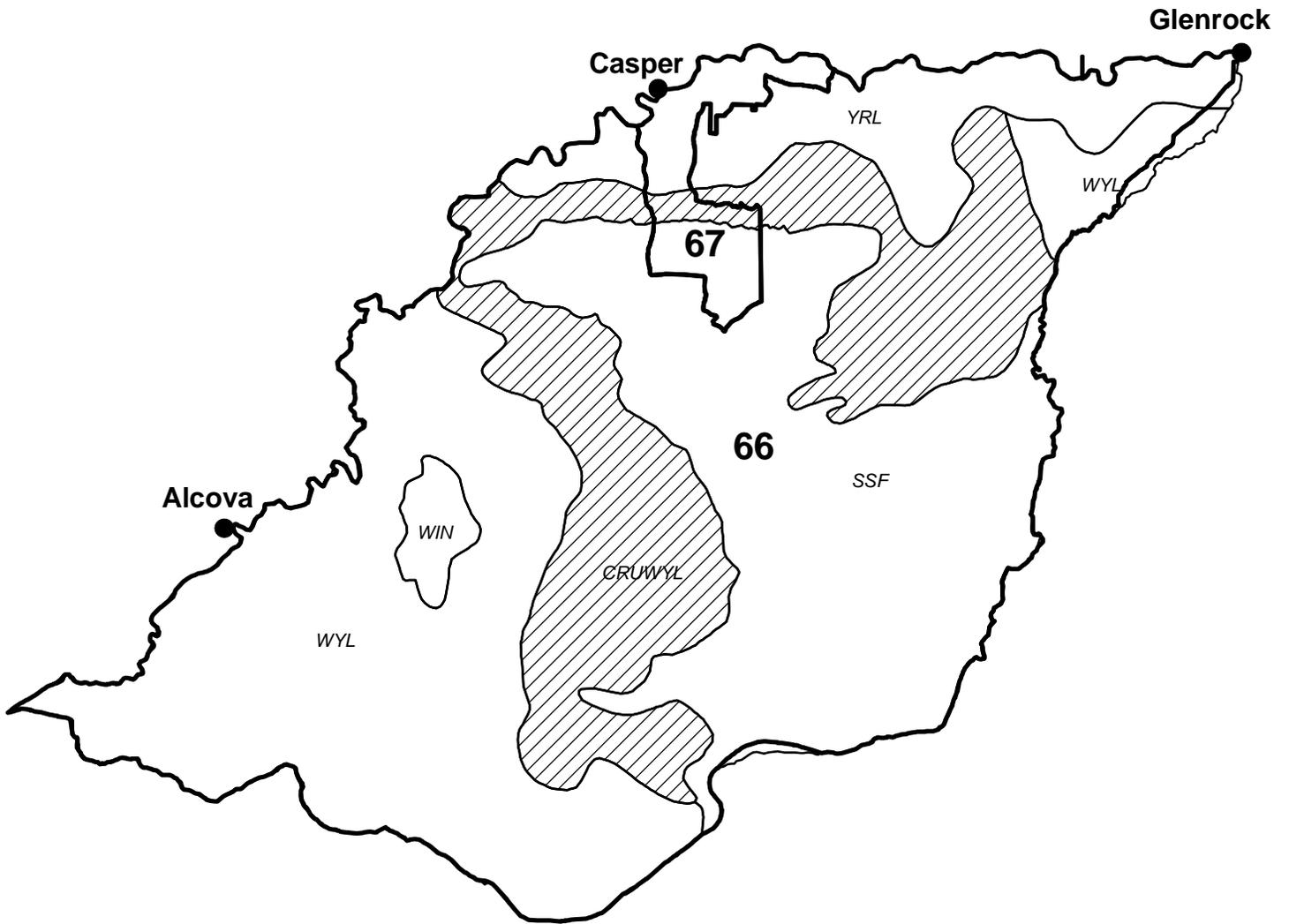
Winter Severity

Within this herd unit, the 2015-2016 winter was relatively average despite precipitation levels well above average. The 2016-2017 winter started out mild with very little snowfall until a winter storm in late-December brought several inches of snow followed by prolonged sub-freezing temperatures. The late December snow was followed by several additional snow events that added a few inches of base during each storm. Snows did not appear to crust over in most places due to low temperatures and high winds. Conditions improved by late January and early February as both temperatures and wind increased. Access to forage was improved during this time, and deer were able to move more freely on their winter ranges. From late February to May 2017, 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

Precipitation, weather, and habitat conditions have been favorable from 2014 to present. Mule deer nutritional condition was very good entering the 2015-2016 winter. Winter conditions were average for 2015-2016, resulting in average mule deer fawn production and survival during bio-year 2015. Above-average precipitation was received during the growing season (April – June) of 2016, resulting in good herbaceous forage production and mixed-mountain shrub leader growth. Although the summer of 2016 was very dry, mild temperatures and good forage production enabled mule deer to enter the 2016-2017 winter in very good nutritional condition. While the early winter of 2016-2017 was marked by heavy snows and a prolonged cold snap, the remainder of the winter was fairly average in terms of snow accumulation and temperature (precipitation data not yet available). Over-winter survival of mule deer was thought to be average across all age classes, and is corroborated by mortality data from mule deer that were collared in late February 2017. Although total weather data is not yet available, average to above average precipitation has been recorded during the growing season of 2017 thus far, which should result in another year of good forage production for mule deer in the coming year.

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



2016 - JCR Evaluation Form

SPECIES: Mule Deer

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

HERD: MD758 - RATTLESNAKE

HUNT AREAS: 88-89

PREPARED BY: HEATHER O'BRIEN

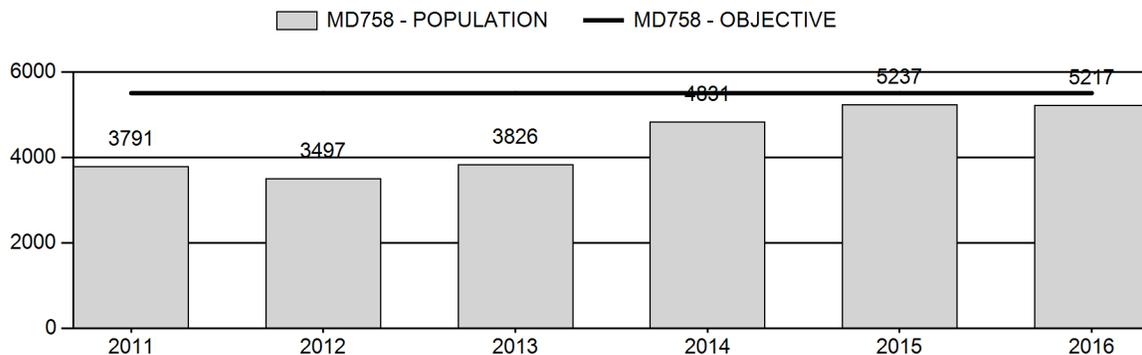
	<u>2011 - 2015 Average</u>	<u>2016</u>	<u>2017 Proposed</u>
Population:	4,236	5,217	5,501
Harvest:	176	161	175
Hunters:	374	337	350
Hunter Success:	47%	48%	50 %
Active Licenses:	383	337	360
Active License Success:	46%	48%	49 %
Recreation Days:	1,417	1,243	1,350
Days Per Animal:	8.1	7.7	7.7
Males per 100 Females	39	38	
Juveniles per 100 Females	60	64	

Population Objective (± 20%) :	5500 (4400 - 6600)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-5.1%
Number of years population has been + or - objective in recent trend:	9
Model Date:	02/28/2017

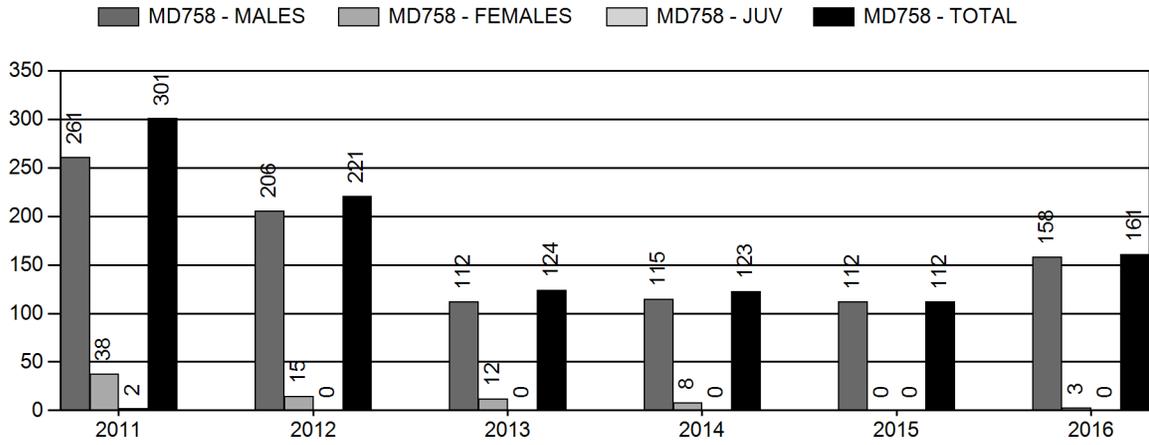
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0%	.2%
Males ≥ 1 year old:	11.8%	14.5%
Total:	2.4%	3.2%
Proposed change in post-season population:	+5.84%	+5.2%

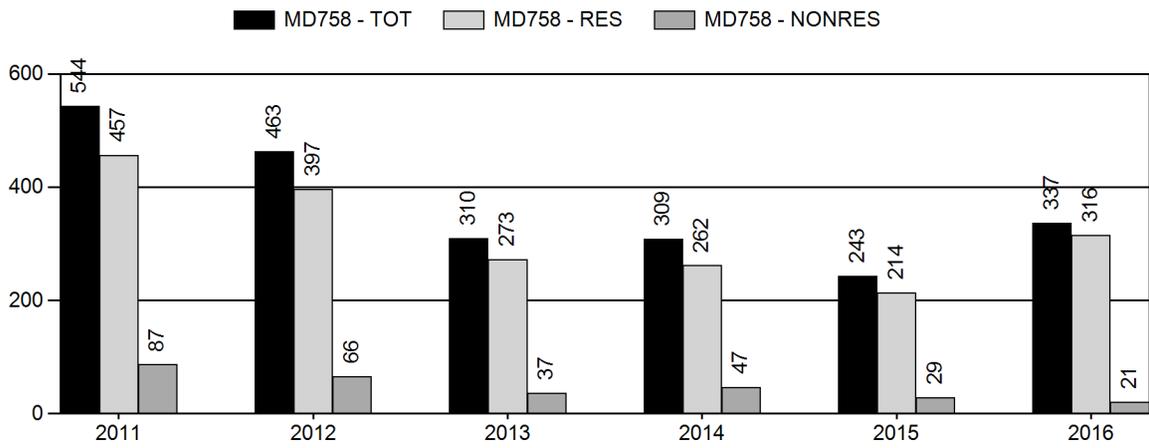
Population Size - Postseason



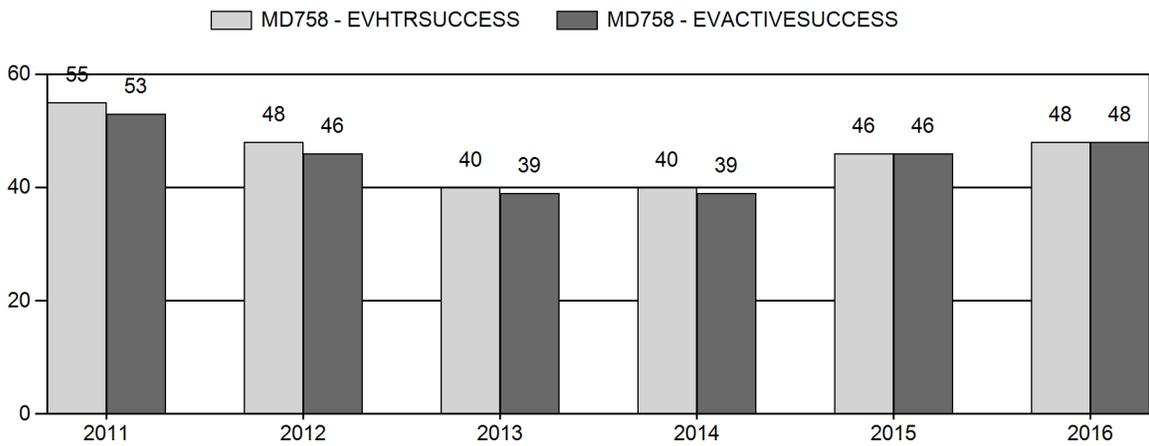
Harvest



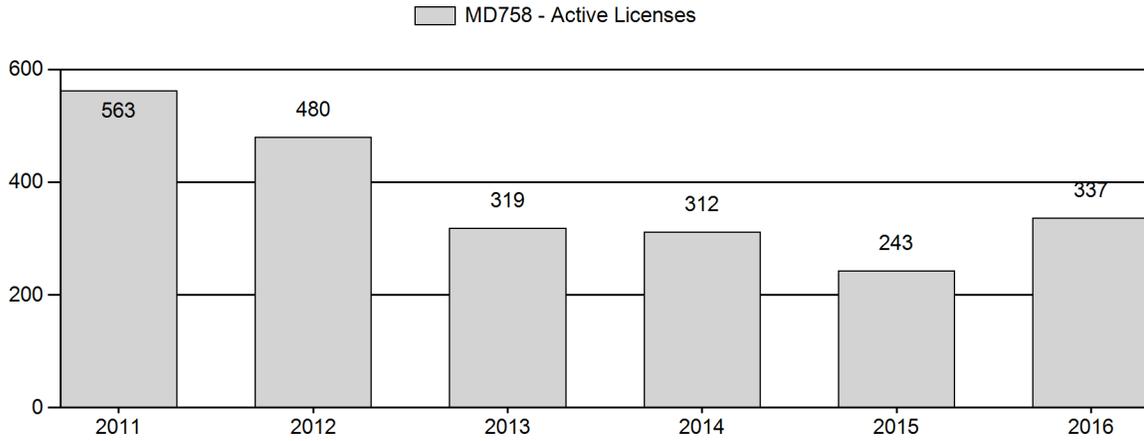
Number of Active Licenses



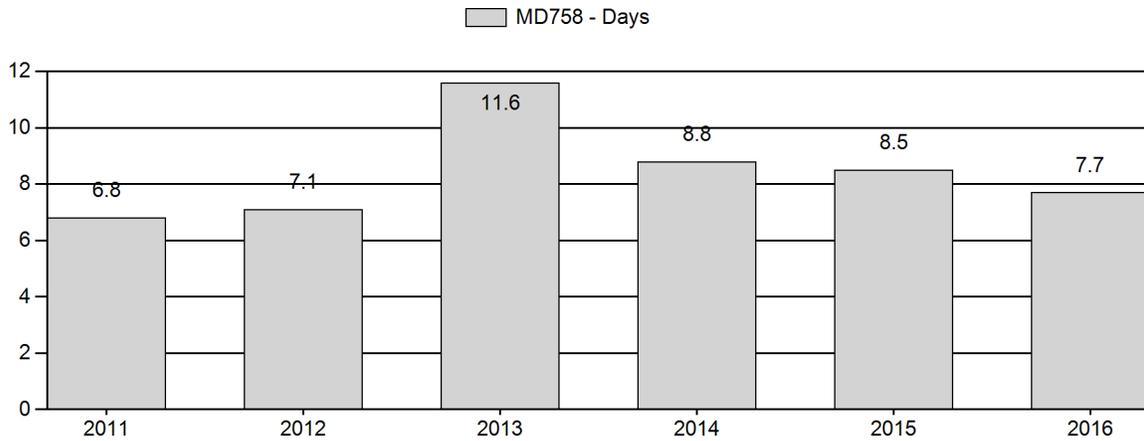
Harvest Success



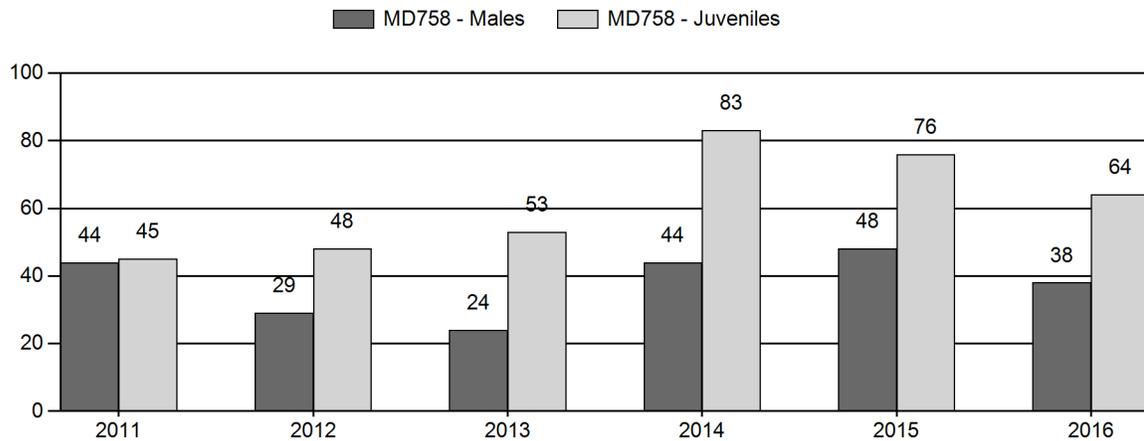
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2011 - 2016 Postseason Classification Summary

for Mule Deer Herd MD758 - RATTLESNAKE

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	%	Ylng			Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult	
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	5,237	96	97	41	3	0	237	22%	491	45%	371	34%	1,099	1,209	20	29	48	± 4	76	± 6	51	
2016	5,217	58	96	30	3	0	187	19%	487	49%	314	32%	988	1,288	12	26	38	± 4	64	± 5	47	

**2017 HUNTING SEASONS
RATTLESNAKE MULE DEER (MD758)**

Hunt Area	Type	Season Dates Opens Closes		Quota	License	Limitations
88		Oct. 15	Oct. 21		General	Antlered mule deer or any white-tailed deer
89	1	Oct. 15	Oct. 31	125	Limited quota	Antlered deer
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2016
88	6	No Change
89	1	+25
Total	1	+25

Management Evaluation

Current Postseason Population Management Objective: 5,500

Management Strategy: Special

2016 Postseason Population Estimate: 5,200

2017 Proposed Postseason Population Estimate: 5,500

2016 Hunter Satisfaction: 66% Satisfied, 17% Neutral, 17% 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 may attempt to modify hunt area boundaries in 2018 to mirror those of Antelope Area 70. 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 severe winter of 2010-2011 and subsequent drought of 2012 resulted in above average mortality of mule deer in the Rattlesnake Herd Unit. Fawn ratios were also very low during this time period, and the population remained well below objective. From 2013 to the present, weather trends have been more favorable, but range conditions and mule deer numbers still seem to be slow in their recovery compared to some adjacent herds. Fawn production and survival gradually increased from 2013 to 2015, as range conditions and nutritional status of does began to improve. The winter of 2015 was fairly average, though some areas experienced prolonged periods of persistent snow. The spring of 2016 was very wet, resulting in rapid plant growth and green-up of rangelands. However, the majority of the summer and fall were extremely dry, causing much of the available forage to cure. Fortunately, precipitation in October resulted in a late surge of plant growth, which may have provided mule deer with a valuable boost in nutrition prior to the winter of 2016-2017. While there were several notable snow storms and cold snaps during the winter of 2016-2017, there were also periods of warm weather and high winds that melted and drifted snow to expose forage. Thus, managers expect fairly average mule deer survival for the winter of 2016-2017. For detailed weather data see <http://www.ncdc.noaa.gov/gac/time-series/us>.

Habitat

This herd unit has no established habitat transects to measure production and/or utilization on shrub species that are preferred browse for mule deer. Anecdotal observations and discussions with landowners in the region indicate growth and moisture during the spring of 2016 was above average, but summer and early fall of 2016 were quite dry. Mule deer became more concentrated in areas where moisture and green forage persisted during this time period. October precipitation resulted in a late fall green-up of forage that likely benefitted mule deer nutritionally prior to the winter of 2016-2017.

Field Data

The Rattlesnake Mule Deer Herd typically has moderate fawn production, with a long-term average of 66 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 in Area 88 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. Fawn ratios were lower in 2016, with 64 fawns per 100 does observed. The lower observed ratio may in part be due to a high number of younger does without fawns in the population, but this ratio is still considered lower than desired considering yearling recruitment did not appear to be proportionally above average. Doe/fawn licenses therefore 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. Since then, buck ratios have recovered, thanks to above average fawn production/survival and low harvest pressure. Given 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 (Table 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 fluctuated since then, dependent upon fawn production/survival and harvest pressure. In 2016, 74% of bucks were categorized as Class I, with 24% Class II and 2% Class III bucks. In this instance, the higher proportion of Class I bucks is likely due to higher fawn production the previous two years. Despite a buck ratio on the upper end of 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 only modestly increase Type 1 license numbers for the 2017 hunting season. Modest harvest pressure should allow a healthy portion of younger age class

bucks to survive into older age classes, improving the distribution of bucks into higher antler classes over the next few years.

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
2016	717	45	78 (74%)	25 (24%)	3 (2%)	151	13	22	7	1	30	42

Table 1. Antler classification analysis for Area 89 within the Rattlesnake Mule Deer Herd Unit, 2008-2016.

Harvest Data

License success in this herd unit is confusing to consider at the herd unit level given the season structure and access differences between Areas 88 & 89. Harvest success in Area 88 was 35% in 2016, which is near the 5-year average and typical for a general license area with little public land access. Harvest success in Area 89 was 80% in 2016, which is the highest success rate for the hunt area since 2011. In 2016, total deer harvested increased in both hunt areas compared to 2015, indicating availability of deer was improved in both hunt areas. Hunter days declined for the third year in a row in Area 89. However, it can be difficult to use days per animal as a reference to population trends as hunters tend to be more selective of bucks and 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 did increase to 66% in 2016 compared to around 57% the past three consecutive years. Although this herd has grown and current high buck ratios can support increased harvest, liberal increases in license issuance are not yet warranted. A large proportion of bucks in the herd are in younger age classes and will need a few 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.

Tooth boxes were mailed to all hunters who successfully drew an Area 89 license in 2009, 2012, and from 2014-2016 with the goal of collecting additional demographic information from harvested deer (Table 2). Hunter participation and submission of samples has been poor since 2014, despite mailing boxes and instructions to all hunters who succeed in drawing a license. In 2016 only 12 tooth samples were submitted for aging by hunters out of 75 who harvested a deer. Despite low participation, average tooth age within the hunt area appears to be fairly steady across years, with no major declines in average or median tooth age. Average measurements for antler spread have also remained fairly constant across years, indicating consistent availability of mature bucks.

	2009	2012	2014	2015	2016
Average Tooth Age	5.6	5.07	5.83	5.88	5.67
Median Tooth Age	5.5	4.5	6.5	5.5	5.5
Average Antler Spread	22	20	23	23	23
Total Sample Size (N)	59	37	13	8	12

Table 2. Hunter-submitted tooth age and antler measurement data from Area 89 deer, 2009-2016.

Population

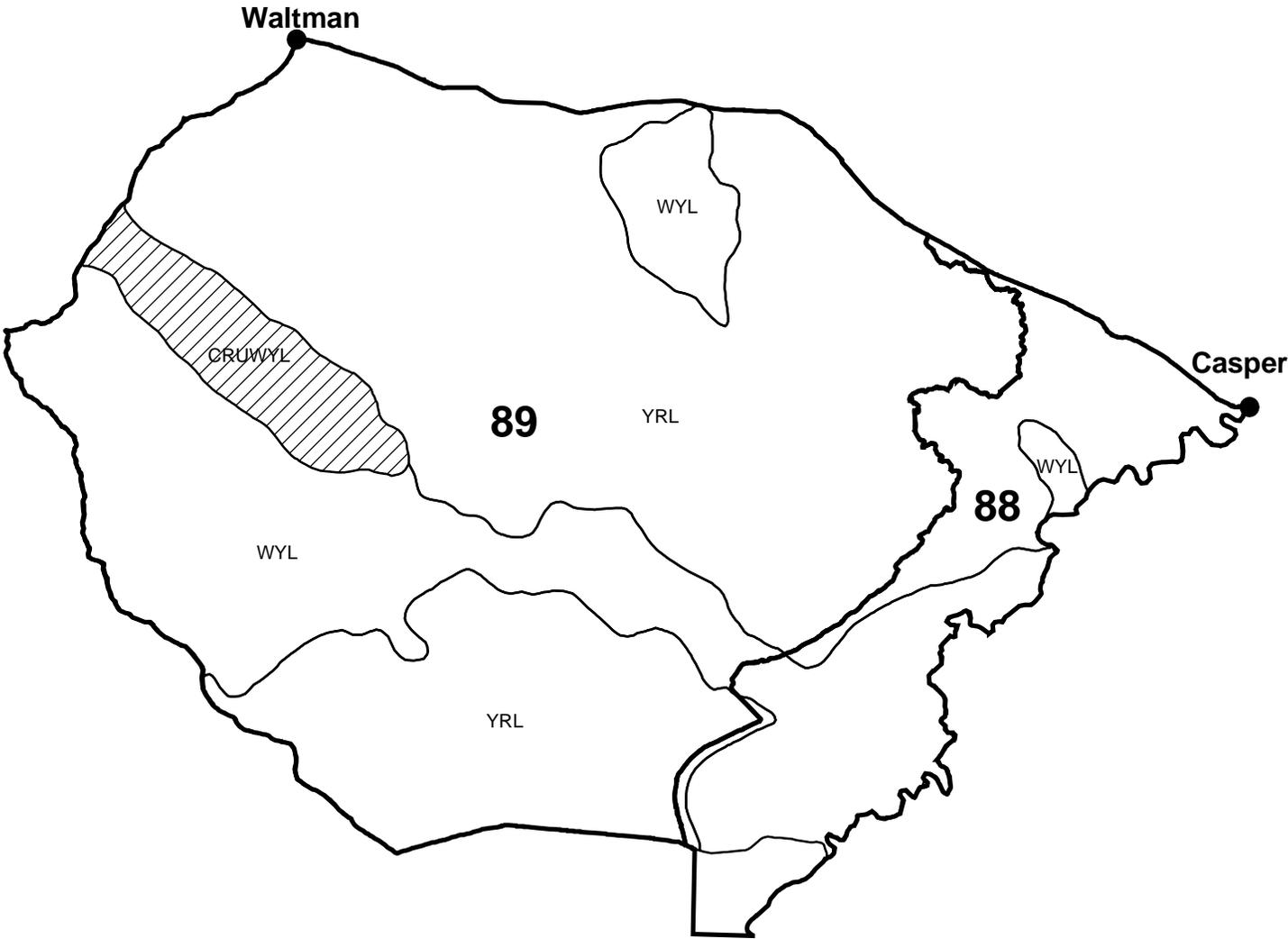
The 2016 postseason population estimate was approximately 5,200 mule deer and trending upward from an estimated low of 4,100 deer in 2012. The “Semi-Constant Juvenile, Constant Adult” (SCJ,CA) spreadsheet model was selected for the postseason population estimate of this herd. This model seemed most representative 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 15th through October 31st for limited quota licenses in Area 89, and October 15th through October 21st for general licenses in Area 88. The same season dates will be applied to the 2017 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 2017 season thus includes a total of 125 Type 1 licenses in Area 89, and a general season in Area 88 for antlered mule deer or any white-tailed deer. Goals for 2017 are to manage buck ratios within special management, and increase hunter success and satisfaction.

If we attain the projected harvest of 175 deer with fawn production similar to the five-year average, this herd will increase slightly. The predicted 2017 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



2016 - JCR Evaluation Form

SPECIES: Mule Deer

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

HERD: MD759 - NORTH NATRONA

HUNT AREAS: 34

PREPARED BY: HEATHER O'BRIEN

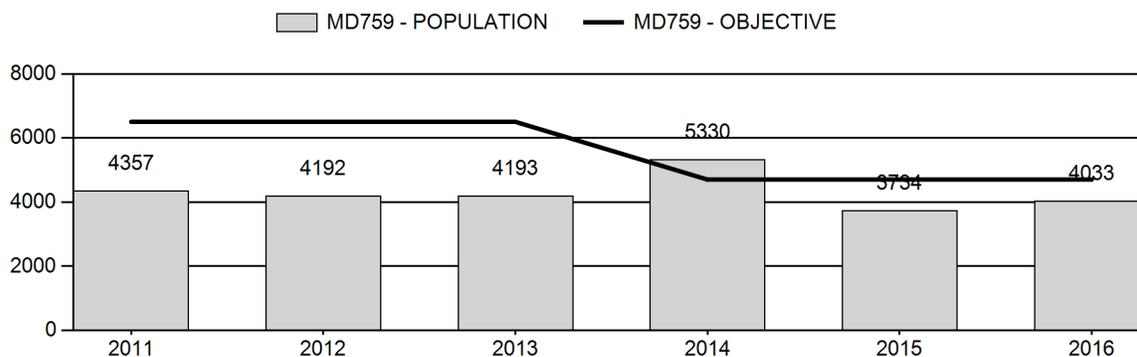
	<u>2011 - 2015 Average</u>	<u>2016</u>	<u>2017 Proposed</u>
Population:	4,361	4,033	4,623
Harvest:	177	144	187
Hunters:	234	188	225
Hunter Success:	76%	77%	83 %
Active Licenses:	244	188	225
Active License Success:	73%	77%	83 %
Recreation Days:	1,180	1,120	1,350
Days Per Animal:	6.7	7.8	7.2
Males per 100 Females	36	37	
Juveniles per 100 Females	67	74	

Population Objective (± 20%) :	4700 (3760 - 5640)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-14.2%
Number of years population has been + or - objective in recent trend:	3
Model Date:	02/28/2017

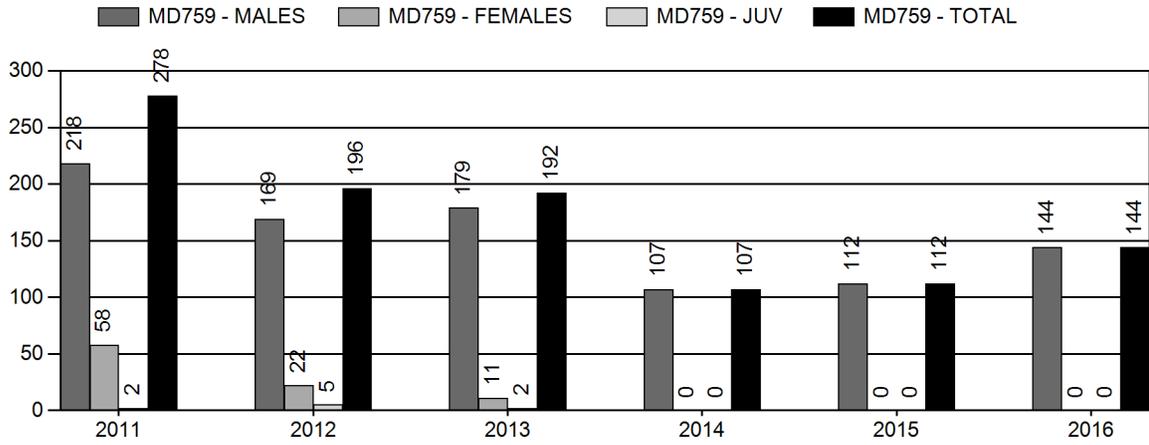
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	0%	1.9%
Males ≥ 1 year old:	16.6%	14.9%
Total:	3.6%	4.3%
Proposed change in post-season population:	+1.3%	+14.3%

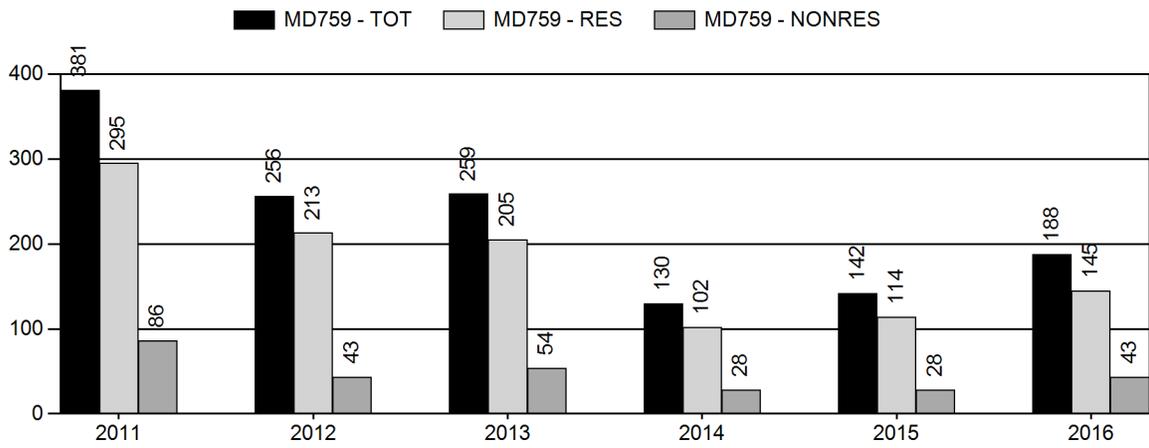
Population Size - Postseason



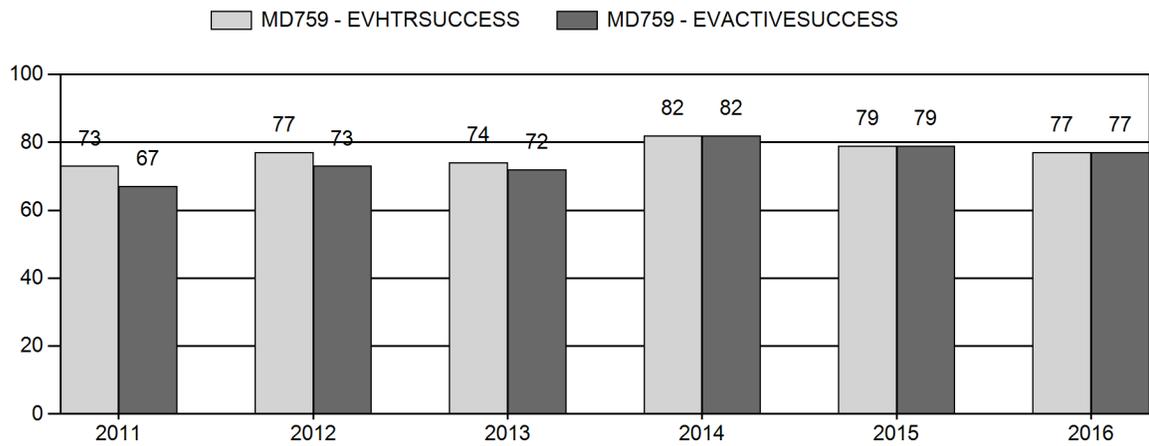
Harvest



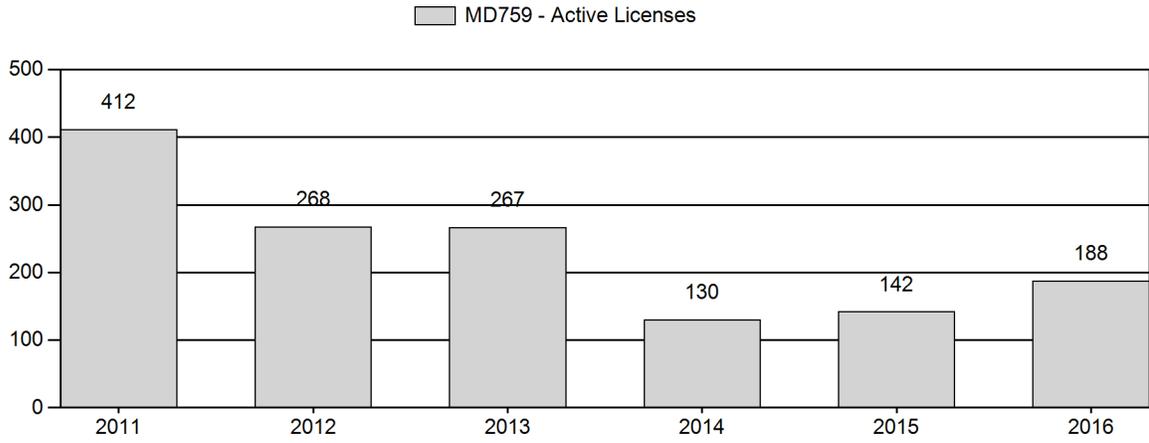
Number of Active Licenses



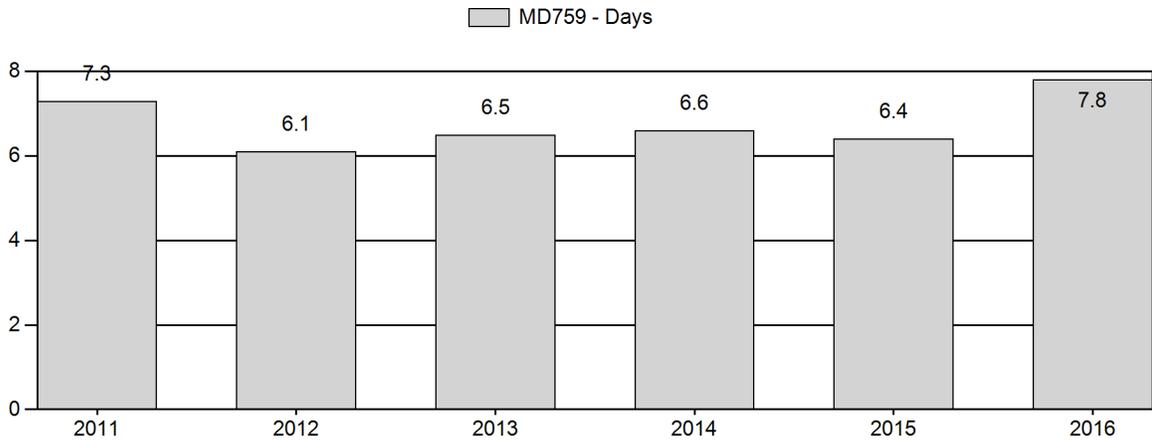
Harvest Success



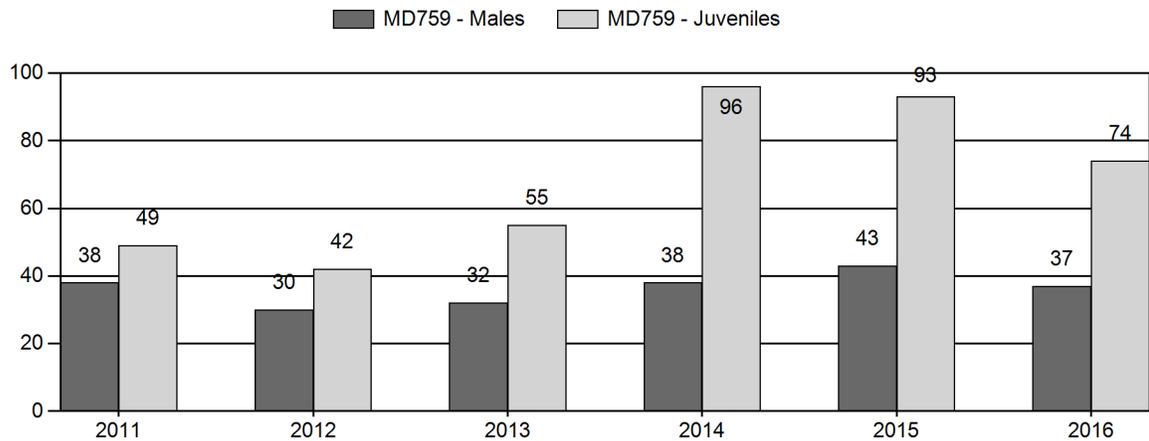
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2011 - 2016 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	%	Ylng			Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult	
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	3,734	78	93	22	1	0	194	18%	452	42%	419	39%	1,065	1,236	17	26	43	± 4	93	± 7	65	
2016	4,033	68	105	36	3	0	212	18%	571	47%	425	35%	1,208	1,336	12	25	37	± 3	74	± 5	54	

**2017 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
	7	Oct. 15	Nov. 30	50	Limited quota	Doe or fawn deer valid on private land
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2016
34	1	No change
	7	+50

Management Evaluation

Current Postseason Population Management Objective: 4,700

Management Strategy: Special

2016 Postseason Population Estimate: 4,033

2017 Proposed Postseason Population Estimate: 4,600

2016 Hunter Satisfaction: 80% Satisfied, 10% Neutral, 10% Dissatisfied

The North Natrona Mule Deer Herd Unit has a postseason population management objective of 4,700 mule deer. The herd is managed using the special management strategy, with the goal of maintaining postseason buck ratios between 30-45 bucks per 100 does. The objective and management strategy were 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 severe winter of 2010-2011 and subsequent drought of 2012 resulted in elevated mortality of mule deer in the North Natrona Herd Unit. Fawn ratios were also very low during this time period, and the population remained well below objective. From 2013 to the present, weather trends have been more favorable, and mule deer numbers have recovered quickly. Fawn production and survival increased from 2013 to 2015, as range conditions and nutritional status of does began to improve. The winter of 2015 was fairly average, though some areas experienced prolonged periods of persistent snow. The spring of 2016 was very wet, resulting in rapid plant growth and green-up of rangelands. The majority of the summer and fall were extremely dry, causing much of the available forage to cure. Fortunately, precipitation in October resulted in a late surge of plant growth, which may have provided mule deer with a valuable boost in nutrition prior to the winter of 2016-2017. While there were several notable snow storms and cold snaps during the winter of 2016-2017, there were also periods of warm weather and high winds that melted and drifted snow to expose forage. Thus, managers expect fairly average mule deer survival for the winter of 2016-2017. For detailed weather data see <http://www.ncdc.noaa.gov/gac/time-series/us>.

Habitat

This herd unit has no established habitat transects to measure production and/or utilization on shrub species that are preferred browse for mule deer. Anecdotal observations during the summer 2016 growing season suggests range conditions were above average during the wet spring, but conditions became very dry during mid to late summer. Herbaceous forage species were observed to be in very good condition in spring and early summer, but had cured by mid to late summer. Late fall moisture and resulting green-up likely benefitted mule deer going into the winter months of 2016-17, and mule deer appeared to be in very good body condition during aerial and ground classification surveys during late November and early December 2016.

Field Data

From 2006-2013, fawn production/survival was moderate to poor, and reached a 15-year low in 2012. Fawn production has improved strikingly since then and reached a historic high of 96 per

100 does in 2014. Fawn production remained high in 2015 and 2016, with an observed fawn ratio of 93 and 74 per 100 does, respectively. Mild winter weather and excellent growing seasons have helped to improve conditions for fawns and lactating does. Overwinter survival of fawns has remained high as well, as evidenced by higher yearling buck ratios the past three years.

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. Buck ratios rebounded with a reduction in license issuance and improved fawn production/survival, and were near the upper threshold of special management by postseason 2015. Thus, license issuance was liberalized for 2016, and the buck ratio decreased slightly to 37 for postseason surveys. Despite an increase in license issuance, harvest success remained in the 76th percentile for 2016, and hunter satisfaction improved to the 80th percentile. Management goals for 2017 are to maintain buck ratios within the range of special management while maintaining current license opportunity.

Since 2008, classified bucks have been further categorized based on antler size (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. Similar to the pattern noted from 2013 to 2014, distribution of bucks shifted slightly from Class I to Class II from 2015 to 2016. 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 current issuance of Type 1 licenses for the 2017 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
2016	1,208	68	105 (73%)	36 (25%)	3 (2%)	144	12	18	6	1	26	37

Table 1. Antler classification analysis for the North Natrona Mule Deer Herd Unit, 2008-2016.

Harvest Data

Hunter success in the North Natrona Mule Deer Herd Unit is typically in the 70-80th percentile, and was 77% in 2016. Hunter days remained fairly average for this herd unit, at 7.8 days per animal, despite fairly low issuance of Type 1 licenses. Survey totals, comments from hunters and landowners, and population modeling all indicate this herd has grown consistently from 2013-present due to improved fawn production/survival. 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 2013-2016 (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	2016
Average Age	4.44	5.4	5.27	5.27	4.85
Median Age	4.5	5.5	4.5	4.5	5.5
Average Antler Spread	21.2	21.2	20	20.9	21.5
Sample Size (N) =	68	52	44	32	40

Table 2. Lab tooth age and antler spread data from Hunt Area 34 harvested mule deer, 2010, 2013-2016.

Population

The 2016 postseason population estimate was approximately 4,000, which represents an increase of approximately 600 deer since postseason 2015. No sightability or other population estimate data are currently available to further align the model in conjunction with postseason classification and harvest data. In the past, this herd has not typically exhibited abrupt changes in population size, as fawn production is usually moderate and habitat conditions are often fair. However, this herd appears to have grown rapidly over the past three years, due mainly to very high fawn production and good overwinter survival. Despite significantly reduced survey effort due to time and budget constraints in 2016, managers classified 1,208 mule deer during postseason classifications, the highest survey total on record for the herd unit. Higher densities of mule deer are also becoming a damage issue on irrigated farmlands in the southeast corner of the herd unit for the first time since 2011.

The “Semi-Constant Juvenile – Semi-Constant Adult Survival” (SCJ,SCA) 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 SCJ,SCA model selects an adult survival rate that is very reasonable for this herd, but was constrained to a lower survival range in 2010 to account for a harsh winter. Lower constraints for juvenile survival were raised from 0.4 to 0.6 to account for the milder winters of 2014 and 2015. Managers believe these to be acceptable adjustments, as they account for known winter conditions and produce model trends that track with observed trends. The CJ,CA model was rejected, as it predicts an unreasonably high rate of population growth. The TSJ,CA was rejected as it predicts a stagnation in population growth that does not correspond to high fawn production/survival and increased total mule deer surveyed over the past three years. 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 SCJ,SCA 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 15th through October 31st. The 2017 season offers the same number of Type 1 licenses, as these were increased in 2016. While population size has increased, buck ratios are in the middle of special management parameters, and distribution of mature bucks across antler classes is still mediocre. Thus, an increase in Type 1 license issuance is not warranted for the 2017 season. Managers would rather maintain high harvest success and hunter satisfaction while allowing younger bucks to mature into older age classes. In addition, 50 Type 7 licenses will be added for the 2017 season to address issues of mule deer congregating on irrigated farmlands. These licenses will be valid on private land only to curb potential damage issues, while conserving doe mule deer on native habitats.

If we attain the projected harvest of 187 mule deer with fawn ratios similar to a 5-year average, this herd will increase in size. The predicted 2017 postseason population size of the North Natrona Mule Deer Herd is approximately 4,600 animals, or 2% below objective.

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

