2017 - JCR Evaluation Form

SPECIES: Mule Deer | PERIOD: 6/1/2017 - 5/31/2018

HERD: MD740 - CHEYENNE RIVER

HUNT AREAS: 7-14, 21 | PREPARED BY: JOE SANDRINI

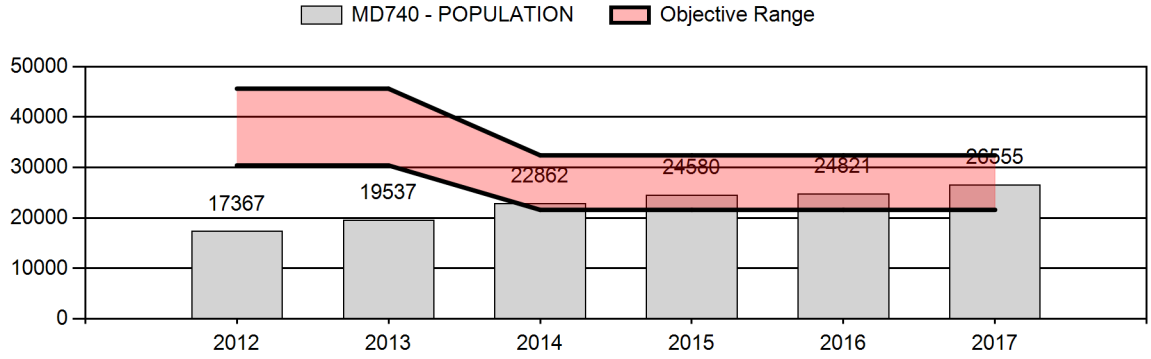
	2012 - 2016 Average	2017	2018 Proposed
Population:	21,833	26,555	27,914
Harvest:	1,069	1,409	1,610
Hunters:	1,994	2,113	2,400
Hunter Success:	54%	67%	67 %
Active Licenses:	2,026	2,143	2,435
Active License Success:	53%	66%	66 %
Recreation Days:	8,109	7,680	8,800
Days Per Animal:	7.6	5.5	5.5
Males per 100 Females	41	45	
Juveniles per 100 Females	67	64	

Population Objective (± 20%) :	27000 (21600 - 32400)
Management Strategy:	Private Land
Percent population is above (+) or below (-) objective:	-1.6%
Number of years population has been + or - objective in recent trend:	8
Model Date:	02/15/2018

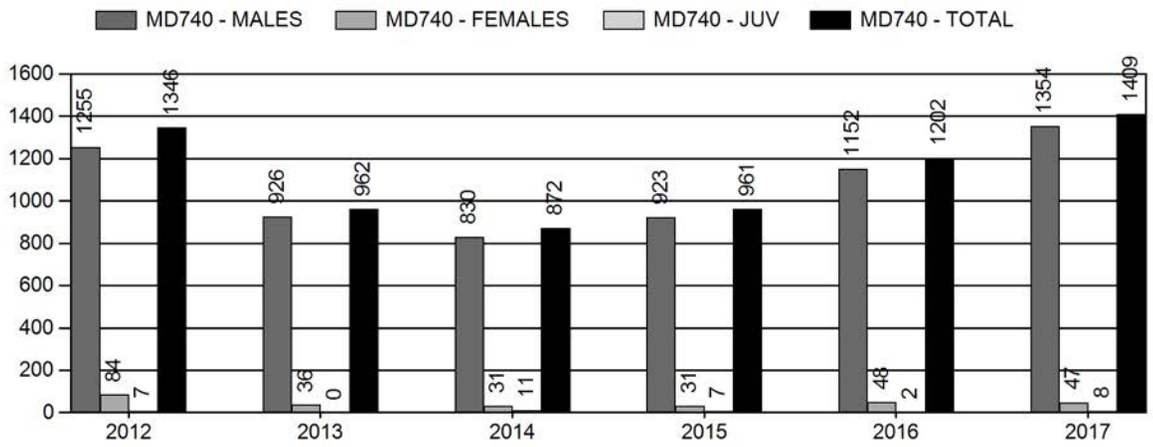
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	JCR Year	Proposed
Females ≥ 1 year old:	0.4%	0.4%
Males ≥ 1 year old:	20.5%	23.0%
Total:	5.5%	6.0%
Proposed change in post-season population:	+2.8%	+5.1%

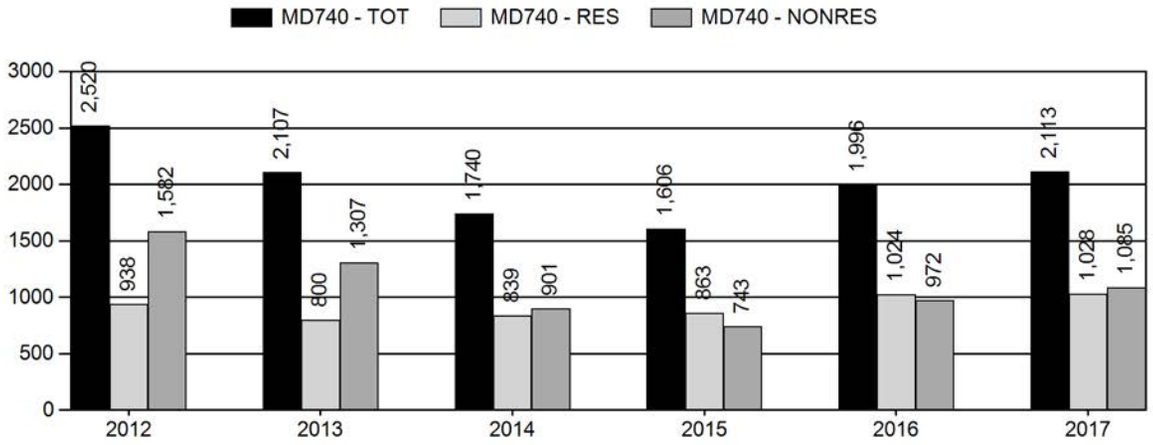
Population Size - Postseason



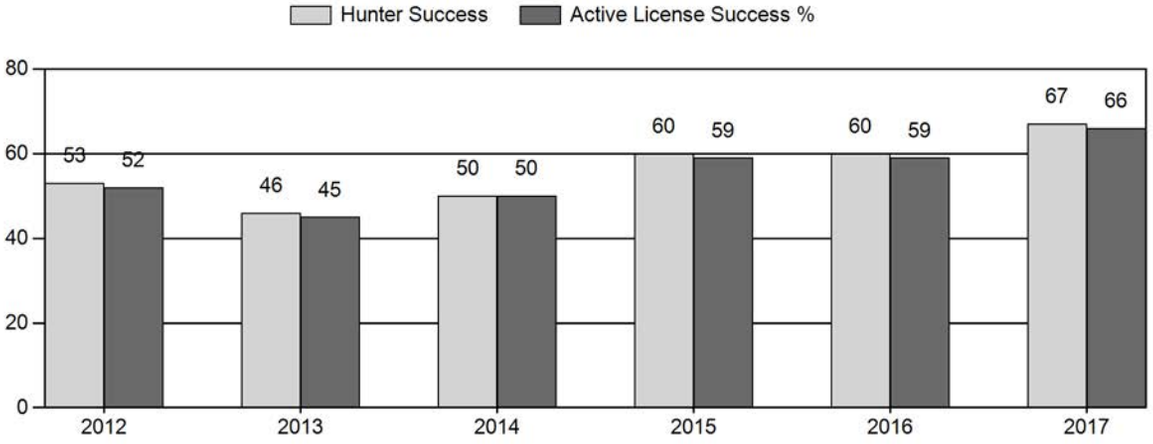
Harvest



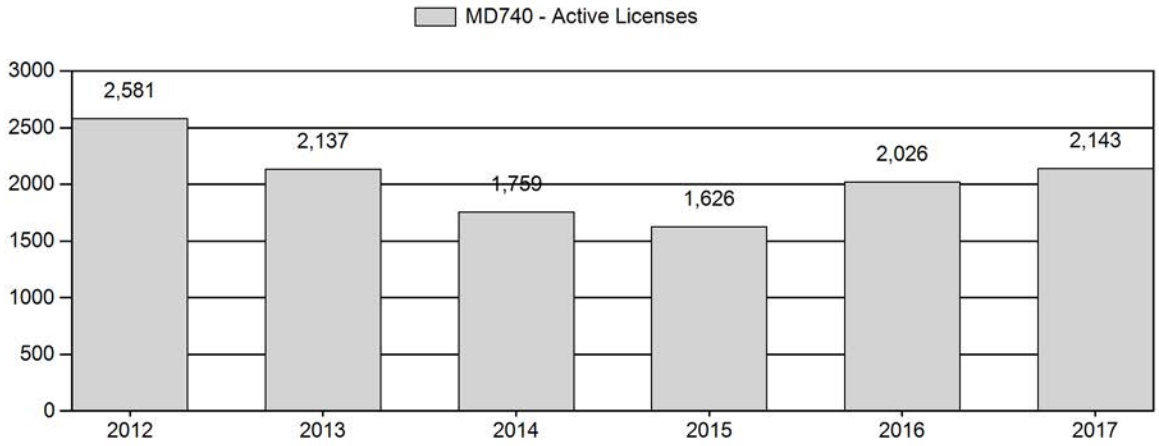
Number of Active Licenses



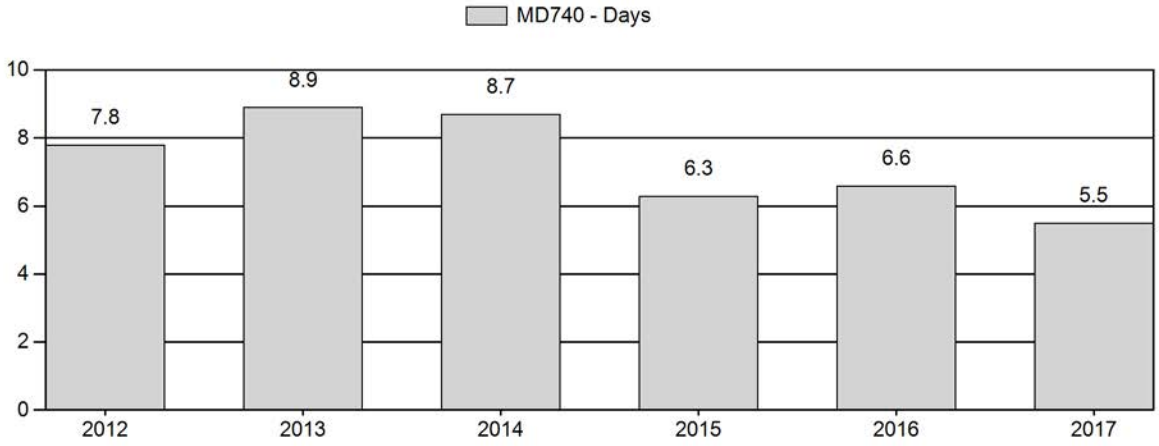
Harvest Success



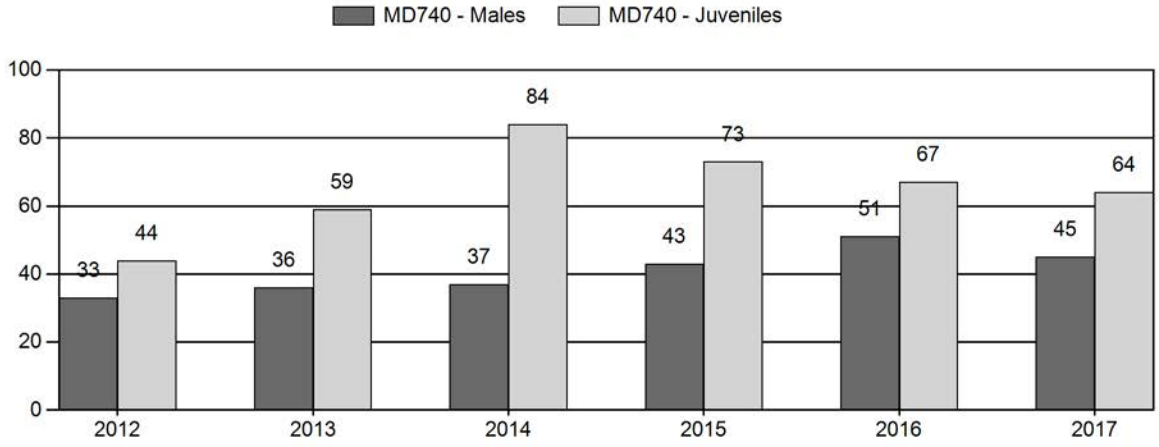
Active Licenses



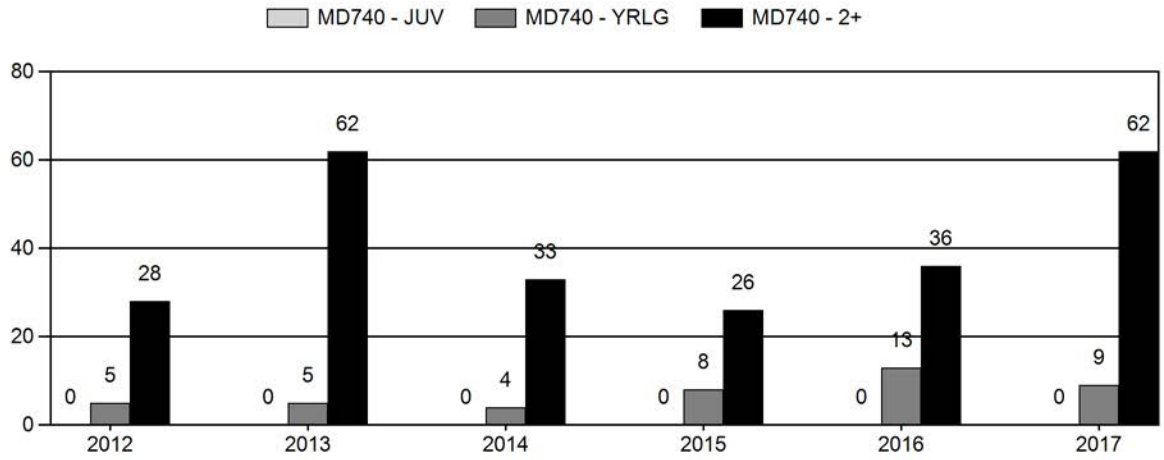
Days per Animal Harvested



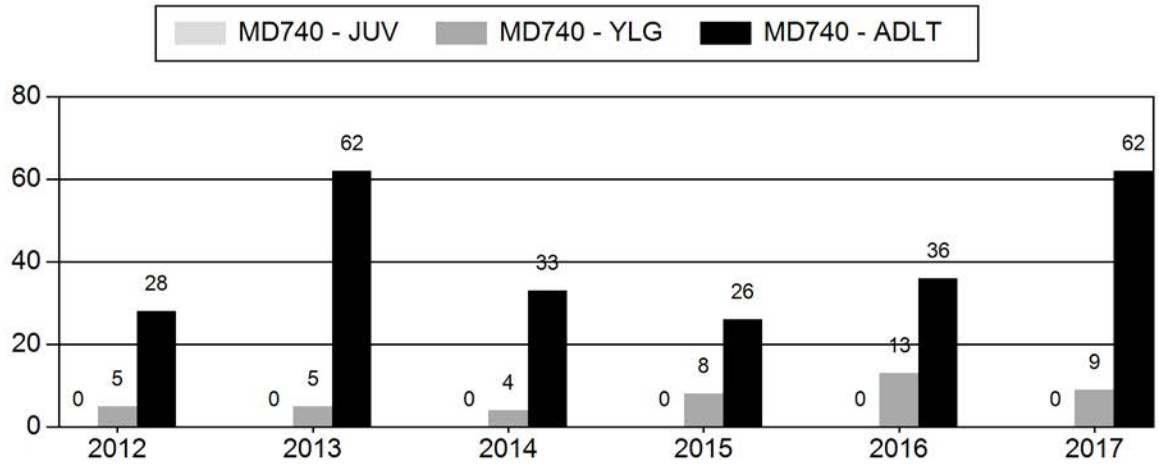
Postseason Animals per 100 Females



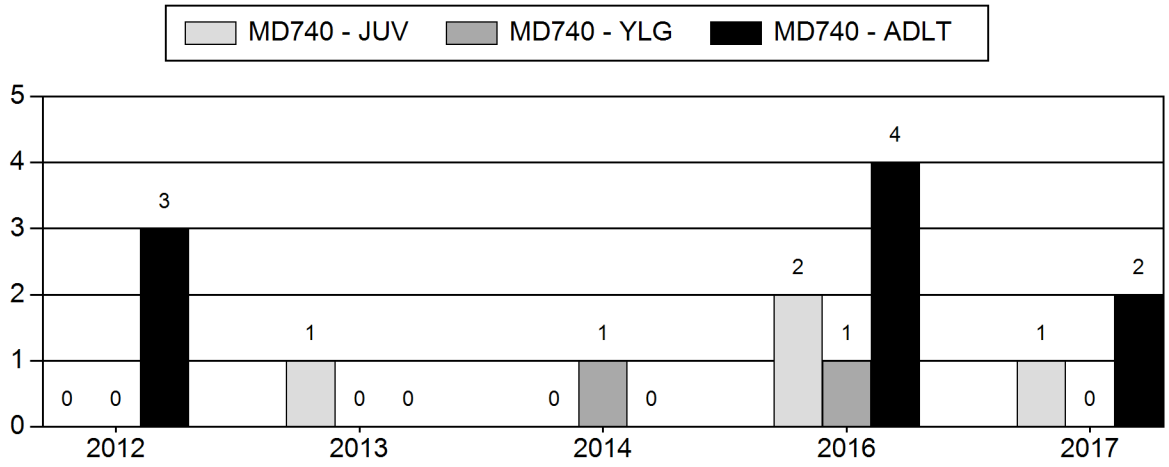
Age Structure of Field Checked Males



Age Structure Data (Field and Laboratory) - Male



Age Structure Data (Field and Laboratory) - Female



2012 - 2017 Postseason Classification Summary

for Mule Deer Herd MD740 - CHEYENNE RIVER

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	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
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	26,555	264	413	109	12	0	798	21%	1,777	48%	1,143	31%	3,718	1,371	15	30	45	± 2	64	± 3	44

2018 HUNTING SEASONS
CHEYENNE RIVER MULE DEER HERD (MD740)

Hunt Area	Type	Season Dates Opens	Season Dates Closes	Quota	License	Limitations
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	125	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	Season Dates Closes
1-14, 21	Sep. 1	Sep. 30

Region B Nonresident Quota: 1,350

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	License Type	Quota change from 2017
10	1	+25
Herd Unit Totals	1	+25
	Region B	+250

Management Evaluation
Current Management Objective: 27,000
Management Strategy: Private Land Management
2017 Postseason Population Estimate: ~ 26,600
2018 Proposed Postseason Population Estimate: ~ 27,900
2017 Hunter Satisfaction: 81% Satisfied 11% Neutral 8% Dissatisfied

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

There are about 6,350 mi^2 in this herd unit, and 5,485 mi^2 (86%) are considered occupied habitat. Approximately 75% of the land within the herd unit is privately owned, with the remaining lands 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 closely approximated that of 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, but also 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 has begun to increase disturbance. 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: The winters of bio-year 2010 and 2011 were tough to somewhat severe in most of the Cheyenne and Niobrara River drainages, and resulted in above average over-winter mortality of fawns. This is evident from observed fawn:doe and yearling buck:doe ratios around this timeframe (Figure 1). These winters were followed by severe drought in 2012. The combination of these climatic conditions led to continued reductions in fawn productivity and survival even though the 2012-13 winter was mild. Bio-year 2013 was a transition year when drought moderated, yielding good forage growing conditions followed by a relatively normal winter. More favorable weather for deer was then experienced through 2015, with spring and summer weather conditions leading to outstanding forage production followed by mild winters. Consequently, fawn production and survival were excellent in both bio-years 2014 and 2015, resulting in substantial herd growth. Bio-years 2016 and 2017 both saw a return to drought conditions throughout most of the herd unit during the growing season. In most locations, cool season forage production was nominal and warm season production limited in both years. Overall, range conditions were generally fair to poor going into the 2016-17 and current winter. The 2016-17 winter saw a return of more normal to severe weather. Consequently, fawn production and survival dropped in 2016, and is expected to remain close to long-term average values through the 2017 bio-year. However, these reductions in productivity and survival have not been to a level that cannot sustain modest herd growth, given conservative hunting seasons in place. In summary, the combination of summer drought and average winter weather conditions the past two years have served to temper herd growth. Weather details can be accessed on-line (http://www.ncdc.noaa.gov/cag/).

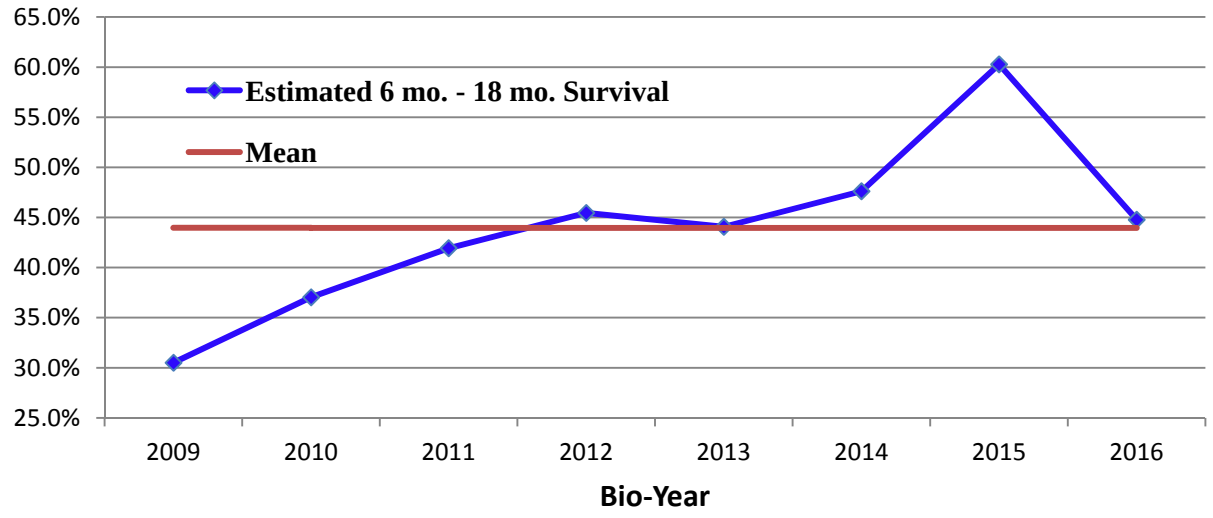


FIGURE 1. Estimated over-winter survival rate of deer from 6 mo. to 18 mo. of age[1] with mean.

[1] Based upon observed fawn:doe ratios and the subsequent year's observed yearling buck:doe ratio. Calculated as $(\text{Yearling Buck:Doe})_{\text{Year 2}}$ / ½$(\text{Fawn:Doe})_{\text{Year 1}}$ Assumes no yearling buck harvest and all change in ratios due to fawn mortality. Therefore, figures likely biased low, but are intended only as a relative comparison between years.

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 dominated more by short grass prairie punctuated with pine breaks, and there is a small area (about 30 mi^2) of southern Black Hills habitat along the Stateline near Newcastle. Rolling ponderosa pine and limber pine (*Pinus flexilis*) hills and ridges dominate the southern portions of the herd unit. Major agricultural crops include 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 across more of the herd unit 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 and 2017 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 near or slightly above long-term averages indicating this population remains below carrying capacity and its current objective is reasonable given the existing population estimation techniques.

FIELD DATA: While postseason fawn:doe ratios have undergone cyclic fluctuations, they have generally trended downward over the long-term (Figure 2). In 2017, the observed, post-season fawn:doe ratio was 64:100, which was near the previous 20-year average of 66:100, but represented a drop from the 67:100 observed the year before, and a decline of 24% from the recent high of 84:100 observed in 2014. This drop in fawn production was likely the result of drought and more normal winter weather, and not due to large numbers of yearling does in the population as the fawn:mature doe ratio[2] was only 74:100, a value that was well below the average of 91:100 observed over preceding three years when this herd grew more rapidly.

[2] Fawn : Mature Doe Ratio = 100 X [Fawns observed / (Does observed – Yearling Bucks Observed)]

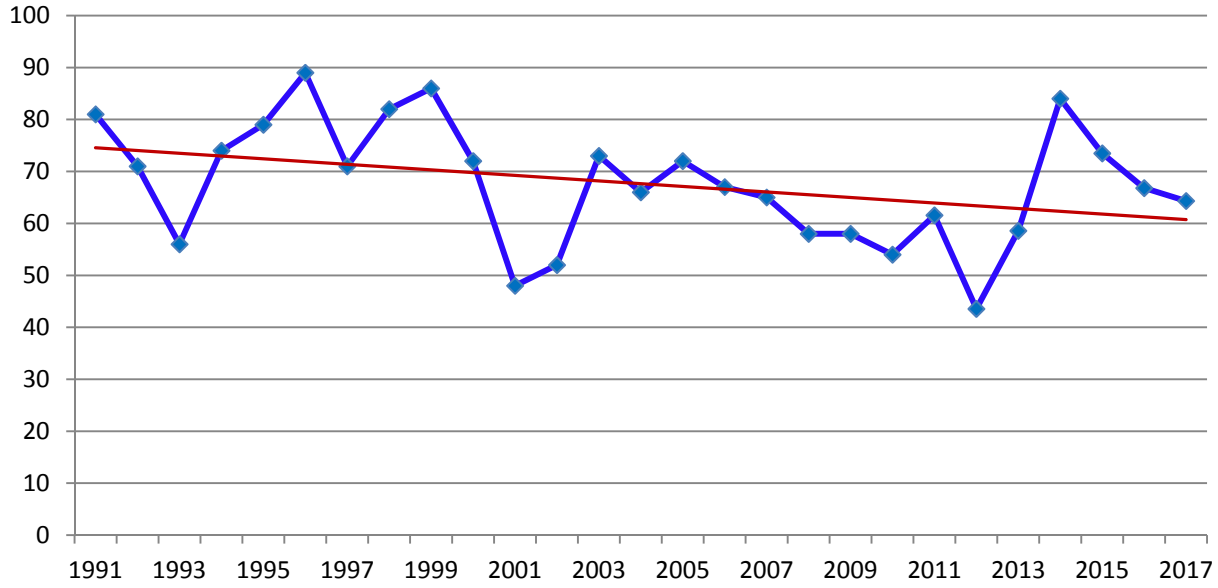


Figure 2. Post-Season Fawn:Doe Ratios (1991 – 2017) – Cheyenne River Mule Deer Herd.

At any rate, the fawn:doe ratios observed between 2014 & 2016 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.

Post-season buck:doe ratios in this herd have fluctuated cyclically (Figure 3). 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 last year. The observed buck:doe ratio declined to 45:100 this year. However, ground classifications in HA 14 may have biased this figure a bit low, as the average hunt area buck:doe ratio was 47:100 while that of HA 14 was only 34:100, and the bulk of the classification and harvest data suggest the buck:doe ratio was closer to 50:100. Driven substantially by fawn production since 2014 and low harvest rates of bucks, the relative number of bucks in this herd has increased substantially compared to the previous 20 years when the buck:doe ratio averaged 35:100. At any rate, there is definitely opportunity to increase buck harvest in this herd unit.

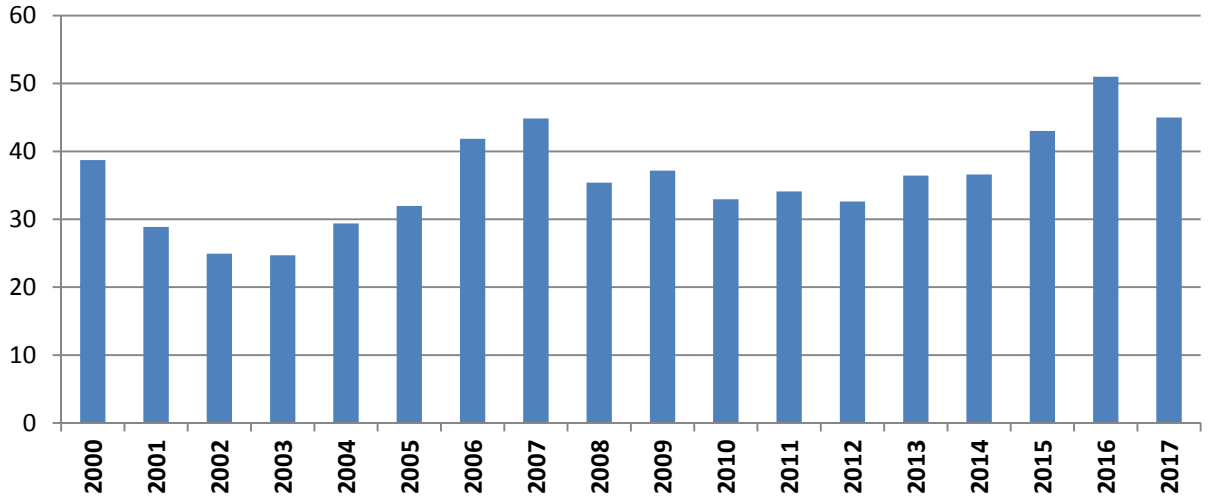


Figure 3. Post-Season Buck:Doe Ratios, Cheyenne River Mule Deer Herd (1997-2015).

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 maintain or 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. We are now at a point where a few landowners are expressing the desire to host more hunters and even entertain some limited doe/fawn hunting, while others are still limiting harvest. Considering the biological data and landowner sentiments, we seem to be near a point where this mule deer population should be actively managed.

Access to private lands for deer hunting continues to reamain impoverished due to leasing by outfitters and to a lesser extent by landowners continuing to limit hunting in the wake of the recent population decline. Over the past several decades, increased outfitter control of private land hunting has significantly curtailed public hunting access to buck deer, and harvest of bucks dropped at times when seasons were liberalized. This reduction in access to private land for deer hunters has steadily increased hunting pressure on accessible public lands and resulted in lower numbers of bucks there. That 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 dropped steadily between 2006 and 2015 as the Region B quota was successively lowered most years. In addition, likely responding to declining deer numbers, resident hunter numbers dropped steadily through 2013 where they remained with about 835 active licenses before increasing 18% in 2016 and stabilizing. With proportionately greater increases in buck deer numbers relative to total hunter numbers, complaints about the low number of deer seen and harvested have diminished significantly over the past three 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 were 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 has exceeded issuance in the initial draw, deer numbers have improved, and HA 10 was converted to limited quota.

Harvest statistics have generally reflected changes in population estimates and license sales. These statistics indicate this population dropped to its low point in 2013, versus 2012 as projected by the model. This was likely attributable to weather conditions that October. However, with the vast majority of the harvest being adult bucks, it is likely 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. In 2017, with very little change in license issuance, total hunter success climbed to 67% from 60% and effort decreased from 6.6 to 5.5 days per harvest. These changes dovetail well with the estimated increase in this population.

POPULATION: This herd's 2017 post-season population estimate of ~ 26,600 puts it 2% below objective; and represents an increase of 42% since 2012. This substantial rebound was a result of excellent reproduction and survival between 2014 and 2016, while hunting seasons remained extremely conservative. This population increase was also 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 again 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 91% correlated with changes in hunter success, and inversely correlated 80% with changes in hunter effort between 2006 and 2017. The competing models are not as well correlated. But, 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, in some locations it does not appear 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 very 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 completely congruent with field personnel's sentiments.

MANAGEMENT SUMMARY: The traditional season dates for this herd unit are Oct. 1-15. In order to facilitate modest 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. Fifty 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.

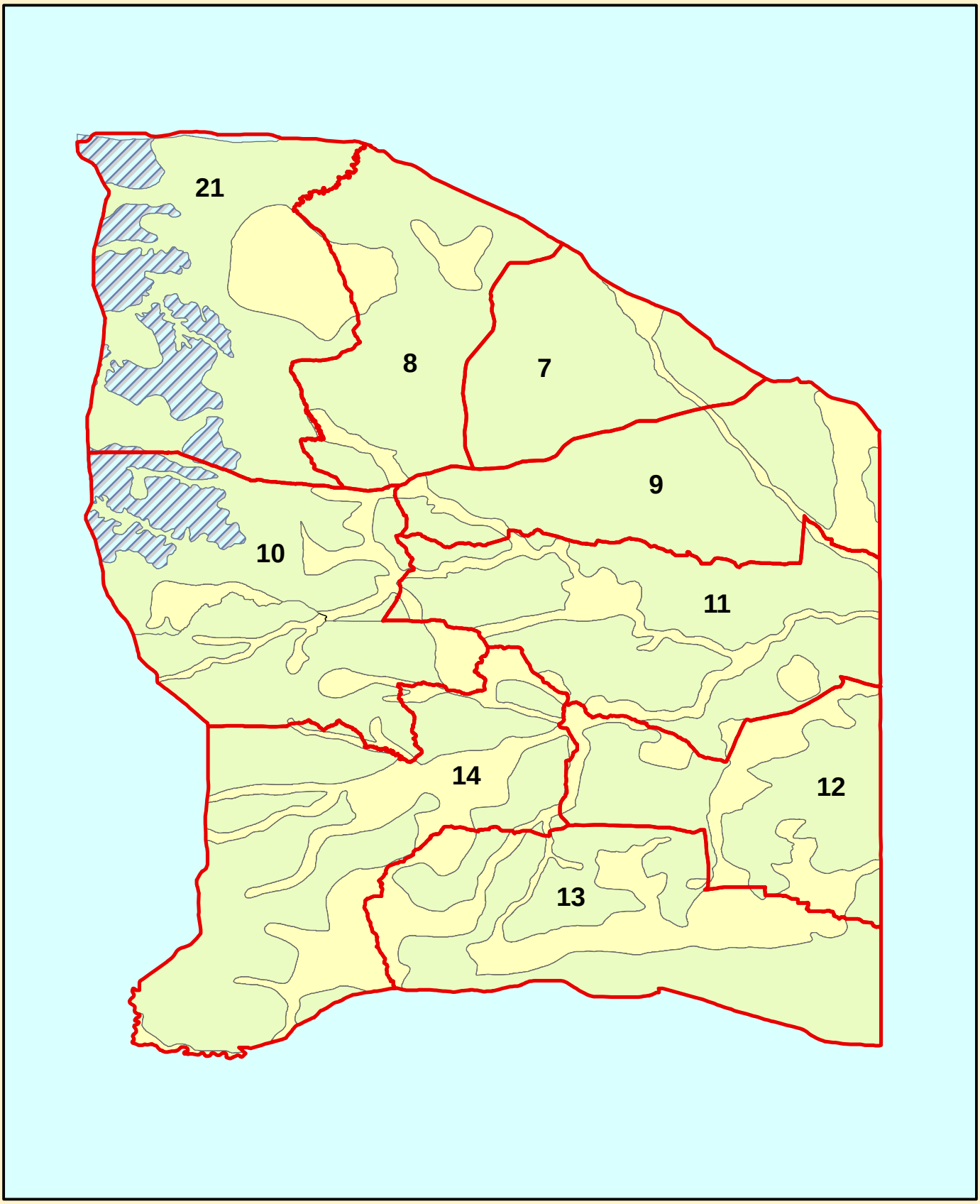
Due to heavy hunting pressure on accessible public land, there is a discrepancy in deer numbers and densities between these areas and surrounding private lands. Historically, this was most exemplified in HA 10, which contains the highest proportion of public land in the herd unit. To address low buck numbers and hunter crowding in this hunt area, we decreased season length, steadily reduced the Region B quota, and finally implemented a 3-point restriction in 2012. These strategies helped improve 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. Similar classification in 2013 and 2014 detected more bucks each year, and the buck:doe ratio remained near 36:100.

Following the inaugural limited quota season in HA 10, comparable classification efforts found buck:doe ratios of 51:100 in 2015 and 57:100 in 2016. However, 30% of the bucks observed were yearlings in 2015 and 43% in 2016. In 2017, most of the deer classified in this hunt area were observed from the ground, with nearly 700 deer observed producing a buck:doe ratio of 41:100. It is now apparent that we can begin to liberalize license issuance in Area 10 over the next couple of years as cohorts of younger deer reach mature age classes. Consequently, Type 1 license issuance is being increased 25%, and a longer season should be considered. In addition, tooth envelopes were mailed to Type 1 license holders in 2017. Based upon harvest survey data, a return rate of 28% was garnered, revealing the median buck harvested was a 3.5 year old deer with 4X4 antlers and averaged a bit over 20" in outside beam width. Finally, limited quota hunting in this hunt area has been very well received by those hunting here, with 91% of hunters reported being satisfied or very satisfied with their hunt in 2017, while none reported any measure of dissatisfaction. Since hunting on limited quota basis was instituted in HA 10, mean hunter satisfaction has been 84%.

Even as this population has recovered, some landowners continue to state they are not willing to host increased numbers of deer hunters, while others want to take more hunters. Overall, local game wardens remain reluctant to increase Region B license issuance due to concerns over non-resident hunters purchasing licenses without securing permission on private lands, resulting in phone calls looking for places to hunt, hunter complaints about access, and dissatisfaction from

those hunters relegated to hunting isolated parcels of public land with low buck numbers. However, now that HA 10 has been limited quota for three years, Region B license demand continues to exceed issuance, and the buck:doe ratio has hovered between 45 and 50:100 past three years, an increase in the Region B quota is undoubtedly warranted. Therefore, Region B licenses will increase 23% to 1,350 in 2018.

Assuming resident hunter participation remains fairly constant, the 2018 hunting season should result in harvest of about 1,550 bucks and 60 antlerless deer. Given five-year average postseason classification values and modeled survival rates, this harvest is projected to allow the postseason population to increase 5% to ~ 27,900. This would put it slightly above the objective of 27,000. However, given winter weather has been more normal to somewhat severe, at least in the northern portion of the herd unit, and considering drought the past two growing seasons will lead to a decline in the fawn:doe ratio, this population will more likely level off or drop in 2018.



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:

2017 - JCR Evaluation Form

SPECIES: Mule Deer | PERIOD: 6/1/2017 - 5/31/2018

HERD: MD751 - BLACK HILLS

HUNT AREAS: 1-6 | PREPARED BY: JOE SANDRINI

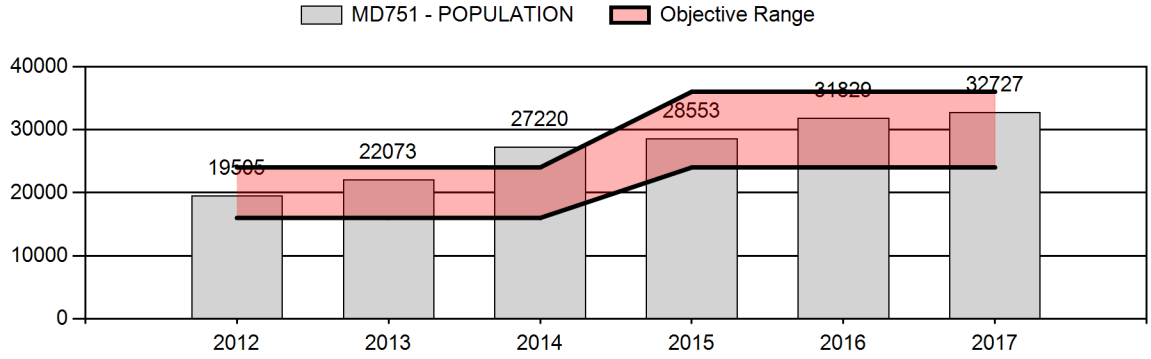
	2012 - 2016 Average	2017	2018 Proposed
Population:	25,836	32,727	33,419
Harvest:	1,966	2,865	3,260
Hunters:	4,277	5,825	6,650
Hunter Success:	46%	49%	49 %
Active Licenses:	4,381	6,098	6,950
Active License Success:	45%	47%	47 %
Recreation Days:	13,239	15,625	17,800
Days Per Animal:	6.7	5.5	5.5
Males per 100 Females	26	31	
Juveniles per 100 Females	79	68	

Population Objective (± 20%) :	30000 (24000 - 36000)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	9%
Number of years population has been + or - objective in recent trend:	2
Model Date:	02/15/2018

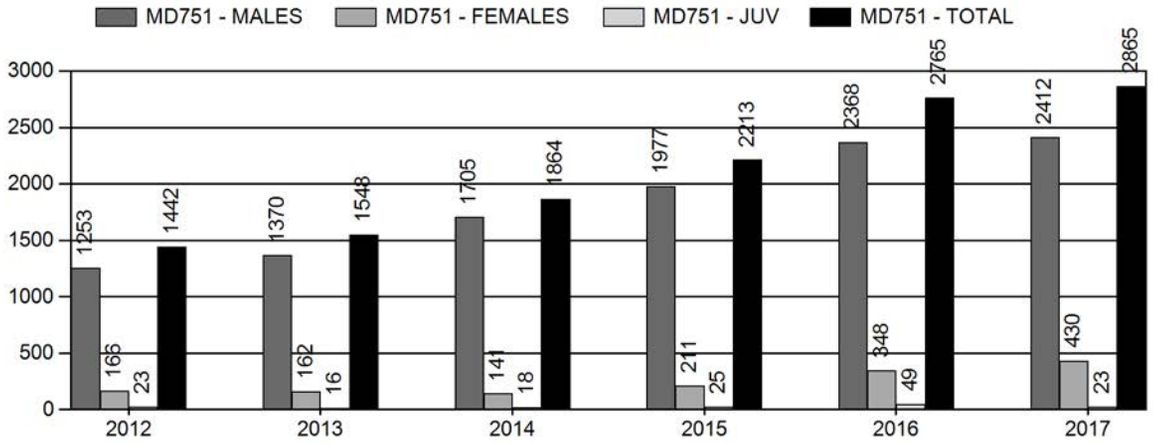
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	JCR Year	Proposed
Females ≥ 1 year old:	2.8%	4.8%
Males ≥ 1 year old:	34.1%	35.9%
Total:	8.8%	9.7%
Proposed change in post-season population:	-2.2%	+2.1%

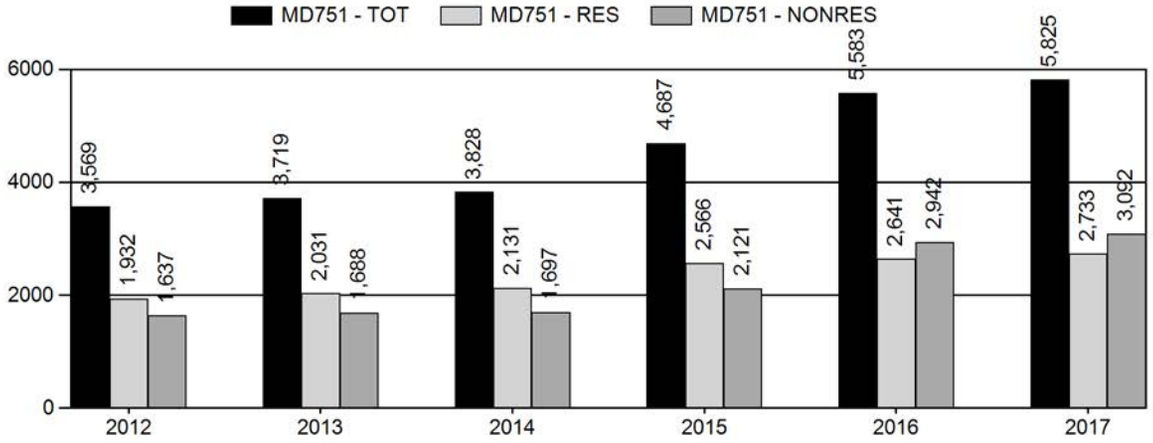
Population Size - Postseason



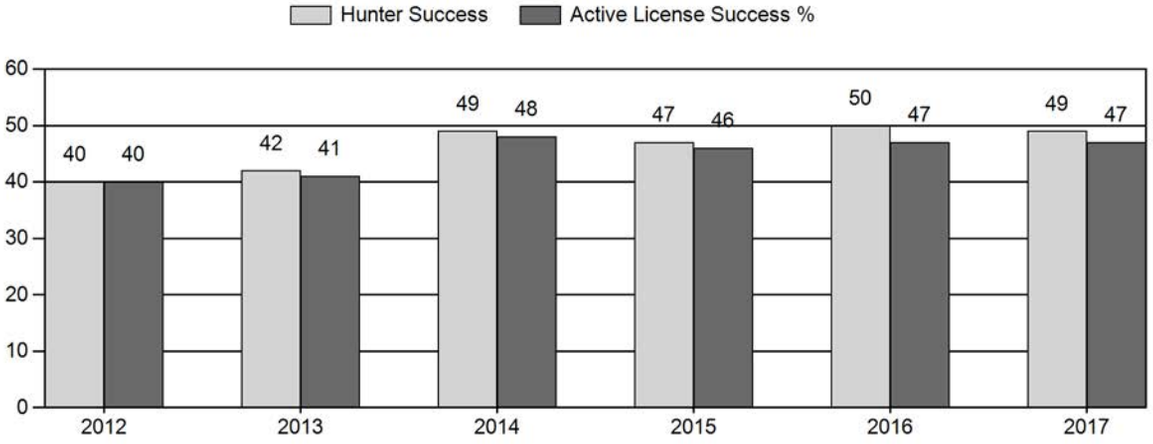
Harvest



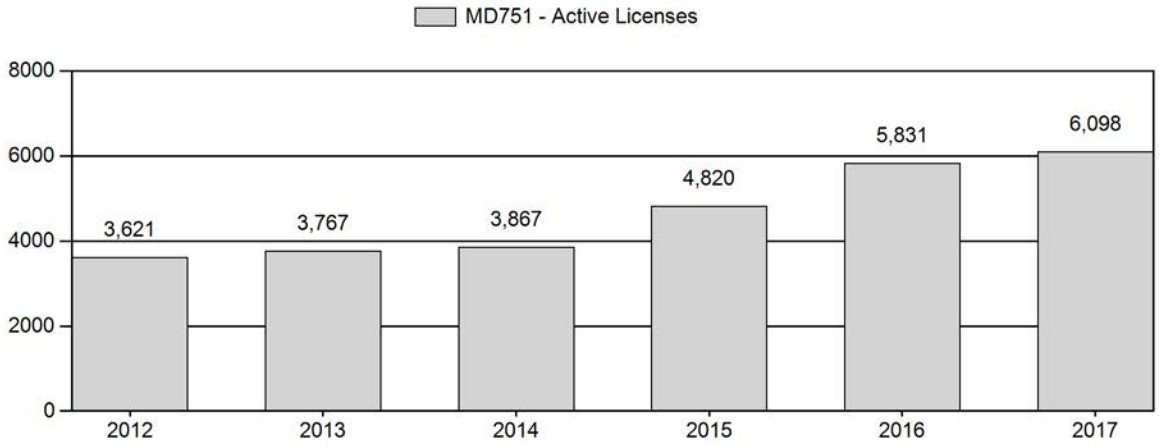
Number of Active Licenses



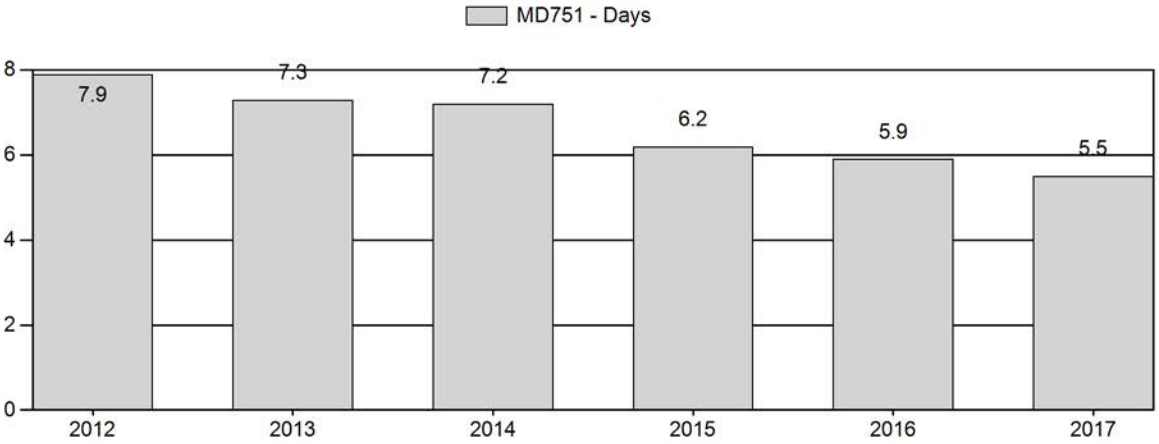
Harvest Success



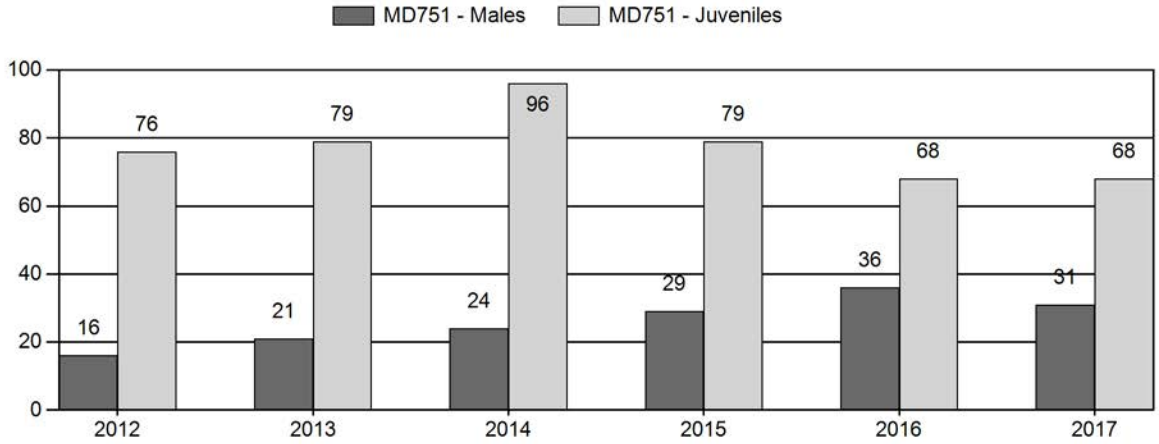
Active Licenses



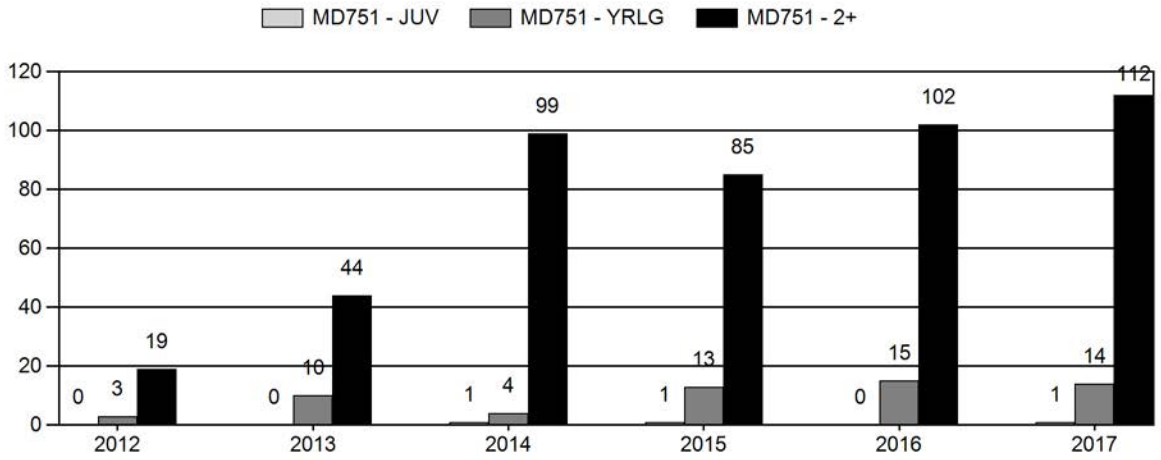
Days per Animal Harvested



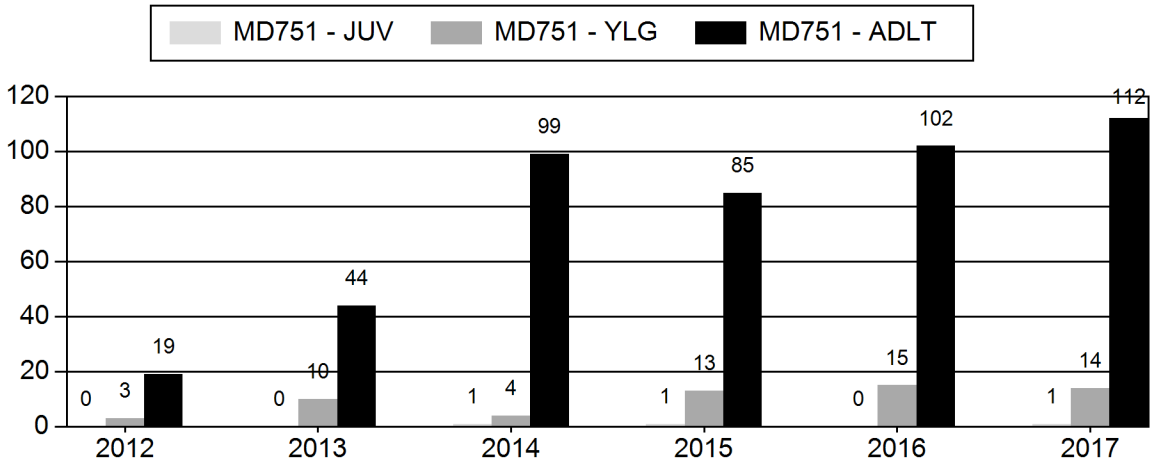
Postseason Animals per 100 Females



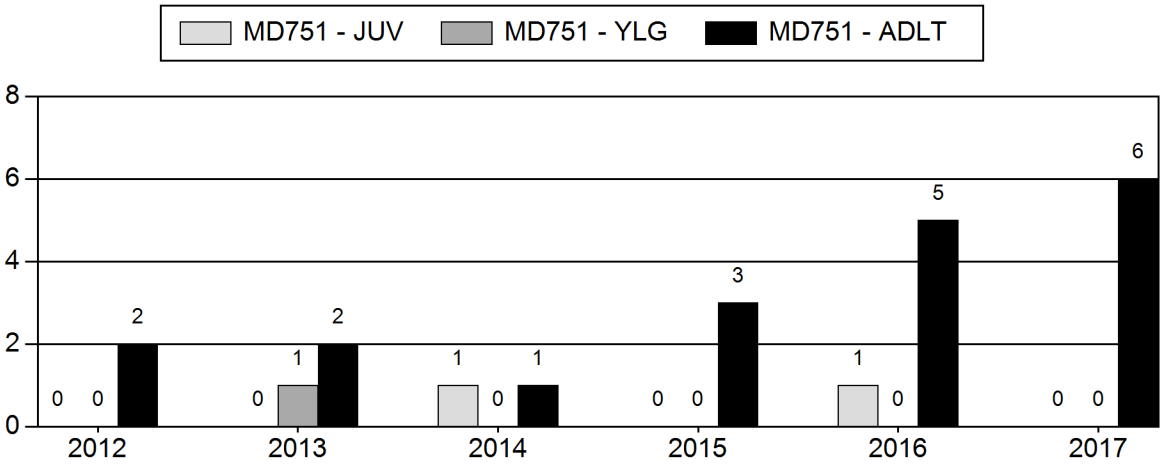
Age Structure of Field Checked Males



Age Structure Data (Field and Laboratory) - Male



Age Structure Data (Field and Laboratory) - Female



2012 - 2017 Postseason Classification Summary

for Mule Deer Herd MD751 - BLACK HILLS

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	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
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	32,727	146	216	57	2	0	421	16%	1,343	50%	917	34%	2,681	1,429	11	20	31	± 2	68	± 4	52

2018 HUNTING SEASONS
BLACK HILLS MULE DEER HERD (MD751)

Hunt Area	Type	Dates of Seasons Opens	Closes	Quota	License	Limitations
1		Nov. 1	Nov. 20		General	Antlered mule deer off private land; any mule deer on private land
1, 2, 3	7	Nov. 1	Nov. 30	4,200	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
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	200	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 2017
1	7	- 200
1, 2, 3	7	+4,200
2	6	- 500
5	6	+ 50
Herd Unit Total	**6**	**+ 4,000**
	7	**- 450**
	Region A	**None**

Management Evaluation
Current Postseason Population Management Objective: 30,000
Management Strategy: Recreational
2017 Postseason Population Estimate: ~ 32,700
2018 Proposed Postseason Population Estimate: ~ 33,400
2017 Hunter Satisfaction: 83% Satisfied 11% 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 mi^2 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, accessible parcels of public land receive much greater hunting pressure than private lands and are probably 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 sympatric 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 of mule deer occupy HA's 1 and 3 and greater proportions of mule deer inhabit HA's 5 and 6. The vast majority of mule deer in the herd unit reside on private land. This results in their management being strongly influenced by landowner sentiments. Field personnel report mule deer numbers are near tolerance levels in most locations; but some landowners, especially those near Newcastle, desire to see more mule deer.

WEATHER: This mule deer population peaked in 2006 following what essentially were seven years of warmer and drier than normal weather. The herd then declined steadily through 2011, something that was exacerbated by a severe winter during bio-year 2010. Increasingly conservative harvest regimes were put in place, and this herd began to rebound slowly in 2012 & 2013, but recovery was hampered by drought throughout the 2012 bio-year. In 2013, there was a transition with the advent of good growing season weather and an average winter. Then, in both 2014 and 2015, warm and wet growing seasons followed by mild winters set the stage for excellent fawn productivity and survival, leading to a significant rebound in the population. 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. More recently, fairly severe drought again plagued the Black Hills during the primary growing season of both 2016 and 2017. These drought years resulted in very poor forage production and led to several large wildfires. Fall weather over this same timeframe was characterized by normal to slightly above average temperatures and below average precipitation. However, in 2016 more normal to severe mid-winter weather was experienced, and severe late winter weather seems to be occurring in the current bio-year. With drought the past two summers and more severe weather the last two years, it is likely improvements in this herd's performance may have come to a temporary end and the population will drop some, rather than increase as modeled. See http://www.ncdc.noaa.gov/cag/ for detailed weather information.

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 (*Artemesia 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 (2017), forage production appeared to be fair or poor in most locations, and winter use subsequently elevated.

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 both 2016 and 2017. Consequently, this population increased significantly between 2012 and 2015. Because a post-season ratio of 66 fawns per 100 does is generally 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 grew steadily between 2012 and 2016 before generally leveling off, which is also reflected in trend counts.

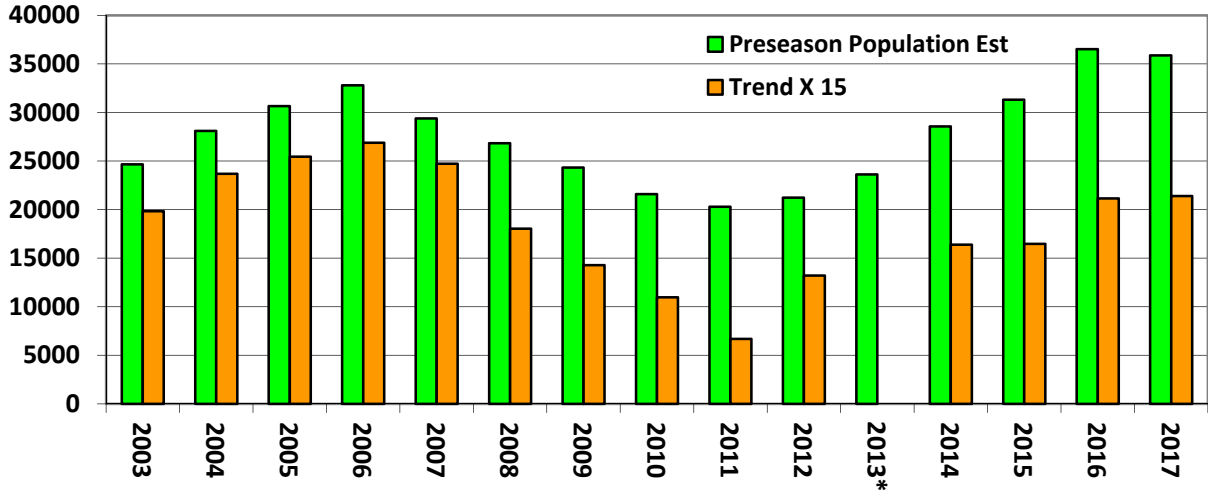


Figure 1. 2003 – 2017 pre-season population estimates produced by the current TSJ CA model, and mule deer observed preseason along trend count routes (increased by a factor of 15).
** Trend counts not conducted in 2013 due to winter storm Atlas.*

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 improved, driving an increase in the total observed buck:doe ratio from 16:100 in 2012 to 36:100 in 2016, before falling back to 31:100 in 2017 following decreased fawn recruitment. However, adult buck:doe ratios observed during this time period remained fairly constant around 13:100 (std. dev.=4), but did jump to about 20:100 in 2016 and 2017 thanks to a strong class of two-year old bucks each year. Over the past five years, post-season buck:doe ratios have averaged 28:100 with variability (std. dev.= 5.8) due to strong numbers of yearling bucks entering the population (until 2017). 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. It is likely non-hunting mortality will increase due to the harsher winter this year, and if fawn survival is about average or below, we anticipate lower buck:doe ratios going into the 2018 hunting season. It is also anticipated the post-season buck:doe ratio will return to near the midrange of the Department's recreational management criteria in 2018.

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. Antlerless harvest has been regulated 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 six years

of overall good fawn production and survival, and our current level of mule deer buck harvest can likely be sustained in 2018, even with lower observed fawn:doe ratios and increased winter mortality this year and last.

With conservative hunting season structures in place between 2010 and 2014, mule deer harvest dropped about 40% from the level experienced when the population last peaked, although reported harvest increased substantially in 2014 without concomitant increases in license issuance.[1] 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 liberalized substantially in 2016, and total harvest increased another 25%. During the 2017 hunting season, with an increase of 100 doe/fawn tags being the only change, about 50 more bucks and 50 more antlerless deer were taken.

Overall, hunting seasons between 2010 and 2014 reduced harvest of mule deer bucks about 37% from the level 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 whitetail 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 less than 7% reporting dissatisfaction. Each year since, Hunter satisfaction climbed has climbed about a percentage point and now sits at 83%. It can be inferred that steady increases in deer hunter success and declines in the effort required to harvest a deer between 2013 and 2016 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 have made 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 several times, and did so again in 2016, when the Time Sensitive Juvenile, Constant Adult (TSJ, CA) model was chosen over competing models. This same model was chosen this again year.

The 2017 modeled, post-season population estimate of Black Hills mule deer is ~ 32,700, which is about 1,000 greater than was anticipated prior to entering projected data for 2018. However,

[1] 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.

this value may be somewhat inflated due to significantly increased reported harvest in 2014 without commensurate changes in season structure or perceived population size. In addition, the effects of EDHV, which caused significant mortality in some locations during 2017, are not yet recognized by the model, as actual changes to future harvest and buck:doe ratios inform the model in "hindsight." Given the current model selection and updated data, the population is now projected to have peaked in 2006 at an estimated postseason population of around 29,200 mule deer (versus the 36,000 reported for that year in 2015). Following that peak, it declined to about 18,800 in 2011 (versus 16,500 reported in 2015). It is then estimated to have rebounded, growing 78% to about 33,500 post-season 2016, and then dropping 2% to ~ 32,700 in 2017[2]. 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 between 2013 and 2016. 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 as previously projected, leveled off or declined some in 2017.

As mentioned above, population modeling of this herd is difficult; and the Time Sensitive Juvenile / Constant Adult (TSJ CA) model was used this year. This was done because the AICc value of this model was within about 10% the Semi-Constant Juvenile / Constant Adult (SCJ SCA) model, and significantly lower than the Constant Juvenile / Constant Adult (CJ CA) model. Both the SCA SCJ and TSJ CA models are well correlated with preseason trend counts since 2006 (SCJ SCA ~ 87% and TSJ CA ~ 82%), 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, in that it provides for a leveling off or decline into 2017 as was expected and seems apparent on the ground. Plus, it does not reach the upper constraint on adult survival (0.9) that the SCJ SCA model does in all years not constrained. Instead, the TSJ CA model produces a very reasonable adult survival rate of 86% and an average juvenile survival rate of 61%. Overall, we consider the selected model to be of fair to poor quality due to the lack of herd specific survival data, violations of the closed population assumption, below adequate classification in some years, and aerial classifications in terrain that makes classifying yearling bucks difficult.

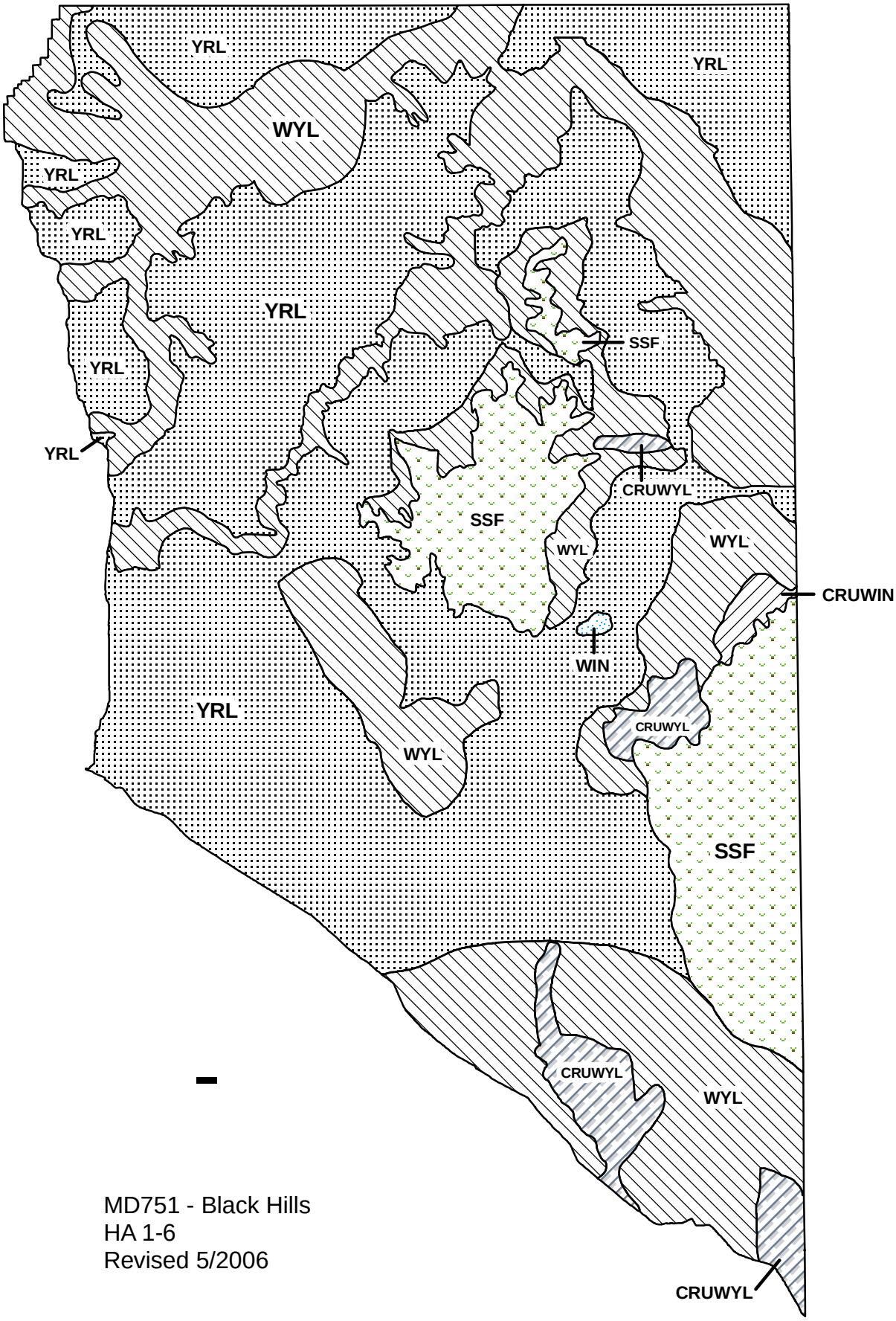
MANAGEMENT SUMMARY: The spreadsheet model suggests this herd is near its management objective of 30,000 mule deer. If the herd actually numbers close to 30,000 mule deer post-season, then the current objective is close to what most landowners desire north of I-90, but may be below some landowners' and hunters' wishes south of I-90. Based upon habitat conditions, the desires of hunters, and landowner sentiments, a season designed to allow this herd to stabilize is warranted at this time. Therefore, the 2018 hunting season is designed to maintain buck hunting opportunity at levels commensurate with the past two years, but increase harvest of antlerless deer by more than 40%. This prescription should result in a lowering of buck:doe ratios, although they should remain in midrange of the recreational management strategy. This prescribed management should yield a stable or decreasing population (contrary to model projections) given the forage conditions and winter weather experienced this year.

[2] All values reported in this paragraph reflect the current population model estimates and therefore do not match previous reports.

Buck mule deer numbers substantially improved in this herd unit between 2012 and 2016. Based upon classification data and population estimates, typical numbers of yearling and two-year old bucks, along with strong cohorts of 3 and 4 year-old bucks, should be available for hunters in 2018. In addition, maintaining high buck harvest will attract more hunters into the area which is vital to obtain antlerless harvest of both mule deer and whitetail, which is needed to curb the growth of both populations.

With the rebound in this population and a sympatric white-tailed deer population at (or above) objective, the structure of doe/fawn license issuance has been changed this year. Long-term harvest data show if doe/fawn licenses are valid for either species of deer, consistently one-third of the antlerless deer harvested will be mule deer. As such, and in order to simplify the regulations and decrease the numbers of various types of license being issued, all of the doe/fawn tags valid north of I-90 will fall under a single license type (HA 1, 2, 3 Type 7 tag valid for doe or fawn on private land only). This single license type replaces the HA 1 Type 6, HA 2 Type 7, and HA 1, 2, 3 Type 8 licenses that have been issued the past several years. Because the Type 8 licenses have been extremely undersubscribed the past couple of years, the total number of doe/fawn licenses valid in HA's 1, 2, and 3 remains unchanged at 4,200. It is projected that a few more doe/fawn licenses will sell in 2018 and active license success will be about 70% on mule deer. This should result in a doe/fawn license harvest from HA's 1, 2, and 3 of about 700 antlerless mule deer. In addition, doe/fawn license issuance for HA 5 is being increased by 50, while remaining unchanged in HA 4 and continuing to be eliminated from HA 6. Because we believe resident general license hunter numbers will not change significantly in 2018, and most non-residents don't harvest antlerless deer on their Region A licenses, doe/fawn harvest on general licenses will likely not change much. As a result, it is projected there will be a total, herd-wide harvest of just under 1,000 antlerless mule deer in 2018. This represents an increase of about 600 antlerless deer above 2017 levels. The relatively low level of female mule deer harvest (about 5%), coupled with consistent data on harvest percentages by species, does not warrant complicating the regulations further by segregating mule deer and white-tailed deer harvest more than already occurs on general licenses.

The 2018 hunting season is modeled to yield a postseason population of about 33,400 mule deer, which represents 2% growth in the post-season population. If this happens, which we doubt given the current weather conditions and recruitment levels, such a change would keep this herd within about 10% of objective.



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

2017 - JCR Evaluation Form

SPECIES: Mule Deer | PERIOD: 6/1/2017 - 5/31/2018

HERD: MD755 - NORTH CONVERSE

HUNT AREAS: 22 | PREPARED BY: WILLOW BISH

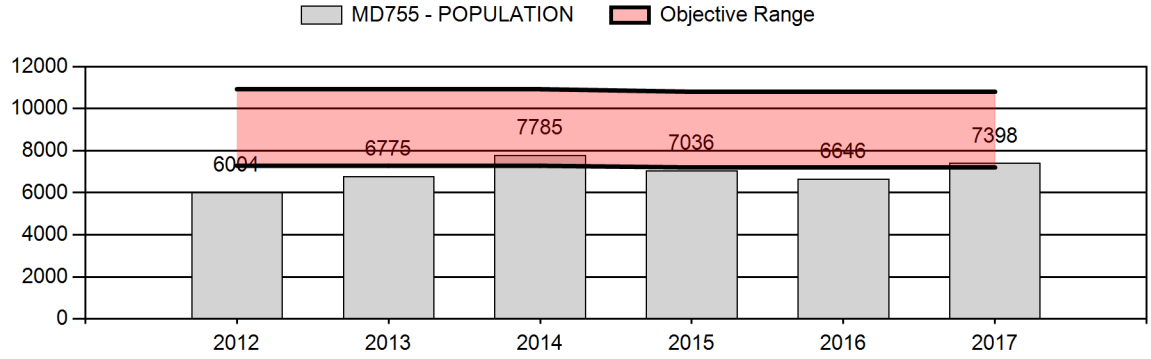
	2012 - 2016 Average	2017	2018 Proposed
Population:	6,849	7,398	7,941
Harvest:	283	212	300
Hunters:	380	235	330
Hunter Success:	74%	90%	91%
Active Licenses:	391	235	330
Active License Success:	72%	90%	91%
Recreation Days:	1,445	853	1,200
Days Per Animal:	5.1	4.0	4
Males per 100 Females	34	49	
Juveniles per 100 Females	78	77	

Population Objective (± 20%) :	9000 (7200 - 10800)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-17.8%
Number of years population has been + or - objective in recent trend:	7
Model Date:	02/21/2018

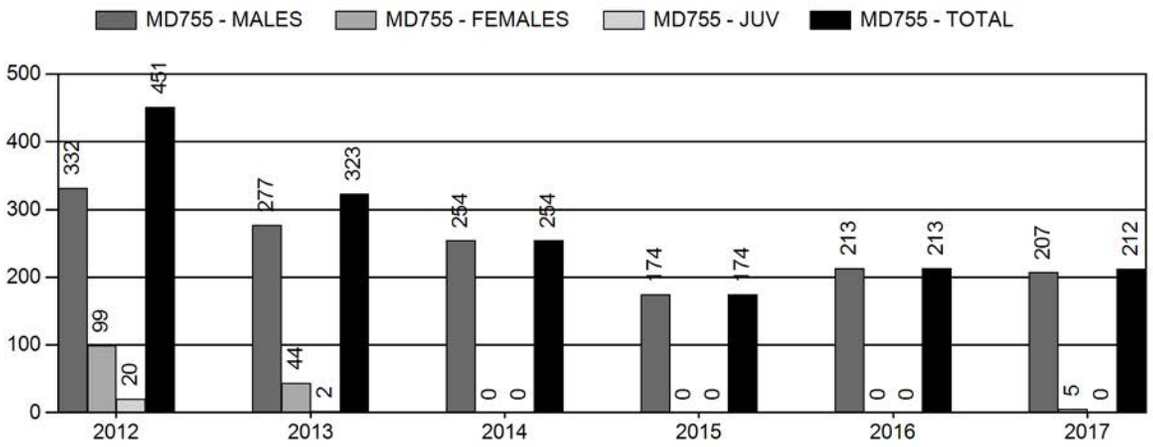
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	JCR Year	Proposed
Females ≥ 1 year old:	.1%	0%
Males ≥ 1 year old:	12.2%	16%
Total:	12.3%	16%
Proposed change in post-season population:	-3%	-4%

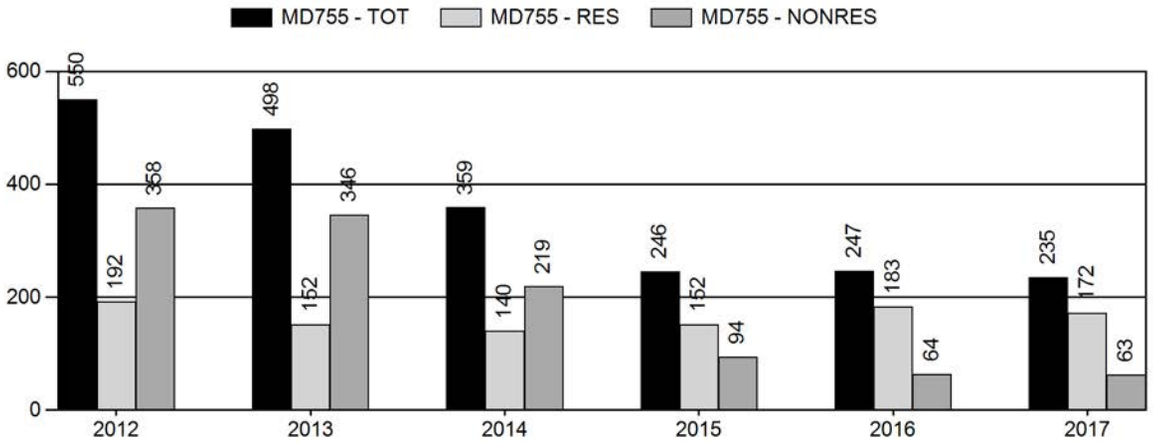
Population Size - Postseason



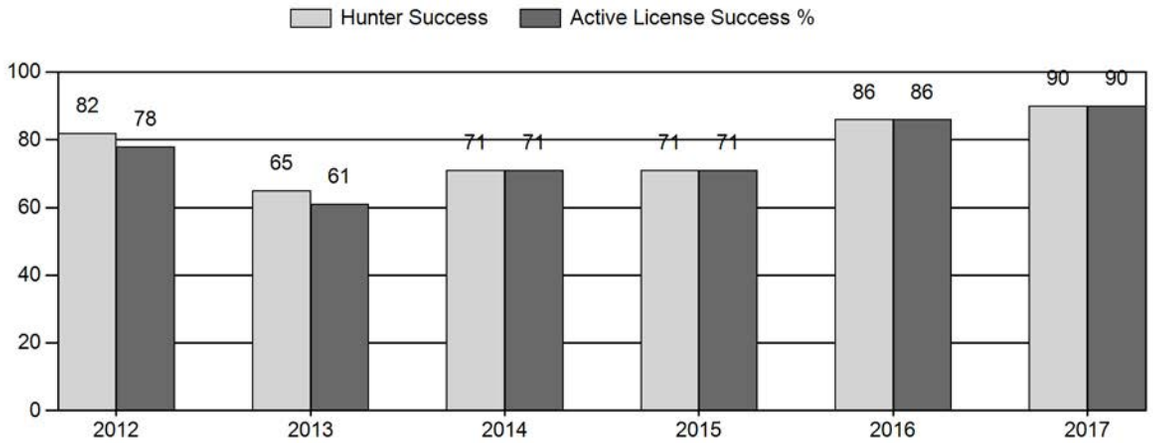
Harvest



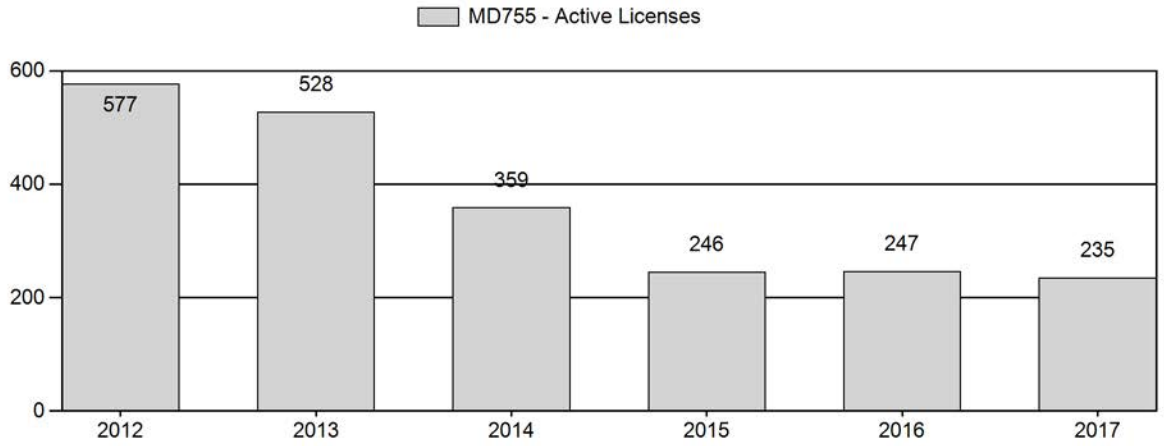
Number of Active Licenses



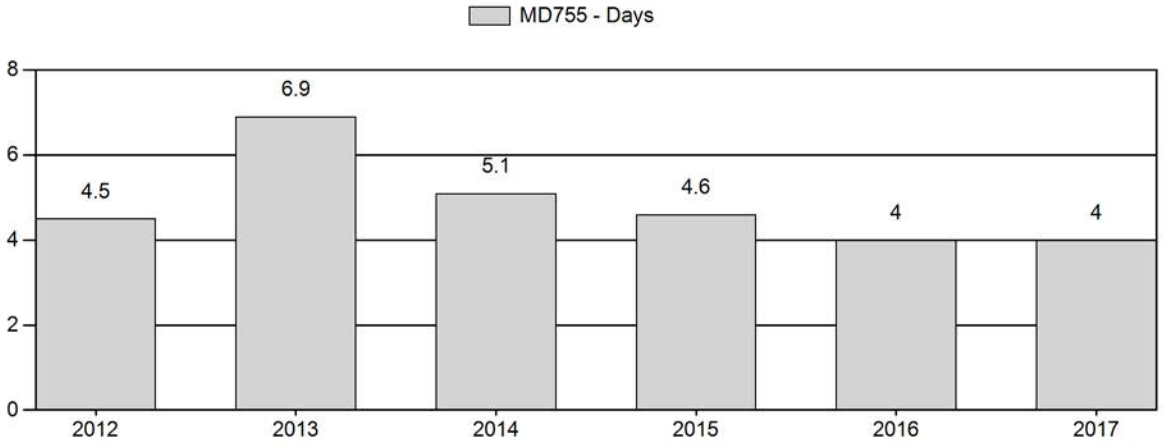
Harvest Success



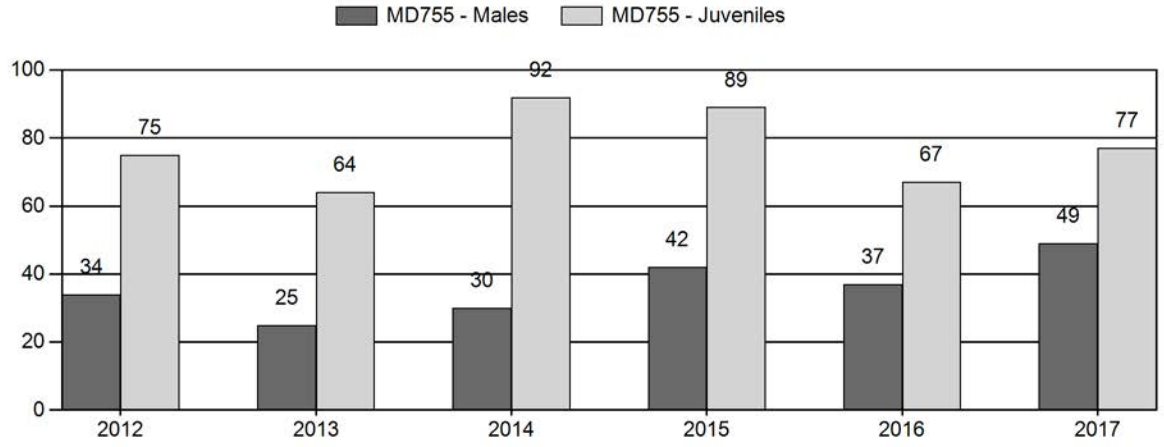
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2012 - 2017 Postseason Classification Summary

for Mule Deer Herd MD755 - NORTH CONVERSE

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	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
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	7,398	41	98	42	7	0	188	22%	383	44%	295	34%	866	1,588	11	38	49	± 5	77	± 7	52

2018 HUNTING SEASONS
NORTH CONVERSE MULE DEER HERD (MD755)

Hunt Area	Type	Season Dates Opens	Closes	Quota	License	Limitations
22	1	Oct. 1	Oct. 14	400	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 2017
22	1	+100

Management Evaluation
Current Postseason Population Management Objective: 9,000
Management Strategy: Special
2017 Postseason Population Estimate: ~7,400
2018 Proposed Postseason Population Estimate: ~7,900
2017 Hunter Satisfaction: 95% Satisfied, 3% Neutral, 2% 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 2017, leading to good early-season forage production. However, this was followed by dry, but cooler than normal conditions through June and July. Ample precipitation was received throughout August which resulted in a secondary green up and helped to cure the forage out well for the winter. This spring and summer precipitation accounted for the above average precipitation received in 2017. The 2017-2018 winter started off mild, with higher than normal temperatures and lower than normal precipitation. The beginning of the year was characterized by more precipitation and a few extreme cold snaps. However, winter precipitation for 2018 thus far is

still less than normal. Snow events have not been frequent or extreme enough to accumulate much snow, allowing mule deer to feed throughout winter. Although some cold snaps occurred, they were not likely of long enough duration to have any significant impacts on the mule deer population. Therefore, mule deer have likely experienced normal over-winter survival this year.

There have been a few extreme weather events in this area in recent years including the drought in 2012 and the winter conditions in 2010/2011. The drought in 2012 did not cause as large of a decrease in fawn production in this herd as it did in adjacent herds. However, over-winter mortality was high in 2010/2011. Survival was impacted significantly enough that reduced survival values were used for modeling this population for the 2010 bio-year.

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. Three out of the past five years have been characterized by higher than normal precipitation, with the other two years receiving precipitation at the lower end of the normal range. These conditions have been effective in allowing the rangelands to recover from the extreme drought in 2012. 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 beginning in 2015 in order to collect more representative baseline pre-disturbance information. The bulk of aerial survey time was spent classifying mule deer along the Pine Ridge, Salt Creek, and in the sand hills where limited road densities and difficult access preclude ground classifications. Classification efforts in 2017 resulted in 866 mule deer being classified, although the sample size goal for 90% confidence was 1,588 mule deer.

Fawn production in 2017 was 77 fawns per 100 does, which is the same as the previous 5-year average. This level of fawn production is contributing to this herd's general upward trend and, if the trend continues, will likely result in this herd meeting objective within the next few years.

The 2017 postseason buck ratio (49) is higher than the previous 5-year average of 34 bucks per 100 does and exceeds management guidelines. Yearling buck ratios in 2017 (11) were comparable to the previous 5-year average of 12 bucks per 100 does. Buck ratios are likely increasing as a result of good fawn production and recruitment, along with conservative license issuance and limited private land hunting access. The buck ratio has not exceeded management criteria in this herd since the late 2000s and this ratio supports field manager's observations that deer hunting opportunity has increased in recent years.

Harvest

Overall harvest has declined in this herd unit as license issuance has decreased to address population decline, although this trend reversed beginning 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. License issuance between 2015 and 2017 was static, but there were 207 bucks harvested during the 2017 season with 90% hunter success. In 2017, it took hunters an average of 4 days to harvest an animal. Days to harvest was high (6.9) in 2013 but has steadily decreased every year since. Overall, 2017 harvest statistics suggest increased buck mule deer availability and improved hunting opportunity within this herd unit.

In 2017, 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 2017 postseason population estimate was about 7,400 mule deer. After population decline following substantial winter mortality in bio-year 2010, this herd is beginning to trend upward 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 (64) and most accurately depicted population trend and size based on field personnel perceptions and landowner input. Adult survival was constrained lower than normal (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.

Management Summary

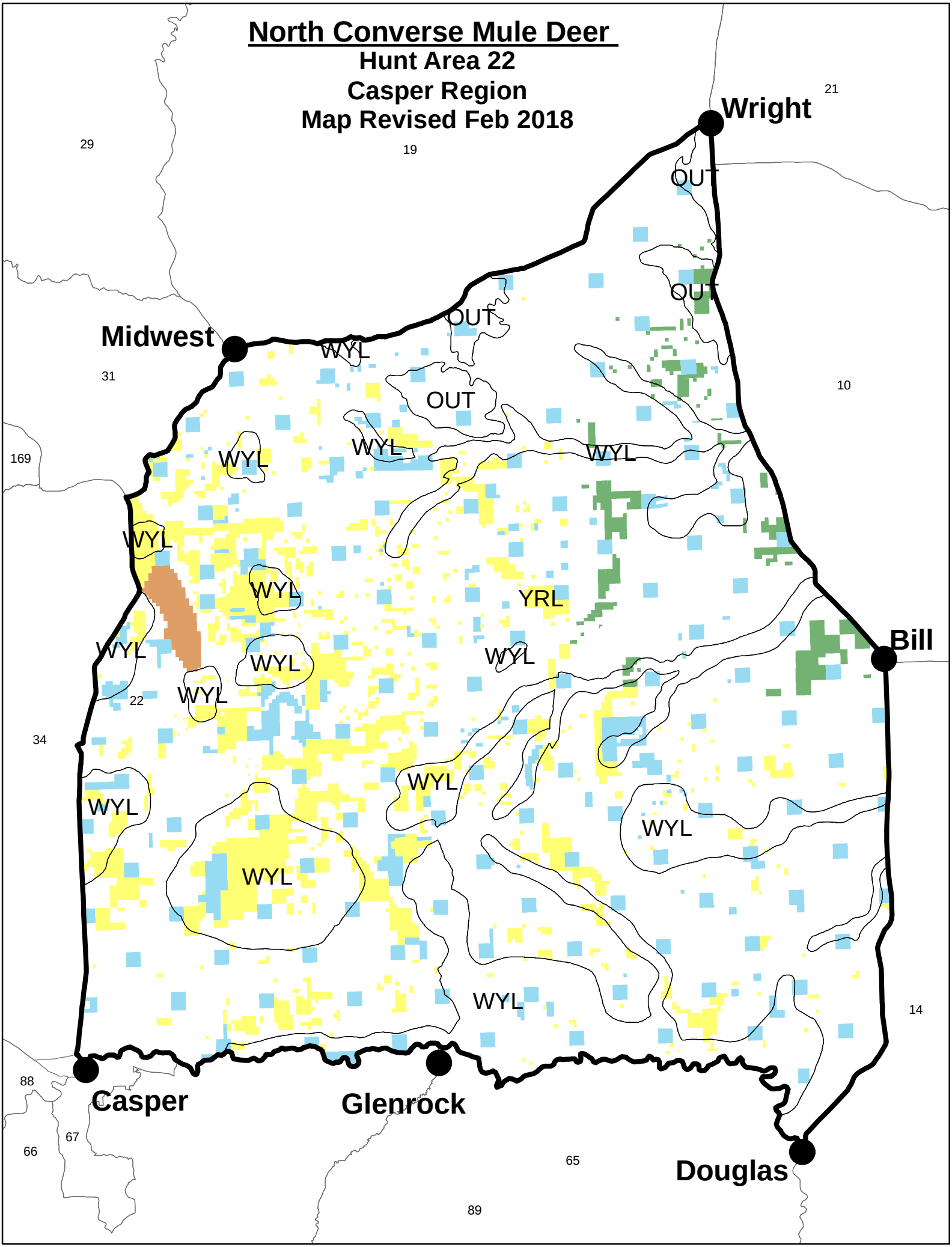
The hunting season in this area has traditionally run from October 1st to October 14th. These season dates have generally been adequate to meet landowner desires while allowing a reasonable harvest. For 2018, the Department is increasing the Type 1 quota by 100 licenses, for a total of 400 licenses. 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. Conservative hunting season structure, including relatively low Type 1 license issuance and no doe/fawn licenses, has been warranted to permit population growth while allowing for more mature bucks to become available for harvest. However, recent hunter success, buck ratios, and population trend suggest more hunting opportunity can now be provided.

In this herd unit, landowner input is given a lot of deference given the limited availability of accessible public land. The proposal to increase Type 1 licenses has proved rather contentious with landowners. A few landowners and outfitters would like even more licenses than proposed. About half of the landowners that field personnel contacted support an increase, with the remainder of landowners strongly preferring to remain at 300 licenses. The data supports an increase, but given the level of contention, only a modest increase has been proposed.

If we attain the projected harvest of 300 bucks and experience normal fawn productivity, the predicted 2018 postseason population will likely increase slightly to 7,900 mule deer, which is 12% below objective.

North Converse Mule Deer

Hunt Area 22
Casper Region
Map Revised Feb 2018



2017 - JCR Evaluation Form

SPECIES: Mule Deer | PERIOD: 6/1/2017 - 5/31/2018

HERD: MD756 - SOUTH CONVERSE

HUNT AREAS: 65 | PREPARED BY: WILLOW BISH

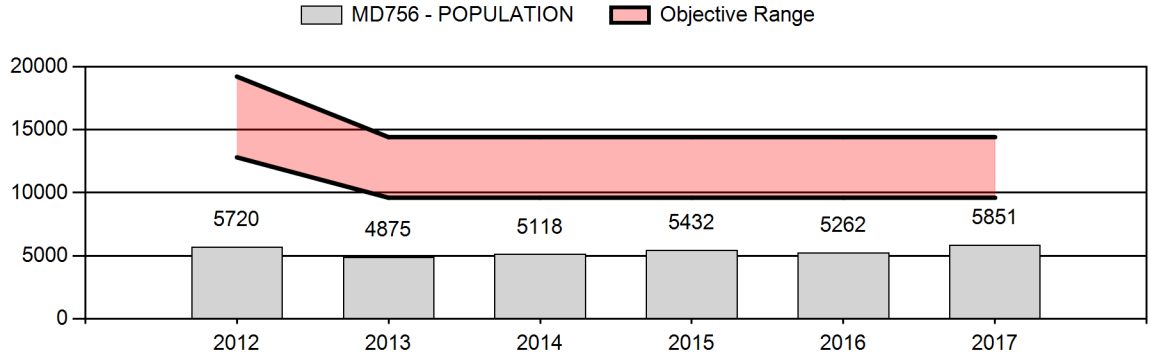
	2012 - 2016 Average	2017	2018 Proposed
Population:	5,281	5,851	5,881
Harvest:	277	265	250
Hunters:	721	710	700
Hunter Success:	38%	37%	36 %
Active Licenses:	721	710	700
Active License Success:	38%	37%	36 %
Recreation Days:	2,643	2,332	2,300
Days Per Animal:	9.5	8.8	9.2
Males per 100 Females	36	47	
Juveniles per 100 Females	56	70	

Population Objective (± 20%) :	12000 (9600 - 14400)
Management Strategy:	Private Land
Percent population is above (+) or below (-) objective:	-51.2%
Number of years population has been + or - objective in recent trend:	12
Model Date:	02/23/2018

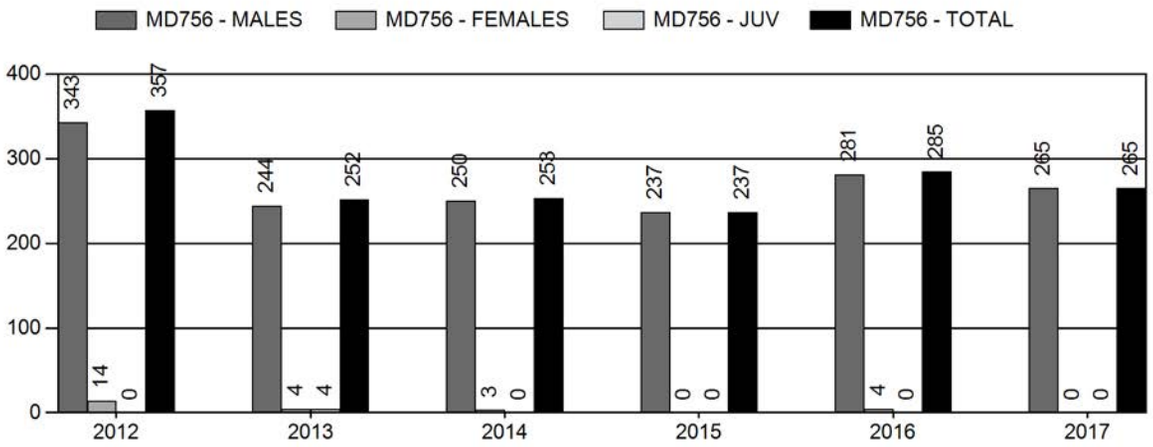
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	JCR Year	Proposed
Females ≥ 1 year old:	0%	0%
Males ≥ 1 year old:	18.0%	17%
Total:	18.0%	17%
Proposed change in post-season population:	-4.7%	-4.5%

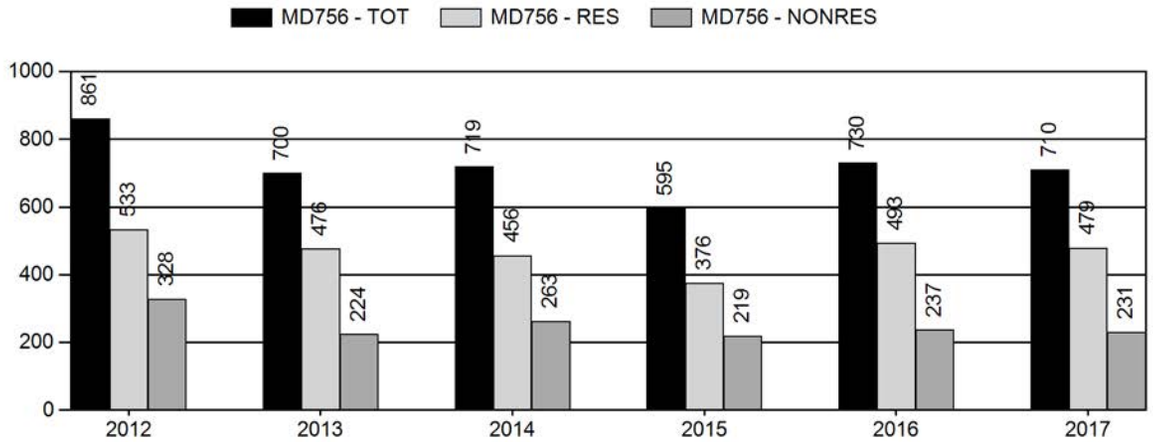
Population Size - Postseason



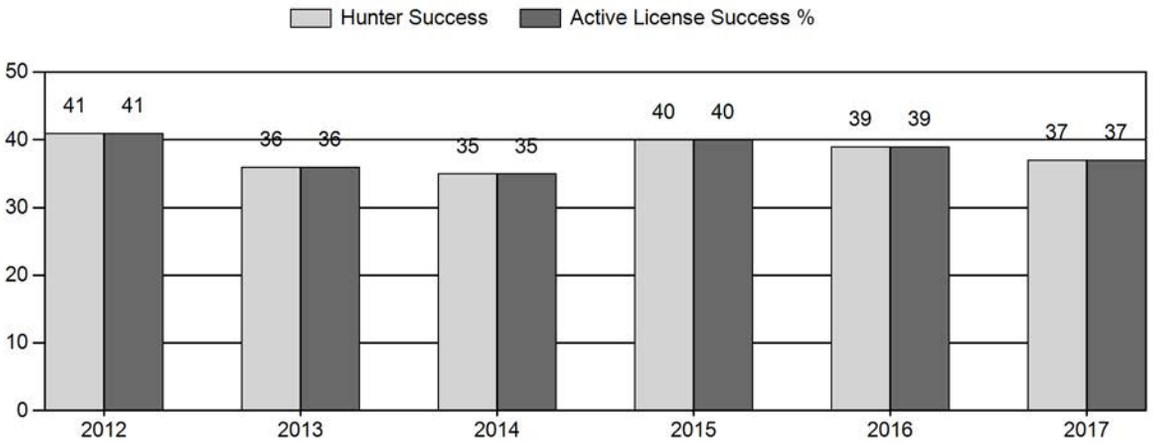
Harvest



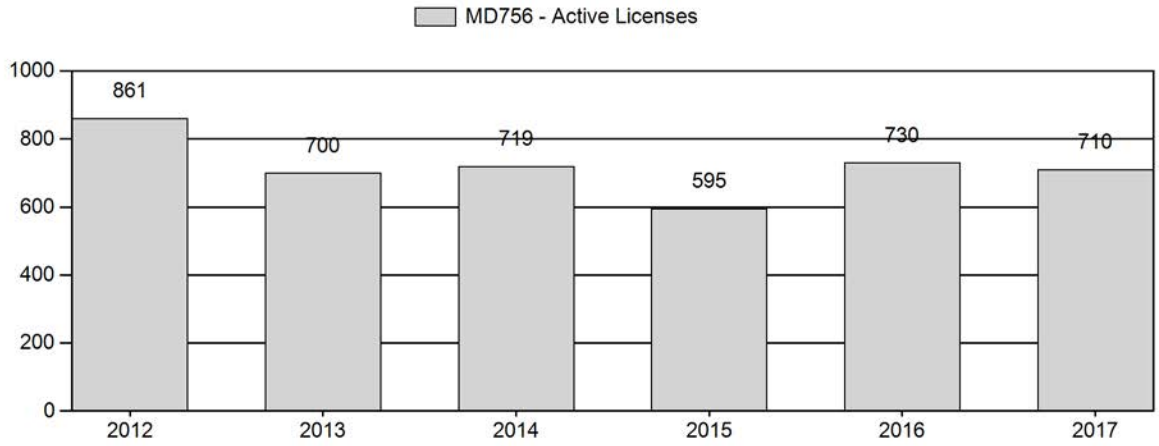
Number of Active Licenses



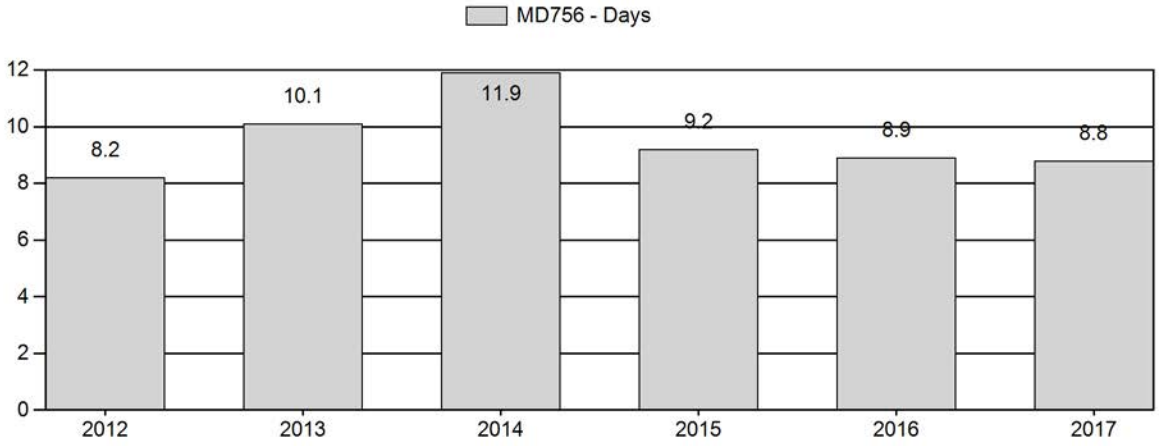
Harvest Success



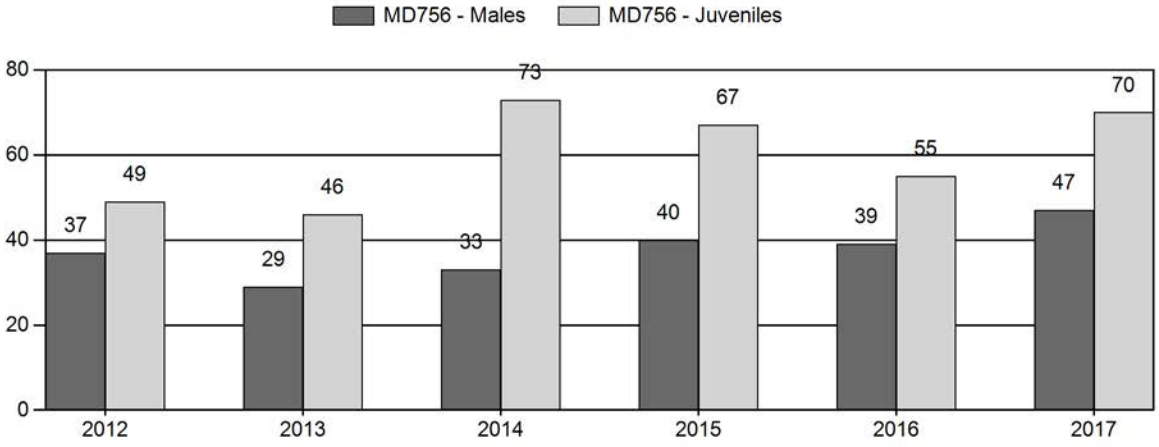
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2012 - 2017 Postseason Classification Summary

for Mule Deer Herd MD756 - SOUTH CONVERSE

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	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
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	5,851	70	103	38	3	0	214	22%	453	46%	319	32%	986	1,315	15	32	47	± 5	70	± 6	48

2018 HUNTING SEASONS
SOUTH CONVERSE MULE DEER (MD756)

Hunt Area	Type	Season Dates Opens	Closes	Quota	License	Limitations
65		Oct. 15	Oct 31		General	Antlered mule deer three (3) points or more on either antler 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

2017 Postseason Population Estimate: ~ 5,900

2018 Proposed Postseason Population Estimate: ~ 5,900

2017 Hunter Satisfaction: 63% Satisfied, 18% Neutral, 19% 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 (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. The CWD prevalence estimate derived from hunter-harvested mule deer in 2015 and 2016 were calculated from low sample sizes. However, the Department increased CWD sampling efforts in 2017 and was able to sample approximately 19% of harvested deer.

Weather

Above average precipitation was received during the early part of the growing season in 2017, leading to good early-season forage production. However, this was followed by dry, but cooler than normal conditions through June and July. Ample precipitation was received throughout August which resulted in a secondary green up and helped to cure the forage out well for the winter. This spring and summer precipitation accounted for the above average precipitation received in 2017. The 2017-2018 winter started off mild, with higher than normal temperatures and lower than normal precipitation. The beginning of the year was characterized by more precipitation and a few extreme cold snaps. However, winter precipitation for 2018 thus far is still less than normal. Snow events have not been frequent or extreme enough to accumulate much snow, allowing mule deer to feed throughout winter. Although some cold snaps occurred, they were not likely of long enough duration to have any significant impacts on the mule deer population. Therefore, mule deer have likely experienced normal over-winter survival this year.

Habitat

Given average precipitation and informal assessments of habitat conditions throughout this herd unit, forage production and quality were moderate in 2017. 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. Aspen stand treatments, juniper removal from riparian areas, and mountain mahogany rejuvenation projects are currently being implemented in the herd unit to improve habitat for mule deer.

Field Data

Fawn production/survival was moderate in this herd through the mid-2000's, and the population fluctuated between approximately 8,000 and 12,000 deer during this time period. The general license season during this time period was 11 days (except in 2008 when it was extended to 17 days), and issuance of doe/fawn licenses ranged from 50 to 400 licenses. From 2008-2013, fawn production/survival was extremely poor, with fawn ratios averaging 50 per 100 does. The population has declined significantly since 2008 from approximately 8,000 to 5,000 deer. In accordance, the general license season was shortened to 7 days and doe/fawn licenses were diminished and subsequently eliminated from the 2011-2017 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 does not reproducing in the population as a result of higher fawn recruitment from the previous two years. Fawn production improved again in 2017 with 70 fawns per 100 does. Since 2013, the population has been trending upward, and the current model estimates a 2017 post-season population of 5,900 mule deer. The 2017 classification conditions were not ideal, with high winds and poor visibility and discontinuous survey efforts. Despite these challenges, 986 deer were classified, although the sample size goal was 1,300 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. Adult does entering into winters with good nutritional condition, coupled with mild winters, has likely increased survival. 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, or at minimum, may constrain the potential for this herd to grow when environmental conditions are favorable.

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, with a correspondingly low yearling buck ratio of 8 the following year. The buck ratio has since increased to 47 bucks per 100 does in 2017 which is higher than the previous 5-year average of 36. The yearling buck ratio was 15 in 2017, which is also the average over the past 3 years indicating good recruitment, 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 2017 resulted in antler classifications in line with the long-term average with 72% Class I (small), 26% Class II (medium), and 2% Class III (large) bucks. This is a reduction in the percentage of Class III bucks from the previous 5-year average (11%), and an increase in the percentage of Class I bucks from the previous 5-year average (66%). While a higher proportion of Class I bucks can be accounted for with increased mule deer production and recruitment, the overall number of Class III bucks was less for 2017 than in years with similar sample sizes of bucks.

Harvest Data

Harvest success was 37% in 2017, which is comparable to the previous 5-year average of 38%. 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 2017, there were 710 active licenses and 265 harvested bucks, which is also comparable to the previous 5-year average of 721 active licenses and 271 harvested bucks. Total harvest and hunter numbers declined dramatically from 2008 to 2013 by 64% and 44%, respectively, but have since stabilized. Hunters apparently began to self-regulate through the late 2000s and early 2010s. Private land access for mule deer hunting has dwindled as well. Despite hunters indicating deer numbers have improved, hunter numbers haven't increased in recent years likely due to a lack of access and/or concerns about CWD.

Population

The 2017 postseason population estimate was approximately 5,900 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. The overall adult survival was constrained between 0.65 and 0.84 given long-term survival estimates in Colorado and the low adult survival rate found during CWD research. Spreadsheet model conventions suggest adult survival constraints should remain between 0.7-0.95. However, the upper contstraint of 0.95 may be unrealistic for this herd given the high prevalence of CWD. 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. Many local hunters have pushed for an even more conservative hunting season to protect younger age class bucks. However, given the high prevalence of CWD in mature bucks, more conservative seasons may exacerbate the disease issue by limiting harvest

as a culling mechanism. A more liberal season aimed at using harvest to decrease CWD would likely be unpopular given the public's concern with this herd. In order to target older age class deer which are more likely to have CWD, while limiting harvest pressure on the overall buck population, a 3-point or better antler point restriction (APR) will be in place for the 2018 season. The APR will also protect younger age class bucks on public land, which may help garner public support for the season length extension. The season will also run until October 31st to allow more opportunity for hunters to harvest older age class bucks. Managers intend to implement the APR for a period of three years. The Department will continue to not issue doe/fawn licenses.

If we attain the projected harvest of 250 bucks and fawn production remains average, this herd will likely remain relatively stable but low. The predicted 2018 postseason population size of the South Converse Herd is approximately 5,900 mule deer. Given poor habitat conditions and high CWD prevalence may be limiting population growth, management goals for 2018 include attempting to harvest older age class bucks which are more likely to be CWD positive, restricting harvest on younger bucks, and maintaining extremely limited doe/fawn harvest. In addition, managers are implementing prescriptive treatments in key habitats to benefit mule deer in this herd unit.

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 degrading the health of breeding-age females, suppressing conception rates, and affecting health and survivorship of neonates. Additionally, CWD adversely affects deer survival due to fatality from the disease and behavioral changes which render infected deer more vulnerable to natural causes of mortality such as predation or exposure.

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

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

A collaborative research project was initiated in 2010 to investigate the effects of CWD on the South Converse Mule Deer Herd. Using GPS-collared deer, a number of variables were explored to better understand the relationship between CWD and the dynamics of the population. This research was a cooperative effort of the United States Geological Survey, the University of Wyoming, and the Wyoming Game and Fish Department, and was concluded in 2014. The research was published in a dissertation in 2015 titled “Chronic Wasting Disease Ecology and Epidemiology of Mule Deer in Wyoming”.

The research confirmed that CWD is a population limiting disease, and estimated λ_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, the study's population models still predicted severe decline in the next 50 years (Devivo, 2015).

Citations

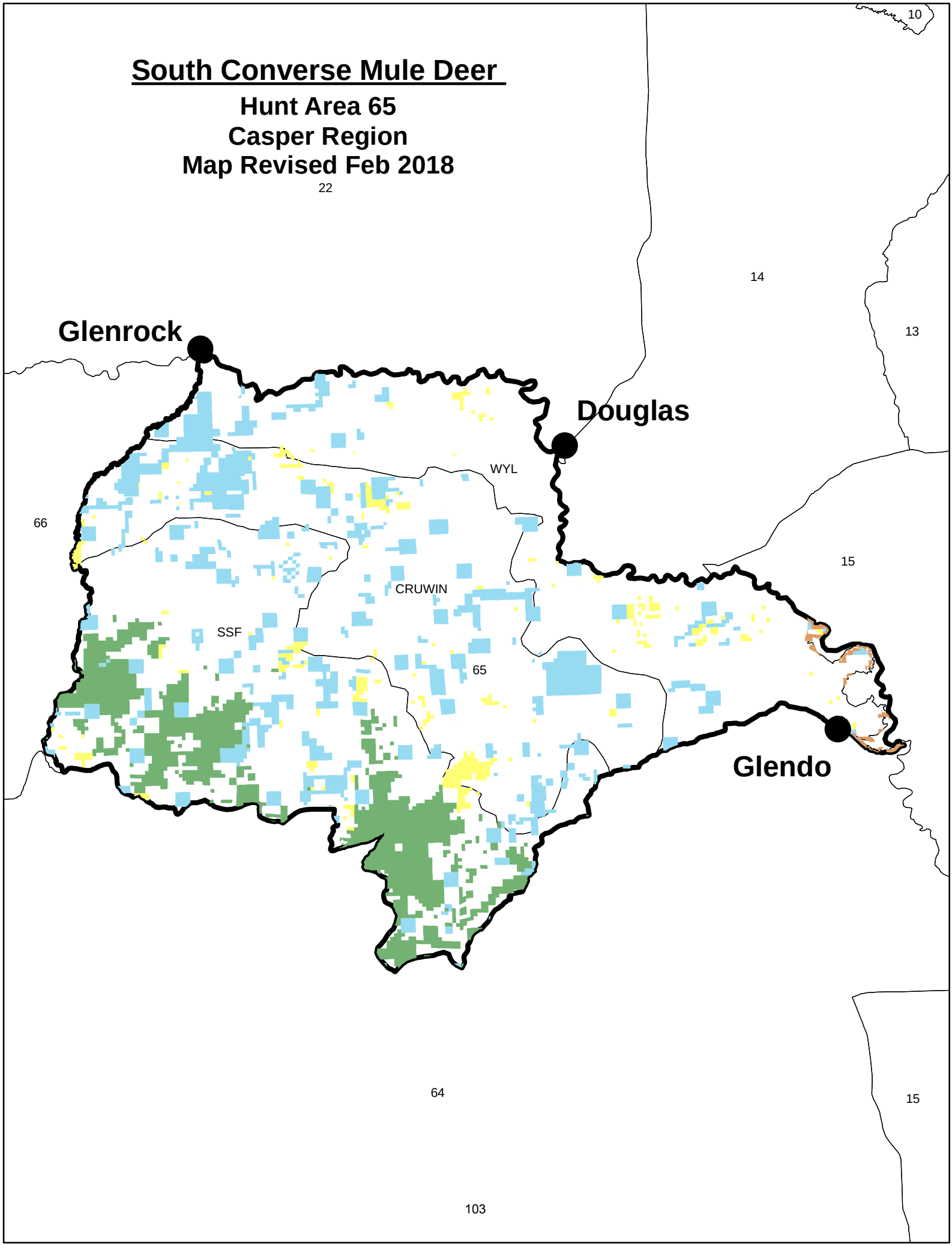
DeVivo, Melia. Chronic Wasting Disease Ecology and Epidemiology of Mule Deer in Wyoming. Diss. University of Wyoming, 2015.

Table 1. CWD surveillance in hunter-harvested mule deer in the South Converse Herd Unit, 2001-2017.

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%**
2017	265	51	18	**35%**

South Converse Mule Deer

Hunt Area 65
Casper Region
Map Revised Feb 2018



2017 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2017 - 5/31/2018

HERD: MD757 - BATES HOLE/HAT SIX

HUNT AREAS: 66-67

PREPARED BY: HEATHER O'BRIEN

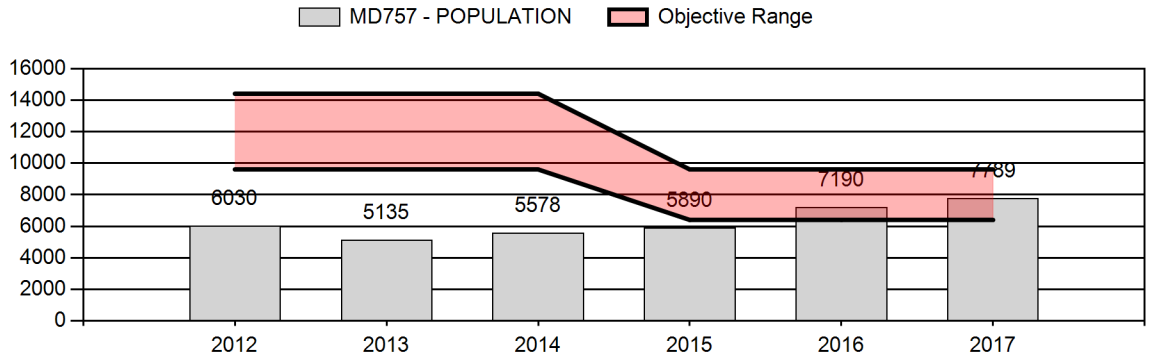
	2012 - 2016 Average	2017	2018 Proposed
Population:	5,965	7,789	6,890
Harvest:	263	437	455
Hunters:	784	985	1,000
Hunter Success:	34%	44%	46%
Active Licenses:	784	985	1,000
Active License Success:	34%	44%	46%
Recreation Days:	3,032	3,372	3,800
Days Per Animal:	11.5	7.7	8.4
Males per 100 Females	28	31	
Juveniles per 100 Females	66	60	

Population Objective (± 20%) :	8000 (6400 - 9600)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-2.6%
Number of years population has been + or - objective in recent trend:	17
Model Date:	03/06/2018

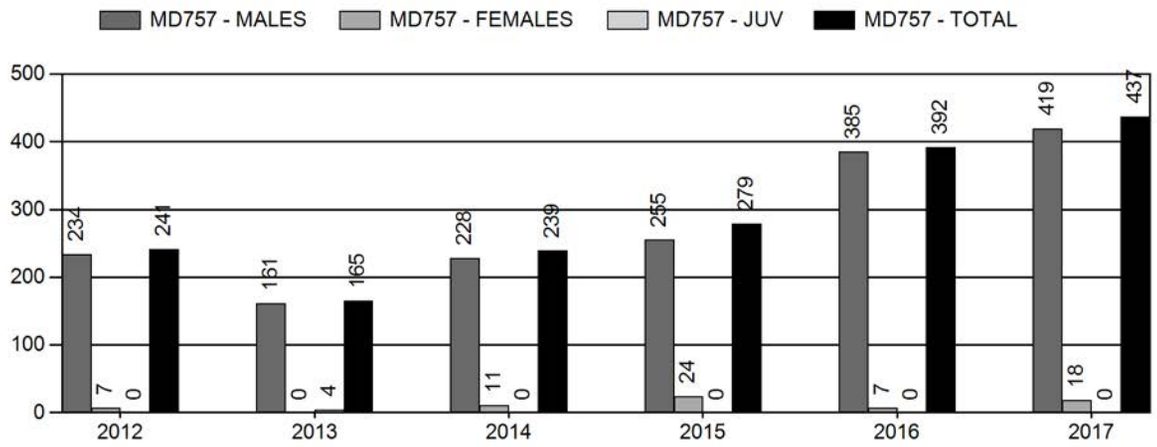
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	JCR Year	Proposed
Females ≥ 1 year old:	.5%	.5%
Males ≥ 1 year old:	24.5%	31.2%
Total:	5.3%	6.2%
Proposed change in post-season population:	-5.7%	-11.5%

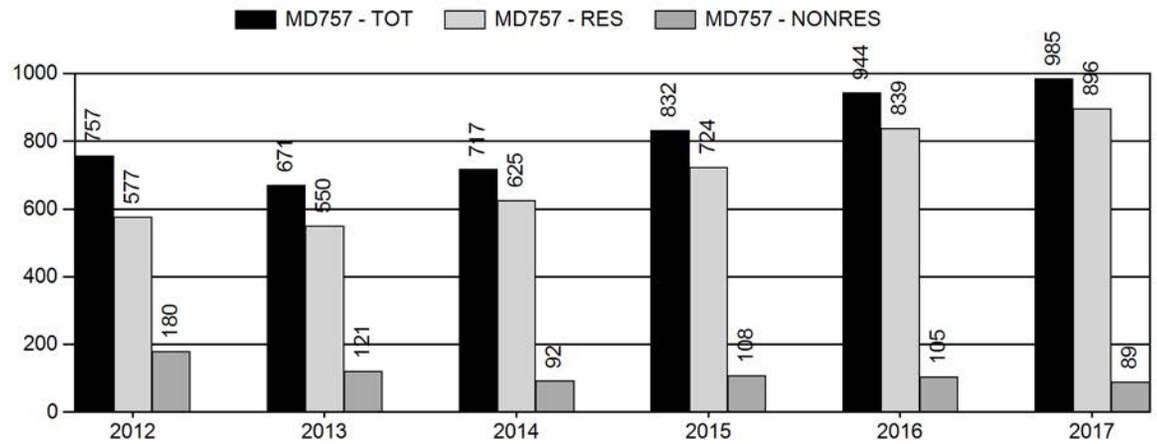
Population Size - Postseason



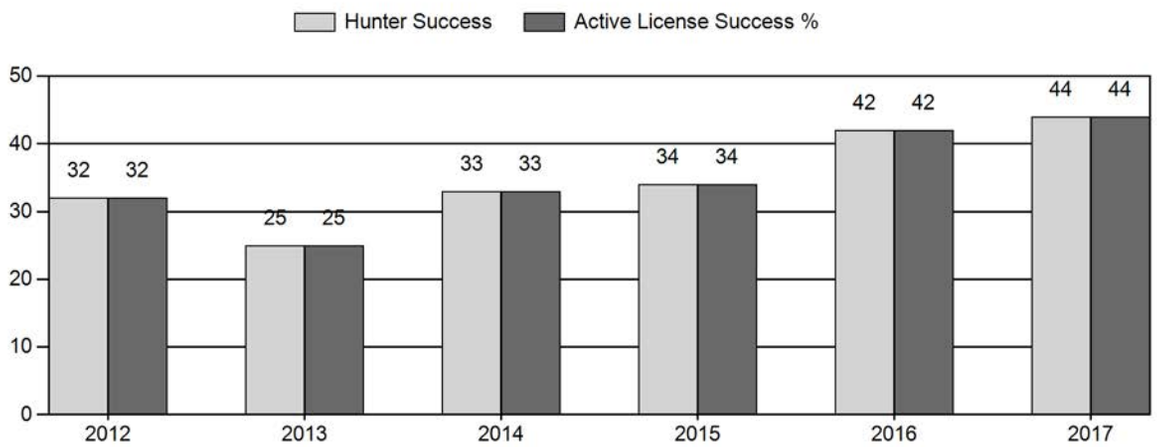
Harvest



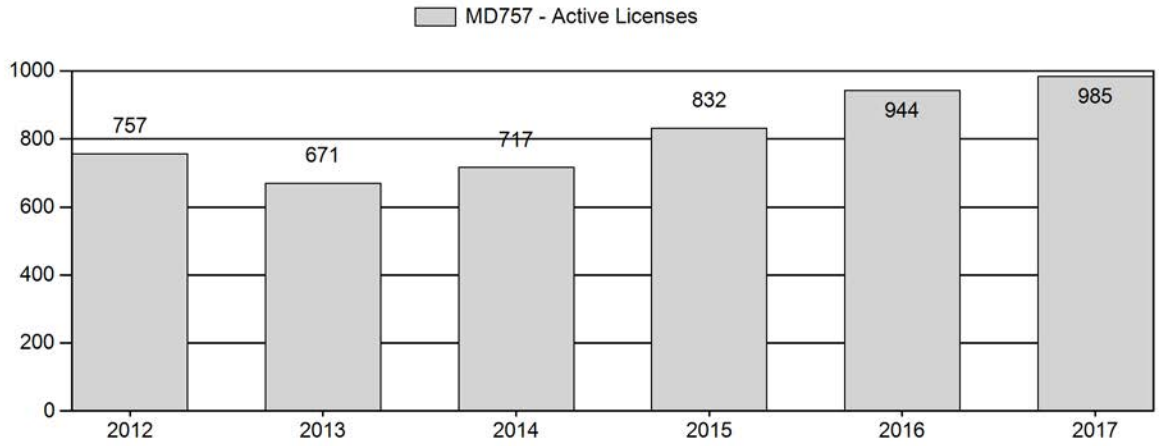
Number of Active Licenses



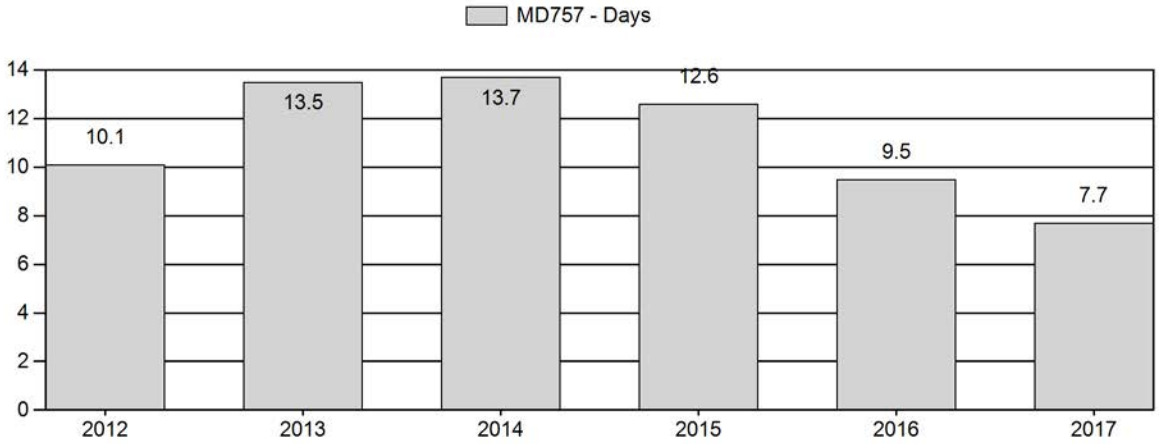
Harvest Success



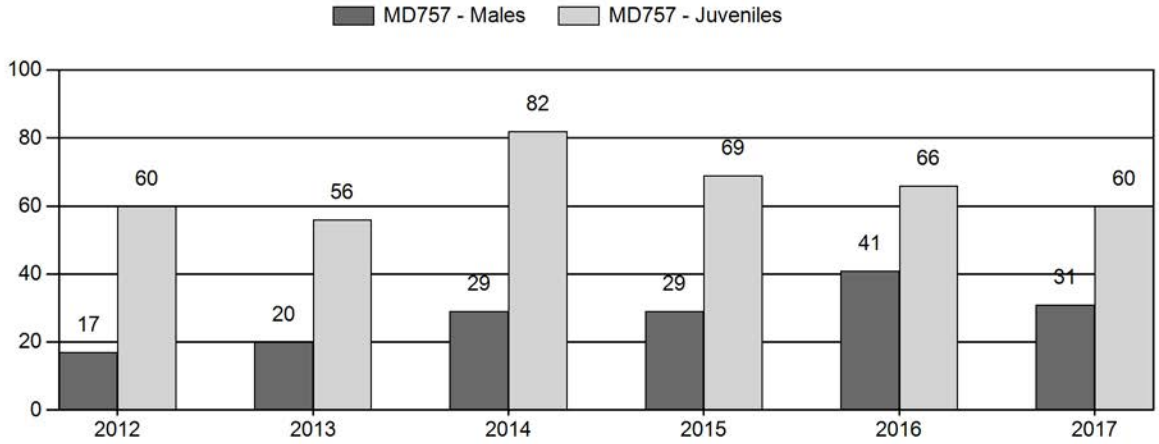
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2012 - 2017 Postseason Classification Summary

for Mule Deer Herd MD757 - BATES HOLE/HAT SIX

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	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
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	7,789	54	108	23	4	0	189	16%	611	52%	365	31%	1,165	1,216	9	22	31	± 3	60	± 5	46

2018 HUNTING SEASONS
BATES HOLE / HAT SIX MULE DEER (MD757)

Hunt Area	Type	Season Dates Opens	Season Dates Closes	Quota	License	Limitations
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
2017 Postseason Population Estimate: 7,800
2018 Proposed Postseason Population Estimate: 6,900
2017 Hunter Satisfaction: 65% Satisfied, 22% Neutral, 13% 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 25-35 bucks per 100 does, as per the Mule Deer Initiative Management Plan. 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 summer of 2012 was the driest on record since 1904 in much of Wyoming. Fawn and buck ratios were very low in the herd unit 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 ratios increased markedly in 2014, 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. The growing season of 2017 was similar to the previous year, with a wet spring, followed by a dry summer and subsequent fall precipitation. The winter of 2017-2018 has been mild, with warm temperatures and little persistent snow. Thus managers expect fairly good mule deer survival for the winter of 2017-2018. For detailed weather data see Appendix A, "Weather Data for the Bates Hole / Hat Six Mule Deer Herd Unit".

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 2017 was 3.47 inches (Figure 1). While this represents a decrease in production from the previous two years, average leader growth in 2017 was still considerably higher than the long-term average. 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 26.4% in 2017 (Table 1). Better habitat conditions in the herd unit in 2014-2017 contributed to improved fawn survival compared to previous years, and this herd has generally grown since 2012. Increased average utilization on shrubs should correlate to an increasing mule deer population, although shrub utilization on some transects may also be attributed to other species, such as elk.

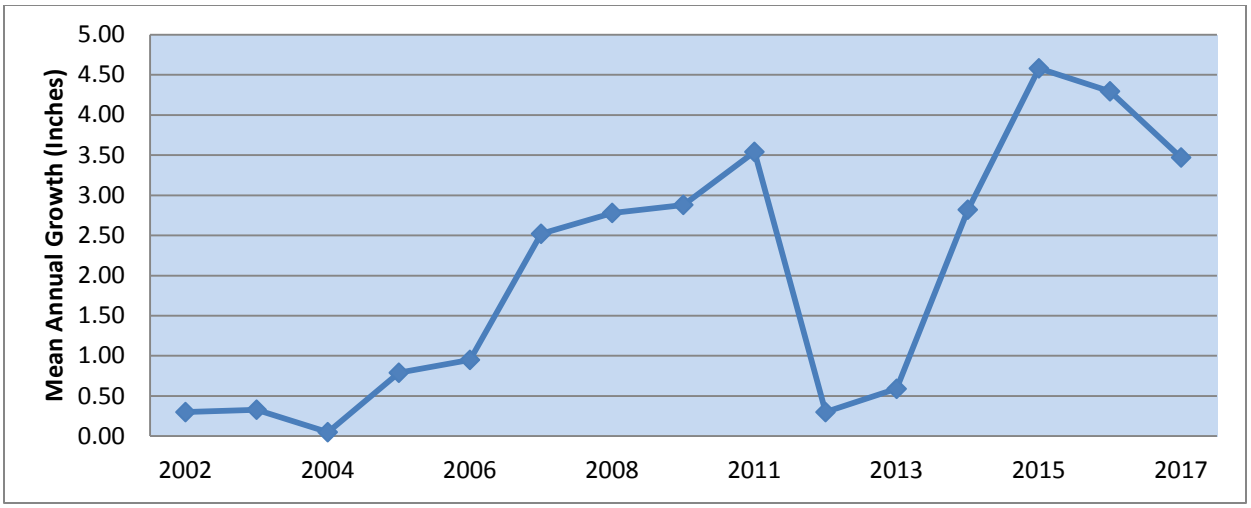


Figure 1. Mean annual growth of true mountain mahogany **(***Cercocarpus montanus*) in the Bates Hole / Hat Six Mule Deer Herd Unit, 2001-2017.

Year	01-02	02-03	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	15-16	16-17
Mean Utilization	28.9	30.65	23.75	12.27	26.73	15.33	23.33	28.00	13.67	20.29	25.90	26.40

Table 1. Mean utilization of true mountain mahogany **(***Cercocarpus montanus*) in the Bates Hole / Hat Six Mule Deer Herd Unit, 2001-2017. Note data were not collected or reported in some years.

Field Data

For much of the past 15 years, fawn ratios have been moderate to poor in this herd. Fawn ratios 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 improve population growth. 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 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 which did not produce fawns of their own. The winter of 2016-2017 seemed to have more impact on fawn survival than the previous three winters, as evidenced by a low yearling buck ratio of 9 per 100 does in 2017. While the low yearling ratio can in part be attributed to harvest of some yearlings during the 2017 hunting

season, field checks did not indicate a disproportionate percentage of yearling bucks in the harvest.

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 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 Management Plan recommended maintaining antler point restrictions in the herd if the buck ratio dropped 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 postseason 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 was removed to provide more liberal hunting opportunity and better distribute hahrvest pressure across buck age classes, with ample availability of bucks. Following the 2017 hunting season, the observed buck ratio was 31 per 100 does. Consequently the season will remain open for antlered mule deer with no antler point restriction, so long as the buck ratio remains above 25 per 100 does.

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 size, as the percentage of Class I bucks increased and percentage of Class II bucks decreased. It should come as no surprise that the percentage of Class I bucks increased from 2012 to 2016 with improved fawn production and the addition of antler-point restrictions, as more young bucks were present in the population. The proportion of Class III bucks has consistently remained under 10% in all years. While only four Class III bucks were observed during both 2016 & 2017 surveys, the overall percentage of Class II bucks improved from 2016 to 2017. Improved distribution of Class II bucks may be due in part to more even harvest pressure across antler classes with the removal of antler point restrictions. However, it may also be the result of a large cohort of 3.5 year old bucks recruited into the larger antler class - a product of high fawn ratios observed in 2014. The shift in proportions of bucks from Class I to Class II is likely to continue after the 2018 hunting season, as harvest pressure remains more evenly distributed across age classes in the absence of an antler point restriction.

Bio-Year	Total Class N for HA	# Bucks Classified					Buck Ratios per 100 Females					
		Ylng	Class I	Class II	Class III	Total	Ylng	Class I	Class II	Class III	All Adult	Total
2008	1,254	75	57 (50%)	41 (36%)	16 (14%)	189	12	9	6	2	18	29
2009	1,320	59	61 (54%)	41 (37%)	10 (9%)	171	8	8	6	1	15	23
2010	1,479	82	49 (49%)	42 (42%)	9 (9%)	182	9	5	5	1	11	20
2011	1,248	47	52 (56%)	33 (36%)	7 (8%)	139	7	8	5	1	14	21
2012	1,272	28	55 (59%)	30 (32%)	9 (9%)	122	4	8	4	1	13	17
2013	1,483	86	50 (61%)	25 (30%)	7 (9%)	168	10	6	3	1	10	20
2014	1,403	83	79 (71%)	26 (23%)	7 (6%)	195	12	12	4	1	17	29
2015	2,061	164	97 (70%)	29 (21%)	13 (9%)	303	16	9	3	1	13	29
2016	1,836	132	198 (85%)	31 (13%)	4 (2%)	365	15	22	3	1	26	41
2017	1,165	54	108 (80%)	23 (17%)	4 (3%)	189	9	18	4	1	22	31

Table 2. Antler classification analysis for **Area 66** within the Bates Hole/Hat Six Mule Deer Herd Unit, 2008 – 2017.

Harvest Data

Hunter success in this herd fluctuates as a function of population size, season length, and season limitations. As this herd declined from 2009-2013, hunting season length was shortened from 11 to 7 days and doe harvest was eliminated. During this time, harvest success decreased to 30th percentile and hunter days increased. Hunter participation and harvest success declined further as antler point restrictions were added in 2013. In the first year of antler point limitations, harvest success was very low at 25%, and was coupled with low participation of only 671 hunters. At the same time, Region D non-resident license issuance was reduced significantly as well, from 2,100 licenses in 2011 to only 400 licenses in 2014. As the herd began to recover from 2014-2016, harvest success began to improve into the 40th percentile. However, Region D license issuance has remained steady at 400 licenses. While hunter participation has gradually increased, the proportion of non-resident hunters in the herd unit has decreased. Harvest success improved further to 44% with the removal of antler point restrictions in 2017. Despite liberalized seasons, participation only increased by 41 hunters and buck harvest only increased by 34 deer from 2016 to 2017.

Hunter field checks were significantly increased in the Bates Hole / Hat Six Herd Unit during the 2017 hunting season. Field personnel increased hunter contacts, to document changes in harvest

associated with the removal of the antler point restriction and better gauge the prevalence of Chronic Wasting Disease (CWD) in the herd unit. A total of 133 harvested mule deer were checked in the field, representing 30 percent of the total harvest. Of those 133 field-checked deer, 17% were yearling bucks, 15% were 2x2 bucks, and the remaining 68% were 3x3 bucks or larger. This data helps to illustrate that harvest pressure on younger aged bucks was present in 2017, but not excessive in the absence of an antler point restriction. Of the harvested mule deer that were field checked, 115 were also tested for CWD. This sample size represents the highest in the herd – nearly equivalent to the previous five years' sample efforts combined (N=120). The resulting prevalence of CWD for the herd unit was 27%, which was also higher than previous five-year average of 23%. Managers will continue to maximize disease testing in 2018, as CWD and its impacts on population dynamics are a growing concern for this herd.

Population

In February 2017, 45 doe mule deer were captured within the herd unit and fitted with satellite GPS radio collars. Location, disease, and mortality data will be collected and analyzed from these deer, in a collaborative effort with the Bureau of Land Management. Information gleaned from this study will be used to update seasonal range delineation, identify important habitats, identify causes and rates of mortality, and monitor disease prevalence within the herd. Data collection from collared deer is expected to last 2.5 years.

The 2017 postseason population estimate for the Bates Hole / Hat Six Herd Unit was approximately 7,800. This estimate represents a slight decrease, after reaching a high of 8,300 deer in 2016. A separate estimate of adult survival derived from GPS-collared adult does was added to the model for 2017. The estimate was calculated using Kaplan-Meier survival estimates from a sample of 45 doe mule deer that were collared in February 2017, and an additional ten does that were collared to replace mortalities in November 2017. The estimated survival rate for adult does was 0.73, which is relatively low compared to the Colorado statewide average of 0.82. When used in conjunction with postseason classification and harvest data, this estimate of known mule deer survival helps to further refine the model.

This herd had poor fawn production/survival and thus poor population performance from 2006-2013. The herd has grown modestly in more recent years as a result of no female harvest, improved weather and range conditions, and improved fawn production/survival. While field personnel have observed higher total mule deer numbers during survey flights from 2014-2016, survey totals were markedly lower in 2017. While this lower deer count may be due to a decreasing population size, it is also likely due to mild weather conditions. Very little snow accumulated at higher elevations prior to November survey flights, and deer appeared to be spread widely across the herd unit rather than amassed on winter ranges. Thus a considerable

number of deer likely went undetected, as survey flights are limited to coverage of mostly winter ranges. Still, the 2017 classification survey total was very close to the sample objective. Thus, resulting age and sex ratios should accurately represent the population.

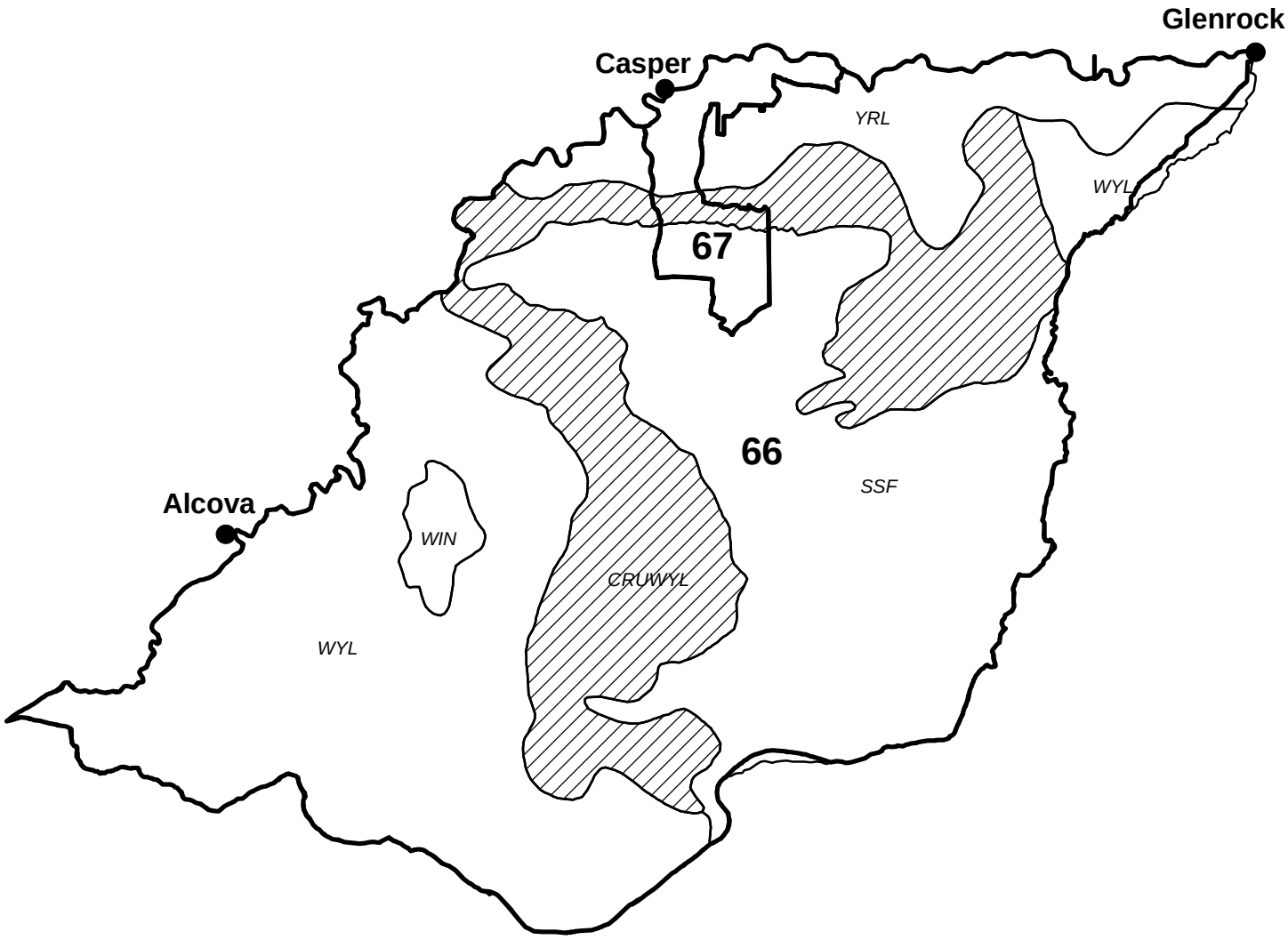
The "Semi-Constant Juvenile, Semi-Constant Adult" (SCJ,SCA) spreadsheet model was chosen for the postseason population estimate of this herd. Managers are confident in the accuracy of observed buck ratios in this herd unit, as sample sizes are typically very good and aerial survey coverage is very thorough. 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 are 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 & 2015). Adult survival was constrained to the survival rate and standard error estimated from collared deer data in 2017, and the SCJ,SCA model adjusts adult survival accordingly. The CJ,CA model was rejected, as it depicts a herd that is unrealistically large. The TSJ, CA model predicts a similar population size and trend as the SCJ,SCA model for the most years, but does not align well to adult survival rates from collared deer in 2017. 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 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 maintained for 2018. The 2018 season will also maintain the limitation of antlered mule deer with no antler point restriction, as buck ratios are still above the 25 bucks per 100 doe threshold defined by the Mule Deer Initiative Management Plan. 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 455 deer with fawn ratios similar to the last five years, this herd will decline slightly. If fawn production and adult survival improve in 2018, the herd should grow slightly. The predicted 2018 postseason estimate for the Bates Hole / Hat Six Herd is approximately 6,900 animals, which is 14% below objective.

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



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

Precipitation

From October 2016 through September 2017 (Water Year 2017), precipitation in the Bates Hole / Hat Six Mule Deer Herd Unit was three inches higher than the 30-year average for the same water year timeframe (Figure 1). Growing season (April-June) precipitation in 2017 was the same as that received in 2016, which was 0.9 inches above the 30-year average. Precipitation during this time frame is extremely important for shrubs, as the majority of annual growth occurs in this period. July and August are typically the driest months during the summer for the region. However, the Bates Hole / Hat Six Mule Deer Herd Unit received 2.4 inches of precipitation in 2017, which is over one-half inch more than 2016 and is one-half inch above the 30-year average. The herd unit also received beneficial precipitation in September and October (0.3 inches above the 30-year average), which helped jumpstart plant growth for the following growing season.

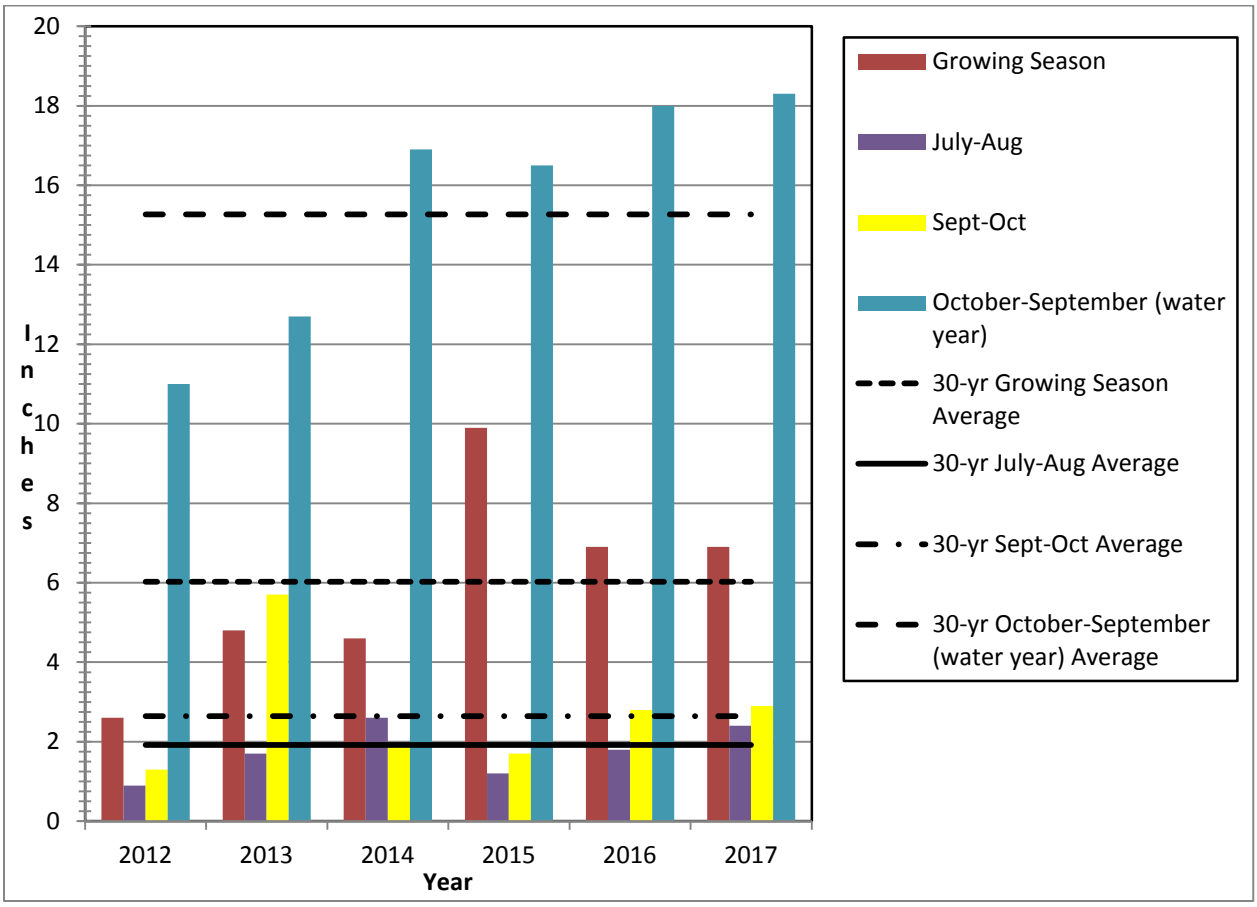


Figure 1. Seasonal precipitation received compared to 30-year averages within the Bates Hole / Hat Six Mule Deer Herd Unit.

Winter Severity

The 2017-2018 winter was fairly mild within the herd unit, with precipitation levels well below average. The 2017-2018 winter started out mild with very little snowfall until a winter storm in early December brought several inches of wet snow. That snowstorm was followed by several additional snowstorms that added a few inches of base during each storm. This period was accompanied by cold temperatures. However, periods of warmer air temperatures and wind melted snow periodically and prevented crusting. From late March through April, air temperatures fluctuated between above normal and cooler periods, producing several timely precipitation events with modest snow accumulations. However, snowfall did not persist more than a few days following each precipitation event from late-March on.

Habitat and Mule Deer Body Condition

Precipitation, weather, and habitat conditions have been favorable from 2014 to present in the Bates Hole / Hat Six Mule Deer Herd. Fawn production was high in 2014, and winter conditions were mild. Moisture was well above average during the growing season (April – June) of 2015, but late summer and early fall moisture was lacking. Despite the dry fall, mule deer nutritional condition was very good entering the 2015-2016 winter. Winter conditions were average for 2015-2016, resulting in average fawn 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. The summer of 2016 was dry, but fall moisture created a late green-up of forage, enabling mule deer to enter the 2016-2017 winter in good nutritional condition. The early winter of 2016-2017 was marked by heavy snows and a prolonged cold snap, followed by fairly average snow accumulation and winter temperatures. Some portions of the herd unit experienced more severe and prolonged winter weather conditions, and overwinter mortality of fawns and collared doe mule deer was higher than expected. The 2017 growing season was similar to that of 2016, with above average precipitation and good herbaceous forage production and mixed-mountain shrub leader growth. Mule deer appeared to be in good body condition transitioning into the winter season. The winter of 2017-2018 was mild, with below average snowfall and few periods of extreme or prolonged cold. Overwinter survival of mule deer was thought to be above average across all age classes, which correlates to a low rate of mortality observed in GPS-collared doe deer in the herd. Although total weather data is not yet available, below average precipitation has been recorded during the 2018 growing season thus far. While the winter was mild and forgiving in the herd unit, increased precipitation will be needed to provide good forage production for mule deer in the coming spring and summer.

2017 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2017 - 5/31/2018

HERD: MD758 - RATTLESNAKE

HUNT AREAS: 88-89

PREPARED BY: HEATHER O'BRIEN

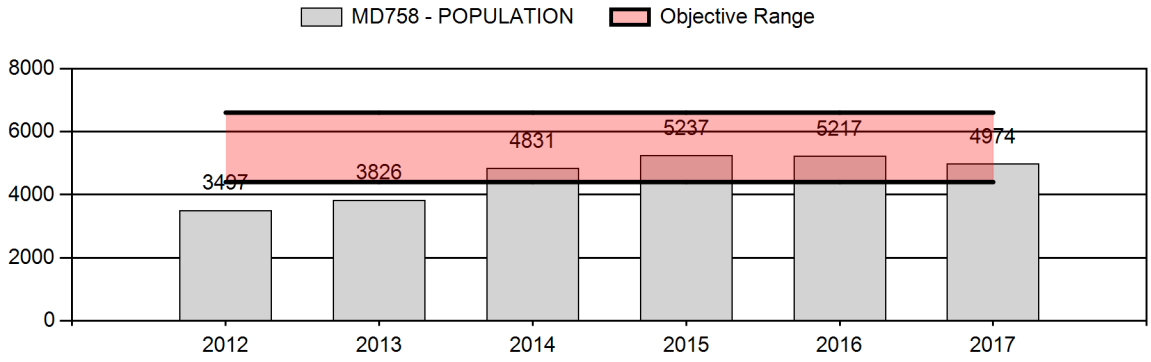
	2012 - 2016 Average	2017	2018 Proposed
Population:	4,522	4,974	5,117
Harvest:	148	210	280
Hunters:	332	357	470
Hunter Success:	45%	59%	60%
Active Licenses:	338	357	470
Active License Success:	44%	59%	60%
Recreation Days:	1,257	1,304	1,700
Days Per Animal:	8.5	6.2	6.1
Males per 100 Females	37	54	
Juveniles per 100 Females	65	89	

Population Objective (± 20%) :	5500 (4400 - 6600)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-9.6%
Number of years population has been + or - objective in recent trend:	34
Model Date:	03/05/2018

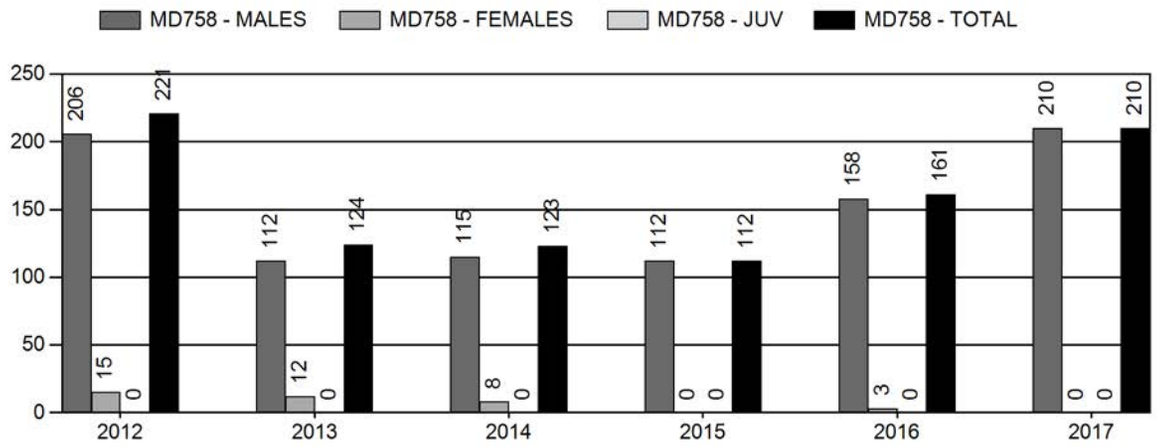
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	JCR Year	Proposed
Females ≥ 1 year old:	0.0%	0.0%
Males ≥ 1 year old:	18.7%	22.6%
Total:	4.0%	5.2%
Proposed change in post-season population:	+21.8%	+2.8%

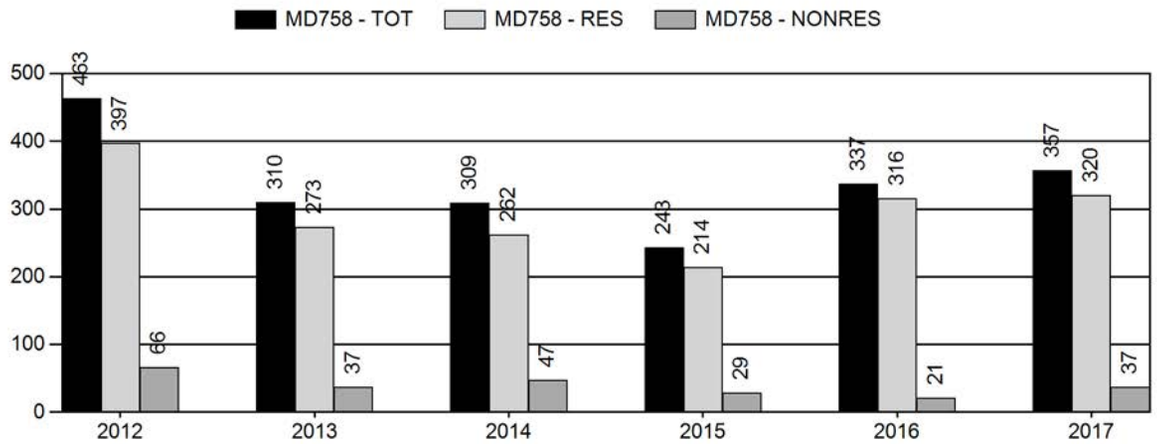
Population Size - Postseason



Harvest



Number of Active Licenses



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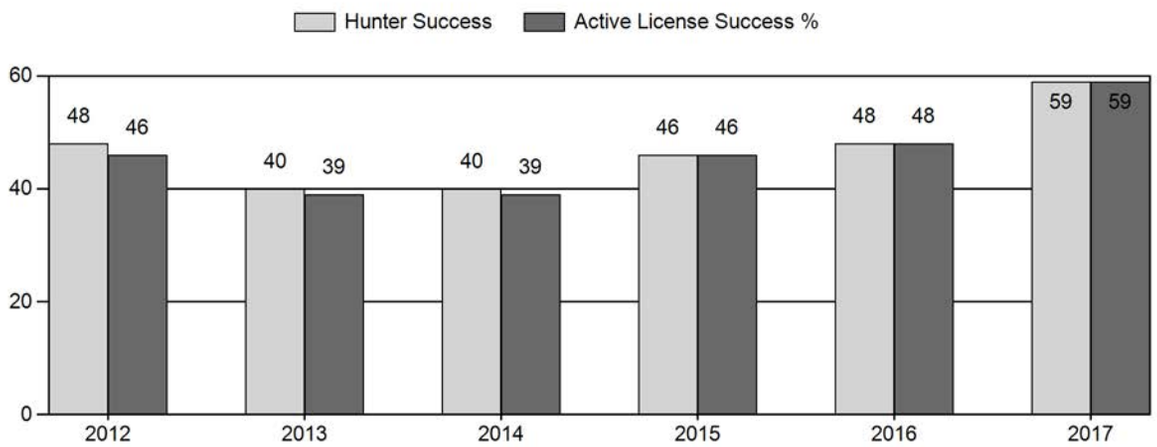

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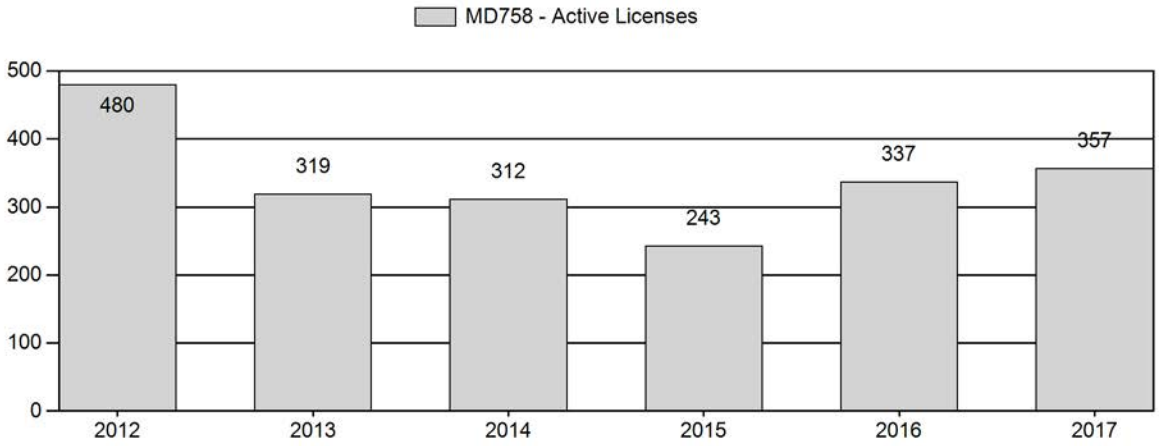
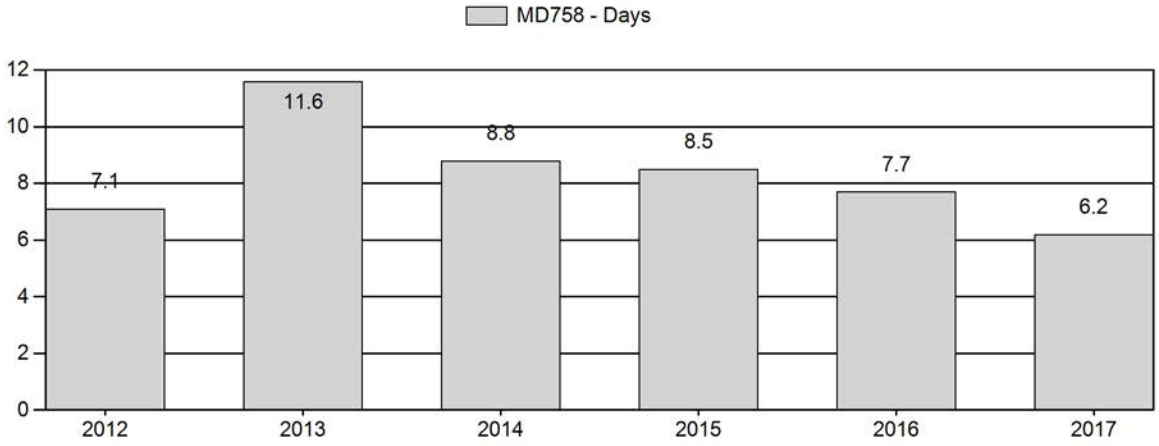
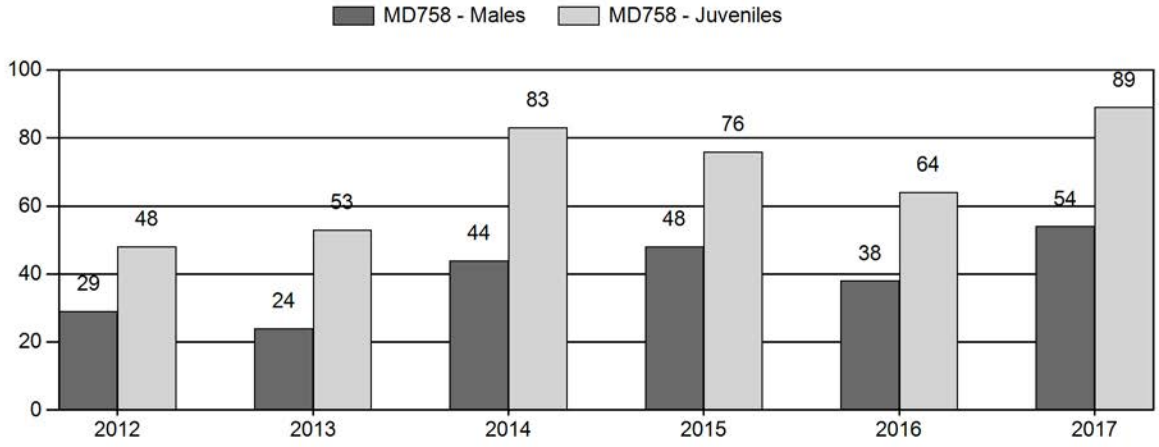


Days per Animal Harvested



Postseason Animals per 100 Females



2012 - 2017 Postseason Classification Summary

for Mule Deer Herd MD758 - RATTLESNAKE

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	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
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	6,114	50	89	95	5	0	239	22%	442	41%	392	37%	1,073	1,132	11	43	54	± 5	89	± 7	58

2018 HUNTING SEASONS
RATTLESNAKE MULE DEER (MD758)

Hunt Area	Type	Season Dates Opens	Season Dates Closes	Quota	License	Limitations
88		Oct. 15	Oct. 21		General	Antlered mule deer or any white-tailed deer
89	1	Oct. 15	Oct. 31	175	Limited quota	Antlered deer
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2017
88		No Change
89	1	+50
Total	1	+50

Management Evaluation

Current Postseason Population Management Objective: 5,500
Management Strategy: Special
2017 Postseason Population Estimate: 5,000
2018 Proposed Postseason Population Estimate: 5,100
2017 Hunter Satisfaction: 71% Satisfied, 15% Neutral, 14% 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 can be disproportionately high on public lands within Area 88, and harvest success in the hunt area is typically low as a result. 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 drought of 2012 resulted in elevated fawn mortality in the Rattlesnake Herd Unit from 2012 to 2013. Fawn survival was 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 gradually recovered in the herd unit. Fawn survival generally increased from 2013 to 2016, 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, but the majority of the summer and fall were extremely dry, causing much of the available forage to cure. Fortunately, precipitation in October produced a late surge of plant growth, which provided mule deer with a valuable boost in nutrition prior to the winter of 2016-2017. The winter of 2016-2017 was again considered to be fairly average, with several notable snow storms interspersed with warm weather and high winds that exposed forage. The summer of 2017 was similar to the previous year, with a wet spring followed by very dry summer conditions. Fall precipitation events were again frequent in 2017, providing a resurgence of fall forage. The winter of 2017-2018 has been mild, with little persistent snow and long periods of warm temperatures. Thus, managers expect above average mule deer survival for the winter. 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 2017 were average, but summer and early fall of 2017 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 2017-2018.

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 2014-2015, and overwinter survival improved over the same period. Fawn ratios were lower in 2016, with 64 fawns per 100 does, but appeared to improve in 2017 with 89 fawns per 100 does observed. While the population appears to be approaching objective for 2018, doe/fawn licenses for Area 88 are not yet warranted as 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. Even in years when the population is below objective, higher buck ratios have been maintained by adjusting Area 89 license issuance accordingly. During 2017 postseason classification surveys, a high proportion of bucks were surveyed throughout the herd unit, with an overall buck ratio of 54 per 100 does. Given the high proportion of mature bucks surveyed in a population that has grown over the past five years, an increase in Area 89 licenses is warranted. An increase of 50 licenses will provide additional hunting opportunity while still maintaining the buck ratio within special management parameters.

Since 2008, bucks classified in Area 89 have been categorized based on antler size (Table 1). The distribution of bucks in larger antler classes (Class II & III) was very good form 2009-2011. Following the severe winter of 2010-2011, the proportion of bucks in larger antler classes dropped significantly. Since then, distribution of bucks across antler classes has fluctuated, dependent upon fawn 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 was likely due to higher fawn survival the previous two years. Despite a buck ratio on the upper end of special management criteria, overall distribution of bucks was weighted toward smaller antler classes. In 2017, a large cohort of bucks were recruited into mature age classes, and the distribution of bucks shifted towards the middle antler class, with 38% Class I, 58% Class II, and 3% Class III bucks observed. At the same time, the population size has increased, and the overall buck ratio has exceeded the upper threshold of special management. Thus, the availability of prime-age bucks should be excellent over the next two to three years, hence the increase in Type 1 license numbers for the 2018 hunting season. The increase in

harvest pressure should reduce buck ratios slightly to within special management criteria, while maintaining a healthy proportion of mature bucks in 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
2017	762	31	53 (39%)	78 (58%)	4 (3%)	166	10	16	24	1	42	51

Table 1. Antler classification analysis for Area 89 within the Rattlesnake Mule Deer Herd Unit, 2008-2017.

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 45% in 2017, with 109 bucks harvested. While better than the 5-year average, this success rate is still low and considered typical for a general license area with little public land access. Harvest success in Area 89 was 88% in 2017 with 101 bucks harvested, and represents the highest success rate for the hunt area since 2009. Total deer harvested also increased in both hunt areas compared to 2016, indicating availability of deer was improved in both hunt areas. Increasing harvest success and higher total deer harvested coincide with an increasing population trend. Hunter days increased from 6.2 days in 2016, to 8.5 days in 2017 for 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 71% in 2017, compared to 66% in 2016, coinciding with an increase in population size, trophy quality, and the overall buck ratio. Managers feel this further justifies an increase in license issuance 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 2014-2017 with the goal of collecting additional demographic information from harvested deer (Table 2). Hunter participation and submission of samples was poor from 2014-2016, but improved in 2017. Despite low participation in some years, 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	2017
Average Tooth Age	5.6	5.07	5.83	5.88	5.67	5.4
Median Tooth Age	5.5	4.5	6.5	5.5	5.5	5.5
Average Antler Spread	22	20	23	23	23	23
Total Sample Size (N)	59	37	13	8	12	20

Table 2. Hunter-submitted tooth age and antler measurement data from Area 89 deer, 2009-2017.

Population

The 2017 postseason population estimate was approximately 5,100 mule deer and trending upward from an estimated low of 3,000 deer in 2013. The "Time-Specific Juvenile, Constant Adult Survival (TSJ,CA) spreadsheet model was selected for the postseason population estimate of this herd. Both the CJ,CA and SCJ,CA models are believed to overestimate population size. Lower constraints on juvenile survival were applied to the SCJ,CA model from 2010-2012 to match observed trends of low fawn production/survival. While the resulting population trend is more plausible than the CJ,CA model, the SCJ,CA still predicts a population that is above objective. It is suspected the (TSJ,CA) model may be underestimating herd sizedue to conservative license issuance. However, managers believe the trends depicted in the model are accurate, and are thus comfortable with a conservative population estimate. While the AIC for the TSJ,CA model is the higher than the CJ,CA model, it is still well within one level of power compared to the both remaining models. The TSJ,CA model appears to be the best representation relative to the perceptions of managers on the ground and follows trends with

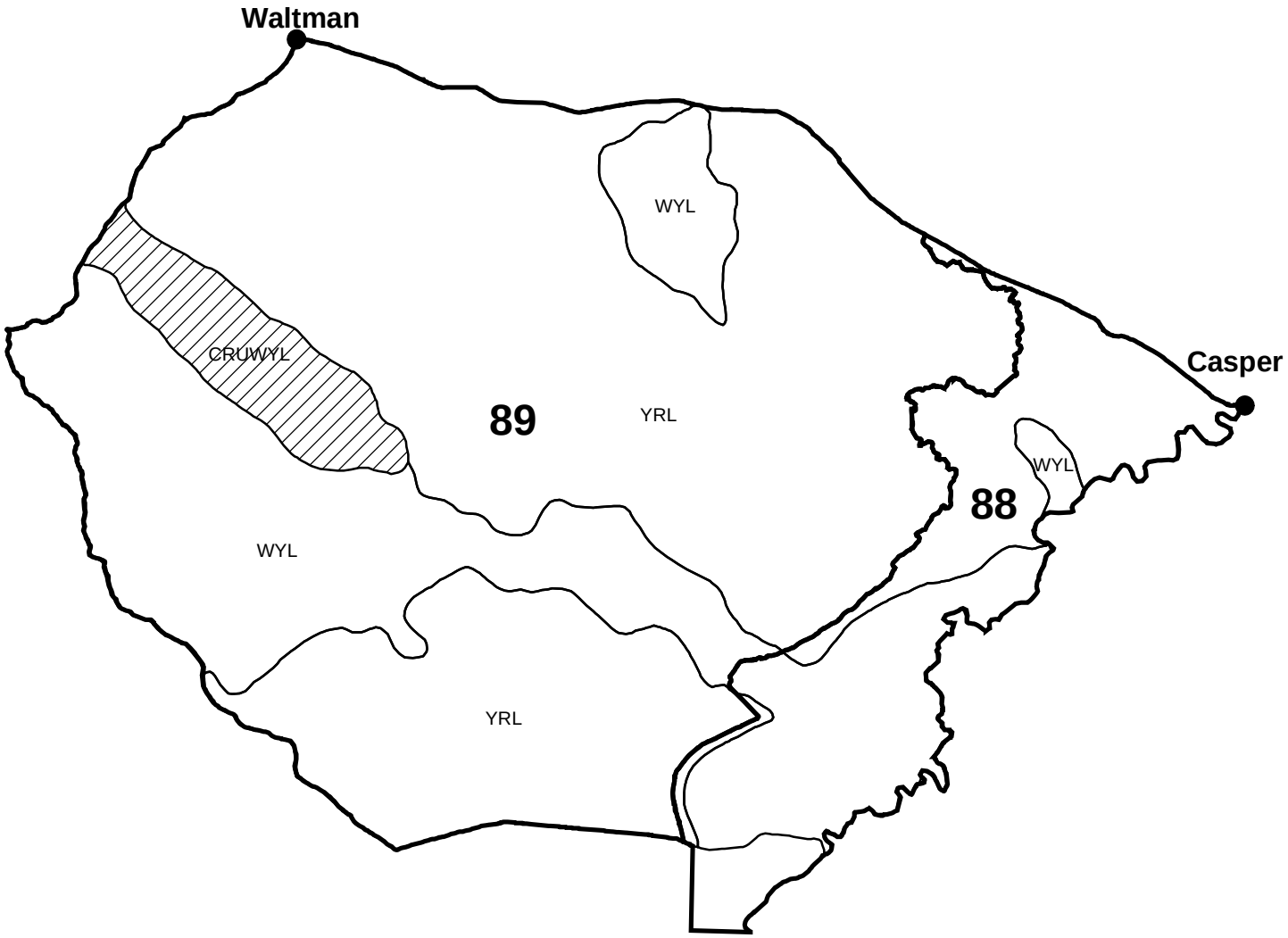
license issuance and harvest success. However, because there are no additional survival or population estimate data to augment the model, it is only considered to be fair in quality.

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 2018 hunting season. There will be an addition of 50 Type 1 licenses to Area 89 to provide additional hunting opportunity, as a high proportion of bucks are entering prime-age class. Area 88-Type 6 licenses remain unnecessary, as there are currently no concerns regarding damage and few access opportunities on private lands. The 2018 season thus includes a total of 175 Type 1 licenses in Area 89, and a general season in Area 88 for antlered mule deer or any white-tailed deer. Goals for 2018 are to manage buck ratios within special management, and increase hunter opportunity, success, and satisfaction.

If we attain the projected harvest of 280 deer with fawn production similar to the five-year average, this herd will increase slightly. The predicted 2018 postseason population size for the Rattlesnake Mule Deer Herd Unit is approximately 5,100 deer, which is 7 percent below objective.

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



2017 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2017 - 5/31/2018

HERD: MD759 - NORTH NATRONA

HUNT AREAS: 34

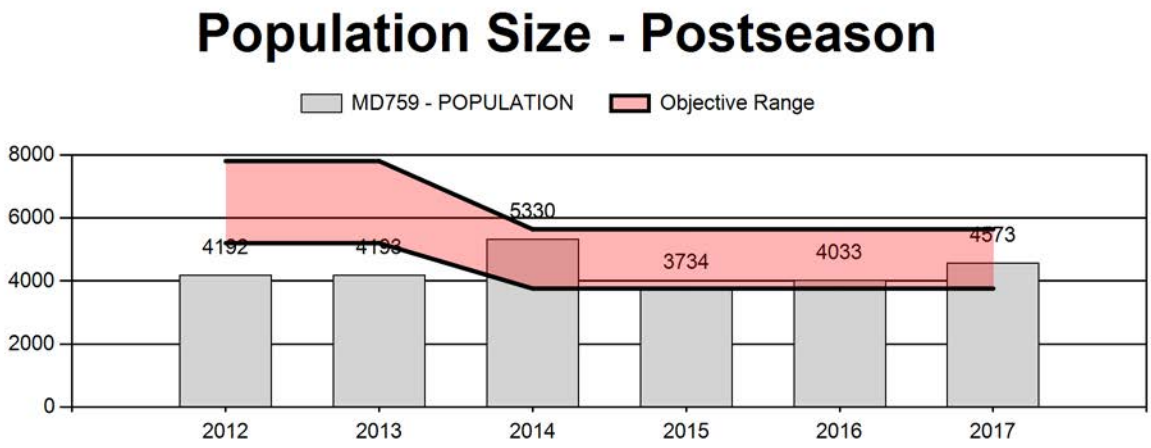
PREPARED BY: HEATHER O'BRIEN

	2012 - 2016 Average	2017	2018 Proposed
Population:	4,296	4,573	4,554
Harvest:	150	188	315
Hunters:	195	206	375
Hunter Success:	77%	91%	84 %
Active Licenses:	199	212	375
Active License Success:	75%	89%	84 %
Recreation Days:	998	767	1,400
Days Per Animal:	6.7	4.1	4.4
Males per 100 Females	36	54	
Juveniles per 100 Females	72	76	

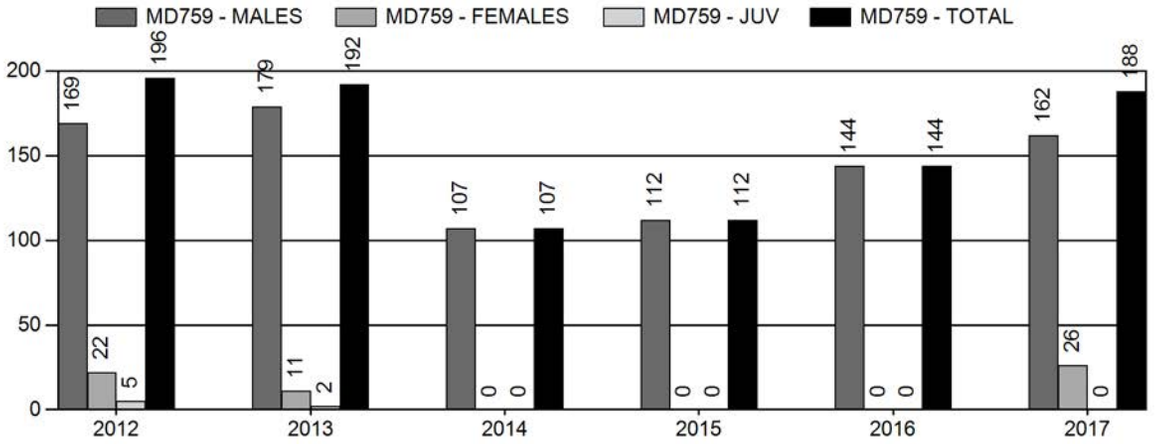
Population Objective (± 20%) :	4700 (3760 - 5640)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-2.7%
Number of years population has been + or - objective in recent trend:	24
Model Date:	03/01/2018

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

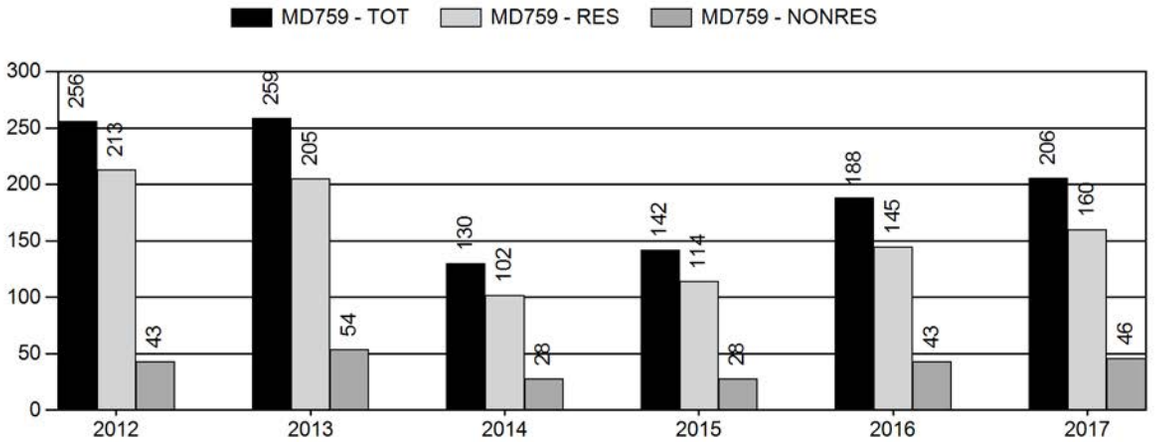
	JCR Year	Proposed
Females ≥ 1 year old:	1.4%	3.5%
Males ≥ 1 year old:	14.3%	21.5%
Total:	2.5%	6.4%
Proposed change in post-season population:	+19.3%	-0.4%



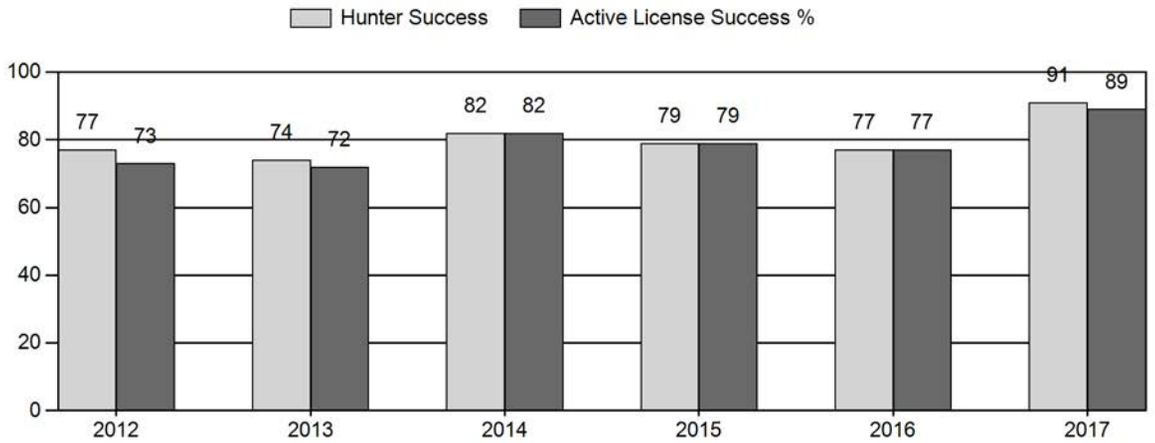
Harvest



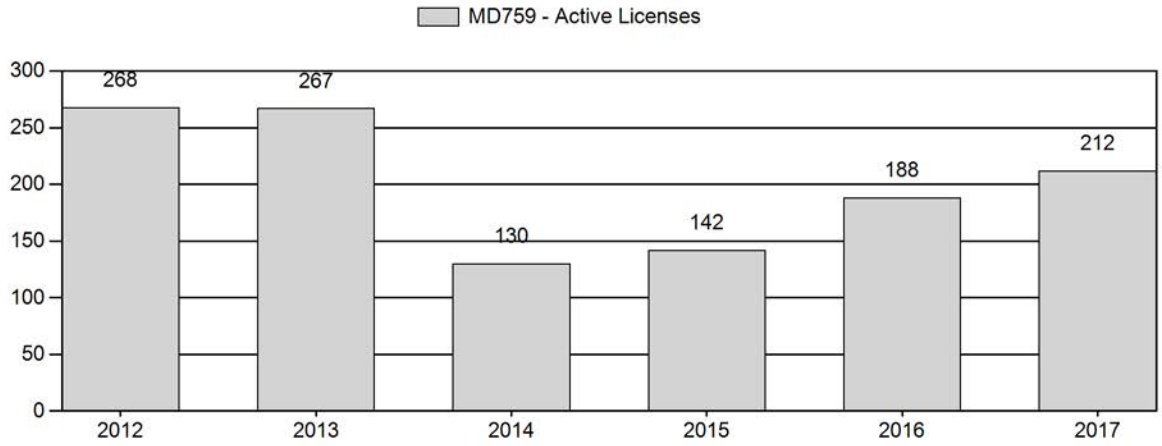
Number of Active Licenses



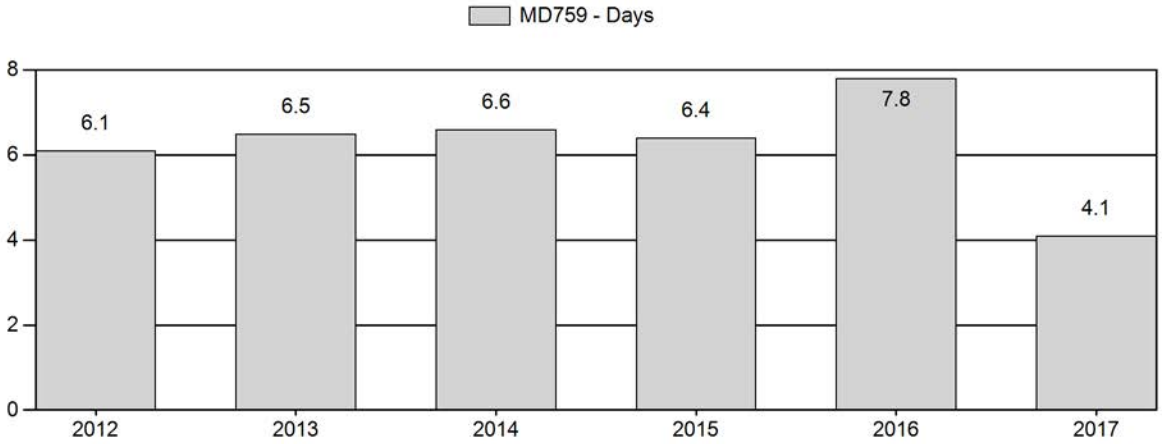
Harvest Success



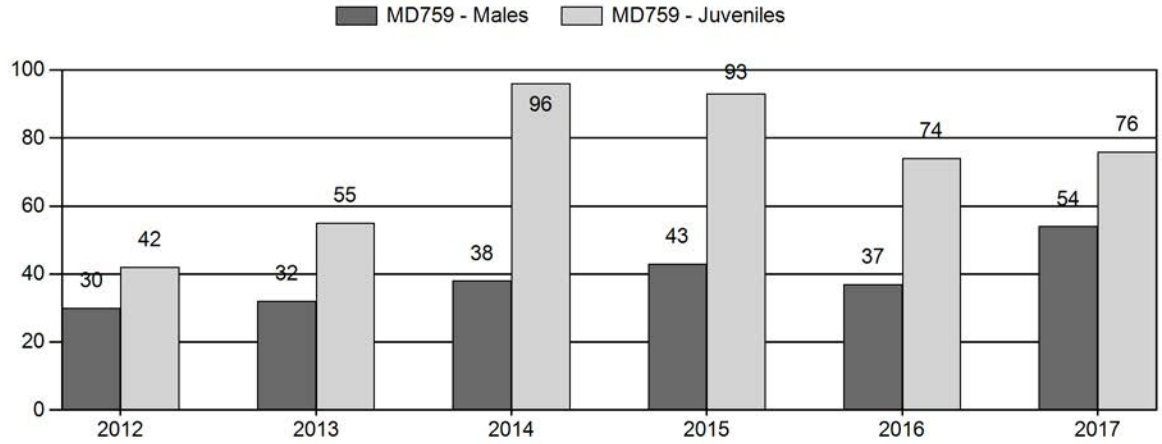
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2012 - 2017 Postseason Classification Summary

for Mule Deer Herd MD759 - NORTH NATRONA

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	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
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	4,573	57	124	34	2	0	217	23%	402	44%	305	33%	924	1,113	14	40	54	± 5	76	± 7	49

2018 HUNTING SEASONS
NORTH NATRONA MULE DEER HERD (MD759)

Hunt Area	Type	Season Dates Opens	Season Dates Closes	Quota	License	Limitations
34	1	Oct. 15	Oct. 31	300	Limited quota	Antlered deer
	7	Oct. 15	Dec. 15	75	Limited quota	Doe or fawn deer valid on or within one (1) mile of irrigated land
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2017
34	1	+100
	7	+25

Management Evaluation

Current Postseason Population Management Objective: 4,700
Management Strategy: Special
2017 Postseason Population Estimate: 4,600
2018 Proposed Postseason Population Estimate: 4,600
2017 Hunter Satisfaction: 80% Satisfied, 13% Neutral, 7% 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 are 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 drought of 2012 resulted in decreased fawn survival in the North Natrona Herd Unit from 2012 to 2013. Fawn ratios were 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 steadily. Fawn survival increased from 2013 to 2016, 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, but 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 provided mule deer with a valuable boost in nutrition prior to the winter of 2016-2017. The winter of 2016-2017 was again considered to be fairly average, with several notable snow storms interspersed with warm weather and high winds that exposed forage. The summer of 2017 was similar to the previous year, with a wet spring followed by very dry summer conditions. Fall precipitation events were again frequent in 2017, providing a resurgence of fall forage. The winter of 2017-2018 has been mild, with little persistent snow and long periods of warm temperatures. Thus, managers expect above average to good mule deer survival for the winter. 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 2017 growing season suggests range conditions were above average during the wet spring, but conditions became very dry by 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. Several wildfires burned in sagebrush-grassland habitats in late summer, particularly in the central and eastern portions of the herd unit. Precipitation in October and the resulting green-up likely benefitted mule deer going into the winter months of 2017-2018, and mule deer appeared to be in good body condition during aerial classification surveys during late November 2017.

Field Data

Following a harsh winter and severe drought in 2012, fawn survival was at a 15-year low for the herd unit. Fawn production has improved strikingly since then, and reached a historic high of 96 per 100 does in 2014. Fawn production was very good in 2017, with 76 per 100 does observed during postseason surveys. 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 four 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 combination of reduced license issuance and improved fawn survival, and were near the upper threshold of special management by postseason 2015. As a result, license issuance was liberalized in 2016 and maintained at the same level for 2017. Both harvest success and hunter satisfaction increased over the same period, and the buck ratio improved to 40 per 100 does in 2017. Thus, this population can support an increase in harvest pressure on bucks for the upcoming hunting season. Management goals for 2018 are to maintain buck ratios within the range of special management while increasing 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 2013-2014 showed a marked decrease in antler quality compared to previous years. From 2015-2016, increased recruitment within younger age classes increased the proportion of Class I bucks within the herd. While this herd has increased in size substantially due to high fawn production, there are also two large cohorts of younger age-class bucks that will begin to reach maturity over the next two hunting seasons. The first of these cohorts should begin to reach prime age beginning in 2018, and hunters may expect to see increased availability of larger bucks this upcoming fall. This improved availability of prime age class bucks is further justification to increase issuance of Type 1 licenses for the 2018 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
2017	924	57	124 (78%)	34 (21%)	2 (1%)	217	14	31	8	1	40	54

Table 1. Antler classification analysis for the North Natrona Mule Deer Herd Unit, 2008-2017.

Harvest Data

Hunter success in the North Natrona Mule Deer Herd Unit is typically in the 70-80th percentile, and reached an historic high of 88% in 2017. A total of 188 deer were harvested, which is the highest harvest since 2012. Harvest success on doe/fawn licenses that were added on private land in 2017 was very high at 94%, though only about half the licenses sold were active (56%). Hunter days (4.3) were also low compared to the ten-year average (6.1), indicating that hunters had an easier time locating and harvesting deer. Survey totals, comments from hunters and landowners, and population modeling all indicate this herd has grown consistently from 2013-present due to improved fawn survival. Thus, managers suspect hunters had increased opportunity in 2017 to harvest high quality mature bucks.

Tooth age data were collected from harvested bucks in the North Natrona Mule Deer Herd Unit in 2010 and 2013-2017 (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 quite 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. 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	2017
Average Age	4.44	5.4	5.27	5.27	4.85	4.6
Median Age	4.5	5.5	4.5	4.5	5.5	4.5
Average Antler Spread	21.2	21.2	20	20.9	21.5	20.7
Sample Size (N) =	68	52	44	32	40	51

Table 2. Lab tooth age and antler spread data from Hunt Area 34 harvested mule deer, 2010, 2013-2017.

Population

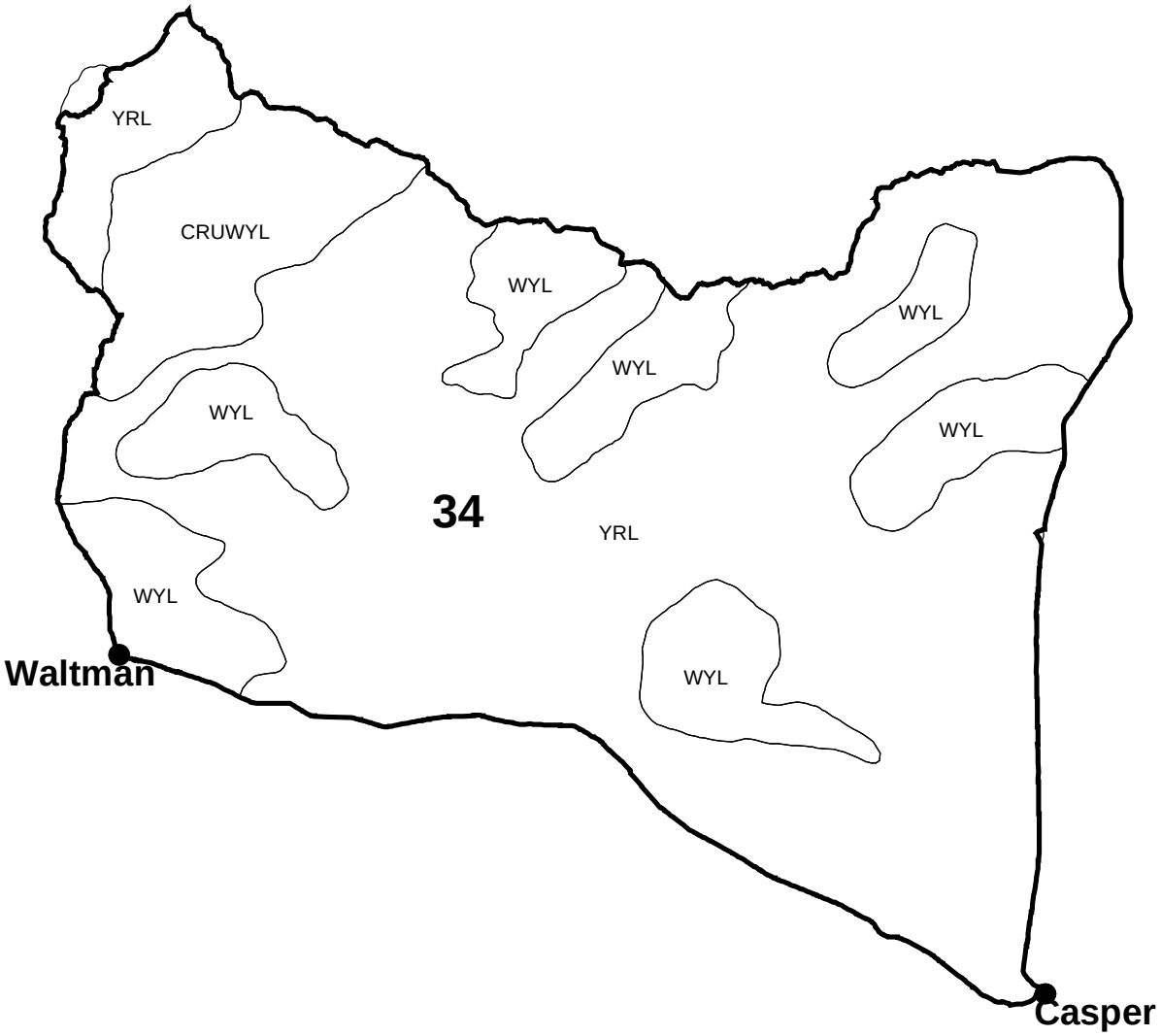
The 2017 postseason population estimate was approximately 4,600, which represents an increase of approximately 800 deer since postseason 2016. No sightability or other population estimate data are currently available to further align the model in conjunction with postseason classification and harvest 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 steadily over the past five years, due mainly to improved fawn production and good overwinter survival. Despite significantly reduced survey effort due to time and budget constraints in 2016 & 2017, managers classified high numbers of mule deer during postseason classifications. Higher densities of mule deer have also become a damage issue on irrigated farmlands in the southeast corner of the herd unit for the first time since 2011.

The "Time-Specific Juvenile – Constant Adult Survival" (TSJ,CA) spreadsheet model was chosen for the postseason population estimate of this herd. This model appears to be most representative of trends within the herd, especially during more recent years represented in the model. 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 CJ,CA and SCJ,SCA models appear to overestimate population growth the last six years, which coincides with years when doe harvest was eliminated in the herd. The TSJ,CA model selects an adult survival rate that is very reasonable for this herd, and selects low fawn survival rates in years known to have had severe winter conditions. All three models have AICs that are low and well within one magnitude of power of each other. Thus, AIC has little bearing on model

selection for this herd. The TSJ,CA model is considered to be of fair quality in representing observed 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 2018 season will offer an increase from 200 to 300 Type 1 licenses as this population appears to be near objective and buck ratios, harvest success, and hunter satisfaction were all high in 2017. A small number of Type 7 licenses were made available in 2017 to address growing numbers of mule deer on irrigated agricultural lands in the southeast portion of the herd unit. For 2018, managers will increase these licenses to provide further opportunity for hunters and landowners to manage deer numbers. These licenses will be valid within one mile of irrigated lands to help curb potential damage issues, while conserving doe mule deer on native habitats.

If we attain the projected harvest of 315 mule deer with fawn ratios similar to a 5-year average, this herd will remain near objective. 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