2018 - JCR Evaluation Form

SPECIES: Mule Deer
PERIOD: 6/1/2018 - 5/31/2019

HERD: MD207 - PAINTROCK

HUNT AREAS: 41, 46-47
PREPARED BY: SAM STEPHENS

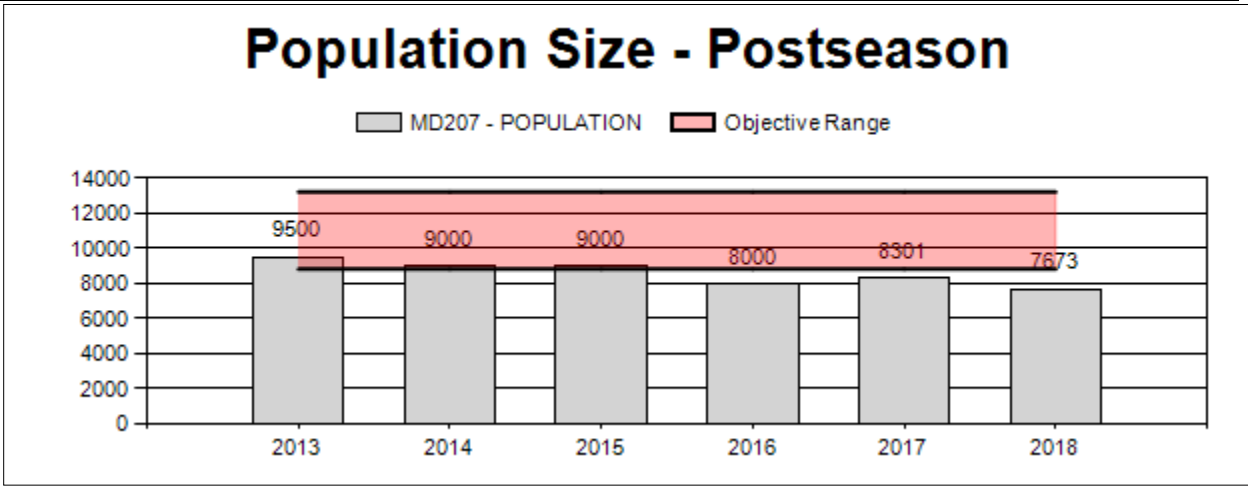
	2013 - 2017 Average	2018	2019 Proposed
Population:	8,760	7,673	7,826
Harvest:	755	680	778
Hunters:	1,425	1,276	1,400
Hunter Success:	53%	53%	56 %
Active Licenses:	1,478	1,365	1,500
Active License Success:	51%	50%	52 %
Recreation Days:	6,326	5,657	6,000
Days Per Animal:	8.4	8.3	7.7
Males per 100 Females	28	26	
Juveniles per 100 Females	70	60	

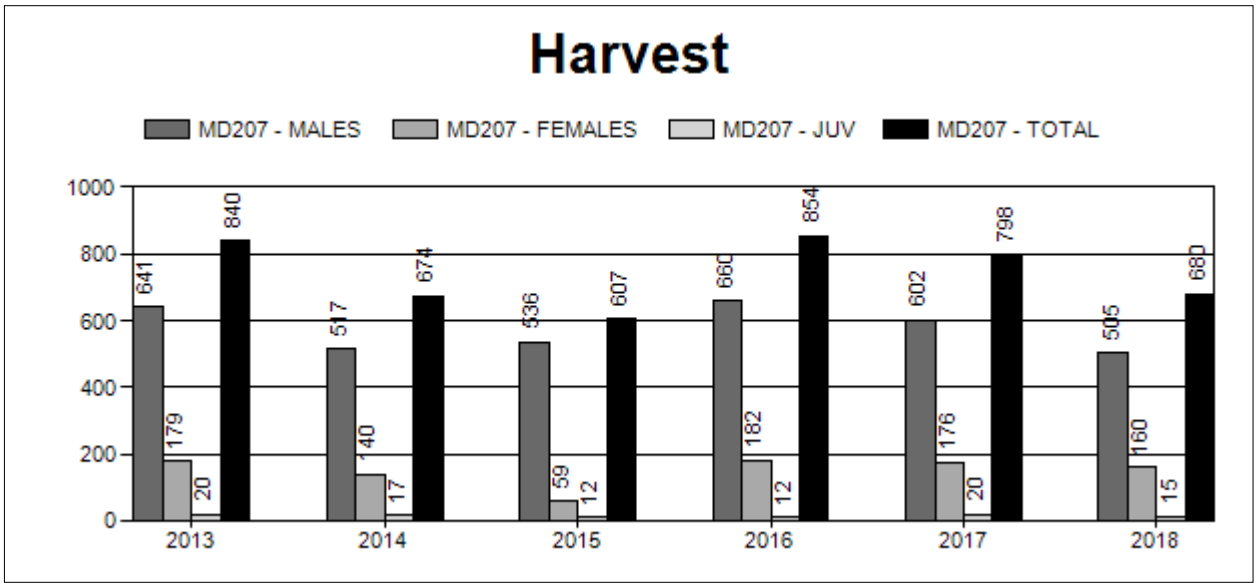
Population Objective (± 20%) : 11000 (8800 - 13200)

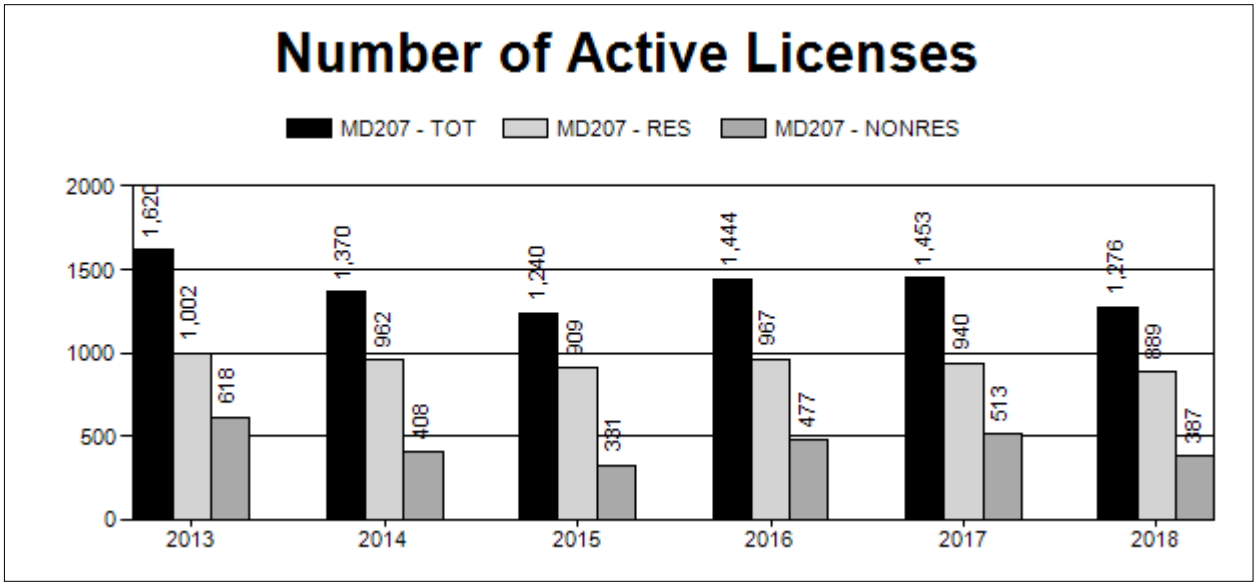
Management Strategy: Recreational
Percent population is above (+) or below (-) objective: -30.2%
Number of years population has been + or - objective in recent trend: 19
Model Date: 02/18/2019

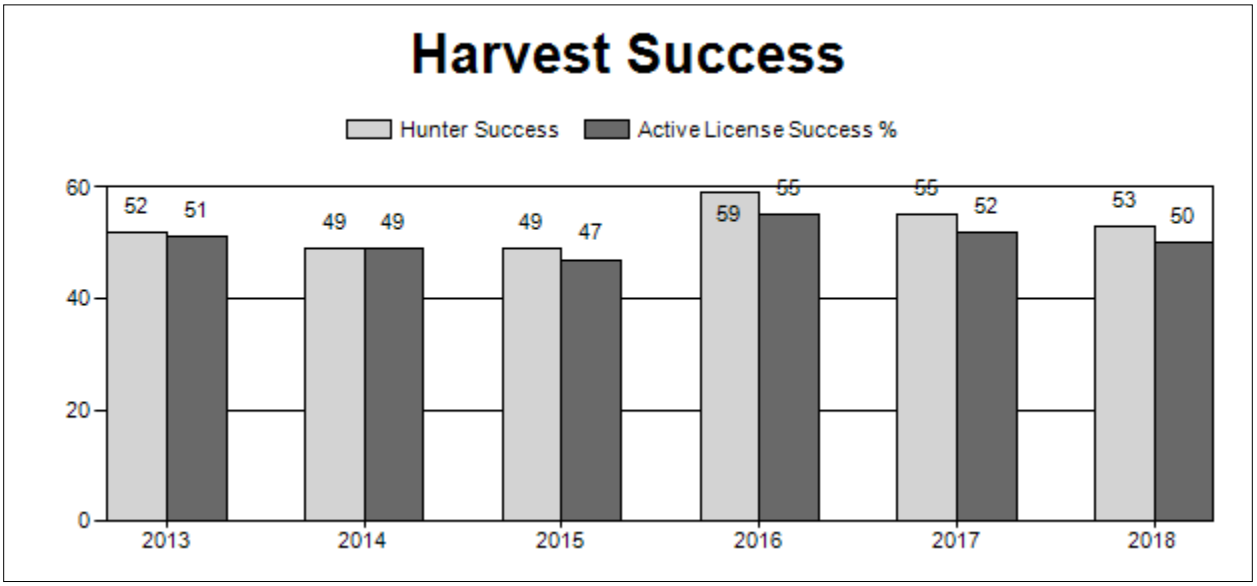
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

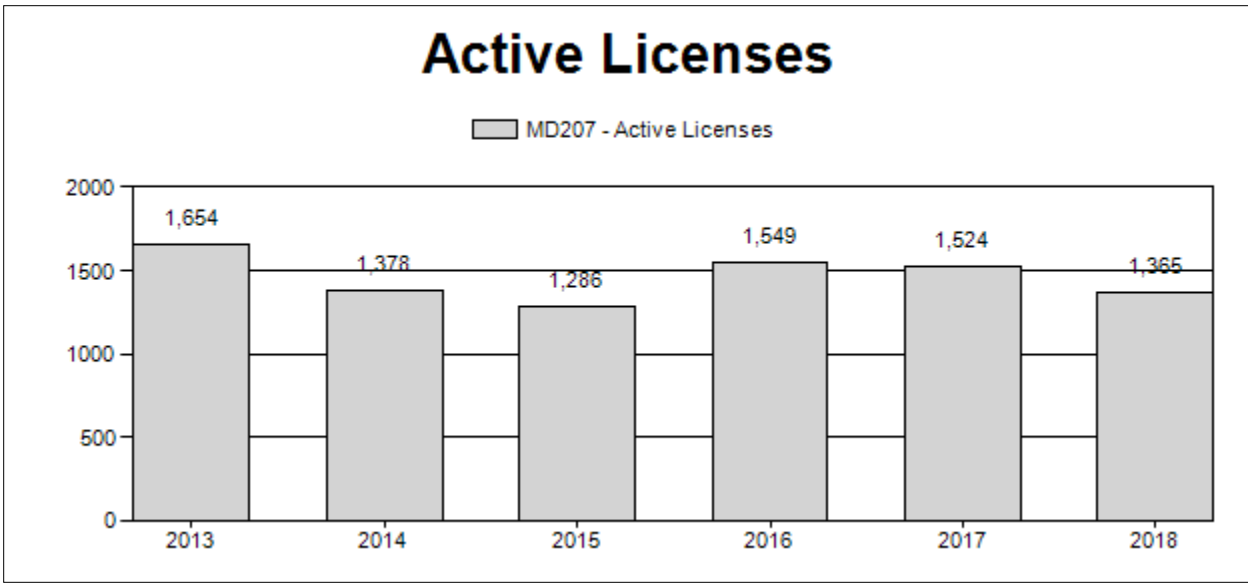
	JCR Year	Proposed
Females ≥ 1 year old:	4%	4%
Males ≥ 1 year old:	34%	38%
Total:	8%	9%
Proposed change in post-season population:	-9%	-9%

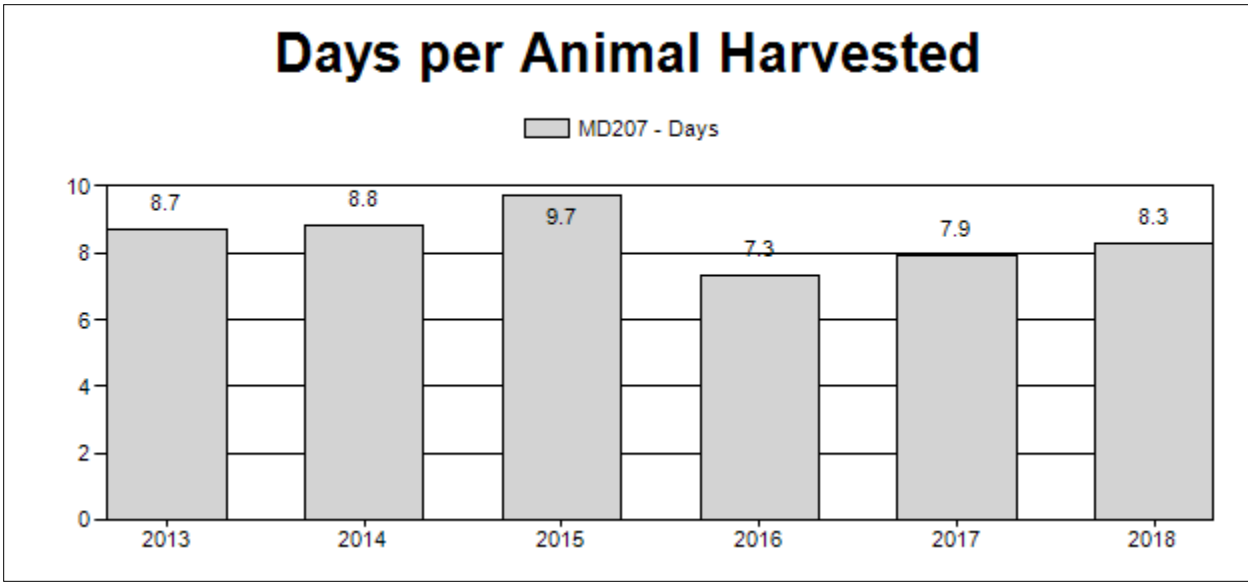


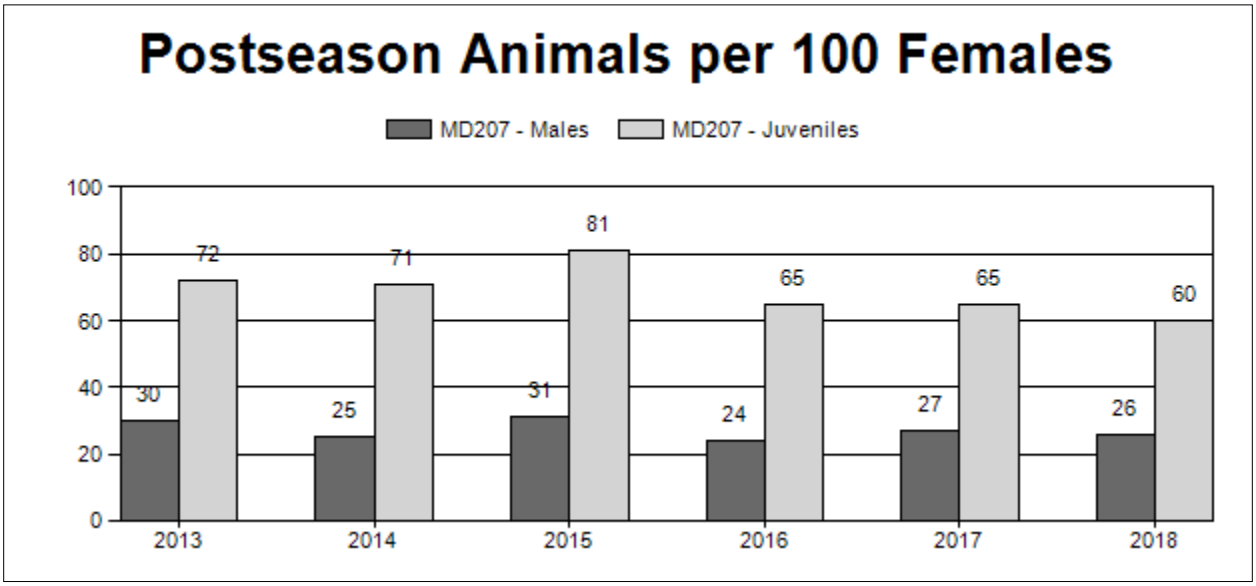

Harvest
MD207 - MALES
MD207 - FEMALES
MD207 - JUV
MD207 - TOTAL
1000
800
600
400
200
0
641
179
20
840
517
140
17
674
536
59
12
607
660
182
12
854
602
176
20
798
505
160
15
680
2013
2014
2015
2016
2017
2018


Number of Active Licenses
MD207 - TOT
MD207 - RES
MD207 - NONRES
2000
1500
1000
500
0
1,620
1,002
618
1,370
962
408
1,240
909
331
1,444
967
477
1,453
940
513
1,276
889
387
2013
2014
2015
2016
2017
2018


Harvest Success
Hunter Success
Active License Success %
60
40
20
0
52
51
49
49
49
47
59
55
55
52
53
50
2013
2014
2015
2016
2017
2018


Active Licenses
MD207 - Active Licenses
2000
1500
1000
500
0
1,654
1,378
1,286
1,549
1,524
1,365
2013
2014
2015
2016
2017
2018


Days per Animal Harvested
MD207 - Days
10
8
6
4
2
0
8.7
8.8
9.7
7.3
7.9
8.3
2013
2014
2015
2016
2017
2018


Postseason Animals per 100 Females
MD207 - Males
MD207 - Juveniles
100
80
60
40
20
0
30
72
25
71
31
81
24
65
27
65
26
60
2013
2014
2015
2016
2017
2018

2013 - 2018 Postseason Classification Summary

for Mule Deer Herd MD207 - PAINTROCK

		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	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2013	9,500	98	0	0	0	141	239	15%	789	49%	570	36%	1,598	904	12	18	30	± 3	72	± 5	55
2014	9,000	94	0	0	0	85	179	13%	704	51%	499	36%	1,382	1,167	13	12	25	± 3	71	± 5	57
2015	9,000	115	96	56	5	0	272	15%	864	47%	703	38%	1,839	1,724	13	18	31	± 3	81	± 5	62
2016	8,000	71	87	63	4	0	225	13%	919	53%	593	34%	1,737	1,214	8	17	24	± 2	65	± 4	52
2017	8,301	92	137	81	10	0	320	14%	1,175	52%	766	34%	2,261	1,164	8	19	27	± 2	65	± 3	51
2018	7,673	98	104	79	9	0	290	14%	1,116	54%	673	32%	2,079	0	9	17	26	± 2	60	± 3	48

2019 HUNTING SEASONS
PAINTROCK MULE DEER HERD (MD207)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
41		Oct. 15	Oct. 24		General	Antlered mule deer or any white-tailed deer
41		Oct. 15	Oct. 31		General	Antlerless deer valid on or within one-half (1/2) mile of irrigated land
41	6	Oct. 15	Nov. 15	150	Limited quota	Doe or fawn valid on or within one-half (1/2) mile of irrigated land
46		Oct. 15	Oct. 24		General	Antlered mule deer or any white-tailed deer
47		Oct. 15	Oct. 24		General	Antlered mule deer or any white-tailed deer
47		Oct. 15	Oct. 31		General	Antlerless deer valid on or within one-half (1/2) mile of irrigated land
47	6	Oct. 15	Nov. 15	100	Limited quota	Doe or fawn valid on or within one-half (1/2) mile of irrigated land

Region R nonresident quota = 600 licenses

Special Archery Season Hunt Areas	Season Dates	
	Opens	Closes
41, 46, 47	Sep. 1	Sep. 30

Management Evaluation

Current Postseason Population Management Objective: 11,000
Management Strategy: Recreational
2018 Postseason Population Estimate: 7,673
2019 Proposed Postseason Population Estimate: 7,826
2018 Hunter Satisfaction: 67% Satisfied, 17% Neutral, 16% Dissatisfied

Herd Unit Issues

The Paintrock mule deer herd unit is about 30% below its post-season population objective of 11,000 deer under recreational management. The objective was lowered in 2013 from 13,000 (set in 1995) to 11,000 deer, because the population was on a downward trajectory, and 13,000 deer was thought to be unattainable after years of drought. Deer survival and productivity are rarely affected by anthropogenic land uses. Bentonite mining and oil/gas development occur in marginal mule deer habitat on the west side of the herd unit. Chronic wasting disease prevalence is increasing in the herd unit and could limit the growth potential of the population. Riparian habitat on private land is farmed which increases available forage, but landowner tolerance of deer-caused crop damage is low. In an effort to slow the population's decline, fairly conservative

(10-day; antlered only) general hunting seasons are designed to allow some harvest of mule deer on public land, while licenses valid within ½ mile of irrigated land are designed to specifically harvest deer causing crop damage.

Weather

Temperature and precipitation data referenced in this section were summarized for the Bighorn Basin (Climate Division #4) by the National Oceanic and Atmospheric Administration at https://www.ncdc.noaa.gov/cag/divisional/time-series. Thirty-year averages constitute that spring 2018 experienced warmer temperatures and below average precipitation. Average temperature and precipitation for summer months were above and below average respectively. During the fall of 2018, precipitation was significantly below normal and temperatures above normal. Temperatures were above normal for December and January, turning colder than average in February. Precipitation was near normal for December and January. The Paintrock mule deer herd experienced a milder than normal winter in 2018-19, likely resulting in an increase of juvenile survival and increased body condition of adult females which will likely have a cascading impact on subsequent population growth in 2019.

Figure 1.

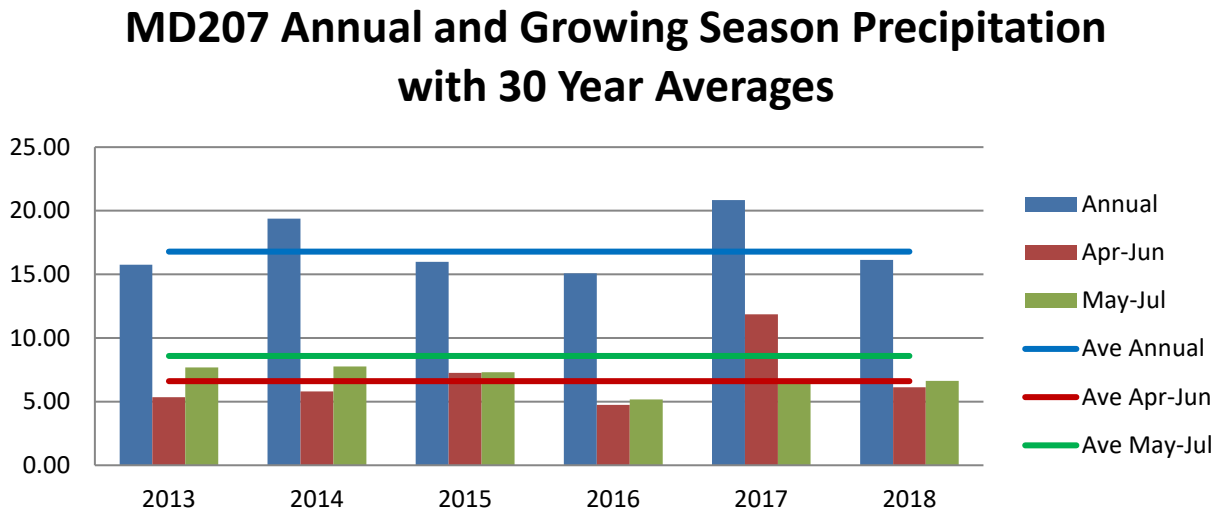
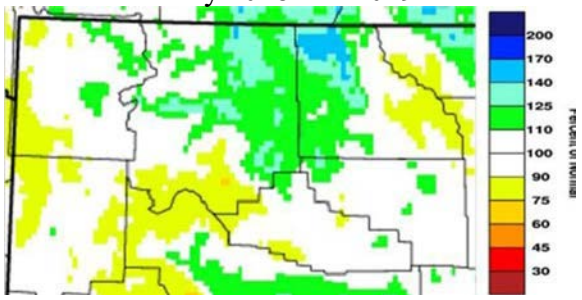
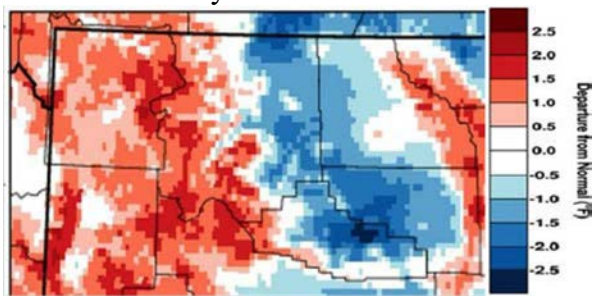


Figure 2.

Departure from normal precipitation (in) for the Bighorn Basin, WY. May 2018-Jan 2019



Departure from normal temperature (˚F) for the Bighorn Basin, WY. May 2018-Jan 2019



Habitat

The herd unit is approximately 1500 mi^2 composed of multiple biomes including, sagebrush-steppe, conifer timber stands, mixed-mountain shrublands, and aspen woodlands. Mule deer habitat in the Paintrock herd unit should be analyzed according to how it's utilized by deer and their respective life history strategy. Like much of the Bighorn Basin, two distinct life history strategies exist amongst mule deer: resident (non-migratory) and migratory deer. Resident deer persist within riparian corridors along Shell Creek, Nowood River, and the Bighorn River and utilize agricultural lands year-round. This has resulted in cropland damage, low landowner tolerance of deer, and the subsequent institution of harvest strategies targeted at alleviating these damage concerns. Resident mule deer habitat is predominantly low elevation sage-brush steppe bisected by riparian corridors composed of deciduous woodlands and irrigated lands. Native plant foraging opportunities for resident mule deer are marginal and heavily impacted by exotic plant invasion. Damage concerns, disease prevalence, and invasive plant abundance make resident mule deer population trends a poor indicator of habitat condition within the herd unit. Migratory deer comprise the majority of deer within the herd unit and exhibit a life-history strategy where individuals utilize forb-rich mesic habitat at the mid to upper elevations (7-10,000ft) in the Bighorn Mountains as parturition and summer range. Deer exhibit migratory behavior as weather drives them down to more xeric and shrub-dominated winter range (4-6500ft). Some migratory deer will comingle with resident populations and contribute to damage on agricultural lands. Habitat utilization is monitored on shrub dominated winter range, used seasonally by migratory deer. Shrub species most used and monitored are curl-leaf mahogany *Cercocarpus ledifolia* and sagebrush *Artemesia tridentate spp.* Two WGFD Wildlife Habitat Management Areas (Medicine Lodge and Renner) are in this herd unit. To provide a general trend of shrub productivity and mule deer browsing pressure, two sagebrush transects were set up in 2004. Utilization of sagebrush in the North Brokenback drainage ranges from <1% to 3% (2004-2018) and in the Alkali drainage ranges from 3% to 24% (2004-2018). Plant health is not affected by such low utilization levels. Snow depth also influences mule deer concentration, and subsequent utilization levels, at these sites. Curl-leaf mahogany leader length is not monitored in this herd unit, however, production on severely browsed and decadent plants was significant in 2018, as a result of increased precipitation. This is likely to increase survival and body condition of wintering mule deer.

Field Data

We collect classification data each December from aerial helicopter surveys at higher elevations and standardized ground survey routes at lower elevations. The 2018 buck ratio is 26 bucks per 100 does which is near the 5-year-average (28:100) and within the recreational management guidelines. The 2018 fawn ratio (60:100) is below the 5-year-average (70:100), and indicates a declining population (Unsworth et al. 1999). In this herd unit, fawn ratios drop during drought (2000-04=54:100), rally during good moisture years (2013-15 = 75:100), and level out during average moisture years (2016-17 = 65:100). Meeting our required minimum sample size, we classified 2,079 mule deer in 2018, which is above the 5-year average (2013-18 = 1,816).

Harvest Data

53% of hunters were successful (2013-17 = 50%) at harvesting a mule deer (n = 680) in 2018. The total number of deer harvested mirrors doe/fawn licenses issued. Hunters in 2018 averaged 8.3 days per harvest, about average (2013-17 = 8.5 days). About 67% of hunters were satisfied with their hunting experience during the 2017 season, with 17% neutral, and 16% dissatisfied.

The hunting season structure has remained fairly constant over the past 20 years. Doe/fawn licenses are issued in response to crop damage. General licenses are open Oct. 15 to Oct. 31st. Hunt Areas vary between "any deer" and "antlered deer" depending on trends in the previous year's sex and age ratios. A 4-point antler restriction was enacted during the 2002 and 2003 hunting seasons when the buck ratio dropped to 16:100 in 2001. Although buck ratios have historically been within the range of recreational management, many of these bucks are young and/or small (<20" antler spread), creating dissatisfaction among a vocal group of hunters.

Population

The spreadsheet model estimates 7,673 post-season mule deer for 2018; this is 30% below the management objective of 11,000 deer. We selected the Time-Specific Juvenile/Constant Adult (TSJ, CA) survival model. We chose the TSJ, CA model, because the AIC score (159) is within the same order of magnitude as the lowest AIC score (121; CJ, CA). Additionally modeling for constant juvenile survival doesn't make sense with mule deer herds, where reproductive rates are closely linked to variable climate and habitat. Some caution is warranted when reviewing this model, since the model has never been anchored to a robust abundance estimate and therefore this model likely performs poorly. It does however seem to accurately track the trend in population performance.

Management Summary

Since the early 1990s, several metrics show the Paintrock mule deer population is declining, with only slight increases during good moisture years with higher fawn ratios. Buck ratios stabilized over the past 5 years, but this could be an unintended product of less does in the population. Vocal hunters urge more conservative buck seasons, focusing on antler point restrictions to increase buck numbers to previous levels and to increase number of trophy (>25" antler width) bucks available. Nonresident hunters made up only 33% of general hunters in 2018, but took 45% of all harvested bucks. The nonresident Region R quota started at 1,500 hunters in 1996 coinciding with high deer abundance in the Paintrock and western North Bighorn herd units. That quota declined to 1,000 hunters in 2004 then to 750 hunters in 2014 in response to declining mule deer numbers. Due to continued mule deer declines in both the Paintrock and North Bighorn herds, the region R quota was decreased to 600 in 2018. However, this does not address the large-scale habitat shifts and other contributing factors, such as disease, competition, and nutrition limitations. The Paintrock mule deer share parturition habitat with an elk herd (EL211) which currently and historically has exceeded the population objective. Low fawn ratios in the Paintrock and neighboring North Bighorn mule deer herds could be an indicator of decreased maternal body condition or parturition habitat quality (Shallow et al. 2015). We believe interspecific competition and resource depletion from elk is a contributing factor to poor population performance in the Paintrock herd. While the Paintrock mule deer herd seems to be on a declining trajectory, more work needs to be done to fully understand the factors associated with population growth, specifically summer range quality, nutrition limitations, and the impact of chronic-wasting disease.

Literature Cited

Shallow,J.R.T., M.A. Hurley, K.L. Monteith, and T.R. Bowyer. 2015**.** Cascading effects of habitat on maternal condition and life-history characteristics of neonatal mule deer. Journal of Mammalogy 96:1

Unsworth, J.W., D.F. Pac, G. C. White, and R.M. Bartman. 1999. Mule deer survival in Colorado, Idaho, and Montana. Journal of Wildlife Management 36:315-326.

2018 - JCR Evaluation Form

SPECIES: Mule Deer
PERIOD: 6/1/2018 - 5/31/2019

HERD: MD208 - SOUTHWEST BIGHORNS

HUNT AREAS: 35-37, 39-40, 164
PREPARED BY: BART KROGER

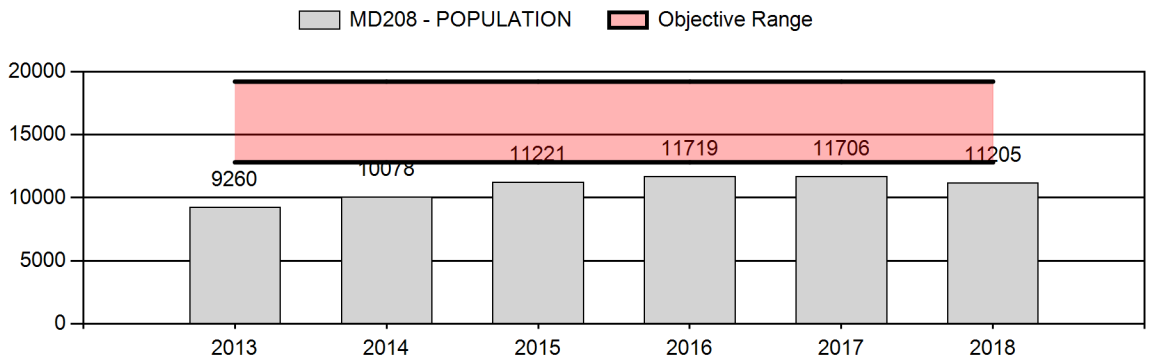
	2013 - 2017 Average	2018	2019 Proposed
Population:	10,797	11,205	11,429
Harvest:	1,194	1,350	1,300
Hunters:	2,022	2,019	2,000
Hunter Success:	59%	67%	65 %
Active Licenses:	2,095	2,164	2,200
Active License Success:	57%	62%	59 %
Recreation Days:	8,730	8,431	8,500
Days Per Animal:	7.3	6.2	6.5
Males per 100 Females	35	37	
Juveniles per 100 Females	68	52	

Population Objective (± 20%) :	16000 (12800 - 19200)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-30.0%
Number of years population has been + or - objective in recent trend:	5
Model Date:	2/22/2019

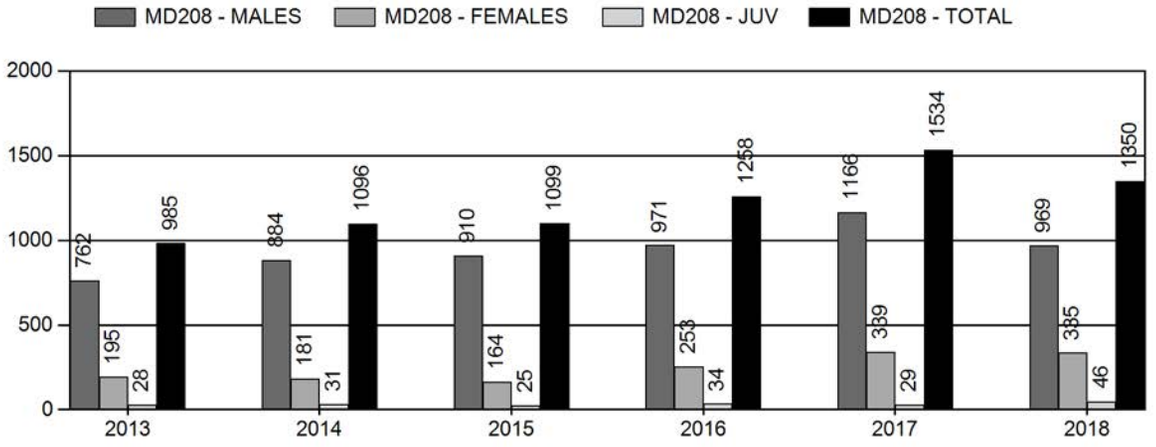
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	JCR Year	Proposed
Females ≥ 1 year old:	6%	6%
Males ≥ 1 year old:	32%	33%
Total:	11%	11%
Proposed change in post-season population:	-4%	+2%

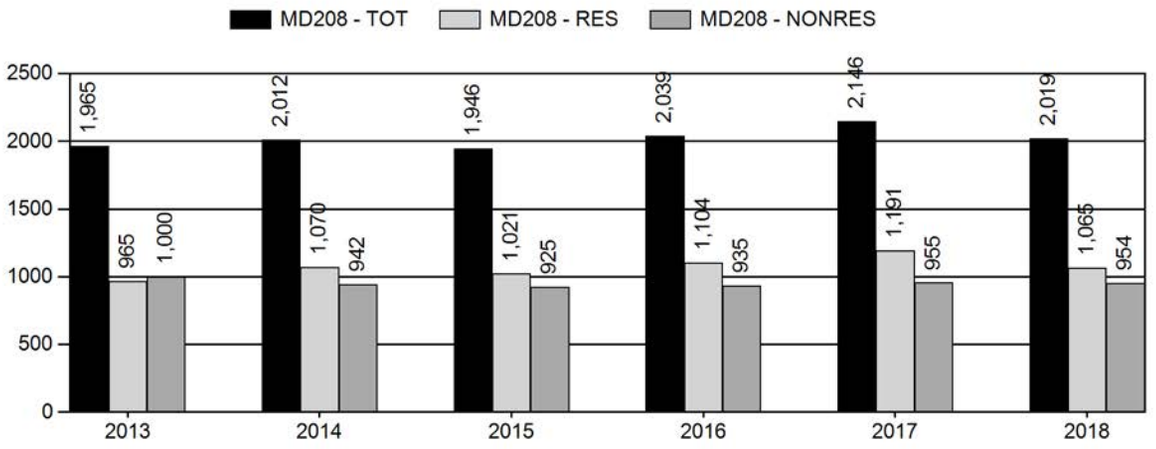
Population Size - Postseason



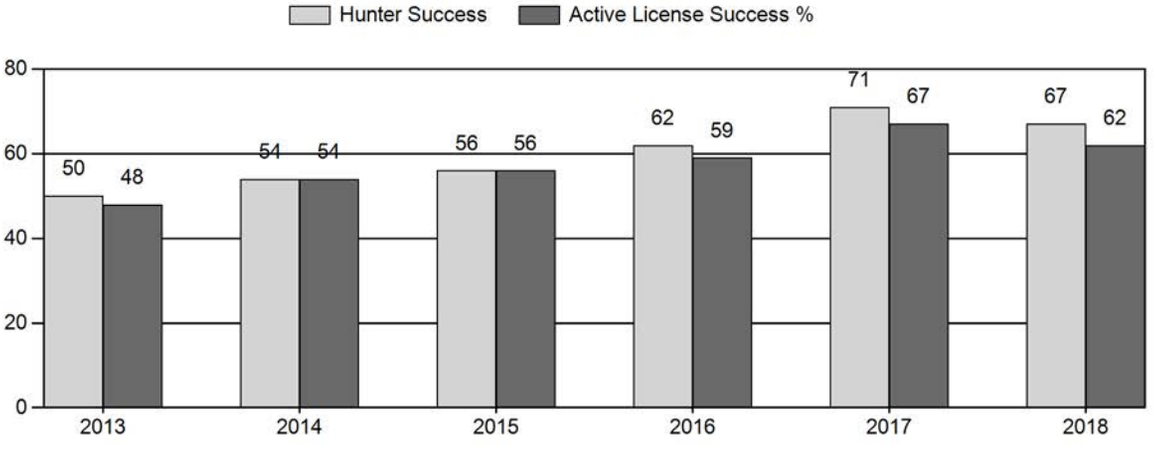
Harvest



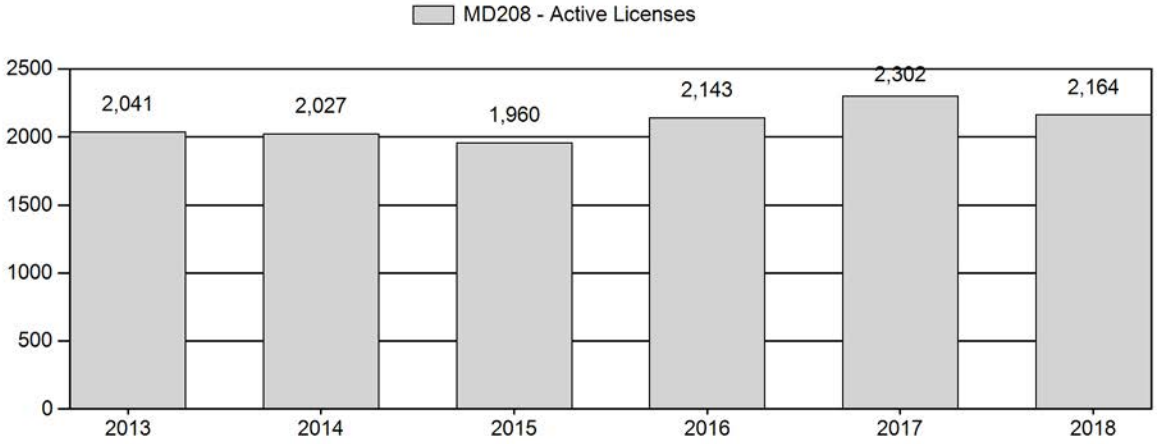
Number of Active Licenses



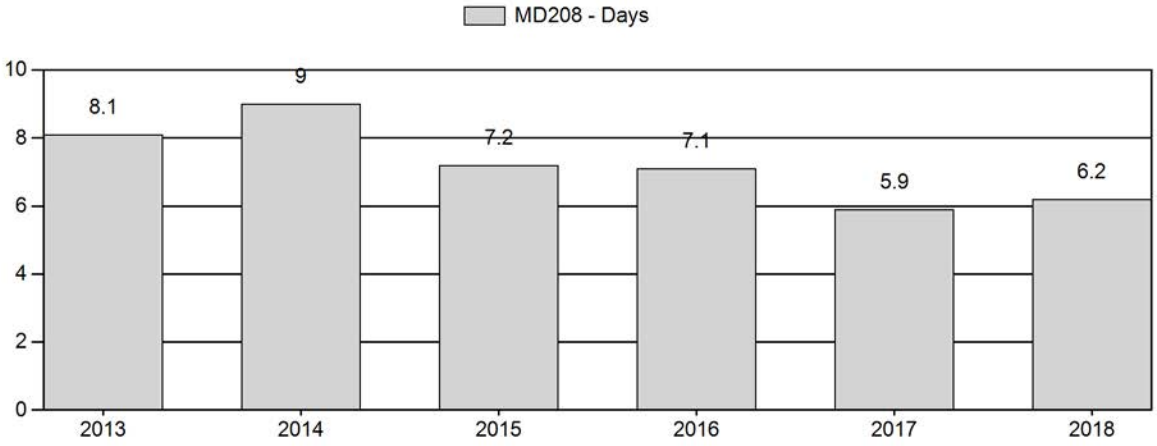
Harvest Success



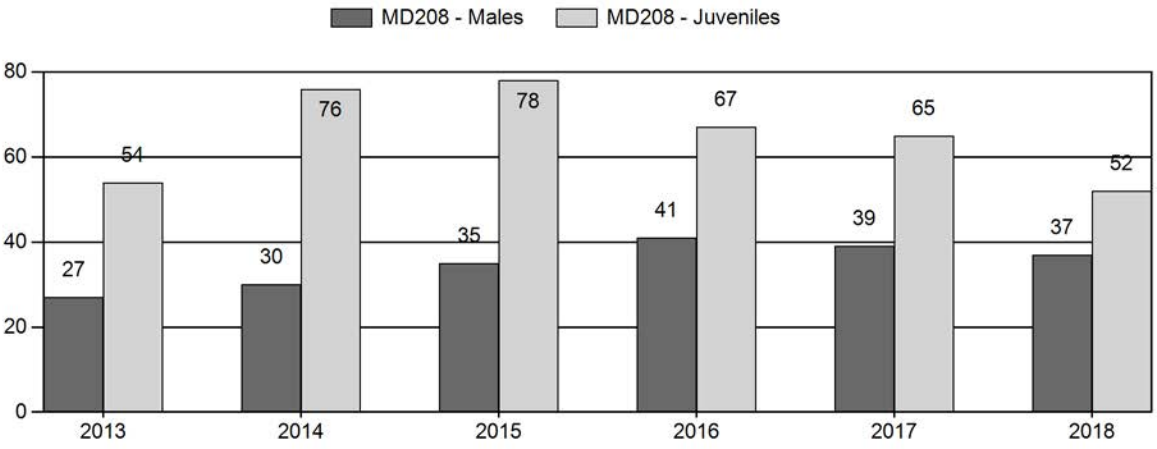
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2013 - 2018 Postseason Classification Summary

for Mule Deer Herd MD208 - SOUTHWEST BIGHORNS

		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
2013	9,260	76	0	0	0	153	229	15%	858	55%	464	30%	1,551	918	9	18	27	± 2	54	± 4	43
2014	10,078	93	40	40	6	83	262	14%	882	49%	674	37%	1,818	1,584	11	19	30	± 2	76	± 5	59
2015	11,221	107	102	67	16	40	332	16%	961	47%	747	37%	2,040	814	11	23	35	± 3	78	± 4	58
2016	11,719	112	175	101	17	0	405	20%	979	48%	659	32%	2,043	1,406	11	30	41	± 3	67	± 4	48
2017	11,706	138	144	116	20	0	418	19%	1,069	49%	696	32%	2,183	1,281	13	26	39	± 3	65	± 4	47
2018	11,205	70	127	85	20	0	302	19%	826	53%	433	28%	1,561	904	8	28	37	± 3	52	± 4	38

2019 HUNTING SEASONS
SOUTHWEST BIGHORNS MULE DEER HERD (MD208)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
35		Oct. 15	Oct. 31		General	Any deer
36	1	Oct. 15	Oct. 31	425	Limited quota	Antlered mule deer or any white-tailed deer
36	8	Oct. 15	Oct. 31	25	Limited quota	Doe or fawn white-tailed deer
37	1	Oct. 15	Oct. 31	225	Limited quota	Antlered deer
37,39	3	Nov. 1	Nov. 30	25	Limited quota	Any white-tailed deer
37	6	Sep. 1	Nov. 15	150	Limited quota	Doe or fawn valid on or within one-half (1/2) mile of irrigated land
39		Oct. 15	Oct. 25		General	Antlered deer
39	8	Oct. 15	Nov. 15	50	Limited quota	Doe or fawn white-tailed deer
40		Oct. 15	Oct. 31		General	Antlered deer valid on national forest; any deer off national forest
40	6	Oct. 15	Oct. 31	200	Limited quota	Doe or fawn valid off national forest
40	8	Oct. 15	Nov. 30	300	Limited quota	Doe or fawn white-tailed deer
164		Oct. 1	Oct. 10		General	Any deer
164	3	Nov. 1	Nov. 30	50	Limited quota	Any white-tailed deer, also valid in Area 125
164	6	Oct. 25	Nov. 15	100	Limited quota	Doe or fawn valid on or within one-half (1/2) mile of irrigated land
164	7	Oct. 1	Oct. 10	50	Limited quota	Doe or fawn valid on or within one-half (1/2) mile of irrigated land
164	8	Nov. 1	Dec. 15	100	Limited quota	Doe or fawn white-tailed deer, also valid in Area 125

Region M Nonresident general license quota –800 licenses

Special Archery Season Hunt Areas	Season Dates	
	Opens	Closes
35, 36, 37, 39, 40, 164	Sep. 1	Sep. 30

Hunt Area	Type	Quota change from 2018
36	1	+50
37	1	+25

39	8	+50 new license
40	8	+100
164	3	+25
164	7	+50
164	8	+100
HU Total	**1**	**+75**
	3	**+25**
	7	**+50**
	8	**+250**

Management Evaluation

Current Postseason Population Management Objective: 16,000
Management Strategy: Recreational
2018 Postseason Population Estimate: 11,200
2019 Proposed Postseason Population Estimate: 11,400
2018 Hunter Satisfaction: 72% satisfied, 16% neutral, 12% dissatisfied

Herd Unit Issues

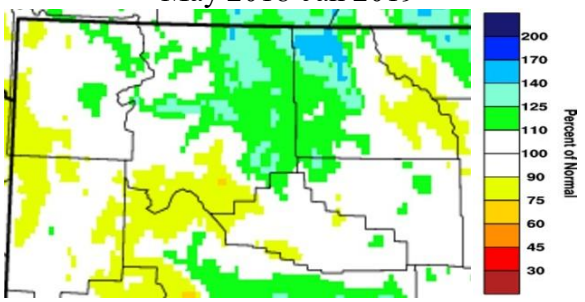
The herd unit is about 70% public land and 30% private land. Deer densities are typically higher in the mid to upper elevations, while the lower elevation desert areas support fewer deer. Poor habitat conditions, long-term drought, crop damage and chronic wasting disease (CWD) continue to be major management concerns for this herd. CWD prevalence has increased in portions of this herd unit, specifically south of Worland in Hunt Area 164, where localized resident deer herds are likely declining because of this disease. Hunter access in the southern and eastern portion of this herd unit is very difficult because of private lands. A sightability survey was flown in February 2017, which resulted in a population estimate of about 11,800 deer, nearly 5,000 fewer deer than the model estimate.

The herd objective and management strategy was last evaluated and approved in 2014, and at that time the population objective was changed from 28,000 deer to 16,000 deer. For the 2019 (5-year) objective review we will maintain the current objective and recreational management strategy for this deer herd. Based on internal discussions and conversations with landowners and hunters, along with the recent change to the objective in 2014, we feel there is no need to again change this objective. Based on our 2017 sightability survey estimate (~12,000 deer), we feel comfortable staying at the current objective while still allowing the population to grow.

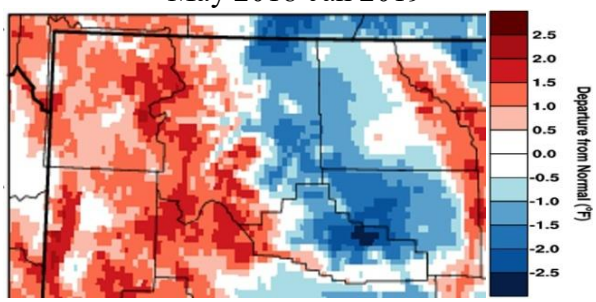
Weather

Above normal precipitation occurred in the northern portions of this herd unit, while the southern portions saw about average conditions during 2018. Most precipitation during the 2018 bio-year occurred during the spring and early summer, and then fell below average during the late summer and fall periods. Below normal temperatures were mostly widespread through the herd unit during the year. Winter temperatures and snowfall have mostly been below normal for the herd unit, and at this time so significant winter die-offs have been observed.

Departure from normal precipitation (in) for the Bighorn Basin, WY.
May 2018-Jan 2019



Departure from normal temperature (˚F) for the Bighorn Basin, WY.
May 2018-Jan 2019



Habitat

Mule deer habitat conditions in this herd unit have declined over the past several decades, mostly due to drought conditions in the 1990's, loss of sagebrush communities due to wildfires, and the invasion of cheatgrass throughout the landscape. Lack of precipitation has also affected available water in many stock reservoirs and perennial streams. Because of these less than optimal habitat conditions, this deer population will likely continue to remain at or below objective levels. Portions of this deer herd will continue to seek better forage and water availability on or near agricultural croplands, thus harvest strategies to reduce damage concerns will continue into the future. Two sagebrush transects were established in this herd unit in September 2004 (Appendix A). Annual production (leader growth) for these transects has averaged around 2.0cm. Winter utilization remains low at about 10% for these transects.

Field Data

Both aerial and ground surveys are used in obtaining post-season classification data for this deer herd. Adequate sample sizes are typically exceeded, mainly because routine classification routes for each hunt area are maintained to compare trends over time. Historically post-season fawn ratios have remained fairly consistent in this herd unit, averaging around 60 fawns:100 does. However, between 2014 and 2017 fawn ratios increased to an average of 72:100. Unfortunately, the 2018 fawn ratio dropped to 52:100. Buck ratios typically average around 32:100 for this herd, but in 2016 and 2017 the ratio jumped to around 40:100, but declined slightly to 37:100 in 2018. The recent increased fawn production has resulted in an overall increase in the deer population. Between 2012 and 2017 the number of deer classified increased by nearly 80%, with 2,183 deer being classified in 2017, however dropped to only 1,561 in 2018.

Harvest Data

Recent harvest statistics further support increased deer numbers in this herd. Between 2013 and 2017 overall buck harvest increased by more than 50%, while hunter success increased from 50% in 2013 to 71% in 2017. In 2018, buck harvest dropped by nearly 100 bucks compared to 2017, and hunter success dropped slightly to 67%. These harvest trends also reflect field personnel perceptions that deer numbers have increased and hunting conditions have improved, but the 2018 harvest showed some declines which field personnel also perceived during the 2018 hunting season. Doe/fawn harvest has nearly doubled since 2015 because of increasing deer numbers, with a 2018 harvest of 370 does and fawns. Hunter effort has improved slightly in recent years from 9.0 days in 2014 to 6.2 days in 2018.

Population

The Constant Juvenile and Constant Adult Survival (CJ and CA) spreadsheet model best represents the long-term population trend for this herd. The model has the lowest AIC (n=90), and supports an adequate representation of recent trends in the population and best reflects the current perceptions of field personnel, harvest statistics and classification sample sizes. Overall, the model is considered a good representation of herd trend and population.

Management Summary

With recent improving deer numbers, and an overall hunter satisfaction rating of 72%, slight increases in Type 1 license quotas will occur for Hunt Areas 36 and 37. Hunt Area 164 will see a new Type 7 license with a quota of 50 to mainly control and minimize damage concerns south of Worland. The Region M quota of 800 licenses will remain the same for 2019. All other changes will be directed at increasing white-tailed deer harvest within the herd unit. The projected 2019 harvest is about 1,300 deer, with a post-season 2019 estimate of around 11,400 deer.

2018 - JCR Evaluation Form

SPECIES: Mule Deer
PERIOD: 6/1/2018 - 5/31/2019

HERD: MD209 - BASIN

HUNT AREAS: 125, 127
PREPARED BY: BART KROGER

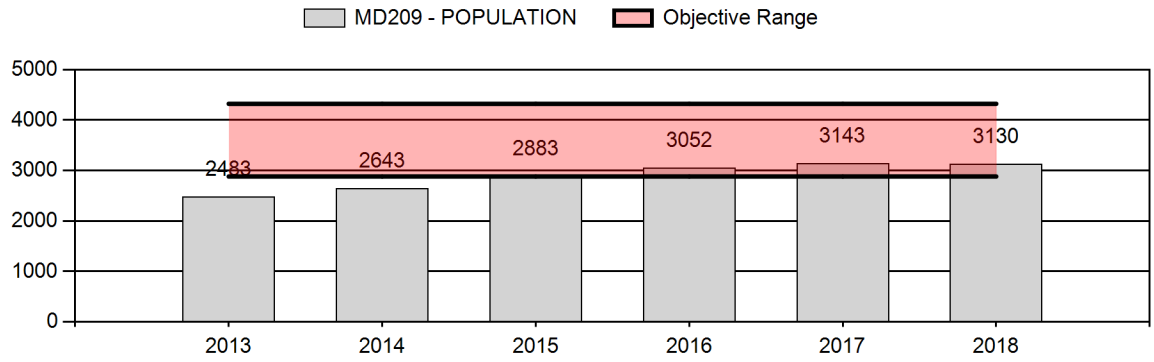
	2013 - 2017 Average	2018	2019 Proposed
Population:	2,841	3,130	3,138
Harvest:	151	134	130
Hunters:	304	282	290
Hunter Success:	50%	48%	45%
Active Licenses:	317	284	290
Active License Success:	48%	47%	45%
Recreation Days:	1,181	1,123	1,100
Days Per Animal:	7.8	8.4	8.5
Males per 100 Females	35	35	
Juveniles per 100 Females	66	53	

Population Objective (± 20%) :	3600 (2880 - 4320)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-13.1%
Number of years population has been + or - objective in recent trend:	10
Model Date:	2/22/2019

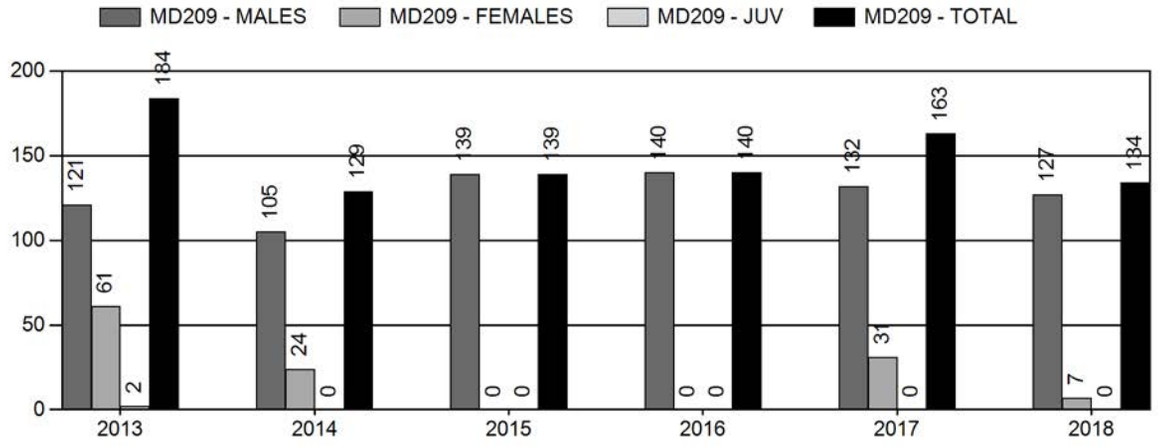
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	JCR Year	Proposed
Females ≥ 1 year old:	1%	0%
Males ≥ 1 year old:	16%	17%
Total:	4%	4%
Proposed change in post-season population:	0%	0%

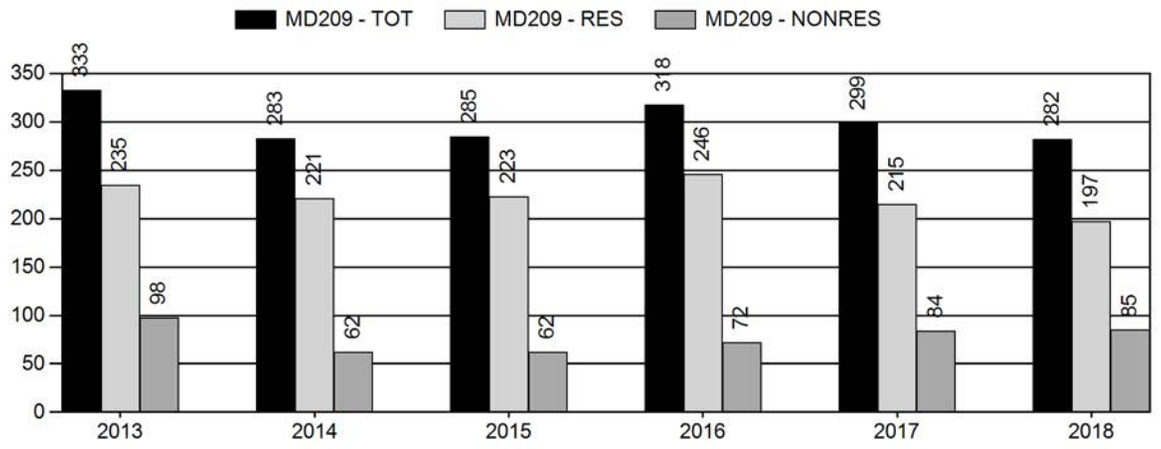
Population Size - Postseason



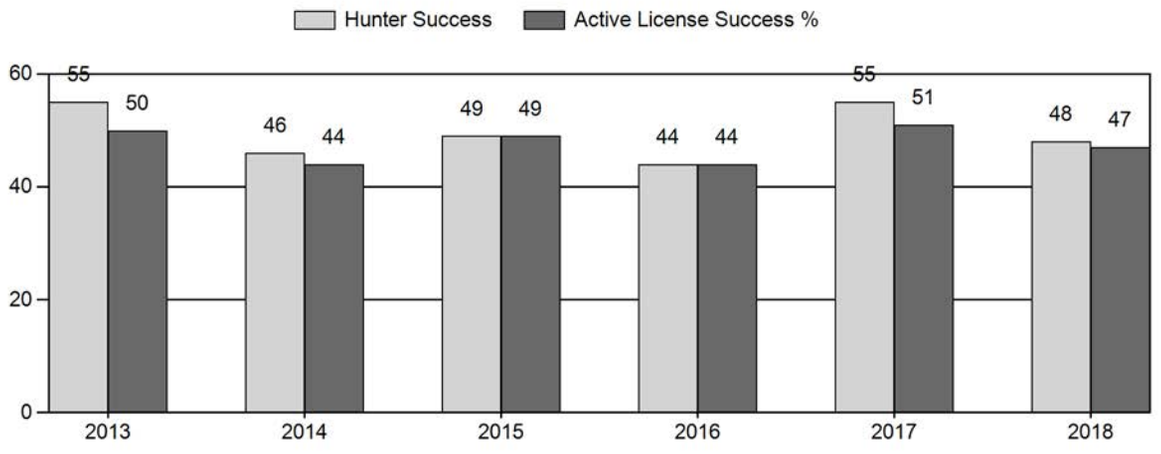
Harvest



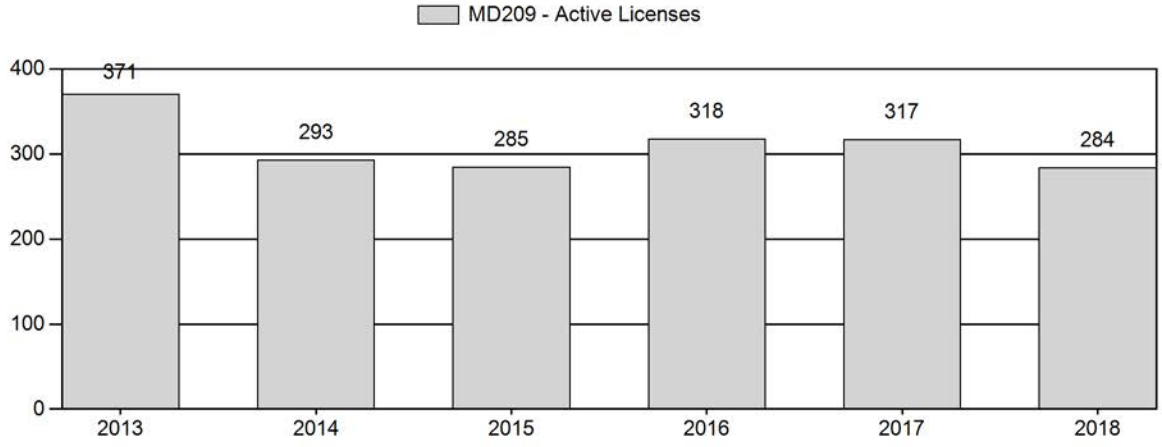
Number of Active Licenses



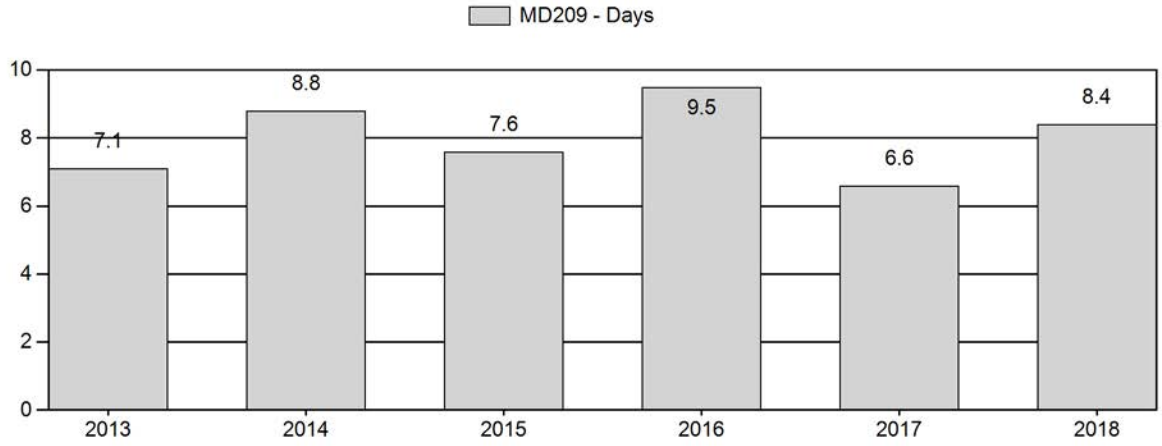
Harvest Success



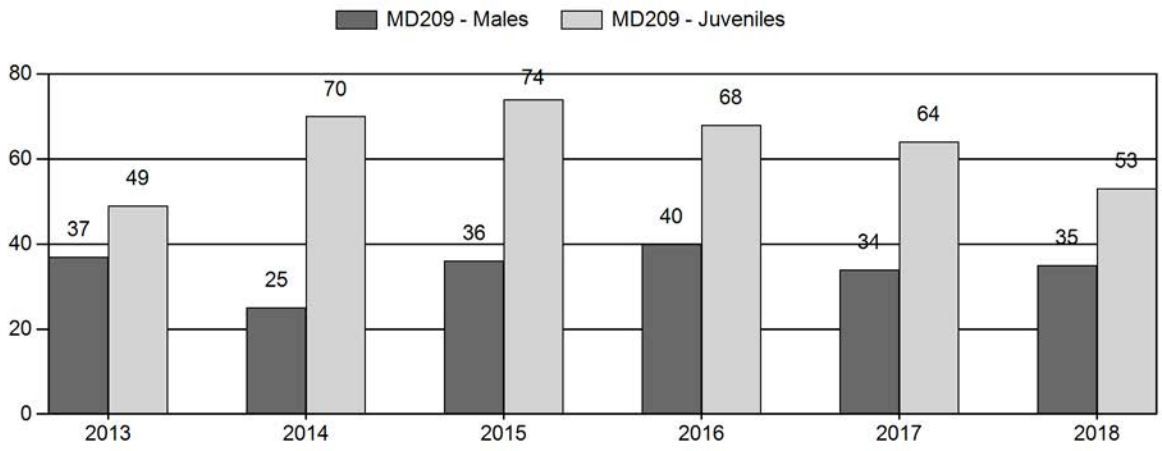
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2013 - 2018 Postseason Classification Summary

for Mule Deer Herd MD209 - BASIN

		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
2013	2,483	30	0	0	0	58	88	20%	236	54%	116	26%	440	669	13	25	37	± 5	49	± 6	36
2014	2,643	17	0	0	0	35	52	13%	210	51%	147	36%	409	998	8	17	25	± 5	70	± 9	56
2015	2,883	33	44	23	5	0	105	17%	295	48%	218	35%	618	1,118	11	24	36	± 5	74	± 7	54
2016	3,052	42	103	34	4	0	183	19%	460	48%	314	33%	957	1,004	9	31	40	± 4	68	± 5	49
2017	3,143	25	29	37	5	0	96	17%	283	51%	181	32%	560	953	9	25	34	± 5	64	± 7	48
2018	3,130	29	55	28	5	0	117	19%	336	53%	179	28%	632	759	9	26	35	± 4	53	± 6	40

2019 HUNTING SEASONS
BASIN MULE DEER HERD (MD209)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
125	1	Nov. 1	Nov. 15	100	Limited quota	Antlered deer
125	6	Sep. 15	Oct. 15	25	Limited quota	Doe or fawn valid on or within one-half (1/2) mile of irrigated land
127		Oct. 15	Oct. 24		General	Antlered deer
127	3	Nov. 1	Nov. 30	25	Limited quota	Any white-tailed deer, also valid in Area 125
127	8	Oct. 15	Nov. 30	75	Limited quota	Doe or fawn white-tailed deer

Region X Nonresident General license quota – 300 licenses

Special Archery Season Hunt Areas	Season Dates	
	Opens	Closes
125, 127	Sep. 1	Sep. 30

Hunt Area	Type	Quota change from 2018
127	8	+25
HU Total	**8**	+25

Management Evaluation

Current Postseason Population Management Objective: 3,600
Management Strategy: Recreational
2018 Postseason Population Estimate: 3,100
2019 Proposed Postseason Population Estimate: 3,100
2018 Hunter Satisfaction: 64% satisfied, 18% neutral, 18% dissatisfied

Herd Unit Issues

This herd unit is about 80% public land and 20% private land, however, deer densities are higher on and around private irrigated lands, whereas the dry desert public land areas support fewer deer. Poor habitat conditions, long-term drought, available water sources and chronic wasting disease continue to be major management concerns for this herd. Much of the herd unit is arid desert shrubland, thus limiting the options for vegetation treatment because of the potential for cheatgrass invasion. Since 2006, eight guzzlers have been installed or upgraded to provide additional water sources for deer in this herd unit.

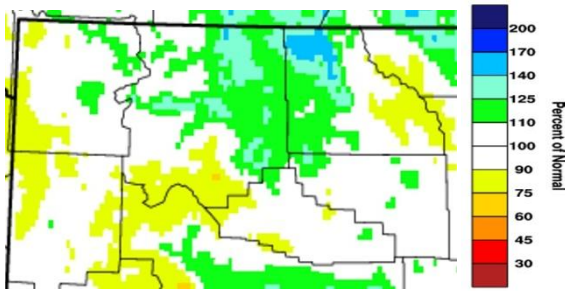
The population objective and management strategy for this herd unit was last evaluated and approved in 2014, and at that time no changes were made. For the 2019 (5-year) objective review we will continue to maintain the current objective and recreational management strategy for this deer herd. Based on internal discussions and conversations with landowners and hunters, along with this herd consistently remaining below objective, we feel there is no need to change the

objective. Most hunters and landowners want to see this deer herd increase, and by staying at the current objective we will have room for increases to occur if they happen.

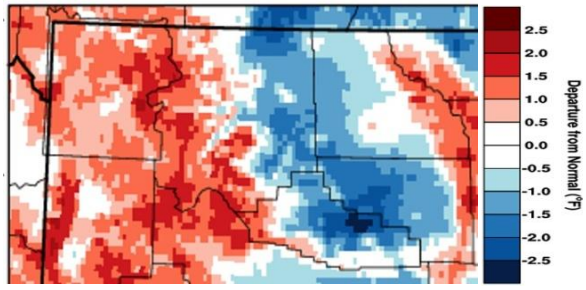
Weather

Generally, this herd unit lies in a 5-7 inch precipitation zone within the interior portions of the Bighorn Basin. Thus, these drier conditions make for poorer habitats and reduced available water for this deer herd as compared to other surrounding herds. Above normal precipitation occurred in the northern portions of this herd unit, while the southern portions saw about average to below normal precipitation during 2018. Most precipitation during the 2018 bio-year occurred during the spring and early summer, and then fell below average during the late summer and fall periods. Below normal temperatures were mostly widespread through the herd unit during the year. Winter temperatures and snowfall have mostly been below normal for the herd unit, and at this time so significant winter die-offs have been observed.

Departure from normal precipitation (in) for the Bighorn Basin, WY.
May 2018-Jan 2019



Departure from normal temperature (˚F) for the Bighorn Basin, WY.
May 2018-Jan 2019



Habitat

Limited opportunities exist to increase forage quality of native plant communities due to the prevalence of cheatgrass in this herd unit. Drought conditions have also affected available water in many stock reservoirs and perennial streams. One sagebrush transect (5-Mile Creek) was established in this herd unit in 2004 (Appendix A). Average sagebrush leader growth since 2008 has average 3cm, with utilization levels at about 15%. Overall, habitat conditions in this herd unit are considered poor to fair at best because of past long-term drought. Until normal moisture regimes return, herd growth and survival will be limited by current habitat conditions.

Field Data

Aerial classifications surveys are used in obtaining post-season buck and fawn ratio for this deer herd. Routine classification routes for each hunt area have been maintained in order to reflect general trends in deer numbers over time. Some of the highest fawn ratios recorded for this deer herd occurred from 2014-2017, with a 4-year average of 70:100. Historically, this deer herd averages around 54:100. The 2018 fawn ratio was 53:100. The number of deer classified in recent years has declined, with 632 classified in 2018 compared to 957 deer in 2016. Buck ratios have averaged around 35:100 the past 6 years.

Spotlight surveys along Gooseberry Creek in Hunt Area 125 have been used the past 30 years to monitor relative trends in deer densities along Gooseberry Creek. Based on these surveys, the

number of deer counted has stayed fairly stable through the early 2000's, with roughly about 100 deer being observed annually. However, between 2015 and 2017 the number observed averaged around 175, but dropped to around 60 deer in 2018. Changes in irrigation practices on private lands along Gooseberry Creek have likely changed the distribution of deer, which is why fewer deer were observed in 2018 compared to previous years. At least one landowner, not included in this trend survey, had over 125 deer using his fields, whereas in previous years had only about 25.

Harvest Data

Male harvest statistics for this deer herd have stayed fairly consistent in recent years, mainly because of unchanged season structures. Since 2013, around 125 bucks are harvested annually from the herd unit, with Hunt Area 125 (limited quota) having about a 72% hunter success and Hunt Area 127 (general season) having about a 33% hunter success. Hunter effort is usually between 7-9 days/harvest. Only 125 does and fawns have been harvested from this herd unit in the past 6 years. Most hunters, landowners and field personnel agree deer numbers have improved in recent years, but declined slightly for 2018. Based on the 2014 hunter satisfaction survey, only 50% of the hunters surveyed indicated they were satisfied with their overall hunting experience, whereas in 2018, 64% were satisfied.

Population

The Semi-Constant Juvenile & Semi-Constant Adult Survival (SCJ, SCA) spreadsheet model was chosen to represent this herd based on its population trend. This model has the lowest AIC value (n=79) of all the models, and its trends mostly reflect that of field personnel perceptions, along with most hunters and landowners. The model is considered to be a fair to good representative of herd trend and population estimate, mainly because it tracks well with classification sample sizes and reflects an increasing to stable population.

Management Summary

The only change to the 2019 seasons is an increase of 25 licenses for the Type 8 doe or fawn white-tailed deer season in Hunt Area 127, along with a change to the license limitation. Although mule deer numbers have improved slightly in recent years, the growth of this herd has always struggled, and will likely remain below objective levels in the future. The projected 2018 harvest is 130 mule deer, with a 2019 post-season population of 3,100 deer, or 14% below objective.

2018 - JCR Evaluation Form

SPECIES: Mule Deer
PERIOD: 6/1/2018 - 5/31/2019

HERD: MD210 - GREYBULL RIVER

HUNT AREAS: 124, 165
PREPARED BY: SAM STEPHENS

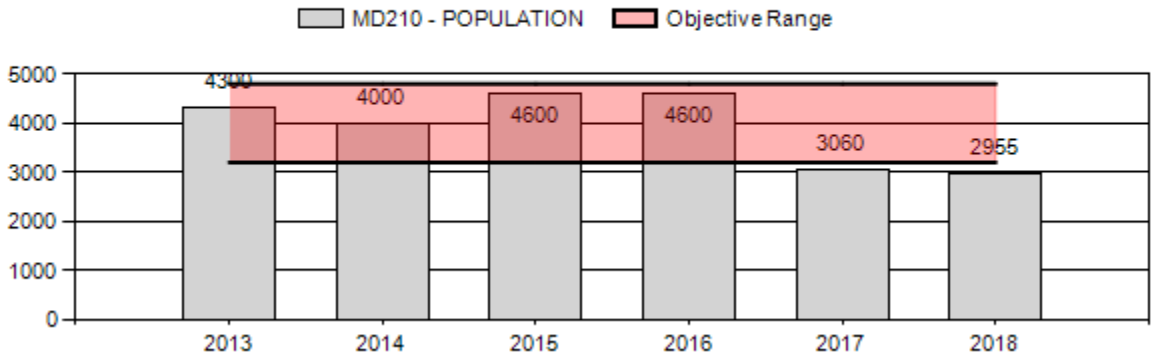
	2013 - 2017 Average	2018	2019 Proposed
Population:	4,112	2,955	3,000
Harvest:	553	457	450
Hunters:	892	896	900
Hunter Success:	62%	51%	50 %
Active Licenses:	1,026	1,010	1,000
Active License Success:	54%	45%	45 %
Recreation Days:	3,358	3,327	3,330
Days Per Animal:	6.1	7.3	7.4
Males per 100 Females	35	31	
Juveniles per 100 Females	92	54	

Population Objective (± 20%) :	4000 (3200 - 4800)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-26.1%
Number of years population has been + or - objective in recent trend:	2
Model Date:	02/22/2019

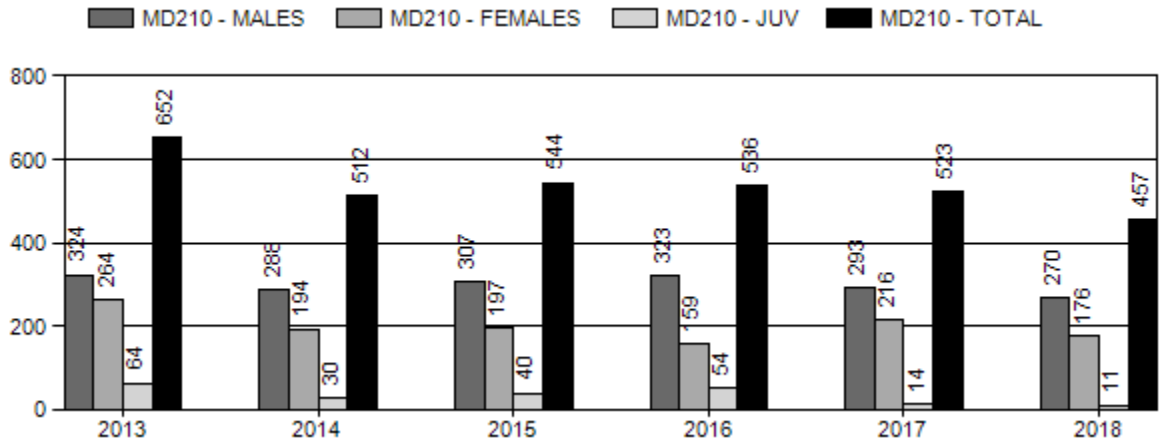
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	JCR Year	Proposed
Females ≥ 1 year old:	8%	8%
Males ≥ 1 year old:	25%	25%
Total:	13%	13%
Proposed change in post-season population:	15%	15%

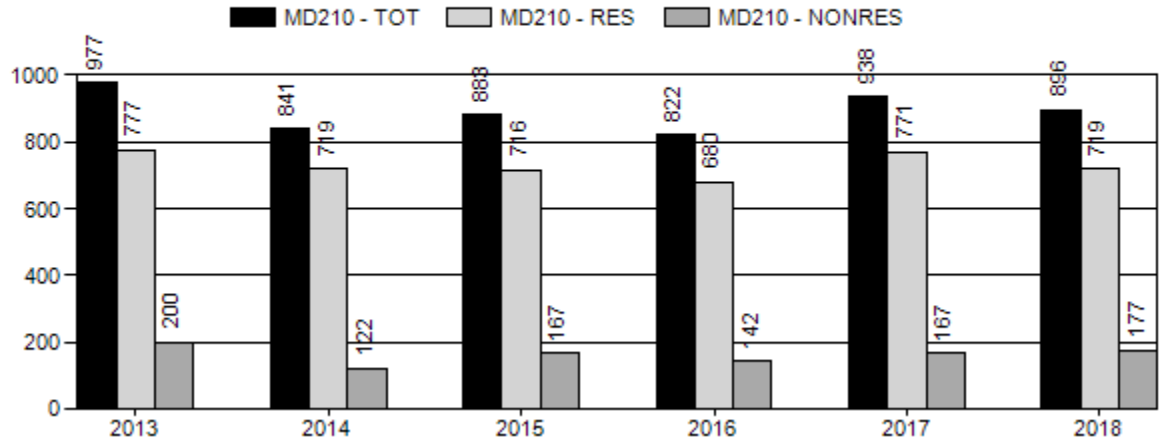
Population Size - Postseason



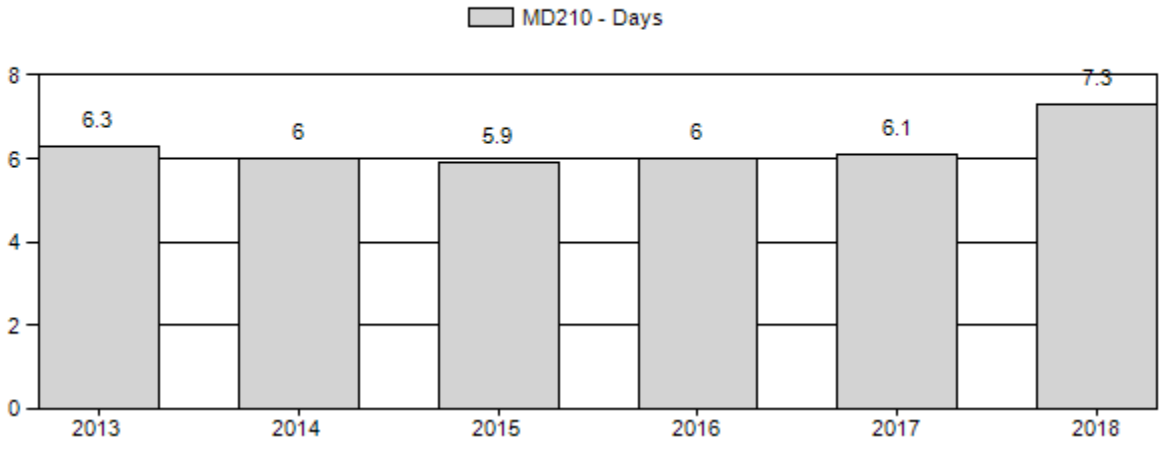
Harvest

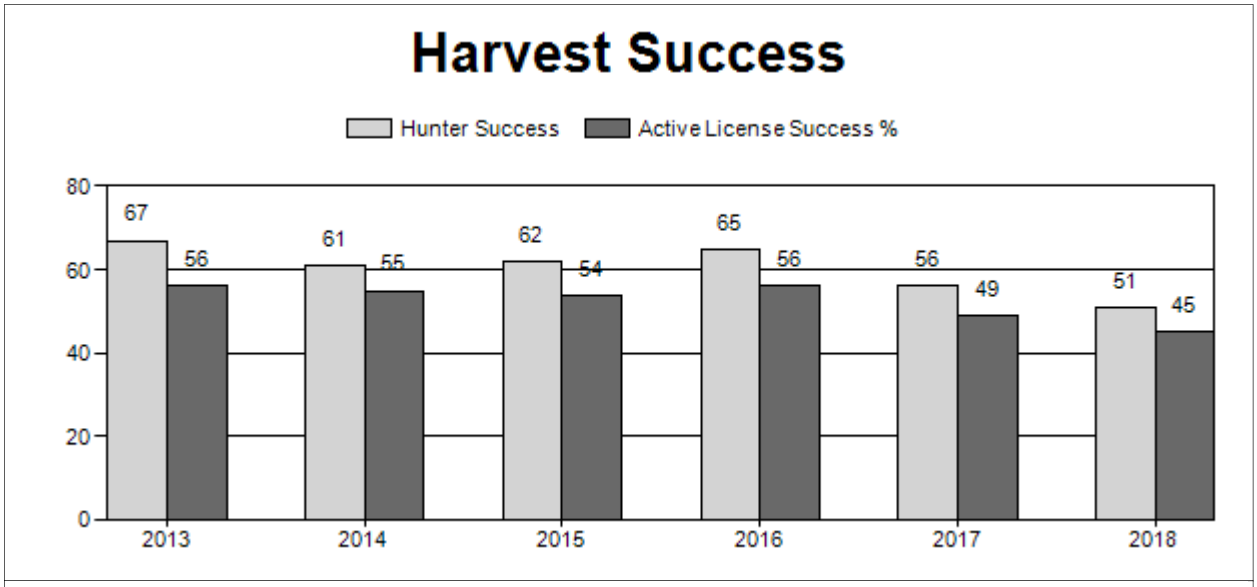


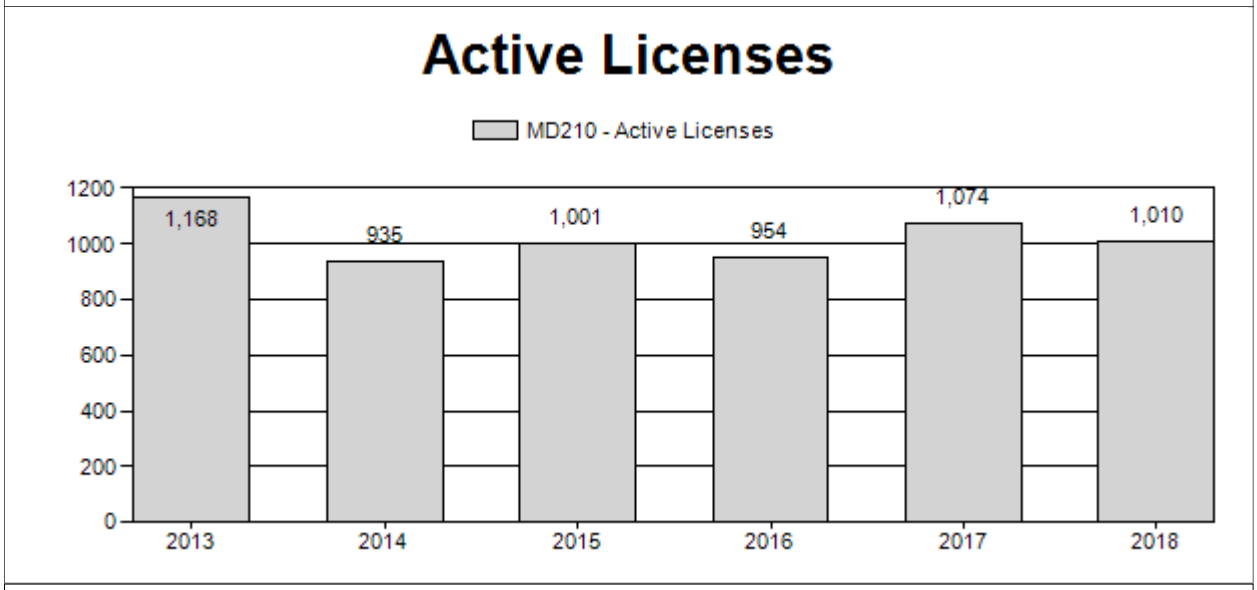
Number of Active Licenses

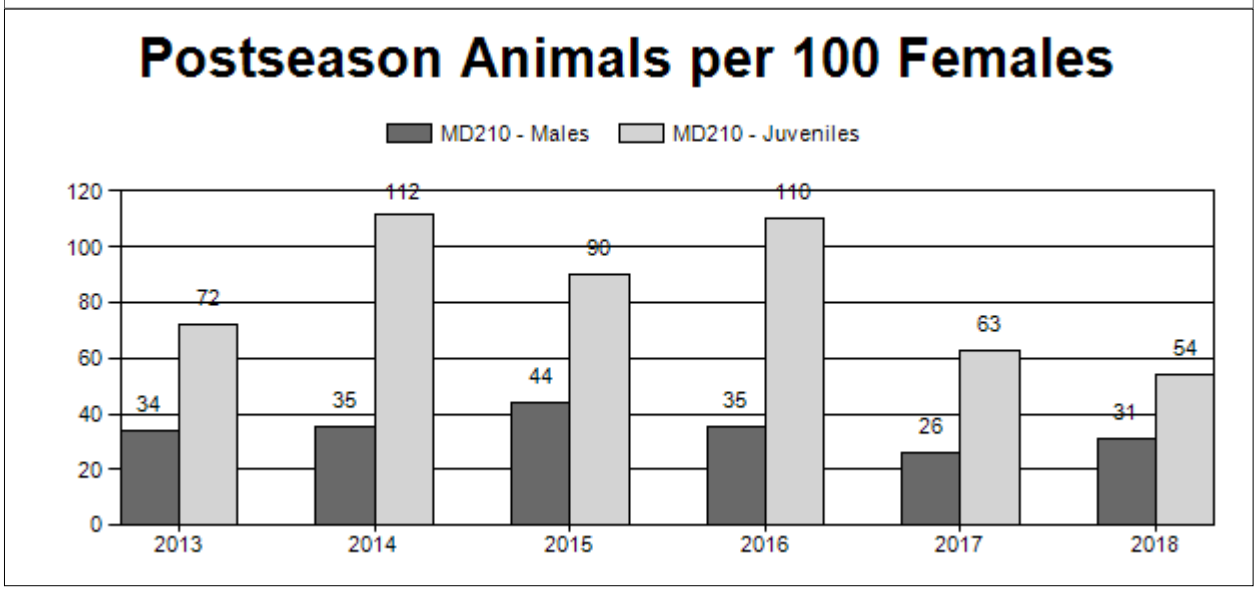


Days per Animal Harvested




Harvest Success
Hunter Success
Active License Success %
80
60
40
20
0
67
56
61
55
62
54
65
56
56
49
51
45
2013
2014
2015
2016
2017
2018


Active Licenses
MD210 - Active Licenses
1200
1000
800
600
400
200
0
1,168
935
1,001
954
1,074
1,010
2013
2014
2015
2016
2017
2018


Postseason Animals per 100 Females
MD210 - Males
MD210 - Juveniles
120
100
80
60
40
20
0
34
72
35
112
44
90
35
110
26
63
31
54
2013
2014
2015
2016
2017
2018

2013 - 2018 Postseason Classification Summary

for Mule Deer Herd MD210 - GREYBULL 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	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2013	4,300	47	0	0	0	95	142	17%	416	48%	301	35%	859	915	11	23	34	± 4	72	± 6	54
2014	4,000	69	0	0	0	114	183	14%	525	40%	590	45%	1,298	1,331	13	22	35	± 3	112	± 7	83
2015	4,600	68	71	50	4	6	199	19%	454	43%	410	39%	1,063	1,529	15	29	44	± 4	90	± 7	63
2016	4,600	38	51	26	3	3	121	14%	347	41%	383	45%	851	1,371	11	24	35	± 4	110	± 9	82
2017	3,060	30	31	17	0	0	78	14%	295	53%	185	33%	558	896	10	16	26	± 4	63	± 7	50
2018	2,955	43	29	10	0	34	116	17%	375	54%	204	29%	695	0	11	19	31	± 4	54	± 5	42

2019 HUNTING SEASONS
GREYBULL RIVER MULE DEER HERD (MD210)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
124		Nov.1	Nov. 10		General	Any deer
124	6	Oct. 15	Nov. 30	100	Limited quota	Doe or fawn on or within one-half (1/2) mile of irrigated land
124	7	Nov.1	Nov. 30	100	Limited quota	Doe or fawn valid on or within one-half (1/2) mile of irrigated land west of Wyoming Highway 30 and Big Horn County Road 8
165	1	Oct. 15	Oct. 31	125	Limited quota	Any deer
165	6	Sep. 1	Oct. 31	100	Limited quota	Doe or fawn valid on private land

Region X nonresident quota: 300

Special Archery Season Hunt Areas	Season Dates	
	Opens	Closes
124, 165	Sep. 1	Sep. 30

Management Evaluation

Current Postseason Population Management Objective: 4,000
Management Strategy: Recreational
2018 Postseason Population Estimate: ~3,000
2019 Proposed Postseason Population Estimate: ~3,000
2018 Hunter Satisfaction: 65% Satisfied, 16% Neutral, 19% Dissatisfied

Herd Unit Issues

The model-based post-season population objective is 4,000 deer under recreational management. Currently the population is under objective and facing a multiplicity of threats including disease, competition, and invasive species however the most pervasive threat seems to be climate-driven. Unlike the more productive migratory deer herds, the Greybull River mule deer herd is limited to the remaining sagebrush steppe habitat used by resident deer year-round. The majority of this herd unit is Bureau of Land Management administered land, bisected by riparian corridors and adjacent irrigated lands. The impact of drought to these systems reduces plant production on native range and drives deer to irrigated private land. Landowner tolerance of deer and the crop damage they cause is low in Hunt Area 124 to the east. A November general hunting season in Hunt Area 124 is designed to address crop damage and prevent this herd from increasing rapidly during high production years. About 20 walk-in hunting areas in Hunt Area 124 provide access to private land. On the other hand, landowners to the west in Hunt Area 165 are typically unconcerned with crop damage, hire outfitters, and helped institute a limited quota hunting season to manage for higher buck ratios. Population recovery from extreme climate conditions

(drought and severe winter) seems slower relative to migratory herd units in Western Wyoming. The viability of shrub-lands used by resident mule deer populations of the Bighorn Basin is likely still recovering from frequent drought years occurring since 1999. Invasive plant species, chronic wasting disease, and intraspecific competition only compound the difficulty for these populations to grow.

Weather

Temperature and precipitation data referenced in this section were summarized for the Bighorn Basin (Climate Division #4) by the National Oceanic and Atmospheric Administration at https://www.ncdc.noaa.gov/cag/divisional/time-series. Thirty-year averages suggest that spring 2018 experienced warmer temperatures and above average precipitation. Average temperature and precipitation for summer months were both above average. During the fall of 2018, precipitation was significantly below normal and temperatures above normal. Temperatures were above normal for December and January, turning colder than average in February. Precipitation was near normal for December and January. The Greybull River mule deer herd experienced a milder than normal winter in 2018-19, likely resulting in an increase of juvenile survival and increased body condition of adult females which will likely have a cascading impact to subsequent population growth in 2019.

Figure 1.

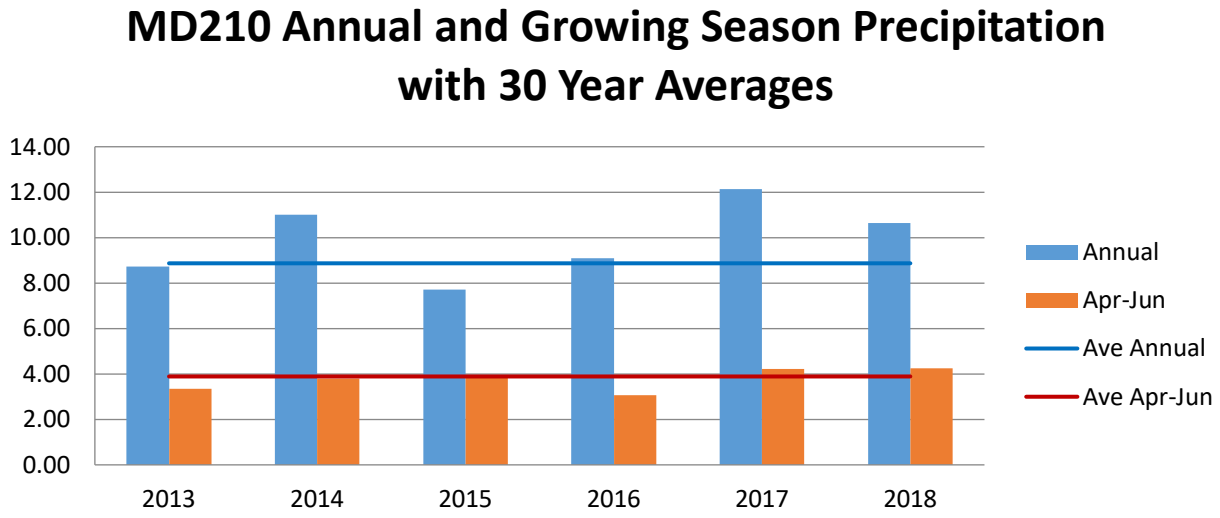
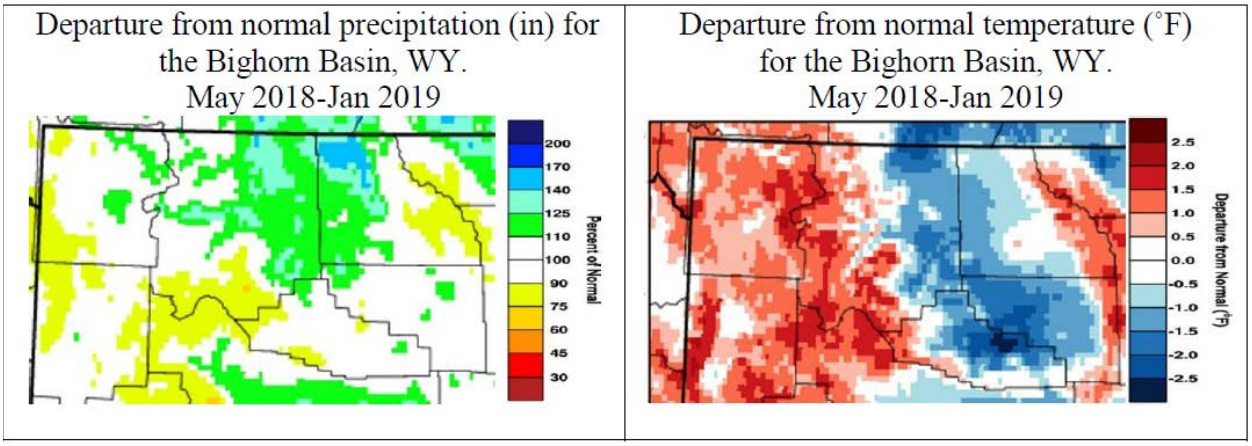


Figure 2.



Habitat
This herd unit stretches east to west across the Bighorn Basin. Uplands are comprised of sagebrush-saltbush-grasslands, and private agriculture is found along major rivers and streams. Habitat quality is limited by a scarcity of moisture (≤12" average annual precipitation) and poor soils producing desert-like conditions. Compared to the rest of Wyoming, the Bighorn Basin is more susceptible to cheatgrass, which does not bode well for already marginal mule deer habitat on public lands. Late spring and early summer moisture resulted in an increase of cheatgrass growth and abundance within the herd unit.

Field Data
The 2018 buck ratio is 31 bucks:100 does which is below the 5-year-average (35:100). The average buck ratio represents a mixture of high buck ratios in Limited Quota Hunt Area 165 and lower recreational buck ratios in General Hunt Area 124. The 2018 fawn ratio (54:100) is far below the 5-year-average (89:100) when record high fawn ratios were recorded. We collect classification data each December from ground surveys; unfortunately, no measure of effort between years exists, and some years we fail to meet our minimum sample size (~1,000). We classified 695 mule deer in 2018. Increasing our sample size and creating a more encompassing classification survey will be a goal for this herd unit in 2019.

Harvest Data
About 51% of hunters were successful (2013-17 = 62%) at harvesting a mule deer (n = 896) in 2018. Hunters in 2018 averaged 7.3 days per harvest, more than average (2013-17 = 6 days). Hunters in 2018 had low success (51%) compared to the 5-year-average (62%). Hunters in 2018 harvested 457 mule deer which is less than average (n=553); however, total deer harvest mirrors the quota of doe/fawn licenses issued. About 65% of hunters were satisfied with their hunting experience during the 2018 season, with 16% neutral, and 19% dissatisfied. Satisfaction declined from 72% in 2017. The nonresident Region X quota (n=300) was established in 2015 when it was split from Region F. The General season harvest in Hunt Area 124 is large enough to mask trends in Limited Quota Hunt Area 165. Historically, general seasons in Hunt Area 124 for bucks only ranged from 7 to 10 days (1990-present), opening November 1. Hunt Area 165 switched to Limited Quota in 1987 with 100-250 licenses issued annually. Buck harvest is influenced more by hunter effort, weather, season dates, harvest of crops (especially corn), and private land access than a reflection of population level. Some Hunt Area 124 hunters complain about the lack of large-antlered bucks, but high harvest to address crop damage limits the "trophy" potential of this herd.

Population
The spreadsheet model estimates 2,955 mule deer for post-season 2018; 26% below the objective of 4,000 deer. We selected the Time-Specific Juvenile/Constant Adult (TSJ, CA) survival model, because the AIC score (180) is within the same order of magnitude as the lowest AIC score (134; CJ, CA), and based on large oscillations in fawn recruitment, it makes biological sense that survival varies temporally. Survival constraints matched normal criteria. This model performs *poor*, because rigorous classification data is lacking due to the nocturnal habits of deer. Plus, fawn ratios vary drastically year-to-year, creating a challenging modeling environment. The

model would benefit from a sample-based population estimate with standard errors. The model estimates the population declined after 2010 possibly due to high doe harvest, or a harsh 2010-11 winter with deep, crusted snow. The population estimate bottoms out at 2,800 deer in 2012, then jumps to 4,600 deer in 2016. The drastic increase estimated for 2014-15 is a result of the record fawn ratios observed, but caution is warranted when interpreting ratio data with small sample sizes.

Management Summary

We propose no changes for this herd unit in 2019. The spreadsheet model estimates fluctuate widely year-to-year, reducing our confidence in its utility for this herd. We continue to manage this herd by providing hunter opportunity while concurrently addressing crop damage. Some hunters request more time to harvest bucks, while other hunters want shorter seasons to allow bucks to mature into older age classes. Due to limited natural habitat, Greybull River mule deer are mostly dependent on riparian habitat and adjacent croplands. Many hunters want fewer does harvested, but with the majority of the deer contributing to damage concerns, this is impractical and irresponsible on a large scale.

2018 - JCR Evaluation Form

SPECIES: Mule Deer
PERIOD: 6/1/2018 - 5/31/2019

HERD: MD211 - SHOSHONE RIVER

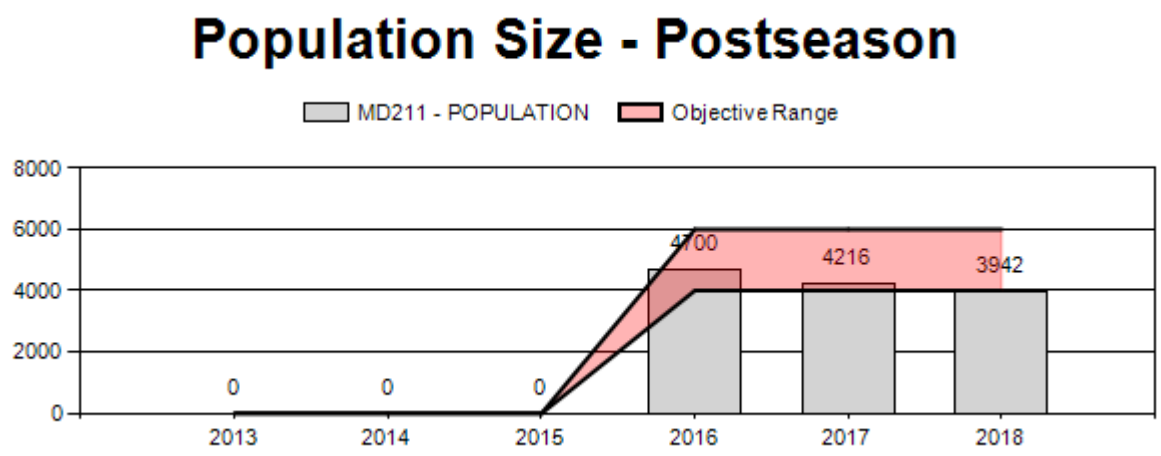
HUNT AREAS: 121-123
PREPARED BY: SAM STEPHENS

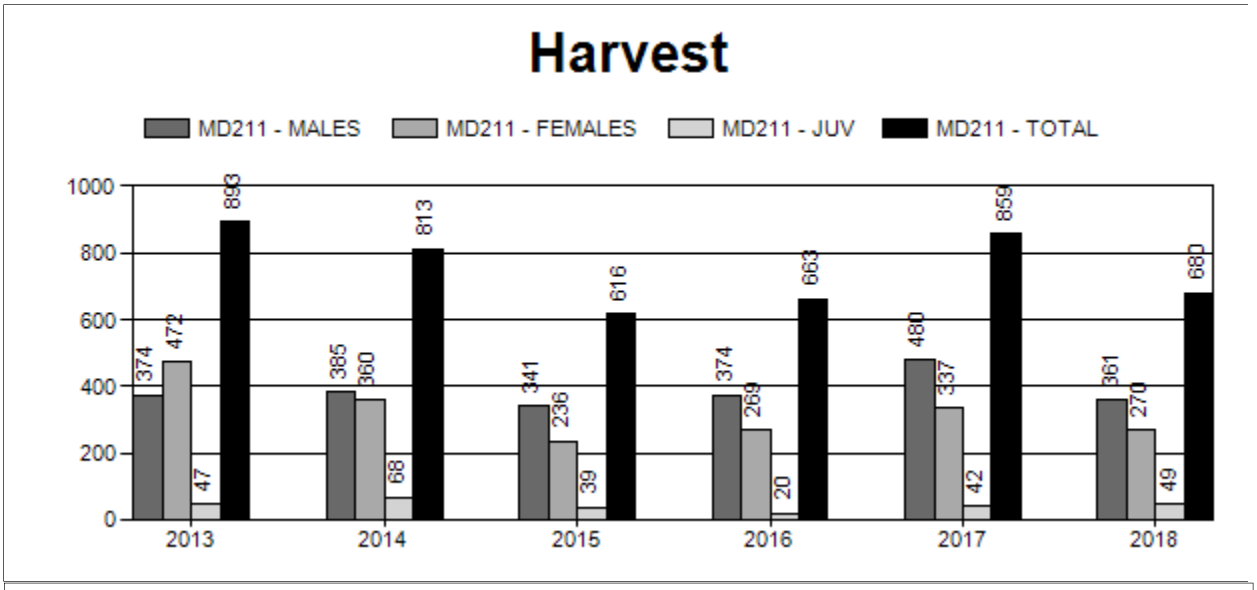
	2013 - 2017 Average	2018	2019 Proposed
Population:	1,783	3,942	4,000
Harvest:	769	680	900
Hunters:	1,481	1,585	1,700
Hunter Success:	52%	43%	53 %
Active Licenses:	1,606	1,688	1,800
Active License Success:	48%	40%	50 %
Recreation Days:	6,342	6,040	6,200
Days Per Animal:	8.2	8.9	6.9
Males per 100 Females	35	33	
Juveniles per 100 Females	89	80	

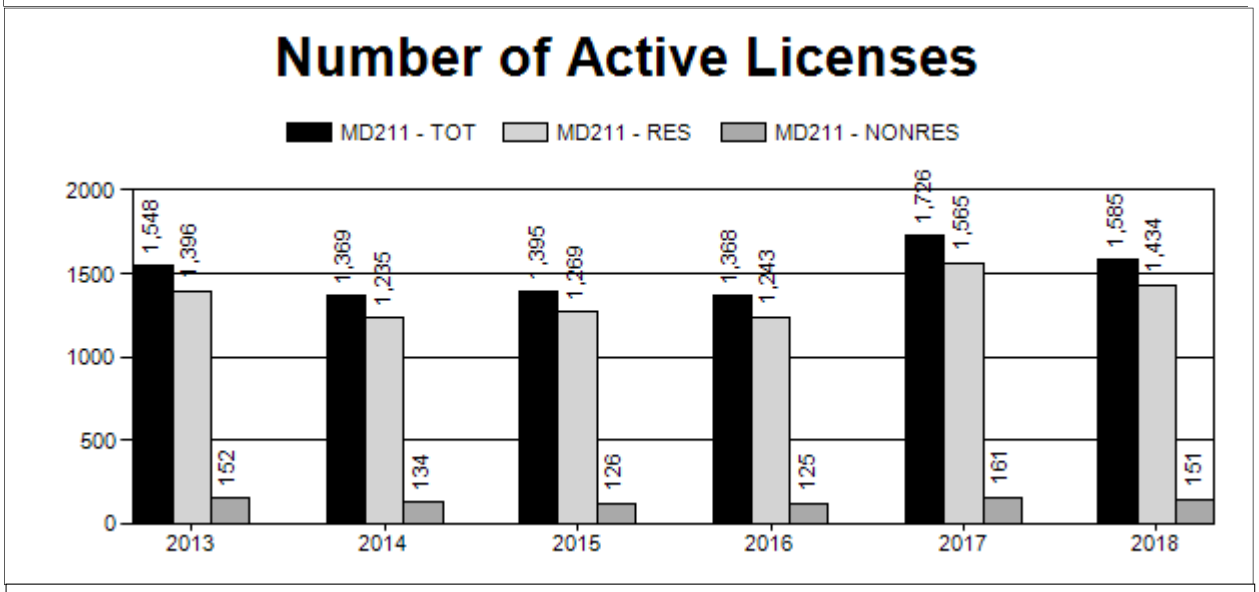
Population Objective (± 20%) :	5000 (4000 - 6000)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-21.2%
Number of years population has been + or - objective in recent trend:	2
Model Date:	02/22/2019

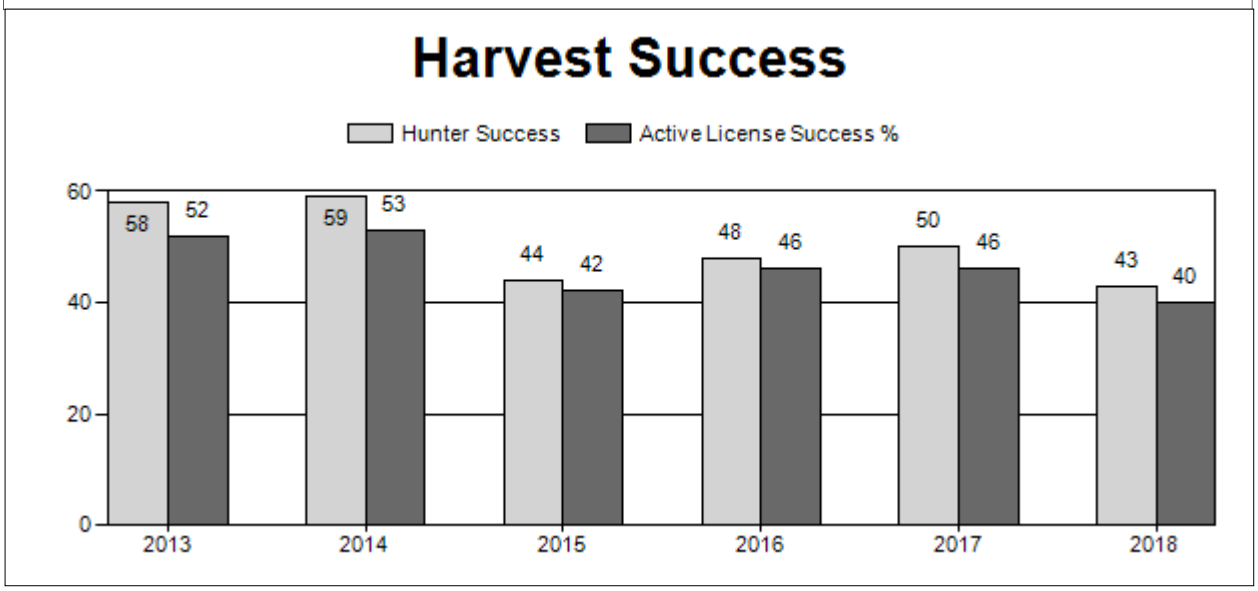
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	JCR Year	Proposed
Females ≥ 1 year old:	14%	17%
Males ≥ 1 year old:	39%	48%
Total:	15%	18%
Proposed change in post-season population:	-16%	-19%

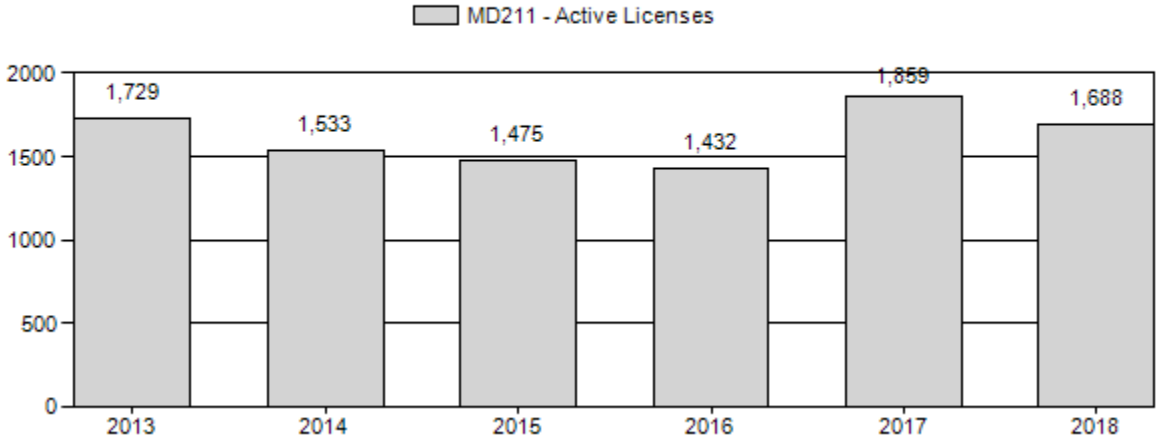



Harvest
MD211 - MALES
MD211 - FEMALES
MD211 - JUV
MD211 - TOTAL
1000
800
600
400
200
0
374
472
47
893
385
360
68
813
341
236
39
616
374
269
20
663
480
337
42
859
361
270
49
680
2013
2014
2015
2016
2017
2018

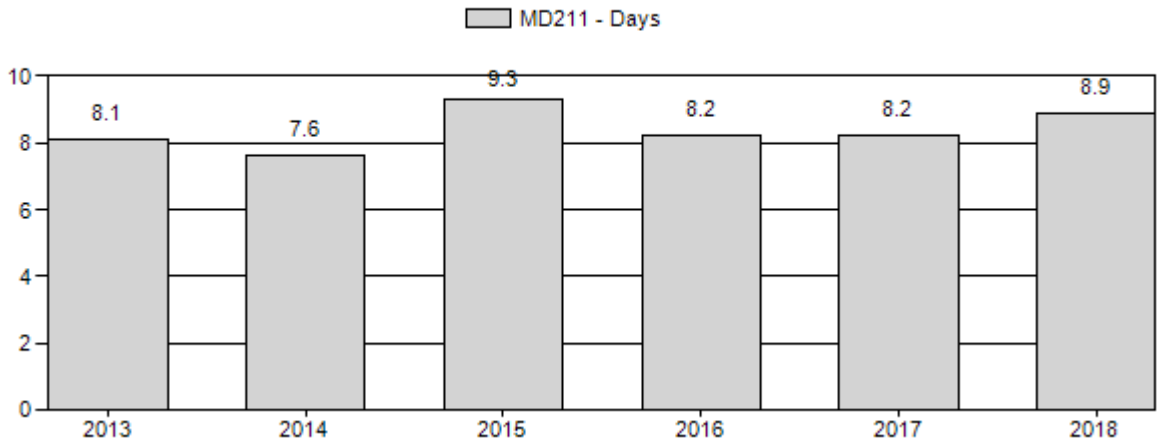

Number of Active Licenses
MD211 - TOT
MD211 - RES
MD211 - NONRES
2000
1500
1000
500
0
1,548
1,396
152
1,369
1,235
134
1,395
1,269
126
1,368
1,243
125
1,726
1,565
161
1,585
1,434
151
2013
2014
2015
2016
2017
2018


Harvest Success
Hunter Success
Active License Success %
60
40
20
0
58
52
59
53
44
42
48
46
50
46
43
40
2013
2014
2015
2016
2017
2018

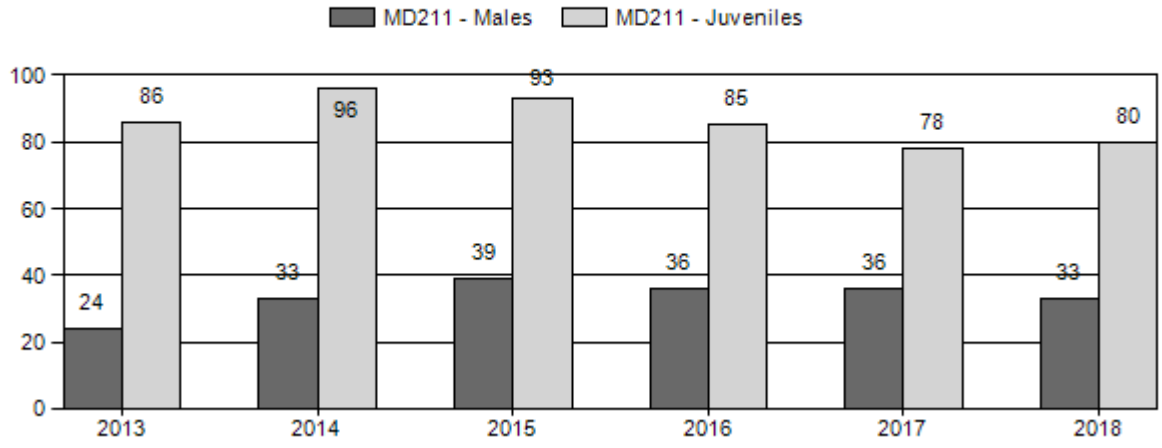
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2013 - 2018 Postseason Classification Summary

for Mule Deer Herd MD211 - SHOSHONE 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	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2013	0	18	0	0	0	14	32	12%	131	47%	113	41%	276	810	14	11	24	± 0	86	± 0	69
2014	0	46	0	0	0	42	88	14%	266	44%	255	42%	609	0	17	16	33	± 0	96	± 0	72
2015	0	44	51	14	0	7	116	17%	301	43%	280	40%	697	0	15	24	39	± 0	93	± 0	67
2016	4,700	43	39	6	0	8	96	16%	265	45%	225	38%	586	1,371	16	20	36	± 5	85	± 9	62
2017	4,216	21	29	6	0	0	56	17%	156	47%	122	37%	334	1,333	13	22	36	± 7	78	± 12	58
2018	3,942	28	18	9	1	0	56	15%	172	47%	138	38%	366	0	16	16	33	± 6	80	± 11	61

2019 HUNTING SEASONS
SHOSHONE RIVER MULE DEER HERD (MD211)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
121		Nov. 1	Nov. 10		General	Any deer
121		Nov. 11	Nov. 30		General	Antlerless deer valid on private land
121	6	Oct. 15	Nov. 30	150	Limited quota	Doe or fawn valid on or within one-half (1/2) mile of irrigated land
122		Nov. 1	Nov. 10		General	Any deer
122		Nov. 11	Nov. 30		General	Antlerless deer
122	6	Oct. 15	Nov. 30	150	Limited quota	Doe or fawn valid on or within one-half (1/2) mile of irrigated land within the Shoshone River drainage
123		Oct. 15	Oct. 31		General	Antlered mule deer or any white-tailed deer
123	6	Oct. 15	Nov. 30	25	Limited quota	Doe or fawn valid on private land south of the Shoshone River

Region X Nonresident deer quota: 300

Special Archery Season Hunt Areas	Season Dates	
	Opens	Closes
121, 122, 123	Sep. 1	Sep. 30

Hunt Area	License Type	Quota change from 2018
121	6	-50
122	6	-50
Herd Unit Total	**6**	**-100**

Management Evaluation

Current Postseason Population Management Objective: 5,000
Management Strategy: Recreational
2018 Postseason Population Estimate: ~4,000
2019 Proposed Postseason Population Estimate: ~4,000
2018 Hunter Satisfaction: 55% Satisfied, 24% Neutral, 21% Dissatisfied

Herd Unit Issues

The model-based post-season population objective is 5,000 deer under recreational management. This objective was established during the public herd unit review in 2016, after 15 years of no objective due to insufficient classification sample sizes. In addition, Hunt Area 121 was

transferred from the Clarks Fork mule deer herd (MD 216) to the Shoshone River herd in 2016. The majority of this herd unit is Bureau of Land Management administered land, bisected by riparian corridors and adjacent irrigated lands. The impact of drought to these systems reduces plant production on native range and drives deer to irrigated private land. Landowner tolerance of deer and the crop damage they cause is low in all three hunt areas. A November General hunting season is designed to address crop damage and prevent this herd from increasing rapidly during high production years. About a dozen walk-in hunting areas provide access to private land. Anthropomorphic land uses, other than farming, that have little effect on deer survival and productivity include housing development, oil/gas development, and mining. Bentonite mining is typically in poor quality habitat with few to no deer. Population recovery from extreme climate conditions (drought and severe winter) seems slower relative to migratory herd units in Western Wyoming. The viability of shrub-lands used by resident mule deer populations of the Bighorn Basin is likely still recovering from frequent drought years occurring since 1999. Invasive plant species, chronic wasting disease, and intraspecific competition only compound the difficulty for these populations to grow.

Weather

Temperature and precipitation data referenced in this section were summarized for the Bighorn Basin (Climate Division #4) by the National Oceanic and Atmospheric Administration at https://www.ncdc.noaa.gov/cag/divisional/time-series. Thirty-year averages suggest that spring 2018 experienced warmer temperatures and above average precipitation. Average temperature and precipitation for summer months were both above average. During the fall of 2018, precipitation and temperatures were below and above average respectively. Temperatures were above average for December and January, turning colder than average in February. Precipitation was near normal for December and January. The Shoshone River mule deer herd experienced a milder than normal winter in 2018-19. Cold and wet weather in February may have energetically taxed some deer, but proximity to agricultural lands likely mitigated those effects.

Figure 1.

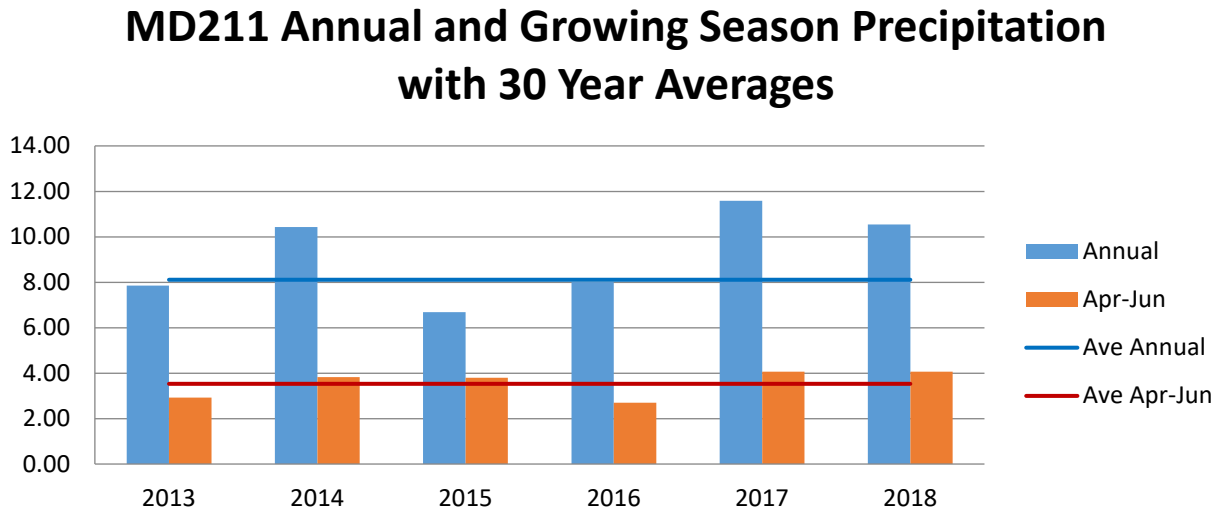
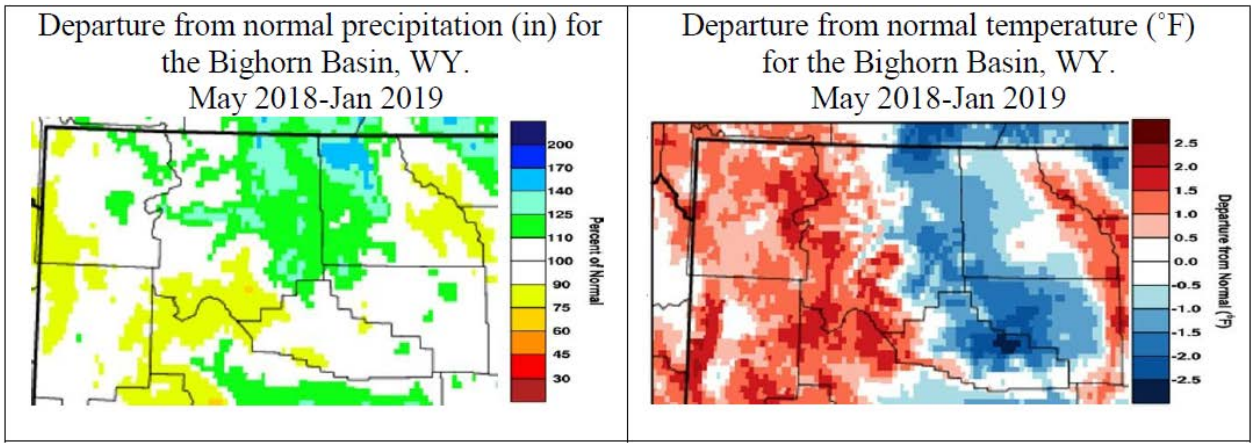


Figure 2.



Habitat

This herd unit stretches east to west across the Bighorn Basin, adjacent to Montana. Uplands are comprised of sagebrush-saltbush-grasslands, and private agriculture is found along major rivers and streams. Habitat quality is limited by a scarcity of moisture (. 12" average annual precipitation) and poor soils producing desert-like conditions. Compared to the rest of Wyoming, the Bighorn Basin is more susceptible to cheatgrass, which does not bode well for already marginal mule deer habitat on public lands. Late spring and early summer moisture resulted in an increase of cheatgrass growth and abundance within the herd unit. No shrub transects are established within the herd unit to measure production and utilization of upland shrubs.

Field Data

We collect classification data each December from ground surveys; unfortunately, no measure of effort between years exists. The 2018 buck ratio is 33 bucks:100 does which is near the 5-year-average (34:100). The 2018 fawn ratio (80:100) is below the 5-year-average (88:100). However, we consistently fall short of our classification objective (1,333 deer). We only classified 366 mule deer in 2017 which is also below the 5-year-average of 500. By December, deer along the Shoshone River stay in heavy cover until a few minutes before dark, making classification surveys challenging and strung out over the month of December. Past attempts to survey the herd unit using a helicopter did not result in improved classification data, so we discontinued the technique. Unsworth et al. (1999) suggests that a winter fawn ratio above 66:100 results in an increasing population. While caution is warranted over small sample sizes, fawn ratios ranged between 78-96:100 over the past 5 years; evidence that the Shoshone River deer herd can grow quickly, given that nutrition is supplemented by irrigated crops.

Harvest Data

About 43% of hunters were successful (2013-17 = 52%) at harvesting a mule deer (n = 680) in 2018. The total number of deer harvested mirrors doe/fawn licenses issued. Hunters in 2017 averaged 8.9 days per harvest, slightly above average (2013-17 = 8.3). Number of hunters and their success mirrors doe/fawn license quotas. About 55% of hunters were satisfied with their hunting experience during the 2018 with 24% neutral, and 21% dissatisfied. Satisfaction

decreased from 59% in 2017. The nonresident Region X quota (n = 300) was established in 2015 when it was split from Region F. Buck harvest is influenced more by hunter effort, weather, season dates, harvest of crops (especially corn), and private land access than a reflection of population level. Some hunters complain about the lack of large-antlered bucks, but high harvest to address crop damage limits the "trophy" potential of this herd.

Population

The spreadsheet model estimates 3,942 mule deer for post-season 2018; 21% below the objective of 5,000 deer. We selected the Time-Specific Juvenile/Constant Adult (TSJ, CA) survival model, because the AIC score (162) is within the same order of magnitude as the lowest AIC score (96; CJ, CA), and it makes biological sense that fawn survival varies temporally. Survival constraints matched normal criteria. This model performs *poor*, since the model has never been anchored with a robust abundance estimate or measured vital rates. Plus, fawn ratios vary drastically year-to-year which challenges the model. The model would benefit from a sample-based population estimate with standard errors. The model estimates the population decreased from about 8,000 deer in 2009 to about 5,000 deer in 2015 after several years of high doe/fawn harvest targeting deer causing crop damage.

Management Summary

The objective of 5,000 deer provides opportunity, yet maintains acceptable levels of deer to satisfy most landowners. The general hunting season allows for ample harvest. Due to limited natural habitat, Shoshone River mule deer are mostly dependent on riparian habitat and adjacent croplands. Many hunters want fewer does harvested and more "quality" bucks available, but with the majority of the deer residing on private croplands, this is impractical and irresponsible on a large scale. Very few (range=5-18) mule deer does are observed during annual nighttime classifications on Yellowtail Wildlife Habitat Management Area. The 2018 General hunting season for Hunt Area 123 (Yellowtail) prohibits the harvest of mule deer does while allowing the harvest of mule deer bucks and any white-tailed deer. We plan to maintain the same general season structure for all hunt areas in the Shoshone mule deer herd unit with a slight reduction in 122 type 6 licenses to account for alleviated damage concerns.

Literature Cited

Unsworth, J.W., D.F. Pac, G. C. White, and R.M. Bartman. 1999. Mule deer survival in Colorado, Idaho, and Montana. Journal of Wildlife Management 36:315-326.

2018 - JCR Evaluation Form

SPECIES: Mule Deer
PERIOD: 6/1/2018 - 5/31/2019

HERD: MD212 - OWL CREEK/MEETEETSE

HUNT AREAS: 116-120
PREPARED BY: BART KROGER

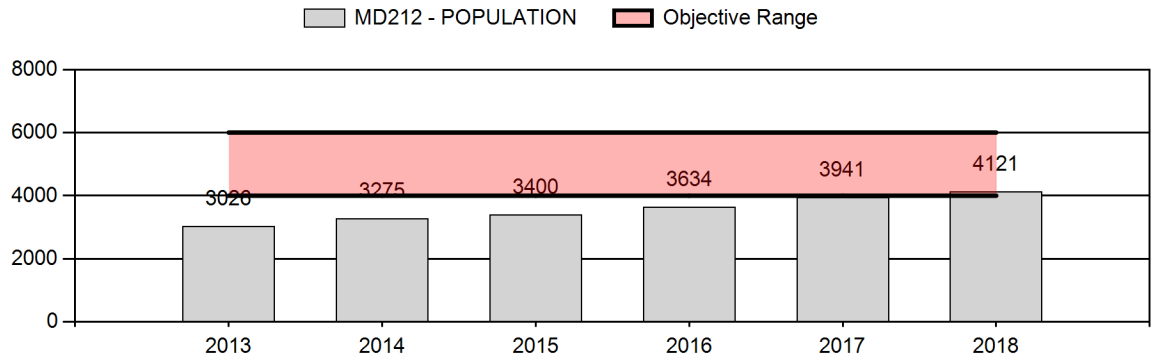
	2013 - 2017 Average	2018	2019 Proposed
Population:	3,455	4,121	4,337
Harvest:	228	251	265
Hunters:	302	323	340
Hunter Success:	75%	78%	78%
Active Licenses:	313	352	360
Active License Success:	73%	71%	74%
Recreation Days:	1,335	1,440	1,500
Days Per Animal:	5.9	5.7	5.7
Males per 100 Females	39	36	
Juveniles per 100 Females	74	67	

Population Objective (± 20%) :	5000 (4000 - 6000)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-17.6%
Number of years population has been + or - objective in recent trend:	10
Model Date:	2/22/2019

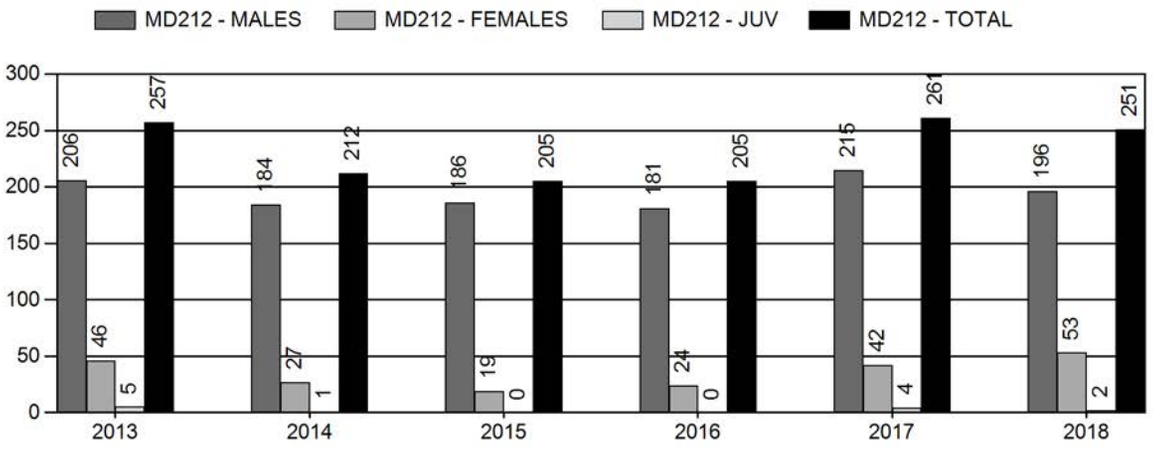
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	JCR Year	Proposed
Females ≥ 1 year old:	3%	3%
Males ≥ 1 year old:	19%	18%
Total:	6%	6%
Proposed change in post-season population:	+3%	+3%

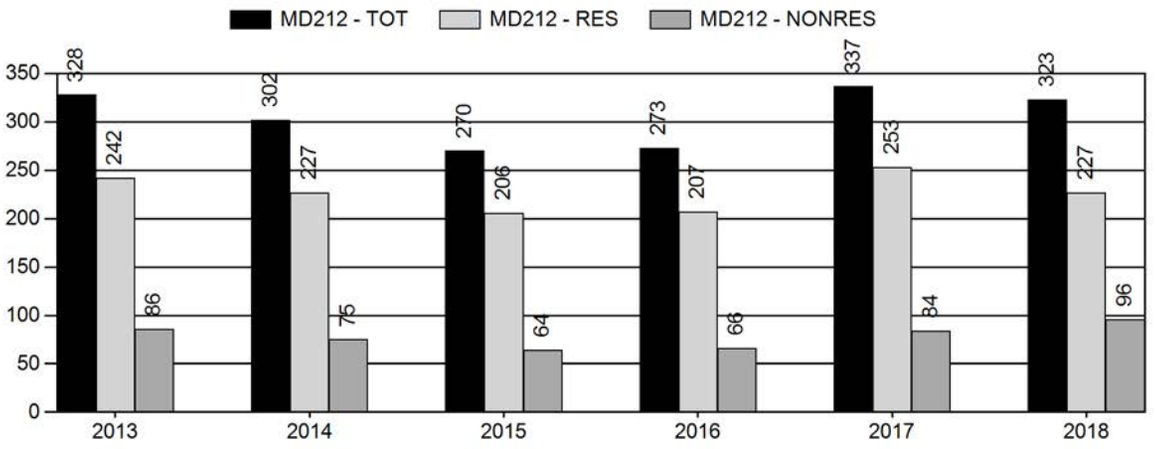
Population Size - Postseason



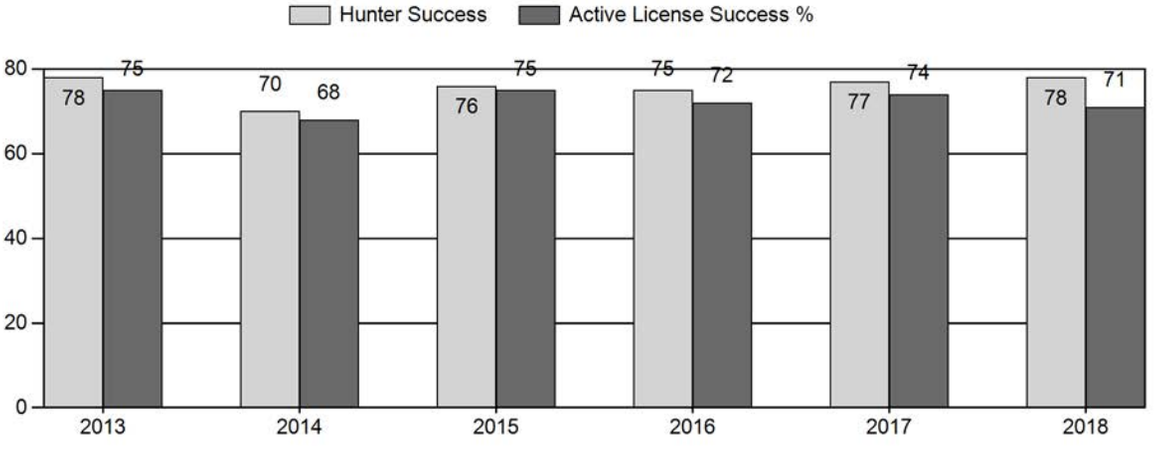
Harvest



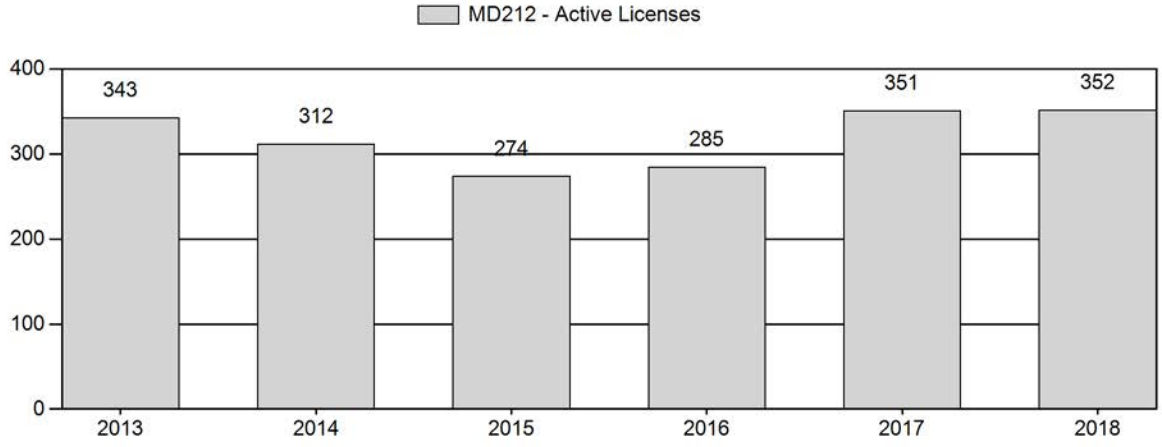
Number of Active Licenses



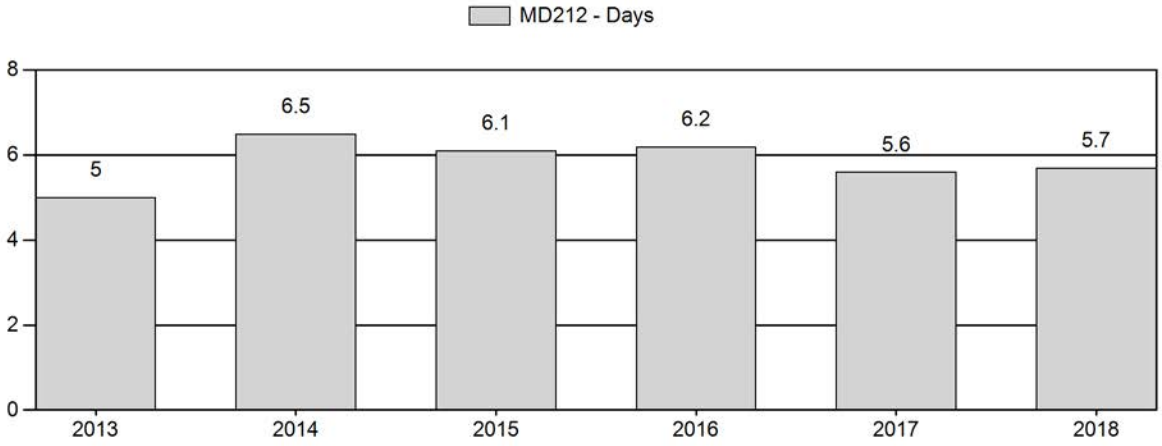
Harvest Success



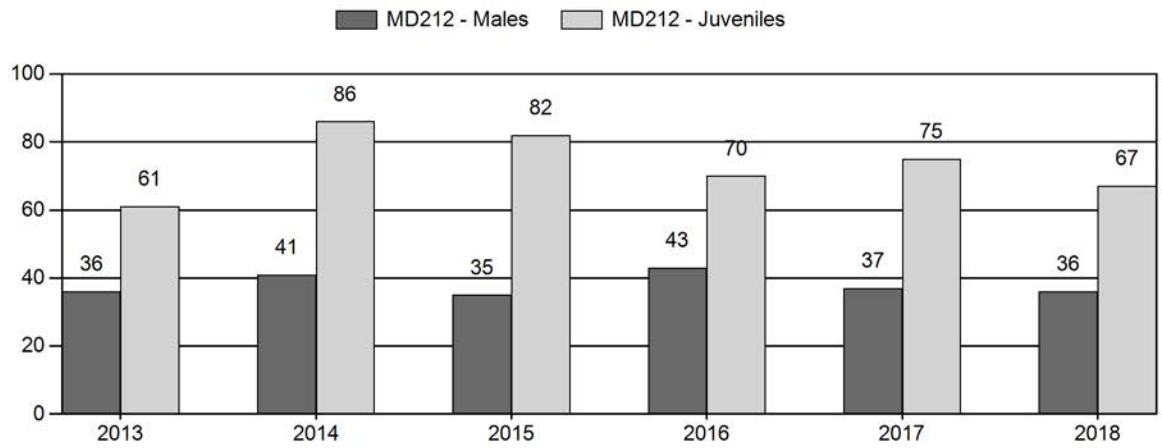
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2013 - 2018 Postseason Classification Summary

for Mule Deer Herd MD212 - OWL CREEK/MEETEETSE

		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
2013	3,026	37	0	0	0	113	150	18%	413	51%	250	31%	813	916	9	27	36	± 4	61	± 5	44
2014	3,275	27	0	0	0	81	108	18%	265	44%	228	38%	601	1,428	10	31	41	± 5	86	± 9	61
2015	3,400	89	70	51	15	0	225	16%	635	46%	518	38%	1,378	1,389	14	21	35	± 3	82	± 5	60
2016	3,634	100	126	90	27	0	343	20%	789	47%	554	33%	1,686	1,141	13	31	43	± 3	70	± 4	49
2017	3,941	48	66	61	13	0	188	17%	509	47%	383	35%	1,080	1,216	9	28	37	± 3	75	± 6	55
2018	4,121	47	71	44	21	0	183	18%	514	49%	346	33%	1,043	1,096	9	26	36	± 3	67	± 5	50

2019 HUNTING SEASONS
OWL CREEK/MEETEETSE MULE DEER HERD (MD212)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
116	1	Oct. 15	Oct. 31	75	Limited quota	Antlered mule deer or any white-tailed deer
116, 117,	3	Nov. 1	Nov. 30	100	Limited quota	Any white-tailed deer
116	6	Oct. 15	Nov. 30	75	Limited quota	Doe or fawn valid on private land
116	7	Sep. 1	Oct. 14	100	Limited quota	Doe or fawn white-tailed deer valid on private land in the Wood River drainage
116, 117, 118	8	Oct.15	Nov.30	150	Limited quota	Doe or fawn white-tailed deer
117	1	Sep. 15	Oct. 15	50	Limited quota	Antlered mule deer or any white-tailed deer
118	1	Oct. 15	Oct. 31	25	Limited quota	Antlered deer
118	1	Nov. 1	Nov. 30		Limited quota	Any white-tailed deer
119	1	Nov. 1	Nov. 15	50	Limited quota	Antlered deer
119	2	Oct. 1	Oct. 15	75	Limited quota	Antlered deer
119, 120	3	Oct. 1	Nov. 30	100	Limited quota	Any white-tailed deer
119	6	Sep. 1	Nov. 15	75	Limited quota	Doe or fawn valid on or within one-half (1/2) mile of irrigated land
120	1	Nov. 1	Nov. 15	75	Limited quota	Antlered deer
120	8	Sep. 1	Dec. 15	200	Limited quota	Doe or fawn white-tailed deer

Special Archery Season Hunt Areas	Season Dates	
	Opens	Closes
116, 117, 118, 119, 120	Sep. 1	Sep. 30

Hunt Area	Type	Quota change from 2018
116	6	+25
119, 120	3	+25
120	8	+50
HU Total	**3**	**+25**
	6	**+25**
	8	**+50**

Management Evaluation

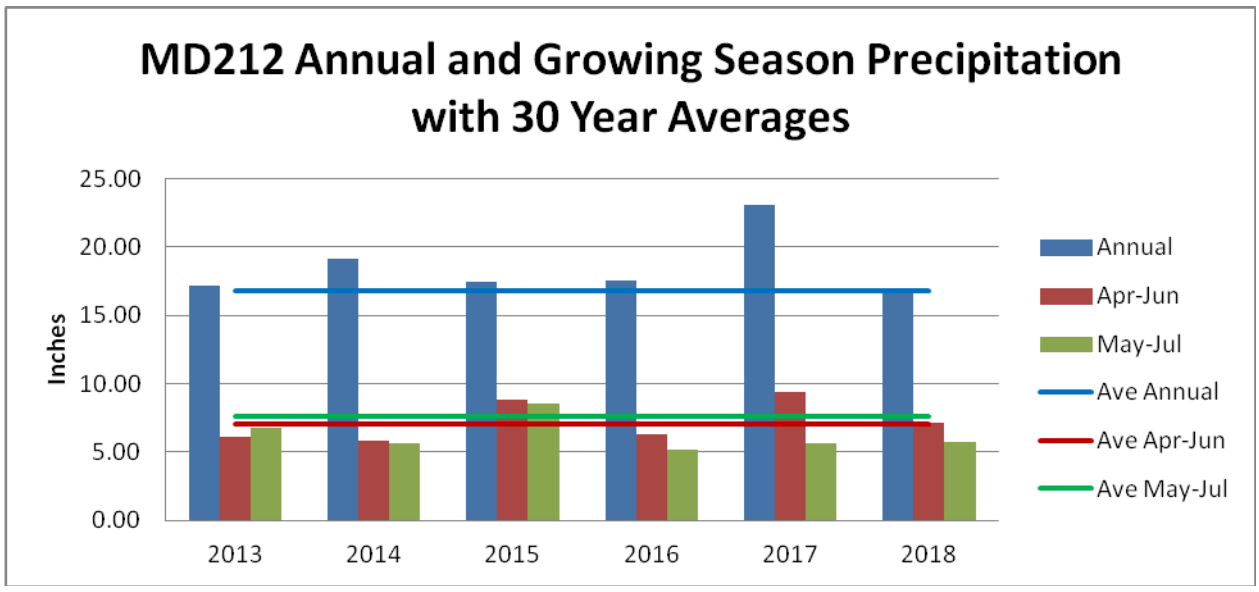
Current Postseason Population Management Objective: 5,000
Management Strategy: Special
2018 Postseason Population Estimate: 4,100
2019 Proposed Postseason Population Estimate: 4,300
2018 Hunter Satisfaction: 76% satisfied, 11% neutral, 13% dissatisfied

Herd Unit Issues

Currently, the management goals of this deer herd is to provide quality buck hunting, allow mule deer populations to increase on public lands, and to address potential damage issues on private lands. This herd unit went through a Mule Deer Initiative (MDI) public process in early 2014. Most landowners, hunters and publics involved with this MDI agree this herd is below desired numbers and that buck quality should improve, but at the same time realize poor habitat conditions, damage issues and predation will likely keep this population below objective. Currently, habitat, damage, predation and chronic wasting disease are issues facing this deer herd.

The herd objective and management strategy was last evaluated and approved in 2014, and at that time the population objective was changed from 8,000 deer to 5,000 deer. For the 2019 (5-year) objective review we will maintain the current objective and special management strategy for this deer herd. Based on internal discussions and conversations with landowners and hunters, along with the recent change to the objective in 2014, we feel there is no need to again change this objective. Current herd unit issues are and will likely keep this deer population below objective levels, even with minimal female harvest. This herd objective will again be evaluated in 2024.

Weather



Precipitation

Annual precipitation from October 2017 thru September 2018 was very near the 30 year average. Precipitation during the growing season (April thru June 2017) was also near average, but the

growing season precipitation for high elevation SSF seasonal ranges (May - July 2017) was lower than the 30 year average.

Winter Severity

The 2017-2018 winter was slightly more severe than the long-term average. Data from the Sunshine 3 NE climate station (10 miles southwest of Meeteetse) showed the average December-March temperature was 1.16 degrees lower than normal, and total inches of snowfall in December-March was 116% of normal.

Habitat

Annual precipitation has been at or above average for the last six years, which may have contributed to the high fawn/doe ratio observed in the Owl Creek/Meeteetse herd unit the last five years. The Department initiated a rapid habitat assessment of the herd unit that primarily focused on the condition of aspen and riparian communities. Nearly all of the 51 assessments conducted in aspen communities showed advanced succession and high risk of replacement by conifers. A 140-acre aspen treatment to remove conifers was completed in the Grass Creek drainage in 2018. Over 500 acres were identified for treatment in the Gooseberry drainage with treatments planned to begin in 2019. A prescribed burn was conducted by BLM in the Gooseberry drainage to reduce conifer encroachment into sagebrush/grasslands. At total of 530 acres were treated in spring 2018 with an additional 800 acres planned for the next three years.

Two permanent shrub transects occur in this herd unit. Data was collected on leader growth, hedging class, age class, and percent utilization. Leader growth reflected the average precipitation in 2018. Utilization continues to be very low on sagebrush in this herd unit, indicating that forage quantity on winter range may not be a limiting factor. These data can be found in Appendix B in the Cody Region JCRs.

Field Data

Both aerial and ground classification surveys are used in obtaining post-season buck and fawn ratios for this deer herd. Routine classification routes for each hunt area have been maintained in order to reflect general trends in deer numbers over time. The number of deer classified in 2015 and 2016 were nearly 100% higher than the numbers classified in prior years. However, since 2016 the number of deer classified has declined by about 40%. The fawn ratio in 2018 was 67:100, slightly higher than the long-term average of 60:100. Fawn ratios between 2014 and 2017 were some the highest on record, which averaged about 78:100 for those four years. Buck ratios continue to remain favorable, with a 6-year average of 38 bucks:100 does. The 2018 buck ratio was 36:100. On average, class III bucks represent about 11% of the adult bucks classified.

Harvest Data

All Hunt Areas (116-120) in the herd unit support limited quota hunting seasons. Type 1 license quotas are typically kept low to allow for higher buck ratios and quality in this special management herd unit. Overwhelming public support for this type of management is heard annually at public season meetings, as well as during the Mule Deer Initiative process in 2014. Doe/fawn licenses have and will continue to be used for damage issues when warranted. Season structures have been designed to help increase this deer population, particularly those deer utilizing native ranges. License quotas, hunter numbers and total harvest have declined by about 30% over the past 10 years due to declines in deer numbers. The biggest declines have been mostly due to Type 6 and 7 license quota reductions. In 2017, buck harvest did increase slightly

over prior years, but dropped again in 2018. Overall, Type 1 hunter success and hunter effort continues to remain favorable at around 78% success and 6.0 days/harvest.

Population

The semi-constant juvenile & semi-constant adult survival (SCJ, SCA) spreadsheet model was chosen to represent this herd. This model supported an AIC value of 59, along with a very good fit (n=21) of the model vs. field male ratios. The 2018 population estimate seems reasonable, and reflects field personnel perceptions, harvest and classification sample size trends, which indicate a slightly increasing population in recent years. Because of this, the model is considered a good representation of the herd.

Management Summary

Type 1 license quotas in all hunt areas appear adequate at this time; with most having license quota reductions in recent years. A slight increase in the Hunt Area 116 Type 6 license quota will occur to further accommodate landowners wishing to harvest a few mule deer does and fawns on their property. Also, the season date was extended in Hunt Area 119 for the Type 6 license to allow harvest of deer moving onto hayfields in November. All other changes are specific to white-tailed deer. The projected 2019 harvest is roughly 265 mule deer, which should help this herd increase slightly but still remain below objective.

2018 - JCR Evaluation Form

SPECIES: Mule Deer | PERIOD: 6/1/2018 - 5/31/2019

HERD: MD215 - UPPER SHOSHONE

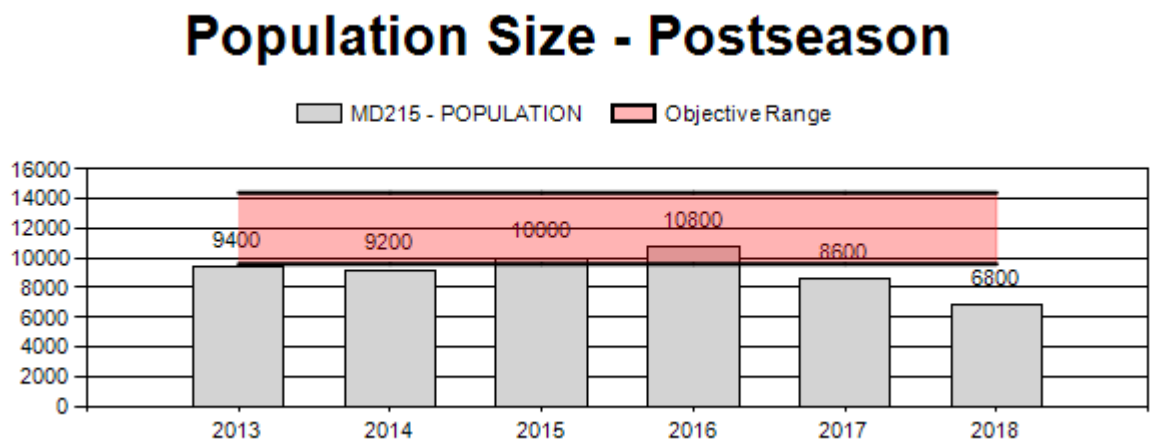
HUNT AREAS: 110-115 | PREPARED BY: TONY MONG

	2013 - 2017 Average	2018	2019 Proposed
Population:	9,600	6,800	6,700
Harvest:	887	364	235
Hunters:	1,700	1,336	875
Hunter Success:	52%	27%	27%
Active Licenses:	1,730	1,366	900
Active License Success:	51%	27%	26 %
Recreation Days:	8,621	7,532	5,000
Days Per Animal:	9.7	20.7	21.3
Males per 100 Females	24	19	
Juveniles per 100 Females	57	52	

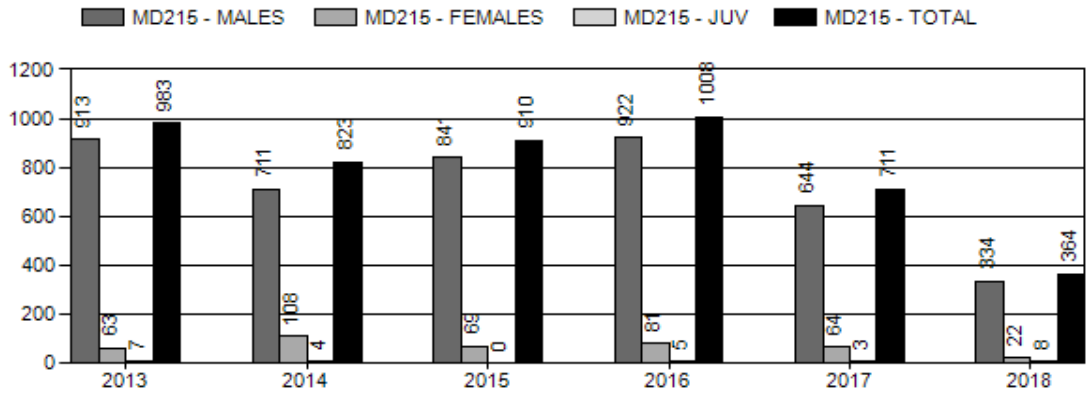
Population Objective (± 20%) :	12000 (9600 - 14400)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-43.3%
Number of years population has been + or - objective in recent trend:	2
Model Date:	3/22/2019

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

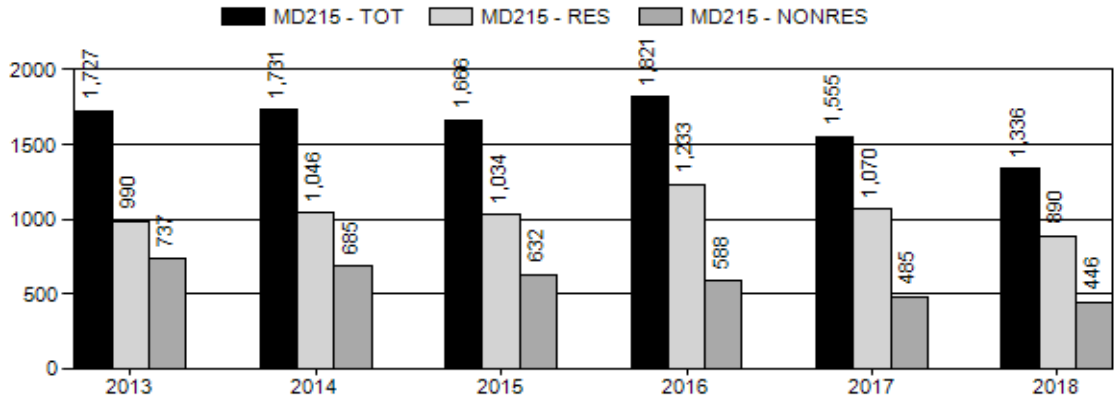
	JCR Year	Proposed
Females ≥ 1 year old:	0.6%	0.9%
Males ≥ 1 year old:	36%	21.4%
Total:	5%	4%
Proposed change in post-season population:	15%	1%



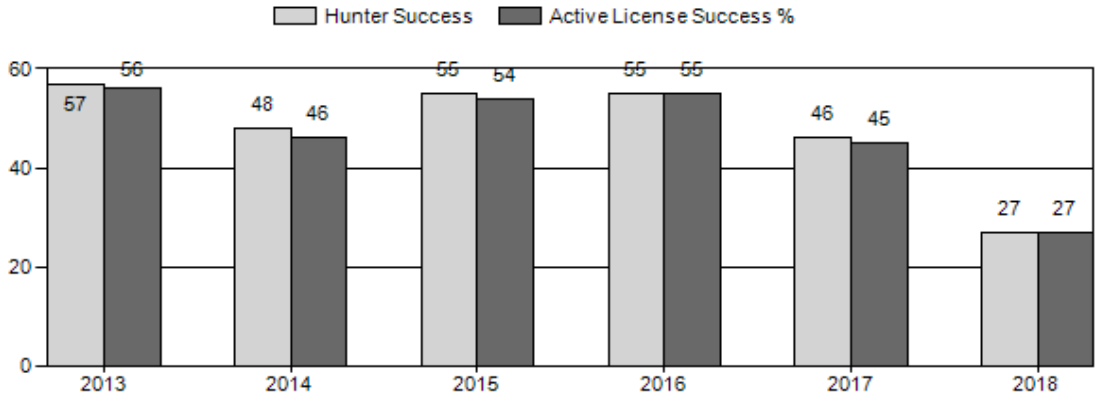
Harvest



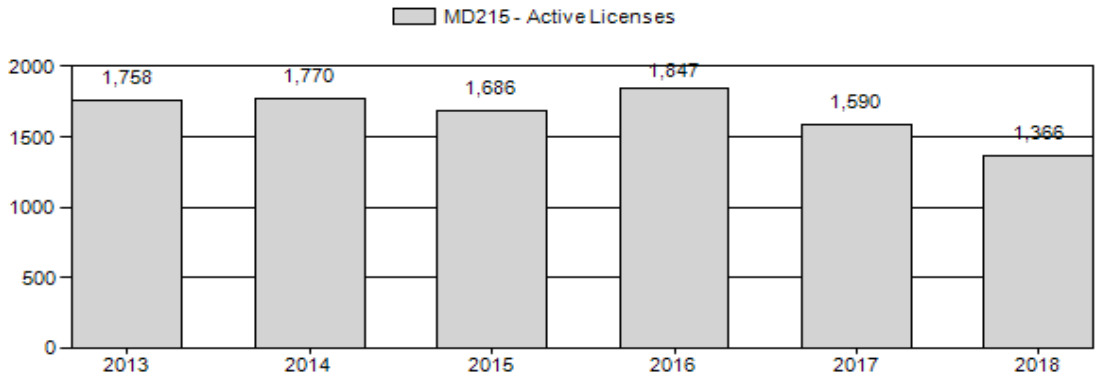
Number of Active Licenses



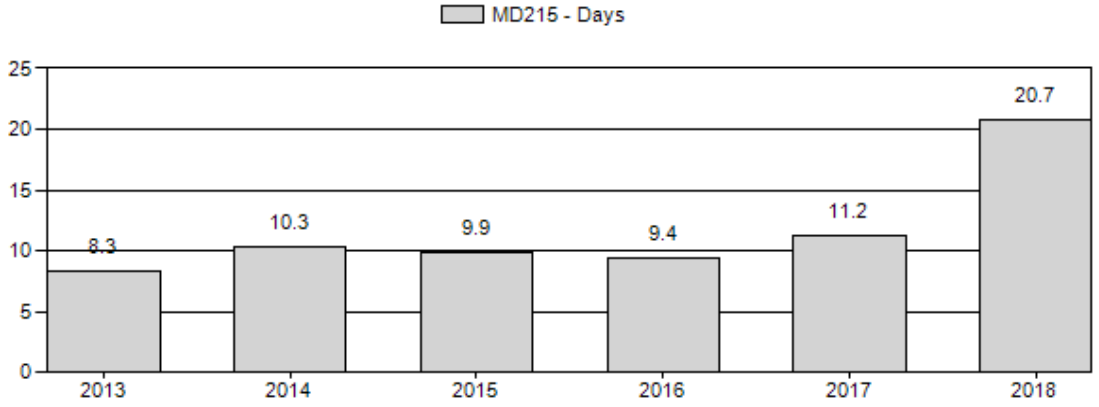
Harvest Success



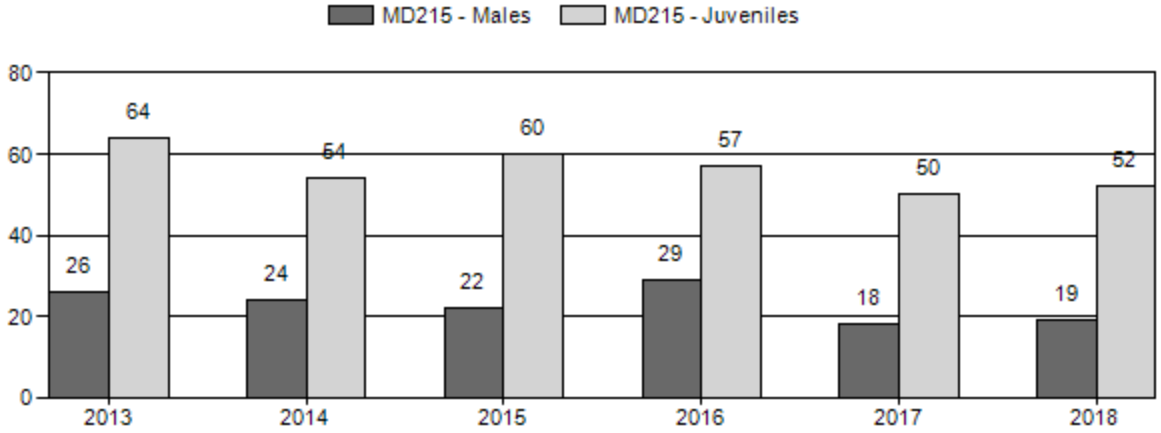
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2013 - 2018 Postseason Classification Summary																					
for Mule Deer Herd MD215 - UPPER SHOSHONE																					
		MALES							FEMALE		JUVENIL				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
2013	9,400	127	0	0	0	117	244	14%	946	53%	607	34%	1,797	1,148	13	12	26	± 2	64	± 4	51
2014	9,200	98	101	20	4	0	223	13%	945	56%	512	30%	1,680	1,010	10	13	24	± 2	54	± 3	44
2015	10,000	76	143	43	1	0	263	12%	1,200	55%	722	33%	2,185	1,020	6	16	22	± 2	60	± 3	49
2016	10,800	189	163	40	6	0	398	16%	1,365	54%	782	31%	2,545	923	14	15	29	± 2	57	± 3	44
2017	8,600	57	99	39	7	0	202	10%	1,154	60%	582	30%	1,938	872	5	13	18	± 2	50	± 3	43
2018	6,800	74	92	42	4	0	212	11%	1,088	58%	569	30%	1,869	854	7	13	19	± 2	52	± 3	44

2013 - 2018 Harvest Age Structure																						
for Mule Deer Herd MD215 - UPPER SHOSHONE																						
	Males												Females									Herd
Year	Juv	1	% *	2+ ^ C1	2+ ^ C2	2+ ^ C3	2+ ^ UC	% **	Tot Aged ++	Not Aged +++	Unk	Tot Chkd	Juv	1	% *	2 ^	% **	Tot Aged ++	Not Aged +++	Unk	Tot Chkd	Tot
2013	1	60	16%	0	0	0	289	83%	350	15	6	371	0	4	24%	13	76%	17	0	1	18	389
2014	1	19	9%	0	0	0	183	91%	203	1	42	246	1	2	12%	15	88%	18	0	7	25	271
2015	0	12	5%	190	46	2	0	95%	250	4	35	289	1	1	3%	30	97%	32	0	3	35	324
2016	2	20	7%	84	95	15	82	93%	298	0	5	303	2	0	0%	22	100%	24	0	6	30	333
2017	2	9	3%	162	105	11	0	97%	277	0	2	279	1	2	12%	15	88%	18	0	1	19	298
2018	0	1	1%	77	71	9	0	99%	158	0	1	159	1	0	0%	7	100%	8	0	0	8	167
*	Percent of aged animals (including unaged adults but excluding juveniles) 1 1/2 years old																					
^	Number of animals two years old and older. Animals aged older than two (excluding unaged adults) are lumped into this two plus category																					
**	Percent of aged animals (not including juveniles or unaged adults) two years old or older																					
++	includes juveniles																					
+++	Unaged adults - unaged animals older than yearlings																					

2019 HUNTING SEASONS
UPPER SHOSHONE MULE DEER HERD (MD215)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
110, 111, 112, 113, 114		Oct. 15	Nov. 3		General	Antlered mule deer four (4) points or more on either antler or any white-tailed deer
110, 111	1	Nov. 1	Nov. 15	25	Limited quota	Antlered mule deer or any white-tailed deer
110, 111	8	Oct. 15	Dec. 31	100	Limited quota	Doe or fawn white-tailed deer
112, 113, 114	1	Nov. 1	Nov. 15	25	Limited quota	Antlered mule deer or any white-tailed deer
112, 113	3	Nov. 1	Nov. 30	35	Limited quota	Any white-tailed deer
112, 113	8	Oct. 15	Dec. 31	175	Limited quota	Doe or fawn white-tailed deer
113	7	Oct. 1	Nov. 15	25	Limited quota	Doe or fawn valid on private land north and east of Carter Creek
115		Sep. 10	Oct. 22		General	Antlered mule deer four (4) points or more on either antler or any white-tailed deer

Region F nonresident general license quota = 550

Special Archery Season Hunt Areas	Season Dates	
	Opens	Closes
110 - 114	Sep. 1	Sep. 30
115	Sep. 1	Sep. 9

Hunt Area	Type	Quota change from 2018
110, 111	1	+25
112, 113, 114	1	+25
112, 113	3	+10
112, 113	8	+25
113	7	+25
Total		**+110**
NR Quota		**-200**

Management Evaluation

Current Postseason Population Management Objective: 12,000
Management Strategy: Recreational
2018 Postseason Population Estimate: 6,800
2019 Proposed Postseason Population Estimate: 6,700
2018 Hunter Satisfaction: 43% Satisfied, 21% Neutral, 36% Dissatisfied

Herd Unit Issues

The ability for WGFD to manage the Upper Shoshone mule deer herd has been challenging due to the inability to harvest deer on summer/early fall habitats and the overall low productivity of the herd over the last 3 years. The population is at one of the lowest points we have seen in 30 years due to low productivity and a loss of adults during the 2016/17 winter. Harvesting mule deer in the Upper Shoshone herd unit relies on deer availability along migration routes outside of Yellowstone NP since there are low numbers of non-migratory deer in the North and South Fork Shoshone River valleys. Many of the issues that arise due to this type of hunt revolve around the timing of this migration and the vulnerability of bucks while hunting later into November. Although there is variation between years when peak numbers of deer move along these routes, it is consistent mule deer bucks become more available to harvest during periods of migration on public lands when those periods coincide with the pre-rut and rutting season. This is also reflected in harvest report records, which show 76% of mule deer bucks harvested each year are taken during the 10 day November portion of the season and the greatest proportion of bucks during those 10 days are taken in the last five days of the season (68% of total harvest).
We are maintaining this herd at the current objective and management strategy based on internal discussions and conversations with our constituents. The population is at an all time low and major changes to the hunting season are being implemented during the 2019 season and the managers feel this is not the time to explore changing the objective. We will review this herd objective again in 2023 in conjunction with reevaluating our proposed hunting season change; however, if the situation arises that a change is needed, we will review and submit a proposal as needed.

Weather

The weather conditions during the 2017/18 winter were fairly mild but the cold temps and snow hung on late into the spring which may have made early migrations difficult (Figures 1 and 2). The 2018/19 winter had been relatively mild until mid-February. We saw an increase in snow and a severe decrease in temperatures during the later part of February (Figure 3). Average precipitation levels in most of the herd unit were relatively normal throughout the year.
Winter weather did not start until October in the high country and was relatively mild throughout the winter months. January classification flights revealed a high proportion of open ridges throughout the area with very little snow in the higher elevation areas.

Figure 1. Percent of normal precipitation for Park County from January to March 2018 to show the increased precipitation during the later part of 2017/18 winter.

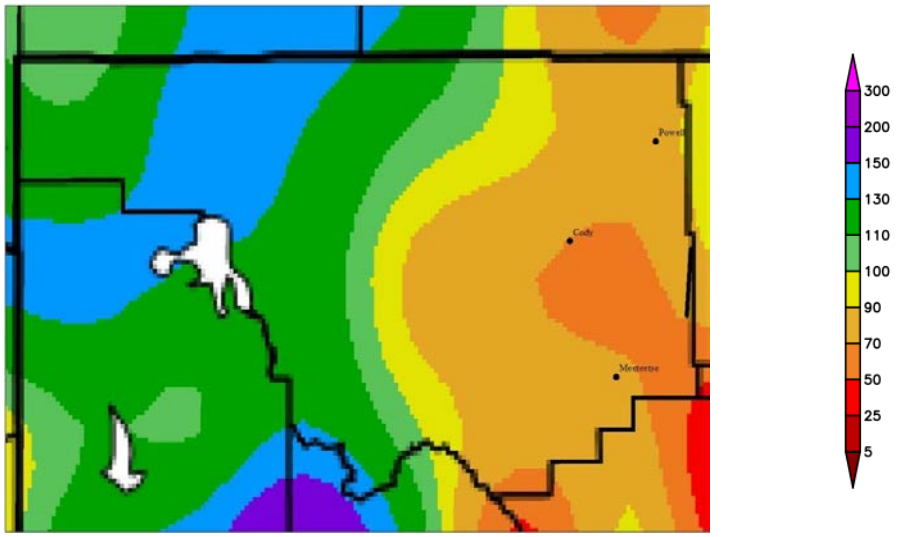


Figure 2. Departure from normal temperature for Park County from January to March 2018.

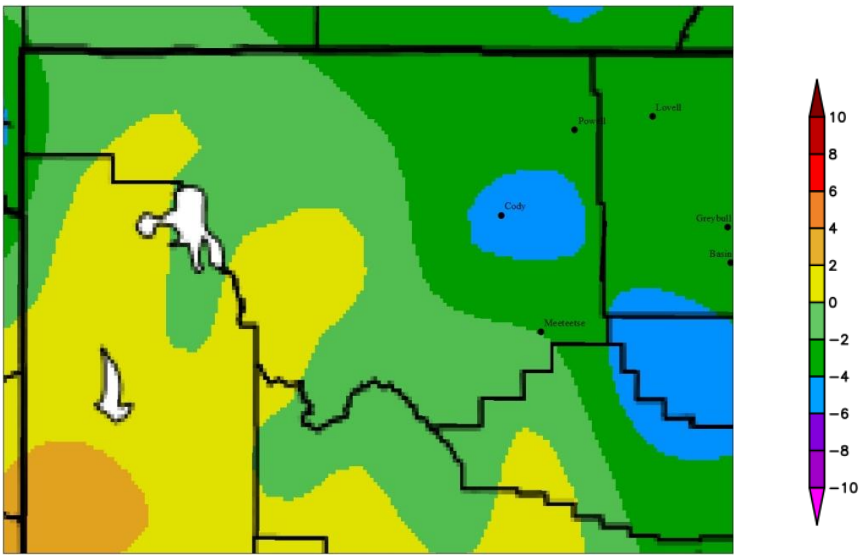
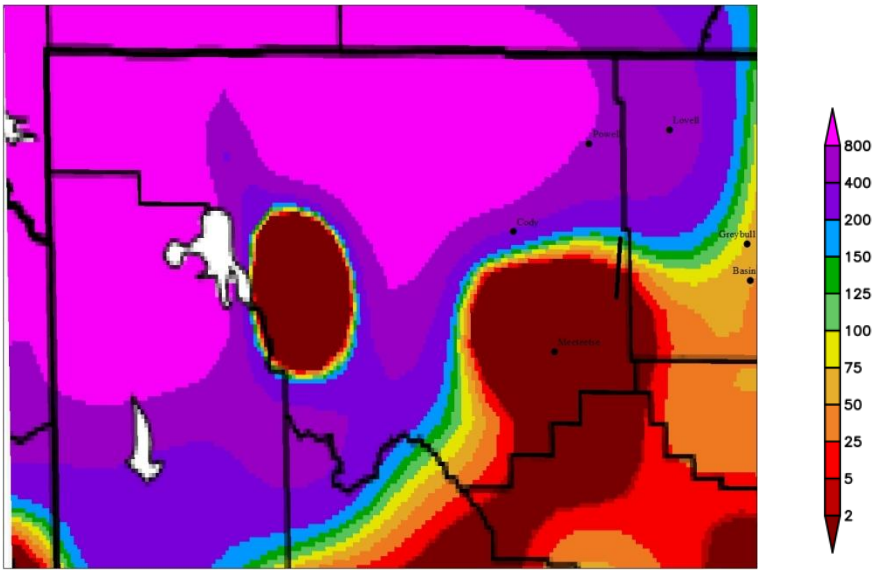


Figure 3. Percent of Normal Precipitation for Park County for February 21 to 27 2019.



Habitat

Two sagebrush transects are monitored in this herd unit; one in the North Fork of the Shoshone River and one in the South Fork of the Shoshone River, but no data was collected for the 2018 biological year. Previous years' summary data can be found in the Cody Region's habitat report in the appendix.

Field Data

The low productivity of this deer herd coupled with hunting seasons focusing on the migratory and rut time period creates difficulties in managing for stable buck:doe ratios in this herd. The deer exhibit low productivity especially over the last 5 years, as evidenced by the 20-year (1997-

2018) average fawn:doe ratio of 61 fawns:100 does (range 42:100 – 74:100). The last 5-year average (55:100, range = 50:100 to 60:100) is even lower and coupled with periodic low fawn to yearling survival has resulted in a below objective population. One indication of fawn survival is to look at a change in ratio of fawns to adults from our November data collection compared to our April data collection (Table 1 for sample sizes). Although the 2017-18 collection period change in ratio was higher compared to 2016-17, the starting ratio was lower (Figure 4). Change in ratio data is not available for the 2014-15 or 2015-16 seasons.

The average buck:doe ratio over the last 10 years is 25:100 does, however the ratio ranged from 18:100 to 32:100. This wide range over a relatively short time period is indicative of the history of this herd over the last 35 years with an average buck:doe ratio of 24:100, but ranging from 9:100 to 35:100 during that time period. The 2018 classification count yielded a ratio of 19:100 total bucks, which coupled with the 2017 data is the lowest 2 year average of total buck ratios since the late 1980s. Another point of concern is the low number of yearling bucks that are in the population now. Managers have seen the last 2 years of yearling ratios at 7:100 and 5:100, these are some of the lowest ever recorded and the lowest 2 consecutive years since the 1980's (Figure 5). The last 4 years average yearling ratio is 8 compared to the previous 20 year average of 12.

Table 1. MD215 total numbers counted for adults and fawns during both count periods for 2011 to 2019 change in ratio surveys.

	Adults		Fawns	
Year	Winter Total	Spring Total	Winter Total	Spring Total
2011-12	1394	978	613	260
2012-13	1383	1252	863	585
2013-14	1189	1691	390	298
2014-15	No change in ratio data			
2015-16	No change in ratio data			
2016-17	1763	1757	782	303
2017-18	1356	801	582	227
2018-19	1300	1362	569	429

Figure 4. MD215 fawn change in ratio for 2011 to 2019.

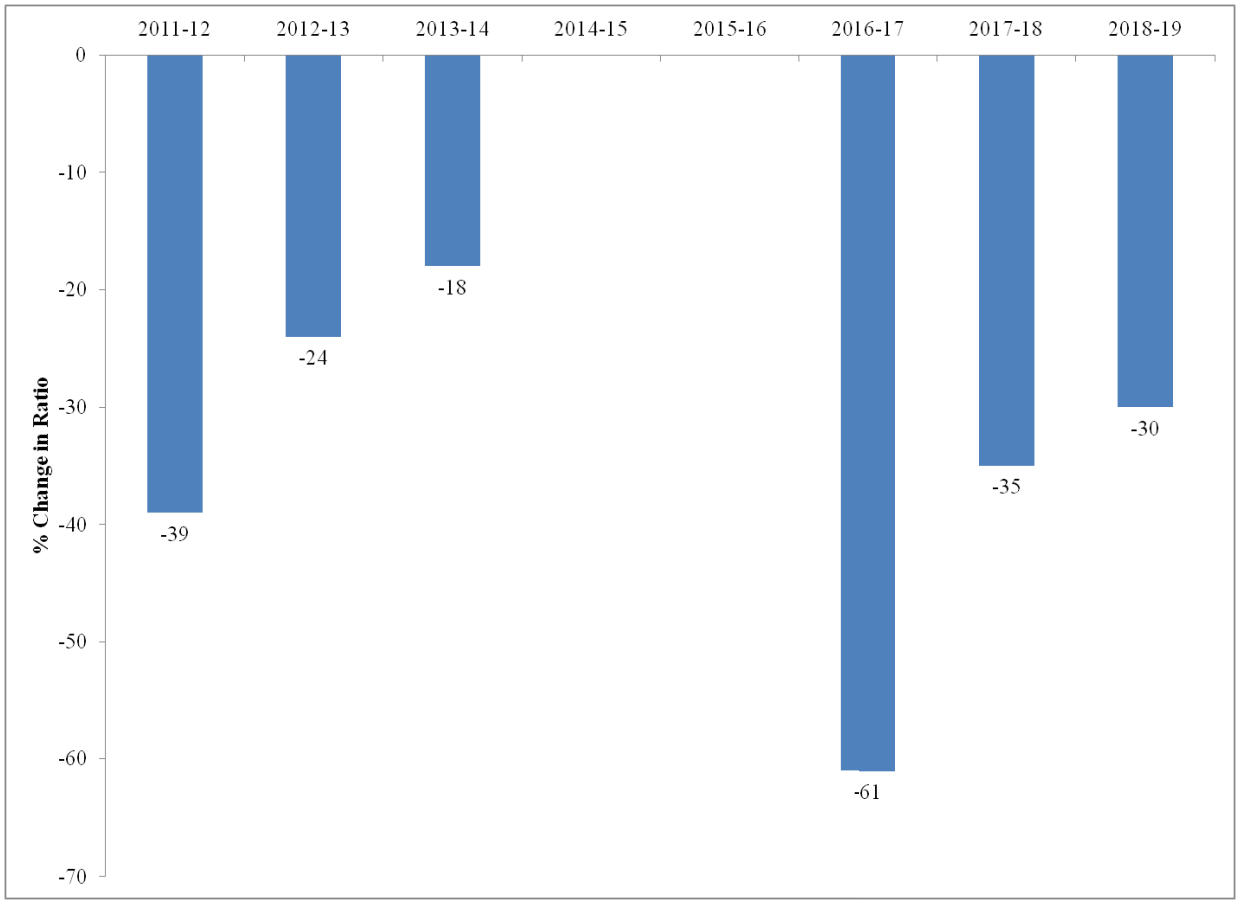
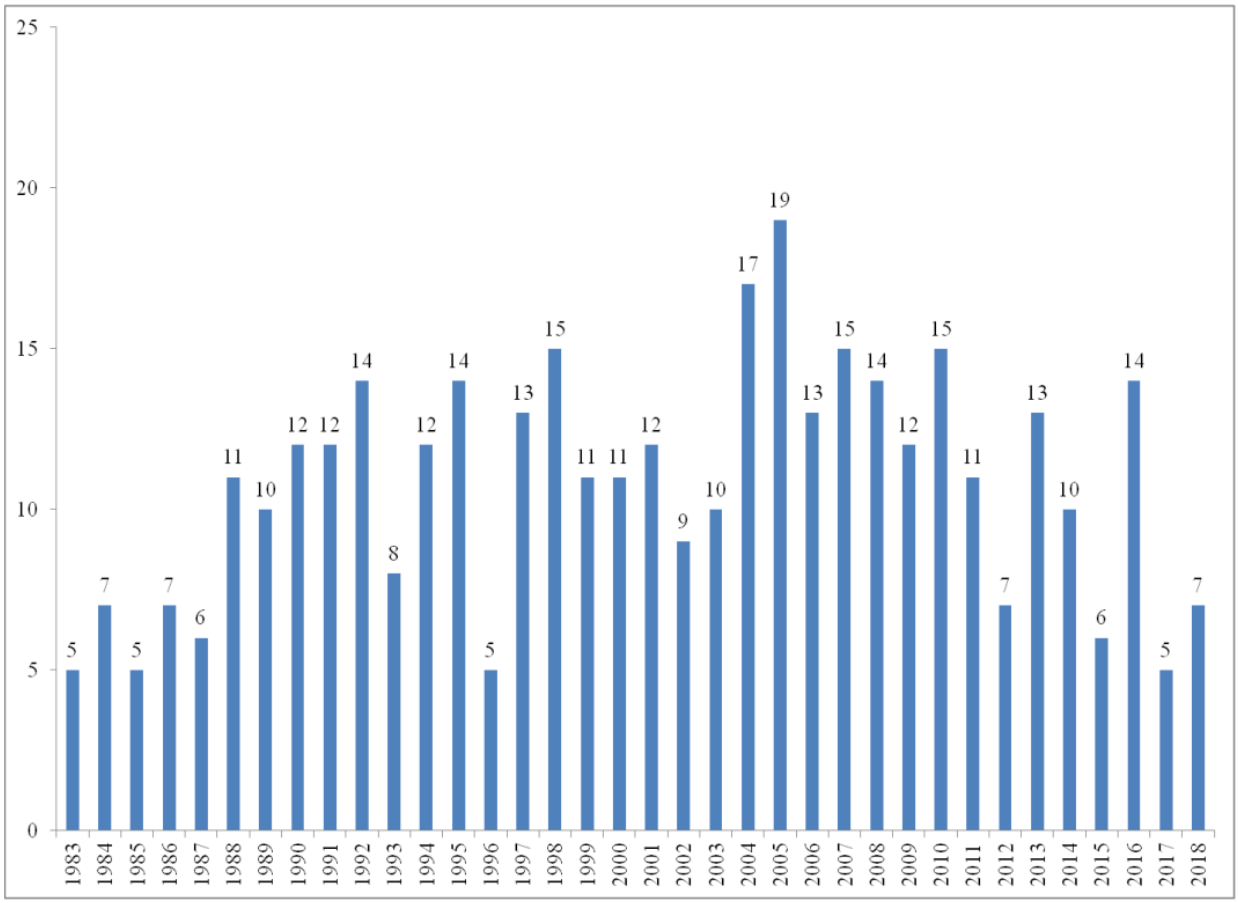


Figure 5. Upper Shoshone mule deer yearling buck ratios over the last 35 years.



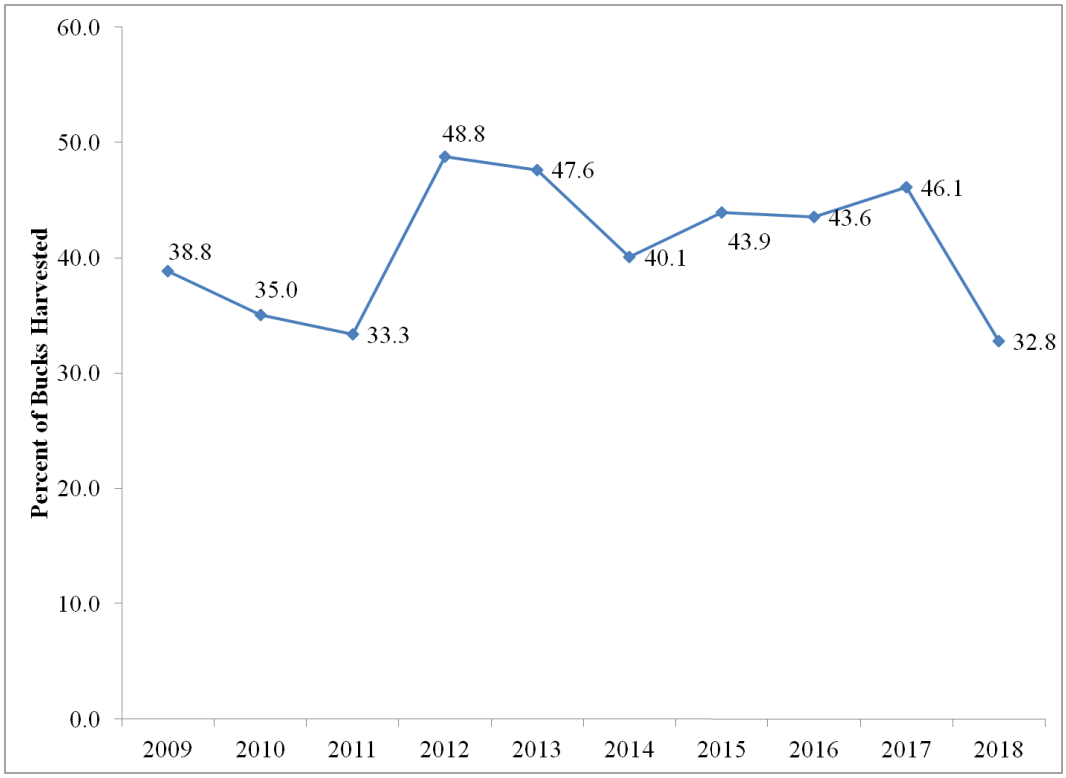
Harvest Data

Buck harvest in the Upper Shoshone deer herd has been variable over the last 5 years (avg = 690, range = 334 to 992) with low doe harvest rates (avg. = 69, range = 22 to 108). In 2018 we saw the lowest buck harvest (334) recorded since 1997 and 1998 in addition to the lowest total hunter numbers ever recorded (1,336). As mentioned above a majority of harvest occurs during the last 10 days of the season (Nov. 1 to Nov. 10). Date of harvest data shows that 76% of those reporting harvest dates in 2018, harvested between Nov. 1 and Nov. 10 with 68% of that harvest occurring between Nov. 6 and Nov. 10. The later season and typical higher harvest success rates lead to a high proportion of bucks in the population being harvested every year (Figure 6). This high harvest rate is most likely due to the nature of the season with hunts occurring while deer are on migration routes and as they begin to become more vulnerable at the onset of rutting activity.

Hunter satisfaction across the herd unit has been declining overall since 2013, with 2018 (42.9%) being lower than the previous 5-year average of 64%. This lower satisfaction is following the decline in the population over the last five years and caused the consistent drop from 2016 (69% satisfied) to 2018 (42.9% satisfied). Harvest success is generally high with the previous 10 year average of 55%; however managers saw the lowest harvest success in this herd since 1997 at 27%.

Doe harvest has been relatively low over the last 5 years in the Upper Shoshone herd with doe harvest mainly occurring in areas where we have damage concerns. We had the lowest doe harvest recorded for the heard in 2018 at 22 does.

Figure 6. Upper Shoshone mule deer herd estimated buck segment of the harvest since 2009.



Population

The "Time Specific Juvenile – Constant Adult Mortality Rate" (TSJ,CA) spreadsheet model was chosen to use for the post season population estimate of this herd, based on having the lowest relative AICc and fitting the on-the-ground population trends we have seen. The postseason population estimate for 2018 is 6,900 deer, or 42% below the population objective. More conservative antlerless seasons were implemented in 2017 and 2018 but due to a severe winter in 2016-2017 and poor fawn production we have seen a great decline in the population. Because of the severe winter and limited collar data, within the TSJ, CA model we constrained adult survival to a lower level (0.7 to 0.80) for the 2016/17 winter.

The spreadsheet model seems to be a useful tool for this herd because it matches the managers' feeling of what is occurring in the field; however, without an independent estimate of the population size we must be cautious in the use of this model as our only source of information.

Management Summary

The Upper Shoshone mule deer herd has been plagued with especially difficult winters and low fawn production over the last 5 years. This has led to the lowest population estimates seen in this herd in many years and the lowest harvest ever recorded. Despite the implementation of a four point restriction in the 2018 season we saw very little response in the buck ratios. This low response is due to a low population and poor recruitment of fawns into the population. The very

low yearling ratio over the last two years is an indication of the low buck recruitment we can expect over the coming 3-5 years. Because of the potential for large portions of the buck population to be harvested in this herd, low fawn productivity and survival over the last 4 years and a desire to decrease the length of recovery time of hunt quality for the herd, managers implemented a season that should decrease overall buck harvest but allow for some limited opportunity later in November.

Decreasing the number of general hunt days in November is based on the premise that the Upper Shoshone mule deer bucks become more vulnerable later into November. Harvest data supports this idea with 76% of the reported harvest in 2018 occurring November 1 to 10 and 69% of that harvest occurring November 6 to 10. Reducing the number of days hunted in November should have the highest probability of decreasing overall buck harvest which should allow the buck numbers to increase over the next 3 to 5 years. It was evident the public enjoyed the November hunt and wanted to maintain some opportunity for that portion of the hunt. They were also supportive of allowing some limited opportunity for hunting later in November on a limited quota license. Based on this feedback managers want to allow for some limited general hunting in November and very limited opportunity hunting later in November because of that public input.

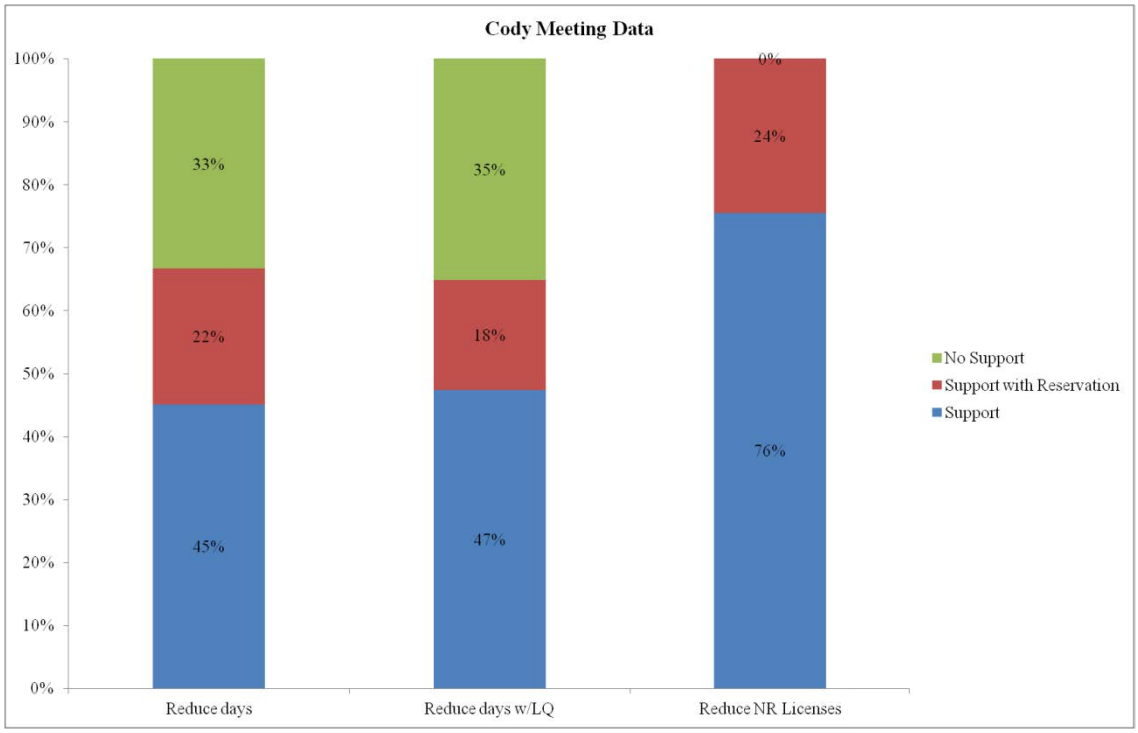
In addition to the change in general season dates and creation of a limited quota license it was determined that the number of non-resident licenses was higher than normal non-resident/resident license splits with over 30% of total hunters being non-resident in the herd units. We are decreasing the number of non-resident region F licenses to 550 in order to align with a 20% non-resident proportion of hunters and decrease bucks harvested by non-residents.

The very limited number of doe licenses in a small portion of hunt area 113 are available in order to deal with resident deer numbers and damage issues that have been increasing that area. This is very limited and should not impact the migrating doe mule deer portion of the herd.

The 2019 hunting season was a culmination of over a year of discussions internally and with the public. Managers became concerned with the trend in the population and hunt quality in 2017 and made efforts throughout 2018 and into 2019 to engage the public and gather input regarding population, buck numbers and buck quality. The consensus has been that the public is concerned with the Upper Shoshone mule deer herd. After the 2018 hunting season and subsequent classification counts managers met to discuss management options to address short and long term concerns with buck numbers and hunt quality. Managers used the input from the public and internal discussions to determine different season structure changes to bring to the public in 2 meetings that were well attended (~130 people). Managers met after the meetings and based on the discussions and levels of support for the different options presented at the meetings the 2019 season was implemented (Figures 7 and 8).

One clear and overwhelming response from the public was in the return of November hunting opportunity if there is a loss in that opportunity with the new season structure. In order to facilitate that discussion in the future, we are proposing a “threshold” that involves revisiting the change with the intent on increasing that opportunity through the general hunt in November. The specifics of this threshold will be vetted through the public process in order to allow for flexibility over the next 3 to 5 years. The managers are committed to meeting with the public each December to discuss their perceptions of herd health, buck numbers and hunt quality. This discussion will allow managers to gauge where the threshold lies and make decisions on moving forward with any changes.

Figure 7. Public support levels for the 3 proposed actions in the Upper Shoshone herd presented at the Cody meeting in February. Participants were divided into small groups after a lengthy presentation to gather levels of support for each of the options. The support levels were explained as 1) Full support, 2) support with reservations and 3) no support. Support with reservation was explained as having support for the idea but having some type of reservation. After discussion with the public during the breakout group time period it was very evident the "reservations" were centered around losing opportunity for general hunting in November and never again increasing that opportunity.



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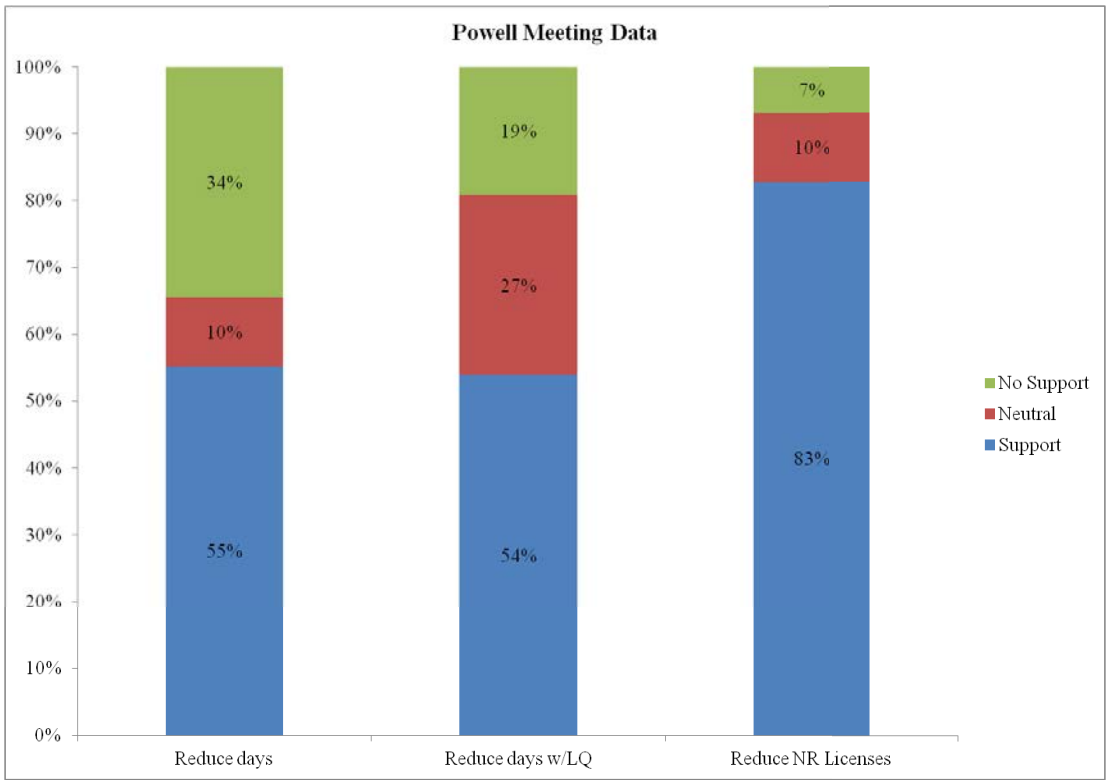


2018 - JCR Evaluation Form

SPECIES: Mule Deer | PERIOD: 6/1/2018 - 5/31/2019

HERD: MD216 - CLARKS FORK

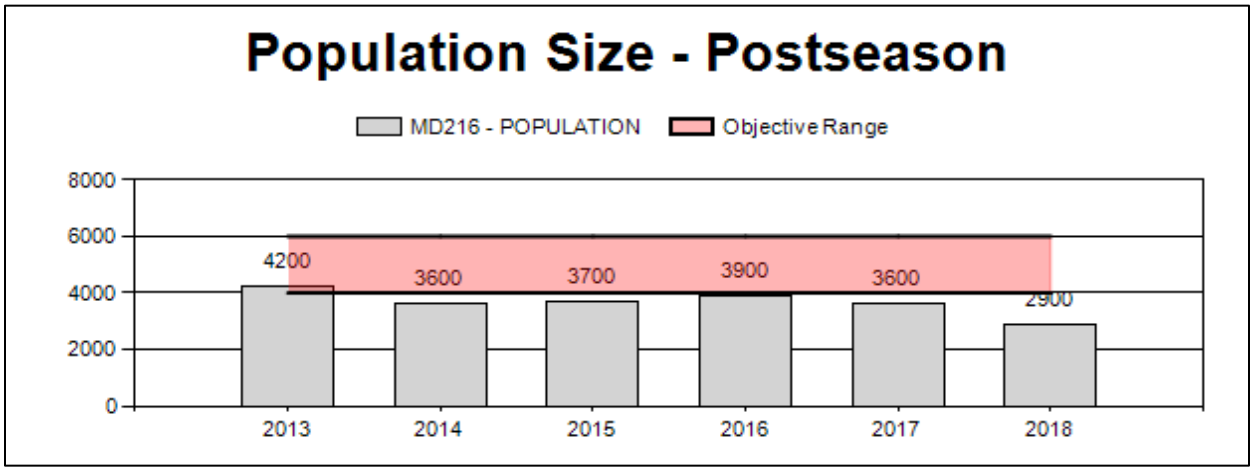
HUNT AREAS: 105-106, 109 | PREPARED BY: TONY MONG

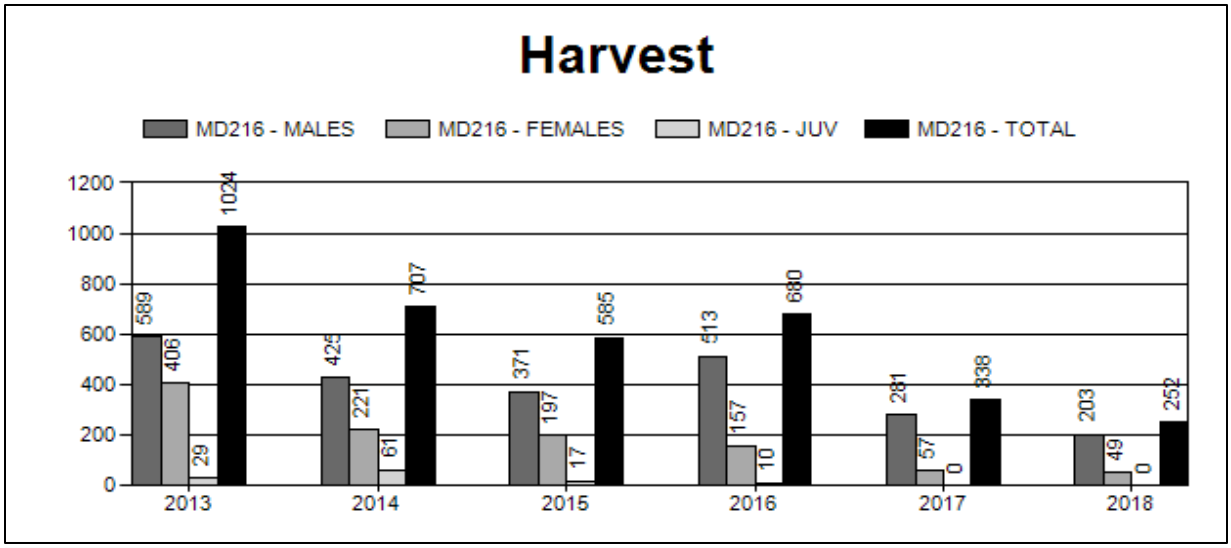
	2013 - 2017 Average	2018	2019 Proposed
Population:	3,800	2,900	2,700
Harvest:	667	252	175
Hunters:	1,352	753	500
Hunter Success:	49%	33%	35%
Active Licenses:	1,441	769	525
Active License Success:	46%	33%	33%
Recreation Days:	6,831	5,043	5,000
Days Per Animal:	10.2	20.0	28.6
Males per 100 Females	29	27	
Juveniles per 100 Females	59	46	

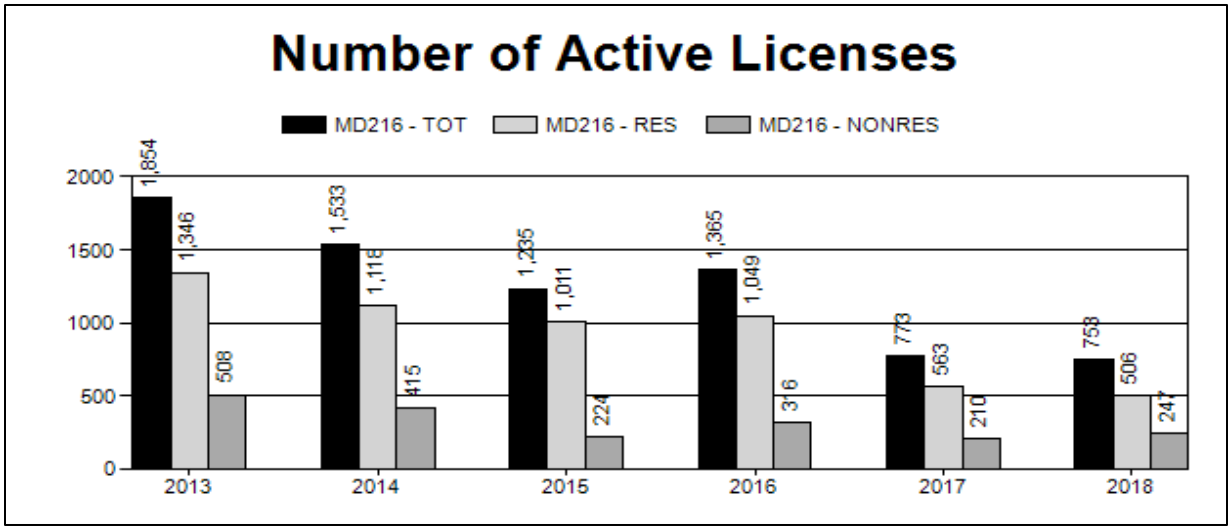
Population Objective (± 20%) :	5000 (4000 - 6000)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-42%
Number of years population has been + or - objective in recent trend:	2
Model Date:	03/1/2019

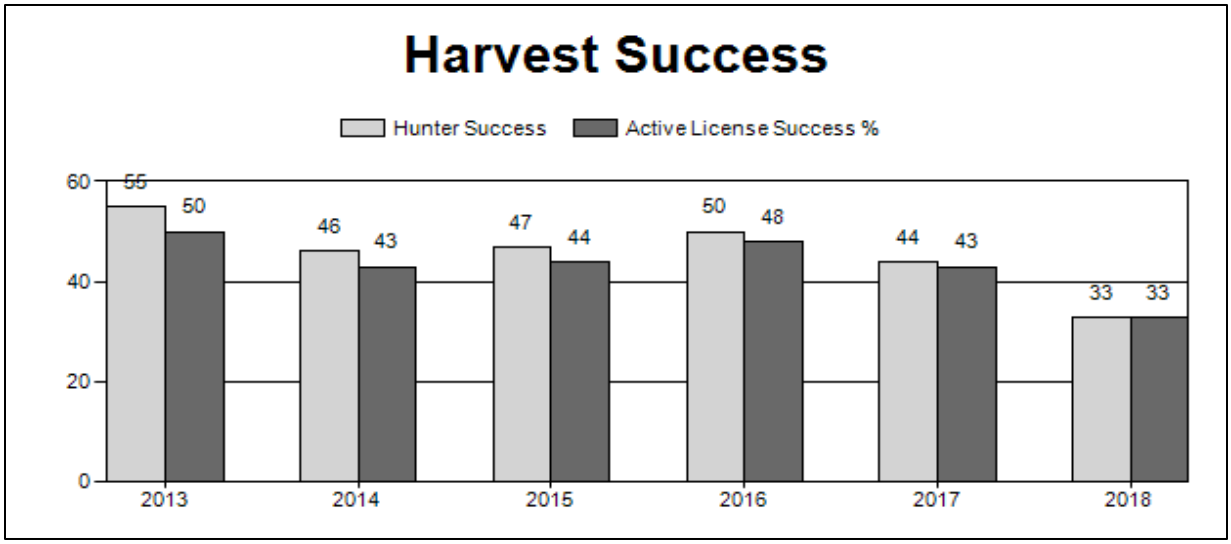
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

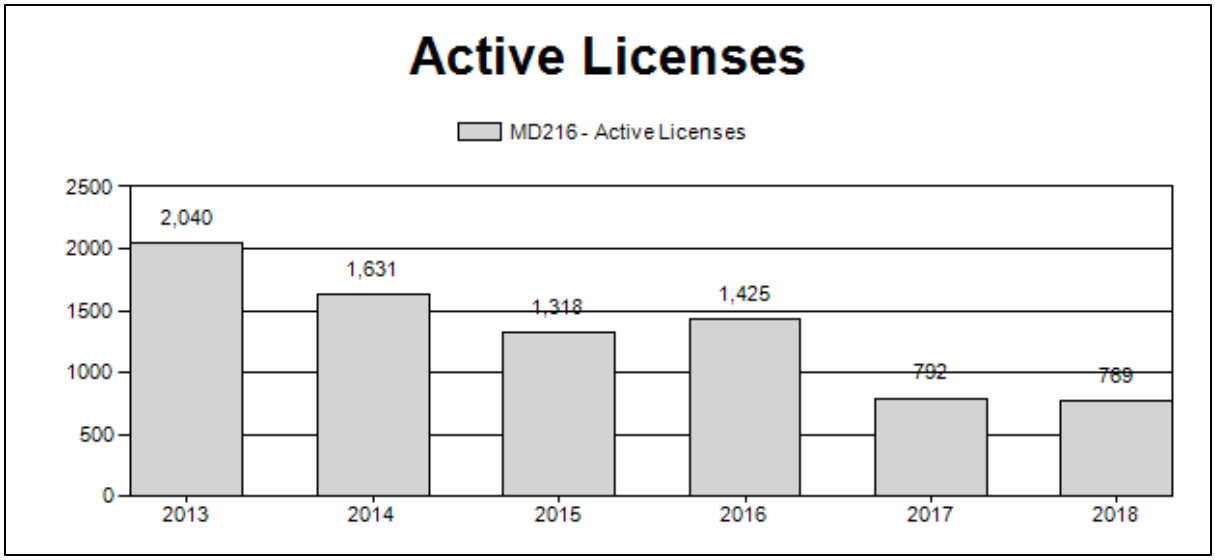
	JCR Year	Proposed
Females ≥ 1 year old:	1.4%	1.7%
Males ≥ 1 year old:	39%	36%
Total:	8%	6%
Proposed change in post-season population:	0%	0%

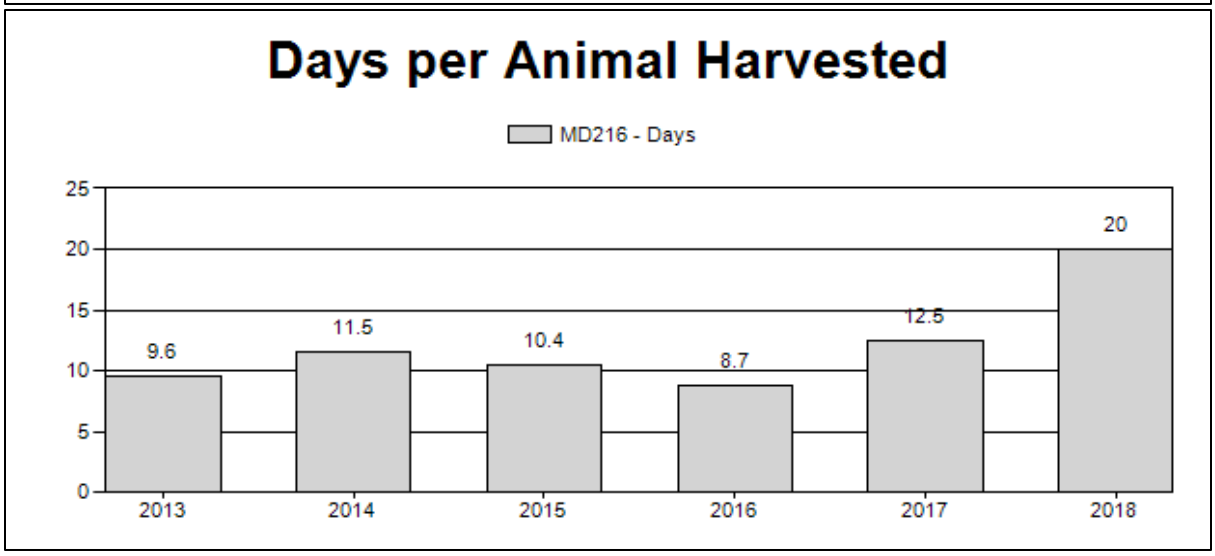


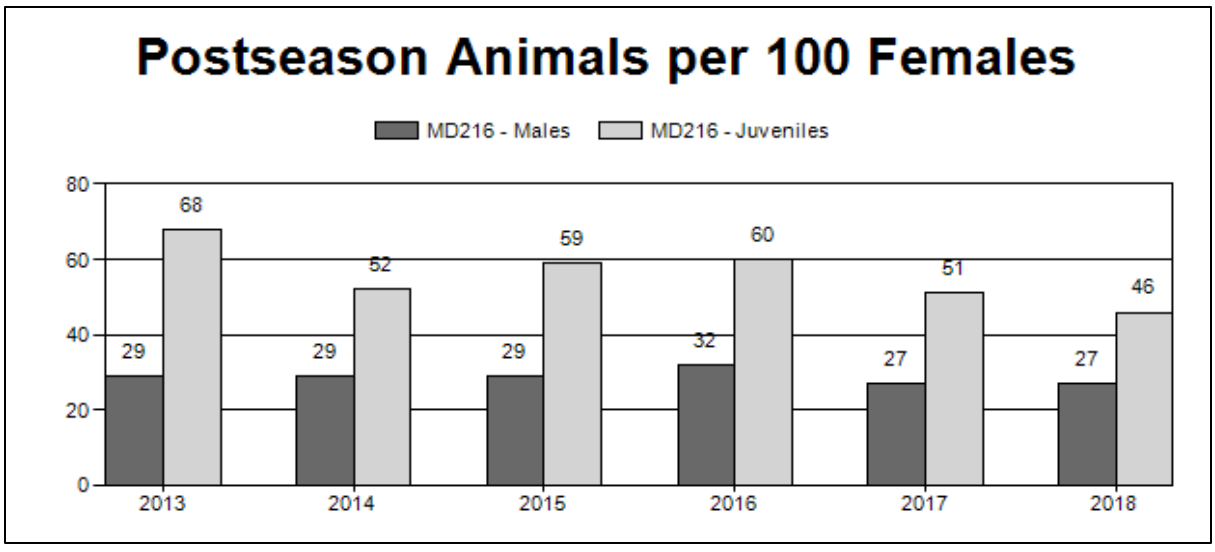

Harvest
MD216 - MALES
MD216 - FEMALES
MD216 - JUV
MD216 - TOTAL
1200
1000
800
600
400
200
0
589
406
29
1024
425
221
61
707
371
197
17
585
513
157
10
680
281
57
0
338
203
49
0
252
2013
2014
2015
2016
2017
2018


Number of Active Licenses
MD216 - TOT
MD216 - RES
MD216 - NONRES
2000
1500
1000
500
0
1,854
1,346
508
1,533
1,118
415
1,235
1,011
224
1,365
1,049
316
773
563
210
758
506
247
2013
2014
2015
2016
2017
2018


Harvest Success
Hunter Success
Active License Success %
60
40
20
0
55
50
46
43
47
44
50
48
44
43
33
33
2013
2014
2015
2016
2017
2018


Active Licenses
MD216 - Active Licenses
2500
2000
1500
1000
500
0
2,040
1,631
1,318
1,425
792
769
2013
2014
2015
2016
2017
2018


Days per Animal Harvested
MD216 - Days
25
20
15
10
5
0
9.6
11.5
10.4
8.7
12.5
20
2013
2014
2015
2016
2017
2018


Postseason Animals per 100 Females
MD216 - Males
MD216 - Juveniles
80
60
40
20
0
29
68
29
52
29
59
32
60
27
51
27
46
2013
2014
2015
2016
2017
2018

2013 - 2018 Postseason Classification Summary																					
for Mule Deer Herd MD216 - CLARKS FORK																					
		MALES							FEMALE		JUVENIL				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
2013	4,200	71	0	0	0	95	166	15%	576	51%	390	34%	1,132	1,083	12	16	29	± 3	68	± 5	53
2014	3,600	48	63	39	11	0	161	16%	550	55%	288	29%	999	893	9	21	29	± 3	52	± 4	41
2015	3,700	40	68	42	18	0	168	15%	580	53%	344	32%	1,092	800	7	22	29	± 3	59	± 4	46
2016	3,900	59	71	33	16	0	179	17%	564	52%	336	31%	1,079	925	10	21	32	± 3	60	± 4	45
2017	3,600	39	42	20	11	0	112	15%	420	56%	216	29%	748	890	9	17	27	± 3	51	± 5	41
2018	2,900	14	40	17	5	0	76	16%	279	58%	127	26%	482	665	5	22	27	± 4	46	± 6	36

2019 HUNTING SEASONS
CLARKS FORK MULE DEER HERD (MD216)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
105		Oct. 1	Oct. 24		General	Antlered mule deer or any white-tailed deer valid on national forest
105		Nov. 1	Nov. 5		General	Any deer valid off national forest
105		Nov. 6	Nov. 17		General	Antlerless deer valid on private land
105, 106, 109	1	Nov. 1	Nov. 15	25	Limited quota	Any deer
106		Oct. 1	Oct. 24		General	Antlered mule deer or any white-tailed deer

Region F Nonresident General License Quota = 550

Special Archery Season Hunt Areas	Season Dates	
	Opens	Closes
105, 106, 109	Sep. 1	Sep. 30

Hunt Area	Type	Quota change from 2018
105, 106, 109	1	-25
Total		**-25**
NR Quota		**-200**

Management Evaluation
Current Postseason Population Management Objective: 5,000
Management Strategy: Recreational
2018 Postseason Population Estimate: 2,900
2019 Proposed Postseason Population Estimate: 2,700
2018 Hunter Satisfaction: 46% Satisfied, 22% Neutral, 31% Dissatisfied

Herd Unit Issues
Managing the Clark's Fork mule deer herd can be challenging because of the mix of migratory and non-migratory deer in the herd unit and the susceptibility of the herd to harsh winters. A majority of deer in this area can be characterized as migrants spending the summer and early fall in Yellowstone National Park however, there is a large number of resident deer living in the agricultural fields in hunt area 105. Creating hunting seasons for migratory deer can be

problematic due to the variable timing of movement in relation to weather patterns and the vulnerability of deer along migration routes. Migratory deer in this portion of Wyoming also exhibit relatively low productivity, while deer associated with agricultural fields have much higher productivity complicating both the ability to manage and the regulations related to that management. In addition to these issues, recently we have experienced poor productivity and at least 2 severe winters. This has led to a hole or gap in the upcoming age classes. We feel due to the poor production and poor survival we could be dealing with very low numbers of the current and 2 previous age classes. This is compounded by the overall decrease in numbers due to the same factors, creating a situation that may result in very few buck deer being available for harvest resulting in decreasing hunter success and satisfaction.
We are maintaining this herd at the current objective and management strategy based on internal discussions and conversations with our constituents. The population is at an all time low and major changes to the hunting season have been proposed for the 2019 season and the managers feel this is not the time to explore changing the objective. We will review this herd objective again in 2023 in conjunction with reevaluating our proposed hunting season change; however, if the situation arises that a change is needed, we will review and submit a proposal as needed.

Weather
The weather conditions during the 2017/18 winter were fairly mild but the cold temps and snow hung on late into the spring which may have made early migrations difficult (Figures 1 and 2). The 2018/19 winter had been relatively mild until mid-February. We saw an increase in snow and a severe decrease in temperatures during the later part of February (Figure 3). Average precipitation levels in most of the herd unit were relatively normal throughout the year.
Winter weather did not start until October in the high country and was relatively mild throughout the winter months. January classification flights revealed a high proportion of open ridges throughout the area with very little snow in the higher elevation areas.

Figure 1. Percent of normal precipitation for Park County from January to March 2018 to show the increased precipitation during the later part of 2017/18 winter.

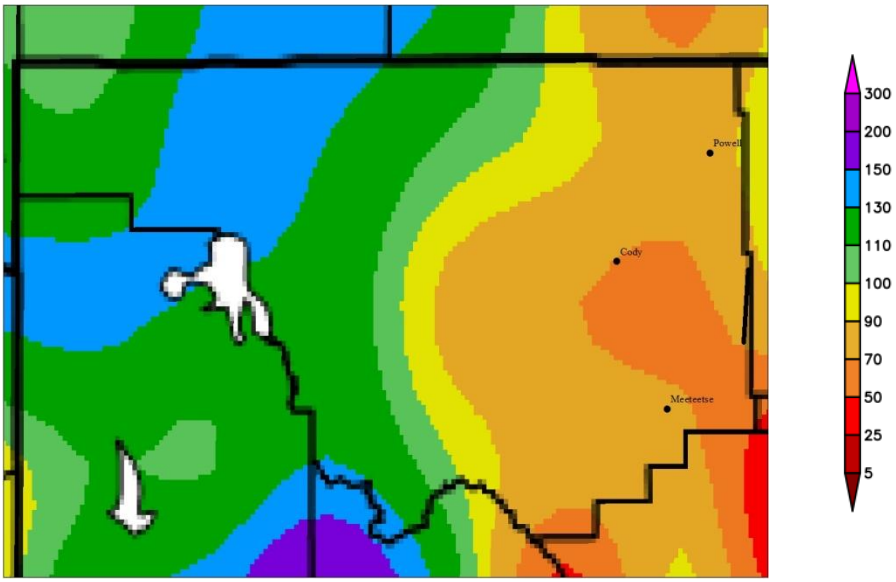


Figure 2. Departure from normal temperature for Park County from January to March 2018.

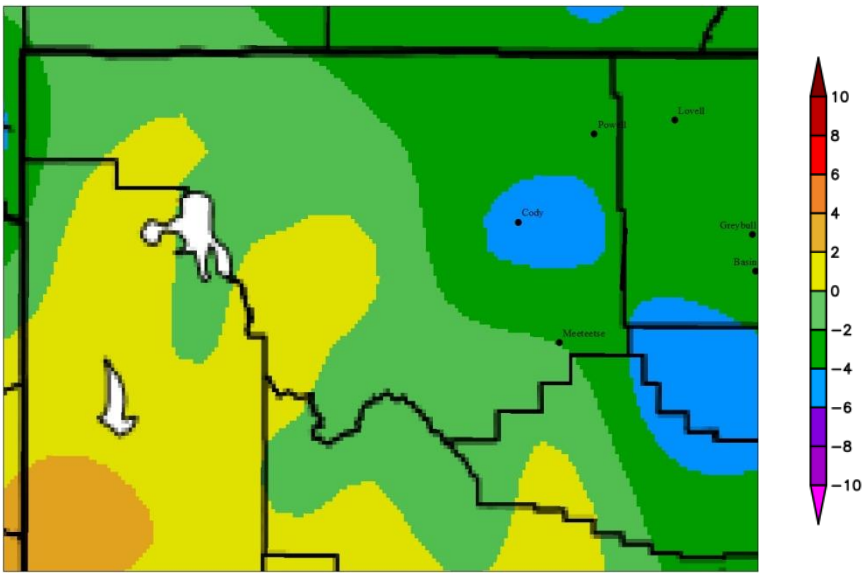
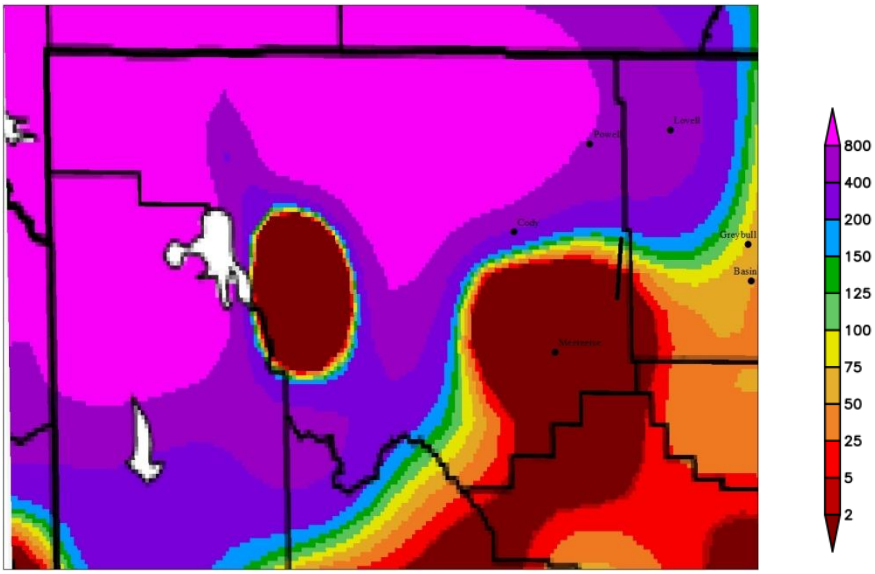


Figure 3. Percent of Normal Precipitation for Park County for February 21 to 27 2019.



Habitat

No habitat monitoring data is collected in this herd unit.

Field Data

The migratory nature of the majority of mule deer in this population may be causing depressed fawn ratios. Long-term data (35 years) shows an overall average fawn ratio of 62:100 does (range = 51:100 to 76:100) compared to a statewide average of 66:100 (range = 53:100 to 81:100). In addition, the last 10-year average of fawn ratios (58:100, range = 51:100 to 70:100) is lower than the first 10-years of available data (1983 to 1992, average = 65:100, range 56:100

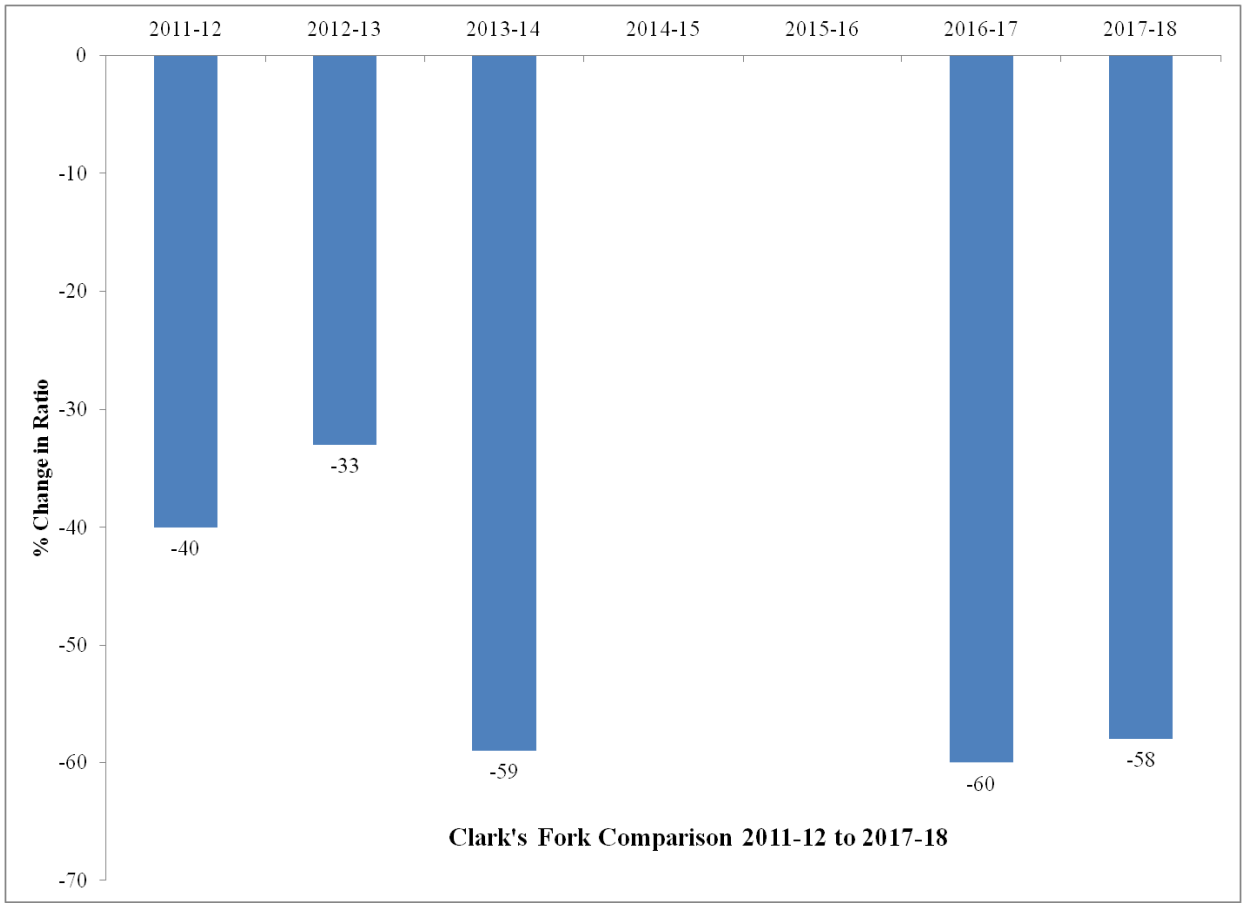
to 76:100). This decreasing trend is exacerbated over the last 5 years with an average fawn ratio of 54:100. Unfortunately lower fawn ratios are causing a depressed population and slower population response after difficult winters. Fawn ratios are an indication of production for the year, but another aspect of production is the survival of fawns over winter. One way to look at fawn survival over winter is the change in ratio of fawns to adults from our November data collection compared to our April data collection (Table 1 for sample sizes). The 2017-18 collection period change in ratio from 41:100 adults to 23:100 adults is a -58% change (Figure 4). Change in ratio data since the 2011-12 winter indicates that on average the Clark's Fork herd has a much higher loss of fawns at -50% compared to an adjacent herd the Upper Shoshone which averages at -35%. The 2018-19 change in ratio data shows a higher level of survival for the fawns, however, the ratio started much lower compared to previous years.

The hunting season structure implemented in 2008 seems to have benefited the adult buck:doe ratio over the last 10 years. The 10 years prior to the removal of the November general season yields an adult buck ratio of 12:100 (range = 9:100 to 15:100) versus the 10 years after the change in season of 19 (range = 16 to 22). Fawn ratios during these same time periods decreased from 61:100 (range = 51:100 to 66:100) during the 10 years prior to 57:100 (57:100 (range = 51:100 to 70:100) after the change in season. Total buck ratios over the last 5 years (average 29:100, range = 27:100 to 32:100) has been higher than historical ratios (average 25:100, range = 12:100 to 42:100) however, the population size must be factored into the equation to understand the total number of bucks available in this herd.

Table 1. MD216 total numbers counted for adults and fawns during both count periods for 2011 to 2018 change in ratio surveys.

	Adults		Fawns	
Year	Winter Total	Spring Total	Winter Total	Spring Total
2011-12	841	470	315	108
2012-13	471	724	270	272
2013-14	742	1375	390	298
2014-15	No change in ratio data			
2015-16	No change in ratio data			
2016-17	743	1122	336	206
2017-18	493	715	216	121
2018-19	355	719	127	188

Figure 4. MD216 fawn change in ratio for 2011 to 2018.



Harvest Data

The Clark's Fork herd is one of the few in the state where harvest relies entirely on the migration period of mule deer ecology. This type of hunt becomes challenging due to variability in migration timing and vulnerability of deer while they are migrating especially when hunting closer to the onset of the male rut. Buck harvest since removal of the general license seasons (2008) in November have been relatively stable and lower at an average buck harvest of 294 (range = 203 to 362) compared to 392 (range = 224 to 511) from the 10 years prior to the change in season. The biggest decrease came within Hunt Area 106 with a change from an average buck harvest of 247 prior to the change in season to 160 after the change. 2018 saw the lowest buck harvest ever estimated for the herd (Hunt Areas 105-109). Harvest success has been relatively high for the herd but decreasing with a 5-year average of 44% and the 2018 success being the lowest recorded since 1997 at 29%. Hunt area success rates are variable with a 5-year average of 44% for Hunt Area 105, 31% for Hunt Area 106 and 73% for Hunt Area 109. 2018 saw a lower than average success rate for Hunt Area 105 (37%) and 106 (21%) with a similar success rate in Hunt Area 109 (73%). Hunter satisfaction is variable between the hunt areas with general hunting seasons (HA 105, 106) and limited quota Hunt Area 109 (Figure 5). Satisfaction data has been collected since 2013 and there is some variation for Hunt Areas 105 and 106, and a steady decline in satisfaction in Hunt Area 109 (Figure 6). Dissatisfaction for the hunts in Clark's Fork

Herd has been increasing since 2016. This increase is most likely due to the decrease in the population of deer after the winter of 2016/17 throughout the herd unit.

Figure 5. Hunter satisfaction for the Clark's Fork mule deer herd in 2018.

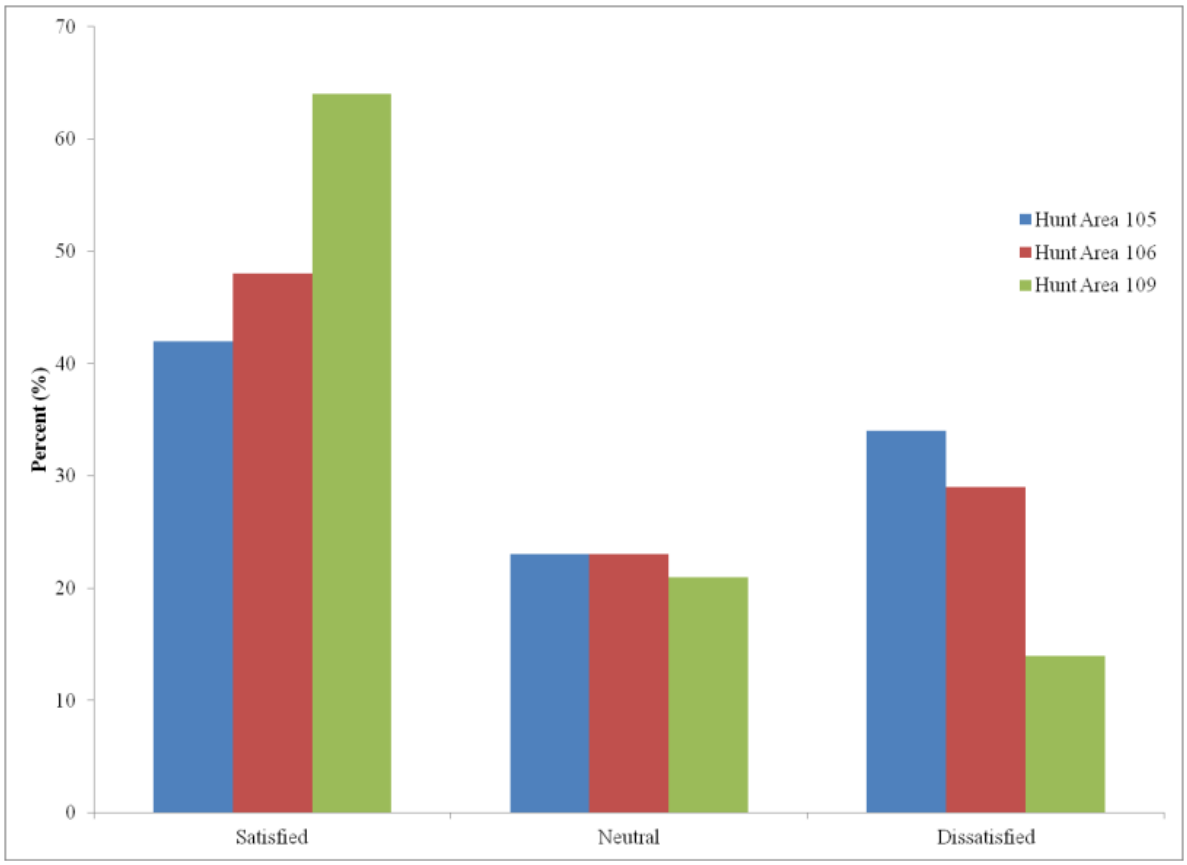
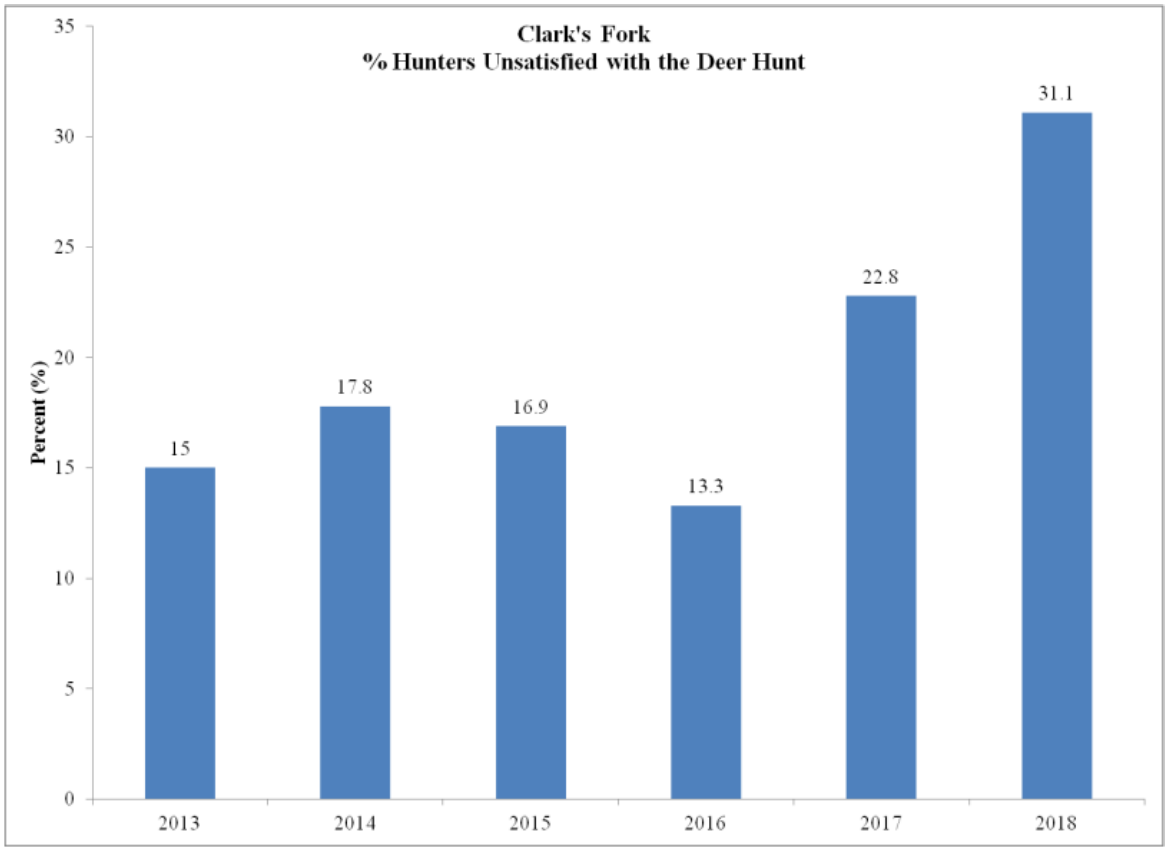


Figure 6. Hunter dissatisfaction for the Clark's Fork herd unit from 2013 to 2018.



Population

The "Time Specific Juvenile – Constant Adult Mortality Rate" (TSJ,CA) spreadsheet model was chosen to use for the post season population estimate of this herd, based on fitting the on-the-ground population trends and predicted buck ratios. The postseason population estimate for 2018 is 2,900 deer, or 43% below the population objective. Very little antlerless harvest occurs in this area but due to a severe winter in 2016-2017 and overall poor production and fawn survival over the last 5 years we have seen a large decline in the population. Because of the severe winter and limited collar data within the TSJ, CA model we constrained adult and juvenile survival to lower levels (0.7 to 0.80 and 0.4 and 0.5 respectively). The spreadsheet model seems to be a useful tool for this herd; however, without an independent estimate of the population size we must be cautious in the use of this model as our only source of information.

Management Summary

The Clark's Fork herd has been hit with several bad winters and low productivity over the last 5 years. The combination of severe winter die offs, low productivity and survival has decreased the population to the lowest levels seen in this herd since the early 1980s. Managers have been concerned with populations, buck numbers and buck harvest over the last 5 years. This concern was magnified when we did not see a normal population rebound after the difficult winter and continued low fawn and yearling buck ratios. The issues facing the Clark's Fork are exacerbated by the low number of deer in the population currently and the mix of migratory and non-migratory deer found throughout the hunt areas.

One major issue is the population levels are low enough that the estimated numbers of bucks (despite the higher buck ratio) that may be available for the 2019 season are not much higher than the average harvest. The population model is estimating around 500 bucks available for harvest in 2019 which when compared to the 5 year average harvest of 359 the potential for a severe and sharp decline in the number of bucks in this population may be a possibility if harvest remains similar to previous years. Although typically with lower buck ratios you would see lower overall harvest success which should drive down total numbers of bucks harvested, because of the nature of this hunt the potential for a large harvest is a possibility.

The majority of this herd spends the summer and early fall in Yellowstone National Park, which limits our ability to hunt deer in this herd to the migratory portion of the season. This type of hunting can lead to large portions of bucks being harvested because of their vulnerability along migration routes. Typically the later into the fall we hunt the more vulnerable bucks become, therefore in a general area the most effective method of reducing buck harvest may be to decrease days off the end of the season.

The decrease in the number of general hunt days in October is based on the premise that the Clark's Fork mule deer bucks become more vulnerable later into October. Reducing the number of days hunted in October should be the most successful way of decreasing overall buck harvest allowing the buck numbers to increase over the next 3 to 5 years. The 2019 hunting season was a culmination of over a year of discussions with the public. Managers became concerned with the trend in the population and hunt quality in 2017 and made a concerted effort during the 2018 hunting season to gauge the public's perception of the issue through field contacts. After the hunting season managers used input from the public and internal discussions to determine different season structure changes to bring to the public in 2 meetings that were well attended (~130 people). Managers met after the meetings and based on the discussions and levels of support for the different options presented at the meetings the 2019 season was implemented (Figures 7 and 8).

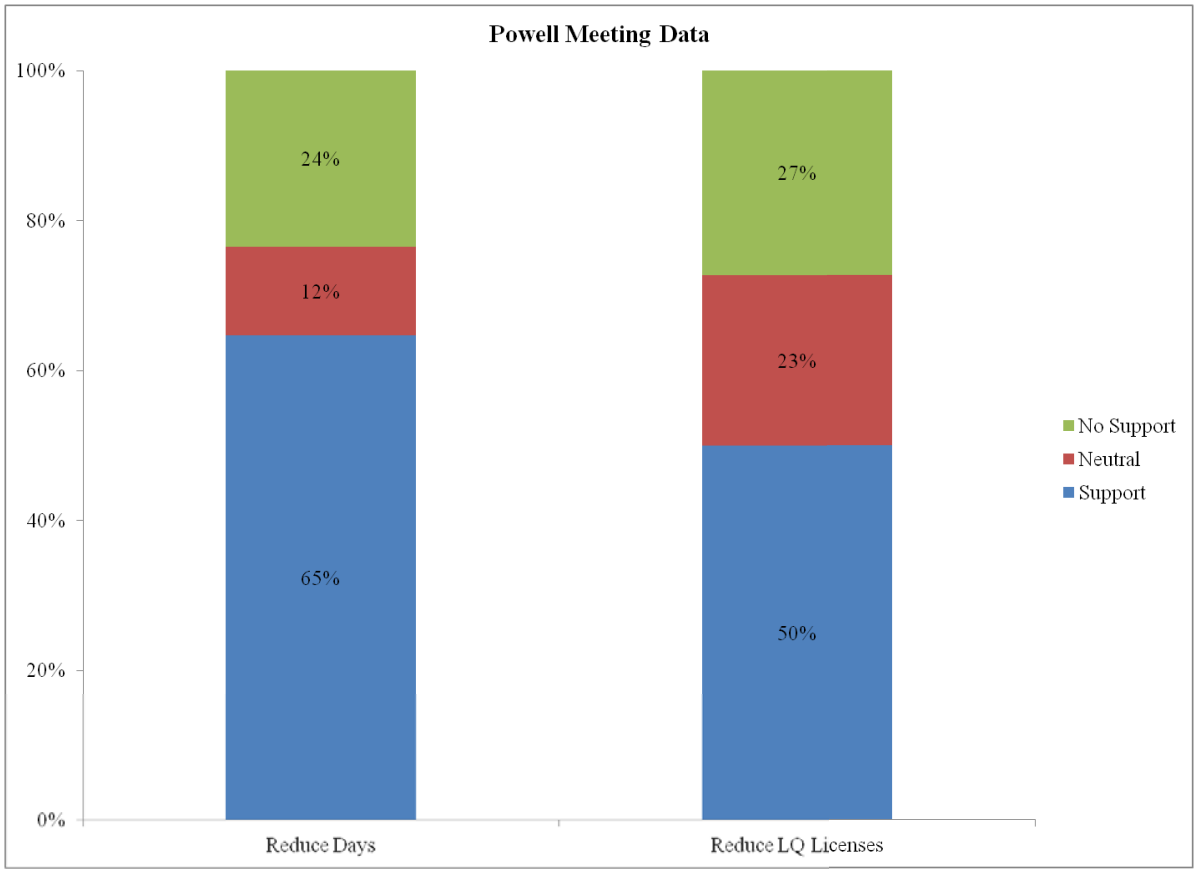
One clear and overwhelming response from the public was in the return of October hunting opportunity if there is a loss in that opportunity with the new season structure. In order to facilitate that discussion in the future, we are proposing a "threshold" that involves revisiting the change with the intent on increasing that opportunity through the general hunt in October. The specifics of this threshold will be vetted through the public process in order to allow for flexibility over the next 3 to 5 years. The managers are committed to meeting with the public each December to discuss their perceptions of herd health, buck numbers and hunt quality. This discussion will allow managers to gauge where the threshold lies and make decisions on moving forward with any changes.

Another confounding factor plaguing this herd is the large number of resident deer in hunt area 105. These deer reside in and around farm ground throughout the eastern portion of the hunt area. The November general seasons in this hunt area are designed to deal with the resident deer that can cause damage to crops. We decreased the days hunted in November and added private land only during the general antlerless to decrease the chance of harvesting the migratory portion of the herd based on feedback from our 2 public meetings in February. This portion of the season should allow for dealing with damage issues through harvest but not negatively impact the struggling migratory portion of the deer herd.

In addition to the change in general season dates and decrease in the limited quota license it was determined that the number of non-resident licenses was higher than normal non-resident/resident license splits with over 30% of total hunters being non-resident in the herd

units. We are decreased the number of non-resident region F licenses to 550 in order to align with a 20% non-resident proportion of hunters and decrease bucks harvested by non-residents.

Figure 7. Public support levels for the 2 proposed actions in the Clark's Fork herd presented at the Powell meeting in February. Participants were divided into small groups after a lengthy presentation to gather levels of support for the options. Our intention was to have 3 support levels, 1) Full support, 2) support with reservations and 3) no support. Unfortunately due to poor communication of the support level definitions and what was expected of the meeting participants there was some confusion on the "support with reservations" support level. In order not to misrepresent the understanding of the public choosing the "middle choice" we have decided to use a "neutral" view instead of a "support with reservation". The "neutral" view should be considered a no opinion or abstaining from casting support of any kind, either for or against.



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