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2019 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2019 - 5/31/2020

HERD: PR745 - RATTLESNAKE

HUNT AREAS: 70-72

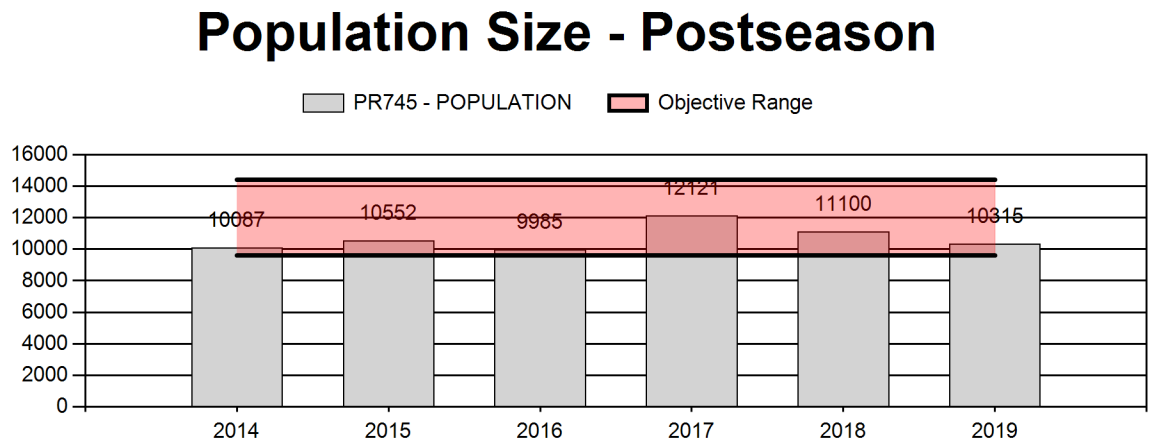
PREPARED BY: HEATHER O'BRIEN

	2014 - 2018 Average	2019	2020 Proposed
Population:	10,769	10,315	9,965
Harvest:	499	1,110	1,340
Hunters:	518	1,126	1,400
Hunter Success:	96%	99%	96 %
Active Licenses:	585	1,215	1,400
Active License Success:	85%	91%	96 %
Recreation Days:	1,597	2,950	4,100
Days Per Animal:	3.2	2.7	3.1
Males per 100 Females	48	67	
Juveniles per 100 Females	72	52	

Population Objective (± 20%) :	12000 (9600 - 14400)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-14.0%
Number of years population has been + or - objective in recent trend:	3
Model Date:	04/06/2020

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

	JCR Year	Proposed
Females ≥ 1 year old:	10.9%	12.3%
Males ≥ 1 year old:	17.2%	27.5%
Total:	10.6%	12.9%
Proposed change in post-season population:	-10.4%	-9.2%



2020 HUNTING SEASONS
RATTLESNAKE PRONGHORN HERD (PR745)

Hunt Area	Type	Archery Dates		Season Dates		Quota	Limitations
		Opens	Closes	Opens	Closes		
70	1	Aug. 15	Sep. 14	Sep. 15	Oct. 31	150	Any antelope
	6	Aug. 15	Sep. 14	Sep. 15	Oct. 31	200	Doe or fawn antelope
71	1	Aug. 15	Sep. 14	Sep. 15	Oct. 31	100	Any antelope
	6	Aug. 15	Sep. 14	Sep. 15	Oct. 31	100	Doe or fawn antelope
72	1	Aug. 15	Sep. 14	Sep. 15	Oct. 31	600	Any antelope
	6	Aug. 15	Sep. 14	Sep. 15	Oct. 31	400	Doe or fawn antelope

2019 Hunter Satisfaction: 96% Satisfied, 3% Neutral, 1% Dissatisfied

2020 Management Summary

1.) **Hunting Season Evaluation:** The model for this herd depicts a population over objective that declined drastically following the severe winter of 2011, and has since grown slowly back toward objective. The model seems to depict population trends well. Four line-transect surveys provide independent abundance estimates that help align trends and improve population estimates. The most recent line-transect survey for the herd was conducted in 2014; an additional survey should be conducted as soon as budgets allow to provide a new abundance estimate.

This herd appears to have stabilized just under the objective for the last five years with concurrent increases in harvest. Field observations had lead managers to believe this herd grew swiftly over the last two years. However, the winter of 2018-2019 was more severe than expected, as was reflected in lower yearling recruitment and fawn production. Winter losses combined with increased rates of harvest in 2019 seem to have slowed population growth, keeping the herd just under objective over the last year. The 2019-2020 winter has become rather severe as well, with deep snow conditions widespread throughout the herd as of mid-February. Overwinter mortality is expected to be above average again this year if current weather patterns hold. Still, good opportunity should remain for hunters in 2020, as preseason 2019 buck ratios were very high in the herd.

Managers would like to increase opportunity for buck hunters this fall, and maintain moderate harvest on does to keep the population at or just below objective. Managers received feedback from landowners in Area 70 requesting more licenses to address pronghorn congregating on

agricultural lands. Thus, the 2020 season structure will include an increase of 50 Type 1 and 50 Type 6 licenses in Area 70. Type 6 licenses also will be increased in Area 71, as post winter trend counts found healthy pronghorn numbers in late March. In Area 72, Type 1 licenses were increased by 100 and Type 6 licenses were decreased by 100.

2.) **Management Objective Review:** In 2020, managers reviewed population and weather data from the previous five years and determined an update was warranted for the Rattlesnake Pronghorn management objective (MO). A proposal to change to a recreational management strategy in all three hunt areas within the herd unit was proposed and reviewed both internally and externally (Appendix A). In July of 2020, the Wyoming Game and Fish Commission approved this change. Buck ratios will be thus be managed using the recreational framework in all three hunt areas, with the goal of increasing hunting opportunity throughout the herd.

3.) **Additional Herd Unit Information:** One new landowner was added to the Access Yes Program in Area 70 and 72. Walk-in Area 17 provides an additional 5,585 acres for pronghorn hunting. This is especially valuable in Area 70, which is dominated by private farmlands. The addition of this Walk-in Area provides further hunting opportunity in an area managed for low pronghorn densities to minimize agricultural damage.

2014 - 2019 Preseason Classification Summary

for Pronghorn Herd PR745 - RATTLESNAKE

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Pre Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2014	10,921	111	191	302	22%	634	47%	416	31%	1,352	1,734	18	30	48	± 5	66	± 6	44
2015	10,913	160	243	403	19%	947	44%	796	37%	2,146	2,231	17	26	43	± 4	84	± 6	59
2016	10,400	178	281	459	21%	965	45%	711	33%	2,135	2,635	18	29	48	± 4	74	± 5	50
2017	12,541	202	324	526	21%	1,173	46%	824	33%	2,523	2,185	17	28	45	± 3	70	± 5	48
2018	12,003	236	452	688	26%	1,187	45%	785	30%	2,660	2,290	20	38	58	± 4	66	± 4	42
2019	11,536	172	490	662	31%	988	46%	511	24%	2,161	2,263	17	50	67	± 5	52	± 4	31

Appendix A:
2020 Objective Review and Recommendations
PR745 – Rattlesnake Pronghorn Herd Unit

Current Management Objective:	Postseason population estimate of 12,000 pronghorn
2015 Management Strategy:	Recreational management for Hunt Area 70; special management for Hunt Areas 71 & 72
2019 Estimate:	10,000 pronghorn, SCJ/SCA spreadsheet model, stable to increasing
2020 Recommendation:	Convert all hunt areas to recreational management; maintain population objective of 12,000 pronghorn.

INTRODUCTION

The Rattlesnake Pronghorn Herd Unit (PR 745) contains Hunt Areas 70, 71, & 72 and is located in central Wyoming (Figure 1). The herd unit encompasses an area of approximately 995 square miles from the city of Casper west along Highway 20/26 to Waltman, south along the Gas Hills Road to west end of the Rattlesnake Hills, southeast along the top of Rattlesnake Hills to the North Platte River, and northeast along the river back to the city of Casper. Relative densities of pronghorn vary within the herd unit, with higher densities found in sagebrush habitats within the Poison Spider and Casper Creek drainages. The main land use is traditional ranching and grazing of livestock, with several areas of oil and gas development. Land status within the herd unit is a mosaic of 53% public (Bureau of Land Management and State of Wyoming Lands) and 47% private lands, with larger tracts of public lands in the western and southern portions of the herd unit. Hunt Area 70, which consists mostly of lands converted to agriculture via irrigation, is dominated by private lands.

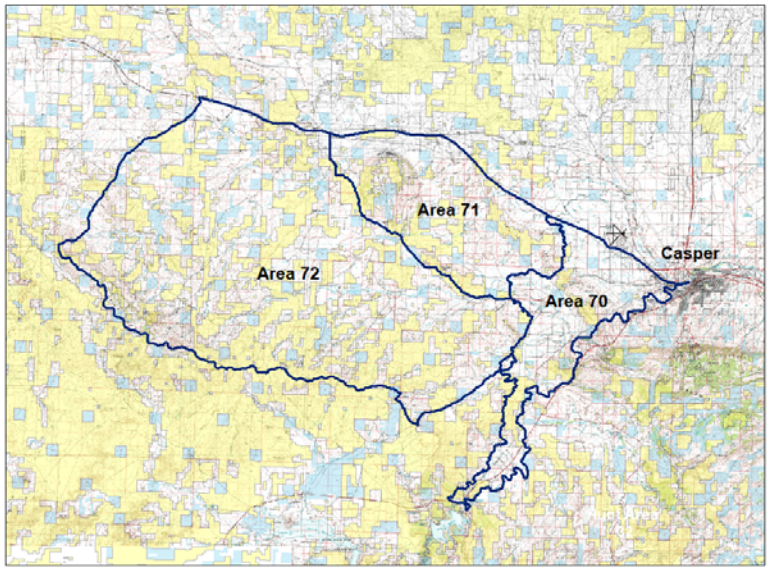


Figure 1. Map of Hunt Areas 70, 71, and 72 within the Rattlesnake Pronghorn Herd Unit, 2020.

OBJECTIVE REVIEW & RATIONALE

The spreadsheet model for this herd produces plausible population trends and reasonable population estimates (Figure 2). This herd was under special management for bucks until the 2015 objective review. Since then, Hunt Area 70 has been under recreational management, as agricultural lands dominate the area and a low density of pronghorn is desired. Hunt Areas 71 and 72 were left under special management strategy. Despite conservative license issuance, buck ratios have fluctuated between both recreational and special thresholds from year to year (Figure 3). Managers have reconsidered the viability of maintaining special management buck ratios in a herd with good hunting access and characteristically good production. Managers feel providing a higher level of hunting opportunity using a recreational management strategy is warranted for all hunt areas within this herd unit. Maintaining buck ratios at recreational management levels may also improve buck quality by reducing resource competition, provided overall population size is managed close to objective. We recommend maintaining the population objective of 12,000 for the Rattlesnake Pronghorn Herd Unit, while converting all hunt areas within the herd to a recreational management strategy. The 20-year average buck ratio in Area 70 is 52, while the 20-year average buck ratio in Areas 71 & 72 is 55. Management of all hunt areas near the upper end of recreational management, with the goal of 45-59 bucks per 100 does, is thus tangible and reasonable.

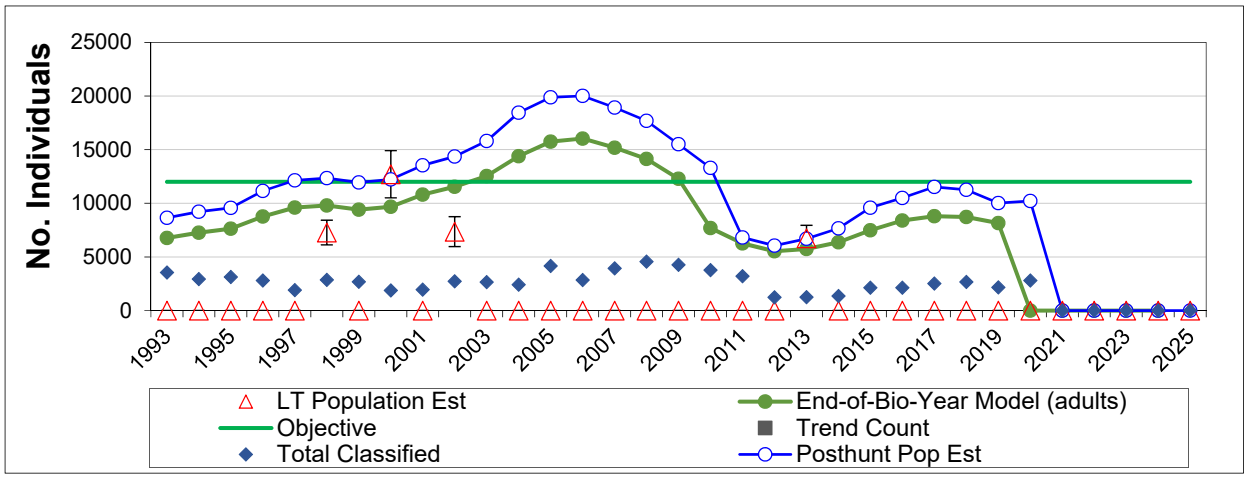


Figure 2. Annual postseason population estimates (blue) for the Rattlesnake Pronghorn Herd Unit, 2000-2019.

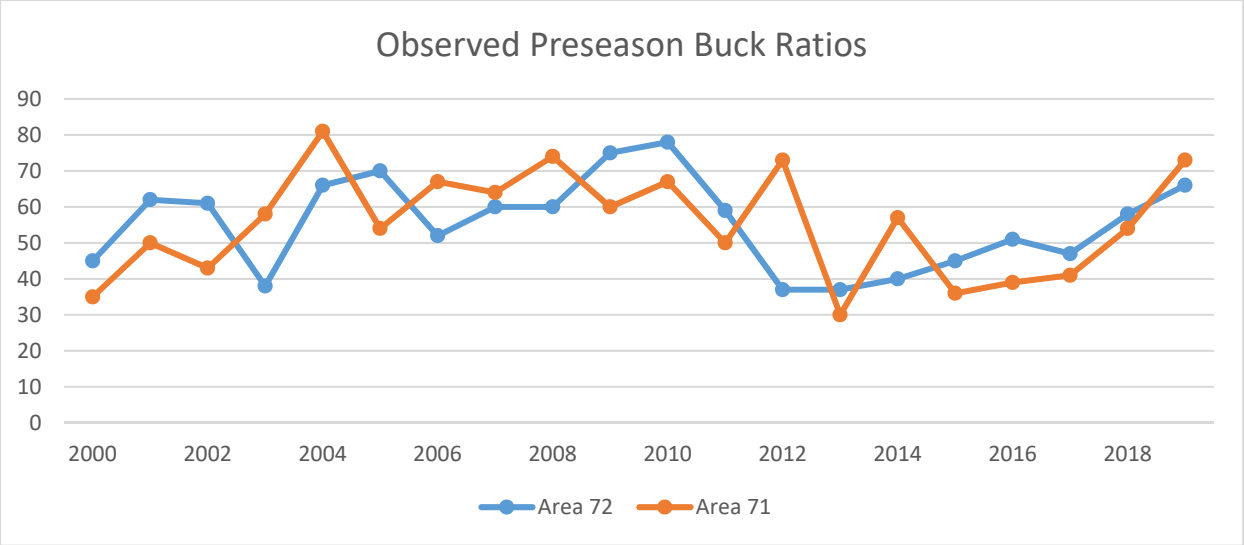


Figure 3. Observed preseason buck ratios for Hunt Areas 71 & 72 in the Rattlesnake Pronghorn Herd Unit, 2000-2019.

PUBLIC OUTREACH

District managers collected feedback from landowners and the public via online survey (Attachment A). A public meeting was not feasible in 2020 due to public safety issues related to the coronavirus pandemic. The Bureau of Land Management was contacted via telephone and email on 15 May 2020, and received a positive response on 28 May 2020 (Attachment B). Members of the public were contacted via Department press release and directed to relevant information and an online survey and comment form. Access to the survey was open on the Department web page from 13 through 25 May 2020. There were 74 total survey responses with 53% in favor of the objective change, 4% neutral, and 43% opposed (Figure 4). Overall, responses were positive from all contacted parties. Managers thus request the Department proceed with the proposed change to the Rattlesnake Pronghorn Herd Unit objective. Managing all three hunt areas with a recreational strategy will realign this herd to statewide objective standards, while still maintaining a healthy buck ratio and providing harvest opportunity to the public. The overall population objective will remain unchanged, and personnel will continue to manage this herd toward 12,000 pronghorn.

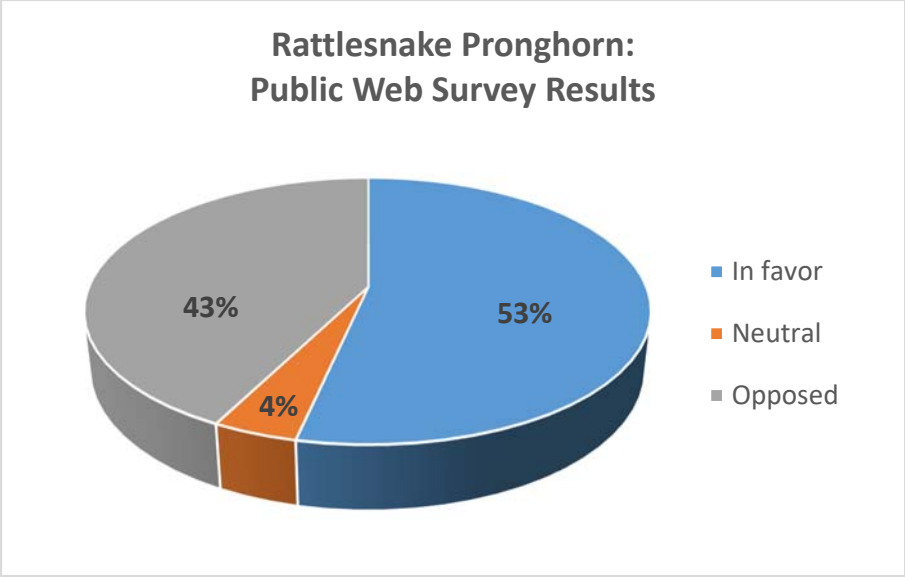


Figure 4. Responses to a web-based public survey regarding proposed changes to the Rattlesnake Pronghorn Herd Unit Objective, May 2020 (N=74).

Attachment A:
Web Survey Results for Rattlesnake Pronghorn Objective Review

Form updated	Your email address	RadioButt	Additional comments
5/13/2020 10:51:17 PM	[redacted]	In favor	
5/14/2020 1:27:52 AM	[redacted]	Opposed	
5/14/2020 3:34:03 AM	[redacted]	In favor	
5/14/2020 1:42:17 PM	[redacted]	Opposed	I am very opposed to provide crowded hunt areas with fewer bucks. This is a terrible idea.
5/14/2020 4:28:20 PM	[redacted]	In favor	
5/14/2020 5:27:28 PM	[redacted]	Opposed	Too much private land not available to hunt to make this proposal feasible.
5/14/2020 6:43:56 PM	[redacted]	In favor	
5/14/2020 9:44:18 PM	[redacted]	Neutral	
5/14/2020 11:46:11 PM	[redacted]	Opposed	
5/15/2020 12:04:17 AM	[redacted]	Opposed	
5/15/2020 1:12:28 PM	[redacted]	In favor	I guess I am in favor as long as the overall herd size can be maintained.
5/15/2020 2:17:47 PM	[redacted]	In favor	
5/15/2020 3:11:18 PM	[redacted]	In favor	Makes management simpler
5/15/2020 3:29:32 PM	[redacted]	In favor	Preliminary data from the Monteith Shop suggests higher buck ratios doesn't necessarily mean larger horned antelope. Generally speaking, more opportunities for antelope hunting is something I support, and think this is a great way to add more hunting opportunity without a noticeable drop in buck quality.
5/15/2020 4:03:04 PM	[redacted]	In favor	
5/15/2020 5:24:40 PM	[redacted]	Opposed	
5/15/2020 5:38:05 PM	[redacted]	In favor	
5/15/2020 6:01:50 PM	[redacted]	In favor	I've hunted 71 annually for 20 years and my family for 40 years. I do think that the unit can support a change to manage for more buck opportunity. I think as long as the doe harvest is maintained relative to winter kill, the unit can support more buck harvest in the future. As a non-resident land owner in 71, i value opportunity to hunt my land annually over very marginal increases in trophy potential by limiting buck tags. Keep up the good work. Sincerely, Cody Carlin. 303-356-8630.
5/15/2020 6:15:39 PM	[redacted]	In favor	Heather, I called the Casper office today and they said to leave you a message at 473-3411 but the voice mail was not setup for that number. I wanted to ask you a couple of questions about antelope 70, 71 25 etc. Rob Ashton 406.465.2043. Thanks
5/15/2020 6:48:03 PM	[redacted]	In favor	As a non-resident landowner I would rather hunt my land more often than have a slightly better chance for trophy potential.
5/15/2020 8:54:17 PM	[redacted]	In favor	
5/15/2020 9:14:18 PM	[redacted]	In favor	
5/15/2020 9:35:15 PM	[redacted]	Opposed	
5/15/2020 10:53:50 PM	[redacted]	In favor	

5/15/2020 11:15:09 PM	[redacted]	Opposed	There is plenty of opportunity in this and other areas. The population is still way under what it should be and their would just be an increase in tags. This area is a trophy area and should be managed that way.
5/16/2020 12:00:41 AM	[redacted]	Opposed	I currently like the high buck to doe ratio.
5/16/2020 12:41:05 AM	[redacted]	Neutral	I'd hate to see the ratio dropped so low. Is there anyway the buck to doe could be changed to 45-59 buck to does? Seems like it would be a meet in the middle for both sides possible.
5/16/2020 1:30:53 AM	[redacted]	In favor	
5/16/2020 2:39:31 AM	[redacted]	Opposed	
5/16/2020 3:01:07 AM	[redacted]	Opposed	I can’t handle all to stupid stuff proposed anymore. I give up stupid wins. Sorry for the non constructive criticism but it’s overwhelming.
5/16/2020 3:53:28 AM	[redacted]	In favor	
5/16/2020 4:22:38 AM	[redacted]	In favor	
5/16/2020 7:20:26 AM	[redacted]	In favor	
5/16/2020 12:03:28 PM	[redacted]	In favor	More hunting opportunities are always good.
5/16/2020 12:32:21 PM	[redacted]	In favor	This would open up more hunting opportunities for our kids and family to enjoy when we are in Wyoming. I am in favor of this change and hope it happens.
5/16/2020 12:36:59 PM	[redacted]	Opposed	
5/16/2020 10:16:38 PM	[redacted]	In favor	
5/17/2020 12:18:42 PM	[redacted]	In favor	hunted in fall of 2019 saw numerous buck and doe
5/17/2020 4:57:23 PM	[redacted]	In favor	
5/17/2020 11:48:26 PM	[redacted]	In favor	
5/18/2020 1:30:40 AM	[redacted]	In favor	I joined two family members on their antelope hunt in Unit 71 last fall. Both were successful in filling their buck tags. Buck sightings were plentiful. While not relevant to the proposed management change, i'd like to share that during that same time period, I was fortunate enough to see a mountain lion while on a hike on private property in the Pine Mountain.
5/18/2020 12:18:32 PM	[redacted]	In favor	
5/18/2020 2:15:26 PM	[redacted]	Opposed	Buck quality would drop too much.
5/18/2020 5:52:05 PM	[redacted]	Opposed	
5/18/2020 7:21:07 PM	[redacted]	Opposed	
5/18/2020 7:31:09 PM	[redacted]	In favor	WGFD KEEP UP THE GREAT WORK YOU ALL DO STAY SAFE
5/18/2020 10:36:40 PM	[redacted]	Opposed	Just G&F being pushed to sell more licenses with disregard to the actual benefit to the habitat/antelope population. Hunt quality will drop & more people in the field will have a HUGE impact on the quality of hunting for every other species. Look at 73. My family used to hunt Area 71, but stopped b/c the quality of hunting got so bad, plus out of control nonresident landowners in the subdivision out there. IN BOLD- THE NUMBER OF GAME WARDENS CAN'T MANAGE THE CURRENT NUMBER OF HUNTERS!
5/19/2020 3:36:19 AM	[redacted]	In favor	

5/19/2020 5:42:22 AM	[redacted]	In favor	
5/19/2020 12:22:37 PM	[redacted]	In favor	
5/19/2020 3:32:15 PM	[redacted]	Opposed	Please Do not do this
5/19/2020 6:37:50 PM	[redacted]	Opposed	
5/19/2020 7:15:50 PM	[redacted]	Opposed	The chance of a successful draw is already high, and the quality of bucks is great.
5/19/2020 8:36:59 PM	[redacted]	Opposed	
5/20/2020 1:13:35 AM	[redacted]	Opposed	
5/20/2020 1:16:08 AM	[redacted]	Opposed	
5/20/2020 5:18:38 AM	[redacted]	Opposed	
5/20/2020 3:24:20 PM	[redacted]	Opposed	I prefer keeping the buck doe ratio higher
5/20/2020 5:06:23 PM	[redacted]	In favor	I support greater license opportunity, which helps recruit new hunters, if the herd can sustain it.
5/20/2020 7:50:12 PM	[redacted]	In favor	please
5/21/2020 2:00:41 AM	[redacted]	In favor	
5/21/2020 3:29:16 AM	[redacted]	In favor	I have hunted both of these units, when I hunted unit 71, I drew my tag as a 3rd. choice nonresident. I hunted unit 72 a couple of years later and the population decrease was dramatic. I would like to see a little better draw odds for these units but I would also like to see fewer hunters competing for the tags . I hunted unit 73 last fall and was glad to see more animals in 71 than I had seen in a long time. Hopefully the population can be maintained at desired levels.
5/21/2020 3:08:03 PM	[redacted]	In favor	Sounds like a great idea.
5/21/2020 3:26:03 PM	[redacted]	In favor	
5/21/2020 4:03:03 PM	[redacted]	Opposed	
5/21/2020 4:09:48 PM	[redacted]	Opposed	I feel this would reduce the quality of Bucks in these areas.
5/21/2020 4:24:17 PM	[redacted]	Opposed	
5/21/2020 4:30:08 PM	[redacted]	Opposed	
5/21/2020 4:32:17 PM	[redacted]	Opposed	
5/21/2020 5:48:41 PM	[redacted]	Opposed	
5/21/2020 5:54:14 PM	[redacted]	Opposed	There was no scientific reason given to change management strategies. The only reason I read was to simplify WGF decisions, goals, and increase revenue. Five years ago, this herd was decimated by over hunting and a hard winter. This herd is finally getting back to normal. Moreover, if you manage all three hunt areas as the same, why have three different hunt areas?
5/22/2020 5:08:51 AM	[redacted]	Opposed	
5/23/2020 4:08:39 PM	[redacted]	Neutral	
5/25/2020 10:42:07 PM	[redacted]	In favor	

Attachment B:
Rattlesnake Pronghorn Herd Unit Objective Review
Bureau of Land Management Response

May 28th, 2020

Ms. O'Brien,

The BLM regularly conducts vegetation monitoring on public land throughout the area. There are approximately 48,600 acres of crucial winter range delineated in the herd unit. Browse indexes have been completed at a number of locations, however, no issues with excessive wildlife herbivory have been noted. Rangelands continue to be monitored annually.

The proposed changes do not conflict with the Casper Resource Management Plan or BLM policy.

Thanks.

James Wright
Wildlife Biologist

Bureau of Land Management
Casper Field Office
2987 Prospector Drive
Casper, WY 82601

2019 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2019 - 5/31/2020

HERD: PR746 - NORTH NATRONA

HUNT AREAS: 73

PREPARED BY: HEATHER O'BRIEN

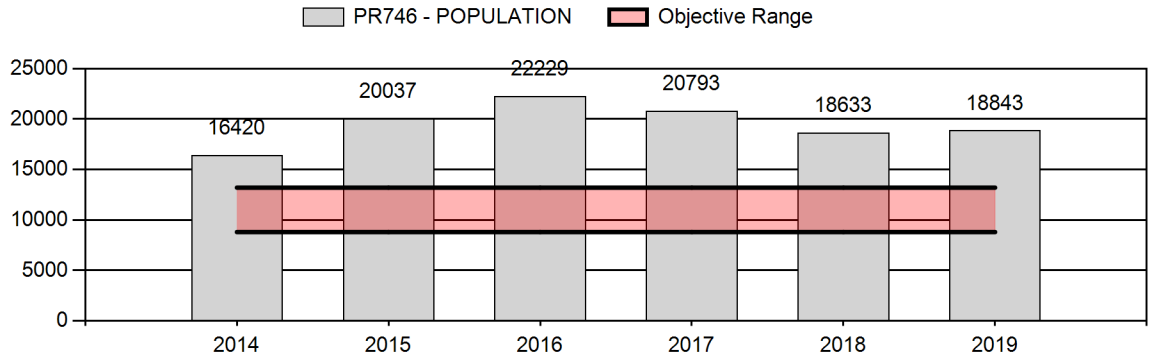
	2014 - 2018 Average	2019	2020 Proposed
Population:	19,622	18,843	17,242
Harvest:	1,323	1,872	2,050
Hunters:	1,378	2,045	2,300
Hunter Success:	96%	92%	89 %
Active Licenses:	1,420	2,125	2,450
Active License Success:	93%	88%	84 %
Recreation Days:	4,059	7,473	9,000
Days Per Animal:	3.1	4.0	4.4
Males per 100 Females	56	60	
Juveniles per 100 Females	81	62	

Population Objective (± 20%) :	11000 (8800 - 13200)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	71%
Number of years population has been + or - objective in recent trend:	7
Model Date:	02/21/2020

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

	JCR Year	Proposed
Females ≥ 1 year old:	9.8%	8.2%
Males ≥ 1 year old:	15.6%	27.1%
Total:	9.9%	11.6%
Proposed change in post-season population:	-6.3%	-7.8%

Population Size - Postseason



2020 HUNTING SEASONS
NORTH NATRONA PRONGHORN HERD (PR746)

Hunt Area	Type	Archery Dates		Season Dates		Quota	Limitations
		Opens	Closes	Opens	Closes		
73	1	Aug. 15	Sep. 14	Sep. 15	Oct. 31	1600	Any antelope
	6	Aug. 15	Sep. 14	Sep. 15	Oct. 31	800	Doe or fawn antelope
	7	Aug. 15	Sep. 14	Sep. 15	Oct. 31	50	Doe or fawn valid on or within one (1) mile of irrigated land

2019 Hunter Satisfaction: 89% Satisfied, 6% Neutral, 5% Dissatisfied

2020 Management Summary:

1.) **Hunting Season Evaluation:** The model for this herd depicts almost exponential growth from 2013-2016, when harvest pressure was low and production/survival were exceptional. From 2016-present, harvest pressure increased significantly, and the herd decreased incrementally each year. Still, this herd remains above objective and managers continue to prescribe liberal hunting seasons. Both trends and population estimates seem to be well-represented by the model. Five line-transect surveys provide independent abundance estimates which help align trends and improve population estimates. Another line-transect survey is scheduled for 2021, and will be paired with a survey in the adjacent herd unit to evaluate combining the two.

Managers found significantly lower numbers of pronghorn in this herd unit during 2019 preseason classification surveys. Resulting fawn ratios and yearling recruitment were lower than previous years as well. Thus, the winter of 2018-2019 was likely more severe than anticipated. This, combined with higher harvest in 2018 contributed to a rapid population decline. Despite this precipitous drop in numbers, the herd remains above the population objective. While hunting seasons remain liberalized to continue management toward the objective, a decrease in doe/fawn licenses was warranted to temper the pace of population decline. The buck ratio for the herd remains high despite the designated recreational management strategy. Increased buck harvest is justified proportionate to availability and opportunity, and to manage the buck ratio towards recreational levels.

The 2020 hunting season continues to manage the North Natrona Pronghorn herd toward objective, while reducing the buck ratio toward recreational management parameters. Type 1 licenses were increased by 400 not only to manage toward recreational limits, but also to

reduce buck ratios and numbers as part of a cooperative research project (see "Additional Surveys" below). Type 6 licenses were decreased by 400 to account for winter losses and slowed production. With no net change in total licenses in the herd, hunter crowding should not worsen and hunter satisfaction is expected to remain high.

2.) **Management Objective Review:** No review in 2020.

3.) **Additional Surveys:** In 2019, this herd became part of a harvest study conducted by WGFD and the Wyoming Cooperative Fish and Wildlife Research Unit. Goals of the project are to quantify changes in average pronghorn horn size relative to changes in buck ratios, buck age structure, population size, and environmental variables. In its first year, managers and researchers collected horn measurements from 129 harvested bucks and tooth samples from 173 harvested does and bucks within the herd. Average horn size for the herd unit was 66 inches in 2019, and 72% of bucks sampled were aged in the field as 4+ years old. Average cementum annuli tooth age of both bucks and does from the herd was 4.5. Interestingly, one buck sampled in 2019 had a cementum annuli tooth age of 11.5 years old.

Managers and researchers will continue to include the North Natrona Pronghorn Herd in this project for the 2020 hunting season. Biologists and technicians will resume collection of horn measurement data from harvested bucks, as well as cementum annuli tooth ages from harvested pronghorn in the herd.

2014 - 2019 Preseason Classification Summary

for Pronghorn Herd PR746 - NORTH NATRONA

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Pre Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2014	17,151	85	210	295	20%	650	44%	520	35%	1,465	1,915	13	32	45	± 5	80	± 7	55
2015	20,894	215	268	483	21%	936	42%	835	37%	2,254	2,729	23	29	52	± 4	89	± 7	59
2016	23,567	319	281	600	26%	905	39%	820	35%	2,325	2,409	35	31	66	± 5	91	± 7	54
2017	22,787	221	375	596	26%	953	41%	768	33%	2,317	3,371	23	39	63	± 5	81	± 6	50
2018	20,993	183	396	579	24%	1,080	45%	716	30%	2,375	2,947	17	37	54	± 4	66	± 5	43
2019	20,902	118	418	536	27%	887	45%	553	28%	1,976	3,068	13	47	60	± 5	62	± 5	39

2019 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2019 - 5/31/2020

HERD: PR748 - NORTH CONVERSE

HUNT AREAS: 25-26

PREPARED BY: MATT HUIZENGA

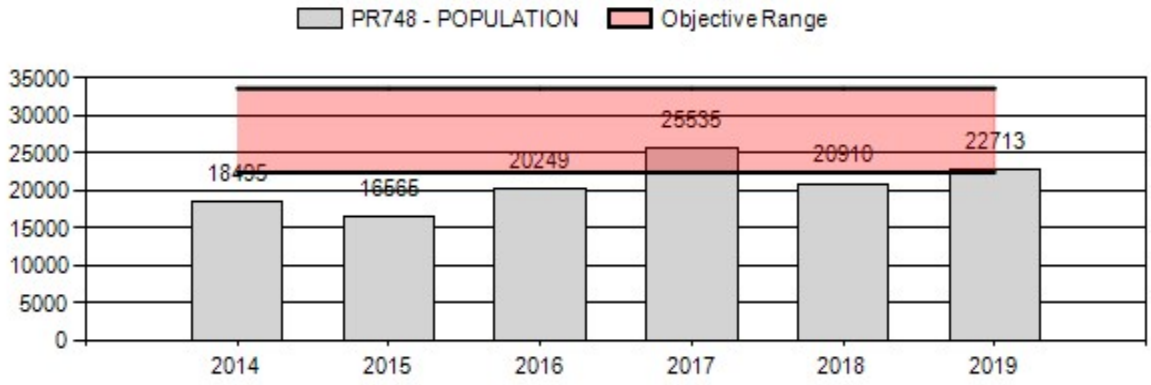
	2014 - 2018 Average	2019	2020 Proposed
Population:	20,351	22,713	25,972
Harvest:	1,818	2,641	2,675
Hunters:	1,923	2,781	2,775
Hunter Success:	95%	95%	96%
Active Licenses:	2,044	2,859	2,850
Active License Success:	89%	92%	94 %
Recreation Days:	5,695	6,915	6,900
Days Per Animal:	3.1	2.6	2.6
Males per 100 Females	58	62	
Juveniles per 100 Females	84	64	

Population Objective (± 20%) :	28000 (22400 - 33600)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-18.9%
Number of years population has been + or - objective in recent trend:	9
Model Date:	02/21/2020

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

	JCR Year	Proposed
Females ≥ 1 year old:	6.9%	4.5%
Males ≥ 1 year old:	29.8%	23.6%
Total:	36.7%	28.1%
Proposed change in post-season population:	-11.6%	-10.3%

Population Size - Postseason



2020 HUNTING SEASONS
North Converse Pronghorn Herd Unit (PR748)

Hunt Area	Hunt Type	Archery Dates Opens	Archery Dates Closes	Season Dates Opens	Season Dates Closes	Quota	Limitations
25	1	Aug. 15	Sep. 30	Oct. 1	Oct. 14	900	Any antelope
25	6	Aug. 15	Sep. 30	Oct. 1	Oct. 14	450	Doe or fawn
26	1	Aug. 15	Sep. 23	Sep. 24	Oct. 14	1300	Any antelope
26	6	Aug. 15	Sep. 23	Sep. 24	Oct. 14	500	Doe or fawn

2019 Hunter Satisfaction: 89% Satisfied, 6% Neutral, 5% Dissatisfied

2020 Management Summary

1) **Hunting Season Evaluation:** Pronghorn numbers are within 20% of objective and showing an upward trend, so the 2020 season structure was unchanged from the 2019 season. Managers considered an increase in licenses. Combined with the potential for public land saturation and lower overall harvest numbers than the past two years even with increased licenses in 2019, it was decided to keep license numbers the same. This herd unit has a large amount of private land with limited access to public land. There are some small parcels of public land available, although they quickly become over-saturated with increased license issuance, and satisfaction greatly decreases. License issuance was maintained to limit population growth while reducing high buck ratios to within recreational management criterion.

2) In 2019, horn length measurements (N=59) were collected from adult male pronghorn, with average horn length being 11 inches. A total of 19% of bucks were $\geq$ 13 inches.

3) This population has trended upward over the past eight years and should continue to slowly increase with the prescribed harvest. There are concerns the increase in licenses issued, lower fawn ratios, as well as the increase in energy development and disturbance throughout the herd unit in the past two years may cause this population to stabilize or decrease.

4) Line transect surveys are not conducted in this herd unit as topography is not conducive to maintaining a consistent altitude above ground level which these surveys require in order to produce an accurate abundance estimate.

North Converse Pronghorn - PR 748

2014 - 2019 Preseason Classification Summary

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Pre Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2014	20,167	121	249	370	23%	669	42%	554	35%	1,593	3,415	18	37	55	± 6	83	± 8	53
2015	18,382	196	251	447	21%	896	41%	820	38%	2,163	3,717	22	28	50	± 4	92	± 7	61
2016	21,902	197	216	413	24%	716	41%	609	35%	1,738	3,480	28	30	58	± 6	85	± 7	54
2017	27,642	154	329	483	30%	624	39%	510	32%	1,617	3,643	25	53	77	± 7	82	± 8	46
2018	23,662	189	336	525	23%	968	43%	748	33%	2,241	2,980	20	35	54	± 5	77	± 6	50
2019	25,619	147	448	595	27%	967	44%	619	28%	2,181	3,152	15	46	62	± 5	64	± 5	40

2019 - JCR Evaluation Form

SPECIES: Pronghorn | PERIOD: 6/1/2019 - 5/31/2020

HERD: PR750 - BLACK THUNDER

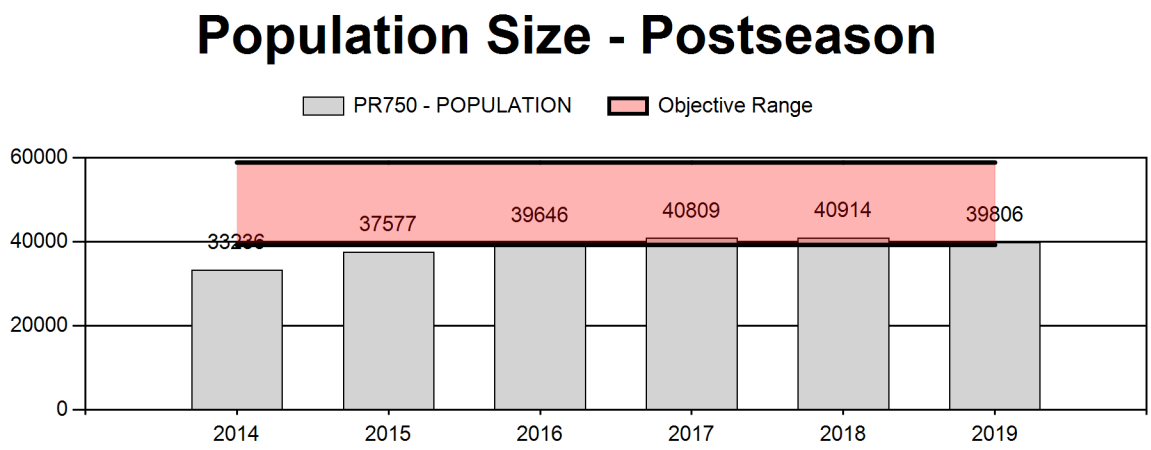
HUNT AREAS: 4-9, 24, 27, 29 | PREPARED BY: JOE SANDRINI

	2014 - 2018 Average	2019	2020 Proposed
Population:	38,436	39,806	29,365
Harvest:	3,861	4,548	3,786
Hunters:	4,347	4,959	4,100
Hunter Success:	89%	92%	92%
Active Licenses:	4,732	5,459	4,500
Active License Success:	82%	83%	84%
Recreation Days:	14,055	16,386	13,500
Days Per Animal:	3.6	3.6	3.6
Males per 100 Females	47	49	
Juveniles per 100 Females	77	63	

Population Objective (± 20%) :	49000 (39200 - 58800)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-18.8%
Number of years population has been + or - objective in recent trend:	11
Model Date:	06/25/2020

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

	JCR Year	Proposed
Females ≥ 1 year old:	5.2%	4.9%
Males ≥ 1 year old:	37.1%	46.5%
Total:	11.2%	9.6%
Proposed change in post-season population:	+3.8%	-26.2%



2020 Hunting Seasons
Black Thunder Pronghorn (PR750)

Hunt Area	Type	Archery Dates		Season Dates		Quota	Limitations
		Opens	Closes	Opens	Closes		
4	1	Aug. 15	Sep. 30	Oct. 1	Nov. 20	175	Any antelope
4	6	Aug. 15	Sep. 30	Oct. 1	Nov. 20	150	Doe or fawn
5	1	Aug. 15	Sep. 30	Oct. 1	Nov. 20	125	Any antelope
5	7	Aug. 15	Sep. 30	Oct. 1	Nov. 20	100	Doe or fawn valid on private land
6	1	Aug. 15	Sep. 30	Oct. 1	Oct. 15	350	Any antelope; also valid on private land in that portion of Area 8 in Weston County
6	6	Aug. 15	Sep. 30	Oct. 1	Oct. 15	50	Doe or fawn; also valid on private land in that portion of Area 8 in Weston County
7	1	Aug. 15	Sep. 30	Oct. 1	Oct. 15	600	Any antelope
7	7	Aug. 15	Sep. 30	Oct. 1	Oct. 25	75	Doe or fawn valid on private land
8	1	Aug. 15	Sep. 30	Oct. 1	Oct. 15	375	Any antelope
9	1	Aug. 15	Sep. 30	Oct. 1	Oct. 31	~~650~~ 450	Any antelope; also valid in that portion of Area 11 in Converse or Niobrara counties
9	6	Aug. 15	Sep. 30	Oct. 1	Oct. 31	~~500~~ 250	Doe or fawn; also valid in that portion of Area 11 in Converse or Niobrara counties
24	1	Aug. 15	Sep. 30	Oct. 1	Oct. 31	300	Any antelope

- continued on next page –

24	2	Aug. 15	Sep. 30	Oct. 1	Oct. 31	500	Any antelope valid on private land
24	6	Aug. 15	Sep. 30	Oct. 1	Oct. 31	50	Doe or fawn
24	7	Aug. 15	Sep. 30	Oct. 1	Oct. 31	250	Doe or fawn valid on private land
27	1	Aug. 15	Sep. 30	Oct. 1	Oct. 15	350	Any antelope
27	7	Aug. 15	Sep. 30	Oct. 1	Oct. 15	75	Doe or fawn valid on private land
29	1	Aug. 15	Sep. 30	Oct. 1	Oct. 15	125	Any antelope
29	2	Aug. 15	Sep. 30	Oct. 1	Oct. 31	500	Any antelope valid on private land
29	7	Aug. 15	Sep. 30	Oct. 1	Oct. 31	250	Doe or fawn valid on private land

2019 Hunter Satisfaction: 84.5% Satisfied 8.9% Neutral 5.7% Dissatisfied

2020 Management Summary

1) **Hunting Season Evaluation:** This herd peaked about 20% to 25% above objective in 2007 before declining substantially through 2013, when it bottomed out approximately 50% below objective. Since then, it has been allowed to grow slowly, but appears to have declined over the past two years due to reduced recruitment and survival, most likely a consequence of relatively harsh conditions during the 2018-2019 winter followed by increased mortality in the spring of 2019. Despite the perceived population decline preceding the 2019 hunting season, the current population model indicates almost identical post-season populations in 2017 & 2018, followed by a slight increase in 2019. Harvest statistics, while not dovetailing exactly, generally support population changes in the model, as success did not decline substantially in most areas during 2019. However, the recent line transect (LT) survey in this herd supports field personnel's perceptions of a noteworthy population drop. As a result, the 2020 hunting season is more conservative, with an overall reduction in license issuance to allow this herd to again grow towards objective. Overall, there was a reduction of 475 any antelope licenses, and 850 licenses valid for doe or fawn. This included the elimination of three types of doe/fawn licenses, and significant reductions in Hunt Area (HA) 9 license issuance following a number of years of intensive harvest pressure. However, a new Type 7 license was made available in HA 7 to address limited damage concerns. Finally, the opening date for archery seasons in HA's 4 and 5 was changed to standardize archery opening dates statewide.

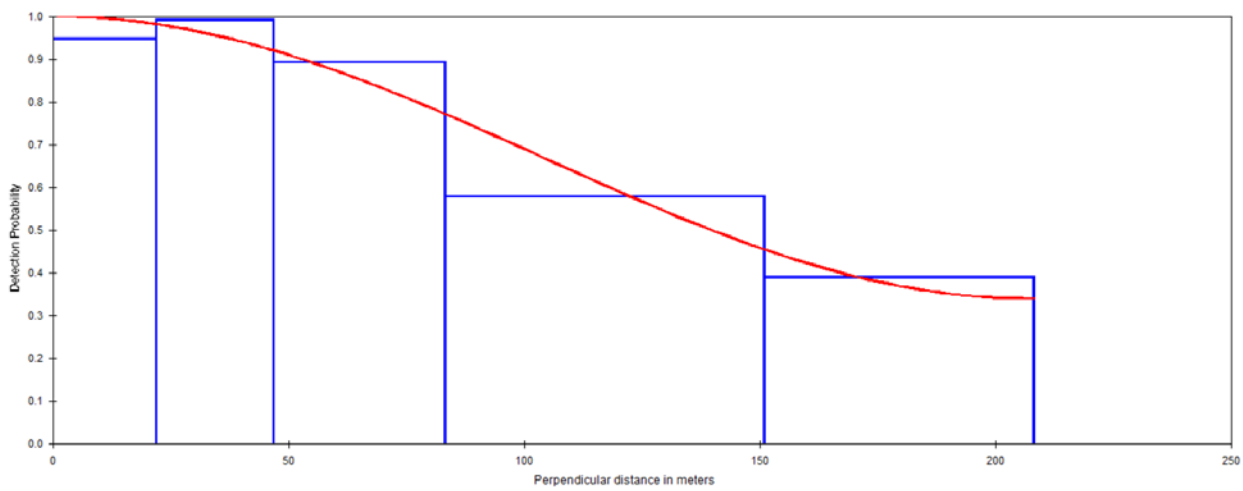
2) **Concerns with this population:** Population estimates for this herd produced by the current model are thought to be fairly good, but do leave room for criticism, as does the LT estimate for bio-year 2019. This is because the model results do not dovetail well with field personnel's

perceptions of the magnitude of variation in this population the past three years. It was hoped the model would be refined and improved after completion of a LT survey this spring. However, the end of year estimate produced by the 2020 LT was low compared to the past couple completed in this herd unit (Appendix 1), and made modeling fitting difficult. The density estimate of the LT analysis (approx. 3 antelope per mi^2) did seem fairly reasonable to field personnel. Seemingly even more reasonable, a simple calculation of antelope density based upon only those pronghorn observed in the A-Band, yielded a density estimate of about 4 antelope per mi^2, and an end of the year population about 45% higher. The former approach suggests this population will drop to 40% below objective in 2020, while the latter approach yields a population projection 30% below objective. Given either approach, this population may quite possibly exhibit a substantial decline post-season 2020. It is possible, however, that actual herd numbers and productivity will not result in a truly substantial decrease; and local managers anticipate the post-season population will drop more on the order of 10%. Finally, there has been a general decline in observed fawn:doe ratios over the past 30 years, which will likely continue in the future with reductions in habitat quality and quantity due to unrelenting industrialization of pronghorn habitat by energy development, and aging of sagebrush stands. Overall, there is a need to look critically at this herd's performance and season structure moving in to 2021.

Black Thunder Pronghorn (PR750)
Line Transect Results
Bio-Year 2019

Effort : 1661.95 kilometers
samples : 60 lines
Width : 208.0 meters
observations: 356 clusters

Model: Uniform key, k(y) = 1/W
Cosine adjustments of order(s) : 1



Cell i	Cut Points		Observed Values	Expected Values	Chi-square Values
1	0.0	21.9	53	55.60	0.122
2	21.9	46.8	63	60.73	0.085
3	46.8	83.2	83	79.13	0.190
4	83.2	151.	100	105.06	0.244
5	151.	208.	57	55.48	0.042

Total Chi-square value = 0.6820 Degrees of Freedom = 3.00

Probability of a greater chi-square value, **P = 0.87743**

Parameter	Point Estimate	Standard Error	Percent Coef. of Variation	95% Percent Confidence Interval	
DS	1.9902	0.21914	11.01	1.6001	2.4754
E(S)	1.4389	0.41218E-01	2.86	1.3601	1.5223
D	2.8638	0.32583	11.38	2.2868	3.5864
N	**18,082**	**2057.3**	**11.38**	**14,439**	**22,644**

Measurement Units

Density: Numbers/Sq. miles
ESW: meters

Component Percentages of Var(D)

Detection probability: 17.4 %
Encounter rate: 76.3 %
Cluster size: 6.3 %

2019 - JCR Evaluation Form

SPECIES: Mule Deer | PERIOD: 6/1/2019 - 5/31/2020

HERD: MD740 - CHEYENNE RIVER

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

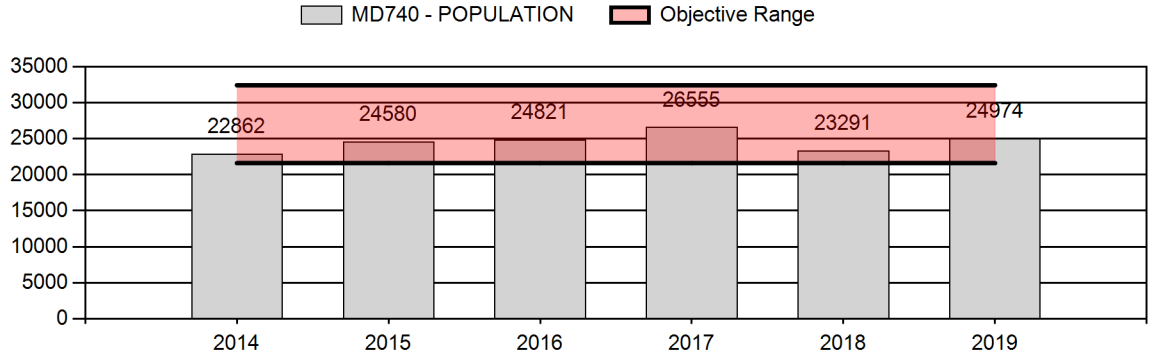
	2014 - 2018 Average	2019	2020 Proposed
Population:	24,422	24,974	25,874
Harvest:	1,166	1,343	1,395
Hunters:	1,940	2,276	2,350
Hunter Success:	60%	59%	59 %
Active Licenses:	1,965	2,303	2,500
Active License Success:	59%	58%	56 %
Recreation Days:	7,520	9,079	9,350
Days Per Animal:	6.4	6.8	6.7
Males per 100 Females	43	37	
Juveniles per 100 Females	69	74	

Population Objective (± 20%) :	27000 (21600 - 32400)
Management Strategy:	Private Land
Percent population is above (+) or below (-) objective:	-7.5%
Number of years population has been + or - objective in recent trend:	10
Model Date:	02/18/2020

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

	JCR Year	Proposed
Females ≥ 1 year old:	0.5%	0.8%
Males ≥ 1 year old:	23.4%	21.5%
Total:	5.6%	5.8%
Proposed change in post-season population:	+0.2%	+3.6%

Population Size - Postseason



2020 Hunting Seasons
Cheyenne River Mule Deer (MD740)

Hunt Area	Type	Archery Dates Opens	Archery Dates Closes	Season Dates Opens	Season Dates Closes	Quota	Limitations
7	Gen	Sep. 1	Sep. 30	Oct. 1	Oct. 15		Antlered mule deer or any white-tailed deer
8	Gen	Sep. 1	Sep. 30	Oct. 1	Oct. 15		Antlered mule deer or any white-tailed deer
9	Gen	Sep. 1	Sep. 30	Oct. 1	Oct. 15		Antlered mule deer or any white-tailed deer
9	7	Sep. 1	Sep. 30	Nov. 1	Nov. 30	50	Doe or fawn valid on private land east of U.S. Highway 85
10		Sep. 1	Sep. 30	Oct. 1	Oct. 21	150	Antlered mule deer or any white-tailed deer
11	Gen	Sep. 1	Sep. 30	Oct. 1	Oct. 15		Antlered mule deer or any white-tailed deer
12	Gen	Sep. 1	Sep. 30	Oct. 1	Oct. 15		Antlered mule deer or any white-tailed deer
12	6	Sep. 1	Sep. 30	Oct. 1	Oct. 15	50	Doe or fawn
13	Gen	Sep. 1	Sep. 30	Oct. 1	Oct. 15		Antlered mule deer or any white-tailed deer
14	Gen	Sep. 1	Sep. 30	Oct. 1	Oct. 15		Antlered mule deer or any white-tailed deer
21	Gen	Sep. 1	Sep. 30	Oct. 1	Oct. 15		Antlered mule deer or any white-tailed deer
21	7	Sep. 1	Sep. 30	Oct. 1	Oct. 31	50	Doe or fawn valid on private land

2020 Region B nonresident quota: 1,500 licenses

2019 Hunter Satisfaction: 71% Satisfied 16% Neutral 12% Dissatisfied

2020 Management Summary

1) **Hunting Season Evaluation:** Following excellent productivity and survival in 2014 and 2015, this herd unit experienced significant growth after reaching a nadir 35% below objective in 2012. Then, between 2016 and 2018 production and survival steadily declined (Appendix 1).

As a result, herd growth was curtailed and the population leveled off about 10% below objective; and buck:doe ratios fell to more reasonable values as harvest of bucks remained fairly consistent (Appendix 1). Since population estimates in this herd are thought to be good, and the trends produced by the model accurate, a conservative hunting season structure was again implemented in 2020 to allow this herd to grow towards objective. The only changes having been made were an increase of 25 Type 1 and 50 Type 7 licenses. Provisions for antlerless harvest continued to be provided essentially on private land in Hunt Areas (HAs) 12 and 21 where limited harvest has been allowed to address localized damage issues. In 2020, this proviso was extended to HA 9 with the addition of 50 doe or fawn licenses valid on private land in a portion of that hunt area. Type 1 license issuance in limited quota HA 10 was augmented 20% and the season extended six days to allow more hunting opportunity in an area where hunter success has averaged over 75% and buck:doe ratios over 60 bucks per 100 does post-season the past five years. The allowance for harvesting any white-tailed deer was also added to limitation section on this license type to standardize its limitations with those of general license hunt areas in the herd unit. HA 10 has continued to produce quality mule deer bucks. Based upon tooth age data, the average age of bucks harvested in HA 10 has increased the past three years with the median buck harvested being a 4.5 year-old 4X4 with a 20-inch antler spread. Over the past couple of decades, post-season classification efforts resulted in about 10% of the deer classified in this herd having been observed in HA 10. Achieved sample sizes for most of these classification efforts were about double the adequate number. Consequently, it makes sense that the HA 10 quota be set at 10% of the Region B quota.

2) **Chronic Wasting Disease (CWD):** Prior to the 2018 hunting season, approximately 1,750 mule deer from the Cheyenne River Herd Unit had been tested for CWD. The vast majority of those were from hunter harvested deer, of which 2.2% were found to have the disease. In 2018, 106 mule deer tested were tested with 9 being positive. Historically, most of the infected deer have come from HA 14 near Douglas. However, more infected deer have been found east and north of HA 14 in HA's 11 and 13 in recent years. In 2019, due to changes in statewide sampling protocol, only 16 mule deer from this herd were tested, of which one from HA 13 was found to be infected.

Appendix 1

2014 - 2019 Postseason Classification Summary

Mule Deer Herd MD740 - CHEYENNE RIVER

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2014	22,862	186	0	0	0	336	522	17%	1,426	45%	1,198	38%	3,146	2,044	13	24	37	± 2	84	± 4	61
2015	24,580	268	193	76	15	43	595	20%	1,373	46%	1,009	34%	2,977	1,672	20	24	43	± 3	73	± 4	51
2016	24,821	298	297	90	8	0	693	23%	1,371	46%	916	31%	2,980	1,506	22	29	51	± 3	67	± 3	44
2017	26,555	264	413	109	12	0	798	21%	1,777	48%	1,143	31%	3,718	1,371	15	30	45	± 2	64	± 3	44
2018	23,291	132	399	114	8	0	653	20%	1,669	51%	970	29%	3,292	1,133	8	31	39	± 2	58	± 3	42
2019	24,974	110	172	75	6	5	368	18%	991	47%	731	35%	2,090	1,400	11	26	37	± 3	74	± 4	54

2019 - JCR Evaluation Form

SPECIES: Mule Deer | PERIOD: 6/1/2019 - 5/31/2020

HERD: MD751 - BLACK HILLS

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

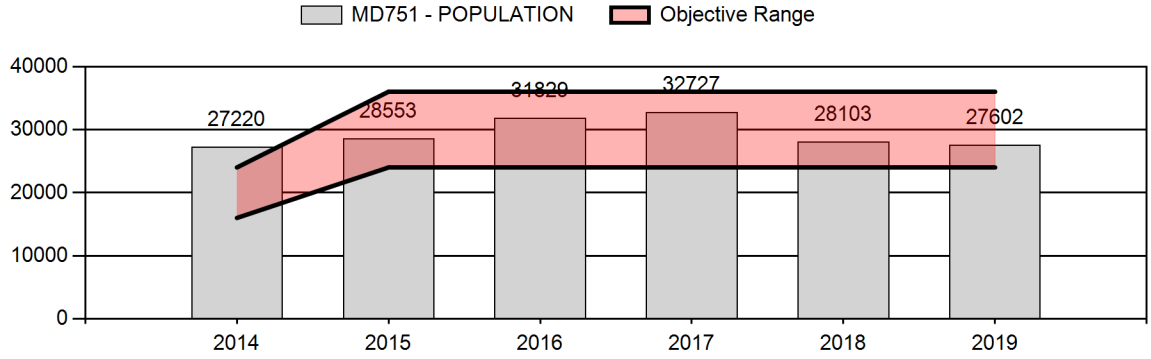
	2014 - 2018 Average	2019	2020 Proposed
Population:	29,686	27,602	26,427
Harvest:	2,385	2,150	1,949
Hunters:	5,050	5,361	5,300
Hunter Success:	47%	40%	37 %
Active Licenses:	5,211	5,578	5,500
Active License Success:	46%	39%	35 %
Recreation Days:	15,078	16,899	15,300
Days Per Animal:	6.3	7.9	7.9
Males per 100 Females	29	23	
Juveniles per 100 Females	75	73	

Population Objective (± 20%) :	30000 (24000 - 36000)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-8.0%
Number of years population has been + or - objective in recent trend:	3
Model Date:	02/18/2020

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

	JCR Year	Proposed
Females ≥ 1 year old:	3.2%	3.2%
Males ≥ 1 year old:	36.8%	34.8%
Total:	7.9%	7.5%
Proposed change in post-season population:	-1.9%	-4.3%

Population Size - Postseason



2020 Hunting Seasons
Black Hills Mule Deer (MD751)

Hunt Area	Type	Archery Dates		Season Dates		Quota	Limitations
		Opens	Closes	Opens	Closes		
1	Gen	Sep. 1	Sep. 30	Nov. 1	Nov. 20		Antlered deer off private land; any deer on private land
1, 2, 3	7	Sep. 1	Sep. 30	Nov. 1	Nov. 30	3,500	Doe or fawn valid on private land
2	Gen	Sep. 1	Sep. 30	Nov. 1	Nov. 30		Antlered deer off private land; any deer on private land
3	Gen	Sep. 1	Sep. 30	Nov. 1	Nov. 30		Antlered deer off private land; any deer on private land
4	Gen	Sep. 1	Sep. 30	Nov. 1	Nov. 20		Antlered deer off private land; any deer on private land except the lands of the State of Wyoming's Ranch A property shall be closed
4	7	Sep. 1	Sep. 30	Nov. 1	Nov. 20	300	Doe or fawn valid on private land
5	Gen	Sep. 1	Sep. 30	Nov. 1	Nov. 20		Antlered deer off private land; any deer on private land
5	6	Sep. 1	Sep. 30	Nov. 1	Nov. 20	200	Doe or fawn
6	Gen	Sep. 1	Sep. 30	Nov. 1	Nov. 20		Antlered deer off private land; any deer on private land

2020 Region A nonresident quota: 4,000 licenses

2019 Hunter Satisfaction: 71% Satisfied 16% Neutral 13% Dissatisfied

2020 Management Summary

1) **Hunting Season Evaluation:** This herd has shown cyclic population fluctuations since at least the 1960's. Most recently, following a population low in 2012 and excellent productivity and survival in 2014 and 2015, this population peaked in 2017 about 6% above objective. At the same time, post-season buck:doe ratios climbed well above historic values. Then between 2016

and 2018 recruitment dropped (Appendix 1) while over-winter mortality of all age classes was amplified in bio-year 2018. Because hunting seasons remained fairly liberal during this timeframe, the population declined steadily to 8% below objective. Additionally, post-season buck:doe ratios returned to long-term values around 23 buck per 100 does (Appendix 1). Since population estimates for this herd are thought to be fair, and shifts produced by the model are congruent with changes in pre-season trend counts, a more conservative hunting season structure was implemented in 2020 to allow this herd to grow back towards objective and reduce buck harvest. The hunting season changes entailed a reduction of 500 non-resident general licenses and 700 doe/fawn tags available for issuance. While the reduction in Type 7 licenses lessens the potential allowable female harvest, it will likely not result in significantly reduced antlerless take based on past license sales history, as this license type is largely under-subscribed and less than one-third of the deer harvested on these licenses are mule deer. Continued high deer densities (both species) in portions of this herd unit continue to warrant significant Type 7 licenses issuance, as the bulk of the mule deer harvested in this herd are taken on private land.

2) **Management Objective Review:** Management objectives for this herd were reviewed in bio-year 2019 with no changes made. As such, we will continue to manage for 30,000 mule deer post-season in the Black Hills using a recreational management strategy. This population objective (set in 2014) represented a 50% increase over the former objective, which was in place for over 30 years. Because area managers and most landowners were very comfortable with mule deer numbers in 2017 when this population was estimated to be at objective, and many would like to see an increase in mule deer numbers now that the population has dropped below objective, it seemed reasonable to not make a change. This mule deer population is very productive compared to most, and can increase substantially when conditions are favorable. As such, maintaining recreational hunting is justified. This allows area managers to provide ample hunting opportunity and attract more non-resident hunters who play a key role in managing the sympatric population of white-tailed deer. Finally, we believe habitat conditions are not a limiting factor in managing this herd towards, or maintaining it at, the current objective.

3) **Chronic Wasting Disease (CWD):** Prior to the 2018 hunting season, just under 1,100 mule deer from the Black Hills had been tested for CWD. The vast majority of those were hunter harvested deer, of which 0.2% were found to have the disease. In 2018, 157 mule deer tested for CWD with 9 being positive. All of the infected deer came from the 131 adult bucks tested. Noteworthy in 2018, almost all of the CWD positive deer came from HA's 1 & 3 (7 of 9). In 2019, due to changes in statewide sampling protocol, only 9 harvested mule deer were tested out of this herd and none found to be infected.

Black Hills Mule Deer - MD 751

2014 - 2019 Postseason Classification Summary

		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
2014	27,220	98	0	0	0	113	211	11%	880	45%	847	44%	1,938	2,466	11	13	24	± 2	96	± 6	78
2015	28,553	158	90	16	0	9	273	14%	939	48%	746	38%	1,958	1,812	17	12	29	± 2	79	± 5	62
2016	31,829	182	183	32	0	0	397	17%	1,113	49%	762	34%	2,272	1,467	16	19	36	± 3	68	± 4	50
2017	32,727	146	216	57	2	0	421	16%	1,343	50%	917	34%	2,681	1,429	11	20	31	± 2	68	± 4	52
2018	28,103	71	109	15	2	0	197	12%	884	53%	582	35%	1,663	1,297	8	14	22	± 2	66	± 4	54
2019	27,602	67	98	21	1	0	187	12%	822	51%	597	37%	1,606	1,508	8	15	23	± 2	73	± 5	59

2019 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2019 - 5/31/2020

HERD: MD755 - NORTH CONVERSE

HUNT AREAS: 22

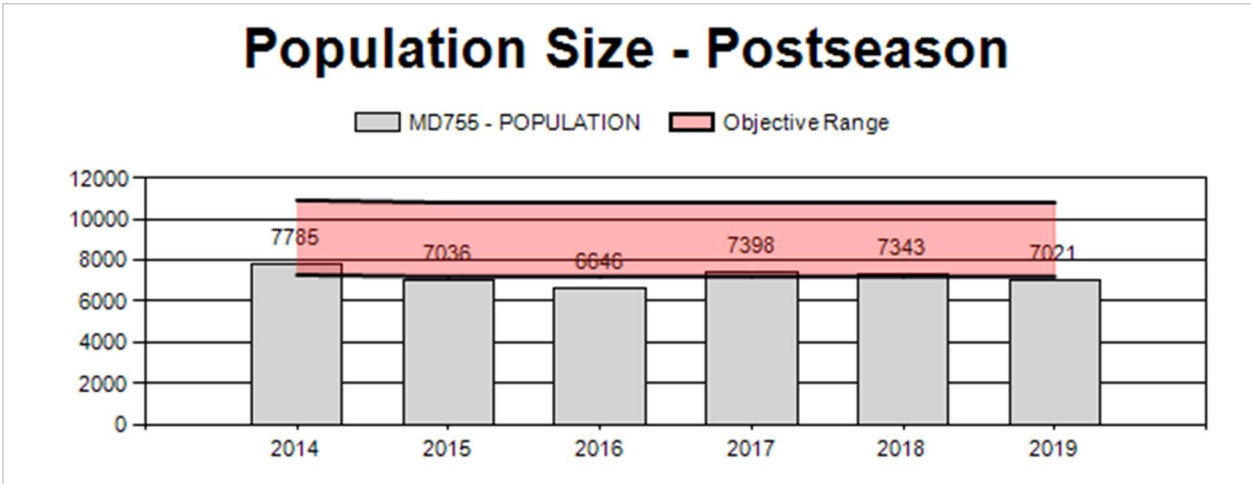
PREPARED BY: MATT HUIZENGA

	2014 - 2018 Average	2019	2020 Proposed
Population:	7,242	7,021	7,610
Harvest:	226	374	370
Hunters:	285	462	450
Hunter Success:	79%	81%	82 %
Active Licenses:	285	462	450
Active License Success:	79%	81%	82 %
Recreation Days:	1,012	1,757	1,750
Days Per Animal:	4.5	4.7	4.7
Males per 100 Females	45	40	
Juveniles per 100 Females	80	57	

Population Objective (± 20%) :	9000 (7200 - 10800)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-22.0%
Number of years population has been + or - objective in recent trend:	11
Model Date:	02/21/2020

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

	JCR Year	Proposed
Females ≥ 1 year old:	0%	0%
Males ≥ 1 year old:	21.4%	15.5%
Total:	21.4%	15.5%
Proposed change in post-season population:	-5.3%	-4.9%



2020 HUNTING SEASONS
North Converse Mule Deer Herd Unit (MD755)

Hunt Area	Hunt Type	Archery Dates		Season Dates		Quota	Limitations
		Opens	Closes	Opens	Closes		
22	1	Sep. 1	Sep. 30	Oct. 1	Oct. 14	500	Antlered mule deer or any white-tailed deer

2019 Hunter Satisfaction: 78% Satisfied, 14% Neutral, 8% Dissatisfied

2020 Management Summary

1) **Hunting Season Evaluation:** The 2020 season structure was conservative in an effort to promote population growth and maintain buck ratios within the special management parameters. License numbers were kept unchanged from the 2019 season. This hunt area is predominantly private land with much of the public land inaccessible to hunters. Public land mule deer hunting is very limited in this area. Many of the large landowners have concerns over mule deer populations and have limited the number of hunters they allow. License issuance is largely based on access to private lands and limited to prevent saturation of available public lands.

2) **Chronic Wasting Disease Management:** There were no CWD management actions taken in the North Converse herd unit in 2019. To date, we do not have any meaningful CWD prevalence data for this herd.

3) The North Converse Herd Unit peaked well over objective in 1997-1998. After that, it has slowly trended downward until a dramatic reduction in population in 2011 likely caused by years of drought and a harsh winter. Since that time, the population has shown a slow upward trend toward objective. The fawn ratio observed in 2019 was significantly lower than average from the prior five year period. This was likely a result of a very cool, wet spring during peak parturition period.

4) The North Converse Herd Unit has been subjected to a very high level of energy development disturbance over the past decade. Impacts from this development on the long-term carrying capacity of mule deer habitats are unknown, but potentially significant.

5) In 2019, we collected antler spread measurements (n=16) from adult male mule deer harvested in the North Converse Herd Unit. Class II bucks represented 31% of all bucks sampled, while Class I bucks represented the other 69%.

6) Buck ratios are consistently very high in this herd. They have averaged 50 bucks:100 does over the past five years.

7) The increasing population trend simulated by the current model is not accurately reflected in the graph on page 1. As the model has evolved, it has not remained congruent with past model simulations.

Appendix 1

North Converse Mule Deer - MD 755

2014 - 2019 Postseason Classification Summary

		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
2014	7,785	23	26	14	3	0	66	14%	220	45%	202	41%	488	1,936	10	20	30	± 5	92	± 11	71
2015	7,036	65	54	35	10	0	164	18%	393	43%	351	39%	908	1,858	17	25	42	± 5	89	± 8	63
2016	6,646	37	42	24	2	14	119	18%	324	49%	217	33%	660	1,224	11	25	37	± 5	67	± 7	49
2017	7,398	41	98	42	7	0	188	22%	383	44%	295	34%	866	1,588	11	38	49	± 5	77	± 7	52
2018	7,343	36	75	16	0	0	127	31%	159	39%	123	30%	409	1,825	23	57	80	± 12	77	± 12	43
2019	7,021	51	93	41	1	0	186	20%	460	51%	262	29%	908	1,644	11	29	40	± 4	57	± 5	41

2019 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2019 - 5/31/2020

HERD: MD756 - SOUTH CONVERSE

HUNT AREAS: 65

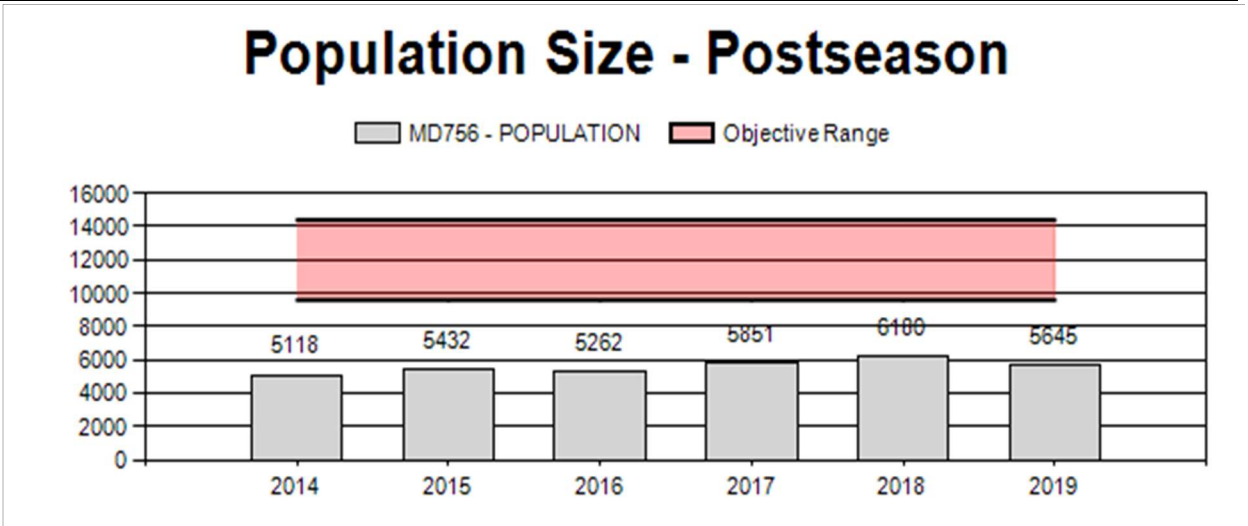
PREPARED BY: MATT HUIZENGA

	2014 - 2018 Average	2019	2020 Proposed
Population:	5,569	5,645	5,614
Harvest:	268	215	275
Hunters:	692	799	750
Hunter Success:	39%	27%	37%
Active Licenses:	692	799	750
Active License Success:	39%	27%	37 %
Recreation Days:	2,591	3,112	3,000
Days Per Animal:	9.7	14.5	10.9
Males per 100 Females	41	40	
Juveniles per 100 Females	65	53	

Population Objective (± 20%) :	12000 (9600 - 14400)
Management Strategy:	Private Land
Percent population is above (+) or below (-) objective:	-53.0%
Number of years population has been + or - objective in recent trend:	20
Model Date:	02/21/2020

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

	JCR Year	Proposed
Females ≥ 1 year old:	0.7%	0.2%
Males ≥ 1 year old:	14.5%	19.5%
Total:	15.2%	19.7%
Proposed change in post-season population:	-3.8%	-4.9%



2020 HUNTING SEASONS
South Converse Mule Deer Herd Unit (MD756)

Hunt Area	Hunt Type	Archery Dates Opens	Archery Dates Closes	Season Dates Opens	Season Dates Closes	Quota	Limitations
65	Gen	Sep. 1	Sep. 30	Oct. 15	Oct. 31		Antlered mule deer three (3) points or more on either antler or any white-tailed deer

2020 Region J nonresident quota: 900 licenses

2019 Hunter Satisfaction: 47% Satisfied, 26% neutral, 27% Dissatisfied

2020 Management Summary

1) **Hunting Season Evaluation:** The 2020 season structure was kept unchanged from the 2019 season. The season continued to go until Oct. 31 with a 3-point or better antler point restriction to increase harvest of mature mule deer bucks. This was put in place to maintain buck numbers on accessible public lands while also increasing opportunity throughout the hunt area. The 2020 season will be the third year of the extended 17-day season and antler point restriction. This area historically has maintained high buck ratios and high CWD prevalence. After hitting a low point in 2012, mule deer numbers grew through 2017 and have since leveled off.

2) **Chronic Wasting Disease Management:** The South Converse herd unit was intensively surveyed in 2018. At that time, CWD prevalence (n=51) was 39% in adult male mule deer. This hunt area has been sampled fairly consistently over the years. Sample sizes have varied by year, however CWD prevalence (n=141) has averaged 38% over the past 6 years in adult male mule deer. The 2019 hunting season was kept extended to Oct. 31 with a 3-point or better antler point restriction in an effort to increase harvest of mature mule deer bucks to potentially reduce CWD spread and prevalence in the Herd Unit.

3) Heavy early snow storms starting October 23rd greatly restricted access to much of the higher elevation and public land areas in the South Converse Herd Unit through the latter half of the 2019 hunting season. These snows likely impacted mule deer harvest as deer were pushed to different areas.

4) Classification flight time was limited to <5 hours of survey time. However, when coupled with ground classifications, a reasonable sample size (n=1,171) was achieved. Observed ratios are therefore reasonable.

5) This herd unit is slated for a sightability survey/abundance estimate within the next few years to anchor the population model.

6) Mule deer harvest in 2019 was the lowest harvest reported in Hunt Area 65 since 1991. Some of the factors considered in that low harvest include: high CWD prevalence, high buck ratios, limited access, low overall deer population, antler point restrictions, and weather events. Likely all of these combined to contribute to the relatively low harvest.

High numbers and easier access to white-tailed deer may have also prompted hunters to harvest white-tailed deer instead of mule deer on their general license in this hunt area.

South Converse Mule Deer - MD 756

2014 - 2019 Postseason Classification Summary

		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
2014	5,118	30	56	24	19	0	129	16%	393	49%	286	35%	808	1,281	8	25	33	± 4	73	± 7	55
2015	5,432	81	68	29	7	0	185	19%	458	48%	308	32%	951	1,164	18	23	40	± 4	67	± 6	48
2016	5,262	137	176	70	20	0	403	20%	1,030	51%	568	28%	2,001	900	13	26	39	± 2	55	± 3	40
2017	5,851	70	103	38	3	0	214	22%	453	46%	319	32%	986	1,315	15	32	47	± 5	70	± 6	48
2018	6,180	41	79	23	8	0	151	22%	299	44%	237	34%	687	1,571	14	37	51	± 6	79	± 8	53
2019	5,645	78	133	31	0	0	242	21%	608	52%	321	27%	1,171	1,281	13	27	40	± 3	53	± 4	38

2019 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2019 - 5/31/2020

HERD: MD757 - BATES HOLE/HAT SIX

HUNT AREAS: 66-67

PREPARED BY: HEATHER O'BRIEN

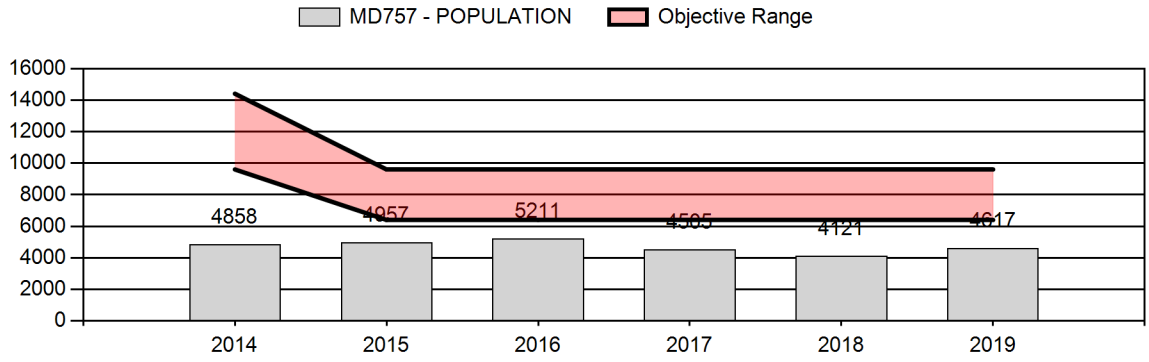
	2014 - 2018 Average	2019	2020 Proposed
Population:	4,730	4,617	4,614
Harvest:	345	196	284
Hunters:	878	782	800
Hunter Success:	39%	25%	36%
Active Licenses:	878	782	800
Active License Success:	39%	25%	36 %
Recreation Days:	3,462	2,851	3,300
Days Per Animal:	10.0	14.5	11.6
Males per 100 Females	32	29	
Juveniles per 100 Females	69	66	

Population Objective (± 20%) :	8000 (6400 - 9600)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-42.3%
Number of years population has been + or - objective in recent trend:	19
Model Date:	02/20/2020

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

	JCR Year	Proposed
Females ≥ 1 year old:	.6%	.4%
Males ≥ 1 year old:	23%	30.1%
Total:	4.1%	6.1%
Proposed change in post-season population:	+12.1%	0.01%

Population Size - Postseason



2020 HUNTING SEASONS
BATES HOLE / HAT SIX MULE DEER HERD (MD757)

Hunt Area	Type	Archery Dates		Season Dates		Quota	Limitations
		Opens	Closes	Opens	Closes		
66	Gen	Sep. 1	Sep. 30	Oct. 15	Oct. 21		Antlered mule deer three (3) points or more on either antler or any white-tailed deer

2020 Region D nonresident quota: 400

2019 Hunter Satisfaction: 49% Satisfied, 22% Neutral, 29% Dissatisfied

2020 Management Summary:

1.) **Hunting Season Evaluation:** The model for this herd depicts a population that has been consistently under objective. It is unlikely the trend line produced by the spreadsheet model is accurate, as managers recall years when there were far more mule deer in the herd than are accounted for by the model. After being at very low levels through 2012, this population grew through 2017 but has since declined. Harvest data are difficult for the model to interpret, with a lack of female harvest and antler-point restrictions constraining totals in recent years. Overwinter survival data from a GPS-collar study were added as an additional data point to the model in 2017. A sightability survey conducted in 2019 provided an abundance estimate, which significantly lowered the overall trend and population estimate in the model. These two independent estimates contribute additional discrete data points and improve model performance.

Postseason classifications have yielded mediocre fawn ratios in the 60s per 100 does for the last five years. Buck ratios are more variable due to changes in harvest limitations from year to year. Antler point restrictions (APRs) of three (3) points or more on either antler are used in the herd in some years, with the goal of conserving younger age-class bucks and reducing harvest pressure in years when the buck ratio is low. In 2019, an APR was reinstated in the herd. Weather also made access difficult during the hunting season, with heavily drifted snow in some areas, mud in others, and strong persistent winds. As a result, harvest success was quite low (25%) compared to the five-year average of 39 percent. Postseason classifications showed a slight increase in yearling bucks, and an improved proportion of mature (class II & III) bucks in 2019 (Table 1).

For the 2020 hunting season, managers prescribed a 7-day general license season, which is typical for the herd. The APR remained as a limitation for harvested mule deer, as an improved buck ratio was still desired. For future seasons, managers recommend leaving the APR in place for a three-year time period followed by removal for at least two years. This will provide more consistency and less confusion for hunters.

2.) **Management Objective Review:** In 2020, managers evaluated population, habitat, and weather data as part of a 5-year management objective (MO) review. The 2019 sightability survey of this herd provided an abundance estimate that adjusted the population model downward significantly. Despite the recent model realignment, managers elected to postpone any action to change the management strategy of this herd until an ongoing mule deer/mountain lion/CWD research project is complete. Managers were also interested to see how this herd will model using PopR, and if there will be any significant differences compared to the current spreadsheet model.

3.) **Additional Surveys:** As part of the Mule Deer Initiative in this herd unit, managers analyzed PRISM precipitation data and also collected Rapid Habitat Assessment (RHA) data throughout the herd unit from 2016-2020. See Appendix A for a summary of both weather and RHA data as it pertains to the Bates Hole / Hat Six Mule Deer Herd Unit.

In 2019 a multi-year research project was initiated in the herd by WGFD in collaboration with Dr. Joe Holbrook at the University of Wyoming – Haub School of Environment and Natural Resources. This study will focus on interactions between mountain lion predation, mule deer, and Chronic Wasting Disease. Thus far several mountain lions have been captured and fitted with GPS collars, and collection of spatial data has begun. Mule deer capture and collaring efforts are scheduled for winter 2021. Along with spatial data, deer GPS collars will provide additional survival data to be incorporated into the population model.

Bio-Year	Total Class N for HA	# Bucks Classified					Buck Ratios per 100 Females					
		Ylng	Class I	Class II	Class III	Total	Ylng	Class I	Class II	Class III	All Adult	Total
2008	1,254	75	57 (50%)	41 (36%)	16 (14%)	189	12	9	6	2	18	29
2009	1,320	59	61 (54%)	41 (37%)	10 (9%)	171	8	8	6	1	15	23
2010	1,479	82	49 (49%)	42 (42%)	9 (9%)	182	9	5	5	1	11	20
2011	1,248	47	52 (56%)	33 (36%)	7 (8%)	139	7	8	5	1	14	21
2012	1,272	28	55 (59%)	30 (32%)	9 (9%)	122	4	8	4	1	13	17
2013	1,483	86	50 (61%)	25 (30%)	7 (9%)	168	10	6	3	1	10	20
2014	1,403	83	79 (71%)	26 (23%)	7 (6%)	195	12	12	4	1	17	29
2015	2,061	164	97 (70%)	29 (21%)	13 (9%)	303	16	9	3	1	13	29
2016	1,836	132	198 (85%)	31 (13%)	4 (2%)	365	15	22	3	1	26	41
2017	1,165	54	108 (80%)	23 (17%)	4 (3%)	189	9	18	4	1	22	31
2018	734	32	59 (89%)	7 (11%)	0 (0%)	98	8	15	2	0	17	26
2019	1,050	55	89 (86%)	10 (10%)	4 (4%)	158	10	17	2	1	19	29

Table 1: Antler Classification Analysis for Area 66within the Bates Hole Hat Six Mule Deer Herd Unit, 2008-2019

2014 - 2019 Postseason Classification Summary

for Mule Deer Herd MD757 - BATES HOLE/HAT SIX

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2014	4,858	83	79	26	7	0	195	14%	665	47%	543	39%	1,403	1,464	12	17	29	± 3	82	± 5	63
2015	4,957	164	97	29	13	0	303	15%	1,039	50%	719	35%	2,061	1,208	16	13	29	± 2	69	± 3	54
2016	5,211	132	198	31	4	0	365	20%	886	48%	585	32%	1,836	1,236	15	26	41	± 3	66	± 4	47
2017	4,505	54	108	23	4	0	189	16%	611	52%	365	31%	1,165	1,216	9	22	31	± 3	60	± 4	46
2018	4,121	32	59	7	0	0	98	13%	384	52%	252	34%	734	1,161	8	17	26	± 3	66	± 6	52
2019	4,617	55	89	10	4	0	158	15%	536	51%	356	34%	1,050	1,058	10	19	29	± 3	66	± 5	51

Appendix A
Weather and Rapid Habitat Assessment Data for the Bates Hole / Hat Six Mule Deer Herd Unit

Precipitation

From October 2018 through September 2019 (Water Year 2019), precipitation in the Bates Hole / Hat Six Mule Deer Herd Unit was 3 inches higher than the 30-year average for the same water year timeframe (Figure 1). The growing season (April-June) precipitation in 2019 (8.3 inches) was similar to the amount received in 2018 (8 inches), and was 2 inches above the 30-year average. Precipitation during this time of year is extremely important for shrubs because this is when the majority of annual growth occurs. During July and August of 2019, typically the driest months during the summer, the Bates Hole / Hat Six Mule Deer Herd Unit received 2.7 inches of precipitation, which is similar to the 2018 July/August precipitation (2.6 inches) and is 0.7 tenths of an inch above the 30-year average. The herd unit received 3 inches of precipitation during September and October 2019, which is a significant improvement over 2018 (1.4 inches) and 0.4 tenths of an inch above the 30-year average of 2.6 inches. Precipitation received during this timeframe is beneficial to help jumpstart plant growth the following growing season. Overall, this herd unit received higher precipitation than 30-year averages across all seasons analyzed.

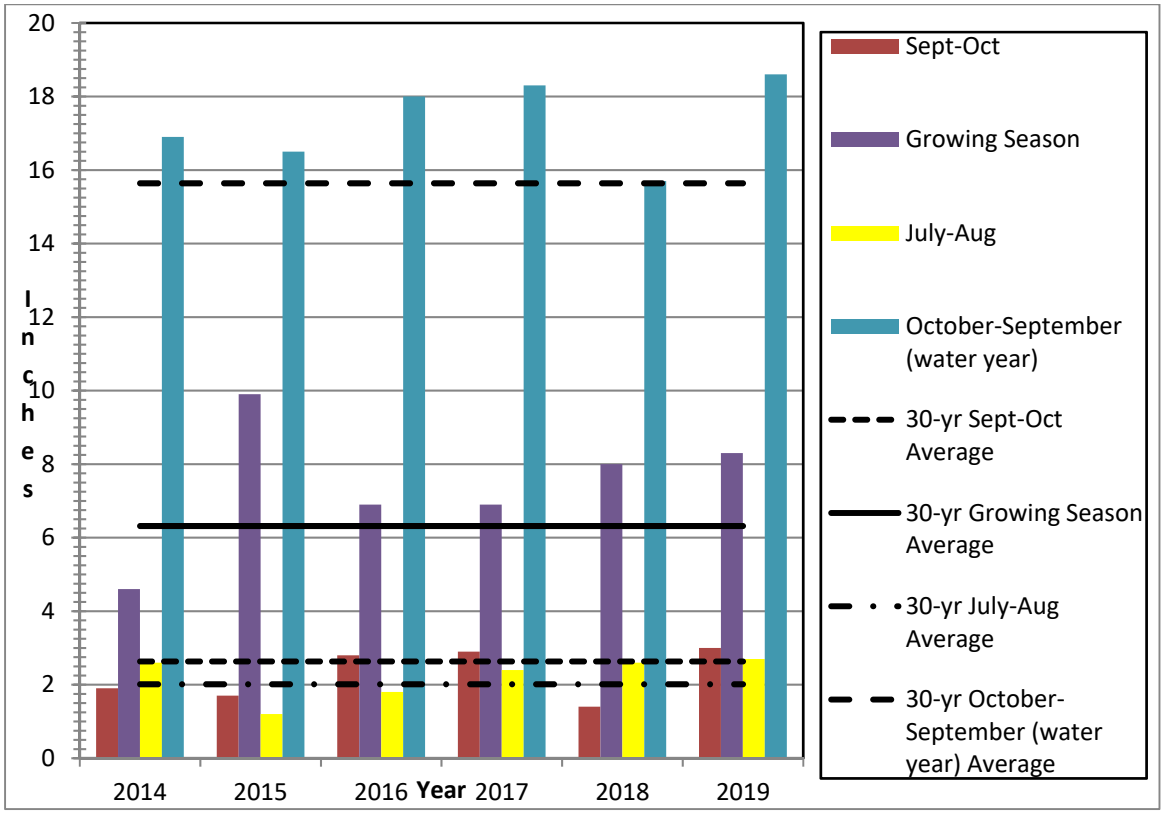


Figure 1. Seasonal precipitation received compared to 30-year averages within the Bates Hole / Hat Six Mule Deer Herd Unit.

Bates Hole RHA data were summarized for years 2016-2020 by survey type and mule deer range. Managers collected 8 aspen RHAs, 99 rangeland RHAs, and 40 riparian RHAs during this time period across approximately 150,000 acres. Summer and spring/summer/fall were combined into one category and winter, winter/yearlong, and yearlong were combined into another category in order to differentiate between habitats that deer use in winter vs. non-winter use to simplify the analysis.

Habitat concerns as shown in the data include severe herbivory in non –winter range aspen habitats. Rangelands had the highest presence of invasives as well as a higher prevalence of advanced successional stages than desired for high quality mule deer habitat. The majority of riparian habitat in non-winter habitats did not meet objectives for providing mule deer habitat. This can largely be attributed to lack of the desired level of deciduous woody plants in riparian areas which is shown by the high prevalence of riparian areas in non-winter habitat that were in an early seral state. Species diversity was also relatively lower than site potential in many riparian areas. While herbivory during the survey time period was mostly light, these issues are likely due to long-term excessive herbivory and de-watering mechanisms. Growing conditions were either normal or above normal for most of the survey time period which likely influenced herbivory pressures in these communities.

		Rangeland RHA		Aspen RHA		Riparian RHA	
		Spring-Summer-Fall	Winter/ Yearlong	Spring-Summer-Fall	Winter/ Yearlong	Spring-Summer-Fall	Winter/ Yearlong
Seral State	Early	16	1	15	0	89	8
	Middle	9	24	84	100	10	86
	Late	75	75	1	0	1	6
Herbivory	Light	65	72	0	100	83	76
	Moderate	20	10	2	0	6	24
	Severe	16	28	98	0	11	0
Invasives	None	72	30	100	0	80	61
	Present	28	70	0	100	20	39
Meets Objectives	Yes	21	71	17	0	1	1
	Partial	36	29	83	100	7	75
	No	43	1	0	0	92	24
Total Acres		**73790**	**46829**	**3337**	**28***	**12307**	**10393**

*small sample

2019 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2019 - 5/31/2020

HERD: MD758 - RATTLESNAKE

HUNT AREAS: 88-89

PREPARED BY: HEATHER O'BRIEN

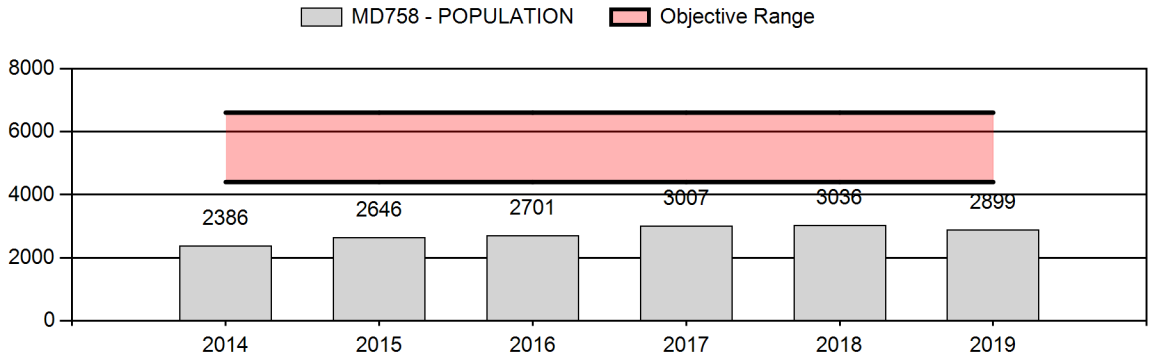
	2014 - 2018 Average	2019	2020 Proposed
Population:	2,755	2,899	3,059
Harvest:	181	241	200
Hunters:	345	476	400
Hunter Success:	52%	51%	50 %
Active Licenses:	346	476	400
Active License Success:	52%	51%	50 %
Recreation Days:	1,244	1,543	1,300
Days Per Animal:	6.9	6.4	6.5
Males per 100 Females	47	35	
Juveniles per 100 Females	76	53	

Population Objective (± 20%) :	5500 (4400 - 6600)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-47.3%
Number of years population has been + or - objective in recent trend:	15
Model Date:	02/23/2020

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

	JCR Year	Proposed
Females ≥ 1 year old:	0.0%	0.0%
Males ≥ 1 year old:	30.7%	28.1%
Total:	7.6%	6.1%
Proposed change in post-season population:	-4.5%	+5.5%

Population Size - Postseason



2020 HUNTING SEASONS
RATTLESNAKE MULE DEER HERD (MD758)

Hunt Area	Type	Archery Dates		Season Dates		Quota	Limitations
		Opens	Closes	Opens	Closes		
88	Gen	Sep. 1	Sep. 30	Oct. 15	Oct. 21		Antlered mule deer or any white-tailed deer
89	1	Sep. 1	Sep. 30	Oct. 15	Oct. 31	175	Antlered mule deer or any white-tailed deer

2019 Hunter Satisfaction: 71% Satisfied, 16% Neutral, 12% Dissatisfied

2020 Management Summary:

1.) **Hunting Season Evaluation:** The model for this herd depicts a population that declined until 2013, then grew during years of improved fawn production and overwinter survival. Population size plateaued in 2018 & 2019, as fawn production and overwinter survival decreased. The trends depicted by the model are reasonable, and an independent abundance estimate was added to the 2019 bio-year that helps align the model for more accurate population estimates.

Postseason classification data were collected exclusively from the ground in 2019, and the resulting sample size (N=650) was significantly smaller than in typical years where portions of the herd are surveyed via helicopter. Managers are thus apprehensive about results, particularly the buck ratio. Buck and fawn ratios both are likely higher than calculated, but lower than the previous year. Buck ratios are historically high in Area 89, but harvest success on Type 1 licenses dropped by 19% in 2019, and general licenses success in Area 88 dropped by 12 percent. The proportion of mature age class (class II & class III) bucks declined during postseason classification surveys in 2019 as well (Table 1). Decreased ratios and harvest success combined with severe winter conditions in 2019-2020 lead managers to prescribe a more conservative season in 2020.

The 2020 season continues to provide quality hunting opportunity but reduces harvest pressure slightly to compensate for slower population growth. For Area 88, managers prescribed a 7-day general license season with licenses valid for antlered mule deer or any white-tailed deer. For Area 89, a total of 175 Type 1 licenses were available for antlered deer, which is a decrease of 25 licenses compared to 2019.

2.) **Management Objective Review:** In 2020, managers evaluated population and weather data as part of a 5-year management objective (MO) review. The 2020 sightability survey of this herd provided an abundance estimate that adjusted the population model downward significantly. Despite the recent model realignment, managers elected to postpone any action to change the management strategy of this herd. Managers were interested to see how this herd will model using PopR, and if there will be any significant differences compared to the current spreadsheet model. Changes to the management objective were thus deferred until these components can be fully utilized and integrated into the decision-making process.

3.) **Additional Surveys:** A sightability survey was conducted for this herd unit in January 2020 using a Bell Jet Ranger flown by Helicopter Solutions MT, Inc. The survey was completed in 37 hours, yielding an abundance estimate of 2,380 deer (95% CI =1,956-2,804) (SE=216) derived from the data analysis in the PopR program. This estimate was incorporated into the population model. See Appendix A for a full report of the 2020 Rattlesnake Mule Deer sightability survey.

The Rattlesnake Mule Deer Herd was also a priority area for Chronic Wasting Disease (CWD) testing in 2019. Despite attempts to inform hunters with informational letters and extra effort by personnel in the field, only 32 samples were collected from the herd unit with a resulting prevalence of 9.4 percent. Tooth samples and antler measurements were also collected from 32 harvested mule deer in 2019. The average cementum annuli tooth age of those sampled was 4.7 years, and the average antler spread for the herd unit was 19.97 inches. Those deer harvested in Area 89 (N=20) had a slightly higher tooth age of 5.18 years and a larger average antler spread of 20.95 inches (Table 2).

Bio-Year	Total Class N for HA	# Bucks Classified					Buck Ratios per 100 Females					
		Ylng	Class I	Class II	Class III	Total	Ylng	Class I	Class II	Class III	All Adult	Total
2008	1,220	71	126 (74%)	40 (23%)	5 (3%)	242	11	20	6	1	27	38
2009	848	31	74 (53%)	54 (39%)	12 (9%)	171	7	17	13	3	33	40
2010	778	38	59 (54%)	45 (41%)	6 (5%)	148	9	14	11	1	26	35
2011	1,009	48	114 (62%)	61 (33%)	9 (5%)	232	9	21	11	2	34	43
2012	503	17	61 (84%)	10 (14%)	2 (3%)	90	6	22	4	1	26	32
2013	548	11	53 (74%)	18 (25%)	1 (1%)	83	4	17	6	0	24	27
2014	684	37	66 (65%)	30 (29%)	6 (6%)	139	12	22	10	2	34	46
2015	896	80	90 (69%)	38 (29%)	3 (2%)	211	20	22	9	1	28	48
2016	717	45	78 (74%)	25 (24%)	3 (2%)	151	13	22	7	1	30	42
2017	762	31	53 (39%)	78 (58%)	4 (3%)	166	10	16	24	1	42	51
2018	620	46	64 (73%)	22 (25%)	2 (2%)	134	21	29	10	1	40	61
2019	281	13	37 (79%)	9 (19%)	1 (2%)	60	9	26	6	1	34	43

Table 1. Antler classification analysis for Area 89 within the Rattlesnake Mule Deer Herd Unit, 2008-2019.

	2009	2012	2014	2015	2016	2017	2018	2019
Average Tooth Age	5.6	5.07	5.83	5.88	5.67	5.4	5.09	5.18
Median Tooth Age	5.5	4.5	6.5	5.5	5.5	5.5	4.5	5.5
Average Antler Spread	22	20	23	23	23	23	20	20.95
Total Sample Size (N)	59	37	13	8	12	20	54	20

Table 2. Hunter-submitted tooth age and antler measurement data from Area 89 deer, 2009-2019.

2014 - 2019 Postseason Classification Summary

for Mule Deer Herd MD758 - RATTLESNAKE

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2014	2,386	47	84	36	6	0	161	19%	368	44%	304	36%	833	1,446	13	31	44	± 4	83	± 7	57
2015	2,646	96	97	41	3	0	237	22%	491	45%	371	34%	1,099	1,209	20	29	48	± 4	76	± 5	51
2016	2,701	58	96	30	3	0	187	19%	487	49%	314	32%	988	1,288	12	26	38	± 3	64	± 5	47
2017	3,007	50	89	95	5	0	239	22%	442	41%	392	37%	1,073	1,132	11	43	54	± 4	89	± 6	58
2018	3,036	79	109	27	2	0	217	24%	407	45%	286	31%	910	1,270	19	34	53	± 5	70	± 6	46
2019	2,899	34	65	21	1	0	121	19%	345	53%	184	28%	650	1,410	10	25	35	± 4	53	± 5	39

APPENDIX A

Rattlesnake Mule Deer
Sightability Survey 2020 Summary

Heather O'Brien – Casper Wildlife Biologist

INTRODUCTION

The Rattlesnake Mule Deer Herd Unit (MD 758) contains Hunt Areas 88 and 89 and is located in central Wyoming (Figure 1). The herd unit encompasses an area of approximately 1,232 square miles from the city of Casper west along Highway 20/26 to Waltman, south along the Gas Hills Road, southeast along the Dry Creek Road, and northeast along Highway 220 back to Casper. Relative densities of mule deer vary within the herd unit, with most deer found in the foothills surrounding the Rattlesnake Range, in the hills around Pine Mountain, and along riparian corridors. The main land use is traditional ranching and grazing of livestock, with several areas of oil and gas development. Uranium, gold and other mineral resources occur in the herd unit, but are not presently under large-scale development. Land status within the herd is a mosaic of 58% public (Bureau of Land Management and State of Wyoming Lands) and 42% private lands, with larger tracts of public lands in the western and southern portions of the herd unit.

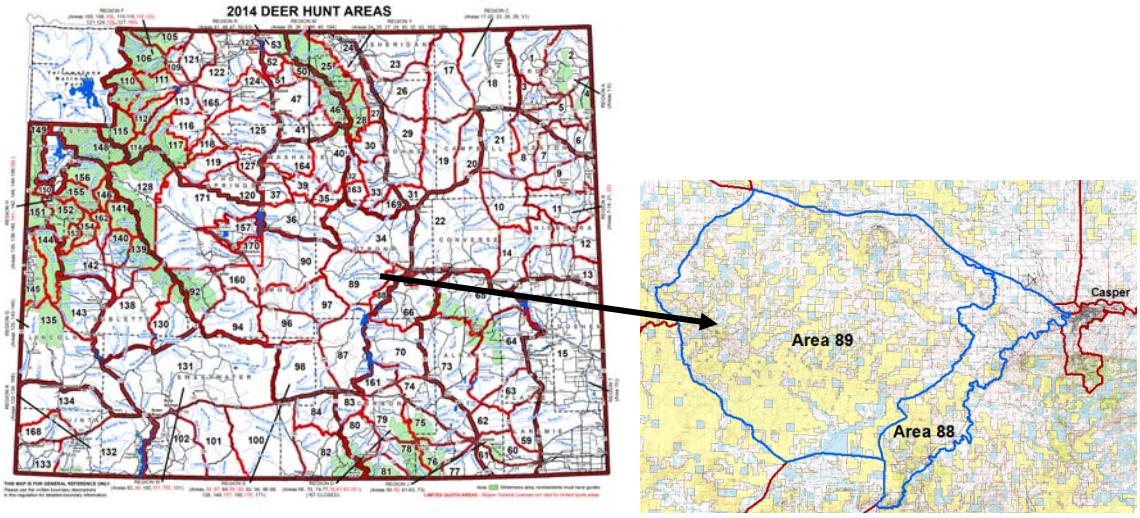


Figure 1. Map of mule deer hunt areas in Wyoming for 2014, with Rattlesnake Herd Unit hunt areas highlighted.

The Rattlesnake Mule Deer Herd Unit contains two hunt areas with different management strategies and season structures. Hunt Area 88 consists mainly of high productivity, irrigated

agricultural lands. Access is difficult as most lands are private, though some landowners provide hunting via the Department's Access Yes program. Hunting seasons follow a general license structure, with the goal of maintaining a lower density of deer to minimize depredation on croplands. By contrast, Hunt Area 89 consists mainly of native rangelands with relatively low annual precipitation. Access is fair, with a mix of public and private lands with some additional hunting access via the Access Yes program. While this larger portion of the herd unit tends to contain lower densities of deer, it also has the reputation of producing high quality mature bucks. Hunting seasons follow a limited quota structure, with the goal of providing a superior mule deer hunt.

Population modeling of the Rattlesnake Mule Deer Herd is difficult using only classification and harvest data. In typical years, classification surveys are conducted on a limited budget. Thus, directed surveys are used and cover a limited portion of the herd unit, and sample goals are not always met. Moreover, the dichotomy of a herd with both a general and a limited quota hunt area creates variations in overall harvest data that violate spreadsheet model assumptions of even harvest distribution. An intensive abundance survey of the herd unit would help better align the model with a stand-alone population estimate.

METHODS

In 2019 & 2020, a sightability survey was designed and conducted within the Rattlesnake Mule Deer Herd Unit. Defined management goals were to analyze survey data as a stand-alone abundance estimate, and to combine results with classification and harvest data to further improve the population model.

To initiate study design, a mapping exercise was conducted among field managers to divide the herd unit into manageable subunits. Objectives for each subunit were to use boundaries that were visible from the helicopter when possible such as roads, drainages, and divides. Each subunit was drawn with the target of being flown in approximately one hour, following flight speed and line spacing guidelines for sightability surveys (Unsworth et. al, 1994). Local field managers collaborated to discuss and draw subunit boundaries on a large aerial photo map of the herd unit prior to digitizing using ArcMap (ESRI, 2011) (Figure 2). Each subunit was assigned a unique number for the purpose of recording and tracking data during aerial surveys, and for comparison between this and future surveys.

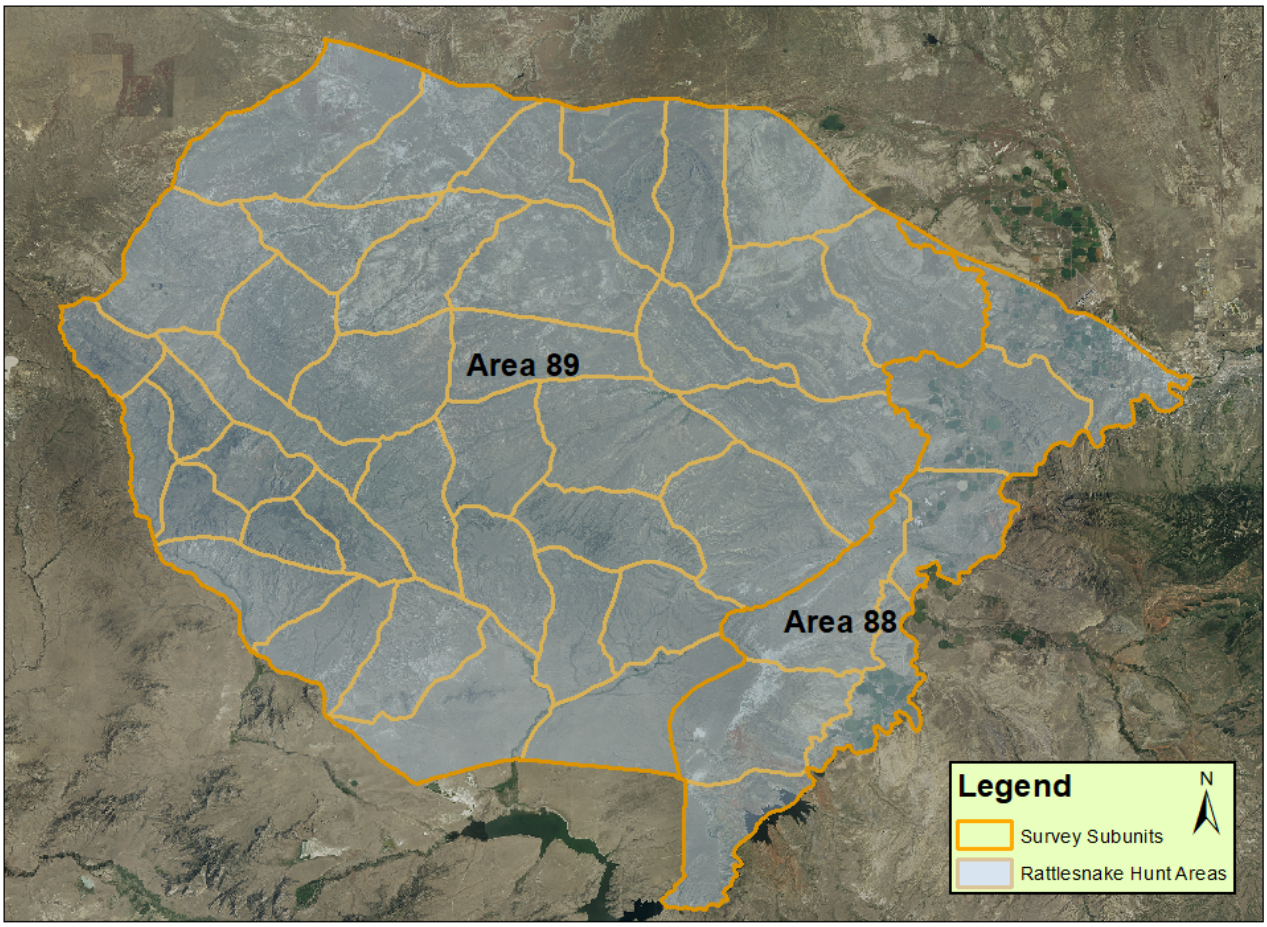


Figure 2. Survey subunits for the Rattlesnake Mule Deer Herd Unit sightability survey, January 2020.

Prior to initiating flights, all potential observers were trained in proper data collection following the protocol for WGFD sightability surveys and safety standards outlined by WGFD flight policy (Wyoming Game and Fish Department 2017, Wyoming Game and Fish Department, 2011). PowerPoint training presentations are available within the Department for both sightability surveys and approved flight policy. Flights were conducted from 13 through 20 January 2020 on days when weather conditions were suitable for flights. All surveys were flown in a Bell Jet Ranger piloted by Kent Potter of Helicopter Solutions MT, Inc. from Laurel, Montana. Two observers were aboard every survey flight, and pilot observations were also included during data collection. The back-seat observer was positioned to view out the opposite side of the helicopter compared to the front-seat observer to maximize the area observed per transect line. Observers were replaced mid-day whenever possible to avoid eye fatigue and maximize survey performance. In cases where observers could not be swapped, 30-45 minute breaks were taken approximately every three hours during helicopter refueling to provide some rest for all-day observers.

Winter habitat conditions during 2020 flights were considered average to mild in terms of snow accumulation and daily temperatures. Higher elevation portions of the herd unit had more

complete snow cover, while lower elevation portions of the herd unit were more open or broken in terms of snow cover. Snow in these areas was not as deep, with exposed shrubs and ground in most areas and deeper drifted snow along drainages and hillsides. Wind conditions were severe enough on several days within the survey period to cancel flights. Managers either cancelled flights on days with high winds or surveyed subunits in the herd where conditions were more favorable and scheduled the remaining subunits later.

Data collection was performed by the back-seat observer for all surveys using a hand-held GPS and standardized data sheet for sightability surveys (Attachment A). Location, number of individual deer in a group, activity of animals upon first sighting, percent snow cover, percent vegetative cover, and vegetative type were recorded for every survey observation. Sightability data were collected simultaneously for elk within the herd unit. Mule deer were not classified by age or sex, since fawns may have been quite large by the time of the survey and some bucks may have lost their antlers. Observed elk were classified, as calves were still distinguishable by size and bulls still had their antlers. Other notable species (coyotes, wintering sage-grouse flocks, congregations of pronghorn, etc.) were also recorded during flights as a means to maximize survey time and collect other useful wildlife data. Flight time to complete each subunit was recorded and saved within the associated survey spreadsheet, so managers can modify subunit sizes for future surveys as needed.

Following the completion of all survey flights, data were compiled into a Microsoft Excel spreadsheet and standardized for import into the software program Aerial Survey for Windows (Unsworth et. al 1999). The pilot and all observers were debriefed and offered the opportunity to provide feedback on survey methods to consider for improvement of future surveys.

RESULTS

A total of 1,352 mule deer were surveyed within 145 recorded observations. Out of 45 total subunits, 37 were flown completely (Figure 3). A total of 34.6 hours were spent flying surveys with a total cost of $36,241.00 including ferry time, fuel truck, and per diem expenses. Several subunits were identified as low priority prior to survey flights. Field managers agreed these were the most likely units to have low densities of deer based on winter conditions and habitat type. Of those subunits identified as low priority, five were not surveyed due to budget constraints. To be less disruptive in developed areas closer to the City of Casper, four additional subunits in Hunt Area 88 were surveyed concurrently from the ground using drive routes on county and public roads.

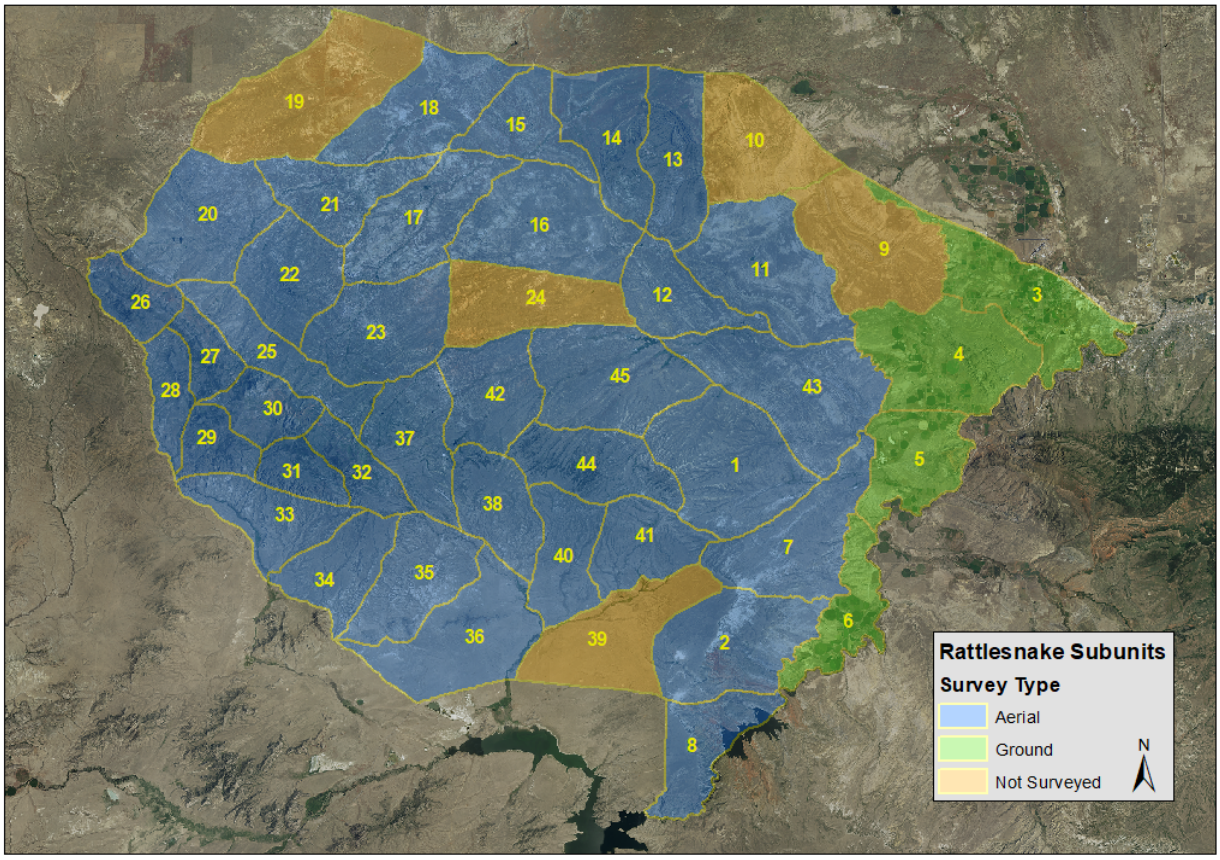


Figure 3. Sightability survey type for subunits in the Rattlesnake Mule Deer Herd Unit, January 2020.

Distribution of observed mule deer across the herd unit was uneven, with higher densities of deer at mid to lower elevations, in areas free of snow, and in habitats containing shrubs utilized for both forage and cover (Figure 4). Deer were also found at higher elevations in areas lacking snow, and in areas with rough topography. Some low elevation habitats were seemingly devoid of deer. This was particularly notable along Poison Spider Creek, where managers expected to find higher densities of wintering deer. Observed group sizes of mule deer were generally larger compared to those groups observed during typical post-season classification surveys, which occur in late November to early December.

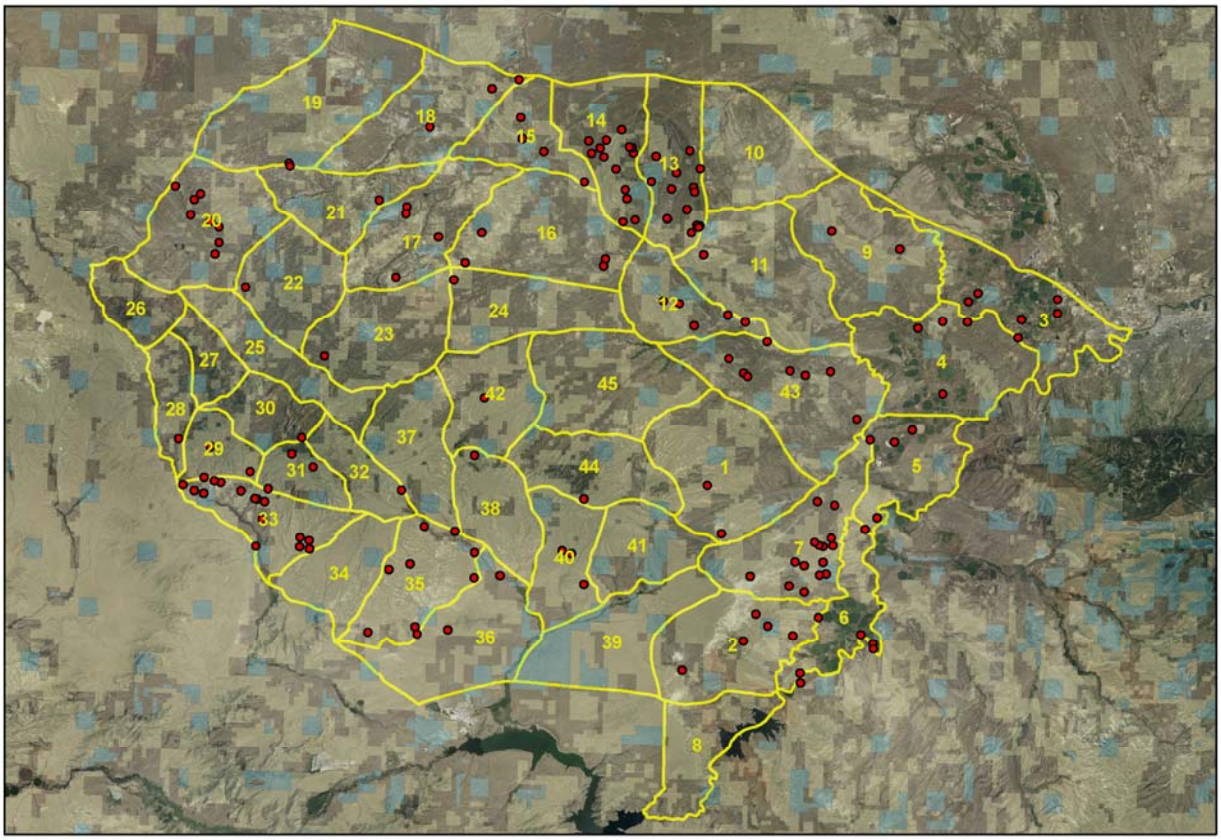


Figure 4. Mule deer group locations and subunits for the Rattlesnake sightability survey, January 2020.

Sightability data analysis using Aerial Survey for Windows yielded an abundance estimate of 2,214 mule deer ±424 using a 95% confidence interval, with a resulting standard error of 216 around the correction (Attachment B). The increase of 889 deer compared to the total observed accounts for those presumably missed by observers due to variations in vegetation and snow cover. The estimate also adds an average number of deer for each of the five subunits that were not flown. Observers agreed this was a reasonable number to have missed, given there are habitats within the herd that contain dense stands of juniper, sagebrush, or conifers, and to account for un-surveyed subunits. Observers also noted deer bedded during the survey were more difficult to see, and that cloud cover during portions of the survey resulted in flat/grey light conditions which made detection more difficult.

The abundance estimate and standard error from the sightability survey were incorporated into the spreadsheet model for the Rattlesnake Mule Deer Herd. This served as an independent data point beyond harvest and classification surveys to better anchor and align the model. Incorporating the abundance estimate from this sightability survey resulted in a lower population estimate for the herd unit. Without the sightability estimate, the spreadsheet model predicted a post-season population of 6,380 deer in 2019. Including the sightability estimate yielded a post-season population estimate of 2,900 deer.

DISCUSSION

Sightability surveys seek to estimate absolute animal abundance at a given point in time, and provide some of the strongest population data available to wildlife managers (Steinhorst and Samual 1989). Sightability models may have their own limitations in terms of cost, and can be biased if groups of animals are undercounted. Despite these limitations, sightability surveys are a powerful source of information for managers compared to traditional classification surveys. Currently, classification surveys do not incorporate a pre-defined survey route or a sampling design. Such directed surveys introduce bias and are not conducted with consistency from one management district to the next, or from one year to the next. Directed surveys also lack true variance estimates (e.g. confidence intervals or standard error), and can still be inefficient and expensive in terms of survey effort.

The abundance estimate and resulting adjustment to the spreadsheet model for the Rattlesnake Mule Deer Herd Unit are strikingly low compared to previous population estimates. The difference of over 3,000 deer illustrates a need to incorporate abundance and survival data to help inform the Department's deer population models and resulting management. Without these anchor points, the spreadsheet model relies on harvest and classification data and assumptions regarding evenly-distributed harvest pressure. These assumptions are violated in the Rattlesnake Herd Unit, as it contains hunt areas with both general and limited quota seasons and allows for only male harvest in both. An alternative model may be necessary to better represent this herd; one which does not rely on specific harvest assumptions and may not rely as heavily on annual classification data.

Distribution of mule deer during the survey dates in mid-January were different than those observed during the typical classification survey period of late November and early December. Some areas had relatively high densities of deer during both survey periods, such as on Pine Mountain, Sage Hen Hill, and along the drainages of Horse Creek and Dry Creek. Other areas had a shift of deer from low to high density (e.g., Clarkson Hill, Keester Basin) or from high to low density (Poison Spider Creek). Since winter conditions were not severe at the time of the sightability survey, this shift may simply be attributed to seasonal movements in a time period that previously was overlooked by managers.

Though an abundance estimate for the Rattlesnake Mule Deer Herd Unit was the main objective for this sightability survey, the resulting data can be used in other ways to improve and inform wildlife management. Location data can be used to review seasonal habitat designations and update boundaries as needed. Location data collected for other species such as sage-grouse has been added to the Wildlife Observation System to improve knowledge of winter habitat use and distribution. In addition, observations of large pronghorn herds can help improve seasonal range designations and may provide impetus to investigate suspected migration routes.

Overall, managers felt very good about the design and implementation of this sightability survey. Minor improvements could be made to the current design to improve future surveys in this herd unit. Subunits that were too small should be combined so that all subunits take approximately one

hour to be completed. This will help divide effort equitably for future surveys, should subunits require random sampling for a partial survey. Location data should also be used to stratify subunits based on deer density, so the survey can be sub-sampled in years when funding does not allow for complete coverage. Methods that were refined designing the survey for this herd can now be applied to the design of surveys in other herd units. The continued application of abundance surveys should help managers improve their knowledge of population dynamics and trend, as well as inform better management decisions in this and other big game herds.

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Attachment A:
Sightability Survey Data Collection Form for the Rattlesnake Mule Deer Herd Unit, Winter 2020

Date:			PRIMARY SPP:		Mule Deer			Page:		of		
Tach Time	Start:		End:			*Weather:*						
Time Spent Flying Unit						Temperature			Cloud cover			
Start						Wind			Precipitation			
End						Primary Observer						
Area			Sub area			Secondary Observer						
					Males				Sightability			
Way Point	Spp.	UN-CLASS	Female	Juv.	Yrlg	Class I	Class II	Class III	Activity	% Snow Cover	% Veg Cover	Veg Class
Activity	1 = Bedded, 2 = Standing, 3 = Moving											
Vegetation Classes	1 = Grassland, Ag. Field, Open, 2 = Sagebrush, 3 = Juniper, Mtn. Mahogany, 4 = Aspen, Riparian Brush, Mtn. Brush, 5 = Conifer											
male class:	Elk males: Class I - raghorn < 270", Class II - Mature adult > 270" Class III - BIG > 320"											
Spp.	E - elk, M - moose, D - mule deer, Wt - whitetail, A - antelope, SG - sage grouse, C -coyote, F - fox, GE - golden eagle, BE - bald eagle, BC- bobcat, ML - mtn. lion, GH - gosshawk											

Attachment B:
Sightability Data Analysis Output for
Rattlesnake Mule Deer Herd Unit
February 2020

Aerial Survey for Windows, Version 1.00 Beta 6.1.4 (12-Feb-2000)

Saturday, February 15, 2020 12:35 PM

Model: Mule Deer, Hiller 12-E, Idaho (Spring)
[Files]
Title = C:\Users\wschul1\Desktop\Beta6.1.3\MD758_v021520.ttl
Summary = C:\Users\wschul1\Desktop\Beta6.1.3\MD758_v021520.sum
.....
MD758_v021520

Section 1: Summary of Raw Counts

Stratum	Units Sampled	Total
1	37	1352
Total	37	1352

Section 2: Summary of Raw Counts for Perfect Visibility Model

This table projects the number of animals that would have been counted if every unit had been flown and visibility had been perfect (no animals obscured by vegetation, etc.)

Strat	No of Units Popn	Sample	Total
1	42	37	1535
Total	42	37	1535

Section 3: Estimates for Total Number

Total Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	42	37	2241	25719	18855	2254	424
Total	42	37	**2241**	25719	18855	2254	**424**

SE = 216.3

2019 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2019 - 5/31/2020

HERD: MD759 - NORTH NATRONA

HUNT AREAS: 34

PREPARED BY: HEATHER O'BRIEN

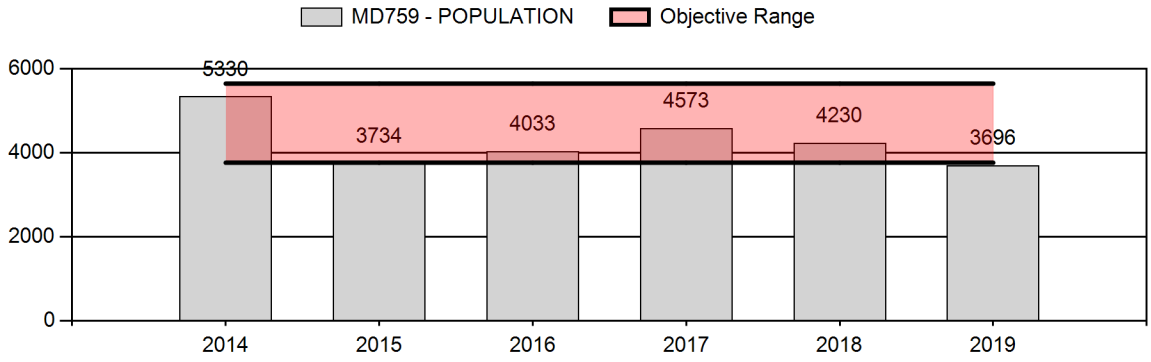
	2014 - 2018 Average	2019	2020 Proposed
Population:	4,380	3,696	4,159
Harvest:	159	251	228
Hunters:	194	336	300
Hunter Success:	82%	75%	76 %
Active Licenses:	197	349	310
Active License Success:	81%	72%	74 %
Recreation Days:	963	1,495	1,400
Days Per Animal:	6.1	6.0	6.1
Males per 100 Females	44	36	
Juveniles per 100 Females	79	69	

Population Objective (± 20%) :	4700 (3760 - 5640)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-21.4%
Number of years population has been + or - objective in recent trend:	5
Model Date:	02/23/3030

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

	JCR Year	Proposed
Females ≥ 1 year old:	1.7%	1.6%
Males ≥ 1 year old:	24.4%	18.7%
Total:	6.3%	5.2%
Proposed change in post-season population:	-4.9%	12.5%

Population Size - Postseason



2020 HUNTING SEASONS
NORTH NATRONA MULE DEER HERD (MD759)

Hunt Area	Type	Archery Dates		Season Dates		Quota	Limitations
		Opens	Closes	Opens	Closes		
34	1	Sep. 1	Sep. 30	Oct. 15	Oct. 31	300	Antlered mule deer or any white-tailed deer
	7	Sep. 1	Sep. 30	Oct. 15	Dec. 15	100	Doe or fawn valid within one (1) mile of irrigated land

2019 Hunter Satisfaction: 77% Satisfied, 10% Neutral, 13% Dissatisfied

2020 Management Summary:

1.) **Hunting Season Evaluation:** The model for this herd depicts a relatively stable population until the harsh winter of 2011. After a brief dip in numbers, the herd recovered and increased gradually until 2017. Moderate fawn production/survival from 2017-present has kept the herd relatively stable in size, just below the population objective. The current model has no independent survival data or abundance estimates. Thus it relies on consistent classification and harvest data alone. While it seems to depict trends accurately compared to field observations, the resulting population estimate for the herd may be high. An independent abundance estimate in the near future would help to align trends for this herd and improve population estimates.

Postseason classification data were collected exclusively from the ground in 2019, and the resulting sample size (N=234) was significantly smaller than in typical years where portions of the herd are surveyed via helicopter. Managers are thus apprehensive about results, particularly the buck ratio. Results for the fawn ratio are likely more realistic. Regardless, fawn production/survival seems to have decreased in both 2018 and 2019. Harvest success also declined in 2019 to 74% - the lowest it has been since 2013. Hunter comments, antler measurements from harvested bucks, and classification data all indicate a decline in mature (class II & III) bucks in the herd (Table 1). This combined with slower population growth, decreased harvest success, and observations of severe winter conditions in 2019-2020 lead managers to prescribe a more conservative harvest for the fall of 2020.

The 2020 season continues to provide hunting opportunity but reduces harvest pressure slightly to compensate for slower population growth. A total of 300 Type 1, Antlered deer licenses are available for the 2020 season, which is a decrease of 50 licenses compared to 2019.

2.) **Management Objective Review:** No review in 2020.

3.) **Additional Surveys:** The North Natrona Mule Deer Herd was a priority area for Chronic Wasting Disease (CWD) testing in 2019. Hunters were solicited for samples via informational letters and increased effort by personnel in the field. A total of 58 harvested mule deer were tested from the herd unit in 2020, with a resulting prevalence of 5.2 percent. Tooth samples and antler measurements were also collected from 53 harvested mule deer in 2019. The average cementum annuli tooth age of those sampled was 4.8 years (5-year average = 4.7), and the average antler spread was 18.12 inches (5-year average = 20.6 inches) (Table 2).

Bio-Year	Total Class N for HA	# Bucks Classified					Buck Ratios per 100 Females					
		Ylng	Class I	Class II	Class III	Total	Ylng	Class I	Class II	Class III	All Adult	Total
2008	1,023	59	111 (73%)	36 (24%)	5 (3%)	211	11	20	7	1	28	39
2009	1,009	51	87 (60%)	44 (31%)	13 (9%)	195	9	16	8	2	26	35
2010	905	47	55 (46%)	44 (37%)	21 (18%)	167	10	12	9	4	25	35
2011	760	52	64 (63%)	34 (33%)	4 (4%)	154	13	16	8	1	25	38
2012	868	36	91 (78%)	20 (17%)	6 (5%)	153	7	18	4	1	23	30
2013	637	28	60 (75%)	19 (24%)	1 (1%)	108	8	18	6	0	23	32
2014	1,033	51	84 (72%)	30 (26%)	2 (2%)	167	12	19	7	1	26	38
2015	1,065	78	93 (80%)	22 (19%)	1 (1%)	194	17	21	5	0	26	43
2016	1,208	68	105 (73%)	36 (25%)	3 (2%)	144	12	18	6	1	26	37
2017	924	57	124 (78%)	34 (21%)	2 (1%)	217	14	31	8	1	40	54
2018	745	56	116 (86%)	17 (13%)	2 (1%)	191	16	32	4	1	38	53
2019	234	11	27 (90%)	3 (10%)	0 (0%)	41	10	23	3	0	26	36

Table 1. Antler classification analysis for the North Natrona Mule Deer Herd Unit, 2008-2019.

	2010	2013	2014	2015	2016	2017	2018	2019
Average Age	4.44	5.4	5.27	5.27	4.85	4.6	4.7	4.8
Median Age	4.5	5.5	4.5	4.5	5.5	4.5	4.5	4.5
Average Antler Spread	21.2	21.2	20	20.9	21.5	20.7	19.9	18.12
Sample Size (N) =	68	52	44	32	40	51	49	53

Table 2. Lab tooth age and antler spread data from Hunt Area 34 harvested deer, 2010-2019.

2014 - 2019 Postseason Classification Summary

for Mule Deer Herd MD759 - NORTH NATRONA

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2014	5,330	51	84	30	2	0	167	16%	441	43%	425	41%	1,033	1,713	12	26	38	± 4	96	± 8	70
2015	3,734	78	93	22	1	0	194	18%	452	42%	419	39%	1,065	1,236	17	26	43	± 4	93	± 7	65
2016	3,291	68	105	36	3	0	212	18%	571	47%	425	35%	1,208	1,336	12	25	37	± 3	74	± 5	54
2017	3,893	57	124	34	2	0	217	23%	402	44%	305	33%	924	1,113	14	40	54	± 5	76	± 6	49
2018	3,825	56	116	17	2	0	191	26%	360	48%	194	26%	745	1,223	16	38	53	± 5	54	± 6	35
2019	3,613	11	27	3	0	0	41	18%	114	49%	79	34%	234	0	10	26	36	± 8	69	± 13	51

2019 - JCR Evaluation Form

SPECIES: White tailed Deer | PERIOD: 6/1/2019 - 5/31/2020

HERD: WD706 - BLACK HILLS

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

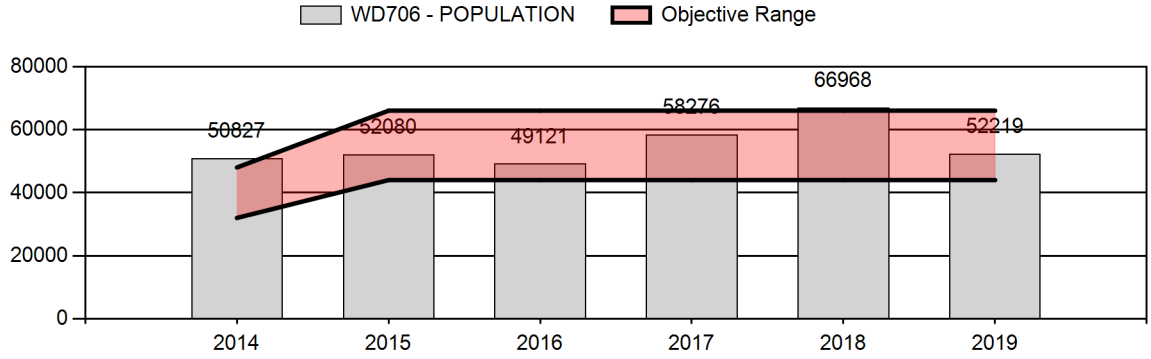
	2014 - 2018 Average	2019	2020 Proposed
Population:	55,454	52,219	56,118
Harvest:	6,122	5,642	5,205
Hunters:	9,057	9,267	8,450
Hunter Success:	68%	61%	62 %
Active Licenses:	9,655	9,743	8,900
Active License Success:	63%	58%	58 %
Recreation Days:	36,158	35,257	32,500
Days Per Animal:	5.9	6.2	6.2
Males per 100 Females	34	27	
Juveniles per 100 Females	74	62	

Population Objective (± 20%) :	55000 (44000 - 66000)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-5.1%
Number of years population has been + or - objective in recent trend:	1
Model Date:	02/18/2020

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

	JCR Year	Proposed
Females ≥ 1 year old:	7.0%	6.6%
Males ≥ 1 year old:	33.3%	27.4%
Total:	10.6%	9.3%
Proposed change in post-season population:	-15.6%	+7.5%

Population Size - Postseason



2020 Hunting Seasons
Black Hills White-Tailed Deer (WD706)

Hunt Area	Type	Archery Dates		Season Dates		Quota	Limitations
		Opens	Closes	Opens	Closes		
1	Gen	Sep. 1	Sep. 30	Nov. 1	Nov. 20		Antlered deer off private land; any deer on private land
1	Gen	Sep. 1	Sep. 30	Nov. 21	Nov. 30		Antlered white-tailed deer off private land; any white-tailed deer on private land
1, 2, 3	7	Sep. 1	Sep. 30	Nov. 1	Nov. 30	3,500	Doe or fawn valid on private land
2	Gen	Sep. 1	Sep. 30	Nov. 1	Nov. 30		Antlered deer off private land; any deer on private land
3	Gen	Sep. 1	Sep. 30	Nov. 1	Nov. 30		Antlered deer off private land; any deer on private land
4	Gen	Sep. 1	Sep. 30	Nov. 1	Nov. 20		Antlered deer off private land; any deer on private land except the lands of the State of Wyoming's Ranch A property shall be closed
4	7	Sep. 1	Sep. 30	Nov. 1	Nov. 20	300	Doe or fawn valid on private land
5	Gen	Sep. 1	Sep. 30	Nov. 1	Nov. 20		Antlered deer off private land; any deer on private land
5	6	Sep. 1	Sep. 30	Nov. 1	Nov. 20	200	Doe or fawn
6	Gen	Sep. 1	Sep. 30	Nov. 1	Nov. 20		Antlered deer off private land; any deer on private land

2020 Region A nonresident quota: 4,000 licenses

2019 Hunter Satisfaction: 72% Satisfied 16% Neutral 12% Dissatisfied

2020 Management Summary

1) **Hunting Season Evaluation:** This herd has shown cyclic population fluctuations since at least

the 1960's due to changes in weather and harvest levels, along with periodic epizootic hemorrhagic disease (EHD) outbreaks. Most recently, following a population low after the 2010-11 winter, this herd grew consistently until peaking about 10% - 15% above objective in 2018. Preseason buck:doe ratios showed a similar trend, peaking in 2018 as well (Appendix 1). Hunting seasons were significantly liberalized in 2015 & 2016 and have remained so since. Following the 2018-19 winter, which was moderately severe and resulted in increased mortality, the population dropped below objective and the buck:doe ratio declined. Consequently, hunter success dropped while effort increased this past year. Population estimates for this herd are thought to be fairly tenuous, but annual shifts produced by the model are quite congruent with changes in pre-season trend counts. Because the buck:doe ratio declined last year and fawn:doe ratios were the lowest observed since 2013, a more conservative hunting season structure was implemented in 2020 to allow this herd to increase towards objective and reduce buck harvest. The changes entailed a reduction of 500 non-resident general licenses and 700 doe/fawn tags available for issuance. While the reduction in Type 7 licenses reduces the potential allowable antlerless take, it will likely not result in significantly reduced harvest based on past license sales history, as this license type is largely under-subscribed. Continued high deer densities in portions of this herd unit continue to warrant significant Type 7 licenses issuance.

2) **Management Objective Review:** Management objectives for this herd were reviewed in bio-year 2019 with no changes made. As such, we will continue to manage for 55,000 white-tailed deer post-season in the Black Hills using a recreational management strategy. This population objective, set in 2014, represented a 38% increase over the former objective, which was in place for over 30 years. The current objective has been retained for the following reasons: 1) area managers and most landowners were comfortable with white-tailed deer numbers in 2017 when this population was estimated to be at objective; 2) many landowners felt there were too many deer in 2018 when it was above objective; and 3) many would now like to see an increase in deer numbers following the recent population decline. Because this white-tailed deer population is very productive and can increase substantially when conditions are favorable, maintaining recreational hunting is justified. This allows area managers to provide ample hunting opportunity and attract more non-resident hunters who play a key role in helping to regulate this population, especially on private lands. Finally, we believe habitat conditions are not a limiting factor in managing this herd towards, or maintaining it at, the current objective.

3) **Chronic Wasting Disease (CWD):** Prior to the 2018 hunting season, just over 2,200 white-tailed deer from the Black Hills had been tested for CWD. The vast majority of those were hunter-harvested deer, of which 0.2% were found to have the disease. In 2018, 126 white-tailed deer harvested by hunters were tested for CWD, with 7 being found positive. All of the infected deer came from the 106 bucks tested. Noteworthy, in 2018, a CWD-positive white-tailed deer was documented for the first time from HA 3. In 2019, due to changes in statewide sampling protocol, only 42 harvested white-tailed deer were tested out of this herd and two (one buck and one doe) found to be infected.

Appendix 1

2014 - 2019 Preseason Classification Summary

White tailed Deer Herd WD706 - BLACK HILLS

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Pre Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2014	55,385	111	198	309	15%	980	47%	778	38%	2,067	1,888	11	20	32	± 0	79	± 0	60
2015	58,681	157	212	369	14%	1,276	47%	1,079	40%	2,724	2,132	12	17	29	± 0	85	± 0	66
2016	56,571	169	224	393	16%	1,216	50%	825	34%	2,434	1,464	14	18	32	± 0	68	± 0	51
2017	65,541	144	321	465	17%	1,331	49%	947	35%	2,743	1,605	11	24	35	± 0	71	± 0	53
2018	74,769	246	429	675	19%	1,721	47%	1,228	34%	3,624	1,641	14	25	39	± 0	71	± 0	51
2019	58,425	50	122	172	14%	643	53%	398	33%	1,213	1,221	8	19	27	± 0	62	± 0	49

2019 - JCR Evaluation Form

SPECIES: White tailed Deer

PERIOD: 6/1/2019 - 5/31/2020

HERD: WD707 - CENTRAL

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

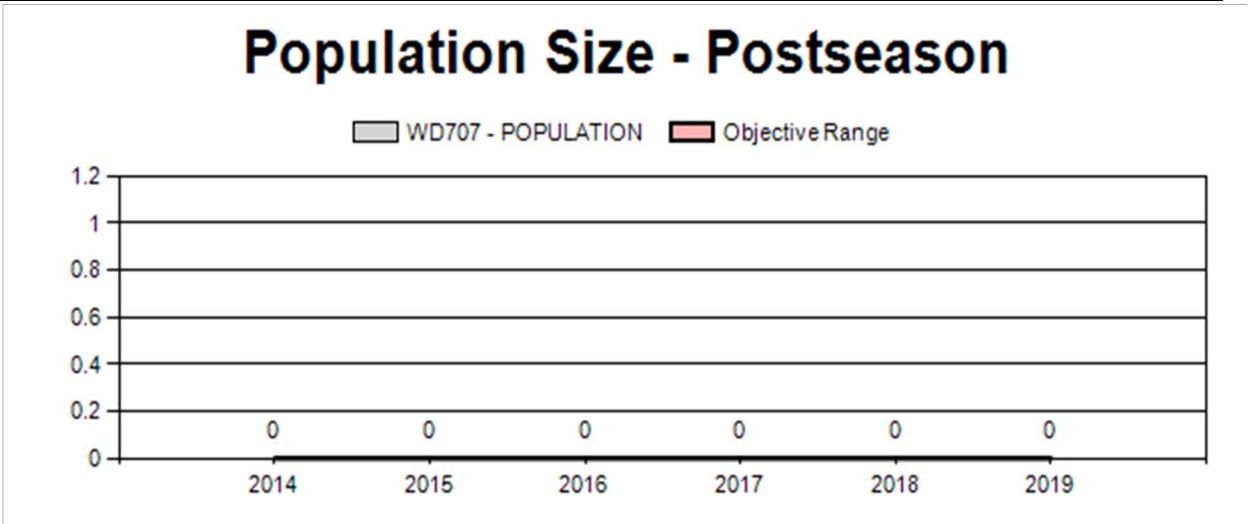
PREPARED BY: MATT HUIZENGA

	2014 - 2018 Average	2019	2020 Proposed
Population:	0	N/A	N/A
Harvest:	959	1,394	1,500
Hunters:	2,063	2,761	2,800
Hunter Success:	46%	50%	54 %
Active Licenses:	2,350	3,146	3,150
Active License Success:	41%	44%	48 %
Recreation Days:	9,007	10,412	11,000
Days Per Animal:	9.4	7.5	7.3
Males per 100 Females	40	25	
Juveniles per 100 Females	75	71	

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

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

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



2020 HUNTING SEASONS
Central White-Tailed Deer Herd Unit (WD707)

Hunt Area	Hunt Type	Archery Dates Opens	Archery Dates Closes	Season Dates Opens	Season Dates Closes	Quota	Limitations
10	3	Sep. 1	Sep. 30	Oct. 1	Nov. 30	35	Any white-tailed deer
10	8	Sep. 1	Sep. 30	Oct. 1	Nov. 30	35	Doe or fawn white-tailed deer
11	Gen	Sep. 1	Sep. 30	Oct. 16	Nov. 30		Any white-tailed deer
11,12, 13,14	3	Sep. 1	Sep. 30	Oct. 1	Nov. 30	300	Any white-tailed deer
11,12, 13,14	8	Sep. 1	Sep. 30	Oct. 1	Nov. 30	300	Doe or fawn white-tailed deer
12	Gen	Sep. 1	Sep. 30	Oct. 16	Nov. 30		Any white-tailed deer
13	Gen	Sep. 1	Sep. 30	Oct. 16	Nov. 30		Any white-tailed deer
14	Gen	Sep. 1	Sep. 30	Oct. 16	Nov. 30		Any white-tailed deer
21	8	Sep. 1	Sep. 30	Oct. 1	Oct. 31	50	Doe or fawn white-tailed deer valid on private land.
22	3	Sep. 1	Sep. 30	Oct. 1	Nov. 30	100	Any white-tailed deer
22	8	Sep. 1	Sep. 30	Oct. 1	Nov. 30	100	Doe or fawn white-tailed deer
34	3	Sep. 1	Sep. 30	Oct. 15	Nov. 30	50	Any white-tailed deer
65	3	Sep. 1	Sep. 30	Oct. 15	Nov. 30	400	Any white-tailed deer, also valid in that portion of Area 66 in Converse County
65	8	Sep. 1	Sep. 30	Oct. 15	Nov. 30	500	Doe or fawn white-tailed deer, also valid in that portion of Area 66 in Converse County
66,88, 89	3	Sep. 1	Sep. 30	Oct. 15	Nov. 30	150	Any white-tailed deer
66,88, 89	8			Aug. 15	Oct. 14	150	Doe or fawn white-tailed deer valid in Area 88
66,88, 89	8	Sep. 1	Sep. 30	Oct. 15	Nov. 30		Doe or fawn white-tailed deer

Note: The above season limitations are restricted to only those lines in the Chapter 6 Regulation that directly affect white-tailed deer hunting. Additional general and limited quota seasons occur in hunt areas 7-14, 21, 34, 65-66, 88, and 89 but are not captured here.

2019 Hunter Satisfaction: 66% Satisfied, 20% Neutral, 14% Dissatisfied

2020 Management Summary

1) **Hunting Season Evaluation:** The 2020 season structure was liberal to allow for high hunter opportunity within the recreational management strategy. White-tailed deer numbers have grown from a low in 2013. White-tailed deer harvest has increased each year since 2014. Buck ratios in 2019 (25 bucks:100 does) were over minimum objective (≥ 20 bucks:100 does postseason). An additional 100 Type 8 licenses were issued in Hunt Area 65 to address high populations and private land damage concerns. Hunt Area 88 Type 8 licenses were added to the grouped Hunt Area 66, 88, & 89 from Aug. 15 to Oct. 14 to allow for increased access to deer as they move between areas. Total licenses issued for Hunt Areas 66, 88, & 89 were decreased by 50.

2) Population data is not collected on this herd unit.

3) All limited quota white-tailed deer licenses for the Central White-Tailed Deer Herd Unit sold out in 2019.

4) Populations in Hunt Area 65 could support more license issuance, however access is limited.

Central White-Tailed Deer - WD 707

2014 - 2019 Postseason Classification Summary

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2014	0	11	24	35	16%	100	47%	80	37%	215	0	11	24	35	± 0	80	± 0	59
2015	0	48	59	107	20%	223	42%	196	37%	526	0	22	26	48	± 0	88	± 0	59
2016	0	78	127	205	16%	635	50%	436	34%	1,276	0	12	20	32	± 0	69	± 0	52
2017	0	69	114	183	21%	404	45%	301	34%	888	0	17	28	45	± 0	75	± 0	51
2018	0	90	161	251	19%	601	46%	456	35%	1,308	0	15	27	42	± 0	76	± 0	54
2019	0	41	65	106	13%	420	51%	299	36%	825	0	10	15	25	± 0	71	± 0	57

2019 - JCR Evaluation Form

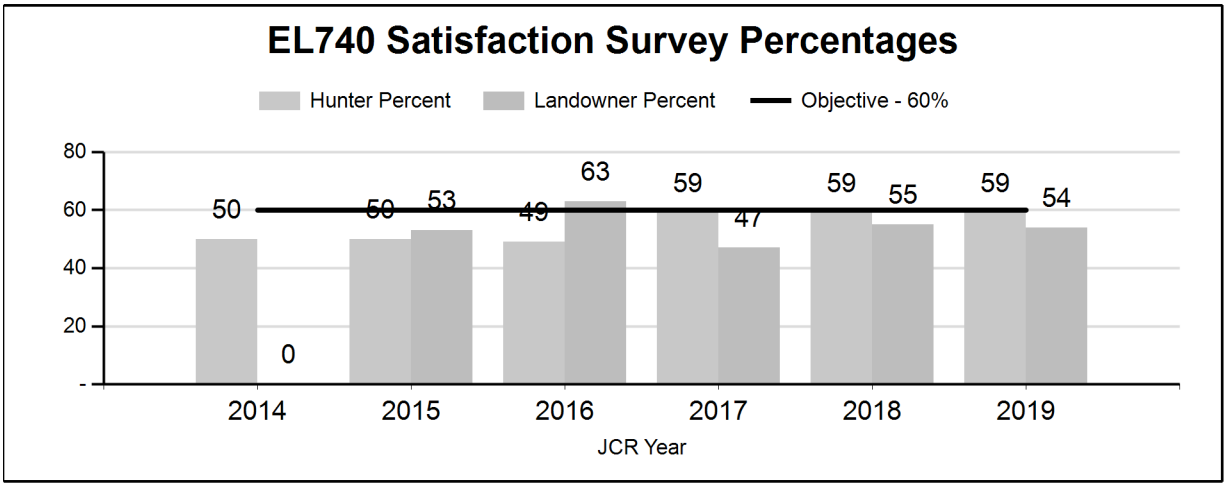
SPECIES: Elk
HERD: EL740 - BLACK HILLS
HUNT AREAS: 1, 116-117

PERIOD: 6/1/2019 - 5/31/2020

PREPARED BY: JOE SANDRINI

	2014 - 2018 Average	2019	2020 Proposed
Hunter Satisfaction Percent	53%	59%	60%
Landowner Satisfaction Percent	55%	54%	60%
Harvest:	593	714	760
Hunters:	1,777	1,848	1,900
Hunter Success:	33%	39%	40 %
Active Licenses:	1,871	1,899	2,150
Active License Success:	32%	38%	35 %
Recreation Days:	17,874	16,265	17,500
Days Per Animal:	30.1	22.8	23.0
Males per 100 Females:	47	0	
Juveniles per 100 Females	44	0	

Satisfaction Based Objective	60%
Management Strategy:	Private Land
Percent population is above (+) or (-) objective:	-4%
Number of years population has been + or - objective in recent trend:	5



2020 Hunting Seasons
Black Hills Elk (EL740)

Hunt Area	Type	Archery Dates Opens	Archery Dates Closes	Season Dates Opens	Season Dates Closes	Quota	Limitations
1	1	Sep. 1	Sep. 30	Oct. 15	Nov. 30	100	Any elk
1	4	Sep. 1	Sep. 30	Oct. 15	Nov. 30	75	Antlerless elk
116	Gen	Sep. 1	Sep. 30	Oct. 15	Nov. 10		Any elk
116	Gen	Sep. 1	Sep. 30	Nov. 11	Nov. 30		Antlerless elk
116	1	Sep. 1	Sep. 30	Nov. 11	Dec. 31	100	Any elk valid off national forest
116	7			Aug. 15	Jan 31	300	Cow or calf valid off national forest
117	1	Sep. 1	Sep. 30	Oct. 15	Nov. 30	350	Any elk
117	1	Sep. 1	Sep. 30	Dec. 1	Jan. 31		Antlerless elk
117	2	Sep. 1	Sep. 30	Oct. 15	Jan. 31	50	Spike elk or antlerless elk
117	4	Sep. 1	Sep. 30	Oct. 15	Jan. 31	200	Antlerless elk
117	7			Aug. 15	Jan. 31	400	Cow or calf valid off national forest; also valid on Thunder Basin National Grasslands

2019 Hunter Satisfaction: 58% Satisfied, 22% Neutral, 20% Dissatisfied

2019 Landowner Satisfaction[1] Surveyed: 43% Satisfied 25% Neutral 29% Dissatisfied

2019 Landowner Satisfaction[2] JCR: 24% Below 54% At 23% Above

[1] These figures are from landowner survey asking specifically about satisfaction in the same manner as the hunter harvest survey.
[2] When asked if elk numbers are below, at, or above desired level.

2020 Management Summary

1) **Hunting Season Evaluation:** Two changes were made to the hunting season structure in 2020:

   - The creation of 100 late season Type 1 licenses valid in Hunt Area (HA) 116 to address the desire of a few landowners to increase bull hunting opportunity when elk are available for harvest on their property and causing damage.

   - The allowance of HA 117 Type 7 licenses to be used on Thunder Basin National Grasslands, where elk occasionally reside in late fall and early winter.

   With the changes implemented, the 2020 harvest should result in about 760 total elk being taken (310 bulls, 385 cows, & 50 calves). The overall harvest strategy being aimed at removing as many elk as possible given very restricted private land access and resultant license saturation in HA 117. Also considered was the need to preserve hunt quality in HA 1, as licenses valid there are highly sought-after due the fact the area is comprised of 97% accessible public land, while very few elk are ever harvested on accessible public land in HA 116. Based upon an estimated preseason herd composition of 47:100:40 (calf:cow:bull) and a recruitment rate of 44 yearling elk per 100 cows (based on historical, harvest tooth age data), taking 695 adult elk would remove the annual yearling recruitment from a preseason herd of about 3,000 head (all age and sex classes).

2) **Management Notes:** In addition to being managed for landowner and hunter satisfaction, this herd has a secondary management objective that seeks an annual bull harvest comprised of 20% aged ≤ 2 years old; 60% aged 3 to 5 years old; and 20% aged 6 years old, or older *(± 5% in all categories).* Tooth age data were not collected in 2019. However, the average harvest percentages of these age classes over the three years prior were 12%, 68%, and 21%, respectively.

   Since 2016, each January a pre-paid return mail survey has been sent to about 160 Black Hills landowners. Subtracting for undelivered surveys, the response rate has declined steadily from 53% to 46% this year. Responses are summarized in Appendix 1. Landowner satisfaction and the reasons for satisfaction are not strictly tied to perceptions of elk numbers. Therefore, they cannot be directly compared to hunter satisfaction measures, because quantifying criterion for each group are different. Consequently, using reports of "at," "above," and "below" desired levels as satisfaction measures is really quite inappropriate. These statements are not measures of satisfaction per se, and while they may be associated to some degree with satisfaction, they are simply subjective indications of perceived elk numbers relative to personal desire. Because of this, both types of "landowner satisfaction" measures are listed above.

   In 2016 and 2020, WGFD partially funded South Dakota Game Fish & Parks (SDGF&P) helicopter-based, late winter elk sightability survey. This funding was used to pay for SDGF&P to survey a significant portion of occupied habitat south of Interstate Highway 90 within HA's 1 & 117. In 2016, 31 subunits were surveyed and a total of 923 elk observed; yielding a sightability estimate of 1,091 elk within the survey area. The 95% confidence limits of that estimate were 988 and 1,521. In 2020, 42 subunits were flown and 1,519 elk found. This effort yielded a sightability estimate of 1,687 elk with 95% confidence limits of 1,584 and 2,118. Directly comparing the 31 subunits flown in both 2016 and 2020 revealed a 36% increase in the

estimated number of elk present in that sub-area. See Appendix 2 for sightability subunit map.

Elk have not regularly been classified post-season in this herd unit due to limited access to private land, the average group sizes present, and canopy cover that hampers observation. However, long-term preseason classification efforts by SDGF&P and occasional classifications by WGFD personnel suggest preseason calf:cow ratios are very consistent around 47:100. Observations of post-season bull:cow ratios have been generally sporadic in Wyoming, but generally close to 45:100. As such, we have normally assumed the preseason calf:cow:bull ratio in this herd to be 47:100:40 given cow harvest has exceeded bull harvest for the last 10 years.

3) **Chronic Wasting Disease (CWD):** Prior to 2019, about 150 elk from the Black Hills had been tested for CWD. The vast majority of these elk were harvested by hunters in HA 117, of which one was found to have the disease. That elk was taken in 2018 when 42 hunter harvested elk were tested (all from HA 117). Previous to 2014, the only other CWD-positive elk found in the Black Hills was a single targeted surveillance elk out of HA 117. In 2019, due to changes in testing protocol around the state, only 4 harvested elk were tested out of this herd (all from HA 117), and none found to be infected.

Appendix 1

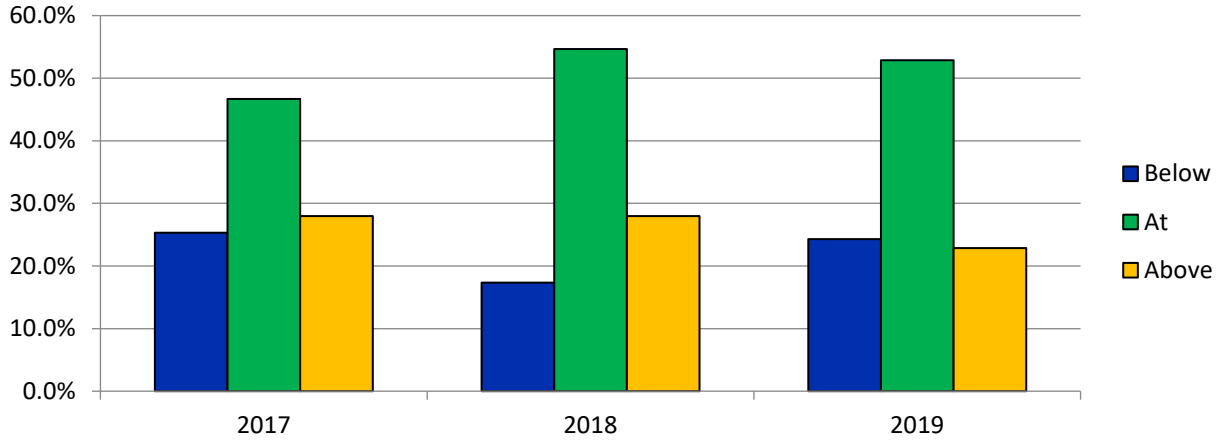


Figure 1. Proportions of landowners reporting perceptions of elk numbers relative to "desired level."

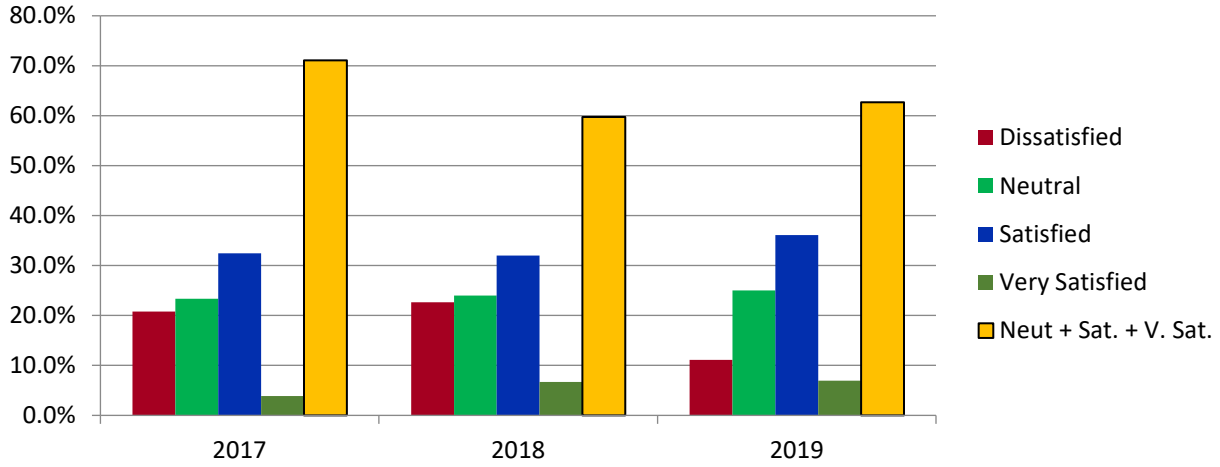


Figure 2. Percentages of landowners reporting various satisfaction levels with elk numbers.

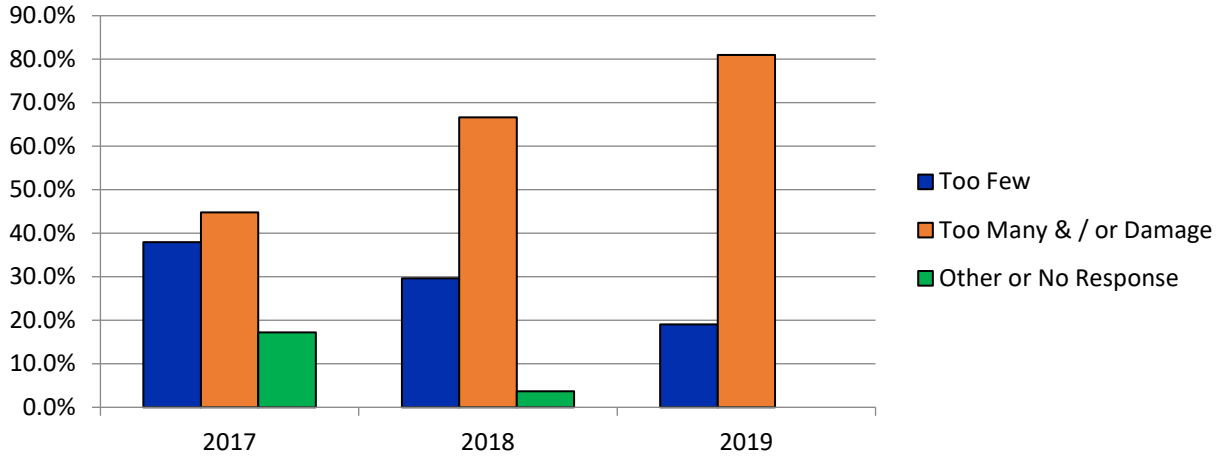
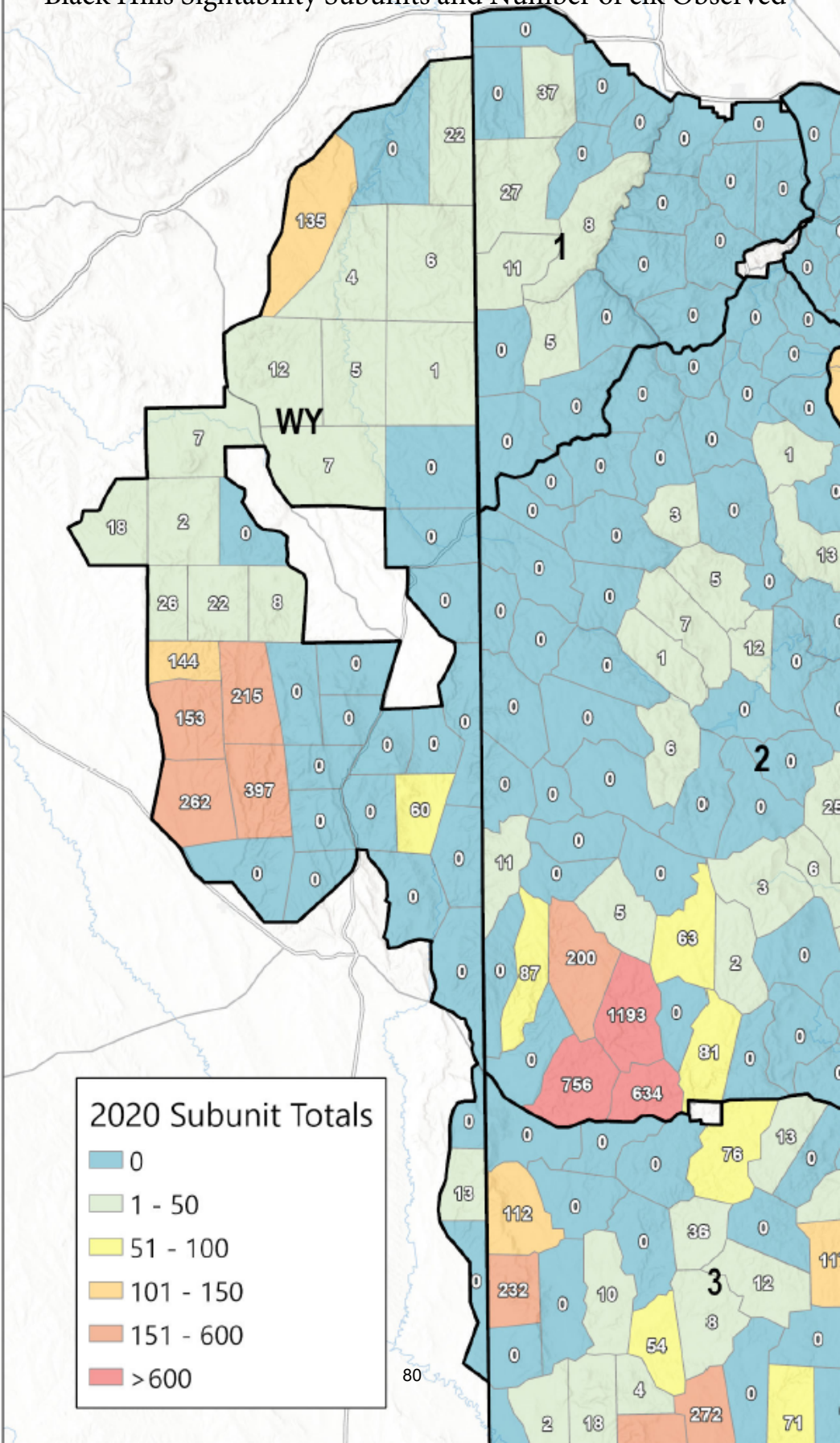


Figure 3. Reason(s) for dissatisfaction with elk numbers.

Appendix 2

Black Hills Sightability Subunits and Number of elk Observed



2019 - JCR Evaluation Form

SPECIES: Elk

PERIOD: 6/1/2019 - 5/31/2020

HERD: EL741 - LARAMIE PEAK/MUDDY MOUNTAIN

HUNT AREAS: 7, 19

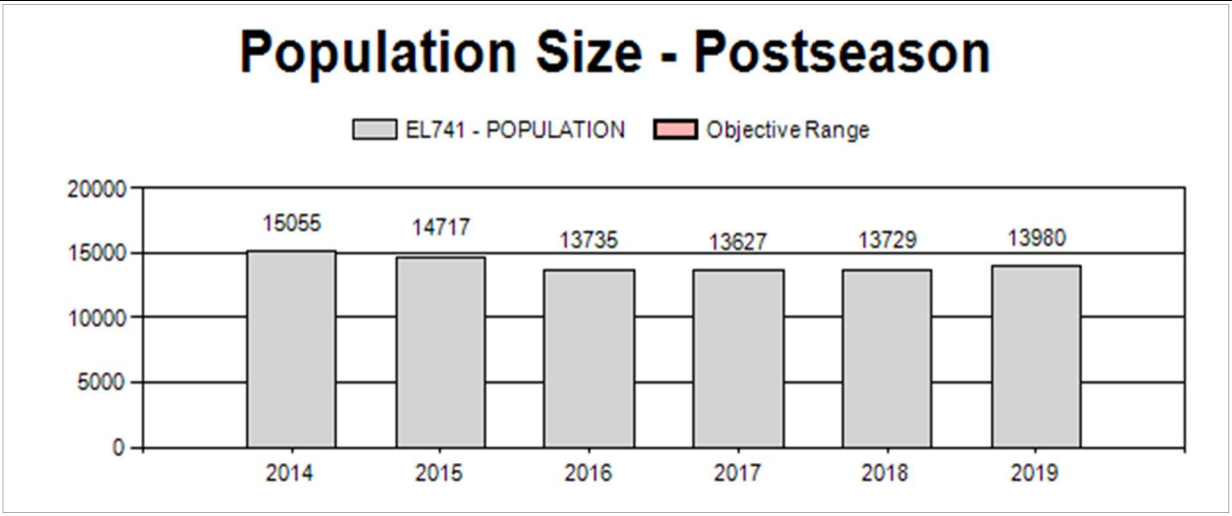
PREPARED BY: MATT HUIZENGA

	2014 - 2018 Average	2019	2020 Proposed
Population:	14,173	13,980	13,608
Harvest:	2,473	1,893	2,500
Hunters:	4,862	4,402	4,600
Hunter Success:	51%	43%	54%
Active Licenses:	4,964	4,487	4,950
Active License Success:	50%	42%	51%
Recreation Days:	35,947	30,255	36,000
Days Per Animal:	14.5	16.0	14.4
Males per 100 Females	37	27	
Juveniles per 100 Females	38	40	

Population Objective (± 20%) :	5000 (4000 - 6000)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	180%
Number of years population has been + or - objective in recent trend:	19
Model Date:	3/11/2020

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

	JCR Year	Proposed
Females ≥ 1 year old:	12.5%	15.7%
Males ≥ 1 year old:	19.3%	20.9%
Total:	31.8%	36.6%
Proposed change in post-season population:	-13.5%	-18.4%



2020 HUNTING SEASONS
Laramie Peak/Muddy Mountain Herd Unit (EL741)

Hunt Area	Hunt Type	Archery Dates Opens	Archery Dates Closes	Season Dates Opens	Season Dates Closes	Quota	Limitations
7	1	Sep. 1	Sep. 30	Oct. 15	Nov. 20	1500	Any elk
7	1			Nov. 21	Dec. 31		Antlerless elk
7	4			Aug. 15	Oct. 14	1200	Antlerless elk valid on private land; valid in all of Platte County
7	4	Sep. 1	Sep. 30	Oct. 15	Dec. 31		Antlerless elk valid in the entire area
7	6			Aug. 15	Oct. 14	2250	Cow or calf valid on private land; valid in all of Platte County
7	6	Sep. 1	Sep. 30	Oct. 15	Dec. 31		Cow or calf valid in the entire area
7	7	Sep. 1	Sep. 30	Jan. 1	Jan. 31	50	Cow or calf
19	1	Sep. 1	Sep. 30	Oct. 1	Oct. 14	150	Any elk
19	1			Nov. 21	Jan. 31		Antlerless elk
19	2	Sep. 1	Sep. 30	Nov. 1	Nov. 20	150	Any elk
19	2			Nov. 21	Jan. 31		Antlerless elk
19	4	Sep. 1	Sep. 30	Oct. 1	Oct. 14	125	Antlerless elk
19	4			Nov. 21	Jan. 31		Antlerless elk
19	5	Sep. 1	Sep. 30	Nov. 1	Jan. 31	125	Antlerless elk
19	6	Sep. 1	Sep. 30	Oct. 1	Oct. 14	225	Cow or calf
19	6			Nov. 1	Jan. 31		Cow or calf

2019 Hunter Satisfaction: 65% Satisfied, 18% Neutral, 17% Dissatisfied

2020 Management Summary

1) **Hunting Season Evaluation**: The 2020 season structure continued to be liberal in an effort to maximize harvest to reduce this population toward objective. Elk numbers in this herd unit continue to remain far above objective despite very liberal license issuance and long season length. For the 2020 season, license numbers were maintained where they have been for the past seven years due to concerns of public land saturation. Type 4 licenses in Hunt Area 7 were amended to match the Type 6 licenses, and will open Aug. 15th in Platte County and private land in Albany and Converse counties to help address early damage issues and increase cow harvest.

2) **Chronic Wasting Disease Management:** The 2019 CWD prevalence was 2% (n=84) for hunter harvested adult male and female elk. There were no CWD management

actions taken in the Laramie Peak/Muddy Mountain herd unit in 2019. The Laramie Peak/Muddy Mountain herd unit was targeted for intensive surveillance in 2018 and will be targeted again in 2022. This herd unit has had good sample sizes (avg. of 114) for the past six years. From 2014-2019, a total of 688 elk were tested, with 43 being positive for CWD for a prevalence of 6%.

3) The last abundance estimate was completed in 2018 with a sightability survey of the Laramie Peak/Muddy Mountain herd unit. The sightability survey estimated a total of 11,182 elk. This gave managers a much more accurate population estimate which increased confidence in model estimates going forward.

4) Heavy early snow storms starting October 23 greatly restricted access to much of the higher elevation areas and public lands in the Laramie Peak/Muddy Mountain herd unit throughout the 2019 hunting season. These snows pushed a lot of elk down to the lower elevations and private land sooner than normal, and also rendered access to public lands difficult or impossible for much of the season. Cow harvest and total elk harvest was the lowest it has been within this herd unit since 2006, when only 3,650 total licenses were issued (compared to the current issuance of 5,775).

5) No flight time was allocated to the Laramie Peak/Muddy Mountain herd unit in 2019. All classifications were done by ground (n=1,887).

6) In 2019, managers collected antler class data (n=108) from hunter harvested bull elk. Class II (>=6 points, heavy 5x5) bulls made up 81% of the sample.

7) Antler classification data has been collected since 2008 during postseason classification surveys. Class II bulls are showing a downward trend while Class I bulls are showing an increase.

8) Based on the observations stemming from the sightability survey, classification and harvest data, and input from hunters and landowners, bull quality (in terms of antler size of mature bulls) is declining despite a very high bull ratio. Avenues were explored to increase bull harvest to reduce bull ratios and promote increased bull quality. In addition, the sightability survey confirmed higher bull numbers occur in Converse County later in the season. The Type 1 license has remained at 1,500 licenses issued per year since 2014. Each year since 2014, an average of 638 Type 1 licenses have been unused. A change to extend the Type 1 any elk season in Converse County was proposed, but not put into effect this year based on the cancellation of public meetings and lack of overall support.

9) This herd unit will remain well above objective for the foreseeable future. Access for female harvest will need to significantly increase throughout the entire herd unit before harvest will effectively reduce the population.

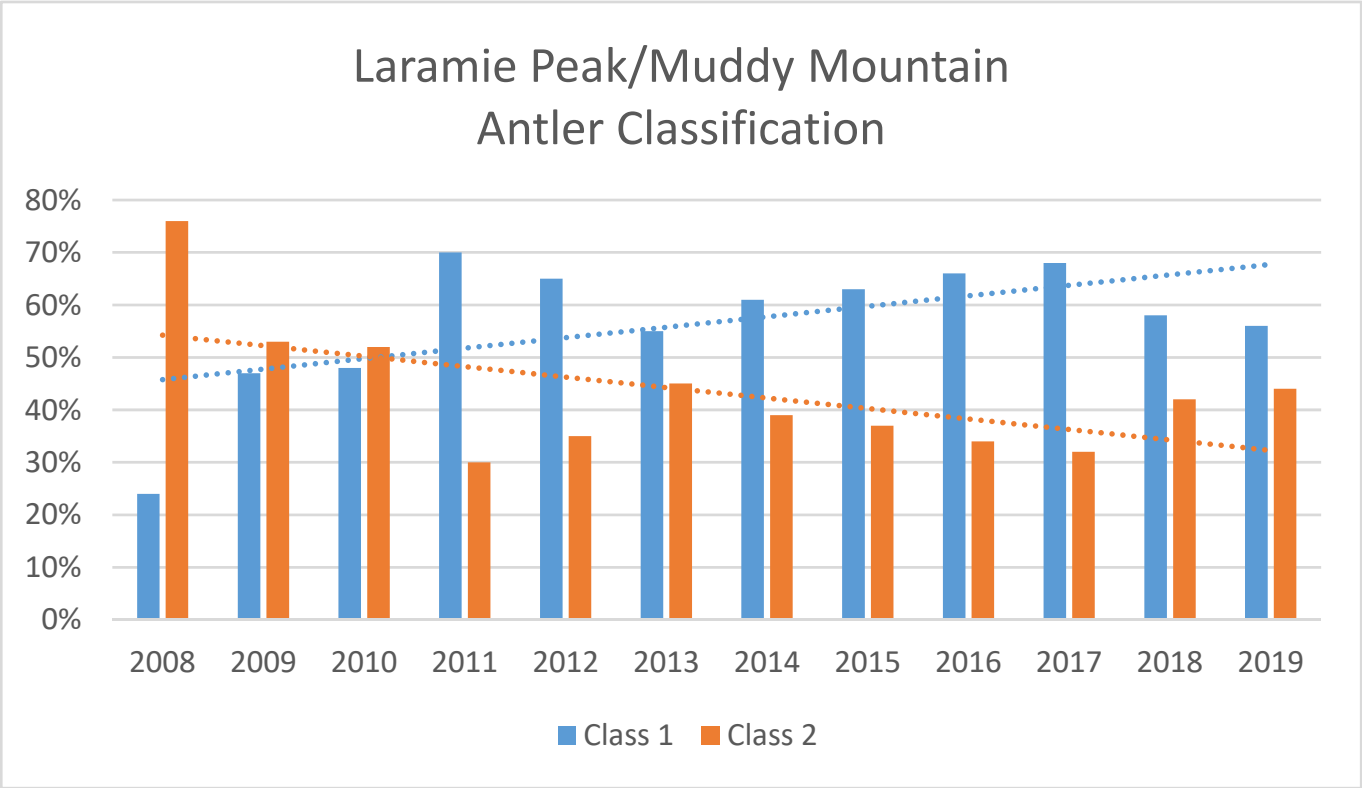
Appendix 1

Laramie Peak/Muddy Mountain Elk - EL 741 2014 - 2019

Postseason Classification Summary

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2014	15,055	383	468	851	15%	3,454	62%	1,270	23%	5,575	592	11	14	25	± 1	37	± 1	30
2015	14,717	404	485	889	18%	2,882	59%	1,116	23%	4,887	504	14	17	31	± 1	39	± 1	30
2016	13,735	383	581	964	21%	2,803	61%	806	18%	4,573	495	14	21	34	± 1	29	± 1	21
2017	13,627	211	339	550	19%	1,645	57%	674	23%	2,869	499	13	21	33	± 2	41	± 2	31
2018	13,729	853	1,630	2,483	27%	4,855	52%	2,021	22%	9,359	602	18	34	51	± 1	42	± 1	28
2019	13,980	120	188	308	16%	1,125	60%	454	24%	1,887	888	11	17	27	± 2	40	± 3	32

Appendix 2


Laramie Peak/Muddy Mountain
Antler Classification
80%
70%
60%
50%
40%
30%
20%
10%
0%
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Class 1
Class 2

2019 - JCR Evaluation Form

SPECIES: Elk

PERIOD: 6/1/2019 - 5/31/2020

HERD: EL742 - RATTLESNAKE

HUNT AREAS: 23

PREPARED BY: HEATHER O'BRIEN

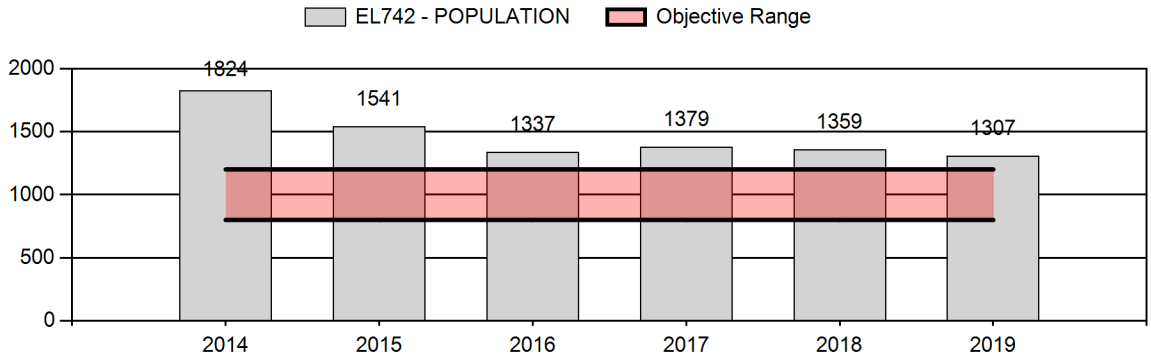
	2014 - 2018 Average	2019	2020 Proposed
Population:	1,488	1,307	1,298
Harvest:	194	152	174
Hunters:	399	391	395
Hunter Success:	49%	39%	44%
Active Licenses:	427	425	430
Active License Success:	45%	36%	40%
Recreation Days:	3,575	3,628	3,650
Days Per Animal:	18.4	23.9	21.0
Males per 100 Females	42	47	
Juveniles per 100 Females	34	26	

Population Objective (± 20%) :	1000 (800 - 1200)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	31%
Number of years population has been + or - objective in recent trend:	28
Model Date:	05/05/2020

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

	JCR Year	Proposed
Females ≥ 1 year old:	8.6%	9.6%
Males ≥ 1 year old:	16.7%	22.4%
Total:	10.8%	11.6%
Proposed change in post-season population:	-3.8%	-.01%

Population Size - Postseason



2020 HUNTING SEASONS
RATTLESNAKE ELK HERD (EL742)

Hunt Area	Type	Archery Dates		Season Dates		Quota	Limitations
		Opens	Closes	Opens	Closes		
23	1	Sep. 1	Sep. 30	Oct. 1	Oct. 31	150	Any elk
				Nov. 15	Dec. 15		Any elk
	4	Sep. 1	Sep. 30	Oct. 1	Oct. 31	125	Antlerless elk
				Nov. 15	Dec. 15		Antlerless elk
	6	Sep. 1	Sep. 30	Oct. 1	Oct. 31	200	Cow or calf
				Nov. 15	Dec. 15		Cow or calf
	7	Sep. 1	Sep. 30	Nov. 15	Dec. 15	50	Cow or calf

2019 Hunter Satisfaction: 50% Satisfied, 33% Neutral, 17% Dissatisfied

2020 Management Summary:

1.) **Hunting Season Evaluation:** The model for this herd does not appear to depict trends or estimate population size accurately. Small herd size, disparate harvest of males versus females, skewed classification data, and an open population make accurate modeling of this herd difficult. The addition of an abundance estimate for the 2019 bio-year was used to better align the model. It should be noted that some elk may have migrated into adjacent herd units at the time of the survey, though none were observed during flights. Classification data collected during the same survey provided a bull ratio that is likely the most accurate in the history of the herd. Using this data and stratifying survey effort in the future should provide more consistent and accurate classification data for this herd and gradually improve model accuracy.

The 2020 season structure was maintained as it has been for the last several years, with the goal of maximizing cow harvest in an over-objective herd with constrained public access. Harvest success on Type 1 licenses tends to be good from year to year, in the 60th percentile. However, harvest on females is consistently poor due to large numbers of cows and calves taking refuge on one property that allows no hunting access. Harvest success on antlerless and cow/calf licenses remains consistently in the 20th percentile as a result. Additional licenses in the unit would likely reduce harvest success and satisfaction due to hunter

crowding on accessible lands. With no additional access to improve harvest success on females, this herd will likely continue to grow and disperse into adjacent areas. Field managers will continue working with landowners in the herd with the goal of improving access and increasing harvest on females.

2.) **Management Objective Review:** No review in 2020.

3.) **Additional Surveys:** A sightability survey was conducted for this herd unit using a Bell Jet Ranger flown by Helicopter Solutions MT, Inc. in January 2020 (Appendix A). The survey was completed in 37 hours, and classification data were collected along with sightability data. An abundance estimate of 1304 elk (95% CI =1,281-1,327) (SE=12) was derived from the data analysis in the PopR program. This estimate was incorporated into the Rattlesnake Elk population model.

2014 - 2019 Postseason Classification Summary

for Elk Herd EL742 - RATTLESNAKE

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2014	1,824	35	113	148	54%	82	30%	46	17%	276	406	43	138	180	± 29	56	± 12	20
2015	1,541	10	86	96	57%	48	29%	23	14%	167	390	21	179	200	± 43	48	± 15	16
2016	1,337	53	77	130	18%	478	66%	114	16%	722	395	11	16	27	± 2	24	± 2	19
2017	1,379	23	71	94	19%	295	58%	116	23%	505	375	8	24	32	± 4	39	± 4	30
2018	1,359	131	107	238	18%	776	60%	274	21%	1,288	441	17	14	31	± 1	35	± 1	27
2019	1,307	66	216	282	27%	603	58%	155	15%	1,040	428	11	36	47	± 2	26	± 1	18

APPENDIX A

Rattlesnake Elk
Sightability Survey 2020 Summary

Heather O'Brien – Casper Wildlife Biologist

INTRODUCTION

The Rattlesnake Elk Herd Unit (EL742) is located west of Casper and is solely comprised of Hunt Area 23 (Figure 1). The herd unit encompasses approximately 1,264 square miles. State and federal lands constitute 51% of the area, with the remainder being privately owned. The availability of public land and the proximity of Hunt Area 23 to Casper make it a popular unit among resident elk hunters. However, one large private land holding in the Snyder Basin area has provided refuge for the majority of elk in this herd unit since the early 1990's. In addition, cabin sites have been developed west of Garfield Peak which also limit public hunting access. Despite the availability of public land east of Garfield Peak, landownership in the western Rattlesnake Hills makes hunter access challenging due to elk distribution, which has resulted in only moderate hunter harvest and success. The Rattlesnake Mountain Hunter Management Area was established in 2000 and has improved hunter access to some degree, but has not significantly increased female elk harvest given typical elk distribution.

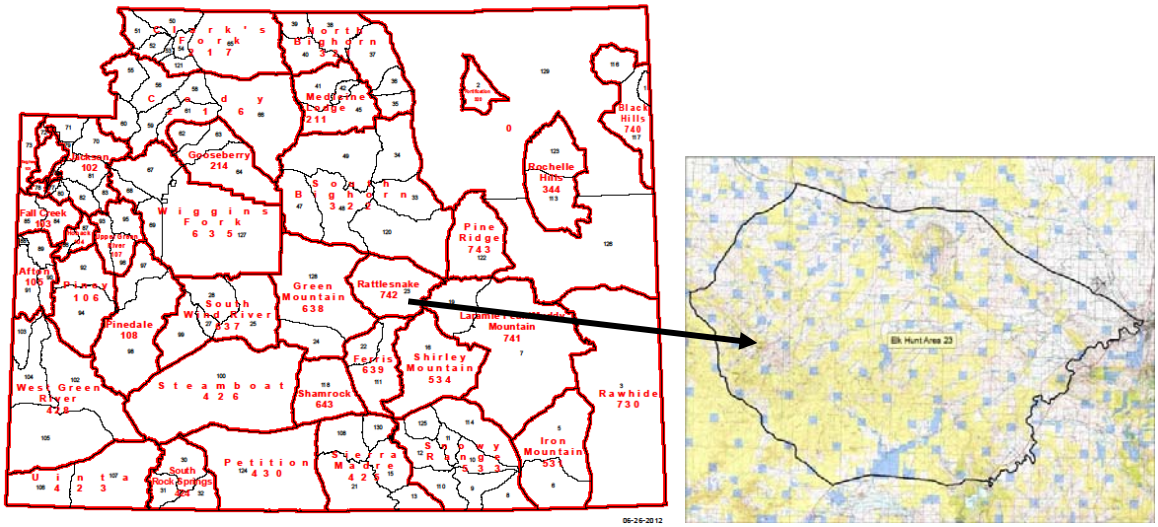


Figure 1. Map of elk hunt areas in Wyoming for 2019, with Rattlesnake Herd Unit highlighted.

Population modeling of the Rattlesnake Elk Herd is difficult using only classification and harvest data. In typical years, classification surveys are conducted on a limited budget. Thus, directed surveys are used to cover a limited portion of the herd unit. While adequate sample size is typically

exceeded during directed surveys for the herd, observed sex ratios tend to fluctuate annually as a function of flight budget and effort. Small groups of bulls in timbered habitats are likely to be under-represented in classification totals, while large cow/calf groups in open habitats are more conspicuous. Inconsistencies within these data result in inaccurate population estimates within the model. Managers thus sought a means to collect more accurate population data and initiated a sightability survey within the Rattlesnake Elk Herd Unit. An intensive abundance survey of the herd unit would help align the model with a stand-alone population estimate and would provide more accurate classification data. Resulting data would in turn inform future survey effort, using stratified random sampling of subunits to be efficient with limited flight budgets.

METHODS

In 2019 & 2020, a sightability survey was designed and conducted within the Rattlesnake Elk Herd Unit. Defined management goals were to analyze survey data as a stand-alone abundance estimate, to classify observed elk by sex and age, and to combine results with existing classification and harvest data to further improve the population model.

To initiate study design, a mapping exercise was conducted among field managers to divide the herd unit into manageable subunits. Objectives for each subunit were to use boundaries that were visible from the helicopter when possible such as roads, drainages, and divides. Each subunit was drawn with the intention of being flown in approximately one hour, following flight speed and line spacing guidelines for sightability surveys (Unsworth et. al, 1994). Local field managers collaborated to discuss and draw subunit boundaries on a large aerial photo map of the herd unit prior to digitizing using ArcMap (ESRI, 2011) (Figure 2). Each subunit was assigned a unique number for the purpose of recording and tracking data during aerial surveys, and for comparison between this and future surveys.

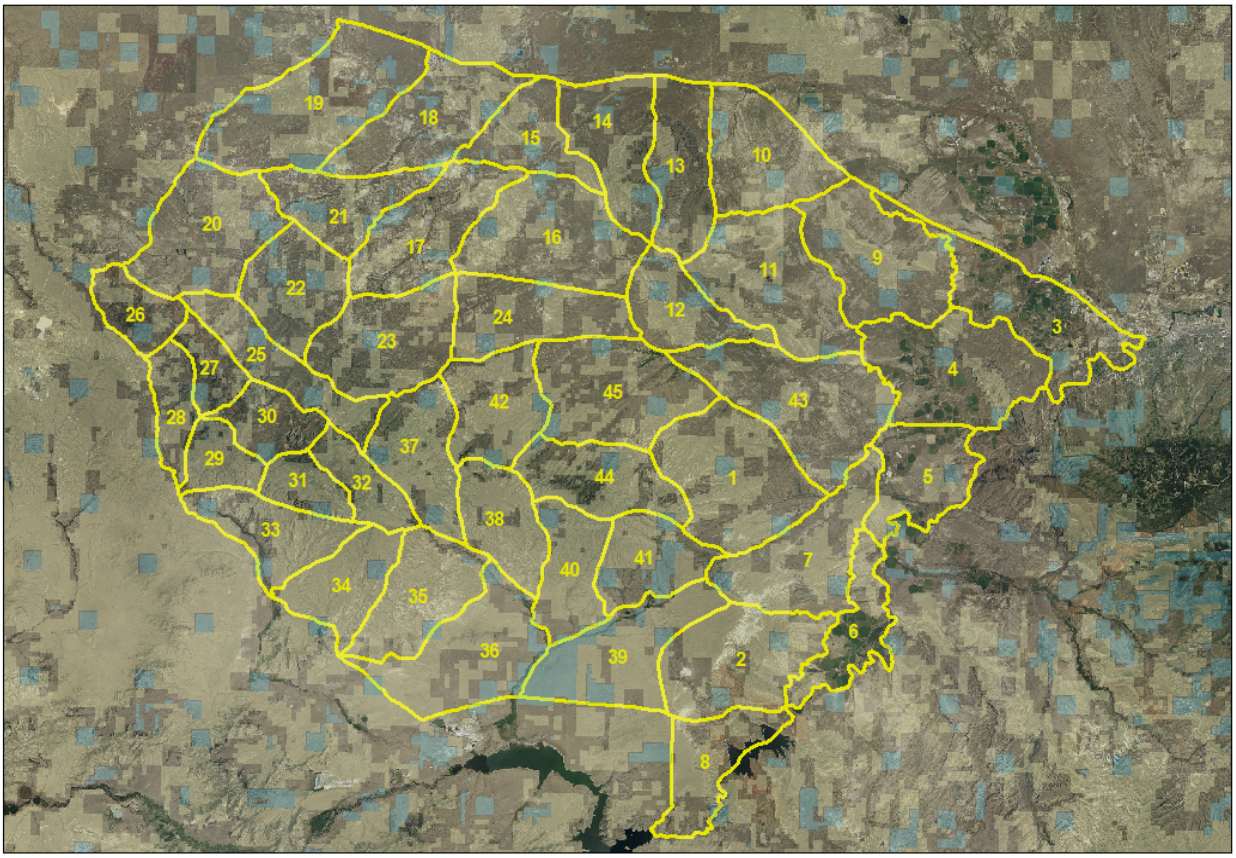


Figure 2. Subunits for the Rattlesnake Elk Herd Unit sightability survey, January 2020.

Prior to initiating flights, all potential observers were trained in proper data collection following the protocol for WGFD sightability surveys and safety standards outlined by WGFD flight policy (Wyoming Game and Fish Department, 2017; Wyoming Game and Fish Department, 2011). PowerPoint training presentations are available within the Department for both sightability surveys and approved flight policy. Flights were conducted from 13 through 20 January 2020 on days when weather conditions were suitable for flights. All surveys were flown in a Bell Jet Ranger piloted by Kent Potter of Helicopter Solutions MT, Inc. from Laurel, Montana. Two observers were aboard every survey flight, and pilot observations were also included during data collection. The back-seat observer was positioned to view out the opposite side of the helicopter compared to the front-seat observer to maximize the area observed per transect line. Observers were replaced mid-day whenever possible to avoid eye fatigue and maximize survey performance. In cases where observers could not be swapped, 30-45 minute breaks were taken approximately every three hours during helicopter refueling to provide some rest for all-day observers.

Winter habitat conditions during flights were considered average to mild in terms of snow accumulation and daily temperatures. Higher elevation portions of the herd unit had more complete snow cover, while lower elevations were more open or broken in terms of snow cover. Wind conditions were severe enough on several days within the survey period to cancel flights.

Managers either cancelled flights on days with high winds or surveyed subunits in the herd where conditions were more favorable and scheduled the remaining subunits later.

Data collection was performed by the back-seat observer for all surveys using a hand-held GPS and standardized data sheet for sightability surveys (Attachment A). Location, number of individual elk in a group, activity of animals upon first sighting, percent snow cover, percent vegetative cover, and vegetative type were recorded for every survey observation. Observed elk were totaled and classified as cows, calves, yearling males, class I mature bulls, and class II mature bulls. Class I bulls are defined as being five points or less on one antler, while class II bulls are 6 points or more on one antler. Large groups of elk (100+) were video-recorded by one observer using a Sony Handycam® handheld digital video recorder. Videos were reviewed later using a computer and video software to freeze-frame images and positively classify elk. Elk that could not be positively classified on video were tallied for sightability analysis only. Sightability survey data were collected simultaneously for mule deer within the herd unit as well. Classification data were not collected for mule deer due to similarities in size between fawns and adults, and loss of antlers on some bucks. Other notable species (coyotes, wintering sage-grouse flocks, congregations of pronghorn, etc.) were also recorded during flights as a means to maximize survey time and collect additional useful wildlife data. Flight time to complete each subunit was recorded and saved within the survey spreadsheet, so managers can evaluate subunit sizes for future surveys as needed.

Following the completion of all survey flights, data were compiled into a Microsoft Excel spreadsheet and standardized for import into the software program Aerial Survey for Windows (Unsworth el. al 1999). The pilot and all observers were debriefed and offered the opportunity to provide feedback on survey methods to consider for improvement of future surveys.

RESULTS

A total of 1,286 elk were surveyed within 64 recorded observations. Out of 45 total subunits, 37 were flown completely (Figure 3). A total of 34.6 hours were spent flying surveys with a total cost of $36,241.00 including ferry time, fuel truck, and per diem expenses. Several subunits were identified as low priority prior to survey flights. Field managers agreed these were the most likely units to have low densities of both elk and mule deer based on winter conditions and habitat type. Of those subunits identified as low priority, five were not surveyed due to budget constraints. To be less disruptive in developed areas closer to the City of Casper, four additional subunits were surveyed from the ground using drive routes on county and public roads. Ground-surveyed subunits were expected to contain mule deer only, and no elk were found.

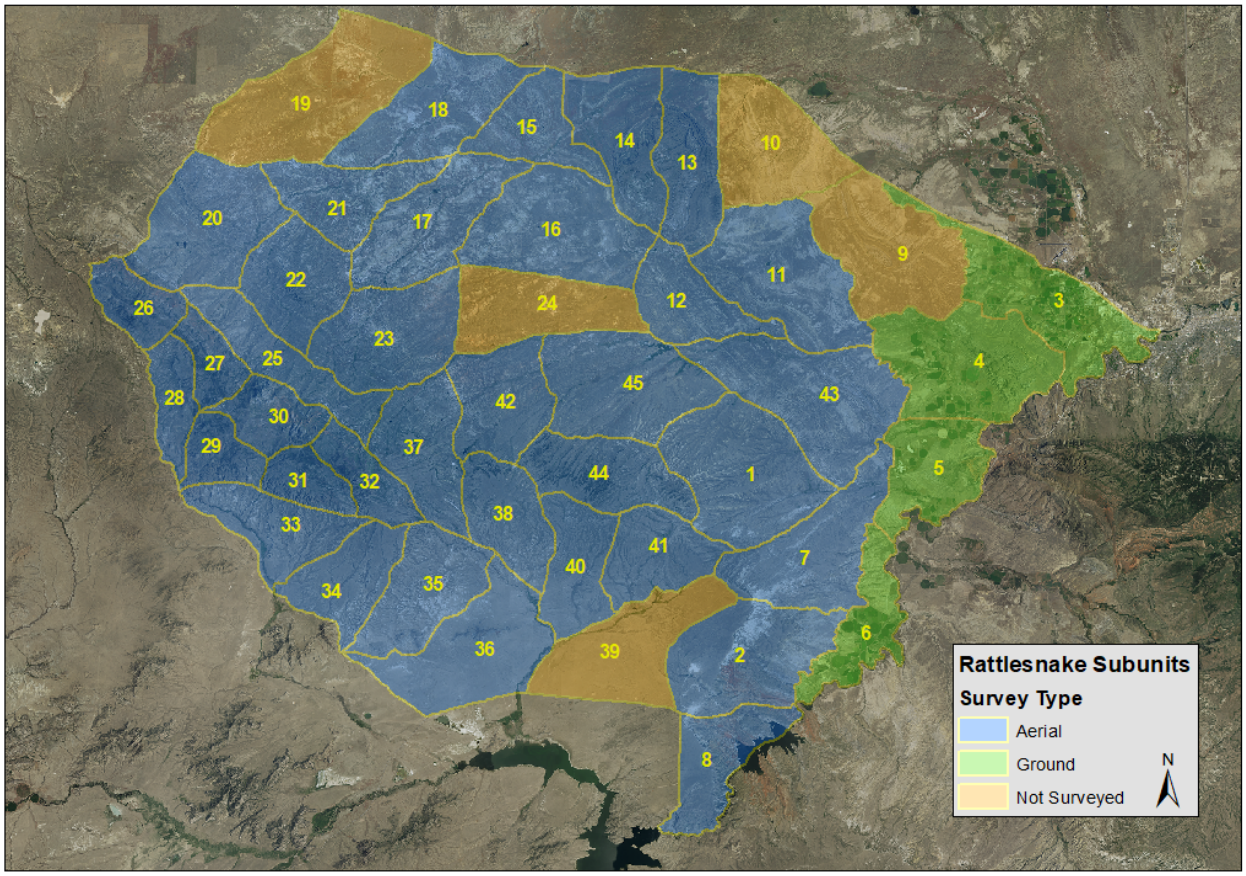


Figure 3. Sightability subunits and survey method used for the Rattlesnake Elk Herd Unit, January 2020.

Distribution of observed elk across the herd unit was uneven, with most elk being found in and around rough hills at mid to high elevation, and in areas with mixed vegetative cover (Figure 4). Elk were sexually segregated in many instances, with very large groups consisting mainly of cows and calves found in more open habitats, and smaller groups of mature bulls found in more variable or timbered habitats. In some cases, elk were found in the same places they are normally observed during late-November directed surveys. For example, large cow-calf groups were found in Snider Basin and around Garfield Peak, and smaller groups were found scattered around Pine Mountain. In other cases, elk were located in areas they are not normally observed in late fall to early winter. Smaller groups of elk were found on open hillsides south of Sage Hen Hill, and in lower elevations near Dry Creek. In areas like Burnt Wagon Draw and east of Ryan Hill, surveyors expected to see small groups of bulls but found few or none. Many other portions of the herd unit were not expected to contain elk, as they are low-elevation open habitats where few if any elk have ever been seen or recorded. The majority of these areas were still flown as part of the simultaneous mule deer sightability survey. Lack of elk observations in these subunits will help inform and streamline future surveys.

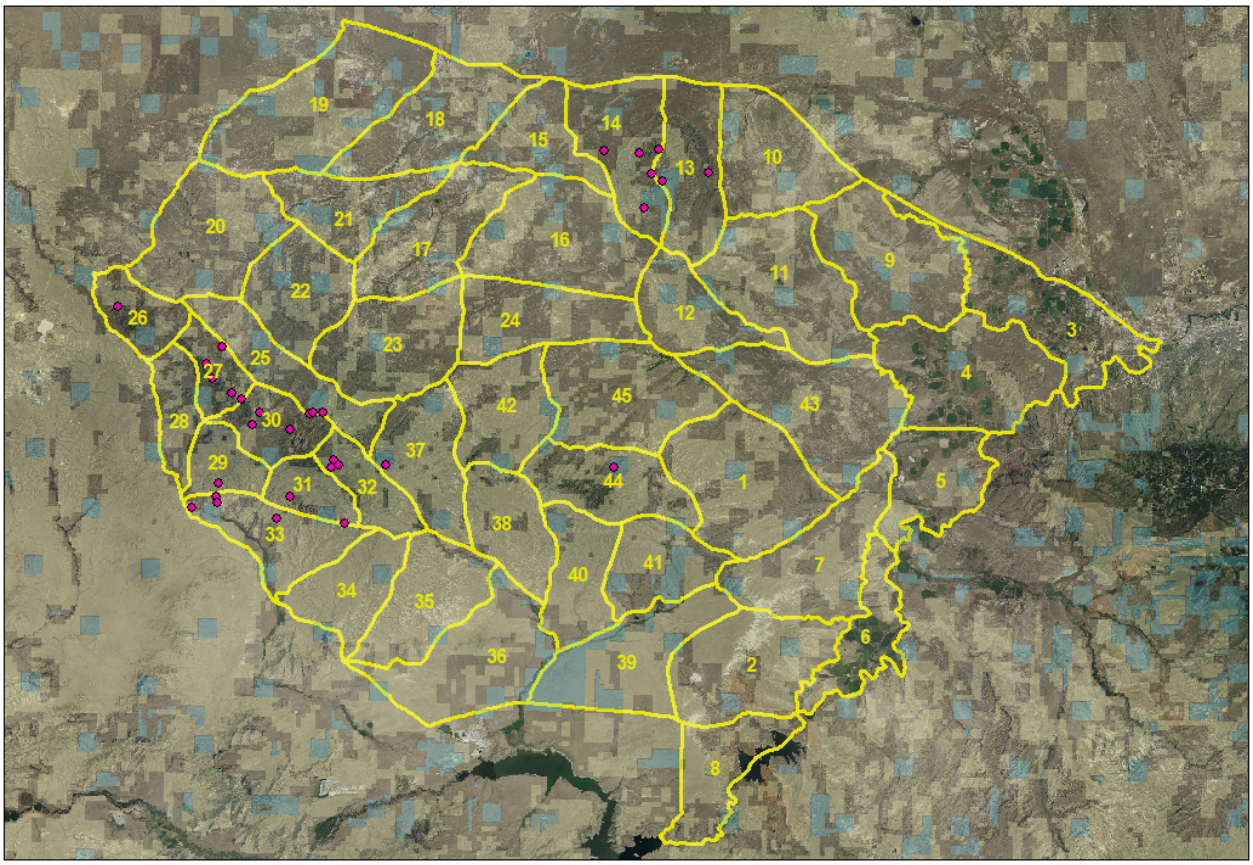


Figure 4. Elk group locations and subunits for the Rattlesnake sightability survey, January 2020.

Sightability data analysis using Aerial Survey for Windows yielded a population estimate of 1,304 elk ±23 using a 95% bound, with a resulting standard error of 12 around the correction (Attachment B). All 45 subunits were included in analysis, with the assumption that the five subunits that were not surveyed contained zero elk. For the sightability analysis of this herd unit, variance was extremely small as a function of the total number of subunits surveyed that contained no elk. Because elk were surveyed simultaneously with mule deer, coverage was almost complete for the entire herd unit. A more typical survey for elk in this herd would focus on fewer subunits, with more targeted effort on occupied elk habitats. Consequently, variance and resulting standard error would be higher in these circumstances.

A total of 1,040 elk were classified into age and sex classes during the sightability survey. An additional 246 elk could not be positively classified from video recordings due to poor lighting, crowding of elk, or other lack of clarity in video imagery. Classification surveys yielded 26 calves, 11 yearling bulls, 36 mature bulls, and 47 total bulls per 100 cows (Table 1). While a higher total number of elk were classified during directed postseason surveys in 2018, it is unlikely that any large groups of elk were missed during sightability surveys. It is more likely that some groups of elk moved outside of the herd unit into adjacent areas and were therefore not observed during this sightability survey.

2014 - 2019 Postseason Classification Summary
for Elk Herd EL742 - RATTLESNAKE

		Bulls			Cows	Calves			Males to 100 Females			Young to	
Year	Post Pop	Ylg	Adult	Total	Total	Total	Tot Cls	Cls Obj	Ylng	Adult	Total	100 Fem	100 Adult
2014	1,824	35	113	148	82	46	276	406	43	138	180	56	20
2015	1,541	10	86	96	48	23	167	390	21	179	200	48	16
2016	1,337	53	77	130	478	114	722	395	11	16	27	24	19
2017	1,379	23	71	94	295	116	505	375	8	24	32	39	30
2018	1,359	131	107	238	776	274	1,288	441	17	14	31	35	27
2019	1,307	66	216	282	603	155	1,040	428	11	36	47	26	18

Table 1. Postseason classification survey results for the Rattlesnake Elk Herd Unit, 2014-2019.

The resulting abundance estimate and standard error from the sightability survey were added into the existing spreadsheet model for the Rattlesnake Elk Herd. Incorporating the abundance estimate from this sightability survey resulted in a lower population estimate for the herd unit compared to previous estimates. Prior to incorporating an independent abundance estimate, the model estimated a post-season population of 1,558 elk. The addition of abundance data to the model shifted the estimate to 1,307 elk post-season.

DISCUSSION

Sightability surveys seek to estimate absolute animal abundance, and provide some of the strongest data available to wildlife managers (Steinhorst & Samual 1989). These models may have their own limitations in terms of cost, and can be biased if groups of animals are undercounted. Despite these limitations, they are a powerful source of information for managers compared to traditional directed surveys. The 2020 sightability and classification survey for the Rattlesnake Elk Herd Unit is the most complete, comprehensive, and intensive survey ever conducted for this herd. The resulting census and distribution data alone are extremely valuable. The subsequent abundance estimate and classification ratios are conceivably the most accurate representation of population size and structure managers have ever developed for this herd.

Postseason classification survey data from previous years are highly variable and likely inaccurate in their estimates of mature bull ratios. Population models that subsequently use these data do not consistently simulate trends or estimate populations accurately. While annual sightability surveys of the entire herd unit are not cost-effective, data from this survey can be used to inform the design of more targeted and efficient surveys for future years. Subunits can be stratified, sampled randomly, and surveyed thoroughly to eliminate the bias of directed surveys. Results from stratified random surveys can be analyzed to include confidence intervals and standard error, are

less costly, and require less time. As the accuracy of classification data improves with better survey design it can be paired with harvest data and periodic abundance estimates to generate a more accurate population model.

Overall, managers felt very good about the design and implementation of the sightability survey for the Rattlesnake Elk Herd Unit. Minor adjustments should be made to improve the current design of future surveys. Subunits that were completed in less than 40 minutes should be combined with similar adjacent subunits or redrawn to improve parity between subunits. Elk location and density data from this survey should be used to stratify subunits for more efficient and cost-effective surveys in future years. The continued application of abundance surveys should improve model function while informing better management decisions in this and other big game herds.

RECOMMENDATIONS FOR FUTURE SURVEYS

- Modify subunits completed in less than 40 minutes by combining with similar adjacent units or re-draw subunit boundaries to require approximately 1 hour survey time.
- Identify natural cut-points in elk densities by subunit using data from this survey.
- Stratify subunits based on high, medium, and low densities of elk for future stratified-random sample surveys.

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Attachment A:
Sightability Survey Data Collection Form for the Rattlesnake Elk Herd Unit, Winter 2020

Sightability

Date:			PRIMARY SPP: ELK					Page:		of		
Tach Time		Start:		End:		*Weather:*						
Time Spent Flying Unit						Temperature			Cloud cover			
Start						Wind			Precipitation			
End						Primary Observer						
Area			Sub area			Secondary Observer						
					Males				Sightability			
Way Point	Spp.	UN-CLASS	Cow	Calf	Spike	Class I	Class II		Activity	% Snow Cover	% Veg Cover	Veg Class

Activity	**1 = Bedded, 2 = Standing, 3 = Moving**
Vegetation Classes	**1 = Grassland, Ag. Field, Open, 2 = Sagebrush, 3 = Juniper, Mtn. Mahogany, 4 = Aspen, Riparian Brush, Mtn. Brush, 5 = Conifer**
male class:	**Elk males: Class I** - raghorn < 270", **Class II** - Mature adult > 270" **Class III** - BIG > 320"
Spp.	**E** - elk, **M** - moose, **D** - mule deer, **Wt** - whitetail, **A** - antelope, **SG** - sage grouse, **C** -coyote, **F** - fox, **GE** - golden eagle, **BE** - bald eagle, **BC**- bobcat, **ML** - mtn. lion, **GH** - gosshawk

Attachment B:
Sightability Data Analysis Output for
Rattlesnake Elk Herd Unit
February 2020

Aerial Survey for Windows, Version 1.00 Beta 6.1.4 (12-Feb-2000)

Thursday, February 27, 2020 03:18 PM

Model: Elk, Hiller 12-E, Idaho (with snow)

.....

ELK742

Section 1: Summary of Raw Counts

Stratum	Units Sampled	Total	Cows	Bulls	BABull	Calves	Spikes	Raghrn	AdBull	Unclas
			--- Number of Each Class Counted ---							
1	45	1286	603	282	216	155	66	148	68	246
Total	45	1286	603	282	216	155	66	148	68	246

Section 2: Summary of Raw Counts for Perfect Visibility Model

This table projects the number of animals that would have been counted if every unit had been flown and visibility had been perfect (no animals obscured by vegetation, etc.)

Strat	No of Units Popn	Sample	Total	Cows	Bulls	BABull	Calves	Spikes	Raghrn	AdBull	Unclas
				--- Number of Each Class Counted ---							
1	45	45	1286	603	282	216	155	66	148	68	246
Total	45	45	1286	603	282	216	155	66	148	68	246

Section 3: Estimates for Total Number

Total

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	1304	0	142	1	23
Total	45	45	1304	0	142	1	23

SE=12

Cows

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	603	0	0	0	1
Total	45	45	603	0	0	0	0

Bulls

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	300	0	140	1	23
Total	45	45	300	0	140	1	23

Branched-antlered bulls

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	233	0	138	1	23
Total	45	45	233	0	138	1	23

Calves

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	155	0	0	0	1
Total	45	45	155	0	0	0	0

Spikes

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	66	0	0	0	1
Total	45	45	66	0	0	0	0

Raghorns

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	160	0	74	0	17
Total	45	45	160	0	74	0	17

Adult bulls

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	74	0	37	0	12
Total	45	45	74	0	37	0	12

Unclassified

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	246	0	0	0	0
Total	45	45	246	0	0	0	0

Section 4: Estimates for Proportions

Cows

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	0.46258	0.00000	0.00002	0.00000	0.00825
Total	45	45	0.46248	0.00000	0.00002	0.00000	0.00825

Bulls

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	0.22982	0.00000	0.00005	0.00000	0.01377
Total	45	45	0.22977	0.00000	0.00005	0.00000	0.01377

Branched-antlered bulls

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	0.17910	0.00000	0.00005	0.00000	0.01457
Total	45	45	0.17906	0.00000	0.00005	0.00000	0.01456

Calves

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	0.11892	0.00000	0.00000	0.00000	0.00212
Total	45	45	0.11890	0.00000	0.00000	0.00000	0.00212

Spikes

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	0.05072	0.00000	0.00000	0.00000	0.00104
Total	45	45	0.05071	0.00000	0.00000	0.00000	0.00104

Raghorns

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	0.12258	0.00000	0.00003	0.00000	0.01111
Total	45	45	0.12255	0.00000	0.00003	0.00000	0.01111

Adult bulls

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	0.05652	0.00000	0.00002	0.00000	0.00849
Total	45	45	0.05651	0.00000	0.00002	0.00000	0.00849

Unclassified

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	0.18869	0.00000	0.00000	0.00000	0.00339
Total	45	45	0.18865	0.00000	0.00000	0.00000	0.00339

Section 5: Estimates for Ratios

Bulls per 100 Cows

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	49.7	0.0	3.9	0.0	3.9
Total	45	45	49.7	0.0	3.9	0.0	3.9

Calves per 100 Cows

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	25.7	0.0	0.0	0.0	0.1
Total	45	45	25.7	0.0	0.0	0.0	0.1

Spikes per 100 Cows

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	11.0	0.0	0.0	0.0	0.1
Total	45	45	11.0	0.0	0.0	0.0	0.1

Spikes per 100 Bulls

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	22.1	0.0	0.7	0.0	1.7
Total	45	45	22.0	0.0	0.7	0.0	1.7

Raghorns per 100 Bulls

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	53.3	0.0	2.2	0.1	2.9
Total	45	45	53.3	0.0	2.2	0.1	2.9

Adult bulls per 100 Bulls

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	24.6	0.0	0.0	0.1	0.5
Total	45	45	24.6	0.0	0.0	0.1	0.5

Branched-antlered bulls per 100 Bulls

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	77.9	0.0	0.7	0.2	1.9
Total	45	45	77.8	0.0	0.7	0.2	1.9

Spikes per 100 Branched-antlered bulls

Stratum	Number of Units Popn.	Sample	Estimate	Variance Sampling	Sightability	Model	Bound 95%
1	45	45	28.3	0.0	2.0	0.0	2.8
Total	45	45	28.4	0.0	2.0	0.0	2.8

Section 6: Summary Statistics

Percent correction from perfect visibility model

Stratum	Units Sampled	Total	Cows	Bulls	BABull	Calves	Spikes	Raghrn	AdBull	Unclas
1	45	1.4	0.0	6.2	8.1	0.0	0.2	8.0	8.4	0.0
Total	45	1.4	0.0	6.4	7.9	0.0	0.0	8.1	8.8	0.0

[Total variances (i.e., standard error squared) are in parenthesis]

Total estimates...

1304	(143)	Total
603	(0)	Cows
300	(141)	Bulls
233	(139)	Branched-antlered bulls
155	(0)	Calves
66	(0)	Spikes
160	(74)	Raghorns
74	(37)	Adult bulls
246	(0)	Unclassified

Proportions...

0.4625	(0.000018)	Cows
0.2298	(0.000049)	Bulls
0.1791	(0.000055)	Branched-antlered bulls
0.1189	(0.000001)	Calves
0.0507	(0.000000)	Spikes
0.1226	(0.000032)	Raghorns
0.0565	(0.000019)	Adult bulls
0.1887	(0.000003)	Unclassified

Ratios...

50	(4)	Bulls per 100 Cows
26	(0)	Calves per 100 Cows
11	(0)	Spikes per 100 Cows
22	(1)	Spikes per 100 Bulls
53	(2)	Raghorns per 100 Bulls
25	(0)	Adult bulls per 100 Bulls
78	(1)	Branched-antlered bulls per 100 Bulls
28	(2)	Spikes per 100 Branched-antlered bulls

2019 - JCR Evaluation Form

SPECIES: Elk

PERIOD: 6/1/2019 - 5/31/2020

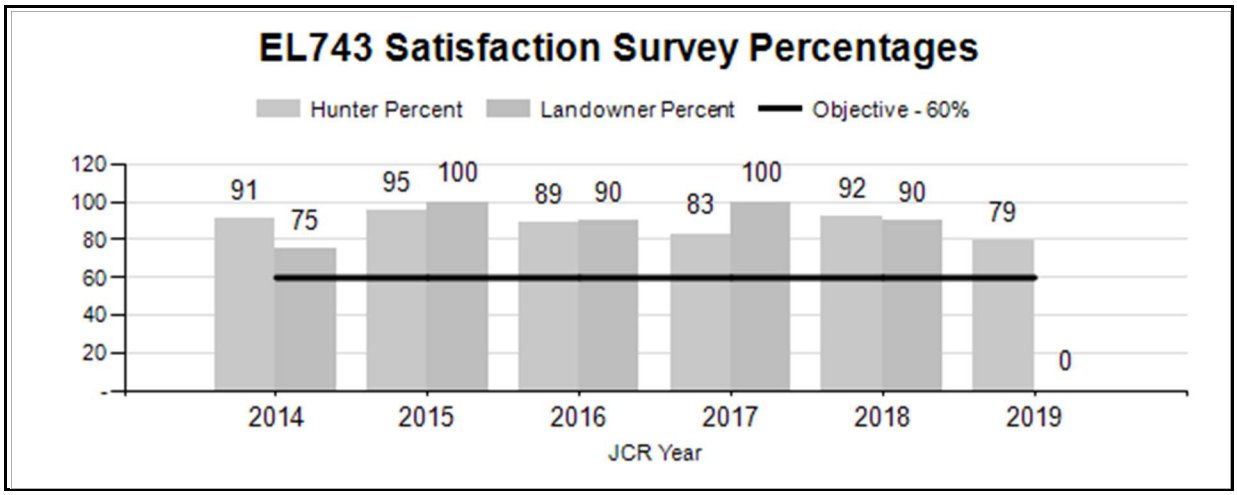
HERD: EL743 - PINE RIDGE

HUNT AREAS: 122

PREPARED BY: MATT HUIZENGA

	2014 - 2018 Average	2019	2020 Proposed
Hunter Satisfaction Percent	90%	79%	90%
Landowner Satisfaction Percent	92%	0%	90%
Harvest:	116	108	150
Hunters:	136	128	175
Hunter Success:	85%	84%	86%
Active Licenses:	146	132	160
Active License Success:	79%	82%	94%
Recreation Days:	539	467	600
Days Per Animal:	4.6	4.3	4
Males per 100 Females:	0	0	
Juveniles per 100 Females	0	0	

Satisfaction Based Objective	60%
Management Strategy:	Private Land
Percent population is above (+) or (-) objective:	N/A%
Number of years population has been + or - objective in recent trend:	1



2020 HUNTING SEASONS
Pine Ridge Herd Unit (EL743)

Hunt Area	Hunt Type	Archery Dates Opens	Archery Dates Closes	Season Dates Opens	Season Dates Closes	Quota	Limitations
122	1	Sep. 1	Sep. 30	Oct. 15	Nov. 30	100	Any elk
122	1			Dec. 1	Dec. 31		Antlerless elk
122	6	Sep. 1	Sep. 30	Oct. 15	Dec. 31	175	Cow or calf

2019 Hunter Satisfaction: 79% Satisfied, 16% Neutral, 5% Dissatisfied

2019 Landowner Satisfaction: 0% Below desired levels, 0% At or about at desired levels, 100% Above desired levels

2020 Management Summary

1) **Hunting Season Evaluation:** The 2020 season structure was conservative to address a landowner-perceived growing population and minimize over-crowding of the minimal public land access. The majority of elk are located on private land or inaccessible public land in this area. Licenses are therefore issued based primarily on amount of private land access allowed by landowners. A total of 25 Type 1 licenses and 25 Type 6 licenses were added to increase harvest potential to limit herd growth and provide additional hunter opportunity. As a result of the lack of public access, Type 6 licenses generally do not sell out for this area. However, landowners expressed a desire for higher female harvest with some indication there will be more access and opportunity.

2) **Chronic Wasting Disease Management:** This herd has not been included yet in CWD surveillance efforts.

3) There were no trend count flights conducted in the Pine Ridge herd unit in 2019. Flights are planned for 2020. Winter trend counts have been quite variable over the years. Under ideal conditions, personnel found a total of 840 elk in 2013, 566 elk in 2016, and 648 elk in 2017. Counts have been attempted along with helicopter deer classification flights in some years with limited success, only finding 49 elk in 2015, 271 elk in 2016, and 88 elk in 2018.

4) There is no population model for this herd. Populations are estimated based off aerial winter trend counts and landowner input. Population estimates since 2013 have stayed steady between 800-1000 elk in this herd. Harvest alone is not believed to be sufficient to curtail population growth, and it is believed elk may be emigrating from this herd.

5) Landowner and hunter satisfaction is the primary objective in this herd. Hunter satisfaction was well over the 60% minimum objective. Landowner satisfaction was not as easily measured. Letters were sent to 21 landowners in the hunt area who typically have elk on their property notifying them of an information gathering meeting and providing contact information for those unable to attend. Only five landowners attended the meeting with

one calling to discuss the season. In addition, five more landowners were contacted by field personnel. No landowners expressed any major concerns and all generally liked how things are going, but were in agreement that elk numbers were higher than desired.

6) The secondary objective for this herd unit is a bull harvest distribution consisting of 60% mature, branch-antlered bulls. One hundred percent of bulls harvested in 2019 were branch-antlered bulls.

7) Hunter success in this area over the past five years is quite high, averaging 86% harvest success with an average of 4.4 days to harvest.

2019 - JCR Evaluation Form

SPECIES: Bighorn Sheep | PERIOD: 6/1/2019 - 5/31/2020

HERD: Non-Herd Unit

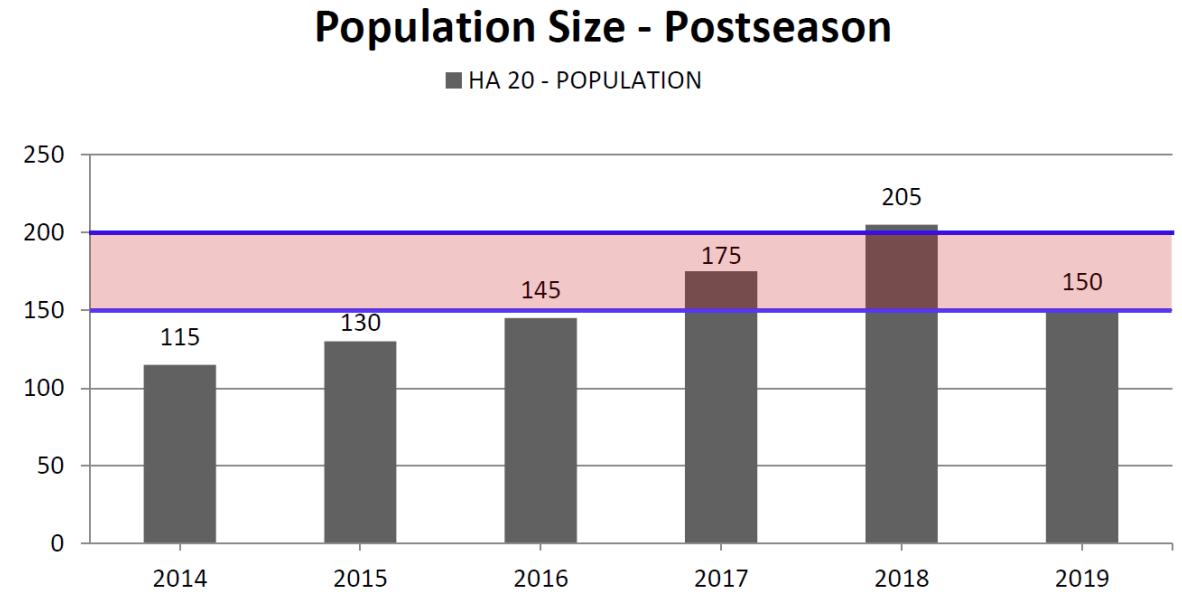
HUNT AREAS: 20 (Kouba Canyon) | PREPARED BY: JOE SANDRINI

	2014 - 2018 Average	2019	2020 Proposed
Population:	154	150	150
Harvest:	2.2	3	3
Hunters:	2.2	3	3
Hunter Success:	100%	100%	100%
Active Licenses:	2.2	3	3
Active License Success:	100%	100%	100%
Recreation Days:	10	15	15
Days Per Animal:	4.6	5.0	5.0
Males per 100 Females	89	105	
Juveniles per 100 Females	50	19	

Population Objective (± 20%) :	150 - 200
Management Strategy:	*Joint Mangement with*
Percent population is above (+) or below (-) objective:	*South Dakota*
Number of years population has been + or - objective in recent trend:	10
Model Date:	No Model

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

	JCR Year	Proposed
Females ≥ 1 year old:	0%	0%
Males ≥ 1 year old:	36.1%	33.5%
Total:	2.0%	2.2%
Proposed change in post-season population:	-26.8%	-10.0%



2020 HUNTING SEASONS
BIGHORN SHEEP HUNT AREA 20 (KOUBA CANYON)

NON-HERD UNIT

Hunt Area	Type	Archery Dates Opens	Archery Dates Closes	Season Dates Opens	Season Dates Closes	Quota	Limitations
20	1	Aug. 15	Sep. 30	Oct. 1	Dec. 31	3	Any ram (2 resident and 1 nonresident)

2019 Hunter Satisfaction: *Bighorn Sheep (BHS) Hunters Not Surveyed*

2020 Management Summary

1) **Hunting Season Evaluation:** The 2020 hunting season should provide 100% success for three hunters pursuing mature rams. Repeated observations of bighorn sheep this winter revealed a significantly increased ram:ewe ratio and a scarcity of lambs (Fig. 1 & 2). As such, it appears a number of ewes in addition to lambs either died or emigrated during the 2019 bio-year. Supporting this assertion, the number of sheep regularly observed and estimated to be in this herd also declined. Given an approximately 50:50 sex ratio and average recruitment and survival over the next year, this population should stabilize at about 150 - 160 individuals. Maintaining a harvest of six rams (three from Wyoming and three from South Dakota) will assist with realigning the ram:ewe ratio, but not impact the herd's growth potential. It is currently estimated that there are about 15-20 class IV rams in the herd. The resident / non-resident split of licenses ensures every fourth license issued for this hunt area goes to a non-resident.

2) **Management Objective Review:** In 2012, joint management criteria for this herd were agreed upon with SDGF&P. This management framework includes an interstate population objective of 150 to 200 sheep. Additionally, hunting seasons are to be implemented when there is a combined Wyoming and South Dakota population of at least 75 to 100 sheep. These seasons are intended to provide for trophy ram hunting, such that harvest of rams in relation to population demographics allows for replacement of Class IV (¾ curl) rams taken. To this end, harvest should normally not exceed 50% of known number of Class IV rams, and annual harvest should not exceed 10% of the total rams based upon available data. This management framework is reviewed annually with SDGF&P.

3) **Population Estimation and Research Projects:** Garnering an accurate population estimate of this herd is vital to its management, and two methods have been tried with limited success: A ground based survey relying on radio-collared BHS was developed as part of a graduate student project in 2013. Most years, this method has produced estimates with very wide confidence

intervals due to the limited number of radio-collared and marked sheep available in the herd (Figure 3). In addition, securing access across private lands for data collection in Wyoming has become impossible without a paid access agreement. A forward-looking infrared (FLIR) survey was attempted in June, 2018. However, the FLIR system was not able to effectively detect BHS. This past year, a project was begun to develop a helicopter based sightability model for this herd. The study is being conducted in tandem with SDGF&P and entails drop net capture and VHF radio collaring of up to 40 bighorn ewes; disease testing of all captured BHS; helicopter and ground based surveys for BHS; and sightability model development based upon topographic and vegetative features to compensate for BHS available for observation but not detected. Trapping BHS proved difficult this past winter, as mild weather yielded inconsistent ewe attendance at bait sites. Nine bighorns were captured in December (3 ewes and 6 rams). In the future, chemically immobilization of ewes via dart gunning may be used as opportunity presents itself. Future capture and model development strategies are being re-evaluated with SDGF&P.

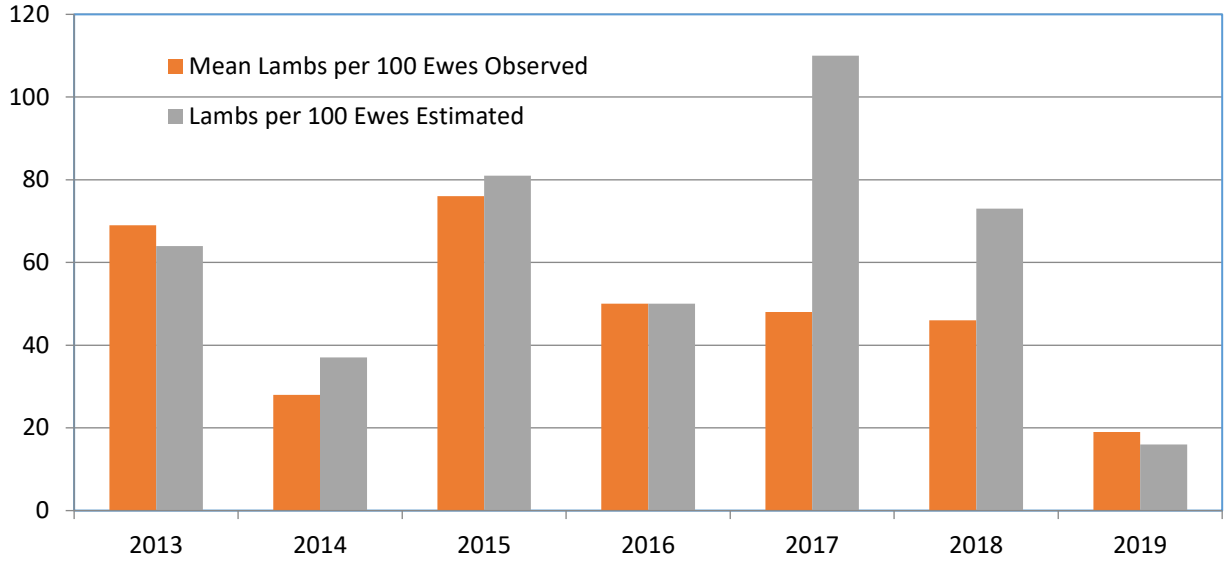


Figure 1. Mean observed^ and estimated* post-season Lamb:Ewe ratios (2013 – 2018)
^ Observed values are mean of pooled, observed data.
** Estimated values derived from average cohort specific population estimates from fall survey.*

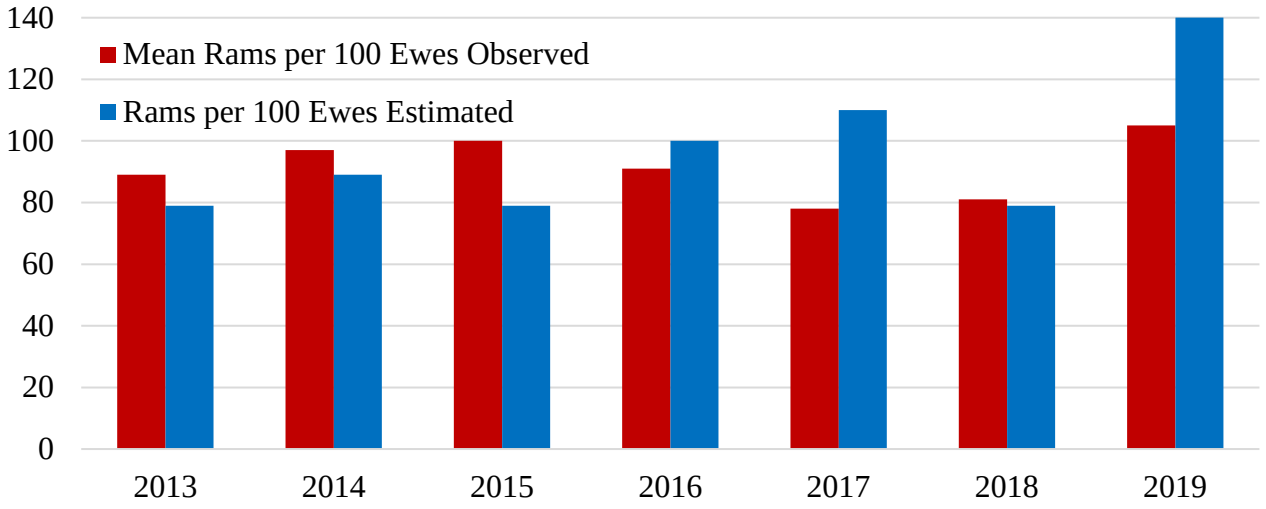


Figure 2. Mean observed^ and estimated* post-season Ram:Ewe ratios (2013 – 2019)
^ Observed values are mean of pooled, observed data.
** Estimated values derived from average cohort specific population estimates from fall survey.*

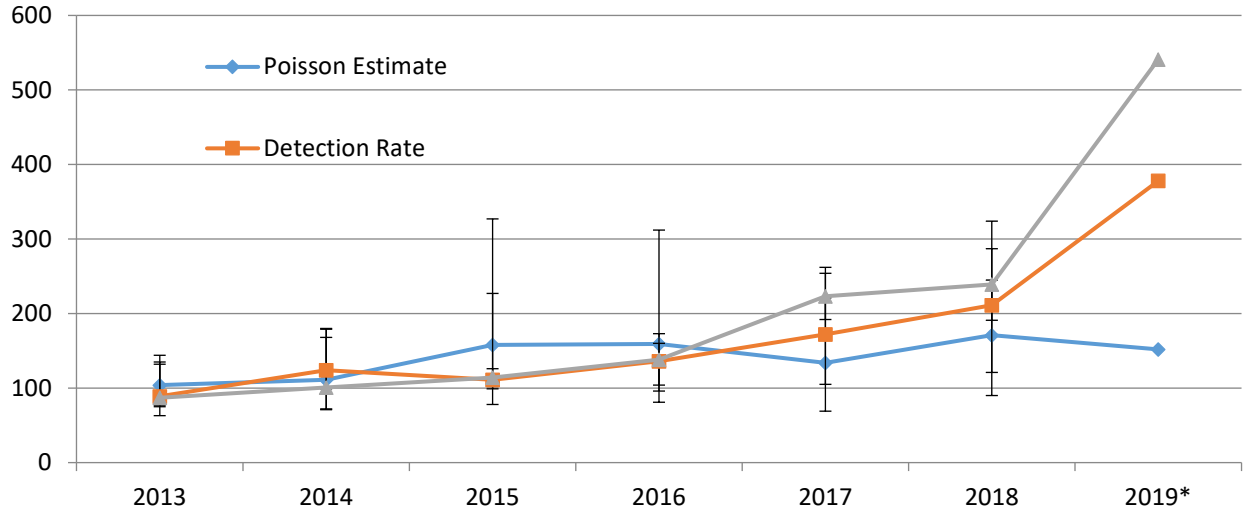


Figure 3. Post season population estimates and 95% confidence intervals for the Kouba Canyon (Elk Mtn.) Bighorn sheep herd (2013-2019).
** Confidence intervals for 2019 not available due to limited number of confirmed marked animals within population of re-sighted bighorns – unable calculate C.I.*