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Acknowledgement

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

2014 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2014 - 5/31/2015

HERD: PR745 - RATTLESNAKE

HUNT AREAS: 70-72

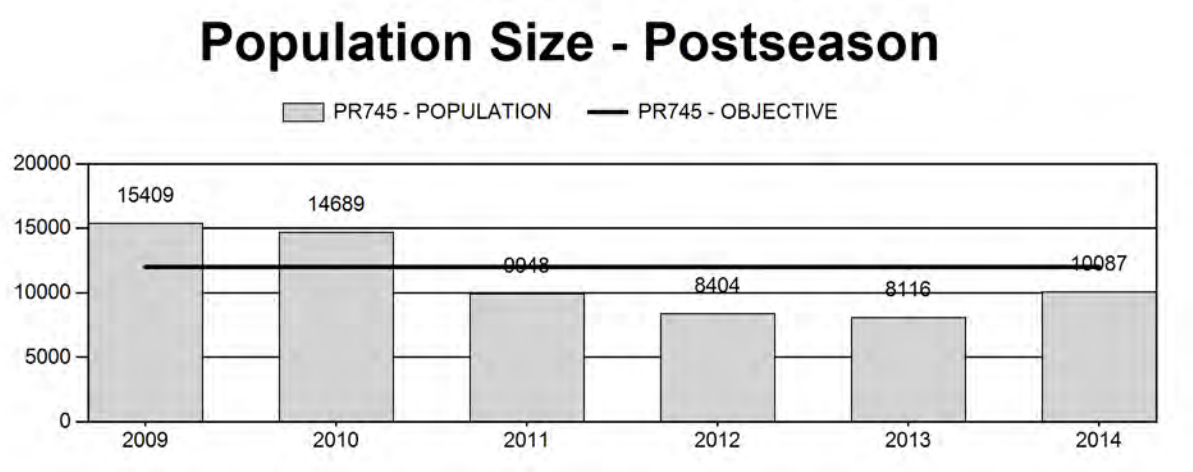
PREPARED BY: HEATHER O'BRIEN

	2009 - 2013 Average	2014	2015 Proposed
Population:	11,313	10,087	11,017
Harvest:	2,227	588	410
Hunters:	2,335	647	450
Hunter Success:	95%	91%	91%
Active Licenses:	2,546	757	475
Active License Success:	87%	78%	86 %
Recreation Days:	7,516	2,356	1,700
Days Per Animal:	3.4	4.0	4.1
Males per 100 Females	61	48	
Juveniles per 100 Females	53	66	

Population Objective (± 20%) :	12000 (9600 - 14400)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-15.9%
Number of years population has been + or - objective in recent trend:	4
Model Date:	02/02/2015

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

	JCR Year	Proposed
Females ≥ 1 year old:	2.73%	1.10%
Males ≥ 1 year old:	25.6%	13.0%
Juveniles (< 1 year old):	0.85%	0.30%
Total:	6.68%	3.72%
Proposed change in post-season population:	+13.2%	+9.2%



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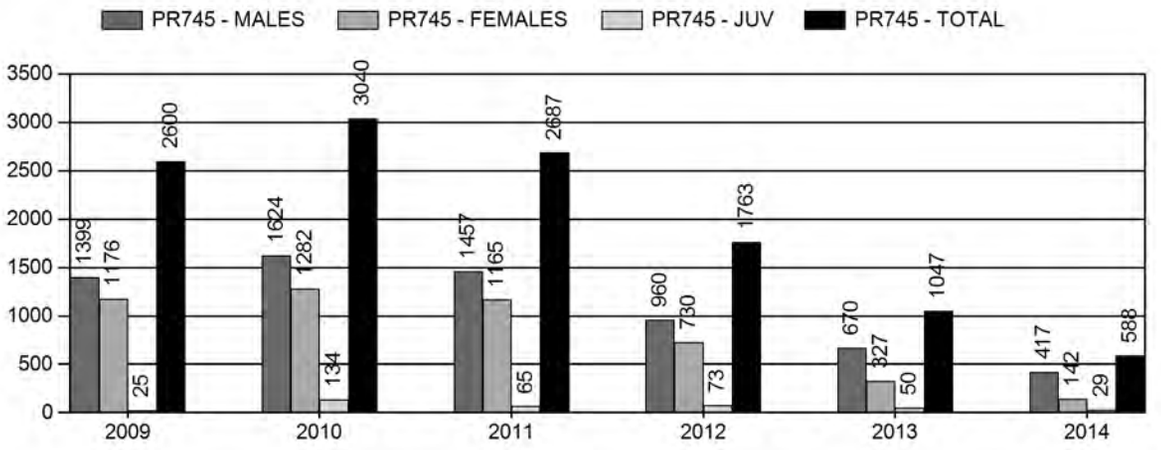
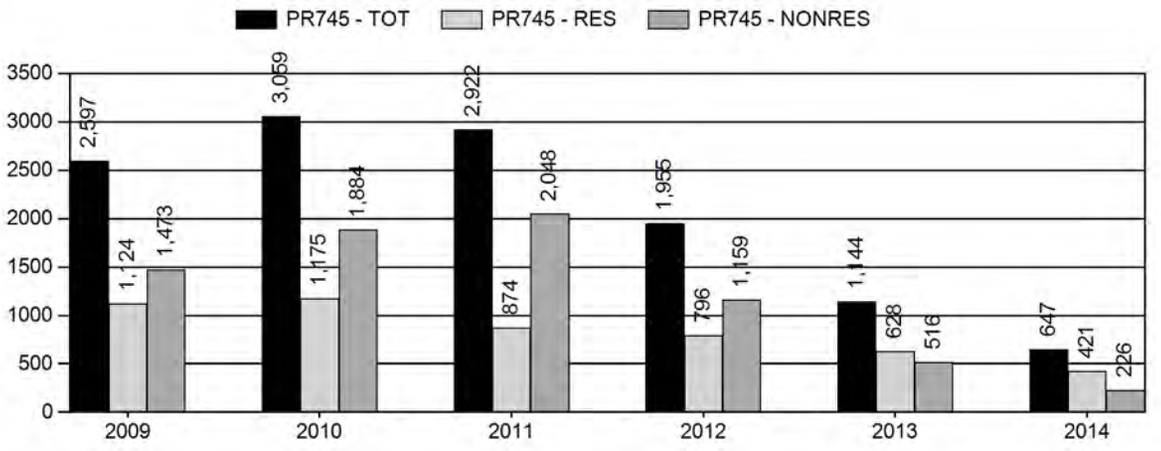
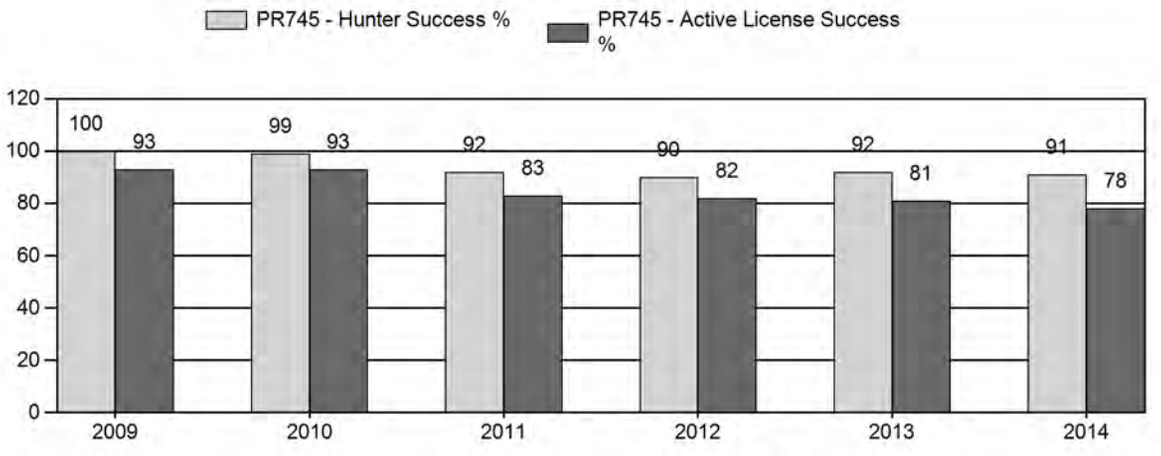


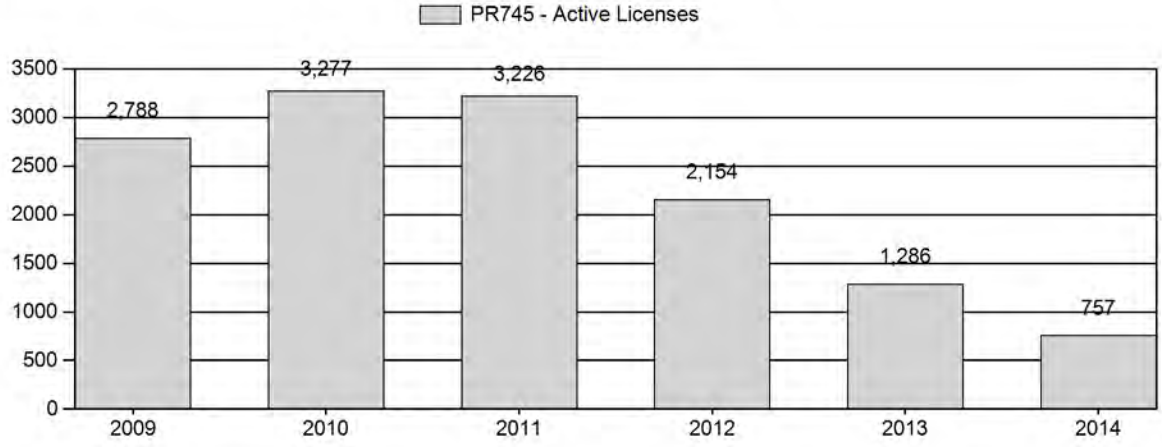
Number of Hunters



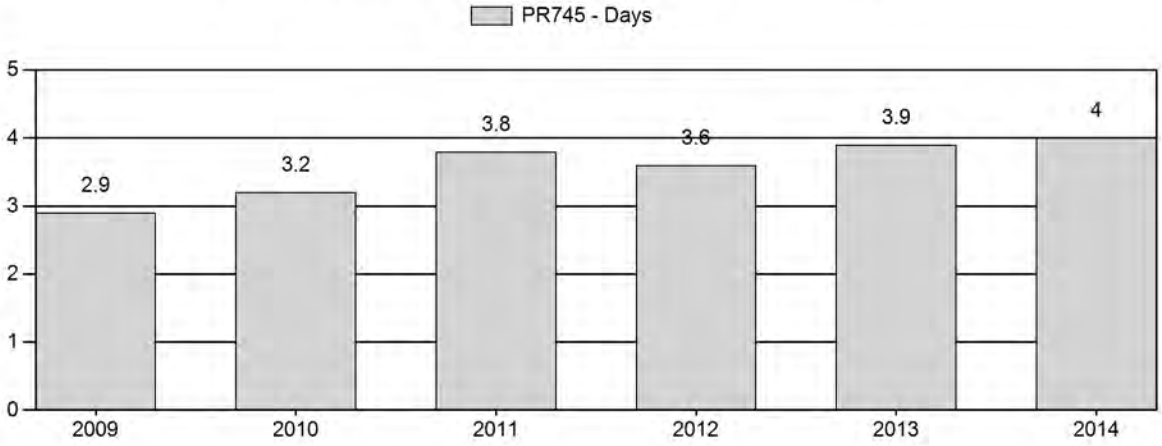
Harvest Success



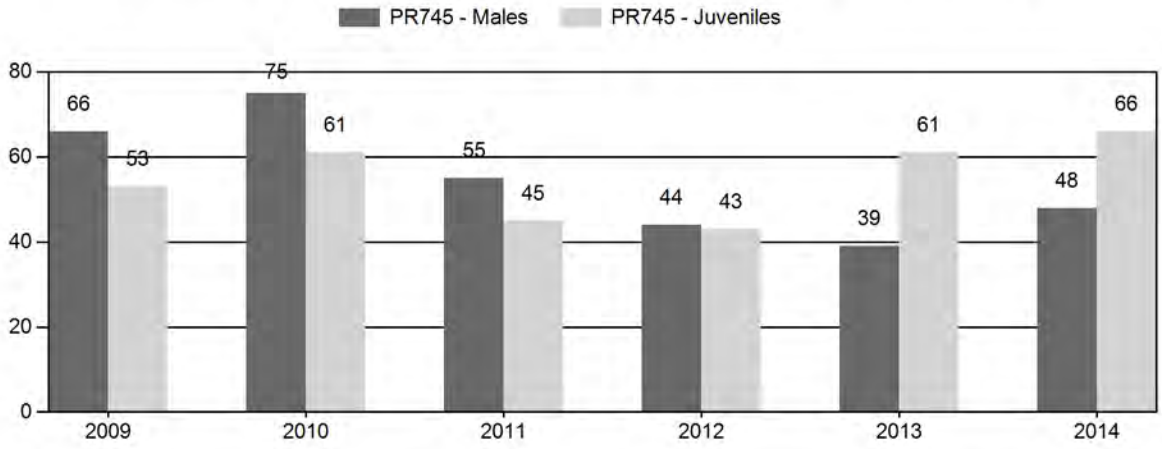
Active Licenses



Days Per Animal Harvested



Preseason Animals per 100 Females



2009 - 2014 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	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	18,269	330	954	1,284	30%	1,951	46%	1,027	24%	4,262	2,276	17	49	66	± 3	53	± 3	32
2010	18,033	271	933	1,204	32%	1,599	42%	970	26%	3,773	2,827	17	58	75	± 4	61	± 4	35
2011	12,938	195	683	878	27%	1,607	50%	721	22%	3,206	1,616	12	43	55	± 3	45	± 3	29
2012	10,343	82	209	291	24%	662	53%	285	23%	1,238	1,140	12	32	44	± 5	43	± 5	30
2013	9,268	45	199	244	20%	624	50%	381	31%	1,249	1,901	7	32	39	± 5	61	± 6	44
2014	10,919	111	191	302	22%	634	47%	416	31%	1,352	1,734	18	30	48	± 5	66	± 6	44

2015 HUNTING SEASONS
RATTLESNAKE PRONGHORN HERD (PR745)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
70	1	Sep. 15	Oct. 31	50	Limited quota	Any antelope
	6	Sep. 15	Oct. 31	25	Limited quota	Doe or fawn antelope
71	1	Sep. 15	Oct. 31	75	Limited quota	Any antelope
	6	Sep. 15	Oct. 31	25	Limited quota	Doe or fawn antelope
72	1	Sep. 15	Oct. 31	250	Limited quota	Any antelope
	6	Sep. 15	Oct. 31	25	Limited quota	Doe or fawn antelope
Archery		Aug. 15	Sep. 14			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2014
70	1	-50
	6	-75
71	1	-25
	6	-25
72	1	-150
	6	-75
Total	1	-225
	6	-175

Management Evaluation

Current Management Objective: 12,000
Management Strategy: Special
2014 Postseason Population Estimate: ~10,100
2015 Proposed Postseason Population Estimate: ~11,000
2014 Hunter Satisfaction: 68% Satisfied, 18% Neutral, 14% Dissatisfied

The Rattlesnake Pronghorn Herd Unit has a post-season population management objective of 12,000 pronghorn. The herd is managed using the special management strategy, with a goal of maintaining preseason buck ratios between 60-70 bucks per 100 does. The objective and management strategy were last revised in 1988, and will be formally reviewed in 2015. A line transect survey was conducted in May 2014 to be used in conjunction with the formal objective review.

Herd Unit Issues

Hunting access within the herd unit is moderate, having some large tracts of public land as well as walk-in areas and a hunter management area. Traditional ranching and grazing are the primary land use over the whole herd unit, with scattered areas of oil and gas development. Hunt Areas 70 & 71 are dominated by private lands. License issuance is typically maintained in Area 70 to address damage issues on irrigated agricultural fields. Periodic disease outbreaks (i.e. hemorrhagic diseases, *Clostridium spp*. infections) are possible in this herd and can contribute to population declines when environmental conditions are suitable. However, there were no reported or confirmed cases of disease outbreak in pronghorn within the Rattlesnake Herd during 2014.

Weather

The winter of 2010-2011 was severe throughout the herd unit, resulting in very high mortality of pronghorn across all age classes. Conditions were warm and dry for the herd unit in 2011 and shrub production was below average, resulting in poor nutrition of pronghorn entering the winter of 2011-2012. Snow pack and resulting spring moisture were below average for the winter of 2011-2012 which likely had a negative impact on lactating does and their fawns. The summer of 2012 was the driest on record since 1904 in much of Wyoming, and the winter of 2012 continued the trend with very low snow accumulation and snow pack. The spring of 2013 was cool with significant precipitation, and average rainfall over the summer as well. Still, habitat conditions appeared to be poor for much of the growing season. Heavy precipitation during the fall of 2013 caused a beneficial late green-up, but also made travel very difficult for hunters. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. Grass and forb growth was excellent, making 2014 the best growing season the region had seen in years. The spring and summer of 2014 undeniably produced improved range conditions that benefitted pronghorn. For detailed weather data see http://www.ncdc.noaa.gov/gac/time-series/us.

Habitat

This herd unit has no established habitat transects to measure production and/or utilization on shrub species that are preferred browse for pronghorn. Anecdotal observations and discussions with landowners in the region indicate that summer and winter forage availability for pronghorn was very good in 2014. Herbaceous forage species were observed to be in very good condition in 2014 compared to previous years, and pronghorn appeared to be more widely distributed across suitable habitat.

Field Data

Fawn production was high in this herd from 1998-2005, and the population grew markedly during this time period. However, license issuance was modest and the population grew above management control by harvest. Fawn production was moderate from 2006-2010, but pronghorn populations were already high by this time period. License issuance increased significantly every year from 2006-2011 in an attempt to curb high pronghorn numbers and reduce the herd toward objective. By 2011, environmental factors combined with low fawn production/survival rapidly reduced this herd below objective. Harsh winter conditions in 2010-11 combined with severe drought have since dropped this herd unit below management objective, and license issuance has become much more conservative. Improved moisture and favorable weather conditions appeared to have helped fawn production and survival in the past two years, as the fawn ratio improved from 43:100 does in 2012 to 61:100 and 66:100 in 2013 and 2014, respectively. Still, the fawn ratio for the Rattlesnake Herd did not improve as much as in adjacent herds, nor did it achieve pre-2005 era fawn ratios. This suggests the carrying capacity for the herd unit is currently suppressed. Native habitats may still be recovering from the very high pronghorn numbers of 2004 to 2011 and prolonged drought conditions.

Buck ratios for the Rattlesnake herd historically range from the mid 40s to mid 70s per 100 does. Buck ratios are most commonly in the upper 50s, just below the lower limit for special management. In more recent years, buck ratios have dropped to the mid-40s as a result of low fawn recruitment and high harvest pressure on a diminishing population. In 2013, the buck ratio for the Rattlesnake Pronghorn Herd reached a 22-year low of 39:100 does. Buck ratios improved to 48:100 does in 2014 as a result of reduced harvest pressure and improved overwinter survival. While it can be difficult to maintain this herd within the range of special management due to differing management strategies for Area 70 versus Areas 71 and 72, hunters have developed high expectations for buck numbers and quality within this herd. This population with thus be managed to improve and maintain a buck ratio within special management parameters, while increasing the overall population toward objective.

The 2014 post-season population estimate was approximately 10,000 and trending upward from 2013 estimates. This herd unit did not have a functional population model until 2012, when a spreadsheet-based modeling system replaced the program POP-II to simulate herd dynamics. Prior management decisions for this herd were made using a combination of classification data, harvest statistics, observations of field personnel, and comments from hunters and landowners regarding pronghorn numbers. Line transect surveys were also conducted in 1998, 2000, 2003, 2007, and 2014 to provide end-of-year population estimates. The 2007 survey was deemed inaccurate and therefore was discarded, but the 2014 survey yielded good results with a reasonable standard error which aligns well with the population model (see Appendix A). The

current population model is considered to be of fair quality, as personnel believe there is significant interchange with the adjacent Beaver Rim Herd Unit. Managers evaluated a merged dataset of the Rattlesnake and Beaver Rim Herds in 2015. However, the combined model did not show adequate enough improvements in predicting population size or trend to merit combining the two herds.

Harvest Data

License success in this herd unit is typically in the 90th percentile. Success declined the last four years to near the 80th percentile while hunter days increased, indicating pronghorn were more difficult for hunters to find and harvest. Despite drastic reductions in license numbers in 2012-2014, license success and hunter days remained mediocre and effort increased significantly as many hunters remarked that bucks were more difficult to find and of lower quality. While some of the low harvest success in 2013 can be attributed to poor access due to muddy and/or snowy conditions, hunting conditions in 2014 were ideal for most of the season, yet license success remained poor at 77. Average hunter days on Type 1 licenses increased to 4.4, and was the highest on record. In addition, reported hunter satisfaction for the Rattlesnake Herd Unit was the lowest in the state in 2014. Thus, managers will recommend further license reductions in 2015 with the goal of increasing buck ratios, hunter satisfaction, harvest success, and population numbers overall.

Population

The "Time-Specific Juvenile Survival – Constant Adult Survival" (TSJ,CA) spreadsheet model was chosen for the post-season population estimate of this herd. This model seemed most representative of the herd, as it selects for low juvenile survival in the years when managers agree that overwinter fawn survival was very poor – particularly in 2010-2012. The simpler models (CJ,CA and SCA,CA) select for higher juvenile survival rates across years, which does not seem feasible for this herd. All three models follow a trend that is plausible; however the CJ,CA model shows an extremely high buck harvest percentage in 2011, and the SCA,CA model shows a 2006 population peak that seems unrealistic. None of the models track very well with the three early line transect estimates, but all three models align very well with the 2013 line transect estimate. While the AIC for the TSJ,CA model is the highest of the three, it is only due to year-by-year penalties on juvenile survival and is still well within one level of power in comparison to the AICs of the simpler models. The TSJ,CA model appears to be the best representation relative to the perceptions of managers on the ground and follows trends with license issuance and harvest success. Overall the current model is considered fair in quality as a representation of herd dynamics.

Management Summary

Traditional season dates in this herd unit run from September 15th through October 31st, and through November 30th for Area 70 Type 6 licenses. We recommend the same season dates for all but Area 70 in 2015, with a reduction of licenses in all hunt areas to promote population growth and improved buck ratios. Area 70 Type 6 licenses will be valid through October 31st to coincide with all other season dates in the herd unit, since license numbers are low and November seasons are not currently warranted. The 2015 season includes a total of 375 Type 1 and 75 Type 6 licenses. Goals for 2015 are to increase pronghorn numbers towards objective, improve buck ratios consistent with special management strategy, and increase hunter success.

If the projected harvest of 410 pronghorn is achieved with fawn production/survival similar to the last few years, this herd will increase significantly in number. The predicted 2015 post-season population size for the Rattlesnake Pronghorn Herd is approximately 10,900 animals, which is 9% below objective.

INPUT	
Species:	Pronghorn
Biologist:	Heather O'Brien
Herd Unit & No.:	Rattlesnake PR745
Model date:	02/02/15

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	141	149	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	136	150	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	71	184	☑ TSJ,CA Model	

Population Estimates from Top Model

Year	Predicted Prehunt Population (year *i*)			Total	Predicted Posthunt Population (year *i*)			Total	Predicted adult End-of-bio-year Pop (year *i*)			LT Population Estimate		Trend Count	Objective
	Juveniles	Total Males	Females		Juveniles	Total Males	Females		Total Males	Females	Total Adults	Field Est	Field SE		
1993	2302	2200	4128	**8629**	2167	1361	3336	**6864**	2078	3829	**5907**				12000
1994	2853	2036	3752	**8641**	2823	1541	3554	**7918**	1891	3711	**5602**				12000
1995	2471	1853	3637	**7961**	2454	1346	3481	**7280**	2246	4181	**6428**				12000
1996	3620	2201	4098	**9919**	3607	1789	3915	**9312**	3155	5066	**8220**				12000
1997	3993	3092	4964	**12049**	3963	2553	4768	**11283**	3893	5897	**9790**				12000
1998	4080	3815	5779	**13674**	4044	2981	5478	**12503**	3336	5616	**8952**	7272	1152		12000
1999	3628	3269	5504	**12401**	3575	2080	5114	**10770**	2898	5689	**8588**				12000
2000	3816	2840	5576	**12232**	3771	1988	5308	**11067**	3370	6385	**9755**	12708	2202		12000
2001	4556	3303	6258	**14116**	4534	2869	6166	**13569**	3396	6357	**9753**				12000
2002	4095	3328	6230	**13653**	4081	2766	6072	**12919**	3197	6175	**9372**	7357	1396		12000
2003	4587	3133	6051	**13771**	4553	2445	5789	**12787**	4156	7171	**11327**				12000
2004	6664	4073	7027	**17765**	6641	3307	6630	**16579**	5036	8024	**13059**				12000
2005	6403	4935	7863	**19201**	6357	4106	7504	**17967**	4799	7868	**12668**				12000
2006	5094	4703	7711	**17508**	5028	3716	7176	**15920**	5267	8388	**13654**				12000
2007	4701	5161	8220	**18082**	4557	3834	7476	**15867**	5293	8593	**13886**				12000
2008	4712	5187	8421	**18320**	4662	3899	7434	**15995**	5409	8575	**13984**				12000
2009	4424	5301	8404	**18129**	4396	3762	7110	**15269**	5133	8126	**13259**				12000
2010	4831	5030	7964	**17825**	4684	3244	6554	**14481**	3535	6512	**10047**				12000
2011	2863	3464	6382	**12709**	2790	1865	5065	**9719**	2569	5406	**7975**				12000
2012	2281	2518	5298	**10097**	2201	1462	4495	**8158**	1951	4794	**6746**				12000
2013	2869	1912	4699	**9480**	2814	1175	4339	**8328**	2348	5311	**7659**	6741	1207		12000
2014	3415	2301	5205	**10921**	3384	1654	5049	**10087**	2707	5589	**8296**				12000
2015	3338	2653	5477	**11468**	3327	2279	5411	**11017**							12000
2016															12000
2017															12000
2018															12000
2019															12000
2020															12000
2021															12000
2022															12000
2023															12000
2024															12000
2025															12000

Survival and Initial Population Estimates

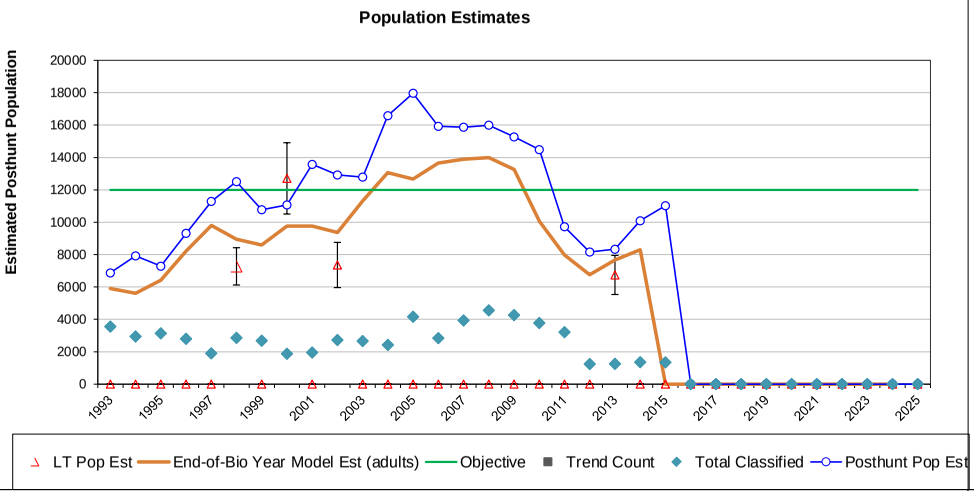
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.90			0.87		
1994	0.42			0.87		
1995	0.90			0.87		
1996	0.89			0.87		
1997	0.85			0.87		
1998	0.40			0.87		
1999	0.67			0.87		
2000	0.90			0.87		
2001	0.40			0.87		
2002	0.40			0.87		
2003	0.90			0.87		
2004	0.66			0.87		
2005	0.40			0.87		
2006	0.83			0.87		
2007	0.90			0.87		
2008	0.90			0.87		
2009	0.90			0.87		
2010	0.40			0.87		
2011	0.40			0.87		
2012	0.41			0.87		
2013	0.90			0.87		
2014	0.61			0.87		
2015	0.75			0.87		
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

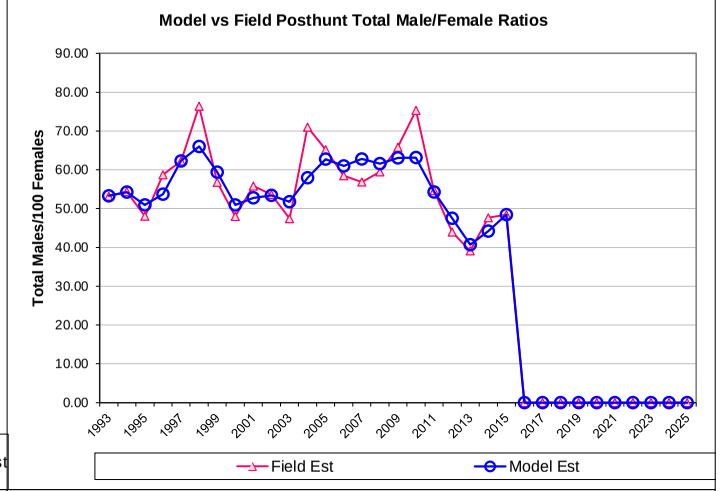
Parameters:	Optim cells
Adult Survival =	0.866
Initial Total Male Pop/10,000 =	0.220
Initial Female Pop/10,000 =	0.413

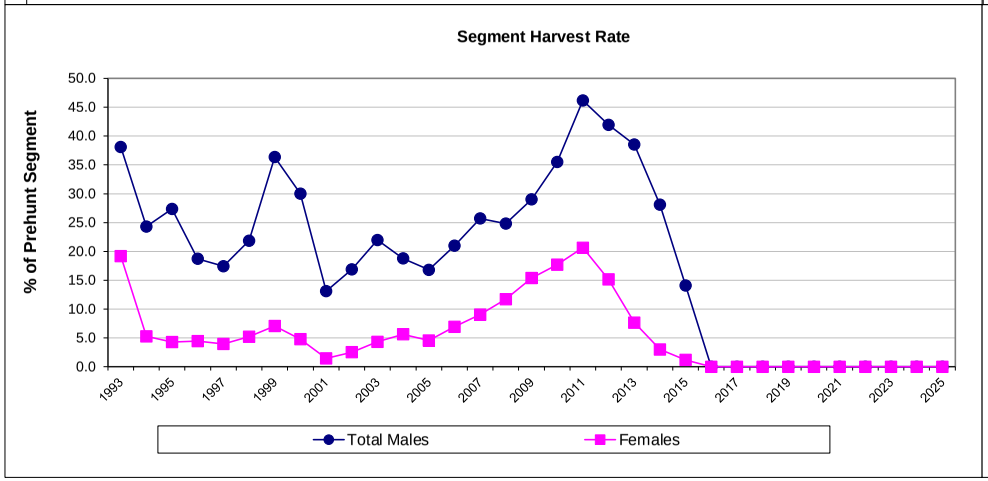
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Over-summer adult survival	98%

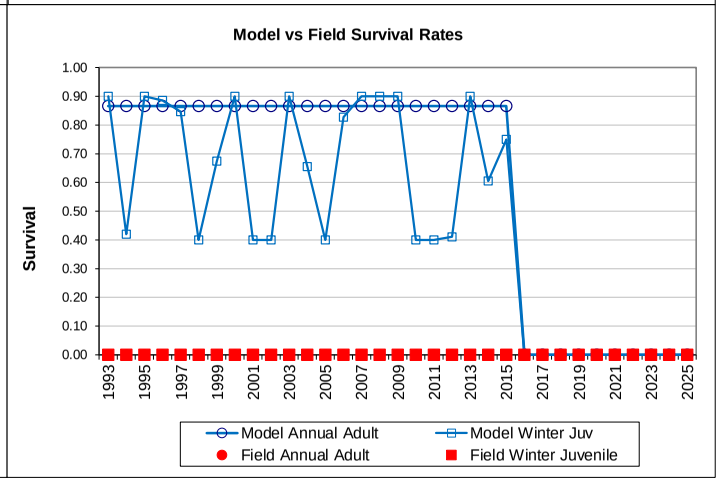
	Classification Counts										Harvest	
Year	Juvenile/Female Ratio			Total Male/Female Ratio							Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est	Field SE	Males	Females	Juveniles	Total Harvest	Total Males	Females
1993		55.76	2.26	53.29	53.18	2.19	762	720	122	1604	38.1	19.2
1994		76.02	3.24	54.26	54.39	2.57	450	180	27	657	24.3	5.3
1995		67.95	2.80	50.95	48.04	2.21	461	142	16	619	27.4	4.3
1996		88.33	3.84	53.72	58.71	2.87	375	166	11	552	18.7	4.5
1997		80.43	4.31	62.27	62.28	3.59	490	179	27	696	17.4	4.0
1998		70.59	3.23	66.01	76.38	3.41	758	274	32	1064	21.9	5.2
1999		65.92	3.02	59.40	56.77	2.72	1081	354	48	1483	36.4	7.1
2000		68.44	3.65	50.94	47.98	2.86	775	243	41	1059	30.0	4.8
2001		72.80	3.84	52.78	55.80	3.19	394	83	20	497	13.1	1.5
2002		65.73	2.96	53.42	53.63	2.58	511	144	12	667	16.9	2.5
2003		75.80	3.35	51.78	47.39	2.42	626	238	31	895	22.0	4.3
2004		94.84	4.51	57.96	70.99	3.65	696	361	21	1078	18.8	5.7
2005		81.44	2.96	62.76	65.18	2.53	754	326	42	1122	16.8	4.6
2006		66.06	2.95	61.00	58.47	2.71	898	486	60	1444	21.0	6.9
2007		57.19	2.21	62.79	56.86	2.20	1207	676	131	2014	25.7	9.0
2008		55.96	2.03	61.60	59.46	2.12	1171	897	46	2114	24.8	11.7
2009		52.64	2.03	63.08	65.81	2.37	1399	1176	25	2600	29.0	15.4
2010		60.66	2.47	63.16	75.30	2.87	1624	1282	134	3040	35.5	17.7
2011		44.87	2.01	54.28	54.64	2.29	1454	1197	67	2718	46.2	20.6
2012		43.05	3.05	47.52	43.96	3.09	960	730	73	1763	41.9	15.2
2013		61.06	3.97	40.70	39.10	2.95	670	327	50	1047	38.5	7.7
2014		65.62	4.14	44.20	47.63	3.33	615	180	15	759	28.1	3.0
2015		60.94	3.91	48.44	48.44	3.35			60	410	14.1	1.2
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES









Comments:

Appendix A:
Rattlesnake Pronghorn Line Transect Survey
Bio-Year 2013 - Results and Histogram

Effort: 471.5700
samples: 42
Width: 209.0000
Left: 0.0000000
observations: 266

Model 1
Hazard Rate key, k(y) = 1 - Exp(-(y/A(1))**-A(2))

Parameter	Point Estimate	Standard Error	Percent Coef. of Variation	95% Confidence Interval	
DS	4.5805	0.80308	17.53	3.2496	6.4566
E(S)	1.5674	0.56614E-01	3.61	1.4598	1.6829
D	7.17	1.2852	17.90	5.0583	10.190
N	6741.0	1206.7	17.90	4750.0	9568.0

Measurement Units

Density: Numbers/Sq. miles
ESW: meters

Component Percentages of Var(D)

Detection probability: 70.4
Encounter rate: 25.5
Cluster size: 4.1

Estimation Summary: Encounter Rates

	Estimate	% CV	DF	95% Confidence Interval	
n	266.00				
k	42.000				
L	471.57				
n/L	0.56407	9.04	21.00	0.46757	0.68050
Left	0.0000				
Width	209.00				

Estimation Summary: Detection Probability

Hazard/Polynomial

	Estimate	% CV	DF	95% Confidence Interval	
m	2.0000				
LnL	-427.21				
AIC	858.42				
AICc	858.46				
BIC	865.58				
Chi-p	0.46230				
f(0)	0.10092E-01	15.02	264.00	0.75202E-02	0.13542E-01
p	0.47412	15.02	264.00	0.35331	0.63625
ESW	99.092	15.02	264.00	73.842	132.98

Estimation Summary – Expected Cluster Size

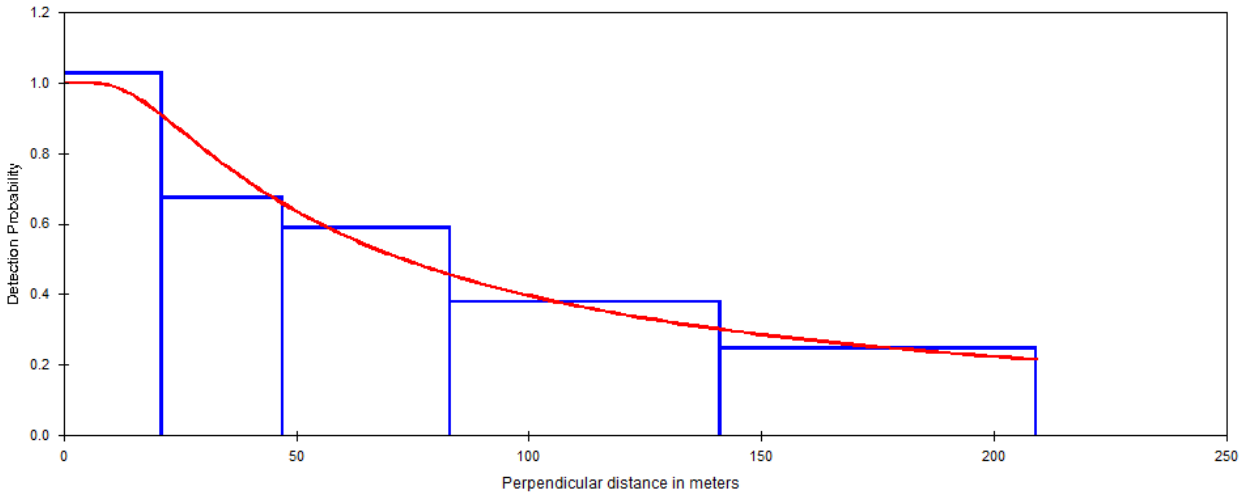
Estimate			
Average cluster size	%CV	df	95% Confidence Interval
1.7105	6.03	1.5191	1.9261

Hazard/Cosine

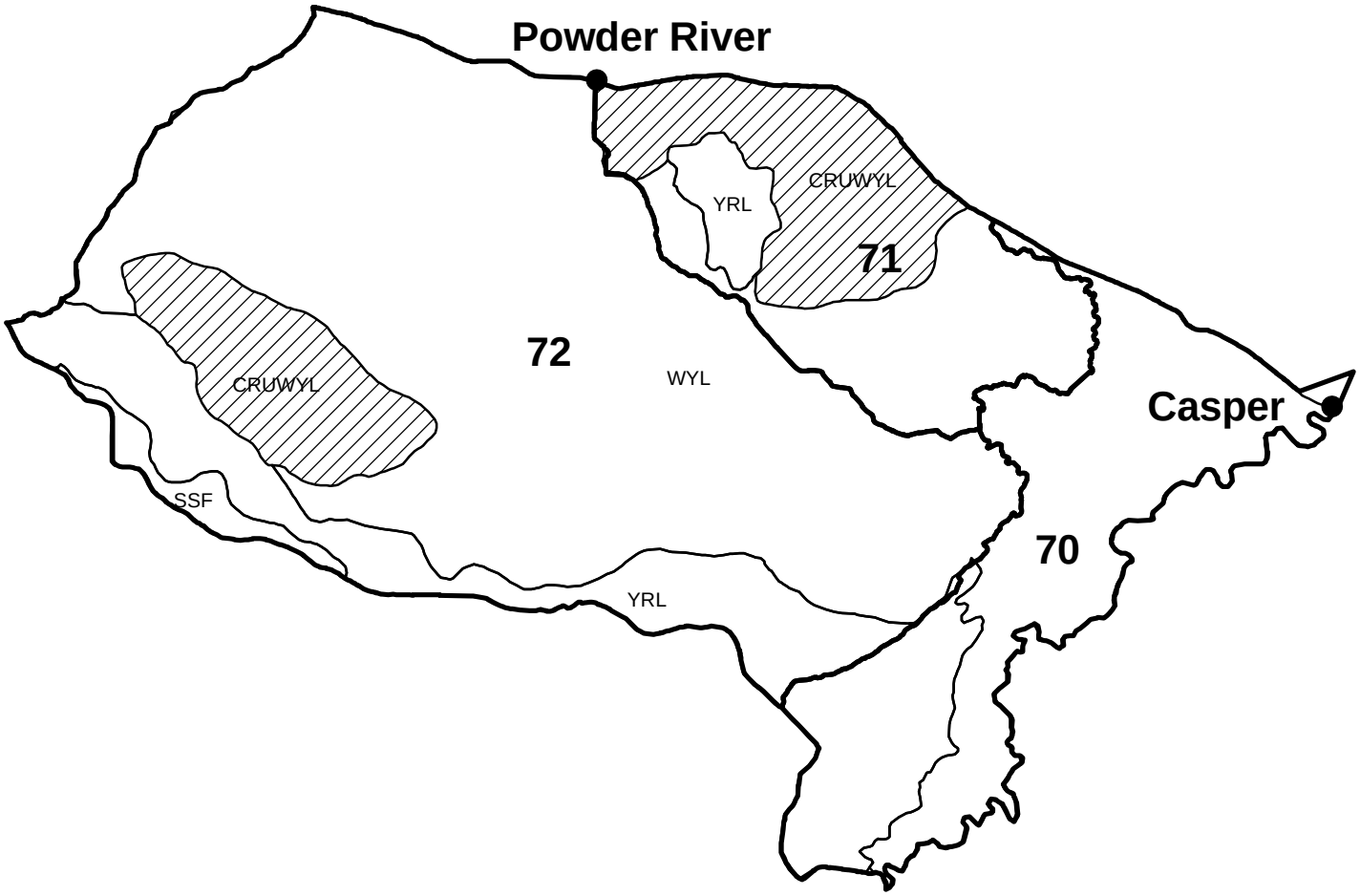
	Estimate	% CV	DF	95% Confidence Interval	
r	-0.43212E-01				
r-p	0.24141				
E(S)	1.5674	3.61	264.00	1.4598	1.6829

Estimation Summary – Density & Abundance

	Estimate	% CV	DF	95% Confidence Interval	
D	4.5805	17.53	184.88	3.2496	6.466
DS	7.1794	17.90	200.66	5.0583	10.190
N	6741.0	17.90	200.66	4750.0	9568.0


1.2
1.0
0.8
0.6
0.4
0.2
0.0
Detection Probability
0
50
100
150
200
250
Perpendicular distance in meters

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



2014 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2014 - 5/31/2015

HERD: PR746 - NORTH NATRONA

HUNT AREAS: 73

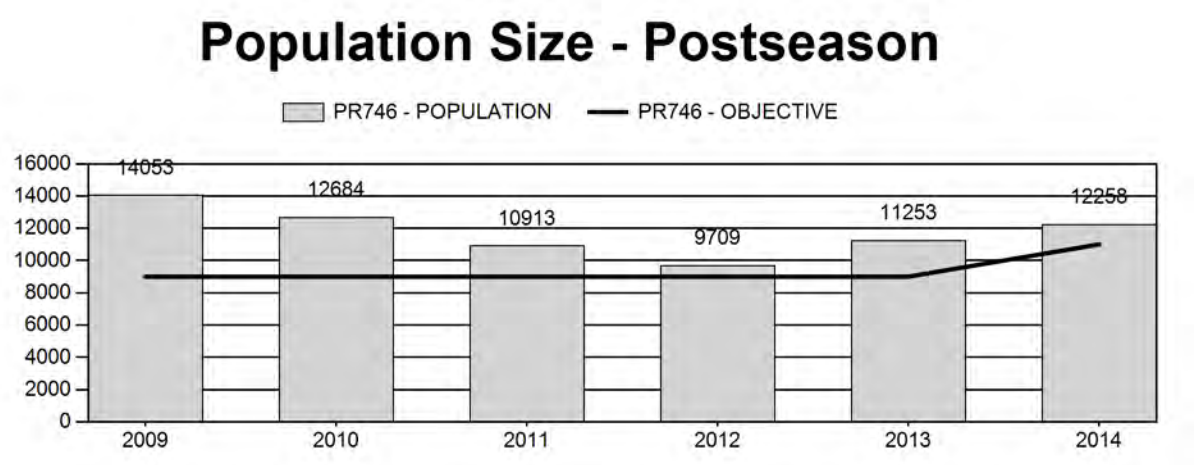
PREPARED BY: HEATHER O'BRIEN

	2009 - 2013 Average	2014	2015 Proposed
Population:	11,722	12,258	11,459
Harvest:	968	664	815
Hunters:	1,122	684	820
Hunter Success:	86%	97%	99 %
Active Licenses:	1,187	709	900
Active License Success:	82%	94%	91 %
Recreation Days:	3,728	1,798	2,200
Days Per Animal:	3.9	2.7	2.7
Males per 100 Females	55	45	
Juveniles per 100 Females	58	80	

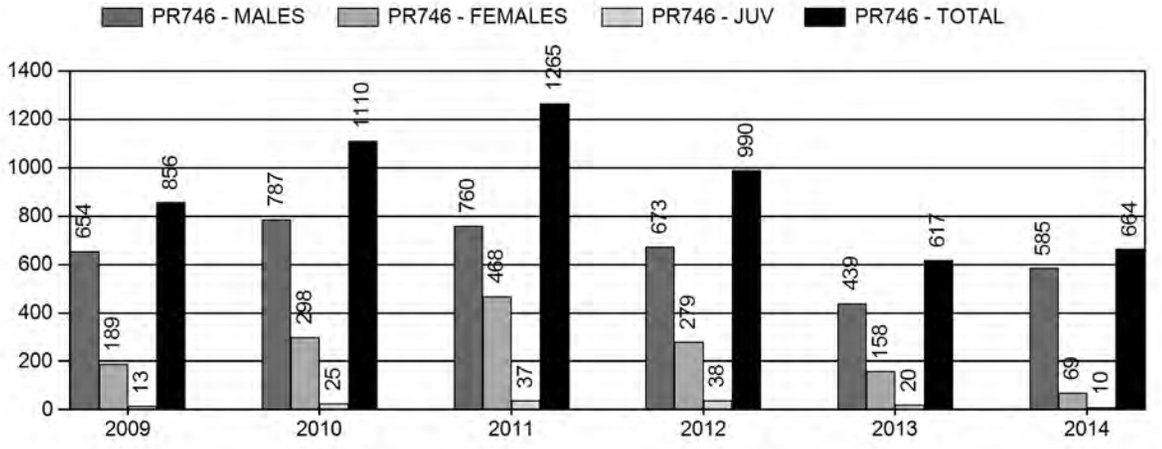
Population Objective (± 20%) :	11000 (8800 - 13200)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	11%
Number of years population has been + or - objective in recent trend:	2
Model Date:	02/18/2015

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

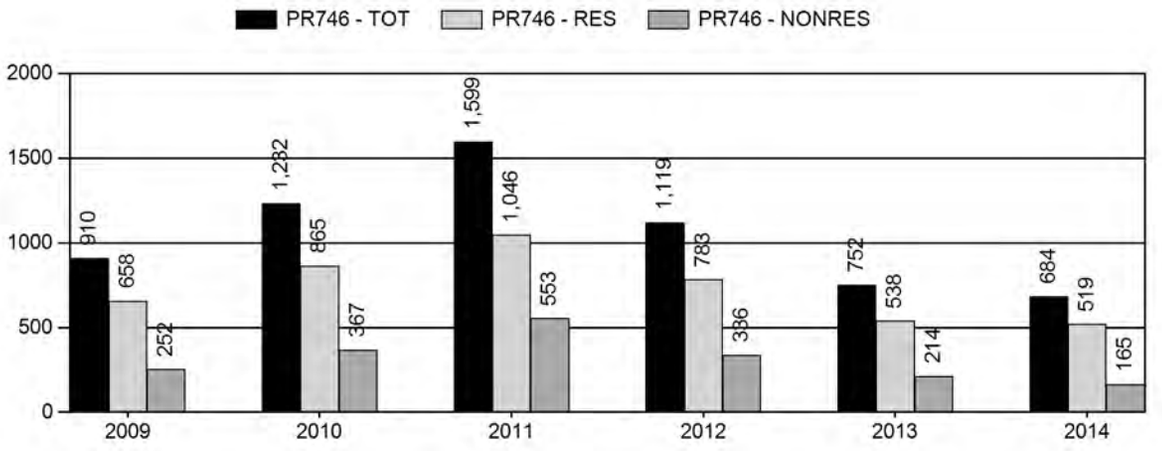
	JCR Year	Proposed
Females ≥ 1 year old:	1.20%	3.87%
Males ≥ 1 year old:	22.3%	21.6%
Juveniles (< 1 year old):	0.22%	0.01%
Total:	.05%	.39%
Proposed change in post-season population:	8.21%	-6.52%



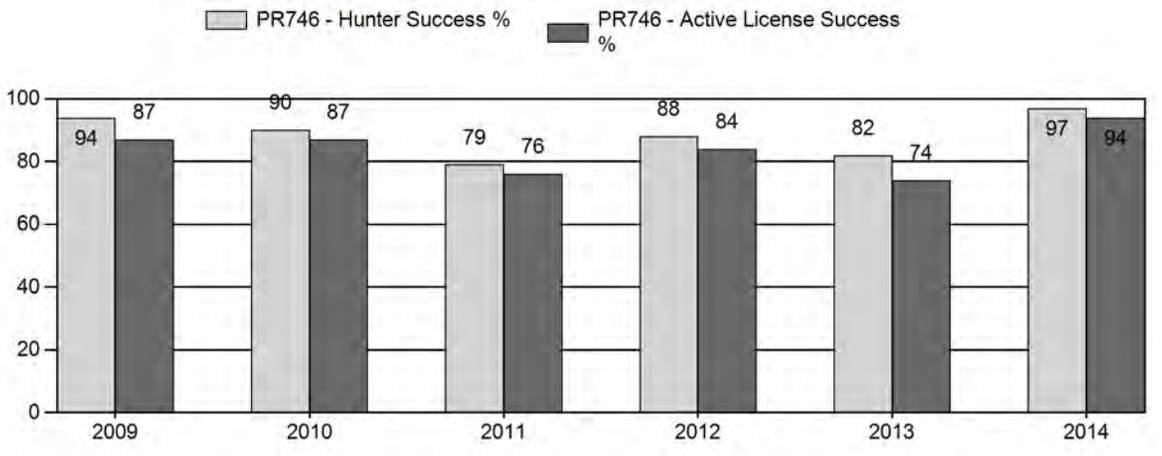
Harvest



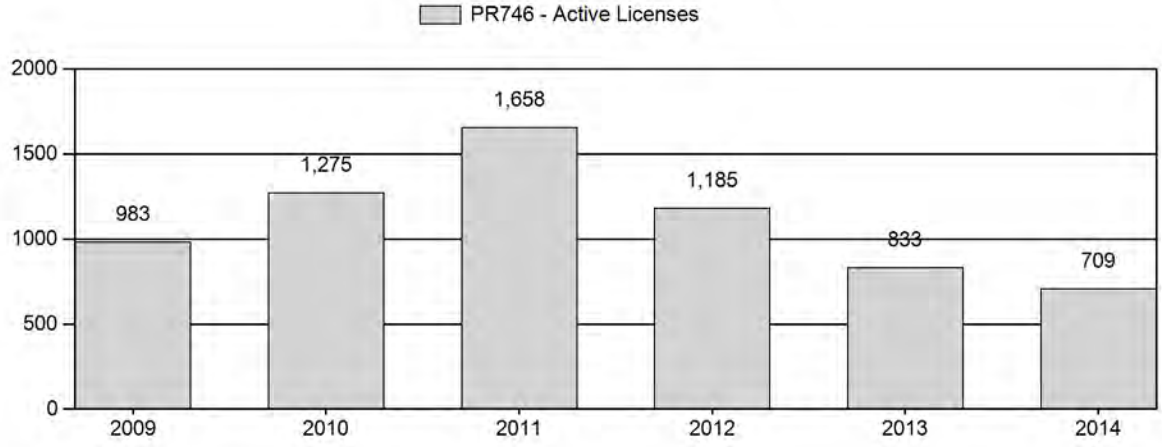
Number of Hunters



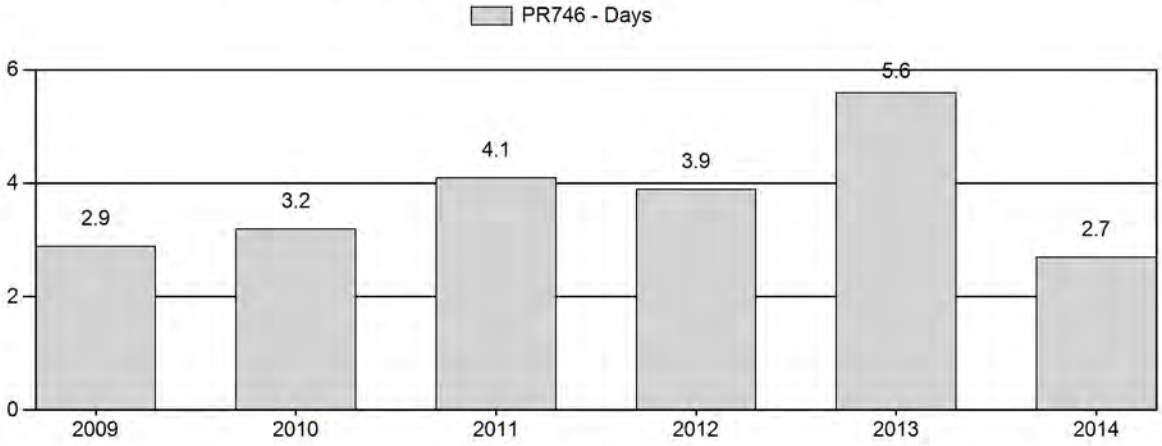
Harvest Success



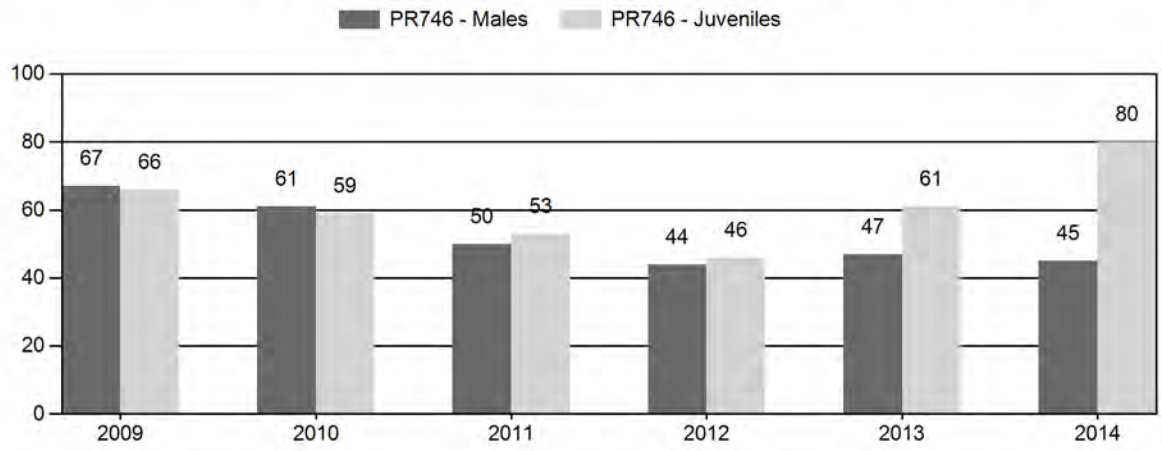
Active Licenses



Days Per Animal Harvested



Preseason Animals per 100 Females



2009 - 2014 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	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	14,995	273	541	814	29%	1,218	43%	809	28%	2,841	2,361	22	44	67	± 4	66	± 4	40
2010	13,905	172	392	564	28%	932	46%	552	27%	2,048	1,988	18	42	61	± 5	59	± 5	37
2011	12,323	119	540	659	25%	1,322	49%	697	26%	2,678	2,129	9	41	50	± 3	53	± 4	35
2012	10,798	127	190	317	23%	713	53%	327	24%	1,357	1,843	18	27	44	± 5	46	± 5	32
2013	11,932	69	318	387	23%	817	48%	497	29%	1,701	1,832	8	39	47	± 4	61	± 5	41
2014	12,988	85	210	295	20%	650	44%	520	35%	1,465	1,915	13	32	45	± 5	80	± 7	55

2015 HUNTING SEASONS
NORTH NATRONA PRONGHORN HERD (PR746)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
73	1	Sep. 15	Oct. 31	800	Limited quota	Any antelope
	6	Sep. 15	Oct. 31	250	Limited quota	Doe or fawn antelope
Archery		Aug. 15	Sep. 14			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2014
73	1	No change
	6	+150

Management Evaluation

Current Postseason Population Management Objective: 11,000
Management Strategy: Recreational
2014 Postseason Population Estimate: ~12,300
2015 Proposed Postseason Population Estimate: ~11,500
2014 Hunter Satisfaction: 91% Satisfied, 8% Neutral, 1% Dissatisfied

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

Herd Unit Issues

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

suitable, though there were no reported or confirmed cases of disease outbreak within the North Natrona Herd in 2014.

Weather

The winter of 2010-2011 was severe throughout the herd unit, resulting in high mortality of pronghorn across all age classes. Conditions were warm and dry for the herd unit in 2011 and shrub production was below average, resulting in poor nutrition of pronghorn entering the winter of 2011-2012. Snow pack and resulting spring moisture was below average for the winter of 2011-2012 which likely had a negative impacts on lactating does and their fawns. The summer of 2012 was the driest on record since 1904 in much of Wyoming, and the winter of 2012 continued the trend with very low snow accumulation and snow pack. The spring of 2013 was cool with significant precipitation, with average rains over the summer as well. Still, habitat conditions remained poor in portions of the herd that received less spring and summer rain. Heavy precipitation during the fall of 2013 caused a beneficial late green-up, but also made travel difficult to impossible for hunters. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. Grass and forb growth were excellent, making 2014 the best growing season the region had seen in years. The spring and summer of 2014 undeniably produced improved range conditions that benefitted pronghorn. For detailed weather data see http://www.ncdc.noaa.gov/gac/time-series/us.

Habitat

Eight sagebrush transects were established within this herd in 2014 as part of the population objective review. These transects were measured for utilization and will be measured again in spring 2015. Utilization was light to moderate on all eight transects in 2014. This suggests current pronghorn population size and the revised objective are sustainable given available habitat. Anecdotal observations and discussions with landowners in the region confirm summer and winter forage availability for pronghorn was very good. Herbaceous forage species were observed to be in very good condition in 2014 compared to the previous years, and pronghorn appeared to be widely distributed across suitable habitat.

Field Data

Fawn production was high in this herd from 2002-2005, and the population grew markedly during this time period. Fawn production was moderate to poor from 2006-2013, but the population continued to grow through 2009 as license issuance did not keep pace with herd growth. In 2010-2011, license issuance increased sharply to address high antelope numbers and

reduce the herd toward objective, prior to our knowledge of high winter mortality. By 2012, higher license issuance was no longer necessary to control growth of the herd, and licenses were reduced. Hunter harvest, mortality from harsh winter conditions in 2010-2011, poor fawn production/survival, and severe drought subsequently reduced this herd. Fawn production improved markedly in 2013, and reached a 13-year high of 80 per 100 does in 2014. Mild winter weather followed by excellent growing season conditions helped to improve conditions for fawns and lactating does in 2014. Overwinter survival of fawns appeared to improve from 2013 to 2014 as well, as evidenced by higher yearling buck ratios.

Buck ratios for the North Natrona Herd historically average in the mid-50s:100 does, though they exceeded recreational limits from 2007-2010, when ratios were in the 60s. Buck ratios dropped markedly in 2011 and reached a 15-year low of 44 bucks per 100 does in 2012. The buck ratio held steady in the mid-40s per 100 does for 2013 and 2014 - well within the target range for recreational management. Ultimate management goals are to maintain buck ratios within this range to sustain high hunter satisfaction, while continuing to offer exceptional opportunity and good drawing odds via recreational management.

Harvest Data

License success in this herd unit is typically in the 80-90th percentile. Harvest success was lower from 2011-2013 as population size dropped markedly. License issuance was also reduced during the same time period, but may not have kept pace with declining pronghorn numbers. Despite this, hunter satisfaction increased from 82% in 2012 to 89% in 2013, indicating that hunters were pleased with their hunt despite issues of poor weather and road conditions. In 2014, license issuance was at a 10-year low, but pronghorn numbers also began to recover. Weather and access conditions were also very good; thus, hunters enjoyed much improved harvest success in the 90th percentile, and significantly lower average hunter days compared to the previous four years. As a result, North Natrona hunters expressed the highest percentage of satisfaction in the state for pronghorn in 2014.

Population

The “Time-Specific Juvenile Survival - Constant Adult Survival” (TSJ,CA) spreadsheet model was chosen to use for the post-season population estimate of this herd. This model seemed the most representative of the herd, as it selects for higher juvenile survival during the years when field personnel observed more favorable environmental and habitat conditions, particularly from 2003-2008. The simpler models (CJ,CA and SCJ,CA) select for a very low juvenile survival rate across years, which does not seem feasible for this herd. All three models follow a trend that seems representative for this herd unit. The three models each align partially to four line-transect estimates – each model aligning through some but not all line-transect estimates completely.

However, the CJ,CA and SCJ,CA models estimate population peaks in 2009 that do not seem realistic compared to the perceptions of field personnel and landowners at that time. While the AIC for the TSJ,CA model is the highest of the three, it is only due to year-by-year penalties and is still well within one level of power in comparison to the AICs of the simpler models. The TSJ, CA model aligns with two of four line transect estimates, and is very close to the confidence intervals for the remaining two. The 2012 line transect had a wide standard error, and is considered to be an overestimate of population size for that year. However, its addition in the model only changes the current population estimate by about 100 animals. Thus, it was left in the model as it provides an additional estimation point for the model to utilize. While the model does select upper and lower constraints for juvenile survival for several years of simulation, The TSJ,CA model still appears to be the best representation relative to the perceptions of managers on the ground while following trends with license issuance and harvest success. Overall the model is considered to be fair in representing dynamics of the herd.

Management Summary

Traditional season dates in this herd run from September 15th through October 31st. Season dates will remain the same for 2015, as will Type 1 license issuance. The 2015 season includes 800 Type 1 licenses and 250 Type 6 licenses. The Type 7 licenses specific to private agricultural lands are still unnecessary in 2015, as damage has not been an issue and access on private lands in the southeast portion of the herd unit has been poor. Landowners that normally utilize the Type 7 license can still take hunters with a Type 6 license, should they have a need to control for agricultural damage. Population growth rates improved in 2014, and managers need to maintain the herd near the new objective of 11,000 rather than allowing further growth. Goals for 2015 are to hold the pronghorn population near objective, increase opportunity for doe/fawn harvest, and to maintain current buck ratios, hunter success, and hunter satisfaction.

If we attain the projected harvest of 815 with average fawn production, this herd will remain stable at slightly above objective. The predicted 2015 post-season population size of the North Natrona Pronghorn Herd is approximately 11,500 animals, which is 4% above objective.

Species:	Pronghorn
Biologist:	Heather O'Brien
Herd Unit & No.:	North Natrona PR746
Model date:	02/18/15

☑ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	104	113	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	98	112	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	40	153	☑ TSJ,CA Model	

Population Estimates from Top Model

Year	Predicted Prehunt Population (year *i*)			Total	Predicted Posthunt Population (year *i*)			Total	Predicted adult End-of-bio-year Pop (year *i*)			LT Population Estimate		Trend Count	Objective
	Juveniles	Total Males	Females		Juveniles	Total Males	Females		Total Males	Females	Total Adults	Field Est	Field SE		
1993	2441	2122	3862	**8424**	2374	1409	3331	**7114**	2253	3993	**6246**				9000
1994	3145	2208	3913	**9266**	3124	1779	3805	**8709**	2373	4223	**6596**				9000
1995	2982	2326	4139	**9447**	2970	1916	4049	**8935**	2260	4206	**6466**				9000
1996	4083	2215	4122	**10420**	4072	1812	3965	**9849**	2394	4347	**6742**				9000
1997	2375	2346	4260	**8982**	2351	1921	4125	**8396**	2467	4472	**6939**				9000
1998	4106	2418	4382	**10906**	4080	1960	4243	**10283**	2516	4594	**7111**	5485	995		9000
1999	3052	2466	4503	**10020**	3041	2046	4376	**9462**	2555	4673	**7228**				9000
2000	3442	2504	4580	**10526**	3429	2050	4431	**9910**	2533	4698	**7230**	8211	1412		9000
2001	3030	2482	4604	**10115**	2993	2161	4499	**9653**	2488	4603	**7091**				9000
2002	3226	2438	4511	**10175**	3217	1998	4334	**9549**	2381	4501	**6882**				9000
2003	3322	2334	4411	**10066**	3310	1873	4224	**9406**	2871	5004	**7875**	8514	1020		9000
2004	4115	2813	4904	**11832**	4063	2248	4702	**11013**	3048	5285	**8332**				9000
2005	4398	2987	5179	**12564**	4366	2343	4947	**11656**	3525	5902	**9427**				9000
2006	3043	3454	5784	**12281**	3024	2781	5410	**11215**	3785	6170	**9954**				9000
2007	2594	3709	6046	**12349**	2557	3032	5719	**11309**	3793	6237	**10030**				9000
2008	3194	3717	6112	**13024**	3173	3061	5931	**12165**	4105	6728	**10832**				9000
2009	4379	4023	6593	**14995**	4365	3303	6385	**14053**	3744	6560	**10304**				9000
2010	3808	3669	6429	**13905**	3780	2803	6101	**12684**	3155	6168	**9323**				9000
2011	3187	3092	6045	**12324**	3146	2240	5527	**10913**	2655	5734	**8389**				9000
2012	2577	2602	5619	**10798**	2535	1862	5312	**9709**	2812	5821	**8633**	11083	2235		9000
2013	3470	2756	5705	**11931**	3448	2273	5531	**11252**	2669	5880	**8549**				9000
2014	4610	2615	5763	**12988**	4599	1972	5687	**12258**	2716	5919	**8635**				11000
2015	3893	2662	5800	**12356**	3877	2029	5553	**11459**							11000
2016															11000
2017															11000
2018															11000
2019															11000
2020															11000
2021															11000
2022															11000
2023															11000
2024															11000
2025															11000

Survival and Initial Population Estimates

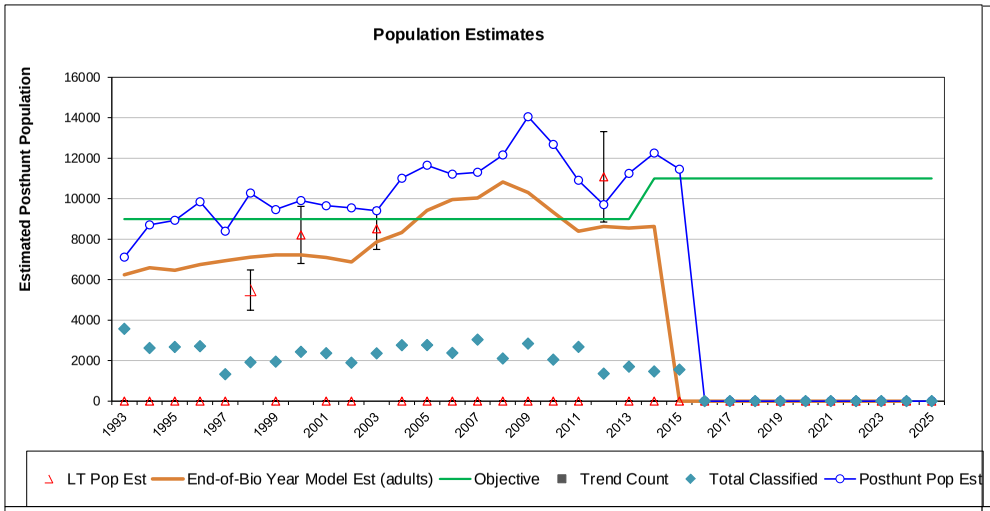
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.90			0.87		
1994	0.53			0.87		
1995	0.40			0.87		
1996	0.40			0.87		
1997	0.68			0.87		
1998	0.40			0.87		
1999	0.51			0.87		
2000	0.44			0.87		
2001	0.40			0.87		
2002	0.40			0.87		
2003	0.75			0.87		
2004	0.54			0.87		
2005	0.68			0.87		
2006	0.90			0.87		
2007	0.90			0.87		
2008	0.90			0.87		
2009	0.40			0.87		
2010	0.40			0.87		
2011	0.40			0.87		
2012	0.75			0.87		
2013	0.49			0.87		
2014	0.44			0.87		
2015	0.40			0.87		
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

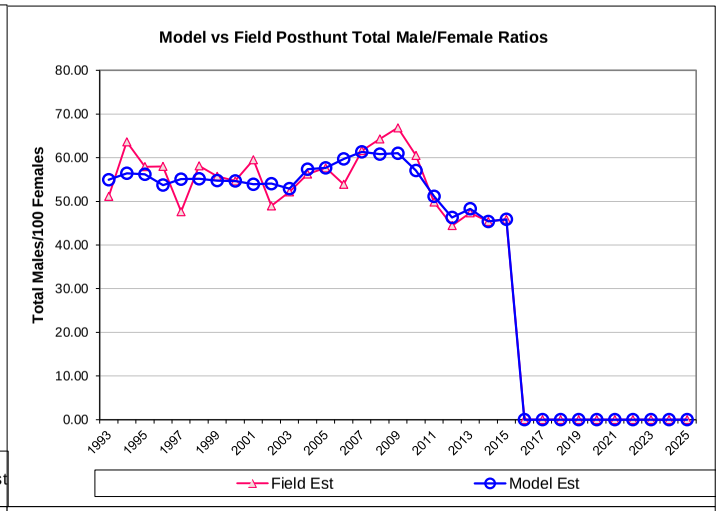
Parameters:	Optim cells
Adult Survival =	0.875
Initial Total Male Pop/10,000 =	0.212
Initial Female Pop/10,000 =	0.386

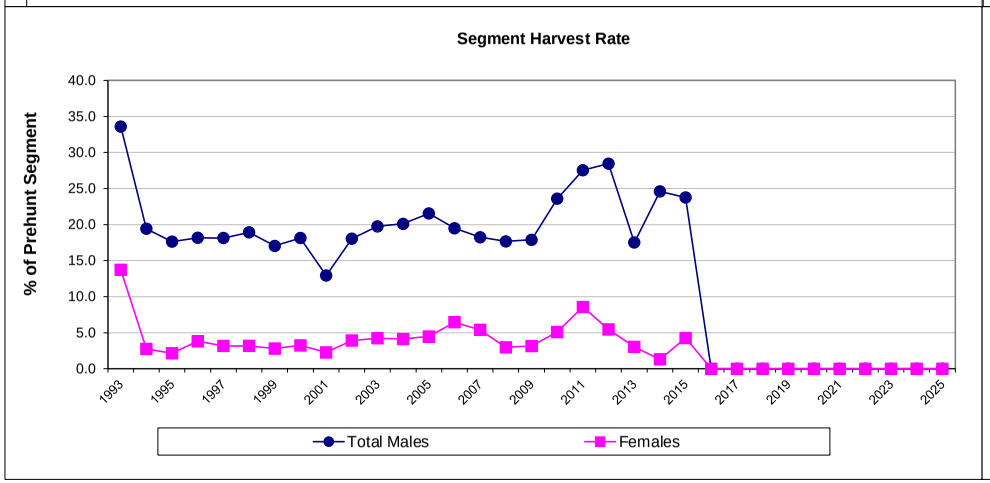
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Over-summer adult survival	98%

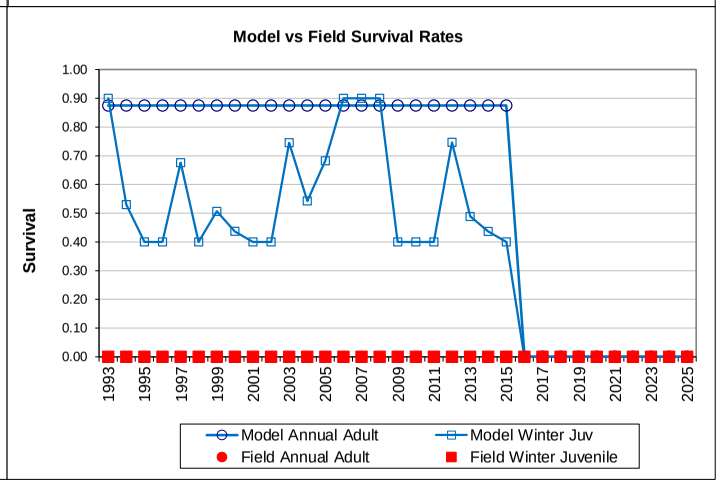
	Classification Counts										Harvest	
Year	Juvenile/Female Ratio			Total Male/Female Ratio							Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est	Field SE	Males	Females	Juveniles	Total Harvest	Total Males	Females
1993		63.21	2.49	54.95	51.14	2.15	648	482	61	1191	33.6	13.7
1994		80.37	3.67	56.44	63.63	3.11	390	98	19	507	19.4	2.8
1995		72.06	3.26	56.20	57.95	2.81	373	81	11	465	17.6	2.2
1996		99.05	4.32	53.74	58.01	2.95	366	143	10	519	18.2	3.8
1997		55.74	3.65	55.08	47.63	3.28	387	123	22	532	18.1	3.2
1998		93.70	4.88	55.17	58.14	3.47	416	127	24	567	18.9	3.2
1999		67.78	3.61	54.76	55.73	3.15	382	115	10	507	17.0	2.8
2000		75.17	3.53	54.67	54.67	2.83	413	135	12	560	18.1	3.2
2001		65.81	3.22	53.91	59.52	3.01	292	95	33	420	12.9	2.3
2002		71.51	3.78	54.04	48.95	2.91	400	161	8	569	18.0	3.9
2003		75.31	3.57	52.91	52.17	2.77	419	170	11	600	19.7	4.2
2004		83.91	3.66	57.36	56.26	2.76	514	184	47	745	20.1	4.1
2005		84.93	3.71	57.67	57.67	2.82	585	211	29	825	21.5	4.5
2006		52.60	2.64	59.72	53.91	2.68	612	340	17	969	19.5	6.5
2007		42.90	2.03	61.34	61.62	2.59	615	297	33	945	18.2	5.4
2008		52.26	2.86	60.82	64.30	3.30	597	165	19	781	17.7	3.0
2009		66.42	3.01	61.01	66.83	3.03	654	189	13	856	17.9	3.2
2010		59.23	3.18	57.06	60.52	3.23	787	298	25	1110	23.6	5.1
2011		52.72	2.47	51.15	49.85	2.38	774	471	37	1282	27.5	8.6
2012		45.86	3.06	46.31	44.46	3.00	673	279	38	990	28.4	5.5
2013		60.83	3.46	48.31	47.37	2.92	439	158	20	617	17.5	3.0
2014		80.00	4.71	45.38	45.38	3.19	520	150	25	664	24.6	1.3
2015		67.12	3.92	45.89	45.89	3.03			225	815	23.8	4.3
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES



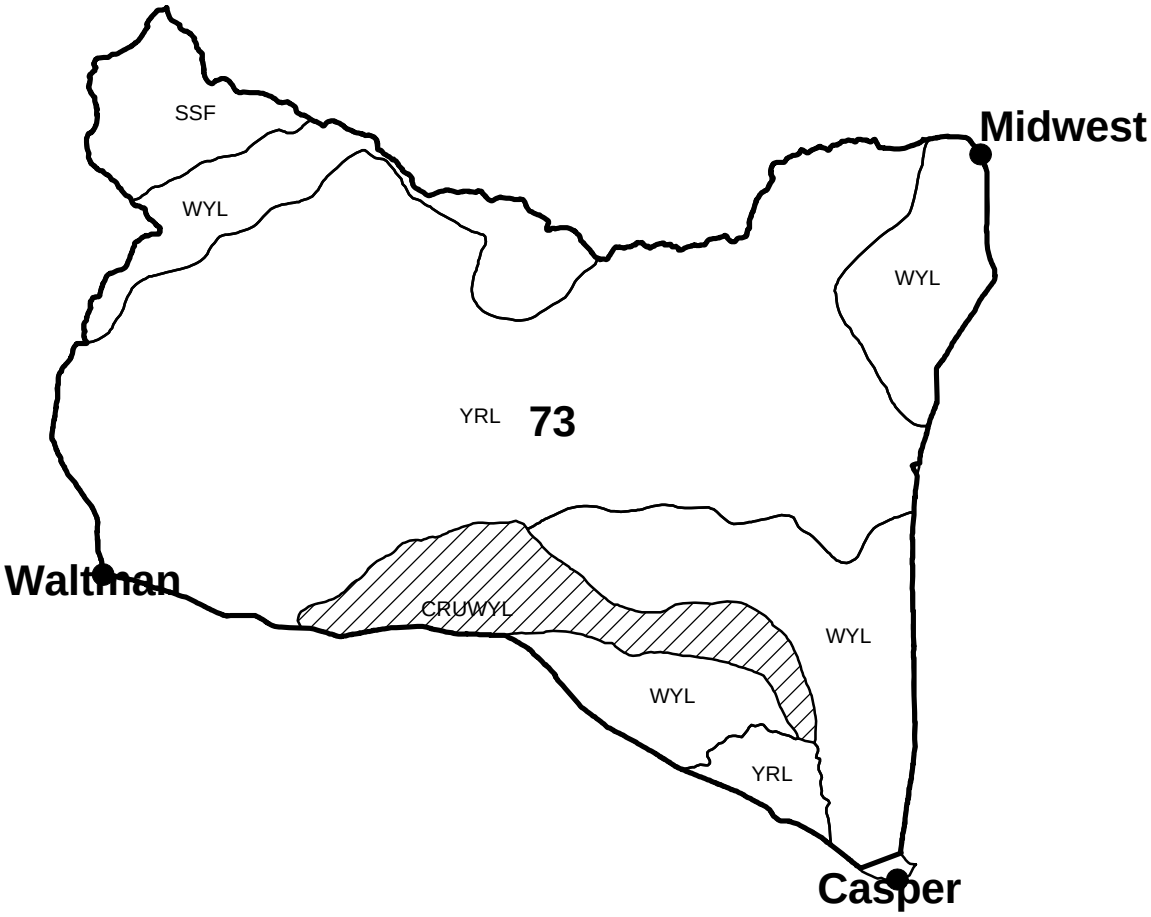






Comments:

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



2014 - JCR Evaluation Form

SPECIES: Pronghorn
PERIOD: 6/1/2014 - 5/31/2015

HERD: PR748 - NORTH CONVERSE

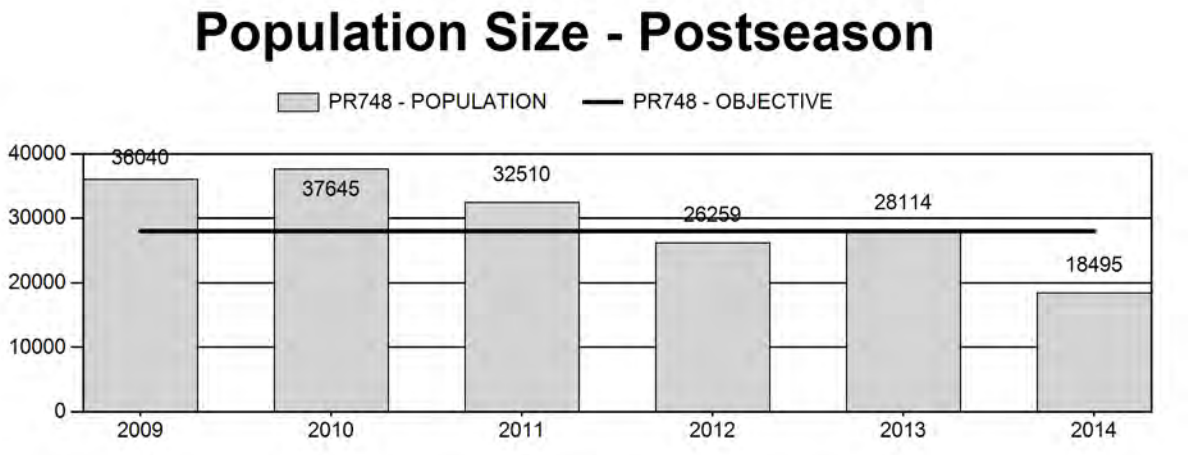
HUNT AREAS: 25-26
PREPARED BY: WILLOW HIBBS

	2009 - 2013 Average	2014	2015 Proposed
Population:	32,114	18,495	19,761
Harvest:	2,930	1,520	1,600
Hunters:	3,299	1,721	1,700
Hunter Success:	89%	88%	94%
Active Licenses:	3,460	1,842	1,800
Active License Success:	85%	83%	89%
Recreation Days:	10,937	5,202	5,100
Days Per Animal:	3.7	3.4	3.2
Males per 100 Females	68	55	
Juveniles per 100 Females	71	83	

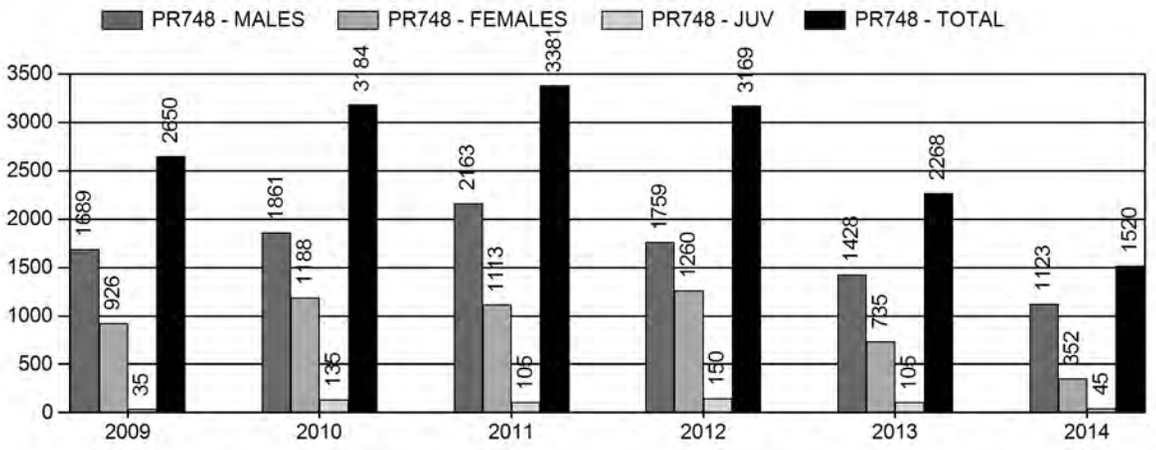
Population Objective (± 20%) :	28000 (22400 - 33600)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-33.9%
Number of years population has been + or - objective in recent trend:	4
Model Date:	2/25/2015

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

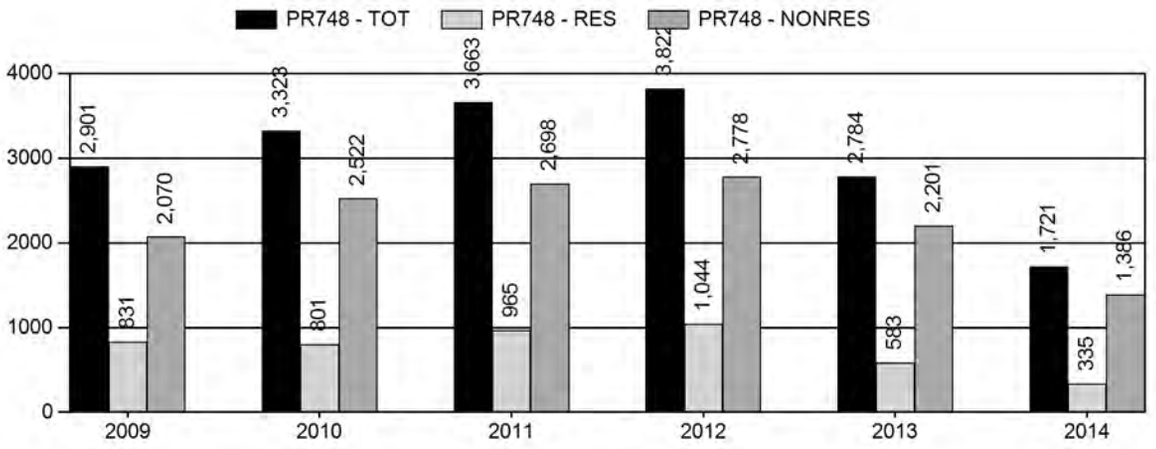
	JCR Year	Proposed
Females ≥ 1 year old:	4.2%	3.7%
Males ≥ 1 year old:	23.9%	21.8%
Juveniles (< 1 year old):	0.6%	0.8%
Total:	7.5%	7.4%
Proposed change in post-season population:	-8.3%	-8.2%



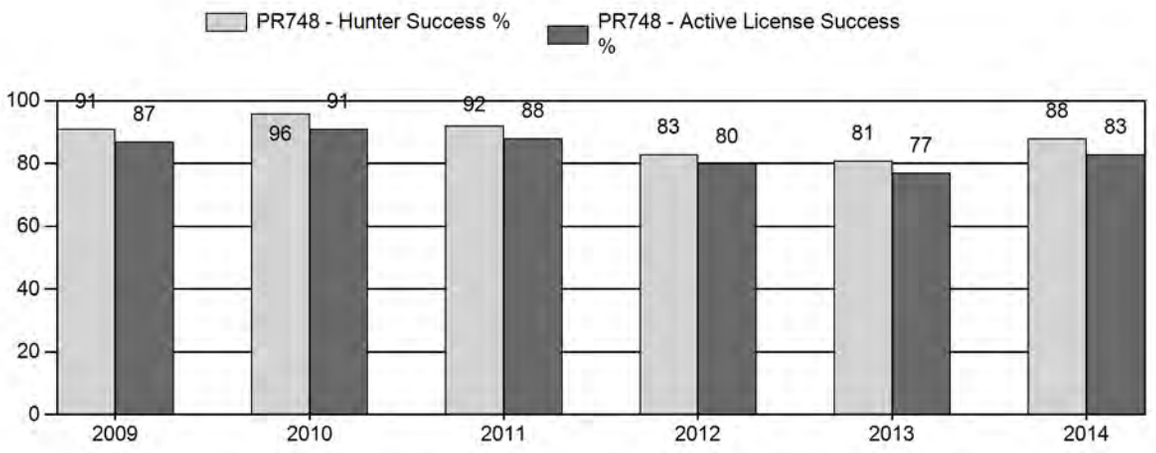
Harvest



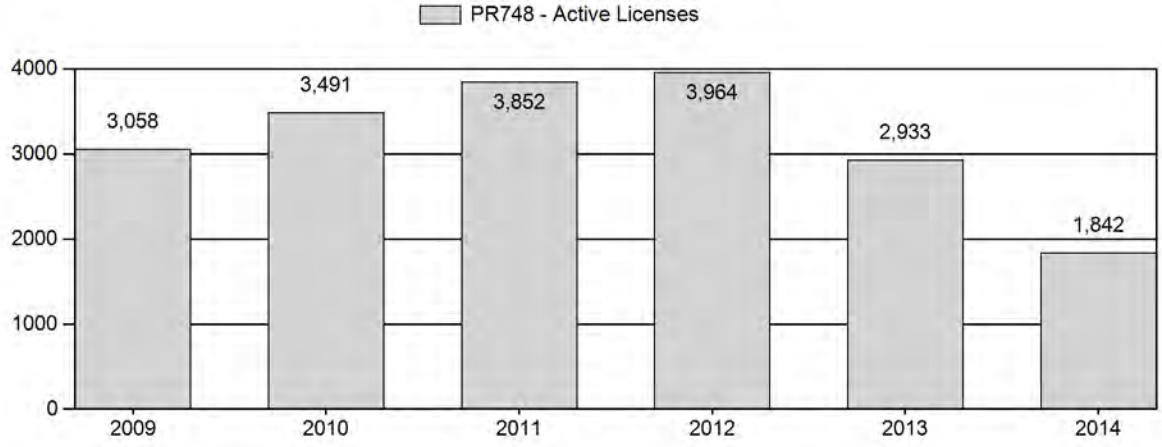
Number of Hunters



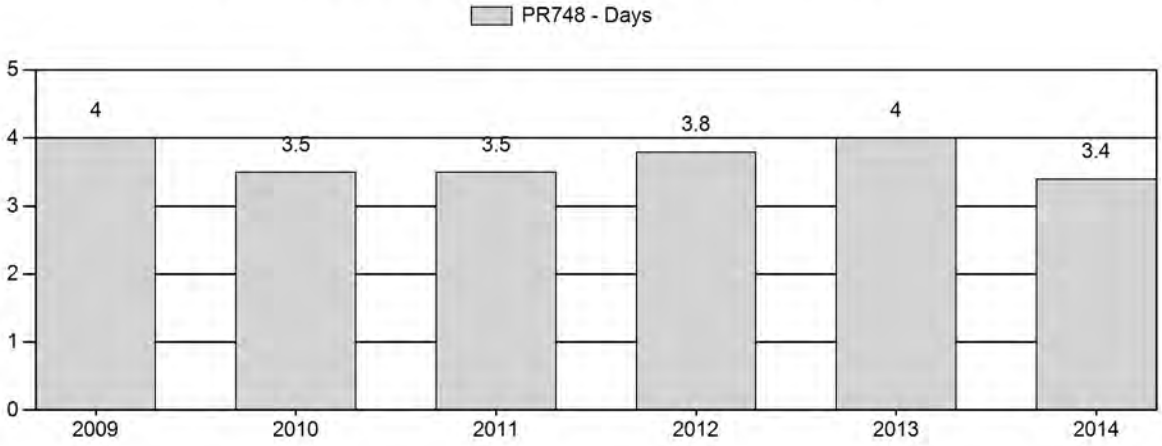
Harvest Success



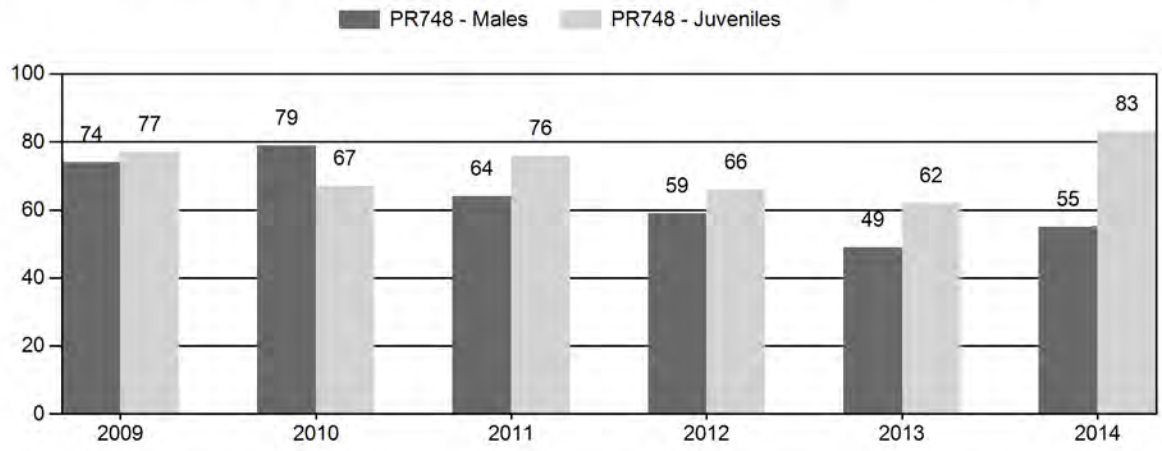
Active Licenses



Days Per Animal Harvested



Preseason Animals per 100 Females



2009 - 2014 Preseason Classification Summary

for Pronghorn Herd PR748 - NORTH CONVERSE

		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
2009	38,955	312	740	1,052	29%	1,430	40%	1,101	31%	3,583	3,287	22	52	74	± 5	77	± 5	44
2010	41,148	373	807	1,180	32%	1,490	41%	999	27%	3,669	3,160	25	54	79	± 5	67	± 4	37
2011	36,229	93	480	573	27%	895	42%	683	32%	2,151	3,105	10	54	64	± 5	76	± 6	47
2012	29,745	82	253	335	26%	567	44%	376	29%	1,278	3,040	14	45	59	± 7	66	± 7	42
2013	30,608	101	294	395	23%	803	47%	498	29%	1,696	2,059	13	37	49	± 5	62	± 6	42
2014	20,167	121	249	370	23%	669	42%	554	35%	1,593	3,415	18	37	55	± 6	83	± 8	53

2015 HUNTING SEASONS
NORTH CONVERSE PRONGHORN HERD (PR748)

Hunt Area	Type	Dates of Seasons Opens	Closes	Quota	License	Limitations
25	1	Oct. 1	Oct. 14	600	Limited quota	Any antelope
	6	Oct. 1	Oct. 14	200	Limited quota	Doe or fawn
26	1	Sep. 24	Oct. 14	900	Limited quota	Any antelope
	6	Sep. 24	Oct. 14	300	Limited quota	Doe or fawn
Archery		Aug. 15	Sep. 30			Refer to license type and limitations in Section 2

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	Type	Quota change from 2014
26	6	-100

Management Evaluation
Current Postseason Population Management Objective: 28,000
Management Strategy: Recreational
2014 Postseason Population Estimate: ~18,500
2015 Proposed Postseason Population Estimate: ~19,800
2014 Hunter Satisfaction: 76% Satisfied, 11% Neutral, 13% Dissatisfied

Herd Unit Issues

The North Converse Pronghorn Herd Unit has a post-season population objective of 28,000 pronghorn. This herd is managed under the recreational management strategy, with a goal of maintaining preseason buck ratios between 30-59 bucks per 100 does. The objective and management strategy were last revised in 1989, and are scheduled for revision in 2015.

Public hunting access within the herd unit is poor, with only small tracts of accessible public land interspersed within predominantly private lands. Two Walk-In Areas provide some additional hunting opportunity, although they are relatively small in size. Primary land uses in this herd unit include extensive oil and gas production, large-scale industrial wind generation, In-Situ uranium production, and traditional cattle and sheep grazing. In recent years, expansion of

oil shale development has dramatically escalated anthropogenic disturbance throughout this herd unit. In addition to current development, the Converse County Oil and Gas EIS is being evaluated. This project proposes to develop up to 5,000 wells on 1,500 pads over the next 10 years. The cumulative impacts on pronghorn in this herd from the present and planned natural resource development are potentially significant.

Weather

Weather conditions throughout 2014 produced above average precipitation, especially during the growing season. These conditions yielded high fawn production and should have also contributed to good body condition of pronghorn going into winter and therefore good over-winter survival. The 2014-2015 winter has been moderate to date with several sub-zero cold snaps and precipitation events occurring earlier in the season, and warmer conditions with mild precipitation realized later in the season. Following more substantial precipitation earlier in the year, warm conditions often occurred in between cold snaps which served to melt out lowlands and expose forage for wintering pronghorn. Therefore, winter survival was thought to be normal over this bio-year.

Habitat

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

Field Data

It has been increasingly difficult to meet classification sample sizes in this herd unit as aerial surveys have been abandoned for safety reasons and budgetary constraints. The total number of animals classified has markedly decreased since aerial surveys were eliminated in 2011. In 2014, the adequate sample size was 3,400 animals, yet only 1,600 pronghorn were classified despite intensive ground coverage.

Fawn production was significantly improved in 2014 with a ratio of 83, which is well above the 5-year average of 70. It should be noted that preseason fawn ratios are typically higher in this herd compared to all other adjacent herd units. This is thought to be attributed to intensive predator control efforts that are sustained throughout much of this herd unit due to widespread domestic sheep production. However, despite relatively higher preseason fawn ratios being observed in this herd unit, overall population trend has declined in this herd to nearly the same extent as adjacent herds. This suggests that while over-summer fawn survival seems to be elevated in this herd, over-winter fawn survival is likely poorer compared to surrounding herds. Several consecutive years of average to above average fawn production and survival will be needed for this population to increase toward objective.

Preseason buck ratios increased in 2014 (55 per 100 does), compared to 2013 (49 per 100 does) but still remain in line with management strategy criteria. Reductions in buck ratios in 2013 were likely due to consecutive years of population decline, with increases realized in 2014 due to a slight upward trend in population growth. The 5-year average preseason buck ratio is 65. Historically high buck ratios exceeding the management strategy maximum in this herd are a function of limited access due to the preponderance of private land and widespread outfitting.

Harvest

Overall harvest has declined in this herd unit as license issuance has decreased in lieu of population decline. The 2014 total harvest of 1,520 was the lowest total pronghorn harvest obtained in this herd unit. However, license success in 2014 (83%) increased from 2013 (77%) and is more comparable to the previous 5-year average of 85%. Additionally, the days required to harvest an animal has been steadily climbing over the last few years, but the trend reversed in 2014. Hunters experienced a decrease in number of days per animal (3.0), which is lower than the previous 5-year average of 3.8. This can most likely be attributed to the stabilization/ slight increase in population beginning in 2013 as well as a reduction in hunting pressure due to decreases in license issuance.

In 2014, 76% of hunters reported being either satisfied or very satisfied with their hunt, indicating a remarkably high level of satisfaction given the lack of public access and population decline. It should be noted that most hunters who speak to Game and Fish personnel are advised to secure access on private land before purchasing a license in areas that have limited public access, or at least be cognizant of the fact that public land availability is extremely limited.

Population

The 2014 post-season population estimate is approximately 18,500, which is 34% below objective. In years past, high fawn productivity coupled with limited access has allowed this herd to exceed the objective very readily. However, this population dropped below objective due to elevated mortality during the relatively severe 2010-2011 winter, and continued to decrease through 2013. Significant reductions in licenses were made in response to population decrease. Poor fawn production in 2012 and 2013 further suppressed this herd, but a significant improvement was realized in 2014. If fawn recruitment is adequate, this should enable this herd to begin to increase toward objective.

The “Time Specific Juvenile – Constant Adult” (TSJ-CA) spreadsheet model was chosen for the post-season population estimate of this herd. All three models had similar relative AIC values. The TSJ-CA model most accurately represented population trend based on field personnel and landowner perceptions. This model is considered to be of fair quality and tracks well with observed preseason buck ratios.

Management Strategy

The traditional season in this herd unit has ran from October 1st to October 14th in Hunt Area 25 and from September 24th to October 14th in Hunt Area 26. These season dates have typically been adequate to meet landowner desires while accommodating a reasonable harvest. For 2015, herd unit-wide Type 1 license issuance was maintained at 1,500 licenses. Type 6 licenses in Hunt

Area 26 were reduced by 100 to accommodate landowner desires while managing this herd toward objective. Hunt Area 25 – Type 6 license issuance was maintained at 200 licenses. Maintaining relatively low harvest pressure on both males and females is warranted given this population is below objective. However, given the current size of this population, managers felt pronghorn numbers were sufficiently high to warrant some level of continued doe/fawn harvest. If we attain the projected harvest of ~1,600 pronghorn and realize normal fawn recruitment, this population is projected to increase to about 19,800 pronghorn, which is 29% below objective.

INPUT	
Species:	Pronghorn
Biologist:	Willow Hibbs
Herd Unit & No.:	PR748
Model date:	01/26/15

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	Constant Juvenile & Adult Survival	131	140	☐ CJ,CA Model	
SCJ,SCA	Semi-Constant Juvenile & Semi-Constant Adult Survival	127	142	☐ SCJ,SCA Mod	
TSJ,CA	Time-Specific Juvenile & Constant Adult Survival	49	174	☑ TSJ,CA Model	

Population Estimates from Top Model

Year	Predicted Prehunt Population (year *i*)			Total	Predicted Posthunt Population (year *i*)			Total	Predicted adult End-of-bio-year Pop (year *i*)			LT Population Estimate		Trend Count	Objective
	Juveniles	Total Males	Females		Juveniles	Total Males	Females		Total Males	Females	Total Adults	Field Est	Field SE		
1993	7939	10114	15543	**33597**	7849	8403	14341	**30594**	9499	14359	**23857**				28000
1994	12934	9309	14071	**36314**	12740	7203	12887	**32831**	7835	12583	**20418**				28000
1995	10102	7679	12331	**30112**	9919	5881	11417	**27217**	8505	13126	**21631**				28000
1996	13385	8335	12864	**34584**	13324	6172	12423	**31919**	10097	15475	**25572**				28000
1997	11093	9895	15166	**36154**	11041	8096	14699	**33836**	11143	16717	**27860**				28000
1998	15798	10920	16383	**43100**	15767	9036	16069	**40872**	10017	15987	**26004**				28000
1999	13020	9816	15668	**38504**	12976	8000	15385	**36361**	8680	14923	**23603**				28000
2000	12710	8506	14625	**35842**	12672	6757	14185	**33614**	7591	13819	**21410**				28000
2001	9835	7439	13542	**30816**	9793	6027	13236	**29056**	7160	13169	**20330**				28000
2002	11070	7017	12906	**30993**	11050	5659	12518	**29226**	6933	12632	**19565**				28000
2003	9891	6795	12379	**29064**	9818	5504	12012	**27334**	6097	11504	**17602**				28000
2004	9811	5976	11274	**27061**	9744	4651	10907	**25302**	7897	13110	**21008**				28000
2005	9681	7739	12848	**30268**	9587	6315	12238	**28140**	6662	11578	**18240**				28000
2006	9569	6529	11346	**27444**	9527	5173	10769	**25469**	8209	12855	**21064**				28000
2007	10225	8045	12598	**30868**	10133	6410	11819	**28363**	9413	13926	**23339**				28000
2008	9099	9224	13648	**31971**	8990	7444	12866	**29300**	9682	14237	**23918**				28000
2009	10742	9488	13952	**34182**	10703	7630	12933	**31267**	10603	15029	**25632**				28000
2010	9875	10391	14728	**34994**	9726	8344	13421	**31492**	8159	12382	**20541**				28000
2011	9260	7996	12134	**29390**	9145	5616	10910	**25671**	6312	10178	**16490**				28000
2012	6614	6186	9974	**22774**	6446	4254	8588	**19288**	4693	8500	**13193**				28000
2013	5166	4599	8330	**18095**	5050	3028	7521	**15600**	4789	8637	**13426**				28000
2014	7009	4693	8464	**20167**	6960	3458	8077	**18495**	5624	9594	**15217**				28000
2015	6608	5511	9402	**21521**	6553	4191	9017	**19761**							28000
2016															
2017															
2018															
2019															
2020															
2021															
2022															
2023															
2024															
2025															

Survival and Initial Population Estimates

Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.79			0.78		
1994	0.40			0.78		
1995	0.83			0.78		
1996	0.83			0.78		
1997	0.90			0.78		
1998	0.40			0.78		
1999	0.41			0.78		
2000	0.40			0.78		
2001	0.53			0.78		
2002	0.48			0.78		
2003	0.40			0.78		
2004	0.90			0.78		
2005	0.40			0.78		
2006	0.90			0.78		
2007	0.90			0.78		
2008	0.90			0.78		
2009	0.90			0.78		
2010	0.40			0.78		
2011	0.40			0.78		
2012	0.40			0.78		
2013	0.90			0.78		
2014	0.90			0.78		
2015	0.40			0.78		
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

Parameters:	Optim cells
Adult Survival =	0.784
Initial Total Male Pop/10,000 =	1.011
Initial Female Pop/10,000 =	1.554

MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Over-summer adult survival	98%

Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio			Harvest				Harvest: Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est	Field SE	Males	Females	Juveniles	Total Harvest	Total Males	Females
1993		51.08	1.47	65.07	65.07	1.74	1555	1093	82	2730	16.9	7.7
1994		91.92	2.77	66.15	66.93	2.20	1914	1077	176	3167	22.6	8.4
1995		81.92	2.48	62.27	61.74	2.03	1634	831	166	2631	23.4	7.4
1996		104.05	3.89	64.79	64.79	2.76	1966	401	56	2423	25.9	3.4
1997		73.14	2.82	65.25	60.82	2.48	1636	424	47	2107	18.2	3.1
1998		96.43	3.97	66.66	78.24	3.40	1713	285	28	2026	17.3	1.9
1999		83.10	3.77	62.65	60.50	3.01	1651	257	40	1948	18.5	1.8
2000		86.91	3.38	58.17	60.45	2.61	1590	400	35	2025	20.6	3.0
2001		72.62	3.07	54.93	53.09	2.48	1284	278	38	1600	19.0	2.3
2002		85.77	3.56	54.37	54.37	2.58	1235	353	18	1606	19.4	3.0
2003		79.90	4.25	54.89	55.90	3.31	1173	334	66	1573	19.0	3.0
2004		87.02	3.56	53.00	50.82	2.44	1204	334	61	1599	22.2	3.3
2005		75.35	2.71	60.24	65.42	2.46	1295	555	85	1935	18.4	4.8
2006		84.33	4.04	57.54	52.05	2.88	1233	525	38	1796	20.8	5.1
2007		81.17	3.50	63.86	65.42	3.00	1486	708	84	2278	20.3	6.2
2008		66.67	2.98	67.59	62.26	2.85	1618	711	99	2428	19.3	5.7
2009		76.99	3.09	68.00	73.57	2.99	1689	926	35	2650	19.6	7.3
2010		67.05	2.74	70.55	79.19	3.09	1861	1188	135	3184	19.7	8.9
2011		76.31	3.88	65.89	64.02	3.43	2163	1113	105	3381	29.8	10.1
2012		66.31	4.41	62.02	59.08	4.07			1260	3169	31.2	13.9
2013		62.02	3.54	55.21	49.19	3.02			735	2268	34.2	9.7
2014		82.81	4.76	55.44	55.31	3.58			352	1520	26.3	4.6
2015		70.28	3.68	58.62	64.52	3.46			350	1600	24.0	4.1
2016												
2017												
2018												
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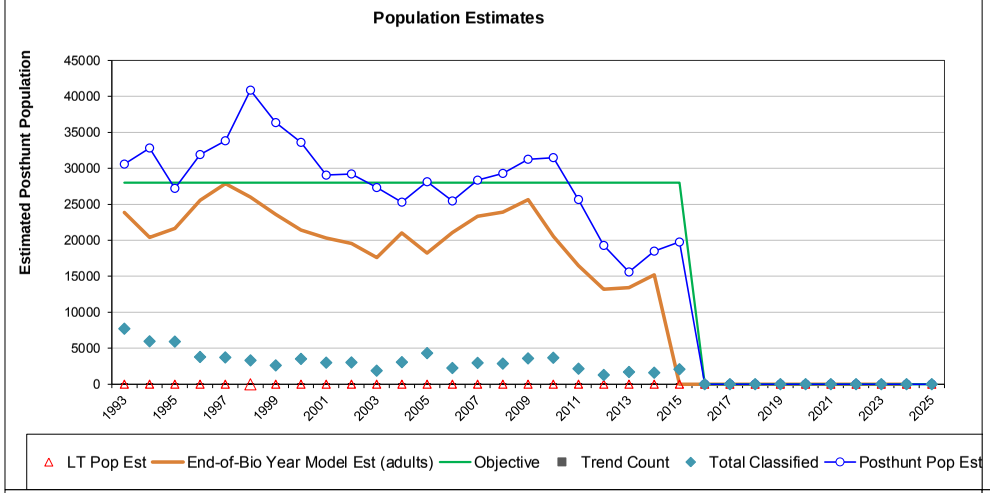
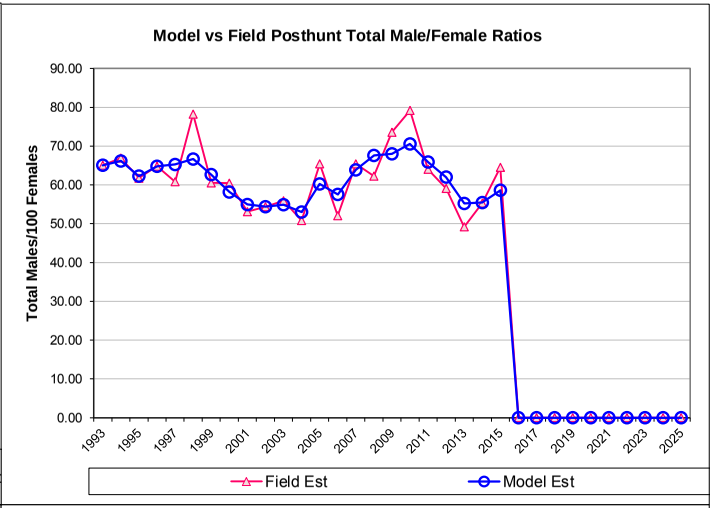
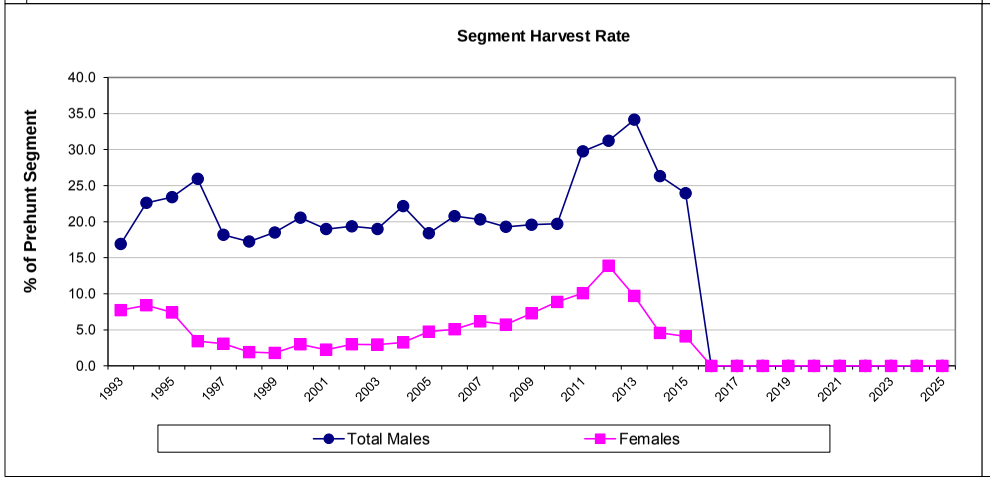
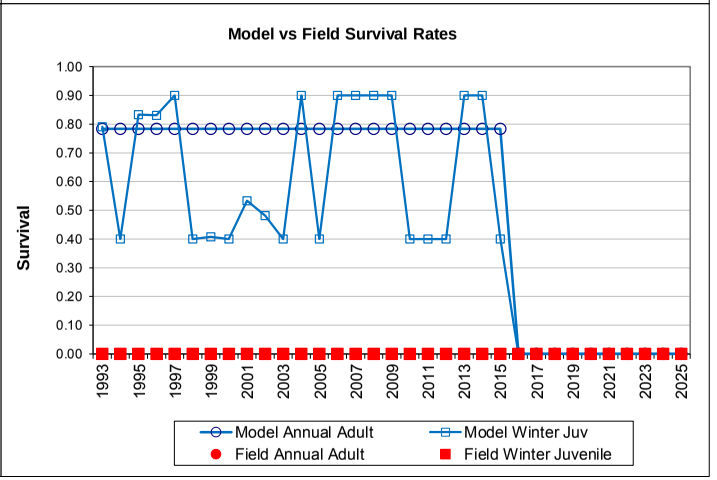
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES









Comments:

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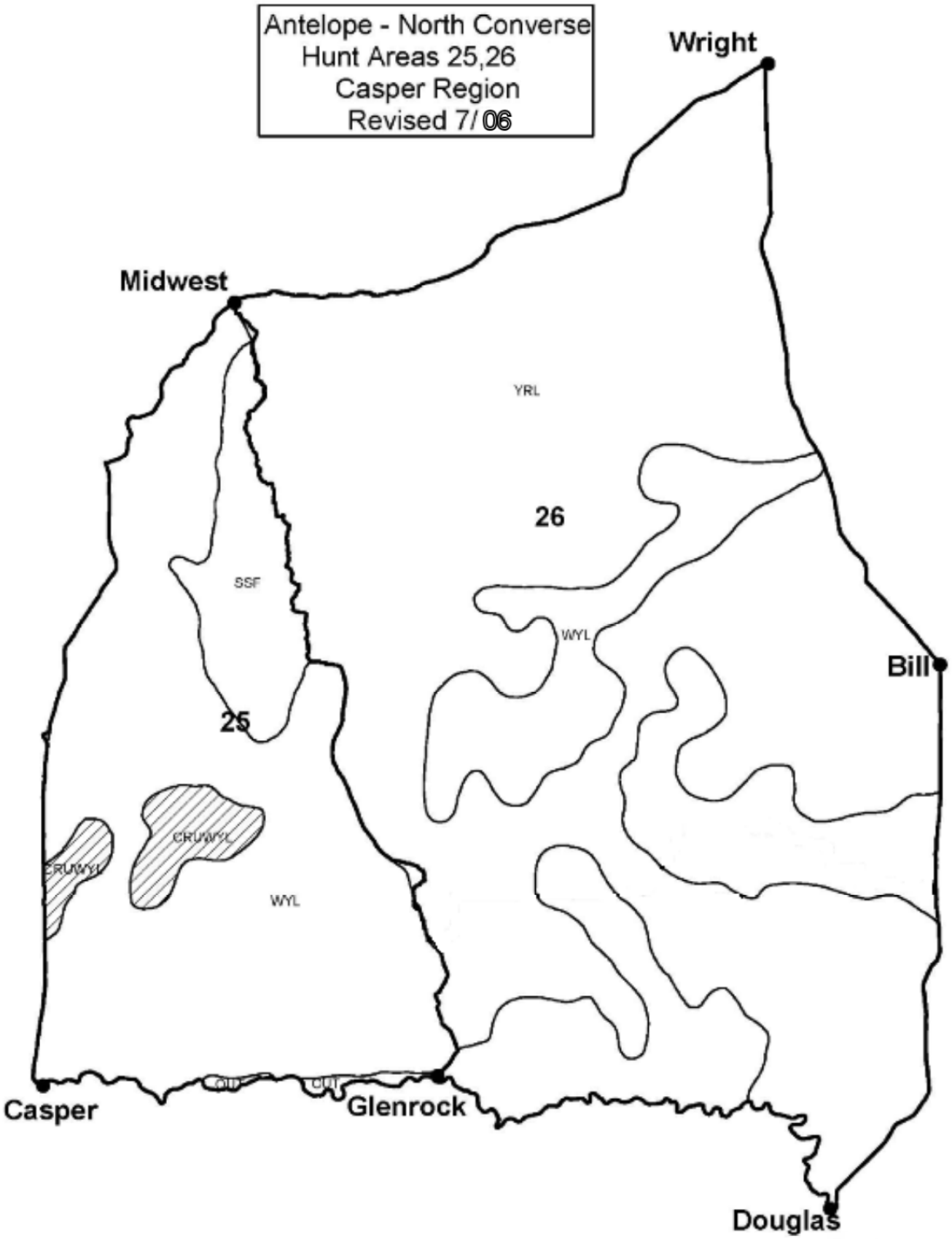

Antelope - North Converse
Hunt Areas 25,26
Casper Region
Revised 7/06
Wright
Midwest
YRL
26
SSF
WYL
Bill
25
CRUWYL
CRUWYL
WYL
Casper
Glenrock
Douglas

2014 - JCR Evaluation Form

SPECIES: Pronghorn
PERIOD: 6/1/2014 - 5/31/2015

HERD: PR750 - BLACK THUNDER

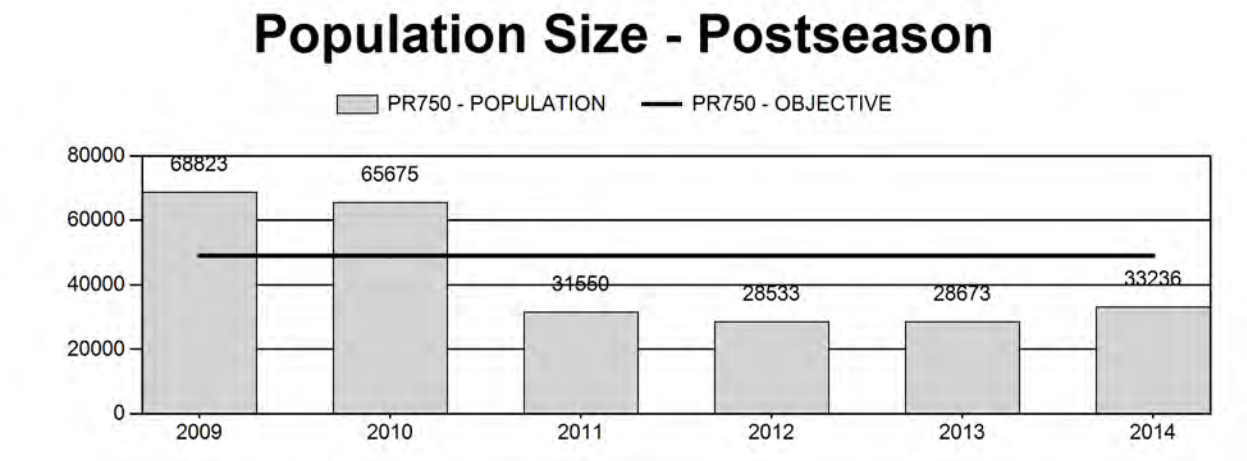
HUNT AREAS: 4-9, 24, 27, 29
PREPARED BY: JOE SANDRINI

	2009 - 2013 Average	2014	2015 Proposed
Population:	44,651	33,236	34,289
Harvest:	6,247	3,366	3,170
Hunters:	6,907	3,997	3,775
Hunter Success:	90%	84%	84 %
Active Licenses:	7,501	4,310	4,050
Active License Success:	83%	78%	78 %
Recreation Days:	23,775	13,740	12,800
Days Per Animal:	3.8	4.1	4.0
Males per 100 Females	55	40	
Juveniles per 100 Females	63	91	

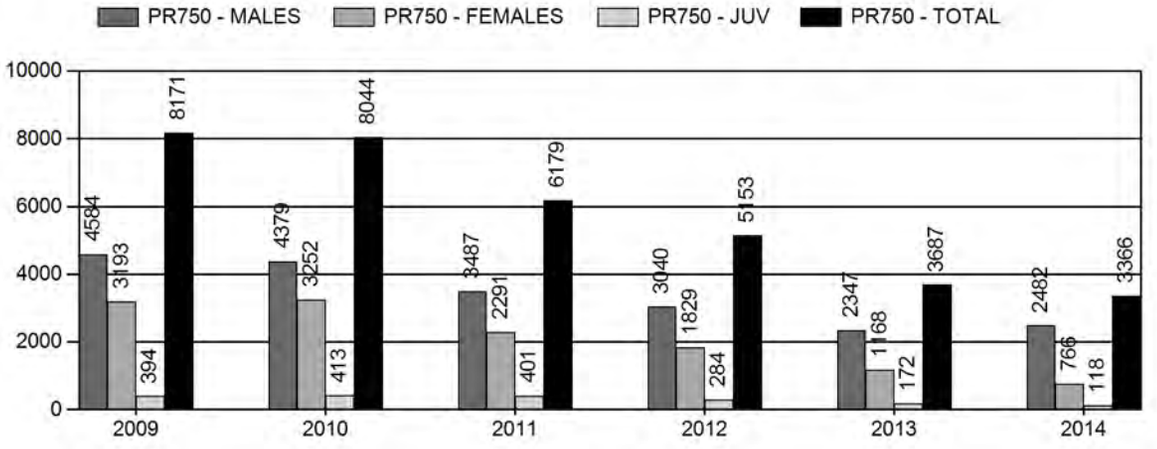
Population Objective (± 20%) :	49000 (39200 - 58800)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-32.2%
Number of years population has been + or - objective in recent trend:	4
Model Date:	02/20/2015

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

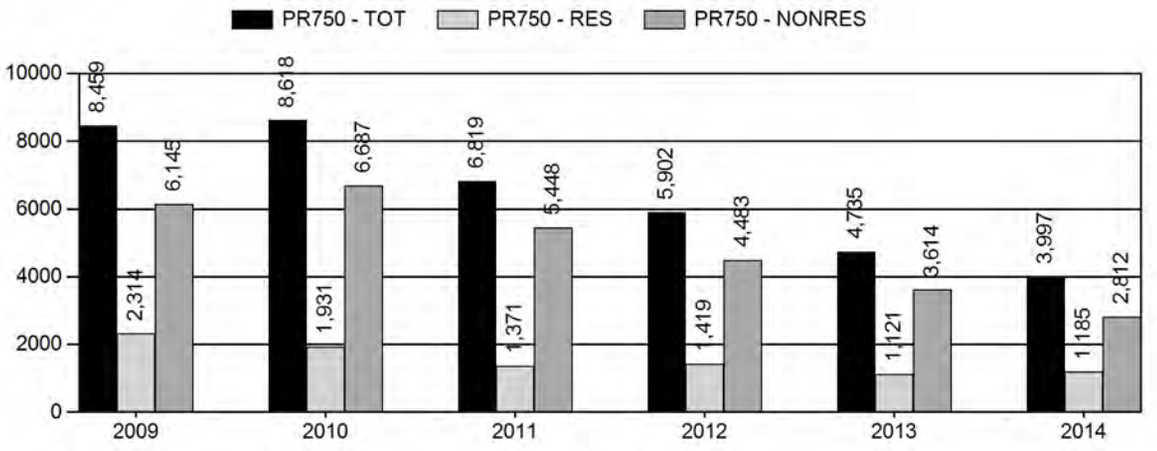
	JCR Year	Proposed
Females ≥ 1 year old:	5.3%	4.7%
Males ≥ 1 year old:	40.3%	31.5%
Juveniles (< 1 year old):	0.9%	1.0%
Total:	10.0%	9.5%
Proposed change in post-season population:	+15.9%	+2.9%



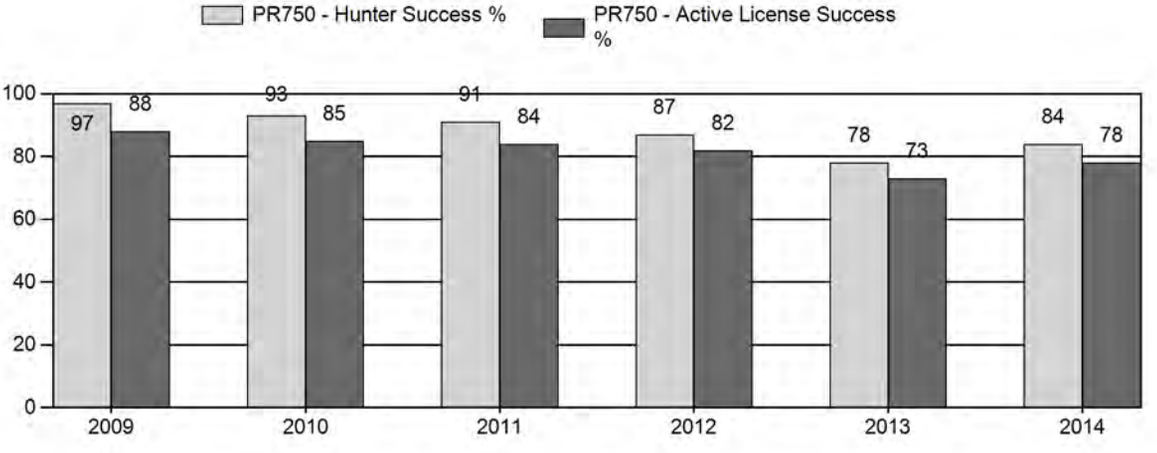
Harvest



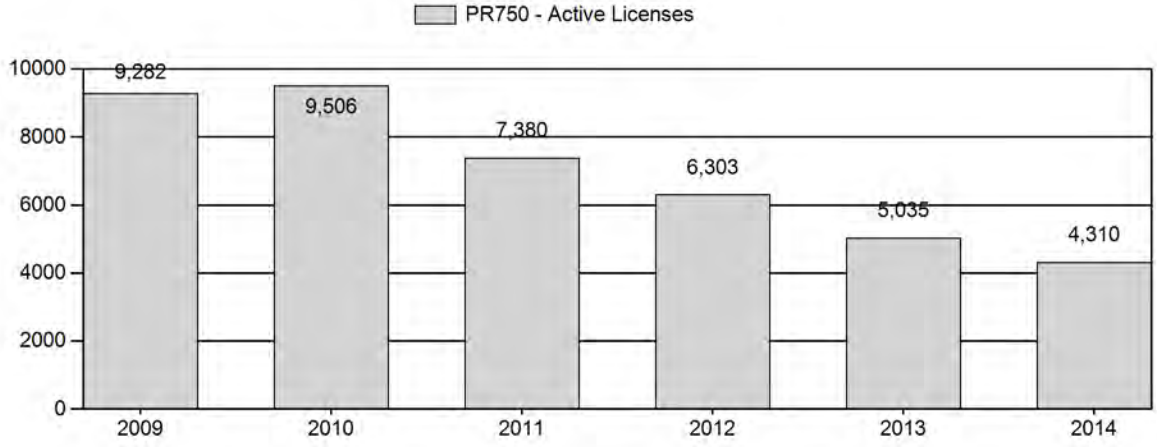
Number of Hunters



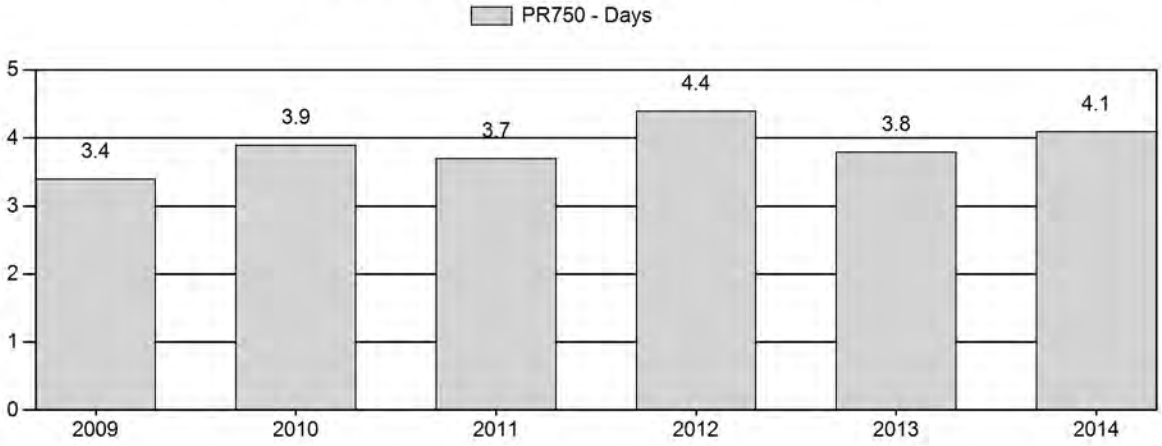
Harvest Success



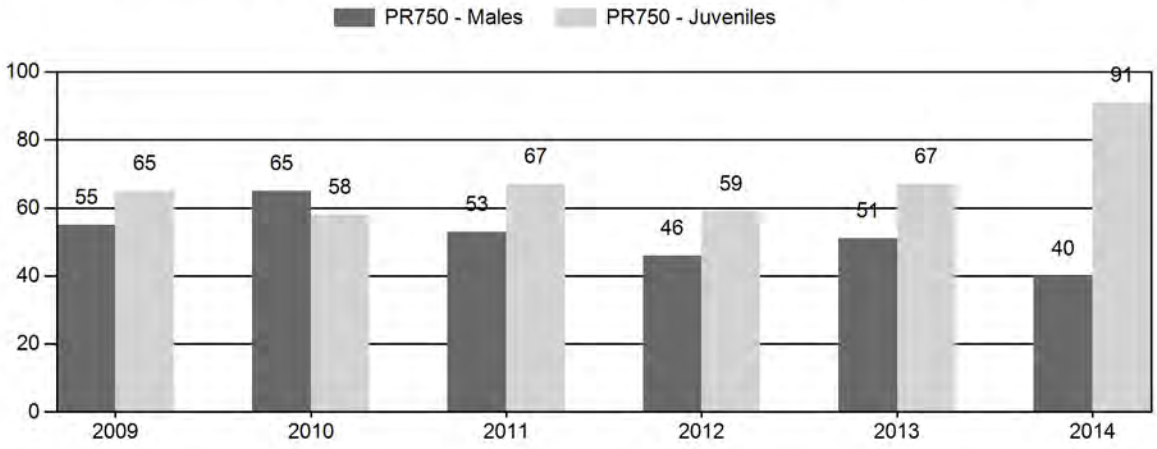
Active Licenses



Days Per Animal Harvested



Preseason Animals per 100 Females



2009 - 2014 Preseason Classification Summary

for Pronghorn Herd PR750 - Black Thunder

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Pre Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	77,811	529	1,611	2,140	25%	3,890	45%	2,530	30%	8,560	2,473	14	41	55	± 2	65	± 3	42
2010	74,523	579	1,584	2,163	29%	3,326	45%	1,930	26%	7,419	2,502	17	48	65	± 3	58	± 3	35
2011	38,347	309	1,011	1,320	24%	2,477	45%	1,667	31%	5,464	2,490	12	41	53	± 3	67	± 3	44
2012	34,201	318	617	935	23%	2,022	49%	1,198	29%	4,155	1,962	16	31	46	± 3	59	± 3	41
2013	32,729	315	733	1,048	23%	2,067	46%	1,380	31%	4,495	2,444	15	35	51	± 3	67	± 4	44
2014	36,939	288	582	870	17%	2,197	43%	2,008	40%	5,075	3,888	13	26	40	± 2	91	± 4	65

2015 HUNTING SEASONS
BLACK THUNDER PRONGHORN HERD (PR750)

Hunt Area	Type	Dates of Seasons Opens	Dates of Seasons Closes	Quota	License	Limitations
4	1	Oct. 1	Nov. 20	150	Limited quota	Any antelope
	6	Oct. 1	Nov. 20	75	Limited quota	Doe or fawn
5	1	Oct. 1	Nov. 20	100	Limited quota	Any antelope
	6	Oct. 1	Nov. 20	50	Limited quota	Doe or fawn valid on private land
6	1	Oct. 1	Oct. 15	300	Limited quota	Any antelope also valid in Area 8
7	1	Oct. 1	Oct. 15	350	Limited quota	Any antelope
8	1	Oct. 1	Oct. 15	300	Limited quota	Any antelope also valid in Area 6
9	1	Oct. 1	Oct. 31	600	Limited quota	Any antelope also valid in that portion of Area 11 in Converse or Niobrara counties
	6	Oct. 1	Oct. 31	650	Limited quota	Doe or fawn also valid in that portion of Area 11 in Converse or Niobrara counties
24	1	Oct. 1	Oct. 31	700	Limited quota	Any antelope
	6	Oct. 1	Oct. 31	350	Limited quota	Doe or fawn
27	1	Oct. 1	Oct. 15	225	Limited quota	Any antelope
	7	Oct. 1	Oct. 15	50	Limited quota	Doe or fawn valid on private land
29	1	Oct. 1	Oct. 15	100	Limited quota	Any antelope
	2	Oct. 1	Oct. 15	400	Limited quota	Any antelope off Thunder Basin National Grasslands
	6	Oct. 1	Oct. 15	100	Limited quota	Doe or fawn valid off Thunder Basin National Grasslands
	7	Oct. 1	Nov. 15	100	Limited quota	Doe or fawn valid south and west of Interstate Highway 25

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

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	License Type	Quota change from 2014
4	1	+50
4	6	+50
6	1	-50
7	1	+50
8	1	-150
24	6	-50
27	1	-75
27	7	-25
29	2	-100
Herd Unit Total	**1**	**-175**
	2	**-100**
	6	NO CHANGE
	7	**-25**

Management Evaluation

Current Postseason Population Management Objective: 49,000
Management Strategy: Recreational
2014 Postseason Population Estimate: ~ 33,200
2015 Postseason Population Estimate: ~ 34,300
2014 Hunter Satisfaction: 76% Satisfied**,** 12% Neutral**,** 12% Dissatisfied

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

The Black Thunder Pronghorn herd unit encompasses much of northeastern Wyoming. Because of the disparity of habitats across the herd unit and the preponderance of private land, this herd unit is managed for recreational hunting. The herd unit encompasses approximately 8,315 mi^2, of which slightly less than 7,300 mi^2 are considered occupied pronghorn habitat. Most of the

unoccupied habitat is found in Hunt Areas (HA's) 4 and 5, which include a portion of the Black Hills having topographical and vegetative features unsuitable for pronghorn. Approximately 77% of this herd unit is private land. The remaining 23% includes lands managed by the United States Forest Service (USFS), the Bureau of Land Management (BLM), and the State of Wyoming. Most occupied USFS lands that are publically accessible to hunters are part of the Thunder Basin National Grassland (TBNG) located in HA's 5, 6, 7, 27, and 29, with HA 27 containing the largest amount followed by HA's 7 and 29. The State of Wyoming owns a large parcel of land in HA 9. Remaining public lands are scattered throughout the herd unit, and many are not accessible to the public. Access fees for hunting are common on private land, and many landowners have leased their property to outfitters. Therefore, accessible public lands are subjected to disproportionately heavy hunting pressure.

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

WEATHER: The winter of 2010-11 was very harsh in the northern half of the herd unit. Over-winter mortality was well above average and losses of all ages of pronghorn continued into the spring. During this winter, large scale movements of pronghorn were also observed. Warmer and drier conditions beset the area during the end of bio-year 2011 and continued through the 2012-13 winter, with the 2012 summer being the driest on record in many places. April of 2013 saw a break in the drought when temperatures dropped below normal for the entire month, and significant precipitation was again received. This wetter and cooler pattern continued through the summer of 2013. In early October 2013, a winter storm "Atlas" blanketed the herd unit with 12" to nearly 36" of wet snow and drifts exceeding 6-feet. While no significant level of pronghorn mortality was detected due to this storm, the snow and resultant muddy conditions forced the cancellation of hunting for some license holders, and made accessing pronghorn difficult in many locations. Ambient temperatures and precipitation were close to long-term averages during the remainder of 2013-14 winter. The following spring and summer saw a growing season with slightly above normal temps and above normal moisture. This yielded excellent forage production. The early winter months of bio-year 2014 have brought temperature and precipitation conditions close to 30-year averages, with a trend towards milder than normal conditions. For detailed weather data see: http://www.ncdc.noaa.gov/cag/time-series/us.

HABITAT: This large herd unit is dominated by Wyoming big sagebrush (*Artemesia tridentata wyomingensis*), silver sagebrush (*Artemesia cana*), and mid-prairie grasses such as wheatgrasses (*Agropyron* spp.), grama grasses (*Bouteloua* spp.), and needle grasses (*Stipa* spp.). In addition, there are several major drainages dominated by plains cottonwood (*Populus deltoides*) and greasewood (*Sarcobatus vermiculatus*). These drainages include the head waters of the Belle Fourche River, the Cheyenne River, Black Thunder Creek, Antelope Creek, Old Woman Creek, Hat Creek, Lance Creek, and Lightning Creek. Steep canyons dominate the southern Black Hills portion of the herd unit, where vegetation consists of ponderosa pine (*Pinus ponderosa*) and its

associated savannah. Other areas are dominated by agricultural croplands, notably near the towns of Douglas, Lusk, Gillette, Upton, and Sundance.

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

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

Beginning in the fall of 2001, Department personnel established Wyoming big sagebrush monitoring transects within the herd unit. These transects were monitored for both production and use through 2010. Only winter use was estimated in 2011. Based on these transects, forage conditions were good as this population peaked in 2006, but in 2007 winter use of sagebrush leaders was excessive.[1] It was apparent the population of pronghorn and other animals (notably cotton-tailed rabbits) browsing sagebrush at that time was not sustainable. Increased harvest along with reduced recruitment and survival began to push this pronghorn population down. As this herd declined, winter use of sagebrush dropped and range conditions improved through 2011. Then, the severe drought of 2012 resulted in what appeared to be very poor forage production and elevated use during and after the growing season. During 2013 and 2014 wet spring and summer conditions were experienced, and there were low numbers of pronghorn on the range. Consequently, casual observations of range conditions showed excellent leader growth and reduced winter use both of these years.

FIELD DATA: This population's recent decline was accentuated during the winter of 2010-2011 and subsequent drought of 2012. Drought in 2012 negatively impacted fawn survival, and the fawn:doe ratio decreased to 62:100. During 2013, fawn production and survival again were reduced, and late summer losses to Epizootic Hemorrhagic Disease (EHDV) observed. The 2013 observed fawn:doe ratio was marginal for allowing herd growth at 67:100. In 2014, fawn production and survival increased substantially with an observed, preseason fawn:doe ratio of 91:100, a value of magnitude not seen in a decade. In recent years, classification sample sizes have been above those required for 90% confidence intervals. The 2014 fawn:doe ratio was 44% above the previous five-year average (63:100), and 25% above the previous 20-year average (73:100).

[1] Different technique applied to measure utilization in 2007. Results may not be directly comparable to previous years.

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

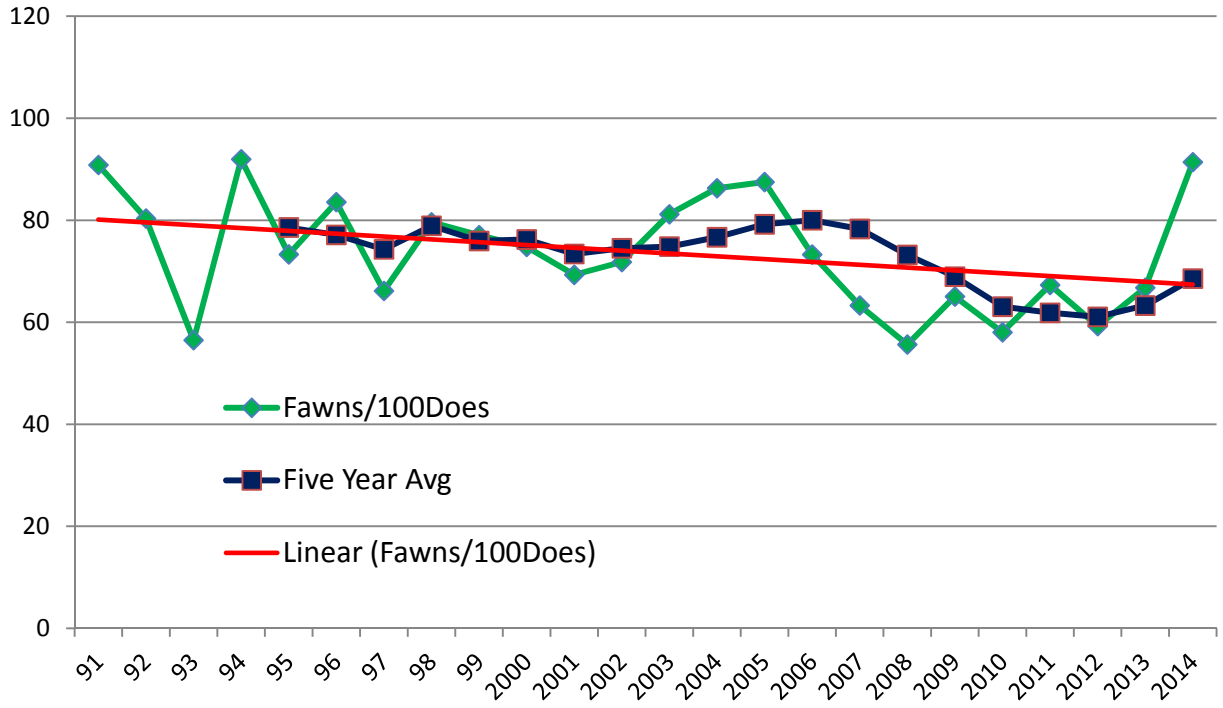


Figure 1: Observed Annual, and Five-Year Average Fawn:Doe Ratios (1991-2014).

Between 2007 and 2012, preseason buck:doe ratios generally declined as this population dropped and the relative percentage of bucks harvested from the population increased each year. The population model simulates an increase in buck ratios from 48:100 in 1999 to a peak of 62:100 in 2007. Observed preseason buck:doe ratios then declined to 46:100 in 2012, before rising to 51:100 in 2013 and then dropping to 40:100 in 2014. Given estimated preseason classification ratios for 2015, the population model suggests the preseason buck:doe ratio will rise to about 44:100, a value well within the Department's recreational management criteria.

Small changes in female mortality rates can greatly affect observed male:female ratios (Bender 2006). Historic fluctuations in observed buck:doe ratios in some hunt areas may have been influenced as much by changes in female survival as by buck harvest, at least in hunt areas where we have no difficulty increasing doe harvest, such as HA 27 and portions of HA's 7, 9, and 29. This may explain the wide variation in observed buck:doe ratios within the herd unit between

some years. As Bender (2006) states, managers should consider the significant influence small changes in female mortality rates have on observed male:female ratios when managing male escapement from harvest in ungulate populations. This is also an important consideration for managers given the spreadsheet models we rely upon are influenced so heavily by observed buck:doe ratios.

HARVEST DATA: Hunter success dropped and effort generally increased between 2008 and 2012 as this population declined. During the 2014 hunting season, hunter success improved on a herd wide basis, but effort increased a similar, relative amount. Overall, most hunt areas continued to exhibit success below what is normally observed for pronghorn within the state and this herd unit. Hunter success on doe/fawn licenses ranged from 68% in HA 9 to 92% in HA 4. Type 1 active license success varied from 70% in HA 29 to 90% in HA 4.

Although hunter success dropped steadily before improving slightly this past year, the hunter satisfaction survey revealed herd unit-wide 39% of hunters were very satisfied, and 37% satisfied with their hunt in 2014; and values almost identical to these were reported in both 2012 & 2013. The vast majority of hunters in this herd unit are non-residents from states without pronghorn who, despite what we consider low pronghorn numbers, are still amazed at the numbers of pronghorn they see and level of success they experience compared to hunting other big game species in their home states.

POPULATION: Following approval of the herd unit combination that created this herd, an official population model was constructed in February, 2015 after several initial and experimental models were tested. The final model used consisted of:

- Combined classification and harvest data collected between 1998 and 2013 from the parent herds.
- 2014 classification and harvest data, which were collected based upon the new herd unit.
- End of bio-year 2000 and 2002 population estimates generated by combining line transect surveys (LT) completed those years in both the Cheyenne River and Highlight herds, and using an estimated variance of the combined results.
- An end of bio-year 2012 LT designed to specifically sample this new herd unit.
- A model fitted and solved through 2014, with 2015 projected classification and harvest data used to estimate the 2015 population.

The "Semi Constant Juvenile & Semi Constant Adult" (SCJ SCA) spreadsheet model was chosen to estimate this herd's population. All three competing models generally simulate a population rise between 2000 and 2006, followed by a decline through 2012 or 2013 and a slight increase into 2014. All three competing models produced post-season population estimates for 2012 within about 5% of each other, and within 10% this past year. The SCJ SCA model exhibited the lowest AICc value, and good fit compared to competing models, with modeled buck:doe ratios not appearing to be over parameterized. As a result, the SCJ SCA model was selected as the preferred model. The magnitude of population trends produced by SCJ SCA model also dovetail fairly well with general trends in harvest statistics and the perceptions of local game managers, landowners, and hunters. Amongst competing models the SCJ SCA model

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

After final model selection, pre and post season population estimates beginning with bio-year 1998 were entered into the JCR database, and adequate and required classification sample sizes calculated for all bio-years using observed fawn:doe and buck:doe ratios.

The Black Thunder pronghorn population is projected to have increased steadily from the late 1990's through 2006, when it peaked about 60% above objective at ~72,000 pronghorn. During this timeframe, fawn survival was very good with above average fawn:doe ratios being observed, while doe/fawn harvest was limited by our inability to sell all available licenses. After its peak in 2006 & 2007, the postseason population declined steadily through 2012 to 42% below objective, where it remained in 2013. Some of this decline was due to increased harvest following regulatory and license issuance changes that increased doe/fawn licenses sales and acted in concert with enrollment of private lands in our walk-in hunting program to increase hunter access. But, more ostensibly, the drop resulted from reduced fawn recruitment due to drought, significant mortality during and following the 2010-11 winter; and increased summer mortality of all age classes due to Epizootic Hemorrhagic Disease (EHDV) during most summers since 2009. The line transect survey conducted in June 2013 resulted in an end of 2012 bio-year population estimate of about 23,890 (Appendix 1). This was a notable reduction from the 2011 line transect estimate of 30,900 for the former Cheyenne River herd alone.

MANAGEMENT SUMMARY: Hunting seasons since 2012 have been conservative in this herd unit, and the 2015 season entails continuing this strategy. Doe/fawn harvest remains significantly reduced or eliminated in all hunt areas, except HA 9. Additionally, issuance of any antelope licenses has been curtailed somewhat to maintain or enhance buck:doe ratios (especially in where there is relatively more public land and hunting pressure has intensified) and in hunt areas where landowners have reduced the number hunters they are willing to host and requested a reduction in license issuance. While the total harvest for 2015 should be similar to that of 2014, reductions in harvest will occur in HA's 6, 8, 27 and 29, while harvest is being increased somewhat in HA's 4 & 7 where pronghorn buck numbers have rebounded more and hunter success has been better. In HA 9, claims for damage from pronghorn are no longer being submitted, and landowners have noted a drop in pronghorn numbers. However, in an effort to continue to limit damage we are maintaining harvest pressure here, despite being well below objective. In HA 29, as a response to complaints from landowners and hunters about low pronghorn numbers and very low hunter success on public lands, we are continuing to issue the bulk of any antelope licenses as a Type 2 license, which are valid off Thunder Basin National Grasslands (TBNG) this year instead of on private land, and the number issued reduced by 100. The changes made in this hunt area the past several years (including reduced numbers of Type 6 licenses restricted to private land, and off TBNG this year) have been well received by many

landowners and have significantly reduced harvest pressure on public lands in the northern part of HA 29 where pronghorn numbers have plummeted.

Concerns continue about low pronghorn numbers on public lands, notably on the TBNG in both HA's 29 & 27. In addition, expansion of the coal mines in HA 27 has recently blocked hunters from being able to access a significant amount of public land in this unit. To help address the situation, we have cut issuance of reduced priced doe/fawn licenses valid in HA 27 by a third and continue to limit their use to private lands via a Type 7 license. In addition, issuance of Type 1 (any antelope) licenses has been reduced 25%. In this hunt area, residents hold 80% of the licenses and draw odds for non-residents are some of the most difficult in the state. Active Type 1 license success in HA 27 has remained near 75% for three years in a row, and the percentage of residents reporting they were satisfied or very satisfied with their hunt fell from 89% in 2011 to 64% in 2012, and has remained near 70% since.

Finally, in order to address landowner concerns along the boundary of HA's 6 and 8, last year a change in license limitations allowing hunters with HA 6 licenses to hunt in HA 8 and vice versa was enacted. The boundary between these hunt areas consists of county roads, which antelope frequently cross. Some landowners whose properties straddle this boundary requested ability for hunters to hunt both sides of these roads. Because landownership patterns are similar in both hunt areas, the Department agreed to try this approach for a couple years, which if successful could lead to a combining of hunt areas. During the 2014 hunting season, a few landowners in HA 6, who live closer to Newcastle, expressed concern that hunter crowding (or at least hunter traffic) was increased due to this change. In order to continue to provide opportunity to hunt both hunt areas on one license, address concerns of landowners, and improve the relatively low hunter success in HA 8 the past two years, we have cut license issuance to near license draw demand levels for HA 6 & HA 8. This should allow most hunters wishing to hunt here the opportunity to draw a license, while limiting the number of individuals who purchase left-over licenses – something that increases hunter crowding on public lands, road hunting activity, and the amount of hunter traffic on county roads.

Given average fawn:doe and buck:doe ratios observed the past 5-years and consistent survival rates, combined with a predicted harvest of 3,170 pronghorn, the 2015 hunting season should allow the post-season population of this herd to grow around 3%, to ~34,300 pronghorn, which is 30% below objective.

LITERATURE CITED:

Bender, Louis C. 2006. Uses of herd composition and age ratios in ungulate management. Wildlife Society Bulletin. Vol. 34 (4): 1225-1230.

INPUT	
Species:	Pronghorn
Biologist:	Joe Sandrini
Herd Unit & No.:	Black Thunder PR750
Model date:	02/20/15

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	161	171	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	111	132	☑ SCJ,SCA	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	64	156	☐ TSJ,CA Model	

Population Estimates from Top Model

Year	Predicted Prehunt Population (year *i*)			Total	Predicted Posthunt Population (year *i*)			Total	Predicted adult End-of-bio-year Pop (year *i*)			LT Population Estimate		Trend Count	Objective
	Juveniles	Total Males	Females		Juveniles	Total Males	Females		Total Males	Females	Total Adults	Field Est	Field SE		
1998	18655	11310	24136	**54101**	18574	8563	23571	**50707**	13674	27397	**41071**				49000
1999	20693	13401	26849	**60943**	20577	10784	26142	**57503**	16360	30364	**46724**				49000
2000	22251	16033	29756	**68040**	22128	13286	28969	**64384**	10193	20454	**30646**	31217	5306		49000
2001	13891	9989	20044	**43925**	13788	7654	19480	**40922**	11270	22090	**33359**				49000
2002	15544	11044	21648	**48236**	15467	8471	21136	**45075**	12552	24159	**36711**	37091	6305		49000
2003	19219	12301	23676	**55196**	19067	9313	22614	**50993**	14473	26634	**41107**				49000
2004	22518	14184	26101	**62802**	22367	11040	25046	**58453**	17131	29944	**47075**				49000
2005	25673	16788	29345	**71806**	25460	13502	28141	**67103**	20368	33747	**54115**				49000
2006	24233	19960	33072	**77266**	24032	16196	31274	**71502**	22237	35995	**58232**				49000
2007	22326	21792	35275	**79393**	22067	17110	32546	**71723**	22260	36338	**58598**				49000
2008	19814	21815	35611	**77240**	19472	16914	32444	**68830**	21156	35290	**56446**				49000
2009	22493	20733	34585	**77811**	22060	15690	31072	**68823**	20911	34888	**55799**				49000
2010	19840	20493	34190	**74523**	19386	15676	30613	**65675**	9453	17739	**27191**				49000
2011	11699	9264	17384	**38347**	11258	5428	14864	**31550**	8166	16787	**24953**				49000
2012	9747	8003	16451	**34201**	9435	4659	14439	**28533**	6936	15868	**22803**	23872	1910		49000
2013	10382	6797	15550	**32729**	10193	4215	14265	**28673**	6913	16082	**22995**				49000
2014	14404	6775	15760	**36939**	14275	4044	14917	**33236**	8147	18127	**26275**				49000
2015	12027	7984	17765	**37776**	11895	5465	16929	**34289**							49000
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Survival and Initial Population Estimates

Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1998	0.67			0.88		
1999	0.67			0.88		
2000	0.30			0.59		
2001	0.67			0.88		
2002	0.67			0.88		
2003	0.67			0.88		
2004	0.67			0.88		
2005	0.67			0.88		
2006	0.67			0.88		
2007	0.67			0.88		
2008	0.67			0.88		
2009	0.67			0.88		
2010	0.40			0.50		
2011	0.67			0.88		
2012	0.67			0.88		
2013	0.67			0.88		
2014	0.67			0.88		
2015	0.67			0.88		
0						
0						
0						
0						
0						
0						
0						
0						
0						
0						
0						
0						
0						
0						

Parameters:	Optim cells
Juvenile Survival =	0.670
Adult Survival =	0.878
Initial Total Male Pop/10,000 =	1.131
Initial Female Pop/10,000 =	2.414

MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Over-summer adult survival	98%

Classification Counts											Harvest	
Year	Juvenile/Female Ratio			Total Male/Female Ratio							Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est	Field SE	Males	Females	Juveniles	Total Harvest	Total Males	Females
1998		77.29	2.01	46.86	45.68	1.40	2497	514	74	3085	24.3	2.3
1999		77.07	2.27	49.91	52.44	1.74	2379	642	106	3127	19.5	2.6
2000		74.78	2.31	53.88	56.03	1.89	2497	716	111	3324	17.1	2.6
2001		69.30	2.34	49.83	48.01	1.82	2123	513	94	2730	23.4	2.8
2002		71.81	2.27	51.02	46.96	1.70	2339	465	70	2874	23.3	2.4
2003		81.18	2.53	51.95	64.66	2.15	2716	966	139	3821	24.3	4.5
2004		86.27	2.44	54.34	47.38	1.61	2858	959	137	3954	22.2	4.0
2005		87.48	2.59	57.21	62.49	2.04	2988	1095	193	4276	19.6	4.1
2006		73.27	1.96	60.35	61.90	1.74	3422	1635	183	5240	18.9	5.4
2007		63.29	1.81	61.78	61.60	1.78	4256	2481	236	6973	21.5	7.7
2008		55.64	1.48	61.26	61.40	1.58	4455	2879	311	7645	22.5	8.9
2009		65.04	1.66	59.95	55.01	1.48	4584	3193	394	8171	24.3	10.2
2010		58.03	1.66	59.94	65.03	1.80	4379	3252	413	8044	23.5	10.5
2011		67.30	2.13	53.29	53.29	1.82	3487	2291	401	6179	41.4	14.5
2012		59.25	2.16	48.65	46.24	1.83	3040	1829	284	5153	41.8	12.2
2013		66.76	2.32	43.71	50.70	1.92	2347	1168	172	3687	38.0	8.3
2014		91.40	2.82	42.99	39.60	1.59	2482	766	118	3366	40.3	5.3
2015		67.70	2.17	44.95	52.40	1.82	2290	760	120	3170	31.5	4.7
0												
0												
0												
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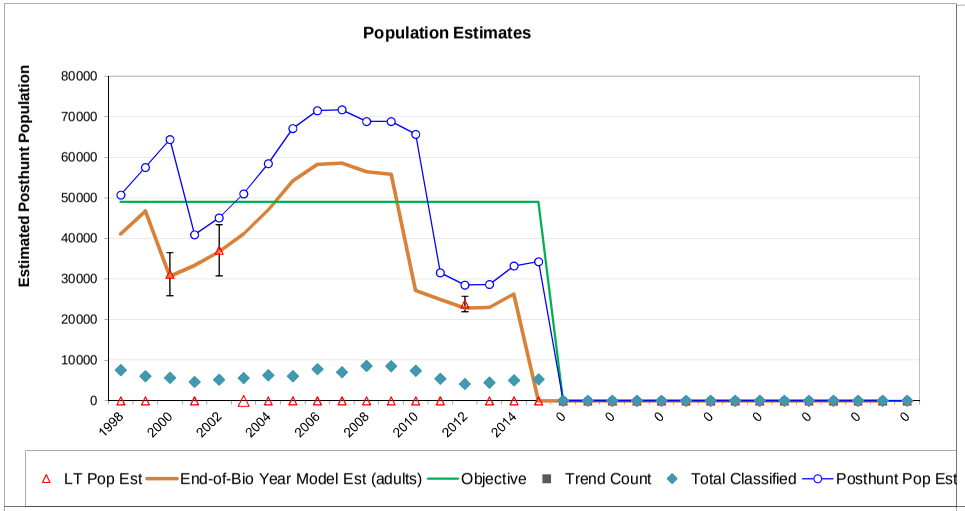
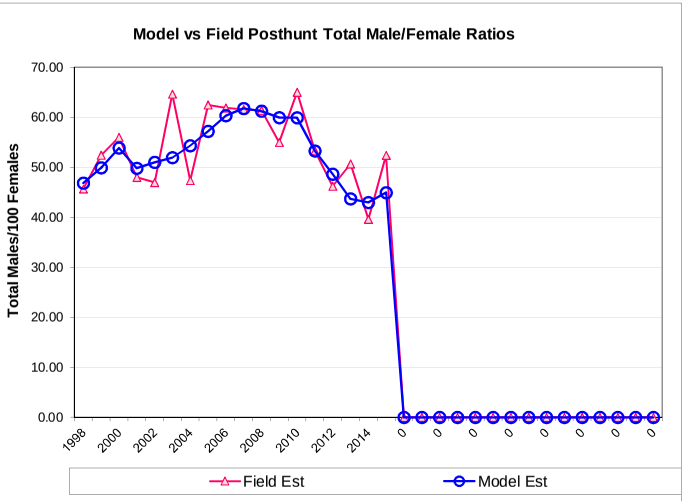
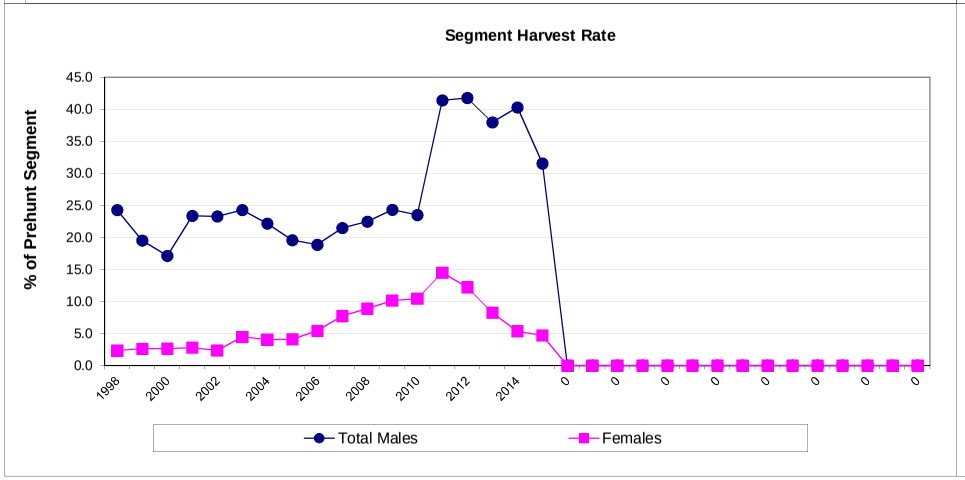
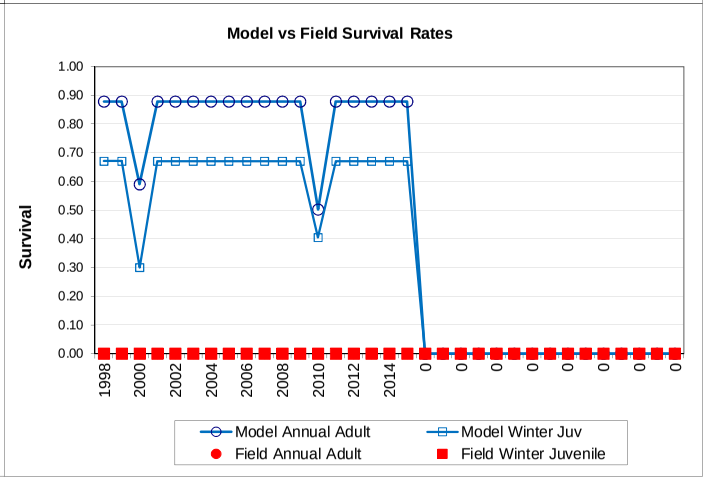
FIGURES









Comments:

END

Appendix 1
PR 750 Line Transect Results
End of Bio-Year 2012

Effort: 3,360.010
No. samples: 116
Width: 215.2000
Left : 0.0000000
Observations: 438

Model
Uniform key, k(y) = 1/W
Simple polynomial adjustments of order(s): 2

Parameter	Point Estimate	Standard Error	Percent Coef. of Variation	95% Confidence Interval	
DS	2.0283	0.14989	7.39	1.7523	2.3478
E(S)	1.6123	0.49495E-01	3.07	1.5179	1.7125
D	3.2701	0.26168	8.00	2.7925	3.8294
N	23,872	1910.3	8.00	20,385	27,955

MEASUREMENT UNITS:
Density: Numbers/Sq. miles
ESW: Meters

COMPONENT PERCENTAGES OF VAR(D):
Detection probability: 23.5
Encounter rate: 61.8
Cluster size: 14.7

ESTIMATION SUMMARY - ENCOUNTER RATES

	Estimate	% CV	df	95% Confidence Interval	
n	438.00				
k	116.00				
L	3360.0				
n/L	0.13036	6.29	58.00	0.11495	0.14783
Left	0.0000				
Width	215.20				

ESTIMATION SUMMARY – DETECTION RATES

Uniform/Polynomial	Estimate	% CV	df	95% Confidence Interval	
m	1.0000				
LnL	-680.71				
AIC	1363.4				
AICc	1363.4				
BIC	1367.5				
CHI-p	0.18952				
f(0)	0.60075E-02	3.88	437.00	0.55669E-02	0.64830E-02
p	0.77351	3.88	437.00	0.71677	0.83473
ESW	166.46	3.88	437.00	154.25	179.63

ESTIMATION SUMMARY - EXPECTED CLUSTER SIZE

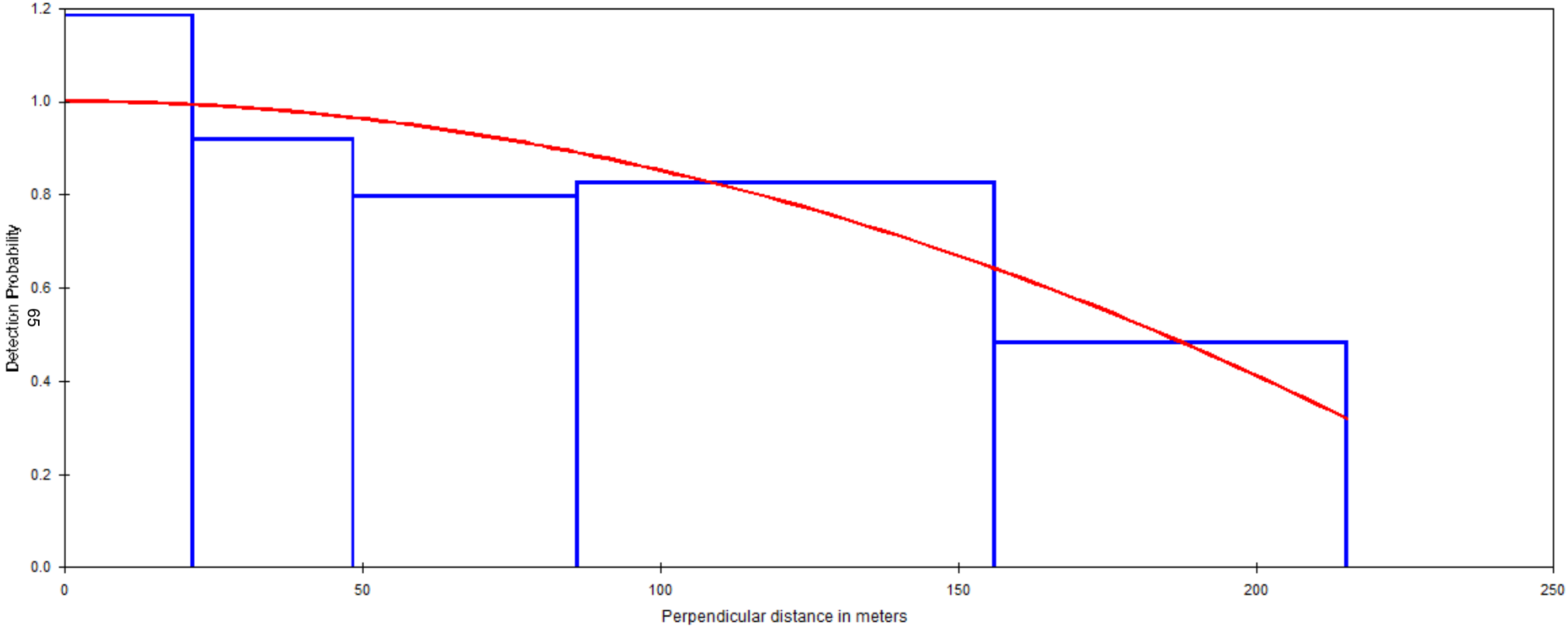
Average Cluster Size	% CV	df	95% Confidence Interval	
1.8037	5.01	437.00	1.6347	1.9901

UNIFORM/POLYNOMIAL

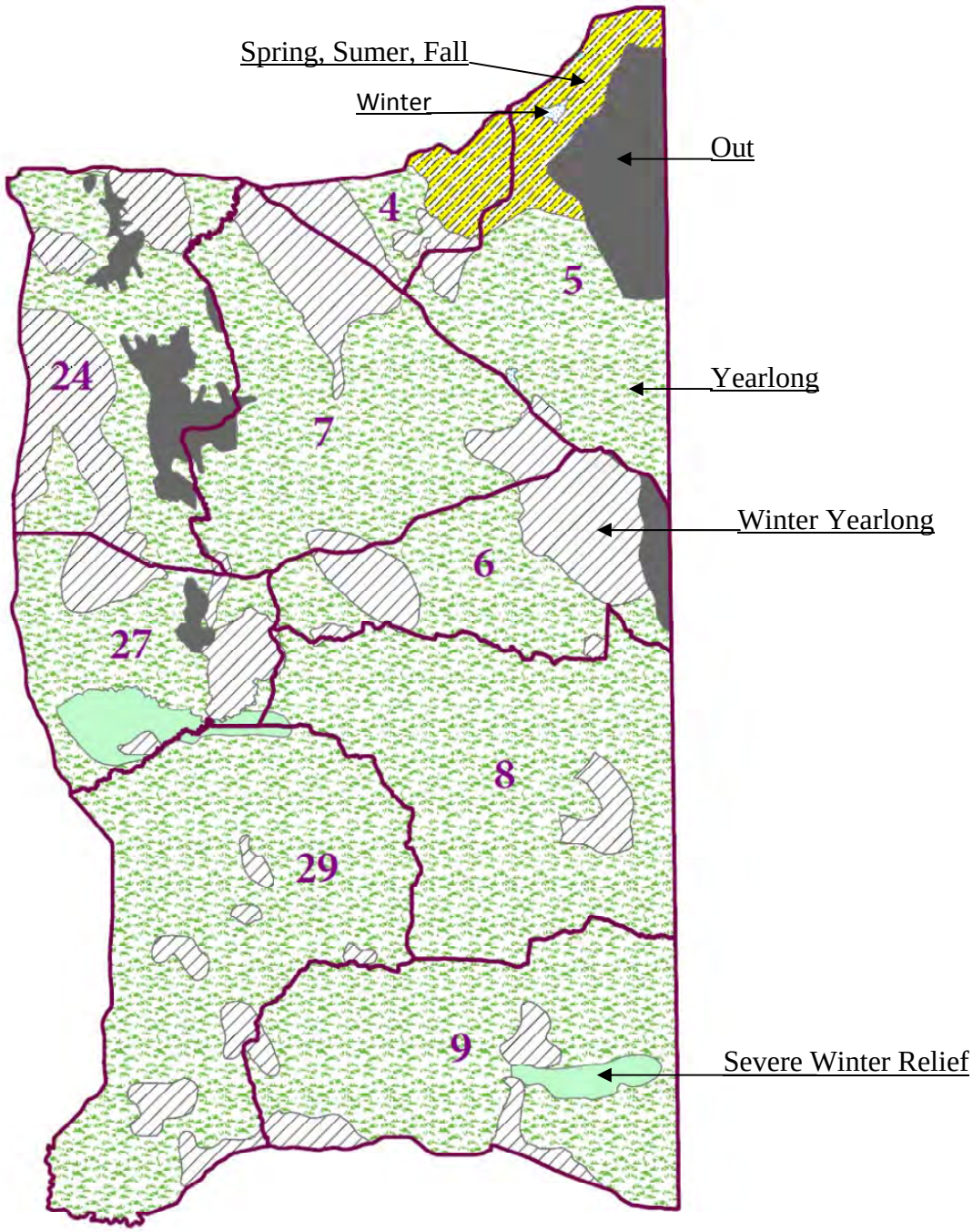
	Estimate	% CV	df	95% Confidence Interval	
r	-0.71954E-01				
r-p	0.66352E-01				
E(S)	1.6123	3.07	436.00	1.5179	1.7125

ESTIMATION SUMMARY – DENSITY & ABUNDANCE
Uniform/Polynomial

	Estimate	% CV	df	95% Confidence Interval	
D	2.0283	7.39	108.35	1.7523	2.3478
DS	3.2701	8.00	147.88	2.7925	3.8294
N	23,872	8.00	147.88	20,385	27,955


1.2
1.0
0.8
0.6
0.4
0.2
0.0
Detection Probability
65
0
50
100
150
200
250
Perpendicular distance in meters

Black Thunder Pronghorn PR750



2014 - JCR Evaluation Form

SPECIES: Mule Deer
PERIOD: 6/1/2014 - 5/31/2015

HERD: MD740 - CHEYENNE RIVER

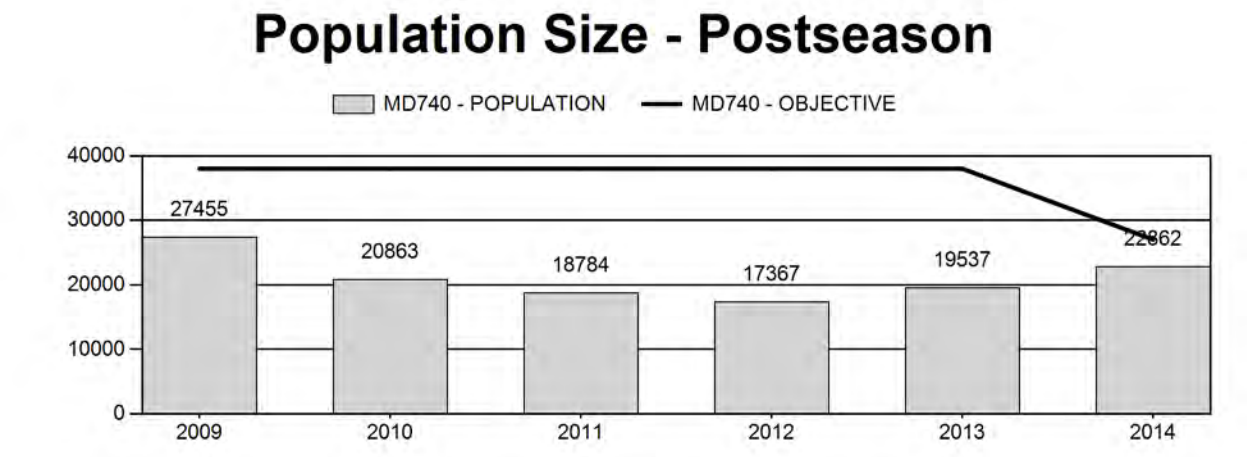
HUNT AREAS: 7-14, 21
PREPARED BY: JOE SANDRINI

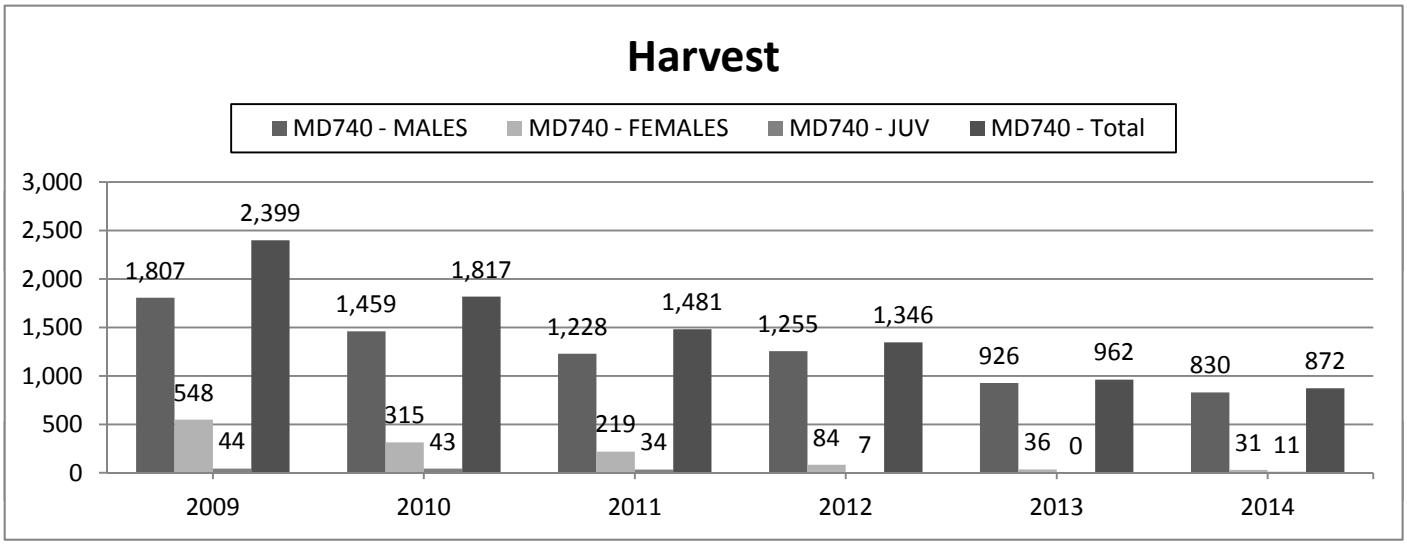
	2009 - 2013 Average	2014	2015 Proposed
Population:	20,801	22,862	23,606
Harvest:	1,123	872	790
Hunters:	2,093	1,740	1,540
Hunter Success:	54%	50%	51%
Active Licenses:	2,146	1,759	1,560
Active License Success:	52%	50%	51%
Recreation Days:	8,692	7,563	6,550
Days Per Animal:	7.7	8.7	8.3
Males per 100 Females	35	37	
Juveniles per 100 Females	56	84	

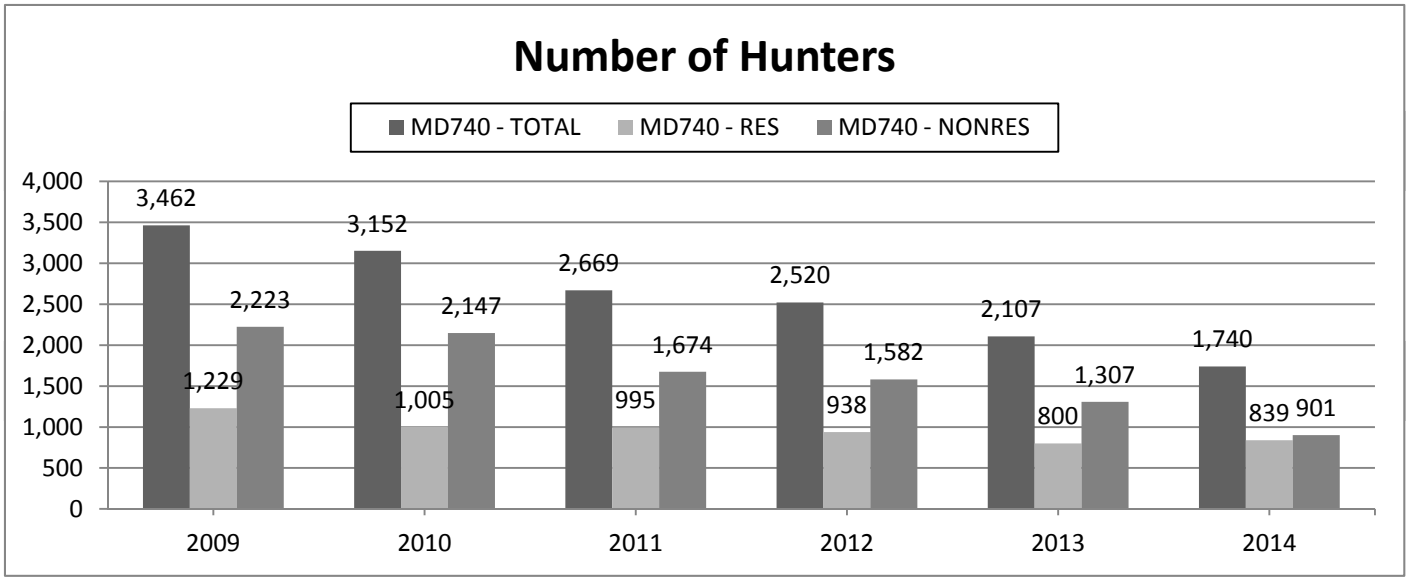
Population Objective (± 20%) :	27000 (21600 - 32400)
Management Strategy:	Private Land
Percent population is above (+) or below (-) objective:	-15.3%
Number of years population has been + or - objective in recent trend:	5
Model Date:	02/20/2015

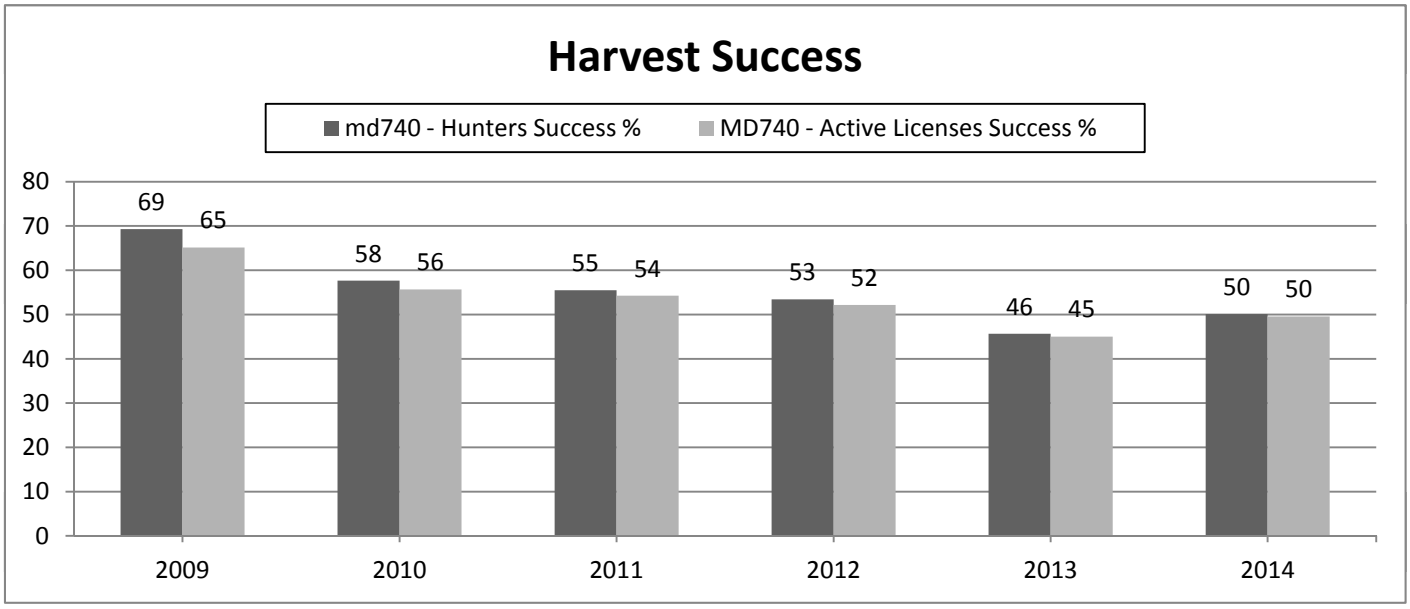
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

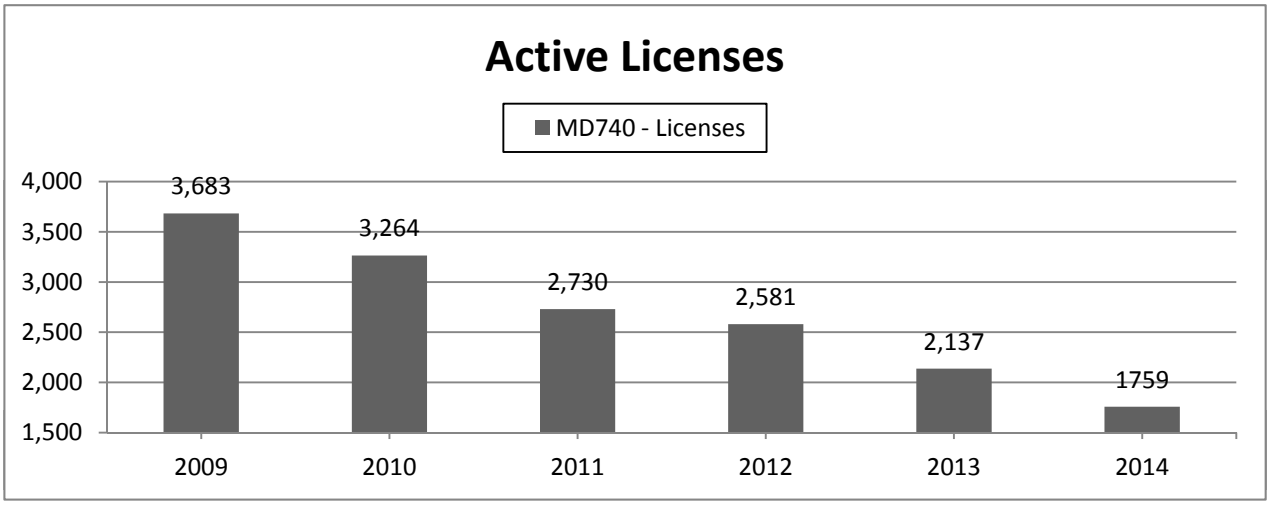
	JCR Year	Proposed
Females ≥ 1 year old:	0.3%	0.3%
Males ≥ 1 year old:	19.3%	13.8%
Juveniles (< 1 year old):	0.01%	0.1%
Total:	4.0%	3.6%
Proposed change in post-season population:	+17%	+3.3%

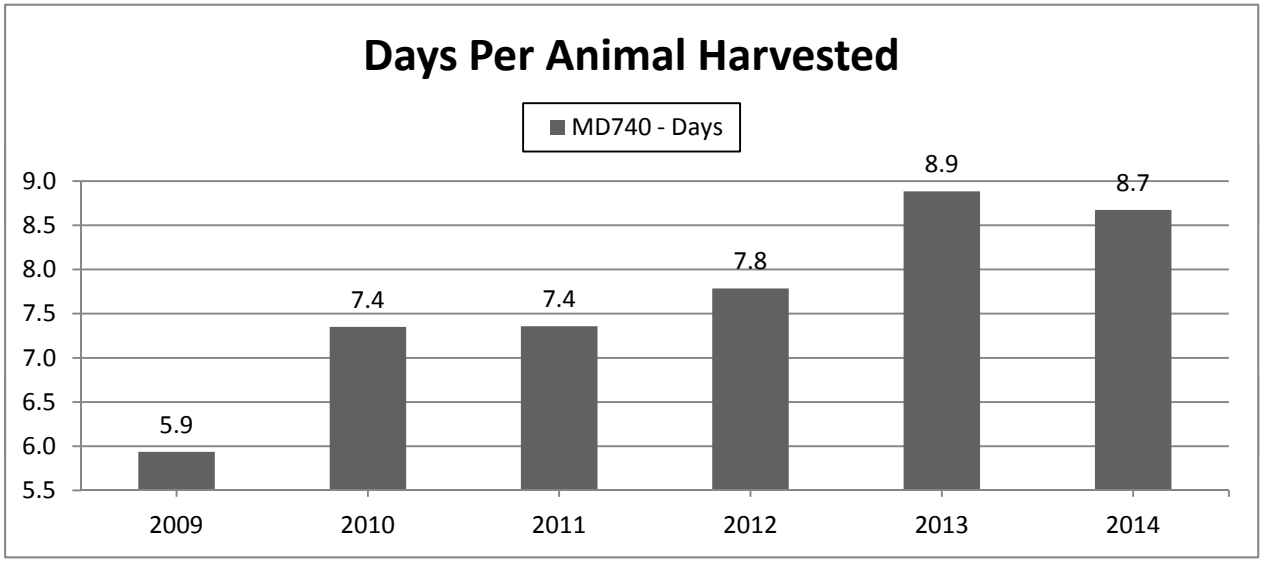


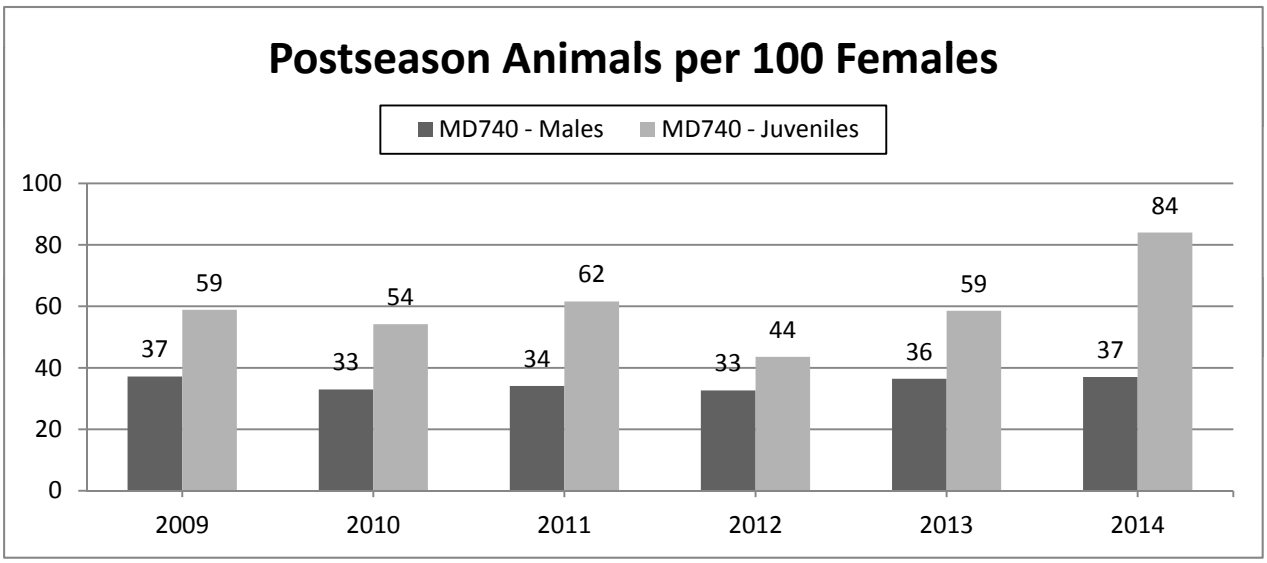

Harvest
MD740 - MALES
MD740 - FEMALES
MD740 - JUV
MD740 - Total
3,000
2,500
2,000
1,500
1,000
500
0
1,807
548
44
2,399
1,459
315
43
1,817
1,228
219
34
1,481
1,255
84
7
1,346
926
36
0
962
830
31
11
872
2009
2010
2011
2012
2013
2014


Number of Hunters
MD740 - TOTAL
MD740 - RES
MD740 - NONRES
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
3,462
1,229
2,223
3,152
1,005
2,147
2,669
995
1,674
2,520
938
1,582
2,107
800
1,307
1,740
839
901
2009
2010
2011
2012
2013
2014


Harvest Success
md740 - Hunters Success %
MD740 - Active Licenses Success %
80
70
60
50
40
30
20
10
0
69
65
58
56
55
54
53
52
46
45
50
50
2009
2010
2011
2012
2013
2014


Active Licenses
MD740 - Licenses
4,000
3,500
3,000
2,500
2,000
1,500
3,683
3,264
2,730
2,581
2,137
1759
2009
2010
2011
2012
2013
2014


Days Per Animal Harvested
MD740 - Days
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.9
7.4
7.4
7.8
8.9
8.7
2009
2010
2011
2012
2013
2014


Postseason Animals per 100 Females
MD740 - Males
MD740 - Juveniles
100
80
60
40
20
0
37
59
33
54
34
62
33
44
36
59
37
84
2009
2010
2011
2012
2013
2014

2009 - 2014 Postseason Classification Summary

for Mule Deer Herd MD740 - CHEYENNE RIVER

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	27,455	165	0	0	0	418	583	19%	1,569	51%	924	30%	3,076	1,159	11	27	37	± 2	59	± 3	43
2010	20,863	89	0	0	0	223	312	18%	947	53%	513	29%	1,772	974	9	24	33	± 3	54	± 4	41
2011	18,784	113	0	0	0	281	394	17%	1,155	51%	711	31%	2,260	1,211	10	24	34	± 2	62	± 4	46
2012	17,367	119	0	0	0	185	304	19%	932	57%	406	25%	1,642	708	13	20	33	± 3	44	± 3	33
2013	19,537	114	0	0	0	302	416	19%	1,142	51%	669	30%	2,227	1,137	10	26	36	± 3	59	± 3	43
2014	22,862	186	0	0	0	336	522	17%	1,426	45%	1,198	38%	3,146	2,053	13	24	37	± 2	84	± 4	61

2015 HUNTING SEASONS
CHEYENNE RIVER MULE DEER HERD (MD740)

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

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

Region B Nonresident Quota: 800

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	License Type	Quota change from 2014
Herd Unit Totals	1	+100
	6	-10
	Region B	-200

Management Evaluation
Current Management Objective: 27,000
Management Strategy: Private Land Management
2014 Postseason Population Estimate: ~ 22,900
2015 Proposed Postseason Population Estimate: ~ 23,600
2014 Hunter Satisfaction: 64% Satisfied, 17% Neutral, 19% Dissatisfied

HERD UNIT ISSUES: The Cheyenne River mule deer herd was created in 2009 by combining the Thunder Basin and Lance Creek herds. In 2014, following an internal review and public input process, the postseason population objective was revised from 38,000 to 27,000 and its management strategy changed from recreational to private land. This was done to better align the post-season population objective with historic herd performance, habitat capacities, and address the impacts of limited access to private land for mule deer hunting (Appendix 1).

There are about 6,350 mi^2 in this herd unit, and 5,485 mi^2 (86%) are considered occupied habitat. Approximately 75% of the land within the herd unit is privately owned, with the remaining lands administered by the United States Forest Service, Bureau of Land Management, or the State of Wyoming. As a result, hunter access is largely limited and controlled by landowners, and access fees along with outfitted hunting are common. Consequently, hunting pressure can be heavy on accessible public land. About two-thirds of the hunters pursuing mule deer in this herd unit are nonresidents. These nonresidents typically are more willing to pay trespass or access fees for hunting privileges on private land or hire an outfitter. Hunt Areas (HA) 8, 10, and 13 are the only areas containing large blocks of accessible public land, which most of the resident hunters seek. Historically, these areas receive heavy hunting pressure throughout the mule deer hunting season.

Primary land uses within the herd unit include livestock grazing, oil and gas production, and some crop production. By far, the dominant land use is livestock grazing. The majority of oil and gas development occurs in the western and north central portions of the herd unit. However, substantial new oil and gas development is occurring in northwest Niobrara County (HA 11) and near Douglas (HA 14). In addition, horizontal oil well development over a large portion of these same two hunt areas is expected to increase disturbance in the future. There are also several large surface coal mines in HA 10 and HA 21, which create a high level of disturbance.

Cultivation of alfalfa, grass hay, oats, and wheat occur mostly in the southern and eastern portions of the herd unit.

WEATHER: Beginning in 2007, drought combined with poor habitat conditions and more normal winter weather patterns reduced recruitment in this herd. Since then, annual harvest of antlerless deer has dropped significantly, while more severe late winter and early spring weather has impacted the herd. The winter of 2010-11 was very harsh in the northern half of the herd unit, and over-winter mortality was well above average. Warmer and drier conditions beset the area during the end of bio-year 2011 and continued through the 2012-13 winter, with the 2012 summer being the driest on record. Overall, the weather pattern during bio-year 2012 resulted in poor forage production, very low recruitment, and average over-winter survival of all age classes of mule deer. Between 2006 and 2012, tougher winter and spring conditions coupled with generally dry summers resulted in reduced fawn productivity and survival when compared to the preceding decade. These conditions may have also fostered the outbreaks of Epizootic Hemorrhagic Disease (EHD) observed in late summer and early fall, especially between 2009 and 2012. As such, the weather patterns over the last decade have been the remote cause for this herd's decline by affecting various proximate mortality factors.

April of 2013 finally saw a break in drought conditions when temperatures dropped below normal for the entire month, and significant precipitation was received. A cold, wet pattern continued with daily temperatures returning to near long-term averages through the summer of 2013. This helped increase forage production, but fawn survival and recruitment remained suppressed, perhaps due to poor body condition of does resulting from the 2012 drought, and continued EHD may have increased late summer fawn mortality. In early October 2013, winter storm "Atlas" blanketed the herd unit with 12" to nearly 36" of wet snow and drifts exceeding 6-feet in some locations. While no significant level of mule deer mortality was detected due to this storm, the snow and resulting muddy conditions forced the cancellation of hunting for some license holders, and made accessing deer difficult in many locations. Ambient temperatures and precipitation were close to long-term averages during the remainder of 2013-14 winter. The following spring and summer saw a growing season with slightly above normal temps and above normal moisture. This yielded excellent forage production. The early winter months of bio-year 2014 have brought temperature and precipitation conditions close to 30-year averages, with a trend towards milder than normal conditions. For detailed weather data see: http://www.ncdc.noaa.gov/cag/time-series/us.

HABITAT: Sagebrush (*Artemisia ssp*.) steppe and sagebrush grasslands with scattered hills dominated by ponderosa pine (*Pinus ponderosa*) comprise most of the western, central, and northern segments of the herd unit. The eastern most lands in the herd unit are comprised of short grass prairie punctuated by pine breaks, and there is a small area (about 30 mi^2) of southern Black Hills habitat along the state line near Newcastle. Rolling ponderosa pine and limber pine (*Pinus flexilis*) hills and ridges dominate the southern portions of the herd unit. Major agricultural crops are grass and alfalfa hay, and winter wheat. Croplands are localized and found primarily near Gillette, Moorcroft, Upton, Newcastle, Manville, and Lusk. These variations in habitat types and limited riparian areas affect deer densities and distribution. The majority of mule deer are typically found utilizing broken topography characterized by sagebrush, conifer

covered hills, or cottonwood and sagebrush dominated riparian communities. Scattered mule deer are found in the open sagebrush-grassland areas.

Several major cottonwood riparian drainages traverse the herd unit including the Belle Fourche River and Cheyenne Rivers and many of their tributary creeks such as Beaver Creek, Lightning Creek, Twenty-Mile Creek, Lance Creek, and Old Woman Creek. Overstory canopy along these drainages is dominated by decadent stands of plains cottonwood (*Populus deltoides*). These riparian cottonwood groves comprise one of the most important habitat types for mule deer in this herd unit. Unfortunately, many are in poor condition and lack recruitment of new cottonwoods and associated woody understory species is a concern. Photo-point transects have shown some dramatic losses of seedling and young cottonwood trees. These losses have been primarily attributed to livestock grazing and beaver, and to a lesser extent by deer and elk. The health and vigor of riparian cottonwood communities and shrub stands needs to be enhanced if mule deer are going to thrive in this part of Wyoming.

The majority of the drainages are ephemeral, and free flowing springs are rare. Water developments for livestock have benefited mule deer in this herd unit. Coal bed methane development has increased water availability near Wright and Gillette, but this water's quality and effects on the mule deer population are unknown.

Beginning in the fall of 2001, Department personnel established Wyoming big sagebrush monitoring transects within the herd unit. Leader production measurements were suspended in 2010, but over-winter estimates of use continued through 2011. The declining health and/or loss of these shrub stands was born out during this monitoring. In 2006 & 2007, drought coupled with grazing and browsing by wild and domestic animals, negatively impacted winter food availability. Conditions improved slightly between 2008 and 2010, but observed fawn:doe ratios were low, which was likely due to more normal to severe winter and spring weather patterns. Even without direct measurements being taken in 2012, it was readily apparent shrub condition and forb production declined substantially, when severe drought impeded growth and the fawn:doe ratio plummeted. Neither sagebrush production nor utilization was measured in 2013 or 2014. However, wetter and warmer than normal growing seasons, along with low numbers of pronghorn and mule deer on the range contributed to a visible improvement in range conditions.

FIELD DATA: While postseason fawn:doe ratios have undergone cyclic fluctuations, they have generally trended downward (Figure 1). In 2014, the observed, post-season fawn:doe ratio was 84:100, a notable improvement from the previous year (59:100), and a value greater than any observed since 2000. Generally suppressed fawn:doe ratios since 2000 are thought to have been a result of poor range conditions due to protracted drought. In fact, extreme drought in 2012 manifested itself in the lowest fawn:doe ratio observed in recent history. Following this nadir, excellent moisture and forage production in 2013 and 2014 allowed doe body condition to improve resulting in an eventual spike in fawn production during bio-year 2014.

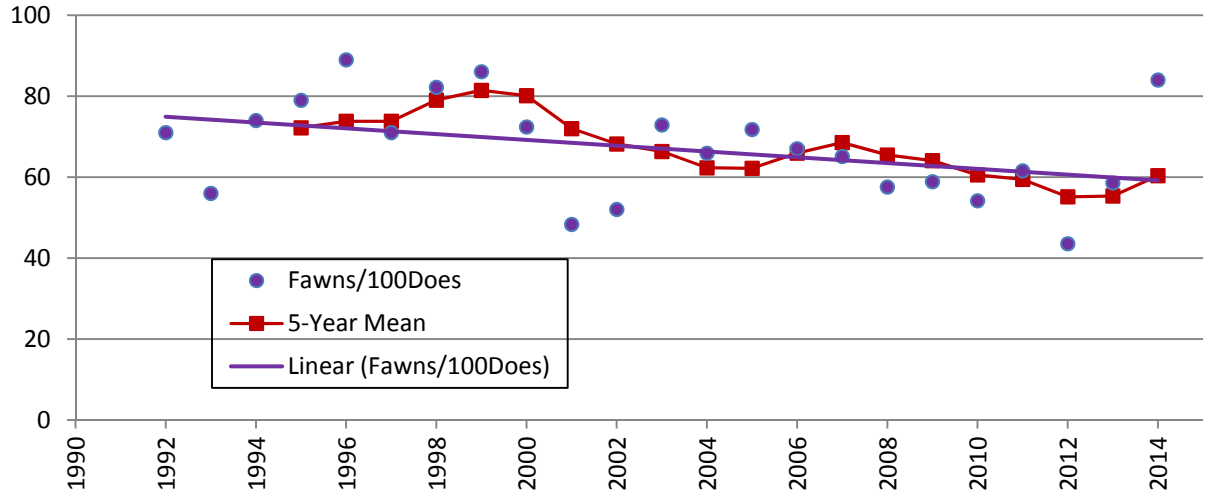


Figure 1. Post-Season Fawn:Doe Ratios, and 5-year mean values (1991 – 2014): Cheyenne River Mule Deer Herd.

While productivity in this herd unit, as measured by fawn:doe ratios, has declined since the early 1980's, poor reproduction did not seem to limit this herd until more recently. Between 2001 and 2009 lower productivity may have been a blessing, as difficult access to private land for hunters hampered our ability to regulate deer numbers through sport hunting, and habitat conditions became poor. At the time, area managers strongly believed the observed decrease in productivity was linked primarily to declines in overall quality and quantity of sagebrush and riparian habitat within the herd unit. However, beginning in 2009, weather conditions began to move away from drought, and with reduced numbers of both domestic livestock and wild ungulates across the range, shrub conditions began to improve; but fawn:doe ratios remained suppressed. During this timeframe more normal to severe winter weather was experienced and the populations of small game animals dropped. This may have indirectly increased predation on fawn mule deer. It does appear fawn:doe ratios in this herd are very sensitive to weather and habitat conditions. Additionally, since about 2006, there have been reports of dead deer each year in the early fall, and Epizootic Hemorrhagic Disease (EHD) was confirmed in multiple cases.

Buck:doe ratios in this herd increased between 2003 and 2007, peaking at 45:100. Since then, they have declined and generally stabilized near the 10-year average of 36:100 (Figure 2). Until 2008, moderate productivity coupled with limited access for hunters to private land yielded an increasing buck:doe ratio (despite enhanced license issuance). Then, as fawn production and survival dropped, buck:doe ratios declined . The 2013 observed, post-season buck:doe ratio was 36:100 and in 2014 it was 37:100. Because access to private land for buck hunters has become so limited, the post-season buck:doe ratio will likely continue to exceed the recreational management maximum. This is why this herd unit was moved to private land management strategy in 2014.

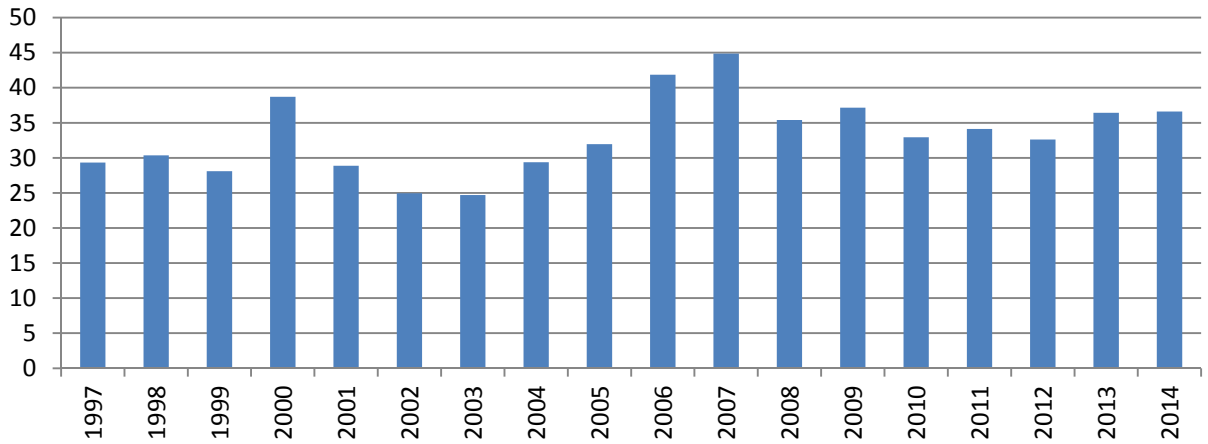


Figure 2. Post-Season Buck:Doe Ratios, Cheyenne River Mule Deer Herd (1997-2014).

HARVEST DATA: Most harvested mule deer are taken off private land because, as previously noted, it provides the majority of mule deer habitat. The Department is currently attempting to balance desires of landowners and hunters to increase deer numbers, but still keep the population at levels that will reduce the chance of a large-scale die-off. This was part of the reason for altering the post-season population objective in 2014 (Appendix 1).

Access to private lands for deer hunting continues to decrease due to leasing by outfitters and landowners limiting hunting in the wake of declining deer numbers. Many landowners have stated, even when the population of deer was higher, that they are not willing to host increased numbers of hunters, or tolerate much in the way of doe/fawn hunting. Consequently, we have basically reached access saturation at this time on much of the private land within the herd unit. Compounding this situation, outfitter control has significantly curtailed public hunting access to buck deer, and harvest of bucks dropped even when seasons were liberalized in the mid 2000's. The reduced access to private land for deer hunters has also increased hunting pressure on bucks on accessible public lands, and resulted in lower numbers of bucks there. This was one of the reasons HA 10 was changed to limited quota hunting in 2014.

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

It was evident from the reduced number of deer found during classification efforts between 2010 and 2013, changes in harvest statistics and landowner contacts that this herd declined substantially during this timeframe. These observations in 2013 were contrary to the population model, which suggested a population increase that year. It is remarkable that the modeled,

preseason population estimate for this herd increased 12% between 2012 and 2013, but hunter success dropped precipitously and effort increased substantially in 2013, even with fewer hunters afield. The 2013 statistics were no doubt influenced by the poor weather and road conditions caused by winter storm Atlas. In addition to the storm's impacts, nearly 20% of the available Region B tags did not sell in the regular drawing that year, but were purchased after the draw. It was apparent from field contacts that many of the hunters purchasing leftover license were forced to hunt already overcrowded public land; and more than a few landowners turned hunters away whom they previously granted permission to hunt. In 2014, harvest statistics indicate preseason mule deer numbers were improved, and more deer were classified post-season, particulars that dovetail with model projections. However, while trends in harvest statistics reversed themselves in 2014, the magnitude of the change was not congruent with the projected increase in the population, especially considering fewer hunters were in the field and the modeled population is projected to have increased 17% between 2013 and 2014. The majority of this simulated population increase stems from the high fawn production measured in 2014.

POPULATION: The 2014 post-season population estimate for this herd is ~22,850. The population model implies this population peaked in 2000 and then dropped following the tough winter that year. The herd is projected to have then rebounded between 2001 and 2005, when it leveled off through 2007 at about 15% above the current objective. Between 2007 and 2012 the herd declined to 31% below its present objective, before returning to its current level. It should be noted the inherent constraints in the spreadsheet models make population estimates at the extremes of the years modeled most tenuous.

The Semi-Constant Juvenile / Semi-Constant Adult (SCJ SCA) model was chosen to estimate this herd's population. It was selected over competing models because it had the lowest relative AICc and fit observed buck ratios relatively well without being overly parameterized. The selected model aligns well with observed buck:doe ratios, and changes in preseason population estimates are about 56% correlated with changes in hunter success, and inversely correlated 90% with changes in hunter effort between 2006 and 2014. However, modeled changes in population size do not seem to be of the magnitude field personnel and many landowners report, as there seemed to be more of a peak in deer numbers about 2006 or 2007 with a steeper increase preceding this and more abrupt decline following. Consequently, the model is considered to be of only fair quality because it has 15-20 years of data; ratio data available for all years in model; the juvenile and adult survival estimates are reasonable; it exhibits modest fit; and results are generally defensible biologically.

MANAGEMENT SUMMARY: The traditional season dates for this herd unit are Oct. 1-15. In order to facilitate population growth commensurate with landowner desires, we have eliminated most doe/fawn harvest and continue antlered-only general license seasons for mule deer. Limited doe/fawn harvest will continue in HA 12, where a couple landowners are experiencing some damage and want to reduce mule deer numbers.

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

the HA 10 buck:doe ratio to the herd-wide average in 2009 and 2010, but deer densities remained depressed; and the observed buck:doe ratio dropped to 16:100 in 2011. With the 3-point restriction in place during 2012, the post-season buck:doe ratio improved to 42:100, but only 27 bucks were observed in over 4 hours of helicopter flight time. The same classification effort in 2013 detected 30 bucks, and these data along those recorded during a fixed winged flight by the Niobrara County Predator Board over private lands found a total of 41 total bucks and a buck:doe ratio of 35:100. As a result, and commensurate with public and hunter sentiments polled during the 2014 hunting season, this HA was moved to limited quota hunting in 2015 with 100 licenses being issued for a season running October 1 to 15.

Many landowners have stated they are not taking deer hunters again this year, or continuing with the reduced number they have hosted recently. In addition, during the past couple of years several ranches that normally hosted several hundred deer hunters have turned these hunters away due to low deer numbers. Harvest statistics from HA 10 also suggest non-resident hunters continue to significantly outnumber resident hunters on public land. Because of the crowding of hunters on accessible public land, the estimated displacement of almost 200 non-residents from HA 10 with the move to limited quota, and lack private landowners willing to host hunters, the Region B quota has again been reduced. The Region B quota of 800 should allow about 85% of first choice applicants to draw a license; and the 2015 hunting season should result in harvest of about 750 bucks and 40 antlerless deer. Given five-year average postseason classification values and modeled survival rates, this harvest is projected to allow the post-season population to increase about 3% in 2015, but it will remain well below objective.

INPUT	
Species:	Mule Deer
Biologist:	Joe Sandrini
Herd Unit & No.:	Cheyenne River MD740
Model date:	02/20/15

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	113	122	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	50	77	☑ SCJ,SCA	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	5	120	☐ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population				Predicted Posthunt Population				Objective
	Field Est	Field SE		Juveniles	Total Males	Females	Total	Juveniles	Total Males	Females	Total	
1995				10300	5764	13642	29706	10210	3594	12879	26683	38000
1996				11928	6254	13989	32170	11897	3953	13387	29237	38000
1997				10218	7092	14950	32260	10164	4739	14313	29216	38000
1998				12081	7194	15168	34443	12038	4368	14644	31050	38000
1999				13584	8096	16656	38336	13524	4636	15716	33877	38000
2000				13313	9948	19177	42437	13253	6489	18303	38046	38000
2001				8297	8056	17896	34249	8210	5072	16985	30267	38000
2002				8350	6846	16770	31966	8284	4114	15920	28318	38000
2003				11102	6072	15906	33080	11020	3830	15116	29965	38000
2004				10213	6709	16110	33033	10158	4558	15412	30128	38000
2005				11112	7040	16081	34234	11009	5037	15337	31383	38000
2006				10427	7712	16290	34430	10393	5545	15504	31442	38000
2007				10064	7938	16233	34235	10017	5794	15383	31194	38000
2008				8912	8025	16012	32949	8873	6091	15413	30376	38000
2009				8802	7907	15671	32381	8754	5920	15069	29742	38000
2010				7256	6025	13646	26927	7209	4420	13308	24937	38000
2011				6377	4685	10536	21599	6341	3486	10301	20128	38000
2012				4587	4929	10605	20122	4580	3549	10513	18641	38000
2013				5958	4418	10219	20595	5958	3400	10179	19537	38000
2014				8705	4735	10382	23821	8693	3822	10348	22862	27000
2015				7120	5959	11395	24475	7109	5134	11362	23606	27000
2016												27000
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												
2026												
2027												

Survival and Initial Population Estimates

Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1995	0.64			0.83		
1996	0.64			0.83		
1997	0.64			0.83		
1998	0.74			0.83		
1999	0.90			0.83		
2000	0.40			0.83		
2001	0.64			0.83		
2002	0.64			0.83		
2003	0.64			0.83		
2004	0.64			0.83		
2005	0.64			0.83		
2006	0.64			0.83		
2007	0.64			0.83		
2008	0.64			0.83		
2009	0.25			0.83		
2010	0.49			0.66		
2011	0.64			0.83		
2012	0.64			0.83		
2013	0.64			0.83		
2014	0.64			0.83		
2015	0.64			0.83		
2016						
2017						
2018						
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2020						
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2027						

Parameters:	Optim cells
Juvenile Survival =	0.639
Adult Survival =	0.833
Initial Total Male Pop/10,000 =	0.359
Initial Female Pop/10,000 =	1.288

MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio			Classification Counts				Harvest: Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1995		79.28	2.65	27.90	27.32	1.31	82	1973	693	2748	37.7	5.6
1996		88.87	3.20	29.53	33.94	1.67	28	2092	547	2667	36.8	4.3
1997		71.01	2.84	33.11	29.32	1.59	49	2139	579	2767	33.2	4.3
1998		82.20	3.05	29.83	30.37	1.57	39	2569	476	3084	39.3	3.5
1999		86.05	2.89	29.50	28.11	1.37	55	3145	854	4054	42.7	5.6
2000		72.41	2.53	35.45	38.72	1.66	54	3144	794	3992	34.8	4.6
2001		48.34	1.99	29.86	28.88	1.44	79	2713	828	3620	37.0	5.1
2002		52.04	2.42	25.84	24.94	1.52	60	2484	773	3317	39.9	5.1
2003		72.90	2.75	25.33	24.70	1.36	75	2039	718	2832	36.9	5.0
2004		65.91	2.62	29.57	29.38	1.54	50	1956	635	2641	32.1	4.3
2005		71.78	2.45	32.85	31.96	1.43	94	1821	677	2592	28.5	4.6
2006		67.04	2.63	35.76	41.85	1.91	31	1970	715	2716	28.1	4.8
2007		65.12	2.57	37.66	44.86	1.99	43	1949	773	2765	27.0	5.2
2008		57.57	2.37	39.52	35.39	1.72	36	1758	545	2339	24.1	3.7
2009		58.09	2.35	39.28	37.35	1.75	44	1807	548	2399	25.1	3.8
2010		54.17	2.97	33.21	32.95	2.15	43	1459	307	1809	26.6	2.5
2011		61.56	2.93	33.85	34.11	1.99	33	1090	214	1337	25.6	2.2
2012		43.56	2.59	33.76	32.62	2.15	7	1255	84	1346	28.0	0.9
2013		58.53	3.00	33.40	34.59	2.12	0	926	36	962	23.1	0.4
2014		84.01	3.29	36.93	36.61	1.87	11	830	31	872	19.3	0.3
2015		62.57	3.04	45.19	34.34	2.05	10	750	30	790	13.8	0.3
2016												
2017												
2018												
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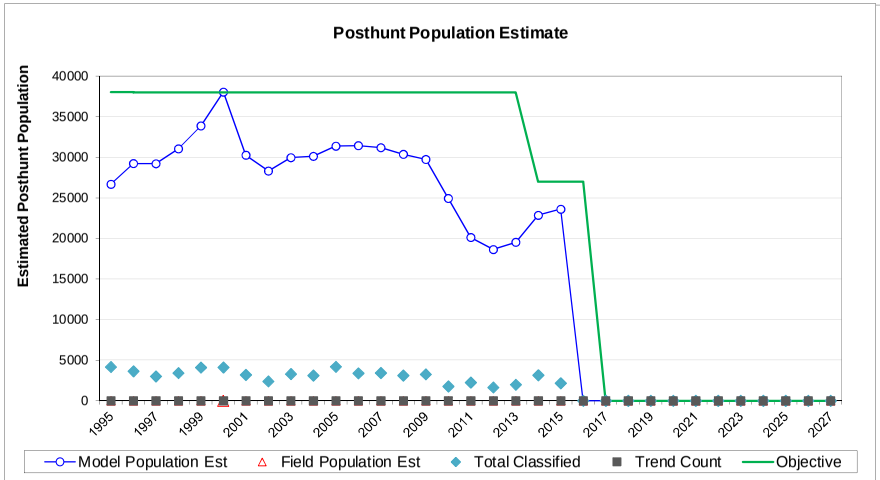
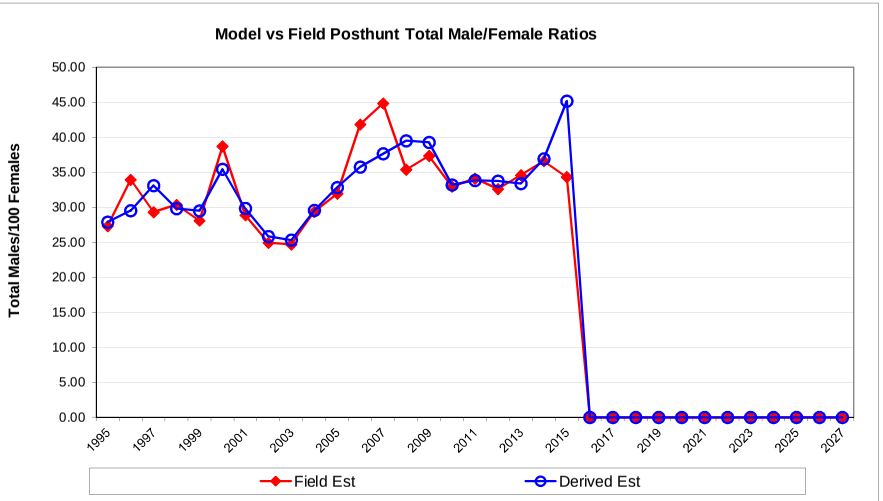
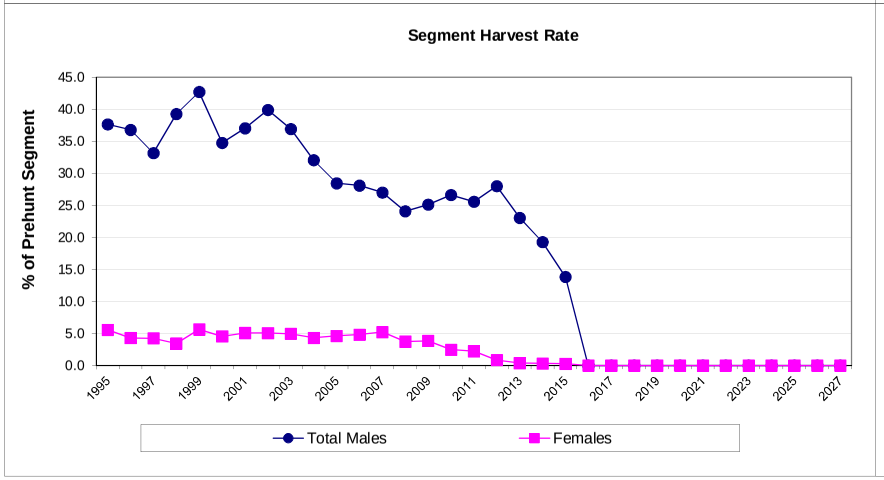
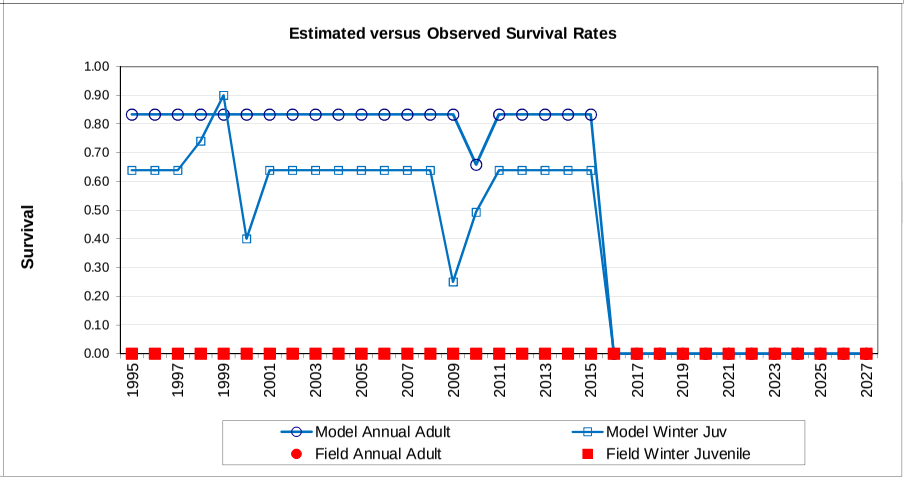
FIGURES









Comments:

END

WYOMING GAME AND FISH DEPARTMENT

5400 Bishop Blvd. Cheyenne, WY 82006

Phone: (307) 777-4600 Fax: (307) 777-4699

wgfd.wyo.gov

May 29, 2014

MEMORANDUM

TO: Scott Smith, Assistant Chief - Wildlife Division

FROM: Justin Binfet and Joe Sandrini

COPY TO: Jahnke, Peckham, Hibbs, file

SUBJECT: Proposed Objective Change Summary: Cheyenne River Mule Deer

The management objective for the Cheyenne River Mule Deer (MD740) herd has been reviewed by both the Sheridan and Casper Regions. This Herd Unit was created in 2009 by combining the Thunder Basin (MD752) and Lance Creek herds (MD753), and it is comprised of Hunt Areas 7 through 14, and 21. These Hunt Areas also encapsulate Non-Resident Deer Region B. The postseason population objective is currently 38,000 (a combination of the population objectives of its parent herds), and it managed for recreational hunting. We are proposing to change the post-season population objective to 27,000 and manage the herd under the Department's "Private Land Management" framework. These changes would also precipitate a proposal to shift to limited quota license issuance in Hunt Area 10 during the 2015 hunting season.

Following internal review and development of the proposed changes, a broad based public information dissemination and comment gathering effort was completed. This effort included:

- Letters mailed to approximately 275 landowners in the herd unit who had submitted deer license landowner coupons in recent years (copy attached).
- Letters soliciting comments on our proposals were mailed to the BLM's Newcastle Field Office; USFS – Thunder Basin National Grasslands; Inyan Kara Grazing Association; and the Thunder Basin Grassland Prairie Ecosystem Association.
- About 35 personal contacts were made with affected landowners, a summary table of these contacts is attached.
- A press release detailing proposed changes, the reasons for the changes and information on public meetings was disseminated to media outlets in northeast Wyoming, including Gillette, Wright, Douglas, Lusk, Newcastle and Sundance. (copy attached)
- Four public meetings presenting the proposals and soliciting public comment were hosted. Meetings were held in Newcastle, Lusk, Douglas, and Wright. A copy of the presentation given along with attendance and comment sheets are attached.

Having completed our herd unit review and considering the public comments received, we offer the following proposal for Commission approval:

Justification:

- This herd unit approximates in size and location the Cheyenne River Pronghorn herd unit, which also has a current population objective of 38,000. It seems incongruent to have a mule deer objective identical to that of a sympatric pronghorn herd objective (which nearly covers the same land mass) given the habitat composition and much higher number of pronghorn here.

- The spreadsheet model for MD740 produces an average, post-season population of approximately 28,000 mule deer since 1995 (std. dev ~ 5,950). The highest estimated population was in 2000 at ~ 41,000, and the lowest in 2012 (~ 17,400). The 2013 postseason estimate was ~18,200.

- Excluding the 2000 population estimate, the population has averaged ~27,200 (std. dev ~ 5,175) since 1995. Since 2001, this population has averaged 25,200 individuals post-season.

- Given fluctuations in weather conditions and ongoing habitat loss to various forms of development, it is likely this herd cannot support more than 27,000 individuals for any significant period of time.

- Habitat monitoring in mule deer wintering areas revealed over-browsing when the population model suggested this population was higher than about 28,000 – 30,000 individuals.

- In years when the population was above 27,000 recruitment appeared to be extremely sensitive to weather conditions. In recent years, low recruitment has occurred in both dry and wet years, even with improved shrub conditions. This suggests factors other than habitat and weather may now be influencing recruitment in this herd.

- An objective of 27,000 seems appropriate given long-term trends in this population, habitat conditions and reduced recruitment and survival in recent years.

- Across the board, landowners and hunters have expressed significant dissatisfaction with deer numbers and harvest opportunity since the 2010 hunting season, a year when the post-season population estimate dropped from 27,000 to 20,000.

- The proposed objective of 27,000 mule deer post season represents a 49% increase over the current post-season population estimate.

- The private land management strategy is appropriate for this area given the vast majority of occupied habitat is privately owned. Furthermore, there has been a substantial decline in hunter access to private lands given the decline of this population. In recent years, an increasing percentage of Region B license holders have been relegated to small parcels of public land or Thunder Basin National Grasslands in Area 10 where mule deer densities are extremely low.

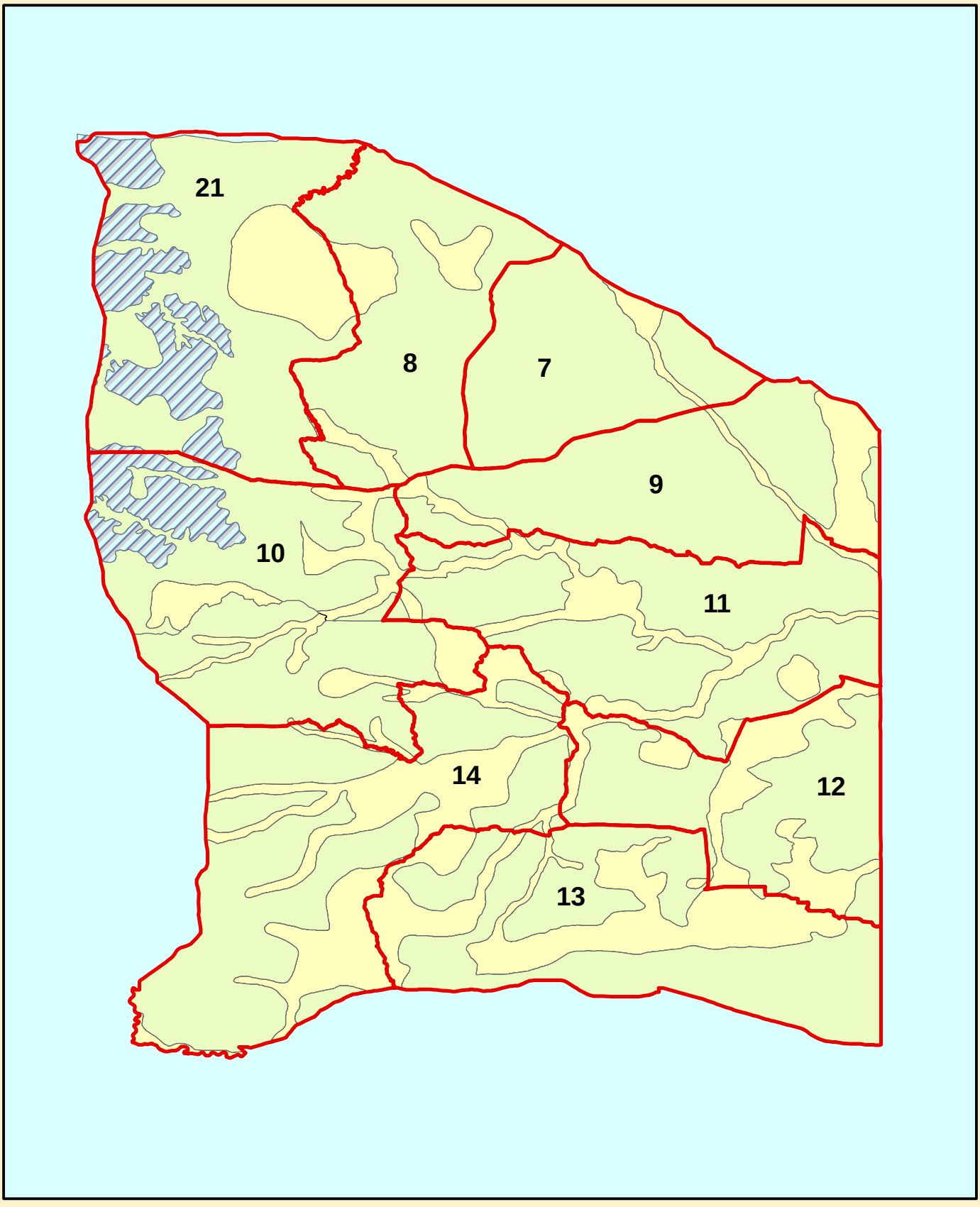
- The majority of occupied habitat in this herd unit is privately owned (approximately 75%). As a result, postseason buck ratios typically exceed recreational management maximums despite this population declining substantially over the last 10+ years. This stems from the fact that landowners reduce hunting access in lieu of population decline despite the proportion of bucks in the population. Neither season length nor Region B

quotas are now able to influence buck ratios as private land access has been significantly curtailed in recent years.

Public Input / Response:

- Three landowners telephoned local personnel after receiving their notification letter. None were opposed to the proposed changes. Rather, concern was expressed about addressing predation on mule deer and provision for doe/fawn seasons in the event damage becomes an issue in the future. Department personnel indicated agreement with their concerns and offered tangible responses in the form of support for ADMB projects in the area and issuance of area specific doe/fawn tags to address damage.

- While not submitting formal comments, representatives from both the Inyan Kara Grazing Association and Newcastle BLM voiced support for all the proposed changes to Newcastle wildlife biologist, Joe Sandrini.



Legend
- Hunt_Areas
- OUT
- YLG
- WYL

MD 740

0 4.25 8.5 17 25.5 34
Miles

Coordinate System:
Central Meridian:
1st Std Parallel:
2nd Std Parallel:
Latitude of Origin:

2014 - JCR Evaluation Form

SPECIES: Mule Deer
PERIOD: 6/1/2014 - 5/31/2015

HERD: MD751 - BLACK HILLS

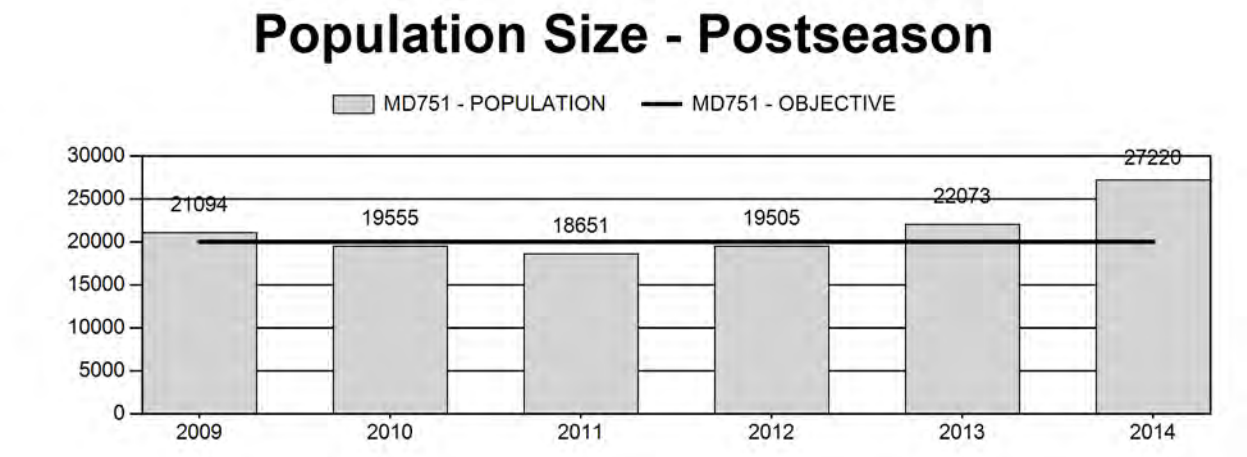
HUNT AREAS: 1-6
PREPARED BY: JOE SANDRINI

	2009 - 2013 Average	2014	2015 Proposed
Population:	20,176	27,220	29,361
Harvest:	1,786	1,864	2,490
Hunters:	4,445	3,828	5,010
Hunter Success:	40%	49%	50 %
Active Licenses:	4,610	3,867	5,200
Active License Success:	39%	48%	48 %
Recreation Days:	13,709	13,370	17,700
Days Per Animal:	7.7	7.2	7.1
Males per 100 Females	18	24	
Juveniles per 100 Females	70	96	

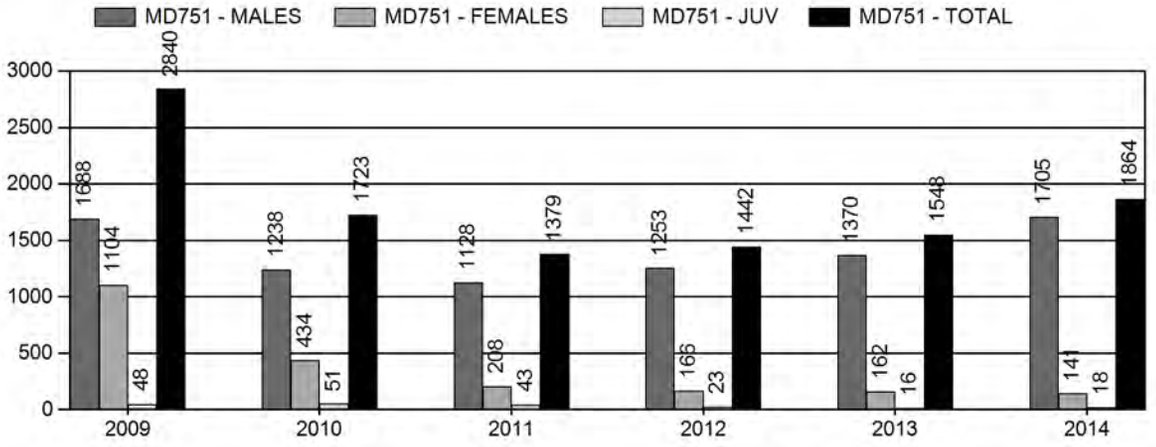
Population Objective (± 20%) :	20000 (16000 - 24000)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	36%
Number of years population has been + or - objective in recent trend:	2
Model Date:	02/20/2015

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

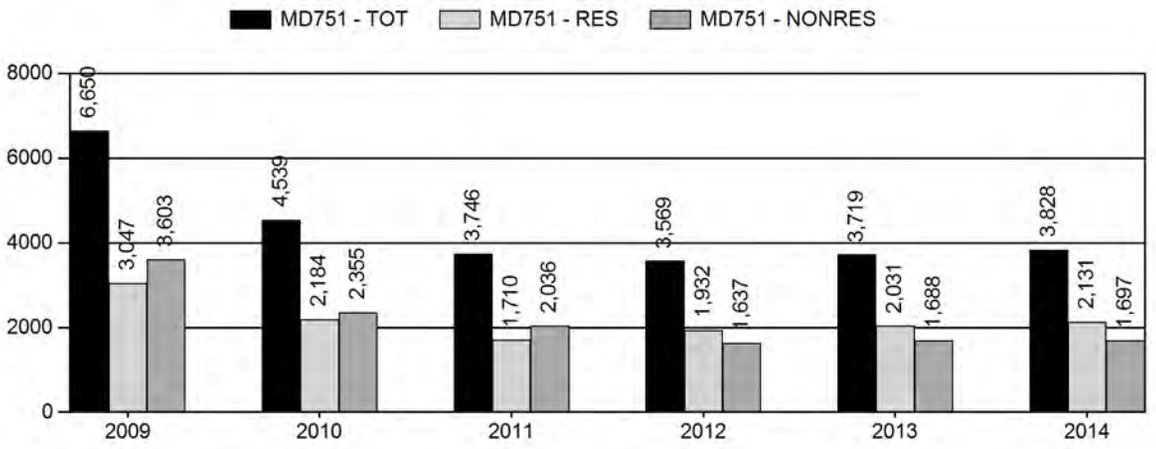
	JCR Year	Proposed
Females ≥ 1 year old:	1.2%	2.1%
Males ≥ 1 year old:	39.6%	38.5%
Juveniles (< 1 year old):	0.2%	0.4%
Total:	7.0%	8.5%
Proposed change in post-season population:	+23.6%	+7.9%



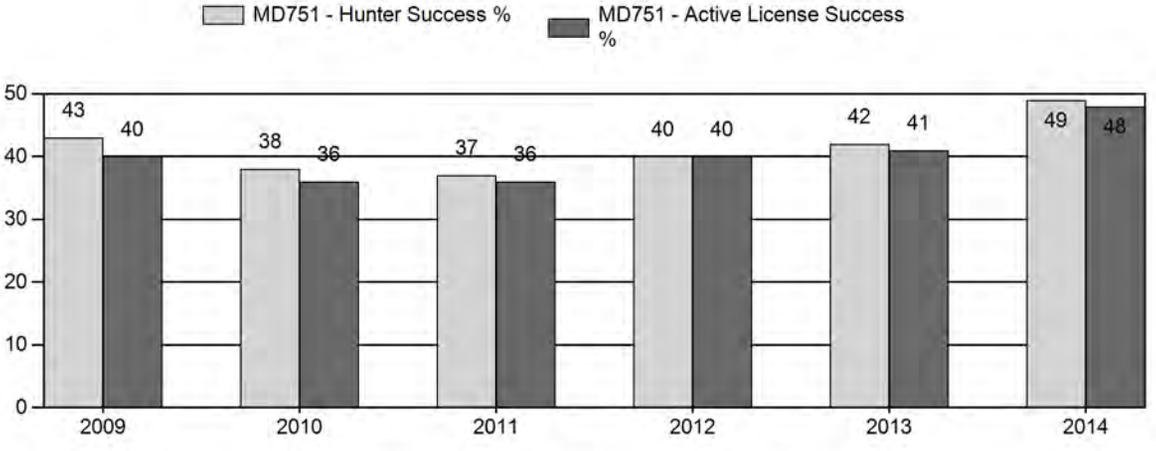
Harvest



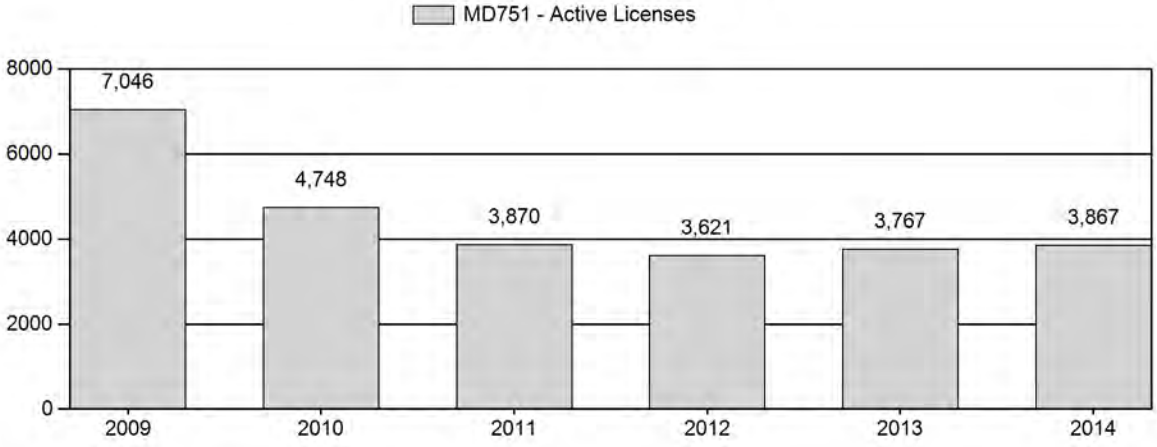
Number of Hunters



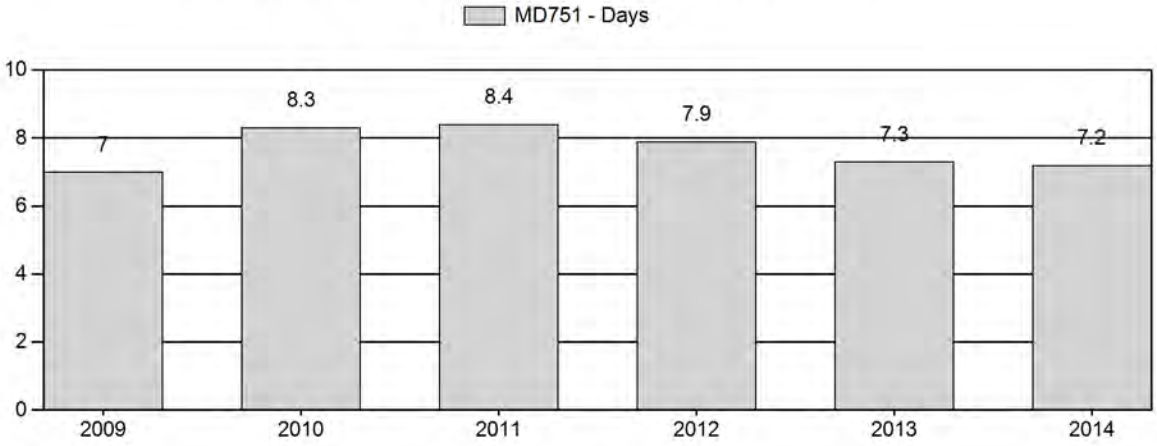
Harvest Success



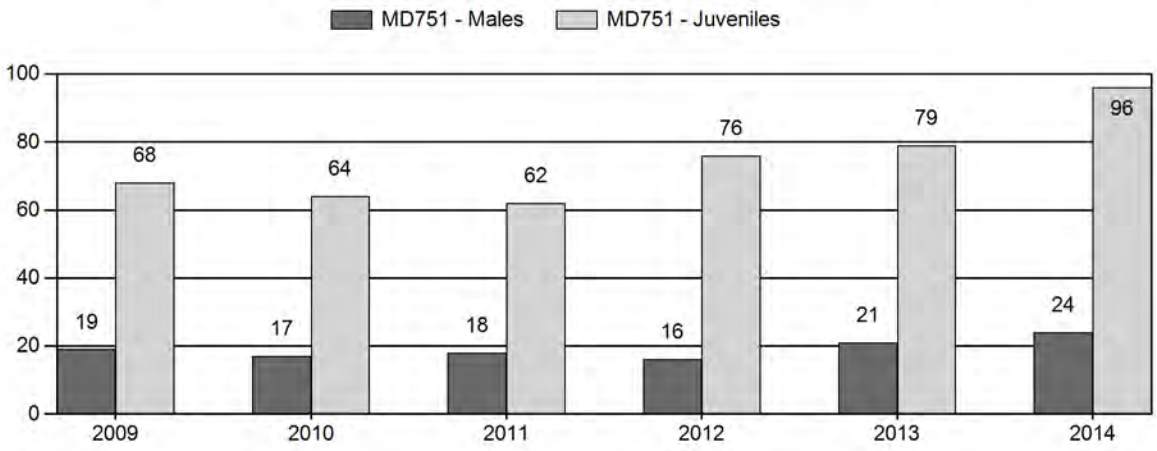
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 Postseason Classification Summary

for Mule Deer Herd MD751 - BLACK HILLS

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	21,094	48	0	0	0	52	100	10%	522	53%	357	36%	979	1,317	9	10	19	± 3	68	± 6	57
2010	19,555	44	0	0	0	71	115	10%	659	55%	421	35%	1,195	1,174	7	11	17	± 2	64	± 5	54
2011	18,651	41	0	0	0	76	117	10%	658	56%	406	34%	1,181	1,118	6	12	18	± 2	62	± 5	52
2012	19,505	58	0	0	0	70	128	8%	787	52%	596	39%	1,511	1,553	7	9	16	± 2	76	± 5	65
2013	22,073	71	0	0	0	62	133	11%	634	50%	499	39%	1,266	1,714	11	10	21	± 2	79	± 6	65
2014	27,220	98	0	0	0	113	211	11%	880	45%	847	44%	1,938	2,475	11	13	24	± 2	96	± 6	78

2015 HUNTING SEASONS
BLACK HILLS MULE DEER HERD (MD751)

Hunt Area	Type	Dates of Seasons		Quota	License	Limitations
		Opens	Closes			
1		Nov. 1	Nov. 20		General	Antlered mule deer off private land; any mule deer on private land
2		Nov. 1	Nov. 30		General	Antlered deer off private land; any deer on private land
2	6	Nov. 1	Nov. 30	250	Limited quota	Doe or fawn valid on private land
3		Nov. 1	Nov. 30		General	Antlered deer off private land; any deer on private land
4		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land, except the lands of the State of Wyoming's Ranch A property shall be closed
4	6	Nov. 1	Nov. 20	200	Limited quota	Doe or fawn valid on private land
5		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land
5	6	Nov. 1	Nov. 20	50	Limited quota	Doe or fawn
6		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Region A Nonresident Quota: 3,500

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	License Type	Quota change from 2014
2	6	+200
4	6	+50
5	6	+25
6	6	-10
Herd Unit Totals	**6**	**+265**
	Region A	**+750**

Management Evaluation
Current Postseason Population Management Objective[1]: 20,000
Management Strategy: Recreational
2014 Postseason Population Estimate: ~ 27,200
2015 Proposed Postseason Population Estimate: ~ 29,400
2014 Hunter Satisfaction: 75% Satisfied, 15% Neutral, 10% Dissatisfied

HERD UNIT ISSUES: The management objective of the Black Hills Mule Deer Herd Unit was set in 1986 for an estimated post-season population of 20,000 mule deer. The herd is managed under the recreational management strategy. It is apparent the current objective is not commensurate with newer population estimates relative to landowner and hunter desires. Thus, the management objective and strategy are currently under review, and a proposed new objective of 30,000 will be taken out for public comment during the spring of 2015.

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

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

White-tailed deer are the more numerous deer species in HA's 2 and 4, whereas more equal proportions or greater numbers of mule deer occupy HA's 1, 3, 5, and 6, depending upon habitat type. The vast majority of mule deer in the herd unit reside on private land. This results in their management being strongly influenced by landowner sentiments. Field personnel report mule deer numbers are improving and nearing tolerance levels in some locations; but many landowners, especially those south of I-90, desire to see more mule deer. A survey of about 450 Black Hills landowners at the end of 2014 revealed a bit more than half of the respondents (54%) who have mule deer on their property believed their numbers to be "about right;" while 42% reported numbers to be "too low;" and only 4% felt mule deer numbers were "too high." Over the past four years, many landowners and the hunting public have expressed the strong desire to see more mule deer, something that is now beginning to be addressed as this population has begun to rebound.

WEATHER: Drought conditions, which were generally persistent throughout the Black Hills between 2000 and 2006, began to moderate some in 2007. Between 2007 and 2011, annual temperatures were generally near or below the previous 30-year average and annual precipitation

[1] Currently under review and slated for revision.

each year was at or above average (http://www.ncdc.noaa.gov/cag/time-series/us). Notably, 2010 was colder and wetter than both the 30-year and 100-year averages; and the winter of 2010-11 severe. Since the late 1890's, only five other winters were as cold and snowy as that of 2010-11. Overall, the predominant weather pattern between 2007 and 2011 was characterized by generally cool summers, more persistent snow cover in late fall and winter, and above normal spring moisture.

Drought returned to the Black Hills in 2012, with well above normal summer temperatures and little rainfall during the growing season. Forage production that year was very poor, and the dry conditions led to several large wildfires in the southern half of the herd unit. These warm and dry conditions that beset the area in April of 2012 continued through the 2012-13 winter (http://www.ncdc.noaa.gov/cag/time-series/us). April of 2013 finally saw a break in this pattern when temperatures dropped well below normal for the entire month and good precipitation was again received. Through the remainder of the growing season, temperatures were slightly above average and precipitation well above normal. This resulted in excellent forage growth. In early October, 2013 winter storm Atlas blanketed the Black Hills with anywhere from about a foot of wet heavy snow near Newcastle, to three feet on the Bearlodge, and over five feet near Cement Ridge. No large scale die-offs of mule deer were witnessed after this storm, but a few mule deer mortalities on the National Forest south of I-90 were discovered. The remainder of the fall and the 2013-14 winter brought very close to average temperatures and snow fall, which resulted in continuous snow cover over much of the Black Hills until late May, and elevated spring run-off. Spring weather was similar to the previous year with temperatures just below normal and about 20% more precipitation than average. This was followed by a summer with close to average temperatures and precipitation about 25% above normal, resulting in a second year of excellent forage production and ultimately fawn production. To date, the 2014-15 winter has been generally mild with below normal amounts of snowfall in most locations.

Based on weather and habitat conditions over the past five years, it is likely mule deer have entered the winter in fair to good condition most years, except bio-year 2012. More normal winter temperatures and precipitation, punctuated by some severe weather, have increased winter stress on mule deer compared to the previous decade, as did the drought of 2012. This weather pattern resulted in recruitment levels that dropped between 2009 and 2011, but have since increased. During this same timeframe, it appears over-winter survival of all age classes of mule deer has been about average, except during the winter of 2010-11 when over-winter mortality is thought to have been significant. With favorable weather conditions the past two years, this herd has begun to respond with increased productivity and survival.

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

Currently, no significant quantification of mule deer habitat quality or quantity are being conducted within this herd unit. A single true mountain mahogany and two bur oak production

and utilization transects have been established. The true mountain mahogany transect is located on mule deer transitional and winter range typical of the southern Black Hills, and the bur oak transects are in winter range more typical of white-tailed deer habitat in the northern hills. While little habitat data overall have been collected, it appears drought conditions negatively affected shrub production, and peak mule deer numbers several years ago may have exceeded what the forage conditions could sustain given the lack of precipitation at the time. The past two years have seen excellent forage production, and browse on winter and transitional ranges has appeared to be in generally good to excellent condition.

FIELD DATA: Between 2009 and 2011 observed fawn:doe ratios were consistently low, exhibiting a mean of 65:100. From 2012 through 2014, observed post-season fawn:doe ratios rebounded, exhibiting increasing values of 76:100, 79:100, and 96:100 each year, respectively. This herd's population now appears to be beginning to increase significantly. Because a post-season ratio of 66 fawns per 100 does is thought to be the level necessary to sustain hunted mule deer populations, the population decline experienced after 2006 was likely due initially to increased harvest rates and a drop in over-winter survival, while increased non-hunting mortality augmented the decline beginning in 2009. In addition, an usually severe winter in bio-year 2010 and localized epizootic hemorrhagic disease (EHDV) outbreaks each summer between 2008 and 2013 increased annual mortality of all age classes. During the 2007 - 2010 period, evidence suggests the mountain lion population in the Black Hills also reached historically high levels. As a result of harvest pressure, weather conditions, disease, and increased predation the estimated post-season population[2] fell 54% between 2006 and 2011. This same period witnessed a similar decline in the estimated preseason population, while preseason trend counts dropped 75% (Figure 1). With better fawn production and survival since 2012, the declining trend has been reversed.

As this population declined after 2006, buck:doe ratios dropped, averaging 17:100 from 2008 through 2012. With better fawn production in 2012 and 2013, yearling buck numbers increased as did the total observed buck:doe ratio, moving up to 21:100 and 24:100 in 2013 & 2014, respectively. Over the past five years, post-season buck:doe ratios in this herd have averaged 19:100 (std. dev.= 3.1). As such, this herd generally exhibits buck:doe ratios at the very bottom end, or below, the Department's management criteria for recreational hunting. Provided non-hunting mortality remains near what it has been the past year or two, we anticipate the buck:doe ratio to stay closer 24:100 over the next couple of years, which is closer to the long-term mean.

[2] Based on revised model of 02/20/2015

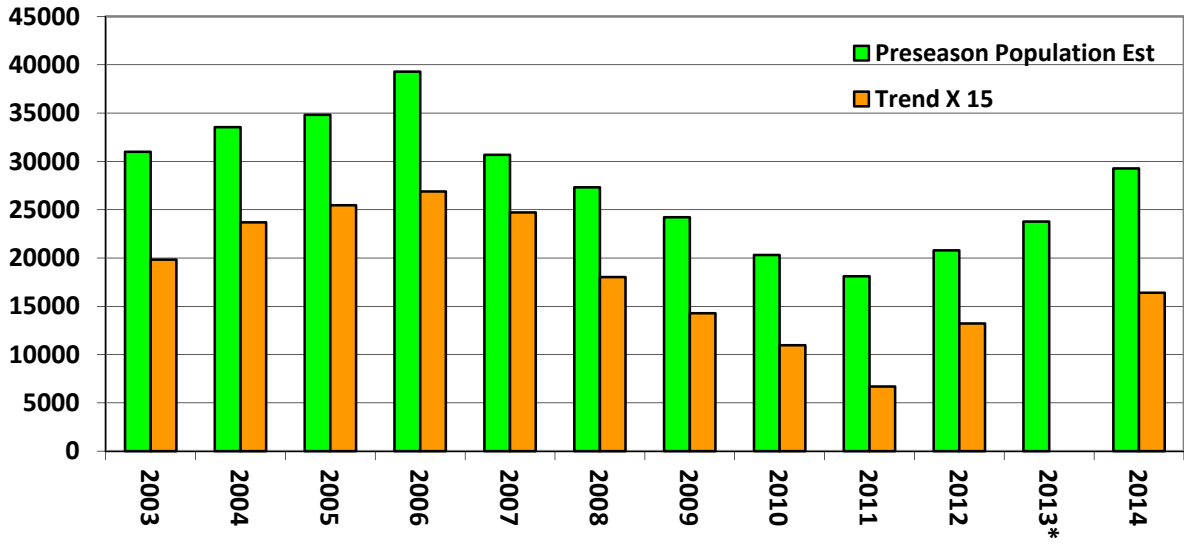


Figure 1. 2003 – 2014 pre-season population estimates produced by TSJ CA model, and mule deer observed preseason along trend count routes (increased by a factor of 15). * *Trend counts were not conducted in 2013 due to winter storm Atlas.*

HARVEST DATA: Deer seasons in the Black Hills have been traditionally structured to address white-tailed deer management. Consequently, this mule deer herd is managed by balancing white-tailed deer seasons and landowner tolerance for deer (both species) with recreational opportunity. An analysis of harvest information shows the number of hunters in the field pursuing bucks has the greatest impact on total harvest. As such, buck harvest has been regulated by altering non-resident hunter numbers via changes in the Region A quota, while resident buck hunter participation can only be limited by shortening the season – notably by inclusion or removal of the Thanksgiving Day weekend and the days following in November. Department surveys and contacts with non-resident hunters indicate most non-residents want to harvest buck mule deer. This fact, combined with a hunting season that targets bucks during the rut, results in very heavy hunting pressure on buck mule deer. Considering this, and the drop in total buck numbers between 2007 and 2011, it was prudent to limit harvest of buck mule deer through last year. We are now at a point following 3-years of good fawn production and survival, especially in 2014, that harvest of mule deer can be liberalized, at least north of I-90.

With more conservative hunting season structures in place between 2010 and 2014, mule deer harvest dropped about 40% from the level experienced when this population peaked, although reported harvest did bump up substantially in 2014[3] along with hunter success. However, hunter success has declined between 2009 & 2011 before trending upwards beginning in 2012; while hunter effort followed a reverse trend. Hunting seasons the past five years reduced harvest of mule deer bucks about 37% from that experienced during the immediately preceding 5-year period with the traditional 30-day November season north of I-90. Comparing these same time periods, resident harvest of mule deer bucks dropped a bit more than 20%, while non-resident harvest of mule deer bucks dropped closer to 50%. During this time frame, harvest of white-

[3] 2014 harvest survey statistics indicate mule deer buck harvest increased about 36% in 2014, something that appears somewhat incongruent with season structure, population trends and field observations.

tailed deer bucks declined less (see WD706). As a result, post-season mule deer buck:doe ratios held fairly stable and then began to improve and deer hunter satisfaction essentially remained unchanged between 2011 and 2013, with about 68% of hunters of both deer species reporting they were either satisfied or very satisfied with their Black Hills deer hunt; and only around 15% indicating they were either dissatisfied or very dissatisfied – regardless of species. Notably, satisfaction measures improved in 2014 with 75% of both mule deer and white-tailed deer hunters reporting they were satisfied with their Black Hills deer hunt, and only 10% reporting negative satisfaction – again regardless of species. It can be inferred from the inherent correlation between harvest success and hunter satisfaction that increases in deer hunter success from 2013 to 2014 influenced reported increases in hunter satisfaction.

POPULATION: Population modeling of this herd has always been difficult. The population violates the closed population assumption due to significant interstate movement of deer combined with interchange between adjacent mule deer herds in Wyoming. In addition, changes in doe harvest rates, outbreaks of EHDV, increased predation, a high level of vehicle-deer collisions, occasional severe weather events, and inadequate classification sample sizes at times make constructing a reliable population model questionable at best. In 2014, the spreadsheet model for this herd was reconstructed and re-initiated after correcting errors detected in the previous model. The present model was set to solve only on years for which field data were available (1993-2014), but used to project the 2015 population. The corrected and revised model produced a higher estimated peak population in 2006 and lower population nadir in 2011 compared to the previously used model. It also indicates a more rapidly growing population the past two years as fawn production and survival have increased.

The 2014 estimated, post-season population[4] of Black Hills mule deer is about 27,200, a value we believe to be artificially high due to significantly increased reported harvest in 2014 without commensurate changes in season structure or perceived population size. This population is projected to have peaked in 2006 at an estimated postseason population of around 36,000 mule deer, and then declined to near 16,500 in 2011. It is then estimated to have begun to rebound, growing almost 65% into post-season 2014. Because the models we use to simulate populations produce their most unreliable estimates in the first and last few years of model construction, we question whether this population has grown as much as indicated over the past three years. This is because 2012 and 2014 trend counts were about 20% to 30% below those found in years contained in the middle of the model at a time when this population is projected to have been at a similar level. At any rate, this herd has begun to rebound after a substantial decline, and while its growth may now need to be tempered in some locations, many landowners and hunters still desire more mule deer on the ground. The last sizeable population decline this herd experienced was in the mid 1990's. That drop was quickly reversed in 1998 and 1999 when very conservative hunting seasons aligned with excellent fawn survival and mild winters. The same scenario may now be unfolding in 2013 & 2014.

As mentioned above, population modeling of this herd is difficult. The Semi Constant Juvenile / Semi Constant Adult (SCJ SCA) model was chosen to estimate this population this year. While the TSJ CA model exhibited the lowest AICc (127) and best fit (12) of competing models, the AICc of the SJC SJA model was very close at 138, with estimates of the preseason population better correlated with trend counts since 1996. In fact, the preseason population estimates

[4] 02/20/2015 model version.

produced by this model between 2003 and 2014 are 95% correlated with preseason trend counts over the same period;[5] and the relative changes projected in the population more in line anecdotal observations of field personnel and landowners. However, this model reaches upper constraints on adult survival (0.9) in all years not allowed to vary independently, something that is unlikely. The TSJ CA model on the other hand, produces a nearly equivalent adult survival rate of 0.877, but very high juvenile survival rates during many of the first years modeled and low juvenile survival rates most years after. Overall, we consider the model for this herd to be of fair to poor quality due to the lack of herd specific survival data, violations of the closed population assumption, below adequate classification sample sizes 4 of the past 6 years, and aerial classifications in terrain that makes classifying yearling bucks difficult.

MANAGEMENT SUMMARY: The spreadsheet model suggests recent postseason populations have exceeded our current management objective of 20,000 mule deer. If the herd actually now numbers closer to 27,000, then our current objective is well below most landowner's and hunter wishes. As reported above, many landowners have expressed dissatisfaction with the number of mule deer, especially south of I-90. Based upon habitat conditions, the desires of hunters and landowner sentiments, a season designed to increase this herd is warranted. However, given the increased productivity and survival witnessed the past couple of years, the growth potential of this herd must be tempered, at least north of I-90. Therefore, the 2015 hunting season is designed to allow increased buck hunting opportunity and begin to increase harvest of does in HA 2, while still fostering total herd growth.

Changes to the 2015 mule deer hunting season in the Black Hills included moving the closing date in HA 1 to November 20th from the 21st, while going to a November 30th closing date for whitetails in this same hunt area and both deer species hunt areas 2 and 3. This change was made to address desires expressed by some landowners and outfitters in hunt area 1 for a shorter deer hunting season, especially for mule deer. The Region A quota was increased from 2,750 to 3,500 to allow for more buck hunting opportunity as this herd approaches what will likely be its revised objective. Additionally, issuance of Type 6 doe/fawn licenses in HA 2, which are valid for both mule deer and white-tailed deer on private lands, have been increased from 50 to 250, while similar license types in HA 4 and HA 5 have been increased from 150 to 200 and 25 to 50, respectively to slow herd growth. The ten Type 6 licenses valid and HA 6 & 9 issued in 2014 have been eliminated as mule deer number here remain depressed.

Mule deer buck numbers are improving. Based upon classification data and population estimates, there should be good cohorts of 1, 2 and even some 3 year-old bucks available for hunters in 2015, but reduced numbers of 4 & 5 year-old bucks. As such, it seems sensible to liberalize buck harvest, something that attracts more hunters into the area, many of whom will harvest whitetail does – something we should encourage to slow the growth of the whitetail population. The increase in Region A license issuance and 30-day season north of Interstate 90 is projected to boost buck mule deer harvest about 30% above the more conservative hunting seasons the past several years. However, if reported mule deer harvest was actually as high as the 2014 harvest survey indicates, the liberalized season structure could increase take up to 60%. Despite this increase in buck harvest, buck:doe ratios should maintain or even slightly increase as this population grows.

[5] Trend counts not conducted in 2013 due to winter storm Atlas.

Issuance of doe/fawn tags has been increased substantially in HA 2 to allow landowners there wishing to control mule deer numbers that opportunity. The past five hunting seasons have seen a consistent take of about 100 to 125 mule deer does and about 15 fawns on general licenses. It is anticipated doe/fawn harvest on General Licenses will also increase about 30% given the changes to the season structure. This relatively low level of female and juvenile mule deer harvest does not seem to warrant complicating the regulations further by segregating mule deer and white-tailed deer harvest on general licenses, a move opposed by many landowners. Another 45 or so antlerless mule deer have been harvested each of the past three years on Type 6 licenses, and harvest on these license types is expected to increase another 70 or so with changes license issuance.

The 2015 hunting season is expected to yield a 2015 postseason population of about 29,400 mule deer, which represents an 8% increase in the current post-season population. Such a change in the population would result in this herd being 45% above the current objective, but much closer the number most hunters and landowners would like to see, and near the value of what will likely be proposed as a revised objective.

INPUT	
Species:	Mule Deer
Biologist:	Joe Sandrini
Herd Unit & No.:	Black Hills MD751
Model date:	02/20/15

☑ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	266	275	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	76	138	☑ SCJ,SCA	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	12	127	☐ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population				Predicted Posthunt Population				Objective
	Field Est	Field SE		Juveniles	Total Males	Females	Total	Juveniles	Total Males	Females	Total	
1995				6283	3933	8360	18575	6220	1961	7783	15964	20000
1996			650	6603	3647	8888	19138	6582	1887	8644	17114	20000
1997			450	4145	2699	8781	15625	4110	1145	8440	13695	20000
1998			589	7646	2880	9445	19971	7613	1337	9217	18166	20000
1999			902	9391	4391	11483	25266	9378	2510	11280	23168	20000
2000			1052	8373	5098	12990	26461	8352	3099	12678	24129	20000
2001			615	7457	5317	13938	26713	7409	3137	13598	24144	20000
2002			981	9678	5066	14481	29225	9641	3055	14129	26825	20000
2003			1322	9691	5668	15634	30993	9617	3242	15065	27925	20000
2004			1579	11248	5829	16470	33546	11186	3079	15702	29967	20000
2005			1697	11149	6157	17518	34824	11080	3433	16640	31153	20000
2006			1792	14514	6444	18330	39287	14415	3877	17424	35717	20000
2007			1648	10161	5378	15140	30679	10094	2986	13891	26970	20000
2008			1202	9504	4136	13673	27313	9398	2052	12651	24102	20000
2009			952	7745	4012	12462	24219	7693	2155	11248	21095	20000
2010			731	6542	3134	10630	20306	6486	1772	10153	18411	20000
2011			446	5791	2785	9537	18113	5744	1544	9309	16596	20000
2012			881	7548	3128	10116	20793	7523	1750	9934	19206	20000
2013				8706	3852	11217	23776	8689	2345	11039	22073	20000
2014			1093	11964	4740	12565	29270	11945	2865	12410	27220	20000
2015				11121	6194	14784	32100	11077	3807	14476	29361	20000
2016												20000
2017												20000
2018												20000
2019												20000
2020												20000
2021												20000
2022												20000
2023												20000
2024												20000
2023												20000
2025												20000
2026												20000

Survival and Initial Population Estimates

Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1995	0.61			0.90		
1996	0.30			0.90		
1997	0.90			0.90		
1998	0.84			0.90		
1999	0.61			0.90		
2000	0.61			0.90		
2001	0.61			0.90		
2002	0.61			0.90		
2003	0.61			0.90		
2004	0.61			0.90		
2005	0.61			0.90		
2006	0.36			0.72		
2007	0.30			0.87		
2008	0.51			0.80		
2009	0.35			0.82		
2010	0.42			0.81		
2011	0.61			0.90		
2012	0.61			0.90		
2013	0.61			0.90		
2014	0.61			0.90		
2015	0.61			0.90		
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2023						
2025						
2026						

Parameters:	Optim cells
Juvenile Survival =	0.605
Adult Survival =	0.900
Initial Total Male Pop/10,000 =	0.196
Initial Female Pop/10,000 =	0.778

MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio			Harvest				Harvest: Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1995		79.92	3.89	25.19	23.66	1.75	57	1793	524	2374	50.1	6.9
1996		76.14	4.31	21.83	23.72	2.02	19	1600	221	1840	48.3	2.7
1997		48.70	3.96	13.57	12.12	1.72	32	1413	310	1755	57.6	3.9
1998		82.60	5.37	14.50	16.25	1.90	30	1403	208	1641	53.6	2.4
1999		83.14	4.43	22.26	23.81	1.95	12	1710	185	1907	42.8	1.8
2000		65.88	3.60	24.45	33.77	2.31	19	1817	284	2120	39.2	2.4
2001		54.49	3.74	23.07	24.75	2.26	44	1982	309	2335	41.0	2.4
2002		68.23	3.32	21.62	21.79	1.60	34	1828	320	2182	39.7	2.4
2003		63.84	2.87	21.52	14.23	1.13	67	2205	517	2789	42.8	3.6
2004		71.24	3.83	19.61	24.79	1.93	56	2500	698	3254	47.2	4.7
2005		66.59	3.62	20.63	23.38	1.85	63	2476	798	3337	44.2	5.0
2006		82.73	4.20	22.25	25.67	1.94	90	2333	823	3246	39.8	4.9
2007		72.66	3.83	21.50	21.50	1.75	61	2175	1136	3372	44.5	8.3
2008		74.29	3.45	16.22	16.22	1.32	96	1894	929	2919	50.4	7.5
2009		68.39	4.70	19.16	19.16	2.09	48	1688	1104	2840	46.3	9.7
2010		63.88	3.99	17.45	17.45	1.76	51	1238	434	1723	43.5	4.5
2011		61.70	3.89	16.59	17.78	1.78	43	1128	208	1379	44.6	2.4
2012		75.73	4.11	17.62	16.26	1.55	23	1253	166	1442	44.1	1.8
2013		78.71	4.71	21.24	20.98	2.00	16	1370	162	1548	39.1	1.6
2014		96.25	4.63	23.08	23.98	1.84	18	1705	141	1864	39.6	1.2
2015		76.52	4.32	26.30	19.34	1.79	40	2170	280	2490	38.5	2.1
2016												
2017												
2018												
2019												
2020												
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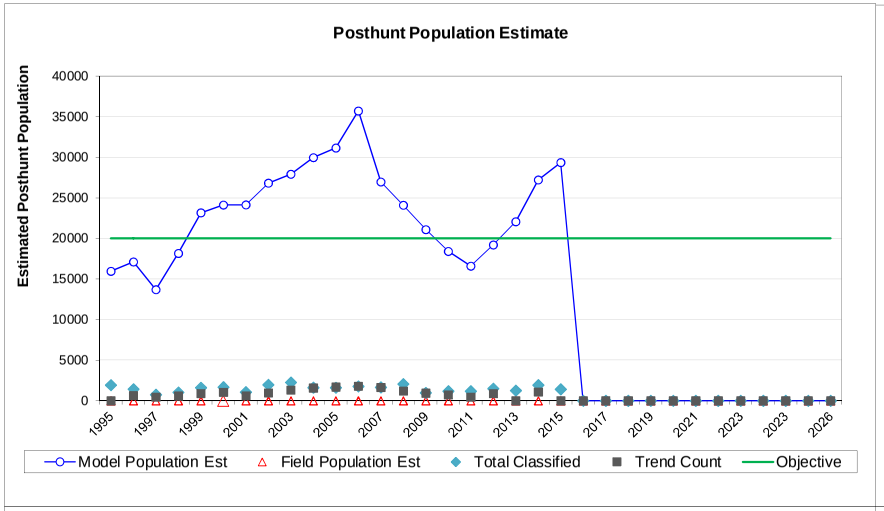
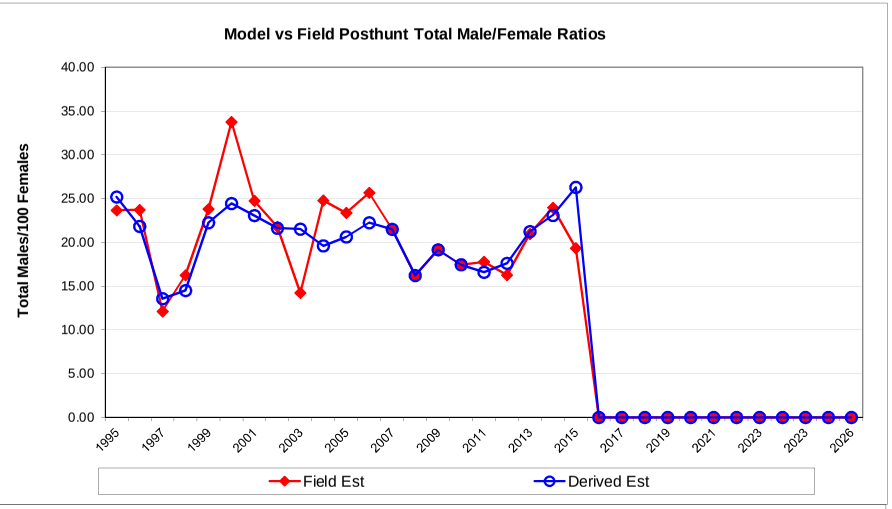
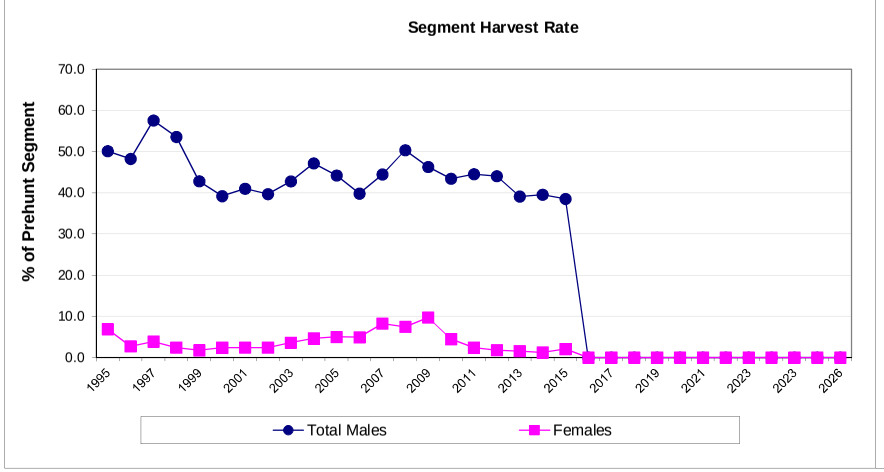
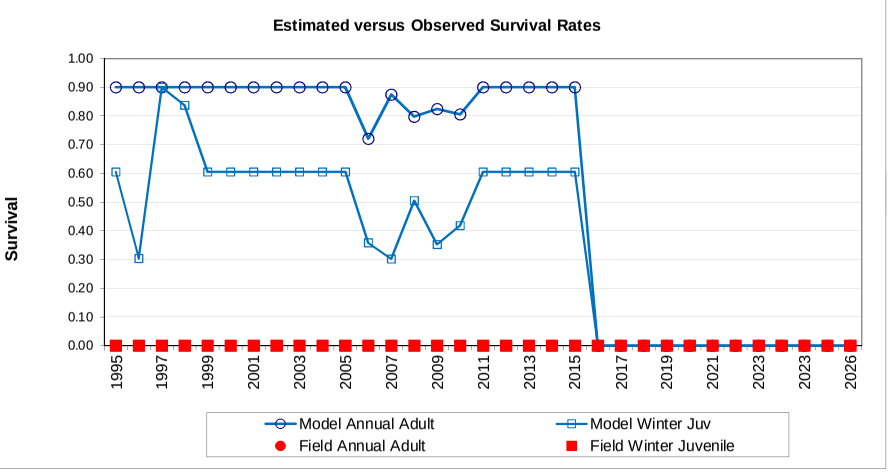
2026												

FIGURES









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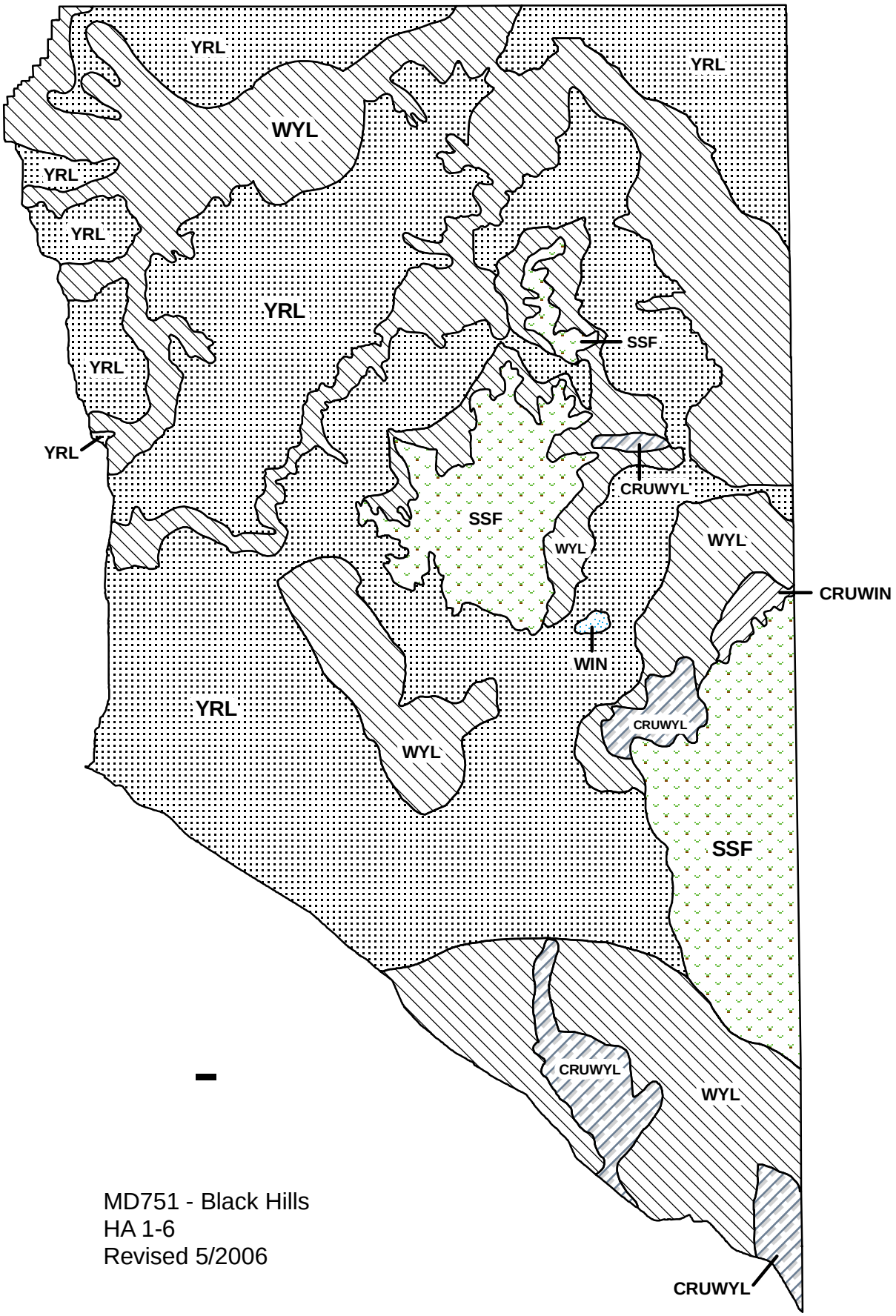


MD751 - Black Hills
HA 1-6
Revised 5/2006

2014 - JCR Evaluation Form

SPECIES: Mule Deer
PERIOD: 6/1/2014 - 5/31/2015

HERD: MD755 - NORTH CONVERSE

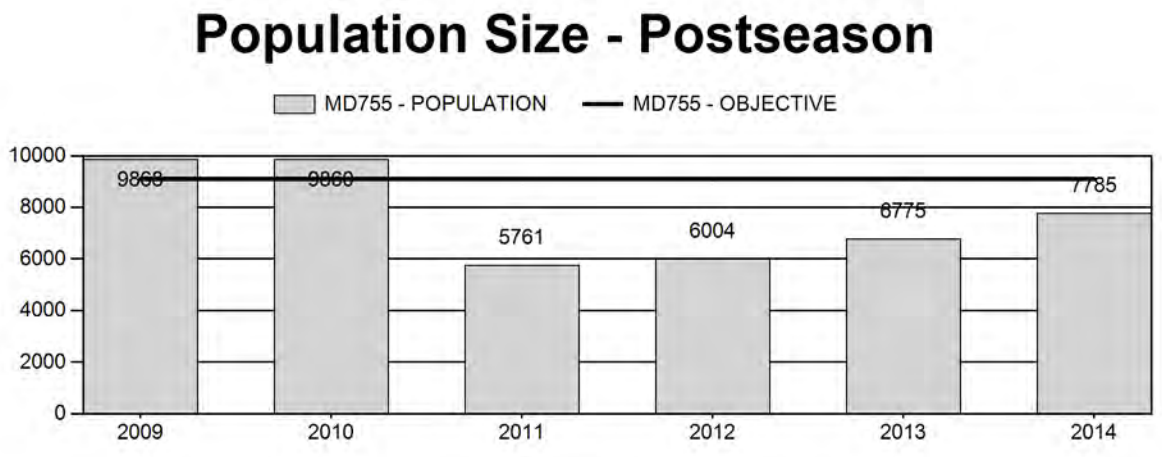
HUNT AREAS: 22
PREPARED BY: WILLOW HIBBS

	2009 - 2013 Average	2014	2015 Proposed
Population:	7,654	7,785	7,949
Harvest:	628	254	210
Hunters:	774	359	260
Hunter Success:	81%	71%	81 %
Active Licenses:	823	359	260
Active License Success:	76%	71%	81 %
Recreation Days:	3,038	1,301	1,000
Days Per Animal:	4.8	5.1	4.8
Males per 100 Females	40	30	
Juveniles per 100 Females	66	92	

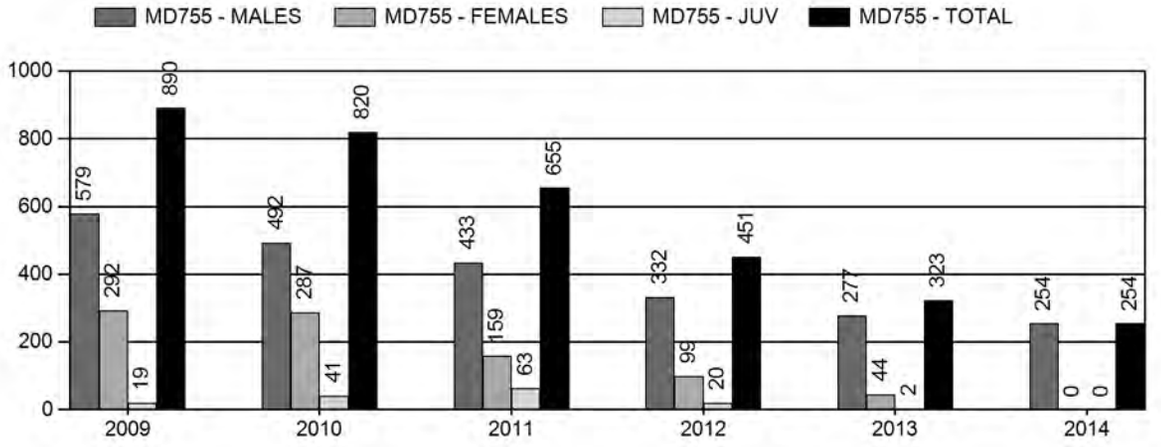
Population Objective (± 20%) :	9100 (7280 - 10920)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-14.5%
Number of years population has been + or - objective in recent trend:	13
Model Date:	02/19/2015

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

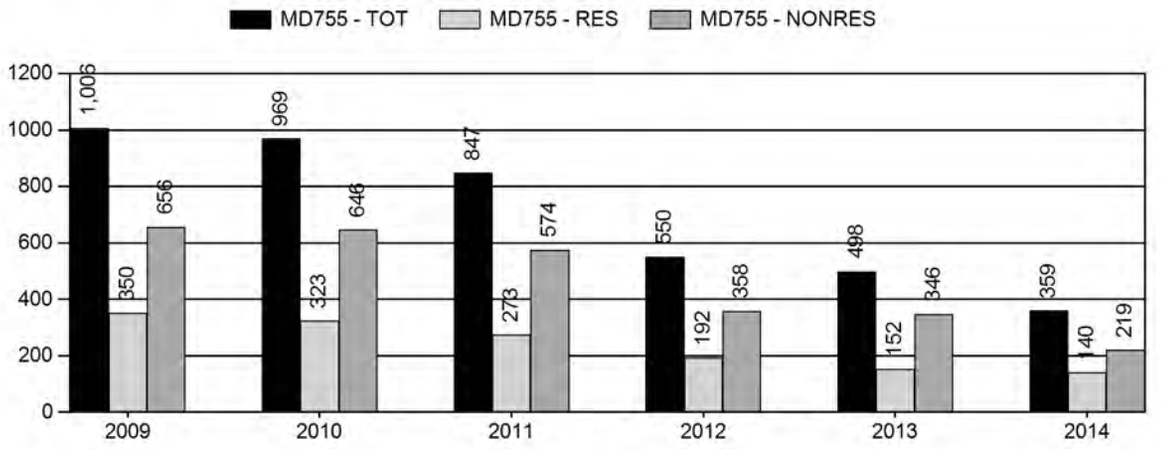
	JCR Year	Proposed
Females ≥ 1 year old:	0%	0%
Males ≥ 1 year old:	16.1%	11.1%
Juveniles (< 1 year old):	0%	0%
Total:	3.2%	2.6%
Proposed change in post-season population:	-3.5%	-2.8%



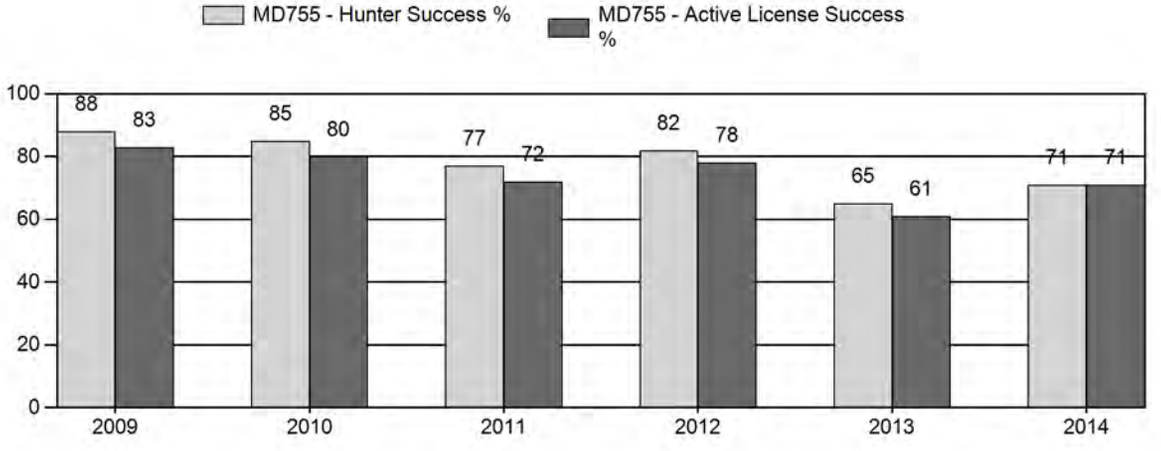
Harvest



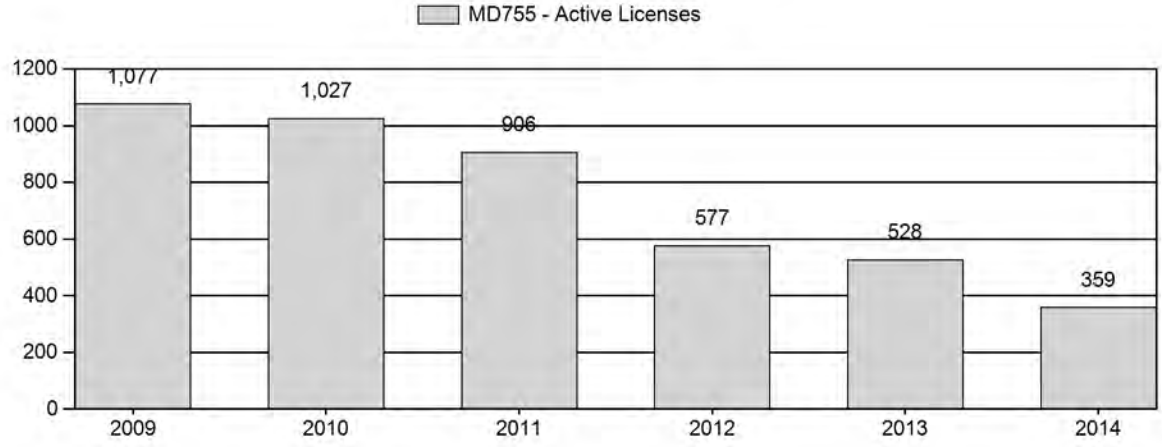
Number of Hunters



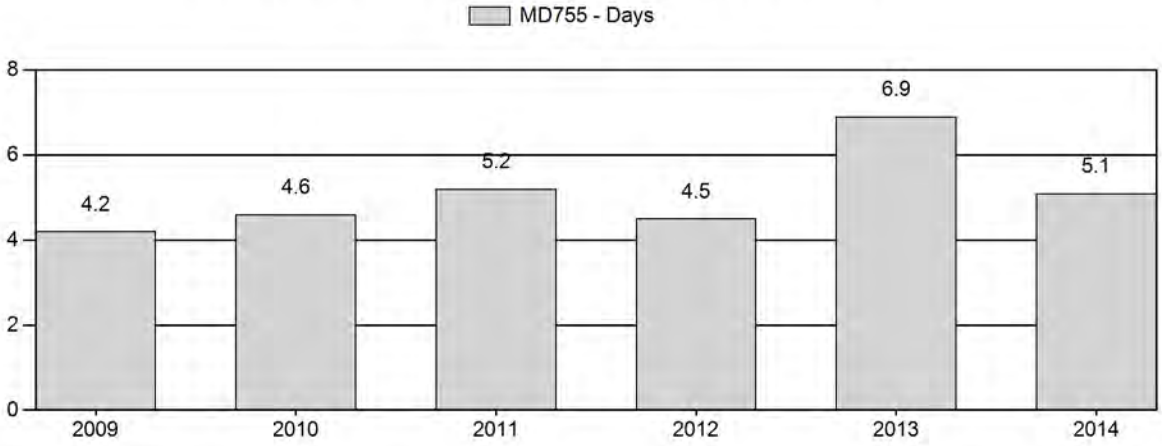
Harvest Success



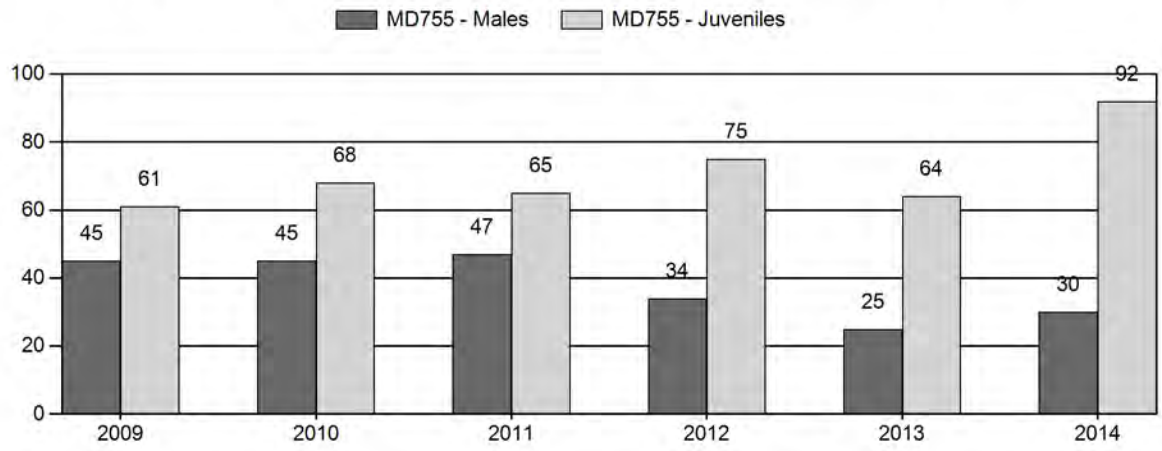
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 Postseason Classification Summary

for Mule Deer Herd MD755 - NORTH CONVERSE

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	9,868	49	0	0	0	126	175	22%	393	49%	239	30%	807	1,351	12	32	45	± 5	61	± 6	42
2010	9,860	39	0	0	0	119	158	21%	349	47%	237	32%	744	850	11	34	45	± 5	68	± 7	47
2011	5,761	26	0	0	0	94	120	22%	257	47%	166	31%	543	1,276	10	37	47	± 6	65	± 8	44
2012	6,004	23	0	0	0	44	67	16%	198	48%	149	36%	414	1,216	12	22	34	± 6	75	± 10	56
2013	6,775	30	0	0	0	39	69	13%	275	53%	176	34%	520	1,095	11	14	25	± 4	64	± 8	51
2014	7,785	23	26	14	3	0	66	14%	220	45%	202	41%	488	1,936	10	20	30	± 5	92	± 11	71

2015 HUNTING SEASONS
NORTH CONVERSE MULE DEER HERD (MD755)

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

Hunt Area	Type	Quota change from 2014
22	1	-100

Management Evaluation
Current Postseason Population Management Objective: 9,100
Management Strategy: Special
2014 Postseason Population Estimate: ~7,800
2015 Proposed Postseason Population Estimate: ~7,900
2014 Hunter Satisfaction: 63% Satisfied, 20% Neutral, 17% Dissatisfied

Herd Unit Issues

The North Converse Mule Deer herd has a postseason population objective of 9,100 mule deer and is managed under the special management strategy, with a goal of maintaining postseason buck ratios between 30-45 bucks per 100 does. The objective and management strategy were last revised in 1997, and are scheduled for review in 2015.

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

Weather

Weather conditions throughout 2014 produced above average precipitation, especially during the growing season. These conditions yielded high fawn production while providing for good body condition of mule deer going into winter. The 2014-2015 winter has been moderate to date with several sub-zero cold snaps and precipitation events occurring earlier in the season, and warmer conditions with mild precipitation realized later in the season. Following more substantial precipitation events earlier in the year, warm conditions often occurred in between cold snaps which served to melt out lowlands and expose forage for wintering mule deer. Therefore, winter survival was thought to be normal over the last bio-year.

Habitat

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

Field Data

It has been increasingly difficult to meet classification sample sizes in this herd unit as it is not a budget priority for aerial surveys. Total number of animals classified has steadily decreased since 2009. In 2014, the adequate sample size was 1,946 animals, yet only 488 mule deer were classified despite intensive ground coverage.

Fawn production/survival dramatically improved in 2014, with a ratio of 92 fawns per 100 does being well above the 5-year average of 67. Several consecutive years of average to above average fawn production and survival will be needed to continue trending towards the population objective.

Postseason buck ratios increased slightly from 2013 (25), but remained relatively low in 2014 (30), which is at the lower end of special management criteria. Again, classification ratios should be viewed with caution as the sample size was ~75% below what was needed to ensure adequacy at a 90% confidence interval. Regardless, it appears postseason buck ratios have declined considerably in the past few years as they typically run in the mid 40s, a notion that has been corroborated by landowners and outfitters.

Harvest

Overall harvest has declined in this herd unit as license issuance has decreased to address population decline. The 2014 harvest of 254 was by far the lowest total deer harvest ever obtained in this herd unit. From 1991 – 2010, an average of 564 bucks were harvested per year in this herd unit. The 2014 harvest of 254 was 55% lower than the long-term average. License success in 2014 (71%) improved from 2013 (61%) but is still lower than the previous 5-year average of 79%. In 2013, hunters experienced a dramatic increase in the number of days per animal (6.9), which is well over the preceding 5 year average of 4.7 days/animal. However, in 2014 the number of days to harvest an animal was reduced to 5.1, indicating buck availability may have been more commensurate with license issuance.

In 2014, 63% of hunters reported being either satisfied or very satisfied with their hunt, indicating a remarkably high level of satisfaction given the lack of public access and population decline. It should be noted that most hunters whom speak to Game and Fish personnel are advised to secure access on private land before purchasing a license in areas that have limited public access, or at least be aware of the limited availability of accessible public land.

Type 1 license issuance has been reduced significantly the past couple of years. As buck ratios have decreased while this population continues to decline, Type 1 licenses should continue to be reduced to increase buck ratios back within special management criteria. Extensive landowner input has also indicated a strong preference for license reduction.

Population

The 2014 postseason population estimate was about 7,800 mule deer. After population decline following substantial winter mortality in bio-year 2010, this herd is beginning to trend toward objective due to increased fawn production.

The "Constant Juvenile – Constant Adult Mortality Rate" (CJ-CA) spreadsheet model was chosen for the post-season population estimate of this herd. This model had a low relative AIC (90) and most accurately depicted population trend and size based on field personnel perceptions and landowner input. This model is considered to be of fair quality based on model fit and simulated population trend. Given consistently inadequate classification sample sizes, observed buck ratios may not be accurate, rendering population estimates simulated by the model somewhat questionable.

Management Summary

The hunting season in this area has traditionally run from October 1st to October 14th. These season dates have generally been adequate to meet landowner desires while allowing a reasonable harvest. For 2015, the Department decreased the Type 1 quota by 100 licenses in order to address declining buck ratios.

If we attain the projected harvest of 210 individuals and experience normal fawn productivity, the predicted 2015 postseason population will likely increase slightly to 7,900 mule deer, which is 13% below objective.

INPUT	
Species:	Mule Deer
Biologist:	Willow Hibbs
Herd Unit & No.:	North Converse
Model date:	02/19/15

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	81	90	☑ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	75	84	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	7	133	☐ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population			Total	Predicted Posthunt Population			Total	Objective
	Field Est	Field SE		Juveniles	Total Males	Females		Juveniles	Total Males	Females		
1993				2740	2758	5127	10625	2729	2147	4889	9766	9100
1994				3447	2519	4864	10830	3417	1873	4575	9866	9100
1995				3634	2457	4768	10858	3608	1886	4552	10046	9100
1996				4243	2515	4796	11555	4233	2025	4583	10841	9100
1997				3601	2790	4978	11370	3542	2191	4743	10475	9100
1998				4545	2759	4942	12247	4490	2130	4722	11343	9100
1999				4217	2945	5162	12324	4197	2262	4896	11354	9100
2000				3276	2984	5237	11497	3249	2283	4977	10509	9100
2001				2890	2765	5070	10725	2875	2141	4851	9867	9100
2002				2467	2550	4868	9885	2447	2005	4622	9073	9100
2003				2743	2327	4565	9635	2723	1803	4356	8882	9100
2004				2906	2223	4407	9535	2897	1670	4166	8732	9100
2005				3296	2152	4288	9736	3280	1613	4019	8912	9100
2006				2564	2200	4258	9021	2557	1582	3981	8119	9100
2007				3394	1992	4044	9430	3379	1436	3840	8655	9100
2008				2661	2073	4129	8863	2643	1494	3890	8026	9100
2009				2251	1939	3988	8177	2230	1302	3666	7198	9100
2010				2339	1671	3694	7704	2294	1130	3378	6802	9100
2011				2193	1540	3463	7196	2124	1064	3288	6476	9100
2012				2458	1441	3344	7242	2436	1076	3237	6748	9100
2013				2133	1529	3378	7040	2131	1224	3329	6684	9100
2014				3104	1580	3381	8065	3104	1301	3381	7785	9100
2015				2624	1888	3668	8180	2624	1657	3668	7949	9100
2016												9100
2017												9100
2018												9100
2019												9100
2020												9100
2021												9100
2022												9100
2023												9100
2024												9100
2025												9100

Survival and Initial Population Estimates

Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.50			0.86		
1994	0.50			0.86		
1995	0.50			0.86		
1996	0.50			0.86		
1997	0.50			0.86		
1998	0.50			0.86		
1999	0.50			0.86		
2000	0.50			0.86		
2001	0.50			0.86		
2002	0.50			0.86		
2003	0.50			0.86		
2004	0.50			0.86		
2005	0.50			0.86		
2006	0.50			0.86		
2007	0.50			0.86		
2008	0.50			0.86		
2009	0.50			0.86		
2010	0.50			0.86		
2011	0.50			0.86		
2012	0.50			0.86		
2013	0.50			0.86		
2014	0.50			0.86		
2015	0.50			0.86		
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

Parameters:	Optim cells
Juvenile Survival =	0.500
Adult Survival =	0.855
Initial Total Male Pop/10,000 =	0.215
Initial Female Pop/10,000 =	0.489

MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio			Harvest				Harvest: Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		55.82	2.87	43.92	42.38	2.39	10	555	216	781	22.1	4.6
1994		74.68	3.31	40.95	40.71	2.19	27	587	263	877	25.6	5.9
1995		79.27	2.95	41.43	44.28	1.98	23	519	196	738	23.2	4.5
1996		92.38	4.09	44.18	45.06	2.48	9	446	194	649	19.5	4.4
1997		74.68	3.15	46.19	49.12	2.36	54	545	214	813	21.5	4.7
1998		95.09	4.45	45.11	41.67	2.51	50	572	200	822	22.8	4.5
1999		85.71	3.67	46.19	45.22	2.36	19	621	242	882	23.2	5.2
2000		65.27	4.25	45.87	46.31	3.37	25	637	236	898	23.5	5.0
2001		59.26	3.47	44.14	39.08	2.63	14	567	199	780	22.6	4.3
2002		52.94	3.09	43.38	38.71	2.51	18	496	224	738	21.4	5.1
2003		62.50	3.40	41.39	38.18	2.45	19	476	190	685	22.5	4.6
2004		69.53	4.60	40.08	33.87	2.85	8	503	219	730	24.9	5.5
2005		81.60	5.66	40.14	45.45	3.78	15	490	244	749	25.0	6.3
2006		64.23	6.20	39.73	44.89	4.87	6	562	252	820	28.1	6.5
2007		88.01	6.50	37.39	46.43	4.16	13	506	186	705	27.9	5.1
2008		67.94	4.67	38.42	52.67	3.92	17	526	218	761	27.9	5.8
2009		60.81	4.99	35.51	44.53	4.05	19	579	292	890	32.9	8.1
2010		67.91	5.72	33.45	45.27	4.34	41	492	287	820	32.4	8.5
2011		64.59	6.43	32.35	46.69	5.16	63	433	159	655	30.9	5.1
2012		75.25	8.16	33.23	33.84	4.78	20	332	97	449	25.3	3.2
2013		64.00	6.18	36.77	25.09	3.38	2	277	44	323	19.9	1.4
2014		91.82	8.95	38.47	30.00	4.21	0	254	0	254	17.7	0.0
2015		71.54	6.87	45.19	36.92	4.41	0	210	0	210	12.2	0.0
2016												
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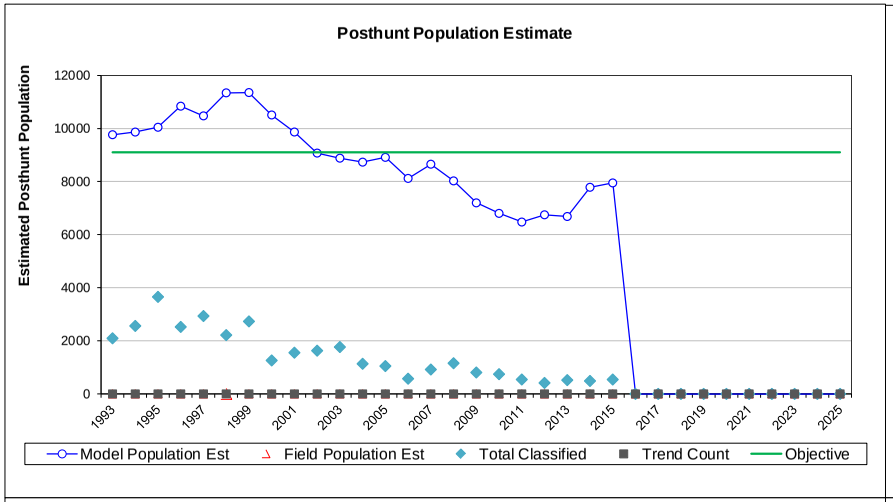
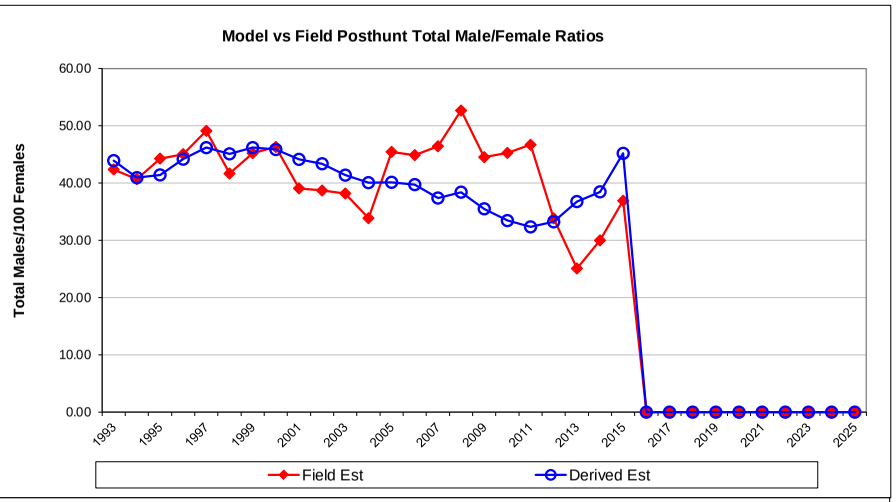
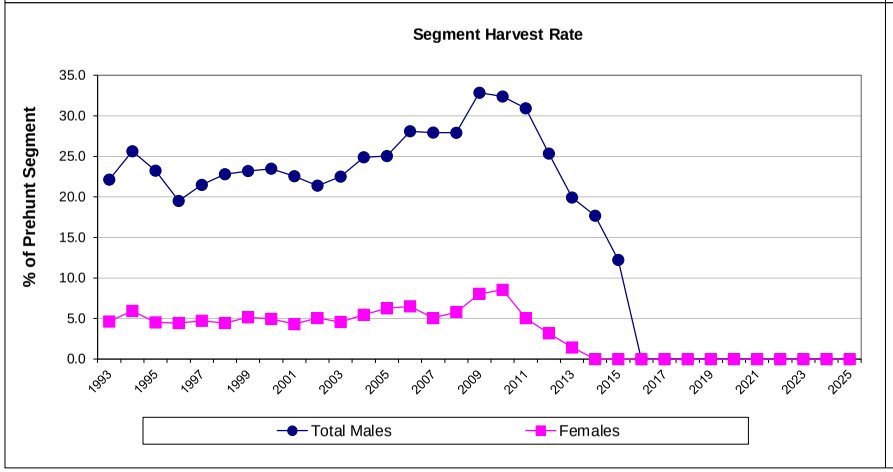
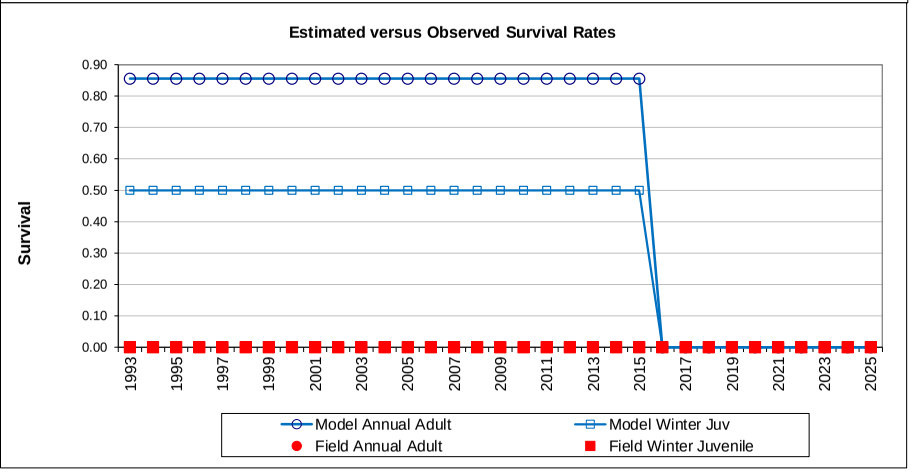
FIGURES









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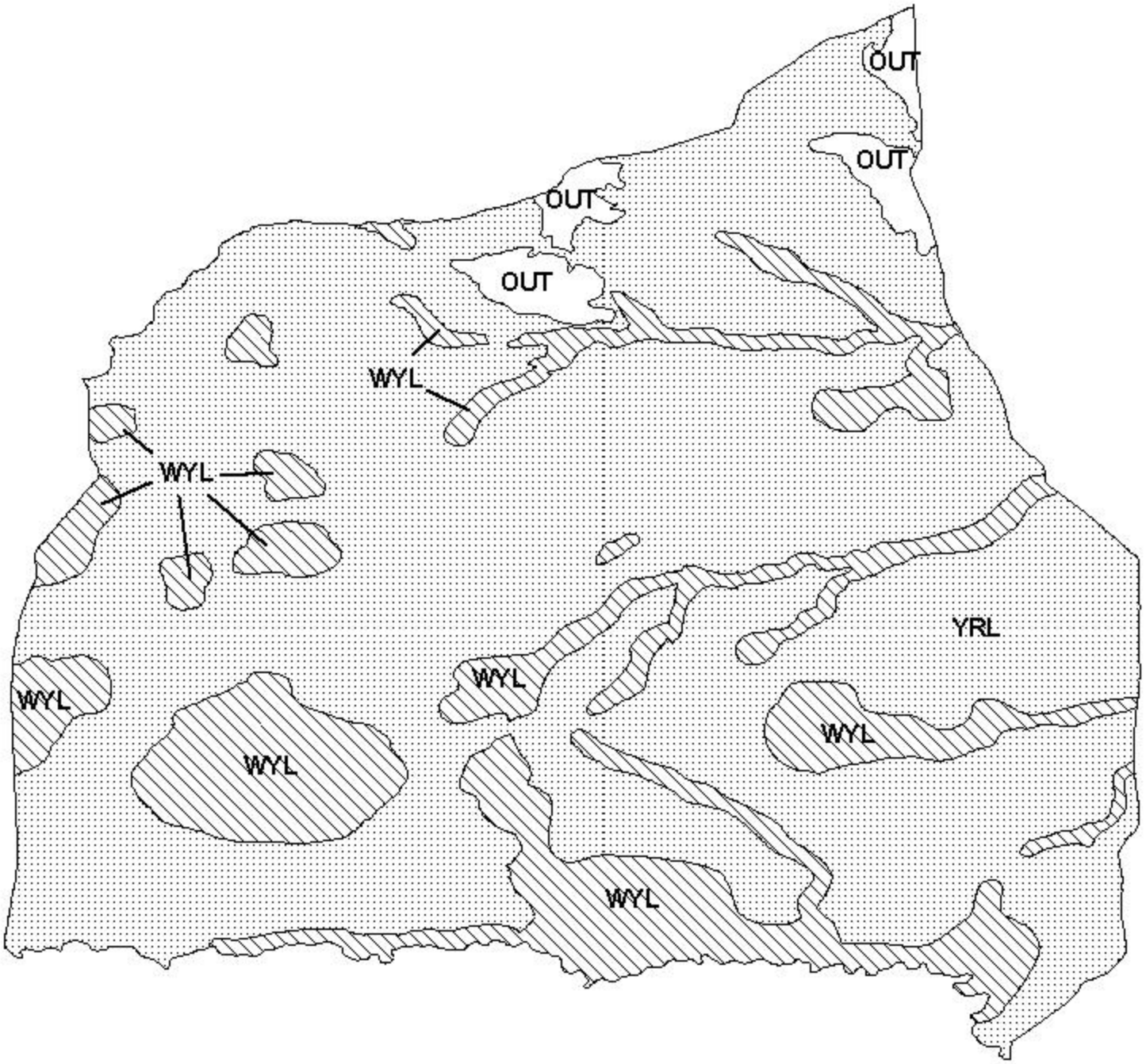


Mule Deer (MD755) - North Converse
HA 22
Revised - 98

2014 - JCR Evaluation Form

SPECIES: Mule Deer
PERIOD: 6/1/2014 - 5/31/2015

HERD: MD756 - SOUTH CONVERSE

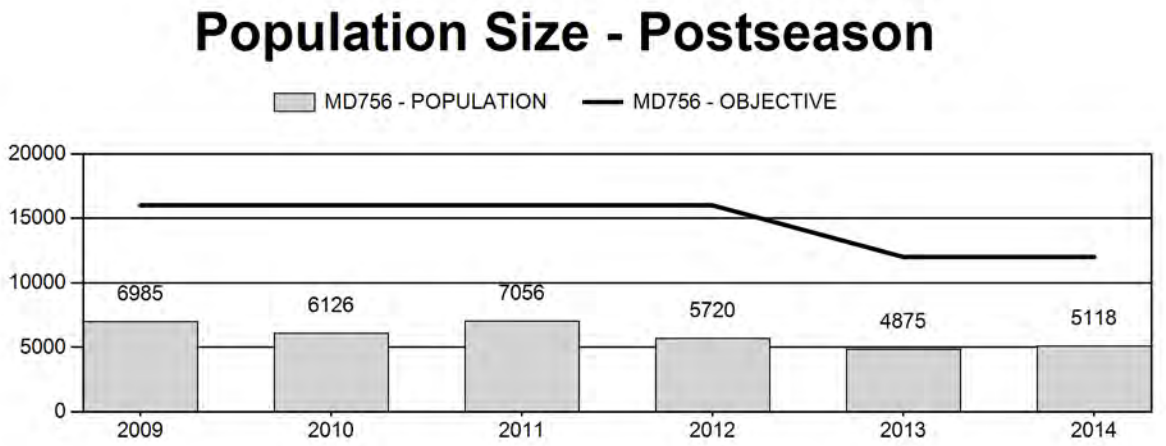
HUNT AREAS: 65
PREPARED BY: WILLOW HIBBS

	2009 - 2013 Average	2014	2015 Proposed
Population:	6,152	5,118	4,996
Harvest:	340	253	253
Hunters:	912	719	720
Hunter Success:	37%	35%	35 %
Active Licenses:	915	719	720
Active License Success:	37%	35%	35 %
Recreation Days:	3,434	3,019	3,020
Days Per Animal:	10.1	11.9	11.9
Males per 100 Females	36	33	
Juveniles per 100 Females	50	73	

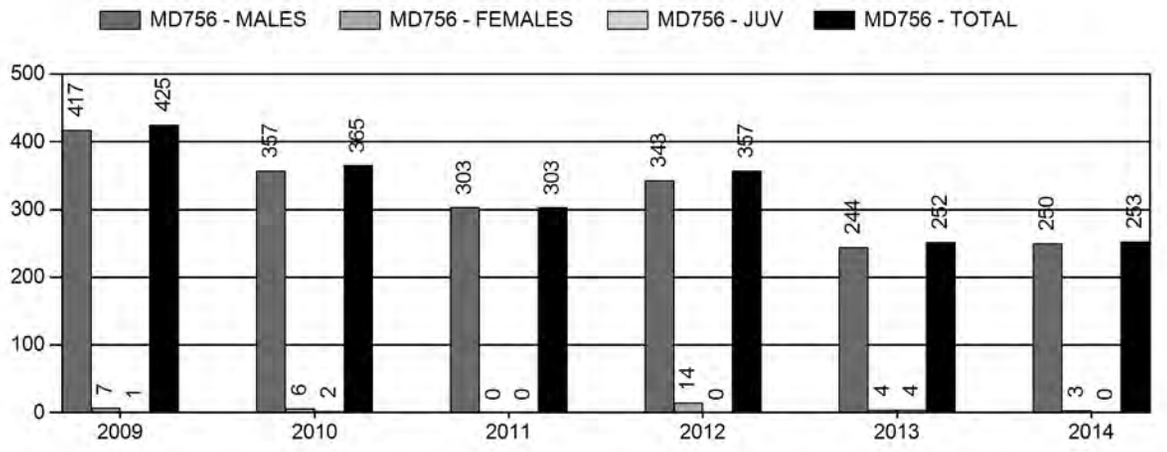
Population Objective (± 20%) :	12000 (9600 - 14400)
Management Strategy:	Private Land
Percent population is above (+) or below (-) objective:	-57.4%
Number of years population has been + or - objective in recent trend:	15
Model Date:	02/19/2015

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

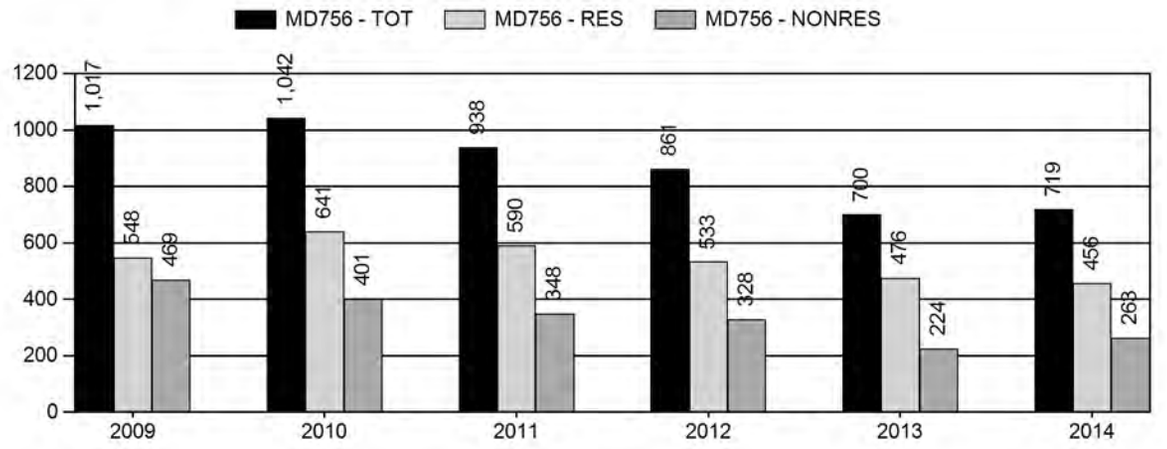
	JCR Year	Proposed
Females ≥ 1 year old:	.12%	.12%
Males ≥ 1 year old:	23.3%	20.6%
Juveniles (< 1 year old):	0%	0%
Total:	4.7%	4.8%
Proposed change in post-season population:	5.2%	5.3%



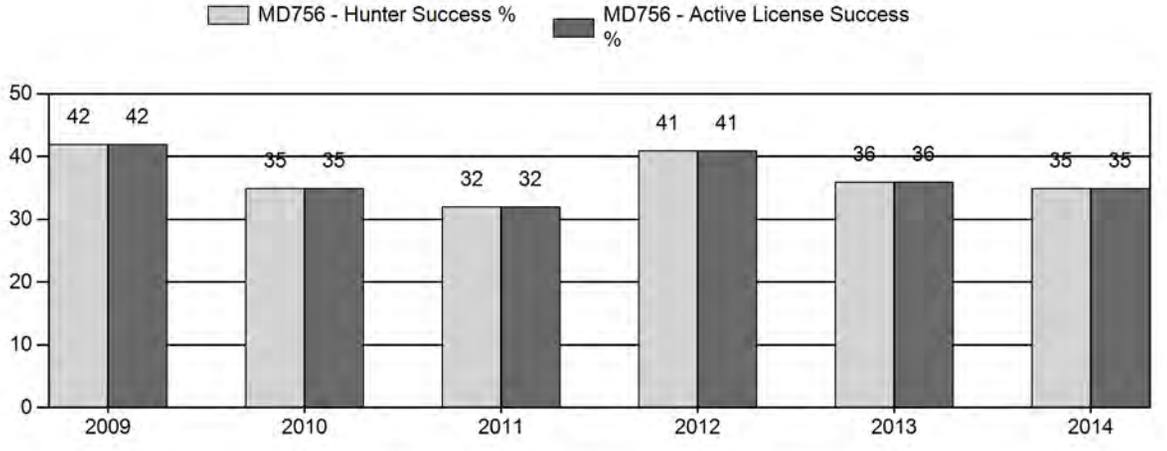
Harvest



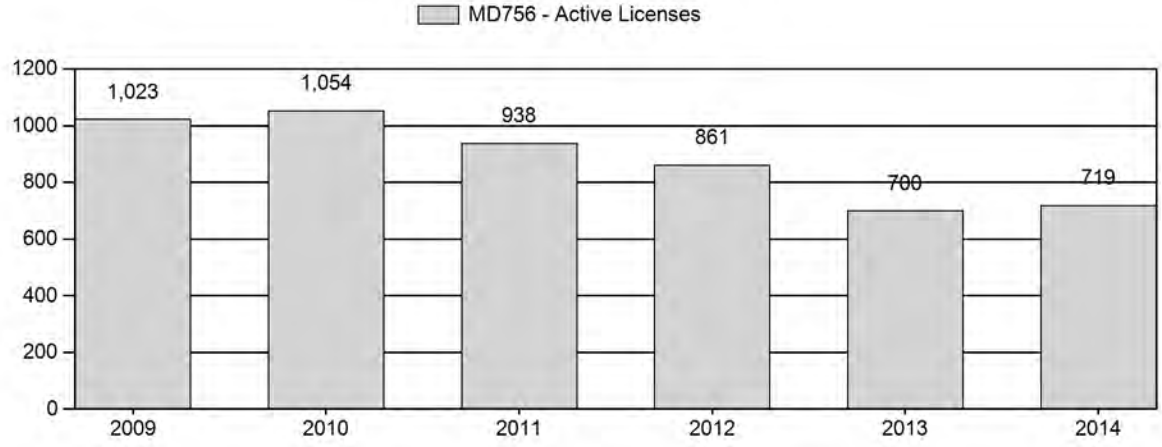
Number of Hunters



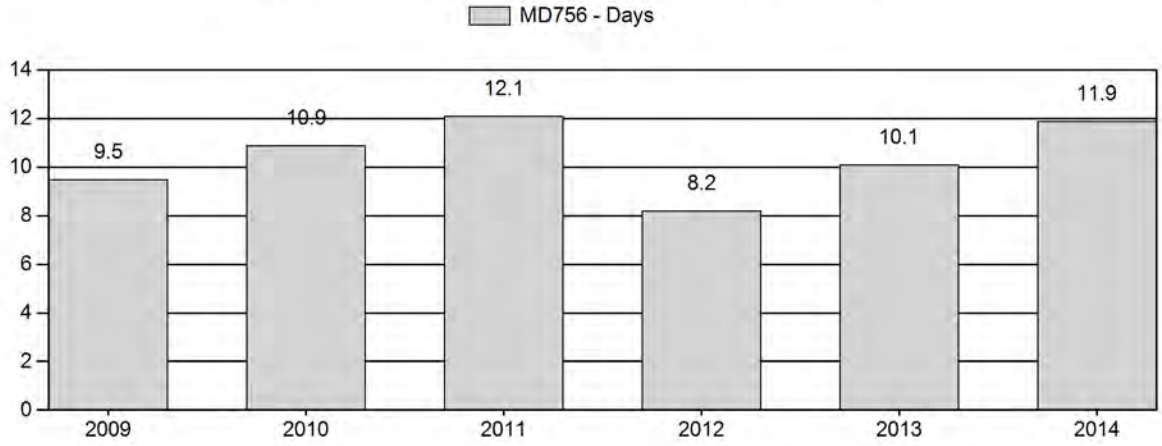
Harvest Success



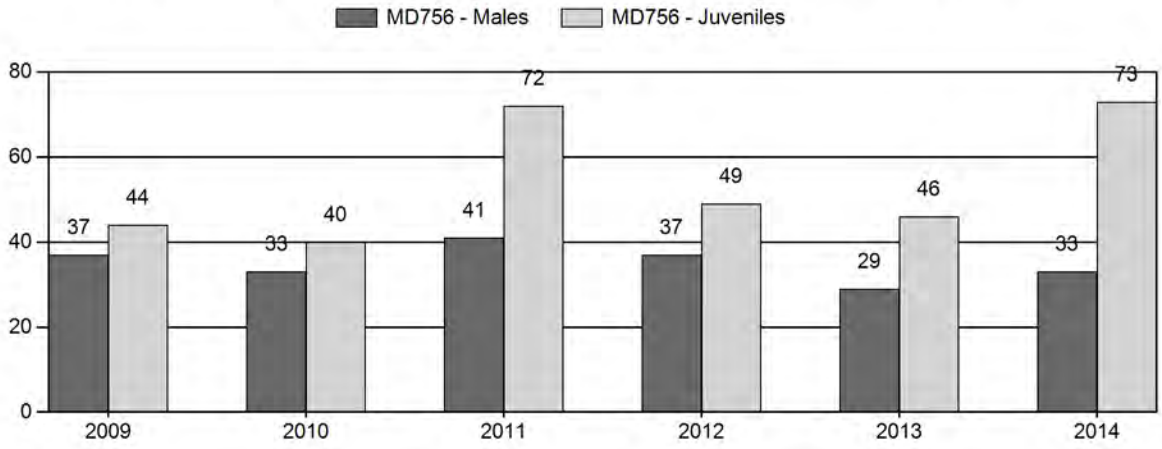
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 Postseason Classification Summary

for Mule Deer Herd MD756 - SOUTH CONVERSE

		MALES							FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	2+ Cls 1	2+ Cls 2	2+ Cls 3	2+ UnCls	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	6,985	57	98	41	10	0	206	20%	557	55%	243	24%	1,006	696	10	27	37	± 4	44	± 4	32
2010	6,126	84	89	51	14	0	238	19%	720	58%	287	23%	1,245	585	12	21	33	± 3	40	± 3	30
2011	7,056	83	99	57	11	0	250	19%	612	47%	441	34%	1,303	778	14	27	41	± 4	72	± 5	51
2012	5,720	111	124	36	20	0	291	20%	787	54%	385	26%	1,463	720	14	23	37	± 3	49	± 3	36
2013	4,875	64	65	17	8	0	154	17%	528	57%	245	26%	927	719	12	17	29	± 3	46	± 4	36
2014	5,118	30	56	24	19	0	129	16%	393	49%	286	35%	808	1,281	8	25	33	± 4	73	± 7	55

2015 HUNTING SEASONS
SOUTH CONVERSE MULE DEER (MD756)

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

Management Evaluation

Current Management Objective: 12,000
Management Strategy: Private Land
2014 Postseason Population Estimate: ~ 5,100
2015 Proposed Postseason Population Estimate: ~ 5,000
2014 Hunter Satisfaction: 58% Satisfied, 18% Neutral, 24% Dissatisfied

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

Herd Unit Issues

Hunting access within the herd unit is marginal, with tracts of public land and national forest interspersed with predominantly private lands. Walk-in and hunter management areas have provided additional hunting opportunity in several places within the herd unit. The main land use is traditional ranching and grazing of livestock, with agricultural fields that have the potential for damage issues when big game are abundant. Doe/fawn licenses have historically been issued to address damage, but are not currently necessary for mule deer. Disease issues are a concern within this herd unit in particular, as the prevalence of Chronic Wasting Disease (CWD) is higher here than any other area in Wyoming or adjacent states. Research investigating population-level effects of CWD was concluded in 2014, with analysis pending. Please refer to Appendix A of this report for further information regarding CWD and recently completed research in the South Converse Herd Unit.

Weather

This herd was impacted by the harsh winter conditions of 2010-2011 and the 2012 drought. Conditions improved in 2013 with adequate precipitation throughout the growing season and

moderate winter conditions. Weather conditions throughout 2014 produced above average precipitation, especially during the growing season, which resulted in excellent forage production throughout the herd unit. Such improved forage yielded good fawn production and excellent body condition of mule deer going into winter. The 2014-2015 winter has been moderate to date with several sub-zero cold snaps and precipitation events occurring earlier in the season, and warmer conditions with mild precipitation realized later in the season. Following more substantial precipitation events earlier in the year, warm conditions often occurred in between cold snaps which allowed for a high degree of mobility and access to forage throughout the winter. Therefore, winter survival should be normal over this bio-year.

Habitat

This herd unit has several established habitat transects that measure production and utilization on True Mountain Mahogany (*Cercocarpus montanus*); however no data were collected in 2014. Given high precipitation and informal assessments of habitat condition throughout this herd unit, forage production and quality were relatively high in 2014 based on field personnel observations. Hunter harvested deer were in good body condition, further indicating improved habitat conditions as a result of high moisture availability throughout the year. However, a significant portion of mule deer habitat in this herd unit is comprised of decadent shrubs with lower palatability and available nutrition. The poor condition of these decadent shrub stands throughout the herd unit may be one of the primary limiting factors on this deer herd.

Field Data

Fawn production/survival was moderate in this herd through the mid-2000's, and the population fluctuated between approximately 8,000 and 12,000 deer during this time period. The general license season during this time period was 11 days, and issuance of doe/fawn licenses ranged from 50 to 400 licenses. A more liberal season was instituted in 2008, lengthening the season to 17 days and offering 200 doe/fawn licenses. From 2008-2013, fawn ratios were poor (40s per 100 does), with the exception of 2011 when the fawn ratio spiked to 72. The population has gradually declined since 2008 from approximately 8,000 to 5,000 deer. In accordance, the general license season was shortened to 7 days. Doe/fawn licenses were diminished and subsequently eliminated from the 2011-2014 hunting seasons. In 2014, fawn production improved (73), and the population appears to have stabilized. Several more years of adequate fawn production will be needed for this herd to increase toward objective.

Buck ratios within the South Converse Herd historically average in the 30s-40s. These ratios seem counterintuitive, as CWD research references higher prevalence in males than females (Farnsworth et al, 2005). Despite the general season structure, higher buck ratios in this unit are a function of limited access to hunting on private lands, where minimal harvest pressure on bucks is typical. In 2013, the buck ratio dropped to a 15-year low of 29, but increased to 33 in 2014.

Since 2008, bucks classified in the South Converse Mule Deer Herd Unit have been further categorized based on antler size. Classification efforts in 2014 showed the highest availability of Class III bucks, with 56% Class I (small), 24% Class II (medium), and 19% Class III (large) bucks. It should be noted that 2014 efforts also obtained the lowest sample size due to a reduction in flight time as a result of helicopter mechanical issues. However, managers feel there is indeed a relatively higher availability of mature bucks in the population, especially larger trophy class bucks, which is corroborated by landowner perceptions. Such increased buck availability is yet another indication that mule deer may be beginning to rebound, which is also supported by the model. Additionally, hunter harvest and pressure has been steadily decreasing over the past several years due to reductions in private land hunting permissions and lower abundance of mule deer which may also be allowing for more mature bucks to enter the population.

Harvest Data

Harvest success was 35% in 2014, which is comparable to the previous 5-year average of 37%. However, there has been a steady decrease in active licenses and buck harvest, with 719 active licenses and 250 harvested bucks in 2014, which is significantly less than the previous 5-year average of 915 active licenses and 333 harvested bucks. Reductions in nonresident hunting pressure can most likely be attributed to nonresident Region J quotas reductions (50% since 2011). However, resident hunting pressure has also decreased with 456 resident hunters in 2014, as compared to the previous 5-year average of 558. Given that this herd unit has a general season structure, reductions in resident hunting pressure is most likely attributable to fewer deer, reduced private land hunting permission, and some level of hunter self-regulation as many hunters have expressed dissatisfaction with availability of mule deer on the few parcels of publicly accessible land in the herd unit. Therefore it is likely that harvest success has remained relatively constant throughout the past few years despite population declines due to decreases in hunting pressure. Harvest success is not expected to improve in this herd unit until fawn production/ survival improves and enhances the growth rate of this herd.

Population

The 2014 postseason population estimate was approximately 5,100 mule deer and has recently leveled off following a downward trend from an estimated high of 14,600 deer in 1998. Population declines in this herd are thought to be a combination of multiple limiting factors including poor habitat condition, lower fawn productivity/survival, and high prevalence of CWD. Rates of adult survival were added to the model for 2010-2013 utilizing data collected as part of a graduate study of Chronic Wasting Disease within the herd unit. These data helped refine the model, making confidence in population estimates stronger.

The "Time-Specific Juvenile Survival – Constant Adult Survival" (TSJ,CA) spreadsheet model was chosen for the postseason population estimate of this herd. This model seemed the most representative of the herd, as it selects for higher juvenile survival during years when field personnel observed more favorable environmental and habitat conditions. The simpler models (CJ,CA and SCJ,CA) select for a very low juvenile survival rate, which does not seem feasible for this herd. All three models simulate population trends that seem representative for the herd unit. However, the CJ,CA and SCJ,CA models estimate a larger population overall which do not seem realistic compared to historic and current perceptions of field personnel. While the TSJ,CA model has the highest AIC, it is still within one order of magnitude of the other model AICs. With the addition of survival data from collared deer, coupled with adequate classification data in all years, the model is considered to be of good quality.

Management Summary

Opening day for hunting the South Converse Mule Deer Herd Unit has traditionally been October 15th, with closing dates that have changed to offer greater or lesser opportunity depending on the management direction desired. In recent years, general licenses have been valid for antlered mule deer only. The 2015 hunting season will consist of a short, seven-day season with no doe/fawn licenses, as the population is considerably below objective. Until habitat conditions and weather allow for higher fawn production and survival, this population will likely remain low and seasons will remain conservative. Again, the impacts of such a high prevalence of CWD on this herd are unknown but potentially significant.

If we attain the projected harvest of 250 bucks and fawn production remains poor, this herd will likely remain stable but low. The predicted 2015 postseason population size of the South Converse Herd is approximately 5,000 mule deer which is comparable to current estimates. Given that habitat conditions are generally poor in this herd unit, and may be a limiting factor to population growth given continual poor fawn production/ recruitment, management goals for 2015 include initiating a habitat treatment in a publicly accessible True Mountain Mahogany stand which will improve browse palatability and nutrition.

Citations

Farnsworth, M.L., L.L. Wolfe, N.T. Hobbs, K.P. Burnham, E.S. Williams, D.M. Theobald, M.M. Conner, & M.W. Miller. Human Land Use Influences Chronic Wasting Disease Prevalence in Mule Deer. Ecological Applications, 15(1): 119-126.

INPUT	
Species:	Deer
Biologist:	Willow Hibb
Herd Unit & No.:	South Converse
Model date:	02/28/14

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	118	127	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	65	82	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	16	129	☑ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population			Total	Predicted Posthunt Population			Total	Objective
	Field Est	Field SE		Juveniles	Total Males	Females		Juveniles	Total Males	Females		
1993				3474	2534	7960	13968	3443	1227	7328	11999	16000
1994				3165	1647	6412	11225	3159	986	6143	10288	16000
1995				3730	1519	5547	10796	3730	932	5547	10209	16000
1996				5029	2406	6011	13446	5029	1776	6011	12816	16000
1997				5263	2593	5901	13758	5263	1795	5901	12960	16000
1998				7120	2455	5662	15237	7120	1745	5662	14527	16000
1999				5452	2787	5847	14086	5438	1756	5677	12871	16000
2000				3906	2706	5768	12380	3889	1827	5502	11218	16000
2001				2488	2561	5431	10480	2465	1841	5200	9506	16000
2002				2445	1931	4555	8931	2404	1318	4301	8023	16000
2003				2238	1601	3931	7770	2203	1112	3649	6964	16000
2004				2565	1860	3842	8266	2559	1307	3814	7680	16000
2005				2613	2089	4048	8749	2611	1626	4006	8242	16000
2006				2259	2257	4116	8632	2257	1690	4074	8021	16000
2007				2645	2336	4198	9179	2637	1658	4081	8377	16000
2008				1985	2482	4374	8842	1975	1783	4305	8063	16000
2009				1677	1880	3850	7408	1676	1421	3843	6940	16000
2010				1394	1606	3497	6497	1391	1214	3491	6096	16000
2011				2416	1574	3353	7343	2416	1241	3353	7009	16000
2012				1510	1452	3102	6064	1510	1075	3086	5671	16000
2013				1261	1142	2713	5115	1257	873	2708	4838	12000
2014				1820	1071	2505	5396	1820	796	2501	5118	12000
2015				1516	1214	2545	5275	1516	939	2542	4996	12000
2016												12000
2017												12000
2018												12000
2019												12000
2020												12000
2021												12000
2022												12000
2023												12000
2024												12000
2025												12000

Survival and Initial Population Estimates

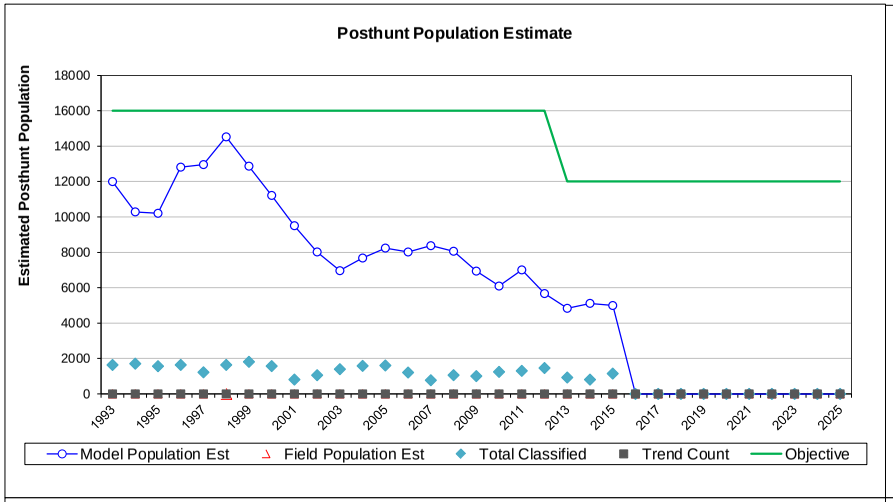
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.40			0.78		
1994	0.47			0.78		
1995	0.90			0.78		
1996	0.48			0.78		
1997	0.40			0.78		
1998	0.40			0.78		
1999	0.49			0.78		
2000	0.58			0.78		
2001	0.40			0.78		
2002	0.48			0.78		
2003	0.90			0.78		
2004	0.84			0.78		
2005	0.76			0.78		
2006	0.90			0.78		
2007	0.90			0.78		
2008	0.49			0.78		
2009	0.59			0.78		
2010	0.90			0.78	0.70	0.07
2011	0.40			0.78	0.65	0.10
2012	0.40			0.78	0.67	0.12
2013	0.62			0.78	0.73	0.14
2014	0.65			0.78		
2015	0.65			0.78		
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

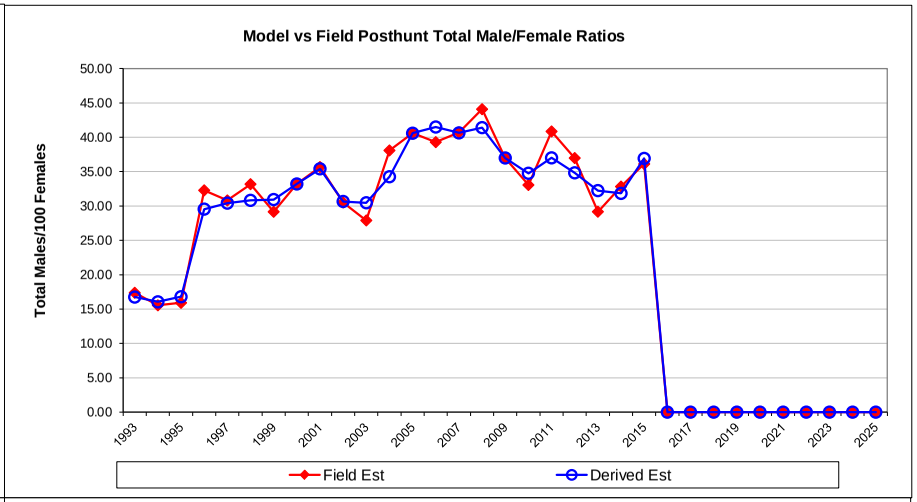
Parameters:	Optim cells
Adult Survival =	0.781
Initial Total Male Pop/10,000 =	0.123
Initial Female Pop/10,000 =	0.733

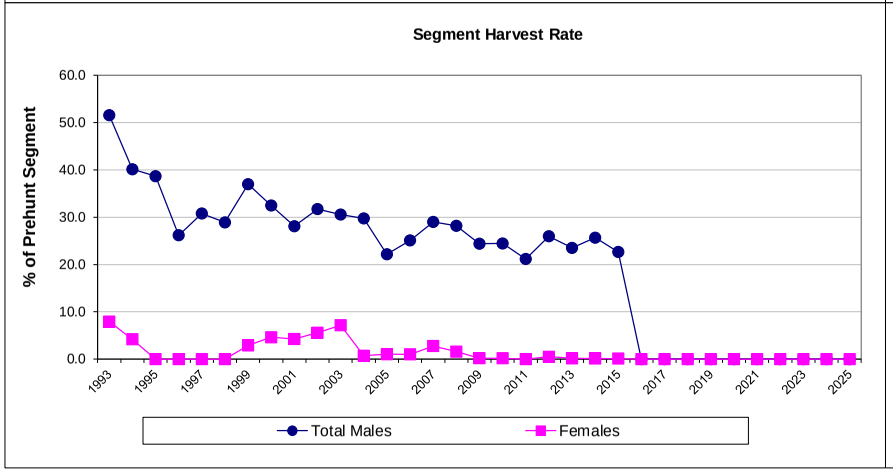
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

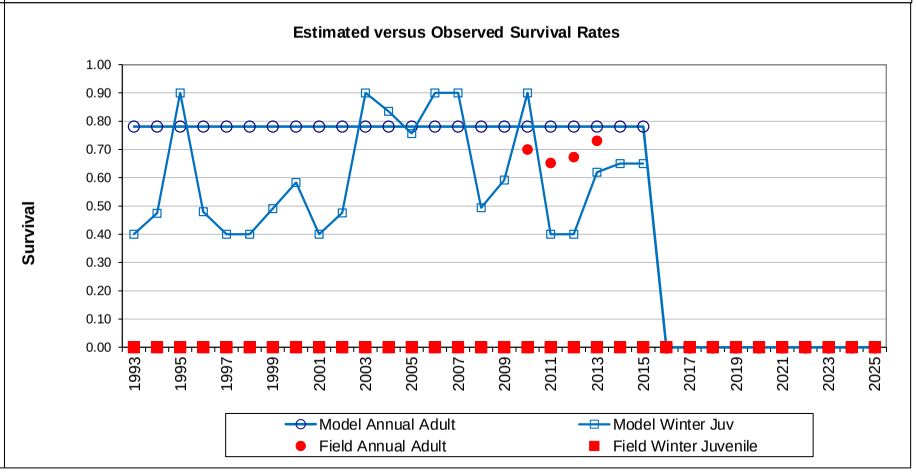
Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio			Harvest				Harvest: Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		46.99	2.63	16.74	17.37	1.43	28	1188	574	1790	51.6	7.9
1994		51.42	2.76	16.05	15.54	1.32	6	601	245	852	40.1	4.2
1995		67.25	3.63	16.79	15.91	1.47	0	534	0	534	38.7	0.0
1996		83.66	4.50	29.54	32.28	2.37	0	573	0	573	26.2	0.0
1997		89.19	5.51	30.41	30.81	2.69	0	726	0	726	30.8	0.0
1998		125.75	6.70	30.82	33.18	2.64	0	645	0	645	28.9	0.0
1999		95.78	4.82	30.94	29.16	2.16	13	937	154	1104	37.0	2.9
2000		70.69	3.96	33.20	33.20	2.40	15	799	242	1056	32.5	4.6
2001		47.40	3.97	35.41	35.67	3.30	21	654	210	885	28.1	4.3
2002		55.91	3.92	30.66	30.51	2.65	37	557	231	825	31.7	5.6
2003		60.38	3.61	30.47	27.90	2.19	32	445	256	733	30.6	7.2
2004		67.10	3.81	34.26	38.08	2.61	5	503	25	533	29.7	0.7
2005		65.17	3.71	40.59	40.59	2.70	2	421	38	461	22.2	1.0
2006		55.39	3.72	41.49	39.29	2.97	2	515	38	555	25.1	1.0
2007		64.63	5.32	40.64	40.69	3.90	7	616	106	729	29.0	2.8
2008		45.88	3.46	41.41	44.09	3.37	9	636	63	708	28.2	1.6
2009		43.63	3.35	36.99	36.98	3.02	1	417	7	425	24.4	0.2
2010		39.86	2.78	34.76	33.06	2.47	2	357	6	365	24.4	0.2
2011		72.06	4.50	37.01	40.85	3.07	0	303	0	303	21.2	0.0
2012		48.92	3.04	34.83	36.98	2.54	0	343	14	357	26.0	0.5
2013		46.40	3.59	32.24	29.17	2.67	4	244	4	252	23.5	0.2
2014		72.77	5.66	31.83	32.82	3.33	0	250	3	253	25.7	0.1
2015		59.63	4.03	36.92	36.12	2.89	0	250	3	253	22.7	0.1
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES









Comments:

APPENDIX A

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

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

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

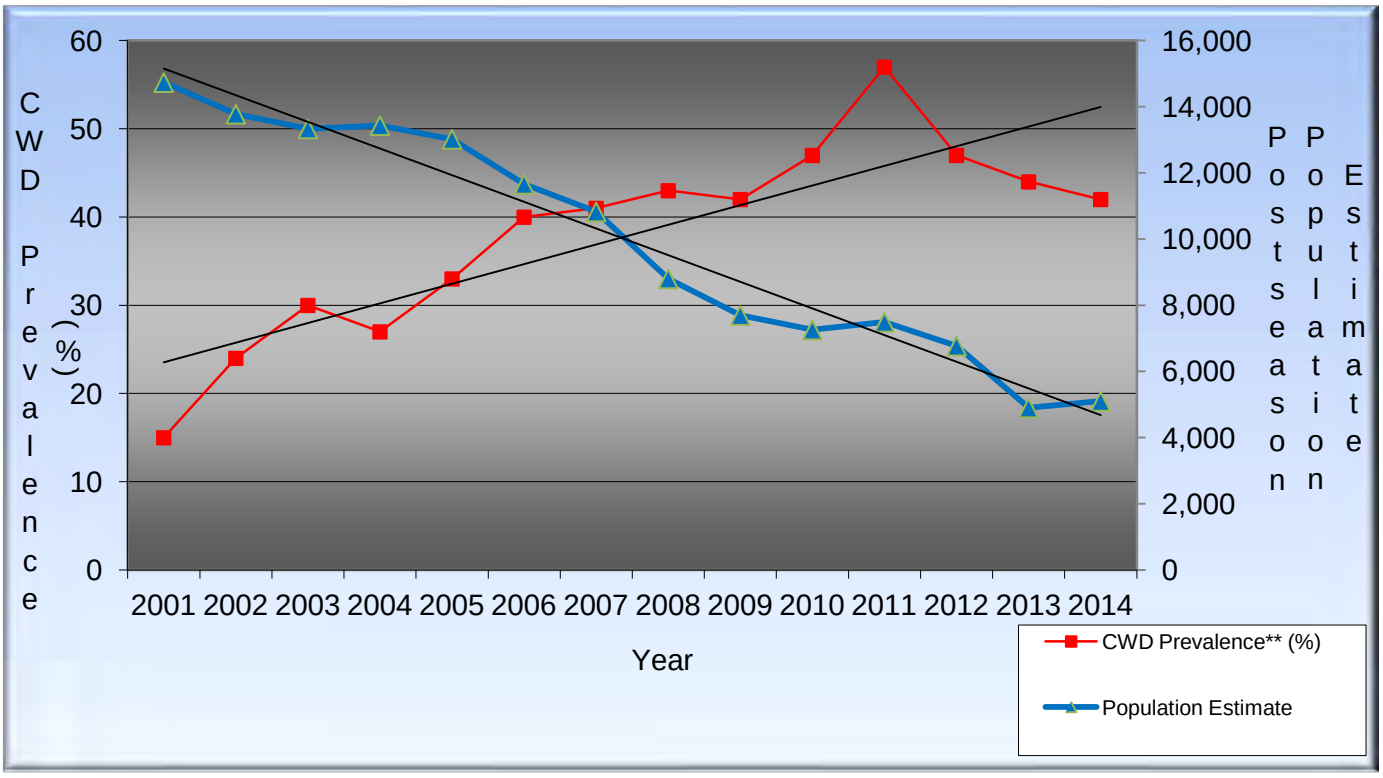
Since 2001, prevalence of CWD in hunter-harvested mule deer has increased significantly in the South Converse Mule Deer Herd, while the population has concurrently decreased (Table 1, Figure 1). Considering CWD is ultimately fatal in cervids, higher prevalence is suspected of having more adverse and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

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

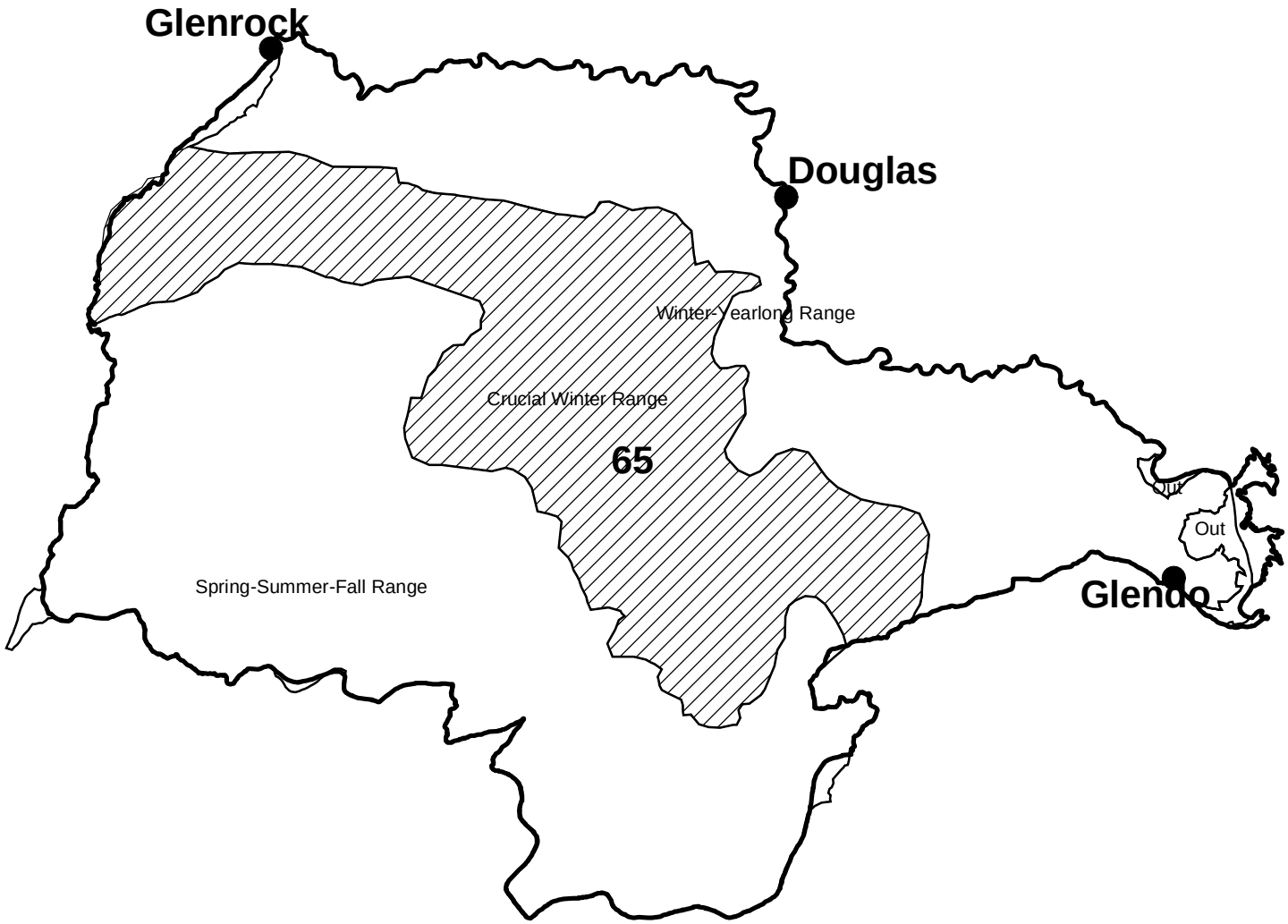
Table 1. CWD surveillance in hunter-harvested mule deer in the South Converse Herd Unit, 2001-2014.

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

Figure 1. CWD prevalence of hunter-harvested mule deer and postseason population estimates for the South Converse Mule Deer Herd Unit, 2001-2014.



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



2014 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2014 - 5/31/2015

HERD: MD757 - BATES HOLE/HAT SIX

HUNT AREAS: 66-67

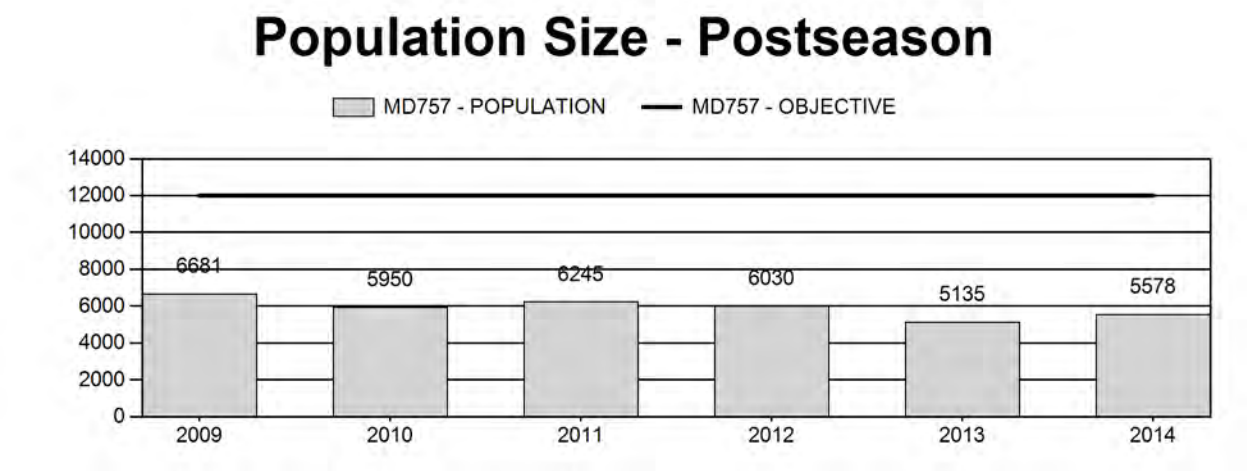
PREPARED BY: HEATHER O'BRIEN

	2009 - 2013 Average	2014	2015 Proposed
Population:	6,008	5,578	5,917
Harvest:	323	239	237
Hunters:	912	717	730
Hunter Success:	35%	33%	32 %
Active Licenses:	915	717	730
Active License Success:	35%	33%	32 %
Recreation Days:	3,125	3,278	2,850
Days Per Animal:	9.7	13.7	12.0
Males per 100 Females	20	29	
Juveniles per 100 Females	56	82	

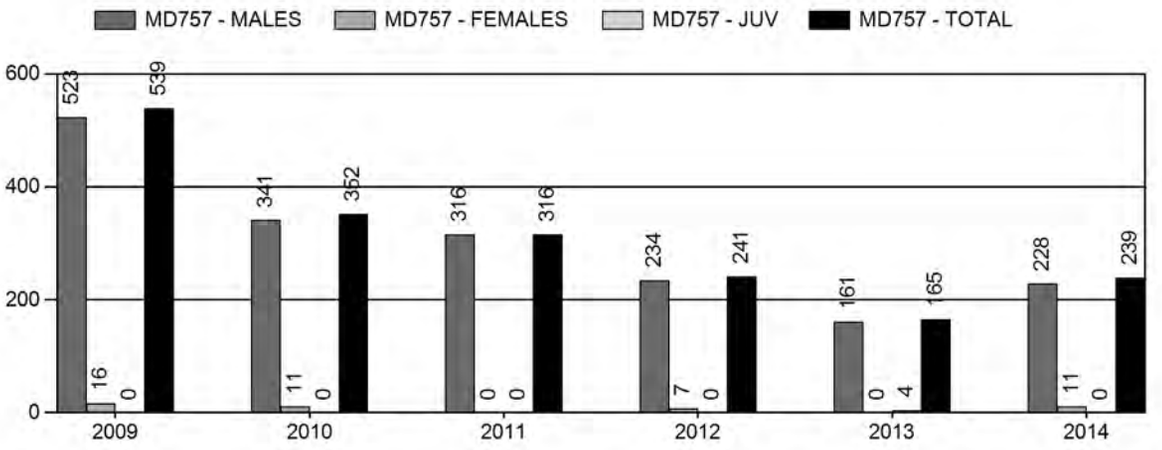
Population Objective (± 20%) :	12000 (9600 - 14400)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-53.5%
Number of years population has been + or - objective in recent trend:	22
Model Date:	02/28/2015

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

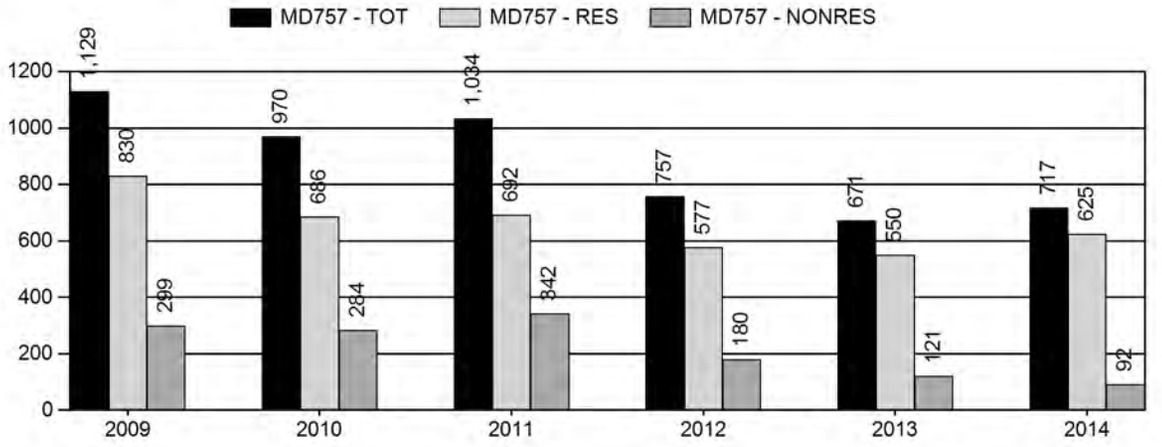
	JCR Year	Proposed
Females ≥ 1 year old:	0.04%	0.06%
Males ≥ 1 year old:	25.6%	19.4%
Juveniles (< 1 year old):	0%	0%
Total:	4.1%	3.80%
Proposed change in post-season population:	+9.9%	+5.77%



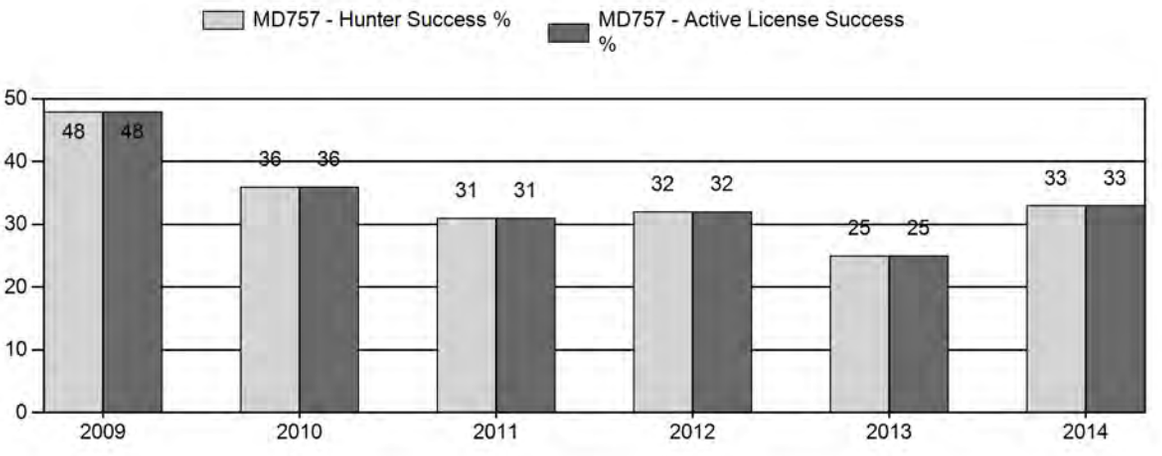
Harvest



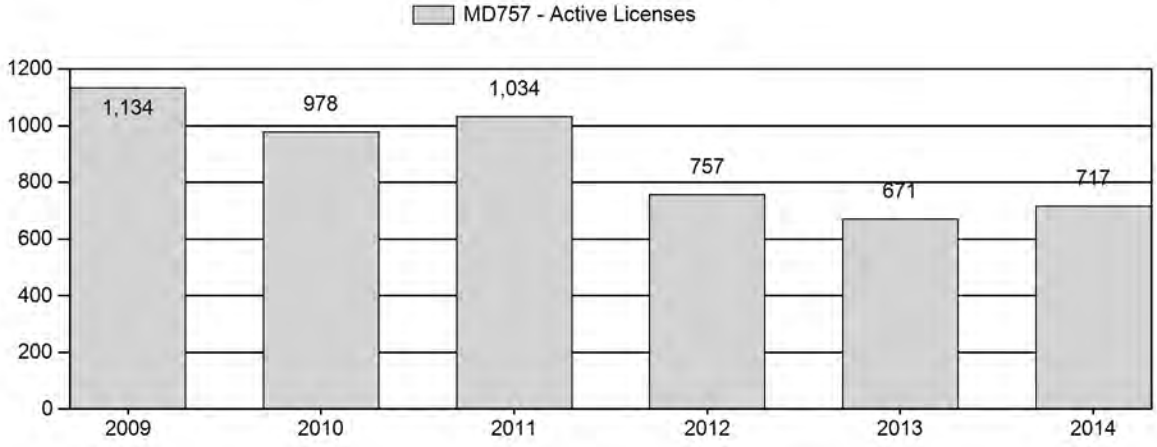
Number of Hunters



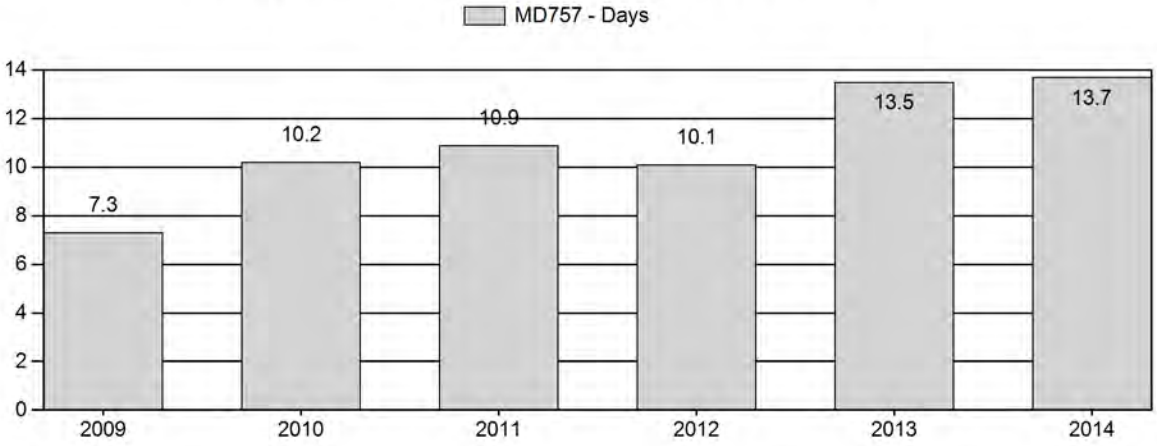
Harvest Success



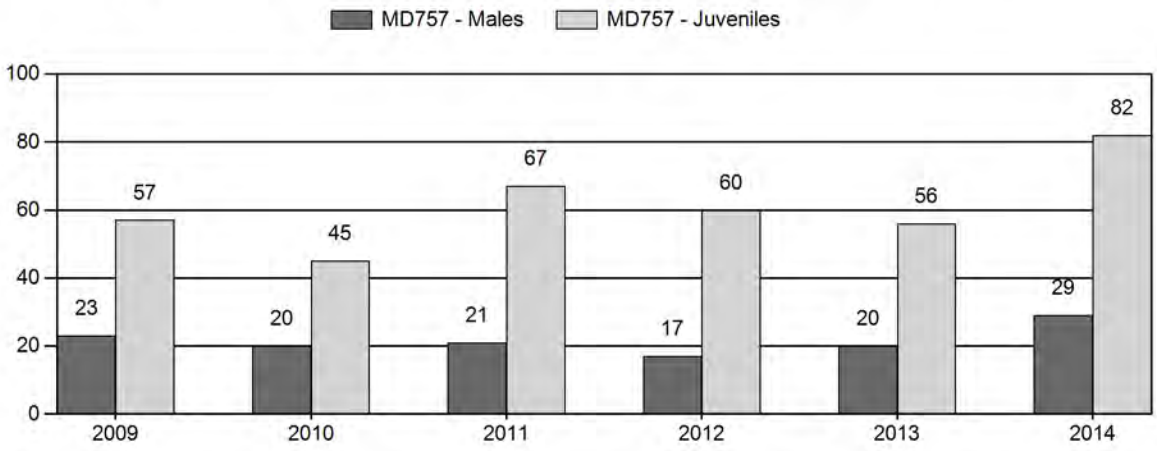
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 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
2009	6,681	59	61	41	10	0	171	13%	730	55%	419	32%	1,320	934	8	15	23	± 2	57	± 4	47
2010	5,950	82	49	42	9	0	182	12%	894	60%	403	27%	1,479	642	9	11	20	± 2	45	± 3	37
2011	6,245	47	52	33	7	0	139	11%	666	53%	443	35%	1,248	698	7	14	21	± 2	67	± 5	55
2012	6,030	28	55	30	9	0	122	10%	718	56%	432	34%	1,272	650	4	13	17	± 2	60	± 4	51
2013	5,135	86	50	25	7	0	168	11%	845	57%	470	32%	1,483	959	10	10	20	± 2	56	± 3	46
2014	5,578	83	79	26	7	0	195	14%	665	47%	543	39%	1,403	1,464	12	17	29	± 3	82	± 5	63

2015 HUNTING SEASONS
BATES HOLE / HAT SIX MULE DEER (MD757)

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

Management Evaluation

Current Postseason Population Management Objective: 12,000
Management Strategy: Recreational
2014 Postseason Population Estimate: 5,600
2015 Proposed Postseason Population Estimate: 5,900
2014 Hunter Satisfaction: 50% Satisfied, 22% Neutral, 28% Dissatisfied

The Bates Hole / Hat Six Mule Deer Herd Unit has a postseason management objective of 12,000 deer. The herd is managed using the recreational management strategy, with a goal of maintaining postseason buck ratios between 20-29 bucks per 100 does. The objective and management strategy were last revised in 1990, and will be formally reviewed in 2015.

Herd Unit Issues

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

Weather

The winter of 2010-2011 was severe throughout the herd unit, resulting in slightly higher mortality of mule deer across all age classes. Conditions were warm and dry for the herd unit in 2011 and shrub production was below average, resulting in poor nutrition of mule deer entering

the winter of 2011-2012. Snow pack and resulting spring moisture were below average for the winter of 2011-2012 which likely had a negative impact on lactating does and their fawns. The summer of 2012 was the driest on record since 1904 in much of Wyoming, and the winter of 2012 continued the trend with very low snow accumulation and snow pack. The spring of 2013 was cool with significant precipitation, and average rainfall over the summer as well. Still, habitat conditions appeared to be poor for much of the growing season. Heavy precipitation during the fall of 2013 caused a beneficial late green-up, but also made travel very difficult for hunters. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. Grass and forb growth was excellent, making 2014 the best growing season the region had seen in years. The spring and summer of 2014 undeniably produced improved range conditions that benefitted mule deer. For detailed weather data see http://www.ncdc.noaa.gov/gac/time-series/us.

Habitat

This herd unit has several established transects that measure production (N=6) and utilization (N=7) on True Mountain Mahogany (*Cercocarpus montanus*). Average leader growth in 2014 on mahogany was 2.82 inches (71.6 mm), and represents a significant increase in production from the previous two years (see Figure 1). Average growth was well below average in 2012-2013, while growth in 2014 was similar to production seen from 2008-2011. Utilization was low, with an average of 5.5% of leaders browsed per shrub. Above-average herbaceous plant production was likely the result of excellent moisture during the growing season. Better habitat conditions in the herd unit for 2014 likely resulted in improved spring and summer fawn survival, and may account for the higher fawn ratio in this herd unit compared to previous years.

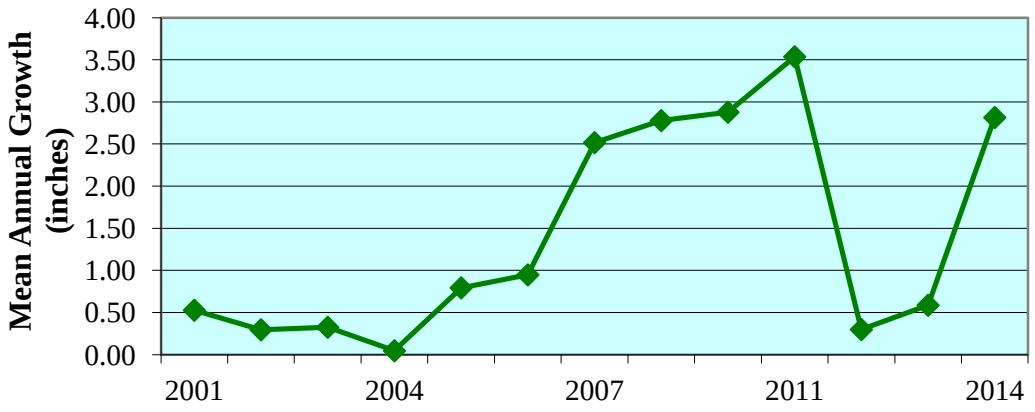


Figure 1. Mean annual growth of true mountain mahogany **(***Cercocarpus montanus*) in the Bates Hole / Hat Six Mule Deer Herd Unit, 2001-2014

Field Data

Fawn production/survival were relatively good in this herd from 1998-2005. The population remained relatively stable, until increased issuance of doe/fawn licenses and longer seasons decreased the herd from approximately 9,300 to 7,000 deer. From 2006-present, fawn production/survival were moderate to poor. The population began to decline, and with it doe/fawn licenses were reduced and then eliminated. In 2013 fawn ratios were again poor, at 56 per 100 does. Despite the elimination of doe/fawn hunting and the restrictions placed on buck harvest, this population continued to decline. Fawn ratios finally improved in 2014 to 82 per 100 does. Winter conditions from 2013-2014 were mild for pregnant does, and were followed by spring weather and range conditions that were excellent throughout the region. Additional years of improved fawn production and survival will be necessary to enhance population growth for the herd in future years.

Buck ratios for the Bates Hole / Hat Six Herd historically average in the mid-20s, though they have occasionally exceeded recreational limits and risen into the low to mid 30's. In more recent years, the buck ratio has declined, reaching a low of 17 per 100 does in 2012. In an attempt to improve yearling buck survival, an antler-point restriction was added in 2013, requiring harvested bucks to be three points or better on one side. The antler-point restriction has allowed yearling bucks the chance to graduate into more mature age classes while reducing overall harvest pressure on the male segment of the herd over the next year. As a result, yearling buck ratios went from 4 in 2012 to 10 in 2013 despite mediocre fawn production. Overall buck ratios improved in 2013 to 20 per 100 does, and again in 2014 to 29 per 100 does. The antler point restriction will remain in place for one more year before it is removed, at which point managers will need to discuss the most appropriate way to proceed with regards to herd health, population status, and public desires.

Despite the current short hunting season and the antler point restriction, many landowners and hunters continue to complain of too much hunter pressure within the herd unit and a lack of mature bucks. Some have voiced a desire to change the herd unit from a general license area to limited quota as a means to improve buck ratios. As part of the statewide Mule Deer Initiative, a citizen working group was formed to discuss these issues in 2014 for the Bates Hole Hat Six Mule Deer Herd Unit. The group will develop a management plan and formal recommendations to Department managers by summer 2015.

Since 2008, bucks classified in Area 66 have been categorized based on antler size (see Figure 2). 2008 represented the best distribution of mature buck classes, with 50% Class I (small), 36% Class II (medium), and 14% Class III (large) bucks. Bucks classified from 2010-2014 showed a decrease in antler quality, as the percentage of Class I bucks increased and percentage of Class II bucks decreased. It should come as no surprise that Class I bucks increased from 2012 to 2014

with the addition of the antler-point restriction to the 2013 hunting season. Class III bucks have consistently remained just under 10% of those surveyed from 2009-2013. In 2014, the proportion of Class III bucks declined to 6%, but the total number of large bucks seen in the survey remained the same. This again is due to the higher total number of Class I bucks present in the postseason population due to the antler-point restriction. The consistent number of Class III bucks surveyed across years is perhaps surprising at first glance - considering surveys occur post-season, that Area 66 is a general license hunt area, and that hunting pressure is assumed to be high. It may be that hunters in a general license area are less concerned with trophy quality and are thus more likely to harvest smaller bucks as the opportunity arises. It may also be that some Class III bucks, despite their discovery during post-season surveys, are more difficult for hunters to find during hunting season. This concept seems unlikely to managers considering the vast network of roads and lack of escapement habitat in some popular portions of the hunt area. However, there still remain places on private lands where mule deer remain protected from harvest. Further research would be necessary to isolate what factors are contributing to the consistent number of Class III bucks observed within the herd unit.

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

Figure 2. Antler classification analysis for **Area 66** within the Bates Hole/Hat Six Mule Deer Herd Unit, 2008 – 2014.

Harvest Data

Hunter success in this herd has fluctuated as a function of population size and season length. In recent years, harvest success was highest when the population was higher and the season was longer. Harvest success has decreased in recent years and hunter days have increased, as the population declined and the season was shortened. Hunter satisfaction has been low in this herd,

which may be a function of hunter crowding and a perceived lack of deer. No significant female harvest has been prescribed since 2007. The season was reduced to 8 days in 2010 and then to 7 days in 2011-2012. Season length remained at 7 days and a 3-point or better antler point restriction was added in 2013. Hunter participation and overall harvest declined when antler point restrictions were added – from around 1,000 total hunters in 2011 to about 700 hunters in 2014. At the same time, Region D non-resident license issuance was reduced significantly: from 2,100 licenses in 2011 to only 400 in 2014. In Area 66, only 13% of hunters were non-residents during the 2014 season. Harvest success was only 26% in 2013 – due in part to the more restrictive season on bucks as well as issues with snow, mud, and poor access conditions. Harvest success in 2014 returned to near the five-year average as weather and access conditions were very good during the hunting season. Overall harvest improved in 2014 as well, despite the antler-point restriction and virtually no harvest of does or fawns. Hunters and landowners commented on seeing more mule deer in the field, especially yearling bucks and does with fawns.

Population

The 2014 postseason population estimate was approximately 5,600 and has recovered slightly, after reaching a low of about 5,100 deer in 2013. Postseason classification data and harvest data are applied to the model to predict population size and trends for this herd. No sightability or other population estimate data are currently available to further align the model.

The "Time-Specific Juvenile, Constant Adult (TSJ, CA) spreadsheet model was chosen for the postseason population estimate of this herd. This model seems the most representative of the herd in terms of recent trends, though some earlier years in the model are not consistent with historic estimates from that era. The TSJ,CA model selects for higher juvenile survival when field observations confirm that overwinter conditions were very mild (i.e. 2005-2006). The TSJ, CA model also adjusts juvenile survival to optimize model fit based on observed buck ratios. Managers are confident in the accuracy of observed buck ratios in this herd unit, as sample sizes are typically very good and coverage is very thorough. The CJ,CA model depicts a herd that is larger than managers suspect. The SCJ,SCA model predicts a similar population size and trend as the TSJ,CA model for more recent years, but does not align as well to observed buck ratios. The TSJ, CA model ultimately appears to be the best representation relative to the perceptions of managers and field personnel, is of good quality, and follows trends with license issuance and harvest success.

Management Summary

Opening day for hunting the Bates Hole / Hat Six Mule Deer Her has traditionally been October 15th, with closing dates that have changed to offer greater or lesser opportunity depending on the

management direction desired. General licenses have been valid only for antlered mule deer since 2000. Doe/fawn licenses have been offered in years when winter range shrub utilization has been excessive. A short, seven-day season with no doe/fawn licenses will be reinstated for 2015. The 2015 season will be the third and final year utilizing an antler point restriction (APR) of three points or more on a side for this herd unit. The required selectivity of an APR season will again allow yearling bucks to be recruited into mature age classes. While the APR harvest regime may improve buck ratios and quality in the short term by lowering overall harvest on bucks, it is fawn productivity and survival that must improve markedly for this herd to grow as a whole.

If we attain the projected harvest of 237 deer with fawn ratios similar to the last five years, this herd will grow slightly. The predicted 2015 postseason estimate for the Bates Hole Hat Six Herd is approximately 5,900 animals, which is 51% below objective.

INPUT	
Species:	Deer
Biologist:	Heather O'Brien
Herd Unit & No.:	MD757 Bates Hole-Hat Six
Model date:	02/27/15

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	134	143	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	94	108	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	13	139	☑ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population			Total	Predicted Posthunt Population			Total	Objective
	Field Est	Field SE		Juveniles	Total Males	Females		Juveniles	Total Males	Females		
1993				1140	839	2090	4068	1121	325	1747	3193	12000
1994				997	508	1706	3210	984	302	1581	2867	12000
1995				1161	697	1775	3633	1161	417	1775	3353	12000
1996				1922	873	2018	4814	1922	536	2018	4476	12000
1997				1703	836	2085	4623	1703	534	2085	4322	12000
1998				1857	1217	2523	5596	1857	756	2516	5129	12000
1999				2231	1278	2762	6270	2231	668	2762	5660	12000
2000				1979	1566	3331	6876	1979	969	3331	6279	12000
2001				2274	1468	3458	7200	2268	948	3419	6635	12000
2002				2768	1284	3367	7419	2757	805	3299	6861	12000
2003				2454	1230	3331	7014	2438	771	3171	6380	12000
2004				2186	1485	3508	7179	2168	951	3255	6374	12000
2005				2248	1262	3204	6713	2208	785	2943	5936	12000
2006				1556	1655	3473	6684	1542	1055	3315	5912	12000
2007				1971	1583	3487	7041	1944	1020	3354	6317	12000
2008				2276	1562	3528	7366	2274	1027	3519	6820	12000
2009				1973	1355	3455	6782	1973	779	3437	6190	12000
2010				1478	1051	3291	5820	1478	676	3279	5433	12000
2011				2034	865	3058	5958	2034	529	3058	5621	12000
2012				1790	852	2984	5626	1790	595	2976	5361	12000
2013				1591	859	2865	5316	1591	682	2861	5135	12000
2014				2218	893	2729	5841	2218	642	2717	5578	12000
2015				2010	1210	2958	6178	2010	952	2956	5917	12000
2016												12000
2017												12000
2018												12000
2019												12000
2020												12000
2021												12000
2022												12000
2023												12000
2024												12000
2025												12000

Survival and Initial Population Estimates

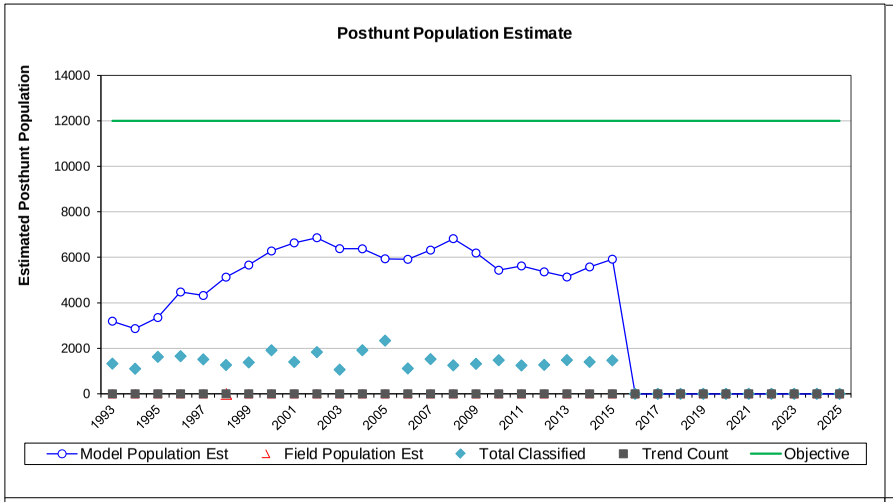
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.42			0.84		
1994	0.90			0.84		
1995	0.90			0.84		
1996	0.40			0.84		
1997	0.90			0.84		
1998	0.69			0.84		
1999	0.90			0.84		
2000	0.66			0.84		
2001	0.43			0.84		
2002	0.40			0.84		
2003	0.69			0.84		
2004	0.43			0.84		
2005	0.90			0.84		
2006	0.90			0.84		
2007	0.72			0.84		
2008	0.43			0.84		
2009	0.40			0.84		
2010	0.40			0.84		
2011	0.40			0.84		
2012	0.40			0.84		
2013	0.40			0.84		
2014	0.60			0.84		
2015	0.40			0.84		
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

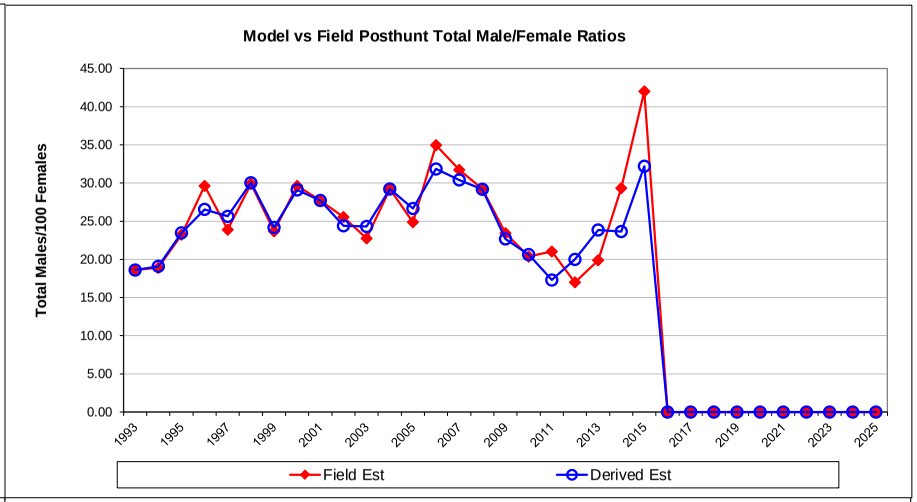
Parameters:	Optim cells
Adult Survival =	0.843
Initial Total Male Pop/10,000 =	0.032
Initial Female Pop/10,000 =	0.175

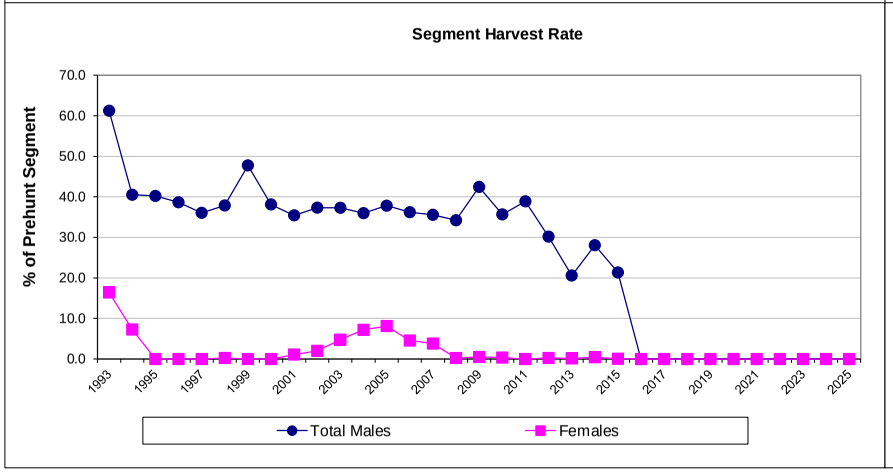
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

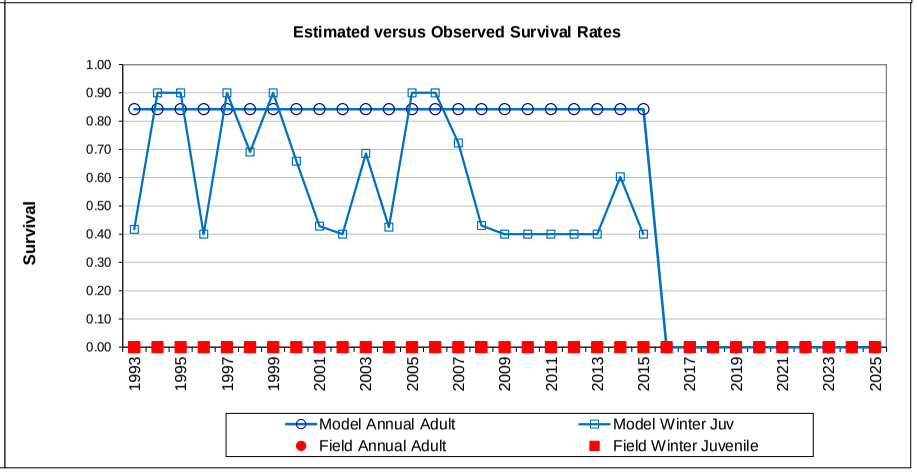
Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio			Harvest				Harvest: Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		64.19	3.81	18.60	18.60	1.74	17	467	312	796	61.3	16.4
1994		62.23	4.07	19.09	18.88	1.92	12	187	113	312	40.5	7.3
1995		65.39	3.54	23.47	23.23	1.82	0	255	0	255	40.2	0.0
1996		95.24	5.03	26.55	29.62	2.28	0	307	0	307	38.7	0.0
1997		81.68	4.49	25.63	23.88	2.00	0	274	0	274	36.1	0.0
1998		73.79	4.54	30.03	29.90	2.50	0	419	6	425	37.9	0.3
1999		80.77	4.65	24.18	23.67	2.08	0	555	0	555	47.8	0.0
2000		59.43	3.06	29.09	29.62	1.95	0	543	0	543	38.1	0.0
2001		66.34	3.91	27.71	27.70	2.21	5	473	35	513	35.4	1.1
2002		83.58	4.18	24.40	25.54	1.91	10	436	62	508	37.3	2.0
2003		76.88	5.06	24.30	22.74	2.29	14	417	145	576	37.3	4.8
2004		66.60	3.37	29.21	29.21	1.96	16	486	230	732	36.0	7.2
2005		75.04	3.35	26.66	24.87	1.63	36	434	237	707	37.8	8.1
2006		46.50	3.33	31.83	34.96	2.77	13	545	144	702	36.2	4.6
2007		57.96	3.37	30.40	31.72	2.28	25	512	121	658	35.6	3.8
2008		64.61	4.05	29.18	29.21	2.42	2	486	8	496	34.2	0.2
2009		57.40	3.52	22.68	23.42	1.99	0	523	16	539	42.5	0.5
2010		45.08	2.70	20.63	20.36	1.66	0	341	11	352	35.7	0.4
2011		66.52	4.08	17.29	21.02	1.95	0	306	0	306	38.9	0.0
2012		60.17	3.66	19.99	16.99	1.66	0	234	7	241	30.2	0.3
2013		55.62	3.20	23.85	19.88	1.68	0	161	4	165	20.6	0.2
2014		81.65	4.72	23.64	29.32	2.39	0	228	11	239	28.1	0.4
2015		68.00	4.04	32.19	42.00	2.92	0	235	2	237	21.4	0.1
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES



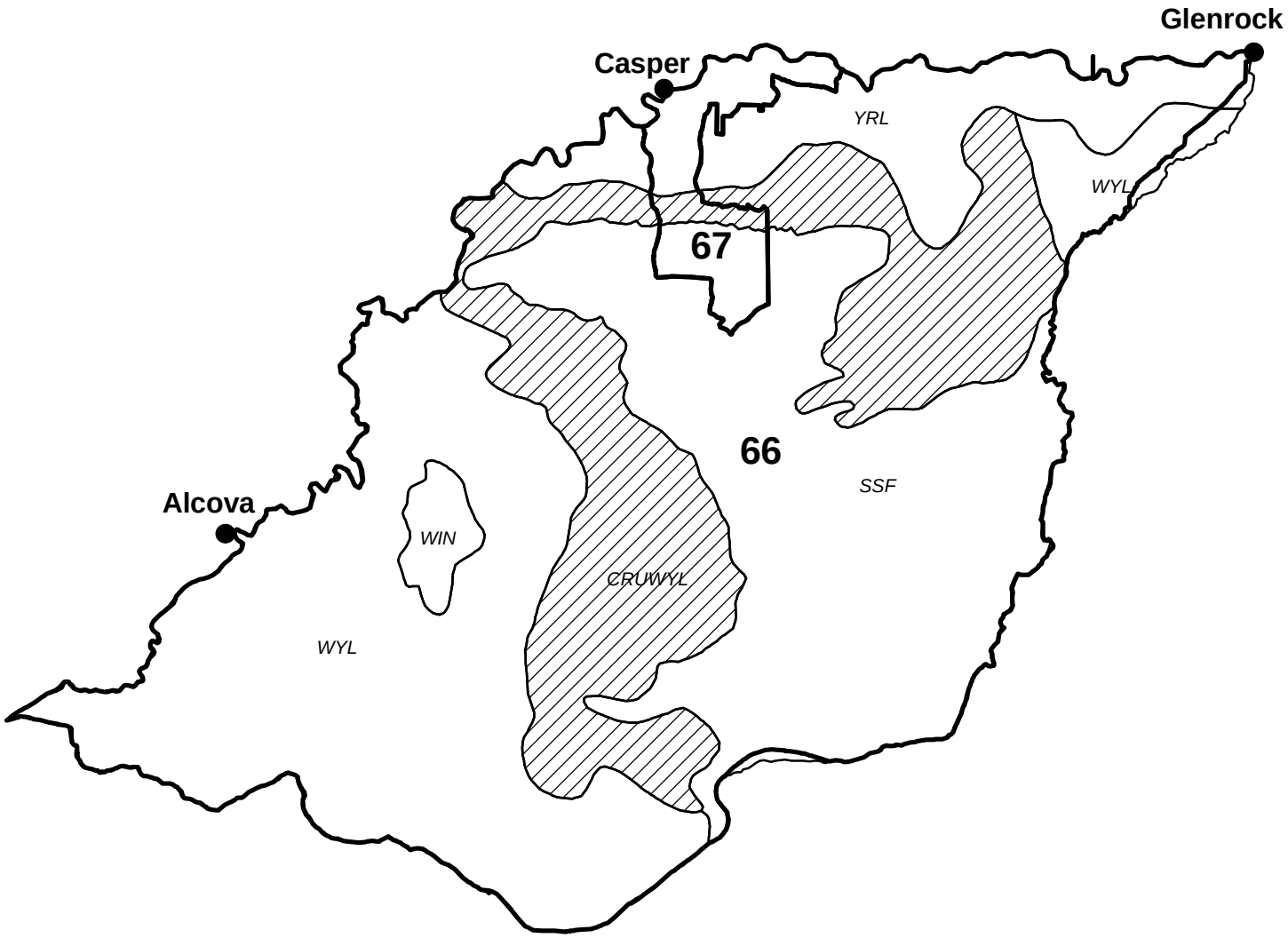






Comments:

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



2014 - JCR Evaluation Form

SPECIES: Mule Deer
PERIOD: 6/1/2014 - 5/31/2015

HERD: MD758 - RATTLESNAKE

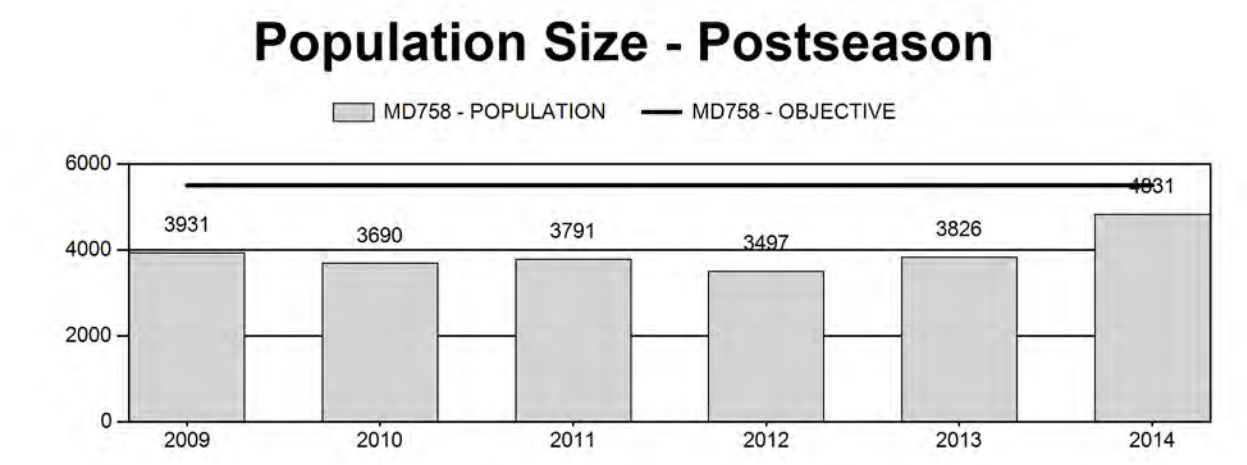
HUNT AREAS: 88-89
PREPARED BY: HEATHER O'BRIEN

	2009 - 2013 Average	2014	2015 Proposed
Population:	3,747	4,831	4,660
Harvest:	305	123	115
Hunters:	529	309	250
Hunter Success:	58%	40%	46 %
Active Licenses:	566	312	250
Active License Success:	54%	39%	46 %
Recreation Days:	2,229	1,086	950
Days Per Animal:	7.3	8.8	8.3
Males per 100 Females	35	44	
Juveniles per 100 Females	51	83	

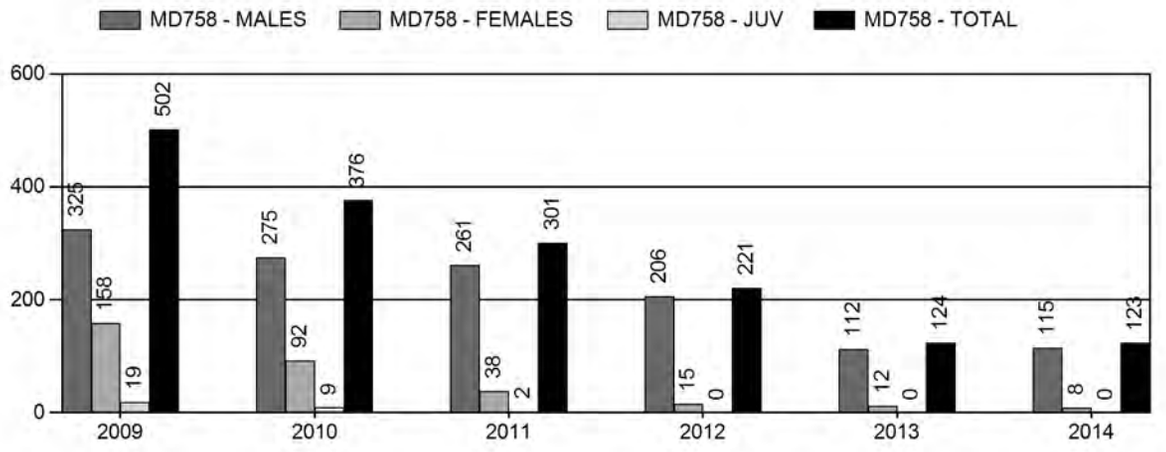
Population Objective (± 20%) :	5500 (4400 - 6600)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	-12.2%
Number of years population has been + or - objective in recent trend:	7
Model Date:	02/27/2015

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

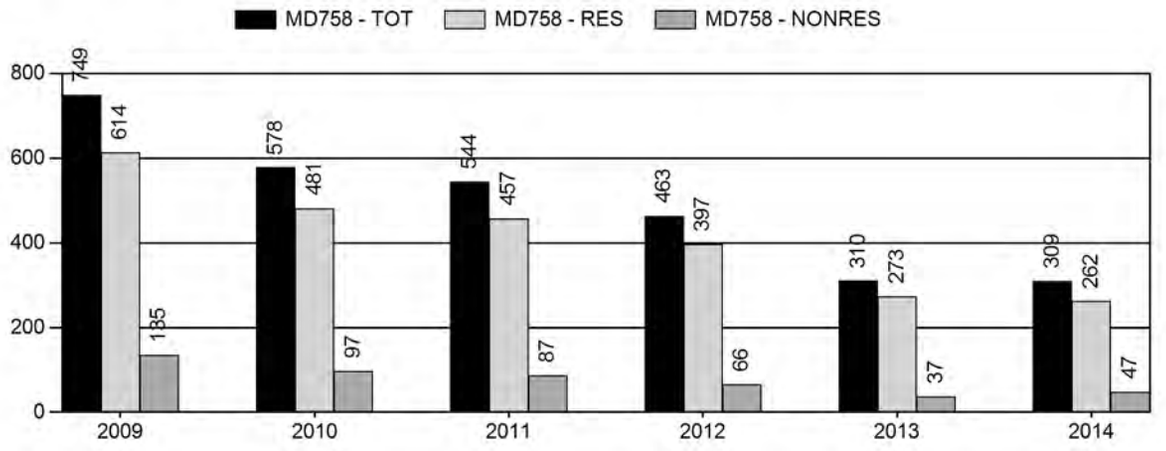
	JCR Year	Proposed
Females ≥ 1 year old:	0.1%	0%
Males ≥ 1 year old:	13.7%	11.0%
Juveniles (< 1 year old):	0%	0%
Total:	2.5%	2.4%
Proposed change in post-season population:	+16.0%	-3.5%



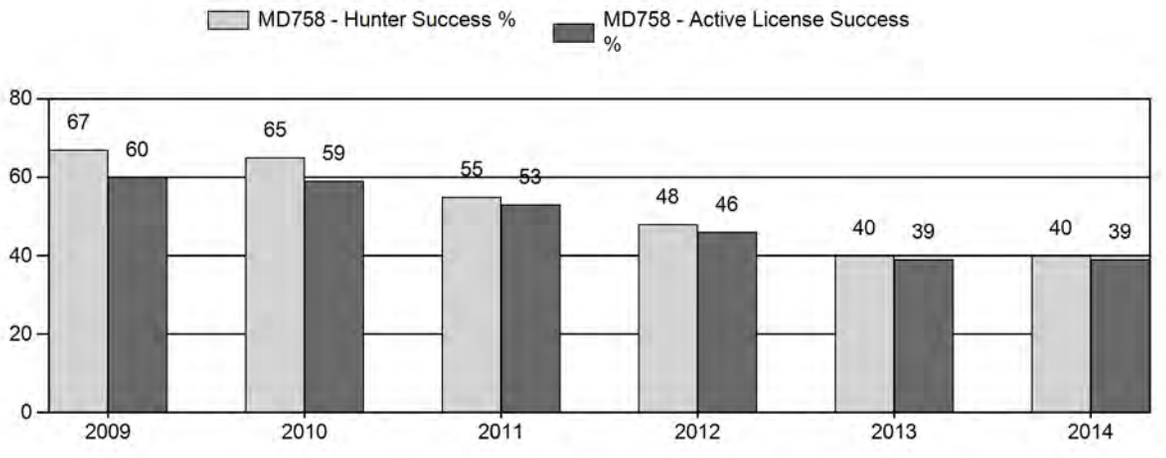
Harvest



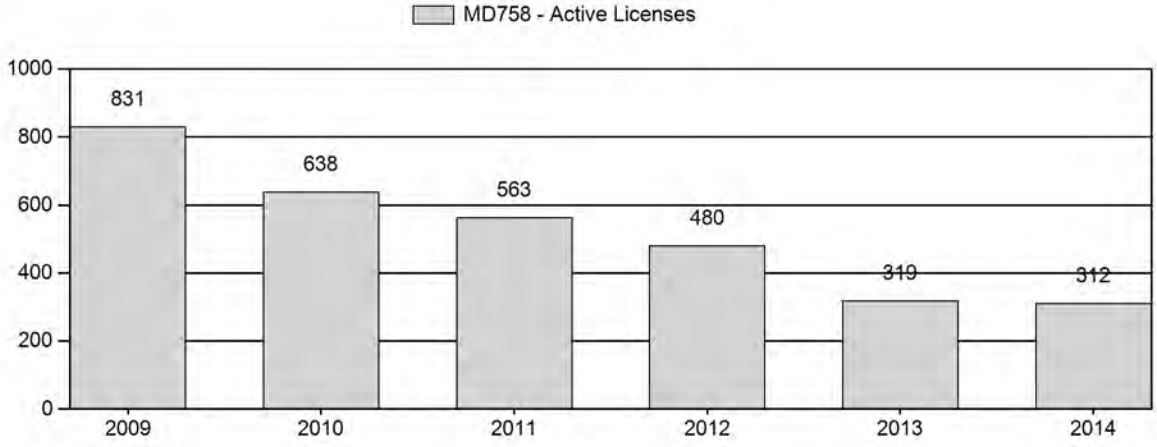
Number of Hunters



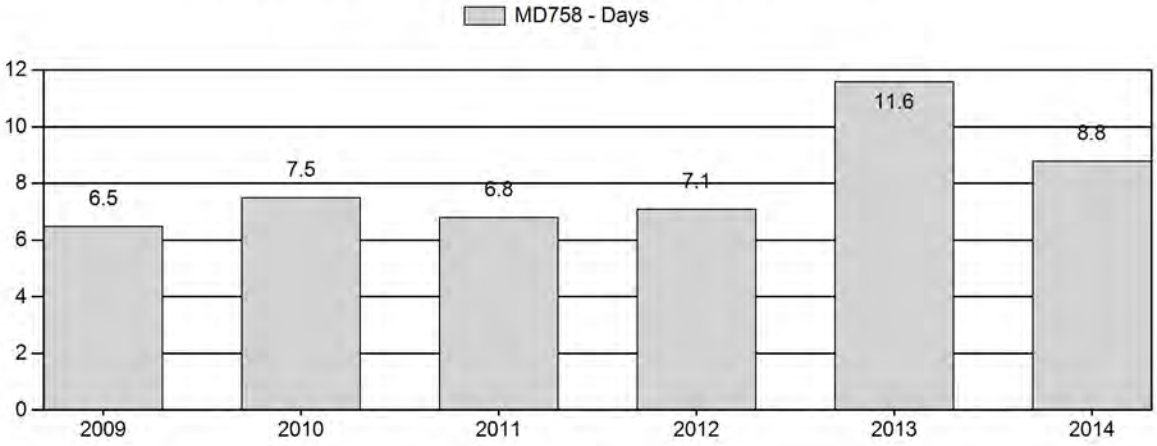
Harvest Success



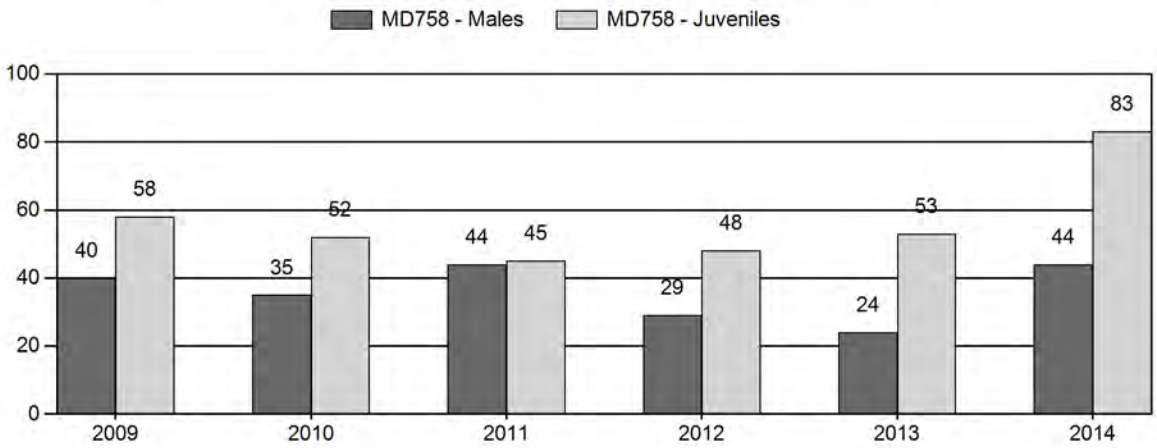
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 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
2009	3,931	34	82	76	12	0	189	20%	469	50%	271	29%	929	922	7	33	40	± 4	58	± 5	41
2010	3,690	49	73	51	6	0	169	19%	487	54%	252	28%	908	797	10	25	35	± 3	52	± 4	38
2011	3,791	53	136	63	9	0	249	23%	570	53%	258	24%	1,077	781	9	34	44	± 4	45	± 4	32
2012	3,497	25	83	10	2	0	109	16%	381	57%	184	27%	674	830	7	22	29	± 4	48	± 5	38
2013	3,826	14	61	20	1	0	91	14%	376	57%	198	30%	665	671	4	20	24	± 3	53	± 5	42
2014	4,831	47	84	36	6	0	161	19%	368	44%	304	36%	833	1,446	13	31	44	± 5	83	± 7	57

2015 HUNTING SEASONS
RATTLESNAKE MULE DEER (MD758)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
88	1	Oct. 15	Oct. 21		General	Antlered mule deer or any white-tailed deer
89	1	Oct. 15	Oct. 31	75	Limited quota	Antlered deer
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2014
88	6	-25
89	1	No Change
Total	1	-25

Management Evaluation

Current Postseason Population Management Objective: 5,500
Management Strategy: Special
2014 Postseason Population Estimate: 4,800
2015 Proposed Postseason Population Estimate: 4,700
2014 Hunter Satisfaction: 55% Satisfied, 20% Neutral, 25% Dissatisfied

The Rattlesnake Mule Deer Herd Unit has a postseason population objective of 5,500 deer. The herd is managed using the special management strategy, with the goal of maintaining postseason buck ratios between 30-45 bucks per 100 does. Management of this herd unit and interpretation of harvest data can be perplexing, with different management directions for Area 88 versus Area 89. The objective and management strategy were last revised in 1985, and will be formally reviewed in 2015.

Herd Unit Issues

Hunting access within the herd unit is moderate. While there are large tracts of public lands and several large walk-in areas in Area 89, there are also many parcels of private land with restricted access. Hunt Area 88 is dominated by private lands with several small public land parcels. Harvest pressure is consistently maintained in Area 88 to address potential damage issues on

irrigated agricultural fields. Consequently, hunting pressure can be disproportionately high on public lands within Area 88. Managers will conduct a review of hunt area boundaries in 2015, to consider moving public lands in the southern portion of Area 88 into Area 89. Traditional ranching and grazing are the primary land use over the whole unit, with scattered areas of oil and gas development and bentonite mining. Periodic disease outbreaks (i.e. hemorrhagic diseases) are possible in this herd and can contribute to population declines when environmental conditions are suitable.

Weather

The winter of 2010-2011 was severe throughout the herd unit, which may have resulted in somewhat higher mortality of mule deer. Conditions were warm and dry for the herd unit in 2011 and shrub production was below average, resulting in poor nutrition of mule deer entering the winter of 2011-2012. Snow pack and resulting spring moisture were below average for the winter of 2011-2012 which likely had a negative impact on lactating does and their fawns. The summer of 2012 was the driest on record since 1904 in much of Wyoming, and the winter of 2012 continued the trend with very low snow accumulation and snow pack. The spring of 2013 was cool with significant precipitation, and average rainfall over the summer as well. Still, habitat conditions appeared to be poor for much of the growing season. Heavy precipitation during the fall of 2013 caused a beneficial late green-up, but also made travel very difficult for hunters. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. Grass and forb growth was excellent, making 2014 the best growing season the region had seen in years. The spring and summer of 2014 undeniably produced improved range conditions that benefitted mule deer. For detailed weather data see http://www.ncdc.noaa.gov/gac/time-series/us.

Habitat

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

Field Data

Fawn production/survival was high in this herd from 1998-2005, and the population grew in stages during this time period. License issuance was modest, until a larger number of doe/fawn licenses were introduced in Area 88 from 2003-2005. Fawn ratios were then moderate to poor from 2006-2013, and the population gradually declined over these years. Issuance of doe/fawn licenses was reduced incrementally in accordance with this decline. Harsh winter conditions in 2010-11 combined with severe drought in 2012 produced the lowest fawn ratios in over 15 years for the herd unit. Fawn ratios recovered slightly in 2013, and then improved significantly in 2014 with 83 per 100 does.

Buck ratios for the Rattlesnake Mule Deer Herd have been maintained consistently within special management parameters since 1999. As a result, hunters have developed high expectations for buck numbers and quality within this herd unit. Buck ratios for the herd are typically in the mid 30s per 100 does, but were as high as 44 bucks per 100 does in 2005 following several years of high fawn productivity. While this herd has dropped in overall numbers over the past six years, buck ratios have been maintained consistently in the 30s and low 40s by adjusting Area 89 license issuance accordingly. However, the buck ratio dropped below special management range to 24:100 does in 2013. Yearling buck ratios have been extremely low over the past few years, and recruitment of bucks into adult age classes has declined considerably. It can be difficult to maintain buck ratios over the entire herd unit, as Area 88 is managed for a low number of deer and Area 89 is managed for high mature buck ratios. After a reduction in license issuance in 2013, buck ratios recovered to within special management range in 2014, with 33 bucks per 100 does observed postseason. Managers will continue to adjust license numbers in the herd unit so as to maintain the buck ratio within special management parameters and assure that an adequate proportion of mature bucks are available for harvest.

Since 2008, bucks classified in Area 89 have been categorized based on antler size (see Figure 1). 2009 represented the best distribution of mature buck classes, with 53% Class I (small), 39% Class II (medium), and 9% Class III (large) bucks. Bucks classified in 2013 showed a marked decrease in antler quality compared to previous years. Class III bucks only represented 1% of the total classified, while Class I and Class II bucks represented 74% and 25% of those surveyed, respectively. In 2014, distribution of surveyed bucks across antler classes improved slightly, with a higher percentage of Class II and Class III bucks. Still, overall distribution of bucks remains weighted toward smaller antler classes. With hunter expectations high for trophy-quality hunting, managers consider this further justification to maintain Type 1 license numbers rather than increasing hunter opportunity for the 2015 hunting season.

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

Figure 1. Antler classification analysis for Area 89 within the Rattlesnake Mule Deer Herd Unit, 2008-2014.

Harvest Data

License success in this herd unit is typically in the 60-70th percentile. Overall harvest success declined from 2010-2013, and days per animal increased. In 2014, overall harvest success was again low (39%) for the herd unit. Area 89 had the same harvest success in 2013 and 2014 (66%) with an increase in days per animal, despite a reduction from 125 licenses to 75 licenses. It can be difficult to use days per animal as a reference to population trends in this herd unit however, as hunters in Area 89 tend to be more selective of bucks and thus take more time to harvest a deer. Selectivity and low deer numbers have likely combined in recent years to contribute to higher harvest days. License reductions in 2013 and 2014 did not improve harvest success, indicating fewer deer were available to fewer hunters. Hunter satisfaction also declined from 2012-2014, from 79% to 56% to 55%, respectively. Continued years with improved fawn production and recruitment are necessary before this herd can support higher harvest. Managers thus plan to maintain record low license issuance in an effort to improve harvest success and hunter satisfaction while maintaining special management buck ratios in the herd unit.

Population

The 2014 postseason population estimate was approximately 4,800 mule deer and trending suddenly upward from an estimated low of 4,100 deer in 2012. Postseason classification data and harvest data are applied to the model to predict population size and trends for this herd. No sightability or other population estimate data are currently available to further align the model.

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

Management Summary

Traditional season dates in this herd run from October 15th through October 31st for limited quota licenses in Area 89, and October 15th through October 21st for general licenses in Area 88. The same season dates will be applied to the 2015 hunting season, with no changes in issuance of Area 89-Type 1 licenses. Area 88-Type 6 licenses will be eliminated, as there are currently no concerns regarding damage and few access opportunities on private lands. The 2015 season thus includes a total of 75 Type 1 licenses in Area 89, and a general season in Area 88 for antlered mule deer or any white-tailed deer. Goals for 2015 are to improve buck ratios, and increase hunter success and satisfaction.

If we attain the projected harvest of 115 deer with fawn ratios similar to the five-year average, this herd will decrease just slightly in number. The predicted 2015 postseason population size for the Rattlesnake Mule Deer Herd Unit is approximately 4,700 deer, which is 12% below objective.

INPUT	
Species:	Deer
Biologist:	Heather O'Brien
Herd Unit & No.:	Rattlesnake MD
Model date:	02/24/15

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	60	69	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	90	107	☑ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	15	120	☐ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population			Total	Predicted Posthunt Population			Total	Objective
	Field Est	Field SE		Juveniles	Total Males	Females		Juveniles	Total Males	Females		
1993				1549	762	2836	5148	1527	358	2620	4504	5500
1994				1117	656	2658	4431	1079	477	2439	3996	5500
1995				1293	663	2399	4354	1278	509	2327	4113	5500
1996				2309	735	2344	5388	2309	649	2344	5302	5500
1997				2273	1088	2588	5950	2253	853	2497	5604	5500
1998				1896	1257	2712	5865	1890	911	2646	5447	5500
1999				2144	1227	2762	6134	2135	945	2648	5728	5500
2000				1683	1311	2819	5813	1665	1022	2672	5360	5500
2001				1899	1275	2736	5910	1899	1036	2645	5579	5500
2002				2123	1339	2763	6225	2100	1105	2651	5856	5500
2003				2210	1445	2814	6469	2205	1220	2704	6128	5500
2004				2396	1571	2884	6850	2382	1287	2784	6452	5500
2005				2569	1669	2994	7231	2558	1337	2890	6785	5500
2006				1775	1753	3127	6655	1771	1393	2984	6148	5500
2007				1788	1627	3036	6450	1773	1211	2812	5797	5500
2008				1550	1467	2884	5901	1543	1074	2664	5281	5500
2009				1481	1294	2701	5477	1460	937	2527	4924	5500
2010				1283	1154	2562	4999	1273	852	2461	4585	5500
2011				1097	1037	2461	4595	1095	740	2418	4253	5500
2012				1131	874	2359	4364	1131	647	2343	4121	5500
2013				1204	799	2299	4303	1204	676	2286	4166	5500
2014				1863	839	2264	4966	1863	713	2255	4831	5500
2015				1330	1045	2411	4787	1330	919	2411	4660	5500
2016												5500
2017												5500
2018												5500
2019												5500
2020												5500
2021												5500
2022												5500
2023												5500
2024												5500
2025												5500

Survival and Initial Population Estimates

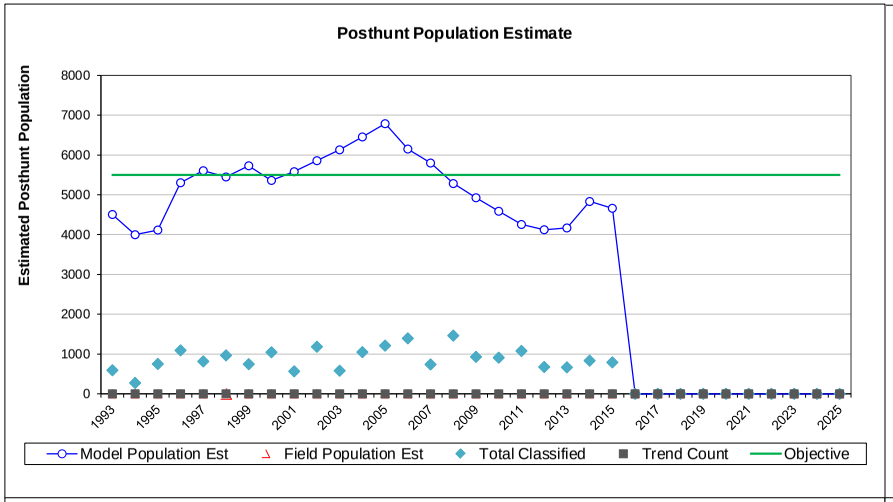
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.45			0.89		
1994	0.45			0.89		
1995	0.45			0.89		
1996	0.45			0.89		
1997	0.45			0.89		
1998	0.45			0.89		
1999	0.45			0.89		
2000	0.45			0.89		
2001	0.45			0.89		
2002	0.45			0.89		
2003	0.45			0.89		
2004	0.45			0.89		
2005	0.45			0.89		
2006	0.45			0.89		
2007	0.45			0.89		
2008	0.45			0.89		
2009	0.45			0.89		
2010	0.45			0.89		
2011	0.40			0.89		
2012	0.40			0.89		
2013	0.40			0.89		
2014	0.45			0.89		
2015	0.45			0.89		
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

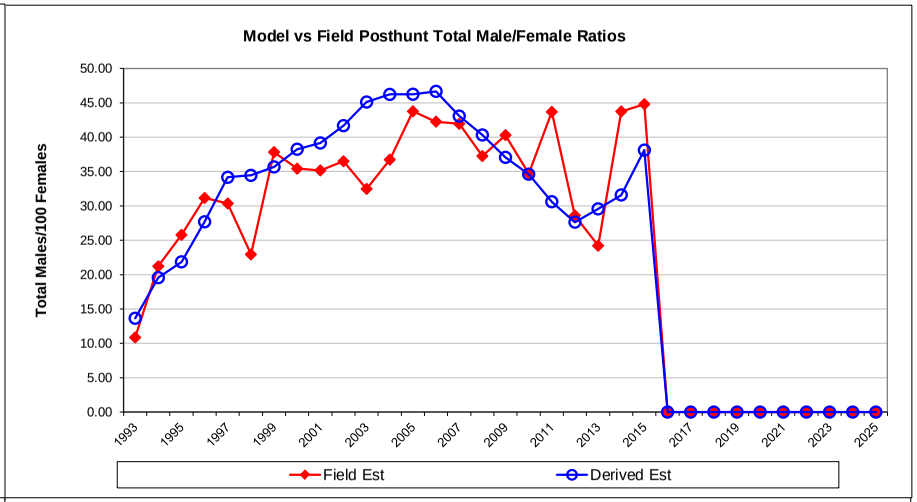
Parameters:	Optim cells
Juvenile Survival =	0.445
Adult Survival =	0.885
Initial Total Male Pop/10,000 =	0.036
Initial Female Pop/10,000 =	0.262

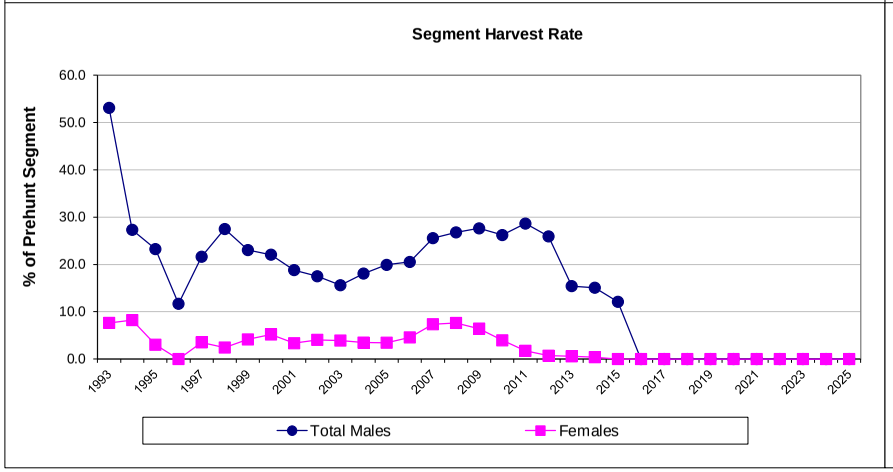
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

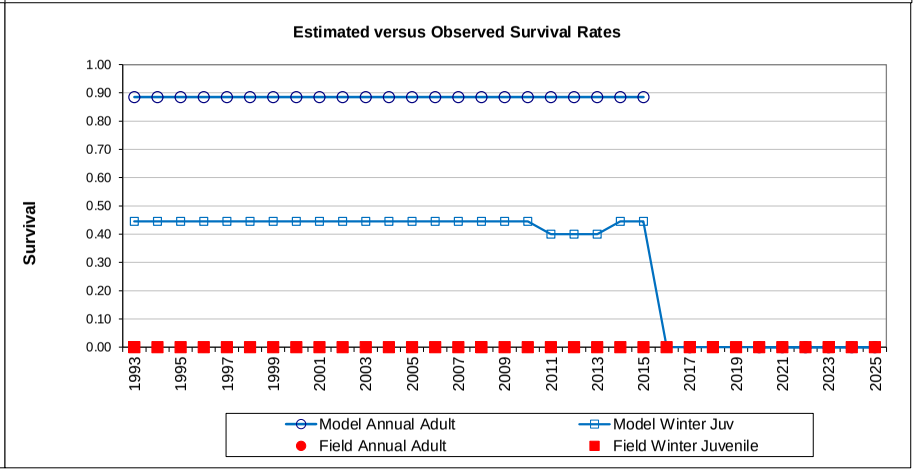
Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio			Classification Counts				Harvest: Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		58.29	5.13	13.65	10.86	1.85	20	368	197	585	53.1	7.6
1994		44.24	6.22	19.56	21.21	3.95	34	163	199	396	27.3	8.2
1995		54.94	4.53	21.86	25.78	2.80	13	140	66	219	23.2	3.0
1996		98.53	6.42	27.69	31.16	2.93	0	78	0	78	11.7	0.0
1997		90.24	6.82	34.16	30.35	3.27	18	214	83	315	21.6	3.5
1998		71.43	4.96	34.45	22.94	2.38	6	314	60	380	27.5	2.4
1999		80.65	6.54	35.67	37.83	3.91	8	257	104	369	23.0	4.1
2000		62.31	4.38	38.25	35.42	3.01	16	263	133	412	22.1	5.2
2001		71.79	6.72	39.16	35.16	4.17	0	218	83	301	18.8	3.3
2002		79.20	5.09	41.68	36.50	3.02	21	213	102	336	17.5	4.1
2003		81.55	7.39	45.12	32.47	3.98	5	205	100	310	15.6	3.9
2004		85.56	5.81	46.23	36.73	3.27	13	258	91	362	18.1	3.5
2005		88.48	5.66	46.25	43.76	3.47	10	302	94	406	19.9	3.5
2006		59.33	3.70	46.67	42.26	2.95	4	327	130	461	20.5	4.6
2007		63.06	5.34	43.07	41.94	4.07	13	378	203	594	25.6	7.4
2008		57.94	3.50	40.32	37.25	2.61	6	357	200	563	26.8	7.6
2009		57.78	4.41	37.07	40.30	3.47	19	325	158	502	27.6	6.4
2010		51.75	4.02	34.61	34.70	3.10	9	275	92	376	26.2	4.0
2011		45.26	3.40	30.61	43.68	3.32	2	270	39	311	28.6	1.7
2012		48.29	4.34	27.64	28.61	3.11	0	206	15	221	25.9	0.7
2013		52.66	4.62	29.57	24.20	2.83	0	112	12	124	15.4	0.6
2014		82.61	6.40	31.60	43.75	4.13	0	115	8	123	15.1	0.4
2015		55.19	4.66	38.12	44.81	4.05	0	115	0	115	12.1	0.0
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES



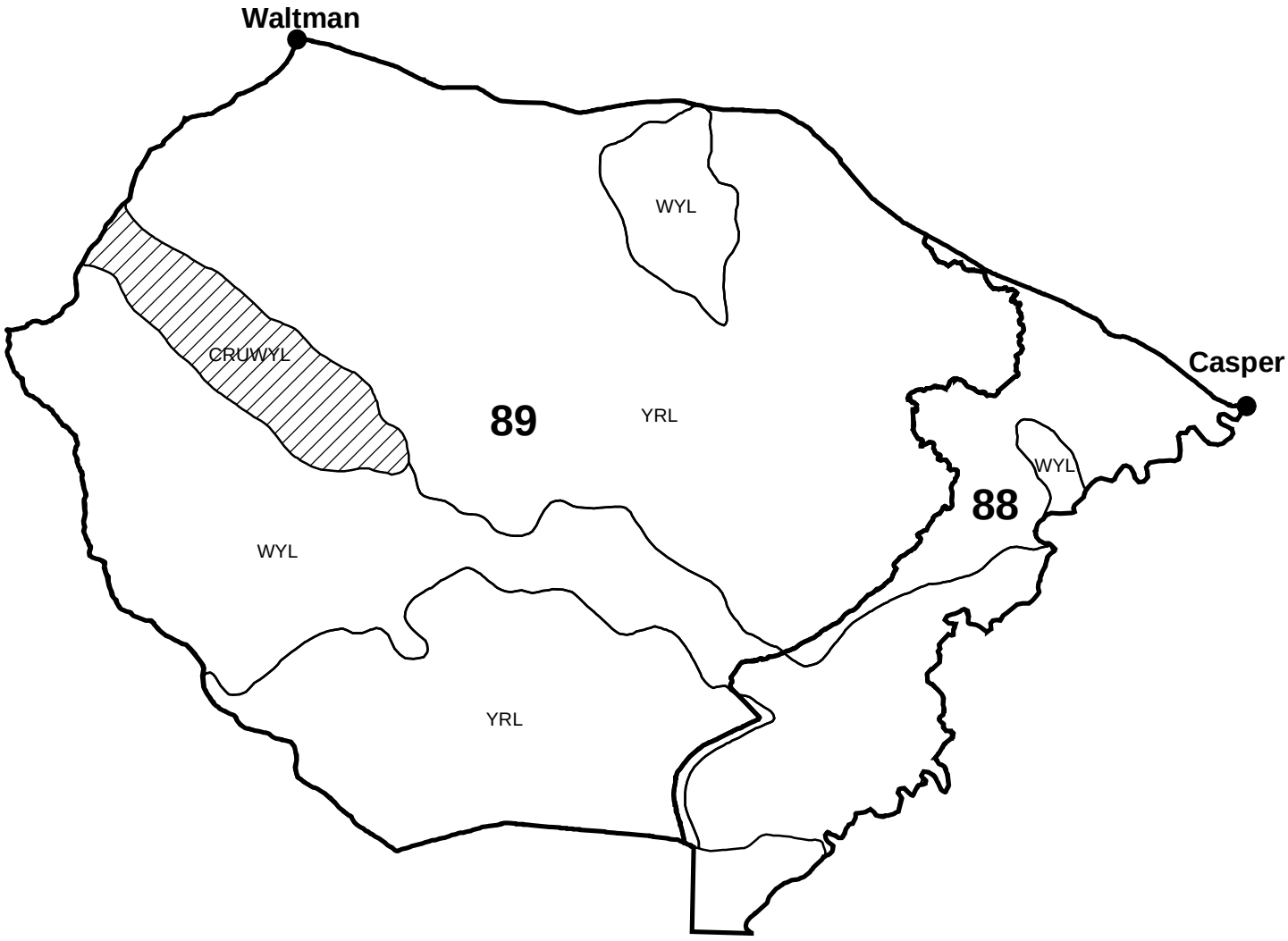






Comments:

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



2014 - JCR Evaluation Form

SPECIES: Mule Deer

PERIOD: 6/1/2014 - 5/31/2015

HERD: MD759 - NORTH NATRONA

HUNT AREAS: 34

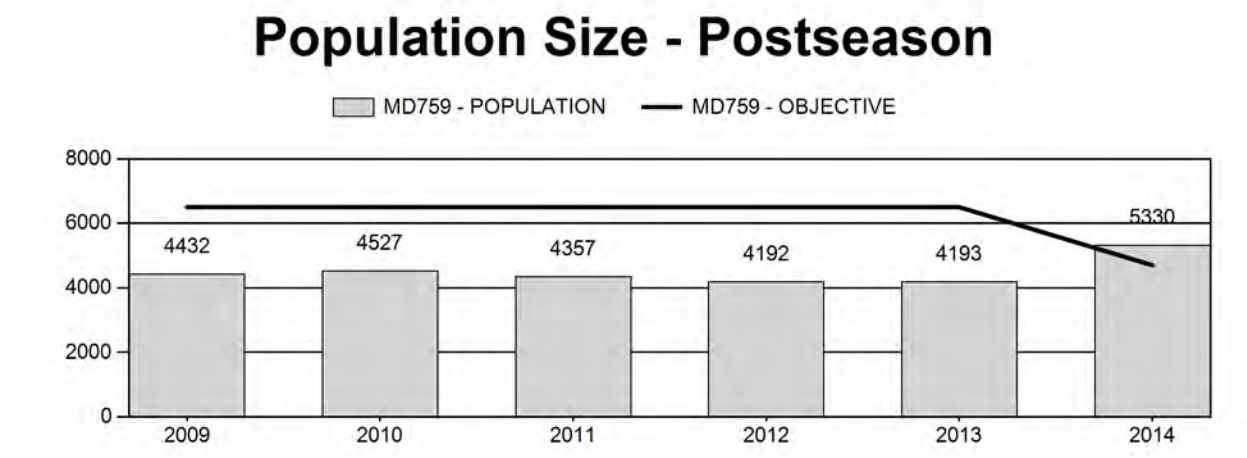
PREPARED BY: HEATHER O'BRIEN

	2009 - 2013 Average	2014	2015 Proposed
Population:	4,340	5,330	5,277
Harvest:	241	107	112
Hunters:	318	130	140
Hunter Success:	76%	82%	80%
Active Licenses:	335	130	140
Active License Success:	72%	82%	80%
Recreation Days:	1,435	709	700
Days Per Animal:	6.0	6.6	6.2
Males per 100 Females	34	38	
Juveniles per 100 Females	49	96	

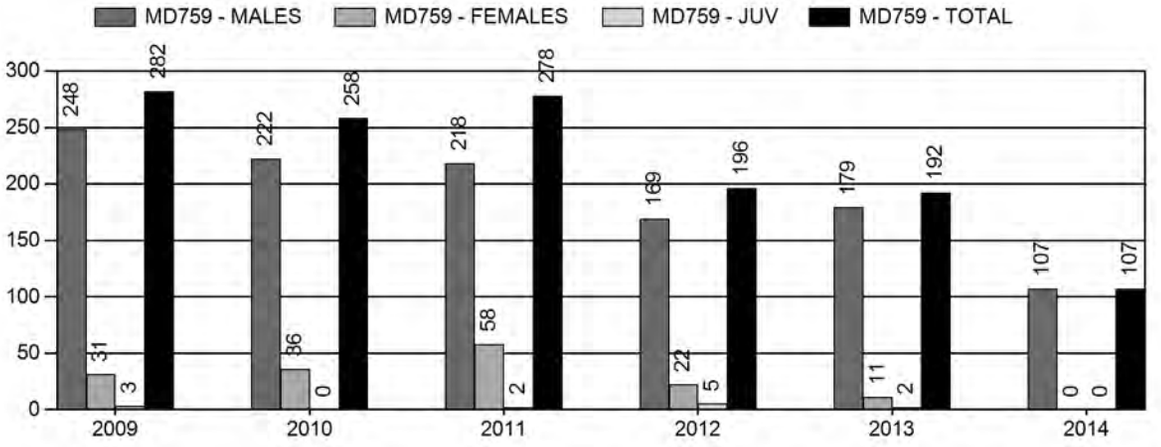
Population Objective (± 20%) :	4700 (3760 - 5640)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	13%
Number of years population has been + or - objective in recent trend:	1
Model Date:	02/23/2015

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

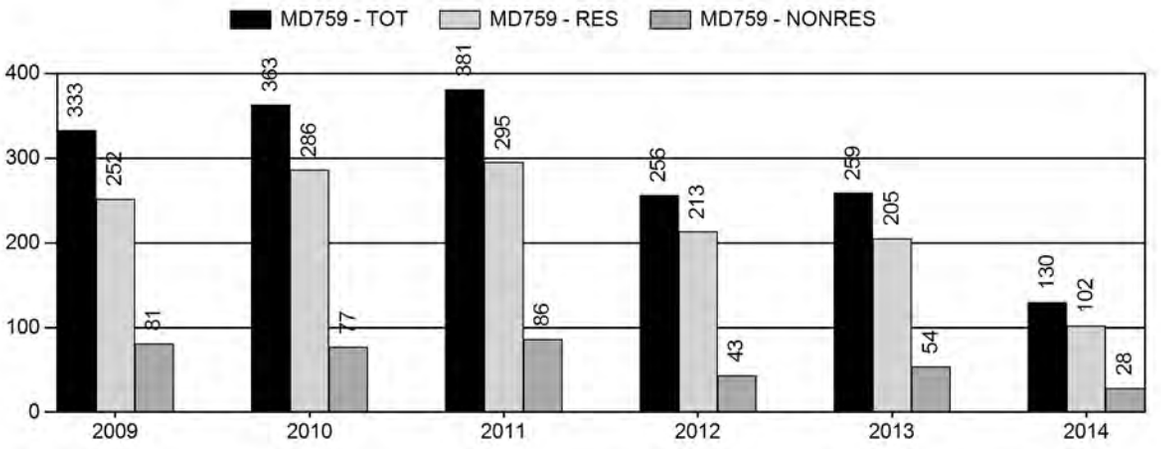
	JCR Year	Proposed
Females ≥ 1 year old:	0%	0%
Males ≥ 1 year old:	11.4%	8.7%
Juveniles (< 1 year old):	0%	0%
Total:	1.96%	2.07%
Proposed change in post-season population:	+26.8%	-0.01%



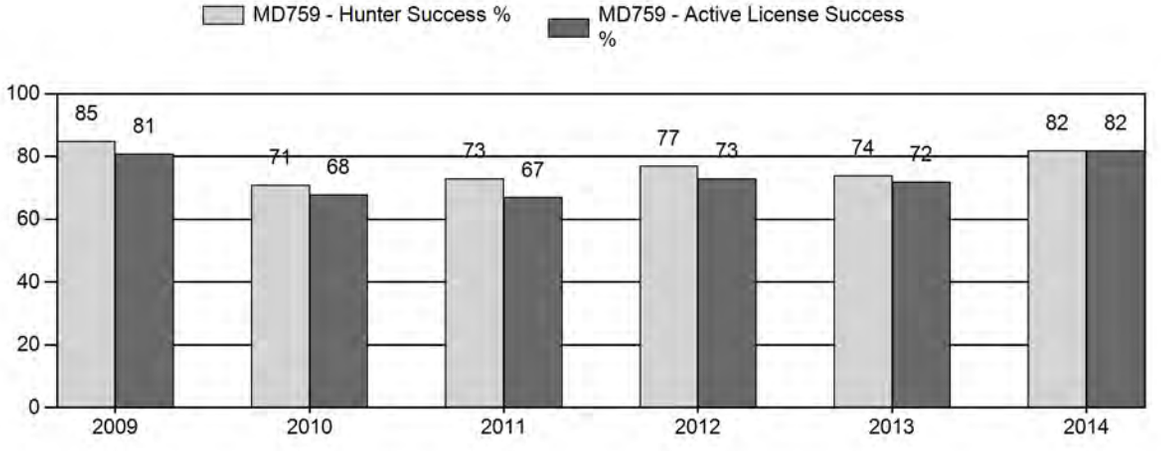
Harvest



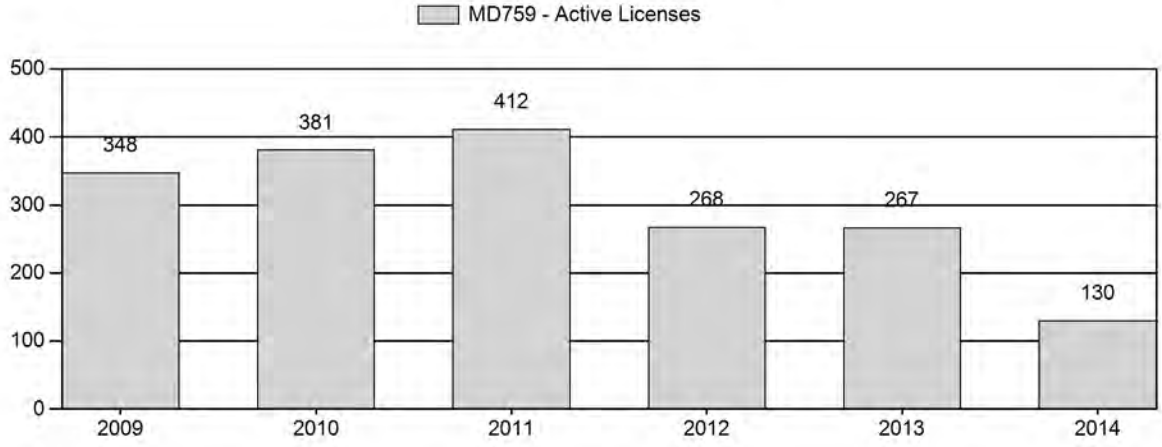
Number of Hunters



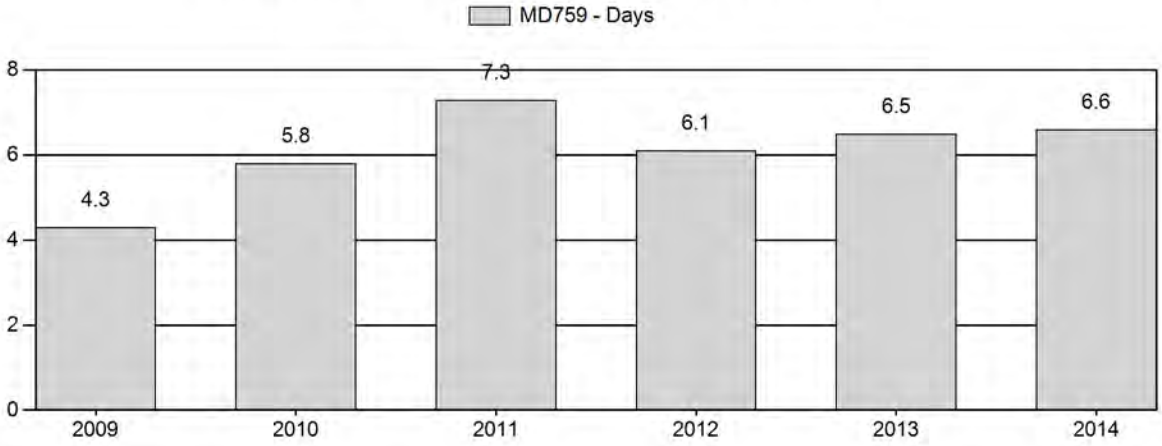
Harvest Success



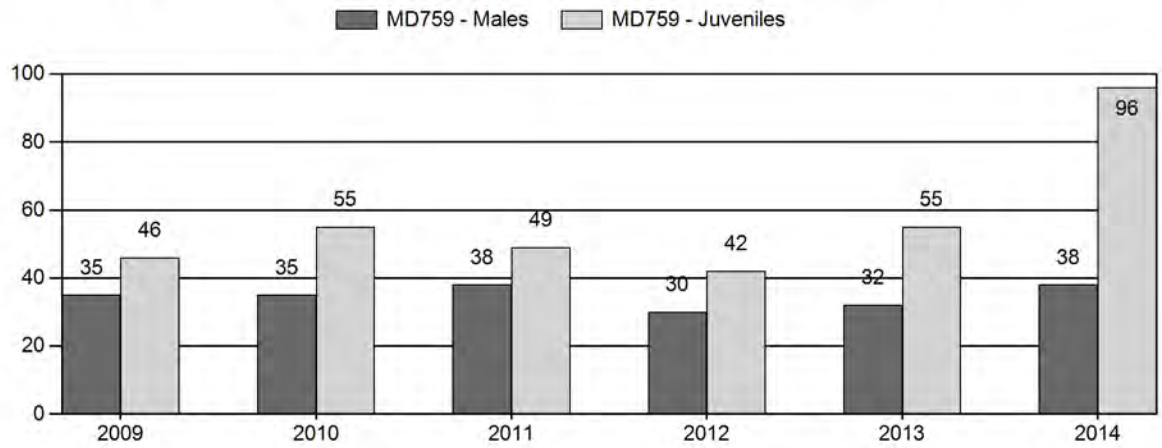
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 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	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	4,432	51	87	44	13	0	195	19%	558	55%	256	25%	1,009	668	9	26	35	± 3	46	± 4	34
2010	4,527	47	55	44	21	0	167	18%	476	53%	262	29%	905	830	10	25	35	± 4	55	± 5	41
2011	4,357	52	64	34	4	0	154	20%	406	53%	200	26%	760	851	13	25	38	± 4	49	± 5	36
2012	4,192	36	91	20	6	0	153	18%	503	58%	212	24%	868	760	7	23	30	± 3	42	± 4	32
2013	4,193	28	60	19	1	0	108	17%	342	54%	187	29%	637	580	8	23	32	± 4	55	± 6	42
2014	5,330	51	84	30	2	0	167	16%	441	43%	425	41%	1,033	1,713	12	26	38	± 4	96	± 8	70

2015 HUNTING SEASONS
NORTH NATRONA MULE DEER HERD (MD759)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
34	1	Oct. 15	Oct. 31	150	Limited quota	Antlered deer
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2014
34	1	No Change

Management Evaluation

Current Postseason Population Management Objective: 4,700
Management Strategy: Special
2014 Postseason Population Estimate: 5,300
2015 Proposed Postseason Population Estimate: 5,300
2014 Hunter Satisfaction: 81% Satisfied, 9% Neutral, 10% Dissatisfied

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

Herd Unit Issues

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

Weather

The winter of 2010-2011 was severe throughout the herd unit, which may have resulted in somewhat higher mortality of mule deer. Conditions were warm and dry for the herd unit in 2011 and shrub production was below average, resulting in poor nutrition of deer entering the winter of 2011-2012. Snow pack and resulting spring moisture was below average for the winter of 2011-2012 which likely had a negative impacts on lactating does and their fawns. The summer of 2012 was the driest on record since 1904 in much of Wyoming, and the winter of 2012 continued the trend with very low snow accumulation and snow pack. The spring of 2013 was cool with significant precipitation, with average rainfall over the summer as well. Still, habitat conditions remained poor in portions of the herd that received less spring and summer rain. Heavy precipitation during the fall of 2013 caused a beneficial late green-up, but also made travel difficult to impossible for hunters. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. Grass and forb growth were excellent, making 2014 the best growing season the region had seen in years. The spring and summer of 2014 undeniably produced improved range conditions that benefitted mule deer. For detailed weather data see http://www.ncdc.noaa.gov/gac/time-series/us.

Habitat

This herd unit contains five habitat transects which measure annual production and utilization of curl leaf mountain mahogany (*Cercocarpus ledifolius*). However, no new production or utilization data were collected on transects in 2014. Anecdotal observations during the summer growing season suggest range conditions were well above average, following extremely poor conditions that prevailed in 2012-2013. Herbaceous forage species were observed to be in very good condition in 2014 compared to previous years, and mule deer appeared to be in excellent body condition by winter 2014.

Field Data

Fawn production were moderate (55-66 per 100 does) in this herd from 1998-2002, and license issuance during this time was higher with an emphasis on buck harvest. During the mild years of 2003-2005, fawn production/survival was quite high (73-89 per 100 does). License issuance was very moderate during this time, and the population grew to a high of approximately 5,500 animals. From 2006-present, fawn production/survival was moderate to poor, and reached a 15-year low in 2012. Fawn production/survival recovered slightly in 2013 with 55:100, but was still poor with regard to conditional needs for population maintenance and/or growth. Fawn production improved strikingly in 2014, reaching a historic high of 96 per 100 does. Mild winter weather followed by an excellent growing season helped to improve conditions for fawns and

lactating does in 2014. Overwinter survival of fawns appeared to improve from 2013 to 2014 as well, as evidenced by higher yearling buck ratios.

Buck ratios for the North Natrona Herd historically average in the mid 30s per 100 does. Type 1 license issuance remained stable at 350 from 2001-2011, as buck ratios stayed well within special management range. In 2012 Type 1 licenses were reduced, as buck ratios were on the lower cusp of special management. Observed buck ratios were again near the lower end of special management in 2013. Yearling buck ratios were extremely poor during the same period, indicating poor recruitment and slowing recovery of mature buck ratios. Hunter satisfaction was also low in 2012 to 2013 (~68%), as hunters have high expectations of buck quality and availability within this special management area. Managers further reduced Type 1 licenses in 2014, to improve hunt quality and reduce pressure on mature bucks. As a result, buck ratios increased to 38 per 100 does, harvest success increased to 82%, and hunter satisfaction improved to 81%. Management goals for 2015 are to maintain or improve buck ratios within the range of special management, and maintain or improve harvest success and hunter satisfaction.

Since 2008, classified bucks have been further categorized based on antler size (see Figure 1). 2010 represented the best distribution of mature buck classes, with 46% Class I (small), 37% Class II (medium), and 18% Class III (large) bucks. Bucks classified in 2013 showed a marked decrease in antler quality compared to previous years. Bucks classified in 2014 showed similar distribution, with a slight shift from Class I to Class II. With hunter expectations high for trophy-quality hunting, managers view this poor availability of trophy class bucks as further justification to maintain low issuance of Type 1 licenses for the 2015 hunting season.

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

Figure 1. Antler classification analysis for the North Natrona Mule Deer Herd Unit, 2008-2014.

Harvest Data

Hunter success in the North Natrona Mule Deer Herd Unit is typically in the 70-80th percentile, and was 82% in 2014. Hunter days remained fairly average for this herd unit, at 6.6 days per animal, despite a reduction of Type 1 licenses. Survey totals, comments from hunters and landowners, and population modeling all indicate this herd remained relatively stable through 2013. Thus, managers suspect hunters are being selective, as the herd has developed a reputation of having high quality mature bucks. Extremely high fawn production is expected to cause a burst of growth in this herd for 2014, provided overwinter survival for 2014-2015 is good.

Tooth age data were collected from harvested bucks in the North Natrona Mule Deer Herd Unit in 2010, 2013, and 2014 (see Figure 2). It should be noted that changes in overall sample size between years are in part due to reductions in license issuance between sample years. Comparing data between years shows a consistency of hunter selection for mature bucks, with the average and median age remaining within prime age classes for mule deer. Average antler spread reported by hunters showed no change for 2010 and 2013, but decreased slightly in 2014. Fairly static results for average and median age of harvested bucks suggests availability of mature bucks has remained relatively constant due to adjustments in license issuance. Slight shifts in average and median age between sample years may be due to variations in age class distribution from one year to the next. No definite trend is apparent with only three years of collected data however, and further research would be necessary to isolate what population and harvest variables may contribute to these shifts. Regardless, these tooth-age data indicate past and current management prescription has resulted in most hunters harvesting prime-age bucks, which is consistent with management strategy.

	2010	2013	2014
Average Age	4.44	5.4	5.27
Median Age	4.5	5.5	4.5
Average Antler Spread	21.2	21.2	20
Sample Size (N) =	68	52	44

Figure 2. Lab tooth age and antler spread data from Area 34 harvested mule deer, 2010, 2013, & 2014.

Population

The 2014 postseason population estimate was approximately 5,300, which represents an increase of approximately 1,000 deer since postseason 2013. Postseason classification data and harvest data are applied to the model to predict population size and trends for this herd. The high fawn ratio observed during 2014 postseason classification surveys contributed nearly twice as many

juveniles to the model simulation compared to the previous year, creating a sudden increase in overall population size. No sightability or other population estimate data are currently available to further align the model.

The "Constant Juvenile Survival – Constant Adult Survival" (CJ,CA) spreadsheet model was chosen for the postseason population estimate of this herd. This model is the simplest and appears to be most representative of trends within the herd. The CJ,CA model selects adult survival rates that are very reasonable for this herd, but only if the juvenile survival rate is increased slightly. The lower constraint for juvenile survival was thus increased from 0.4 to 0.5. Managers believe this to be an acceptable adjustment, as it is small and accounts for slightly milder habitat and winter conditions, and produces a trend that tracks with observed fawn and buck ratios. The SCJ,SCA model is unnecessary since the simpler model tracks well with the herd unit. The TSJ,CA model, while it trends well with observed population dynamics, does not match trends reported for earlier years when the population was estimated to be larger, and both license issuance and harvest success were higher. All three models have AICs that are low and well within one magnitude of power of each other. Thus, AIC has little bearing on model selection for this herd. The CJ,CA model is considered to be of good quality in representing population trends and estimates for this herd based on established model criteria.

Management Summary

Traditional season dates in this herd run for two weeks from October 15th through October 31st. The 2015 season follows the same season dates with 150 Type 1 licenses. While buck ratios are in the middle of special management range, distribution of mature bucks across antler classes is still mediocre. Thus, increases in license issuance and are not yet warranted. Managers would prefer to maintain high harvest success and hunter satisfaction, while allowing an additional year for bucks to progress into older age classes. Type 6 licenses were eliminated in 2014, as there are currently no complaints of damage from mule deer. While fawn production in 2014 caused a sudden estimated population increase, fawn survival over the 2014-2015 winter will still need to be above average for this herd unit to grow as the model predicts. Type 6 licenses may be reinstated in future years should the population grow and damage to agriculture in this area become a concern again.

If we attain the projected harvest of 112 mule deer with fawn ratios similar to a 5-year average, this herd will remain stable. The predicted 2015 postseason population size of the North Natrona Mule Deer Herd is approximately 5,300 animals, or 13% above objective.

INPUT	
Species:	Deer
Biologist:	Heather O'Brien
Herd Unit & No.:	MD 759 North Natrona
Model date:	02/20/15

☑ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	29	38	☑ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	25	39	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	4	130	☐ TSJ,CA Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population			Total	Predicted Posthunt Population			Total	Objective
	Field Est	Field SE		Juveniles	Total Males	Females		Juveniles	Total Males	Females		
1993				918	882	2470	4270	901	541	2268	3710	6500
1994				1218	702	2224	4144	1214	473	2122	3809	6500
1995				1446	721	2173	4339	1435	482	2061	3978	6500
1996				1701	783	2175	4659	1701	580	2115	4396	6500
1997				1496	936	2289	4722	1484	663	2238	4385	6500
1998				1273	956	2343	4571	1273	704	2297	4273	6500
1999				1353	938	2342	4634	1349	671	2237	4257	6500
2000				1225	929	2308	4462	1211	545	2226	3981	6500
2001				1444	783	2264	4491	1434	599	2160	4193	6500
2002				1228	886	2262	4376	1226	647	2193	4066	6500
2003				1656	876	2239	4771	1646	677	2192	4515	6500
2004				2014	1008	2343	5365	2011	741	2266	5018	6500
2005				1752	1156	2500	5408	1748	906	2400	5053	6500
2006				1113	1235	2552	4900	1110	948	2461	4520	6500
2007				1593	1113	2447	5153	1585	865	2333	4783	6500
2008				1198	1158	2453	4809	1195	902	2413	4510	6500
2009				1100	1094	2425	4619	1097	821	2391	4309	6500
2010				1289	998	2381	4668	1289	753	2342	4384	6500
2011				1142	986	2386	4514	1140	749	2313	4202	6500
2012				975	945	2324	4243	969	759	2299	4027	6500
2013				1236	911	2269	4415	1234	714	2256	4204	6500
2014				2214	938	2297	5448	2214	820	2297	5330	4700
2015				1546	1276	2577	5400	1546	1153	2577	5277	4700
2016												4700
2017												4700
2018												4700
2019												4700
2020												4700
2021												4700
2022												4700
2023												4700
2024												4700
2025												4700

Survival and Initial Population Estimates

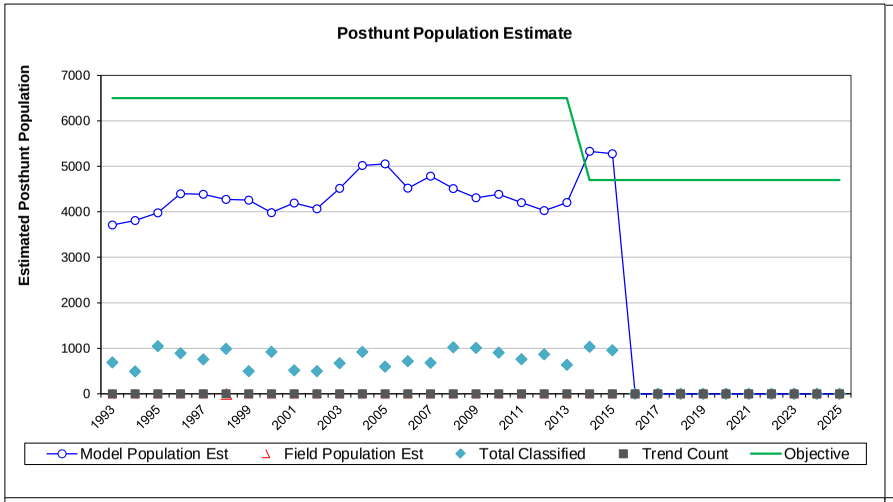
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.50			0.88		
1994	0.50			0.88		
1995	0.50			0.88		
1996	0.50			0.88		
1997	0.50			0.88		
1998	0.50			0.88		
1999	0.50			0.88		
2000	0.50			0.88		
2001	0.50			0.88		
2002	0.50			0.88		
2003	0.50			0.88		
2004	0.50			0.88		
2005	0.50			0.88		
2006	0.50			0.88		
2007	0.50			0.88		
2008	0.50			0.88		
2009	0.50			0.88		
2010	0.50			0.88		
2011	0.50			0.88		
2012	0.50			0.88		
2013	0.50			0.88		
2014	0.50			0.88		
2015	0.50			0.88		
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

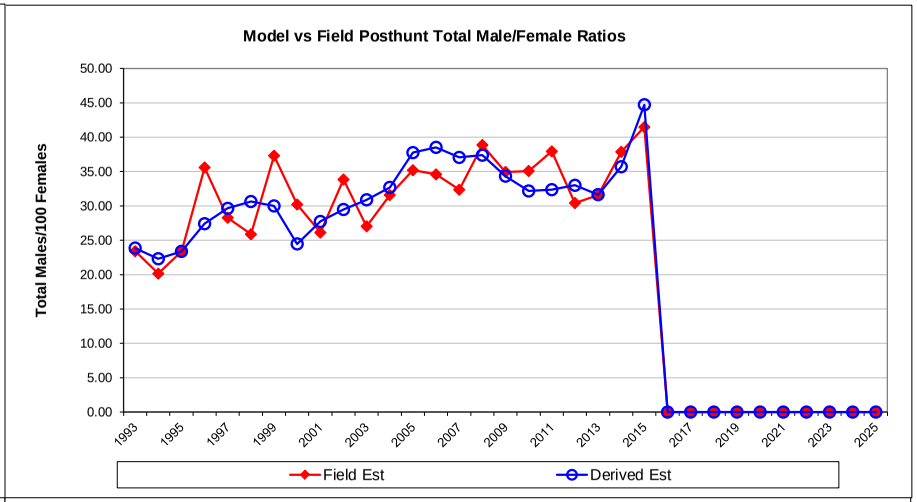
Parameters:	Optim cells
Juvenile Survival =	0.500
Adult Survival =	0.881
Initial Total Male Pop/10,000 =	0.054
Initial Female Pop/10,000 =	0.227

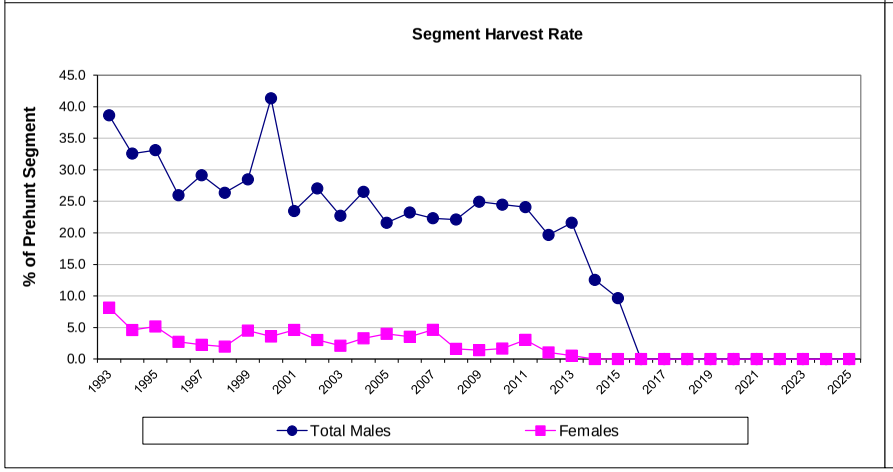
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%

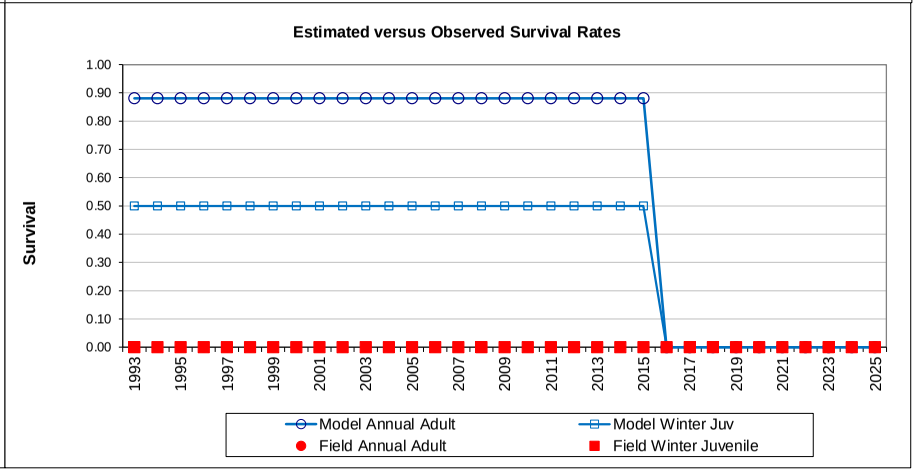
Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio			Harvest				Harvest: Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/o bull adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		39.72	3.62	23.86	23.40	2.61	16	310	183	509	38.6	8.2
1994		57.19	5.69	22.31	20.14	2.95	4	208	93	305	32.6	4.6
1995		69.61	4.66	23.38	23.39	2.31	10	217	102	329	33.1	5.2
1996		80.39	5.93	27.41	35.59	3.42	0	185	54	239	26.0	2.7
1997		66.32	5.33	29.64	28.28	3.05	11	248	47	306	29.1	2.3
1998		55.41	3.98	30.64	25.87	2.44	0	229	42	271	26.4	2.0
1999		60.32	6.19	30.00	37.30	4.51	4	243	96	343	28.5	4.5
2000		54.40	4.10	24.47	30.20	2.80	13	349	75	437	41.3	3.6
2001		66.42	6.42	27.73	26.12	3.51	9	167	95	271	23.5	4.6
2002		55.89	5.76	29.48	33.84	4.15	2	218	62	282	27.1	3.0
2003		75.08	6.28	30.89	27.03	3.21	9	181	43	233	22.7	2.1
2004		88.76	6.33	32.69	31.58	3.15	2	243	70	315	26.5	3.3
2005		72.82	6.62	37.75	35.19	4.07	4	227	91	322	21.6	4.0
2006		45.11	4.05	38.52	34.59	3.42	2	261	82	345	23.2	3.5
2007		67.94	5.79	37.05	32.35	3.55	7	226	103	336	22.3	4.6
2008		49.54	3.69	37.38	38.86	3.15	2	233	36	271	22.1	1.6
2009		45.88	3.46	34.33	34.95	2.91	3	248	31	282	24.9	1.4
2010		55.04	4.23	32.17	35.08	3.16	0	222	36	258	24.5	1.7
2011		49.26	4.26	32.36	37.93	3.59	2	216	66	284	24.1	3.0
2012		42.15	3.45	33.00	30.42	2.81	5	169	22	196	19.7	1.0
2013		54.68	4.97	31.64	31.58	3.49	2	179	11	192	21.6	0.5
2014		96.37	6.55	35.70	37.87	3.44	0	107	0	107	12.6	0.0
2015		60.00	4.50	44.72	41.47	3.51	0	112	0	112	9.7	0.0
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES



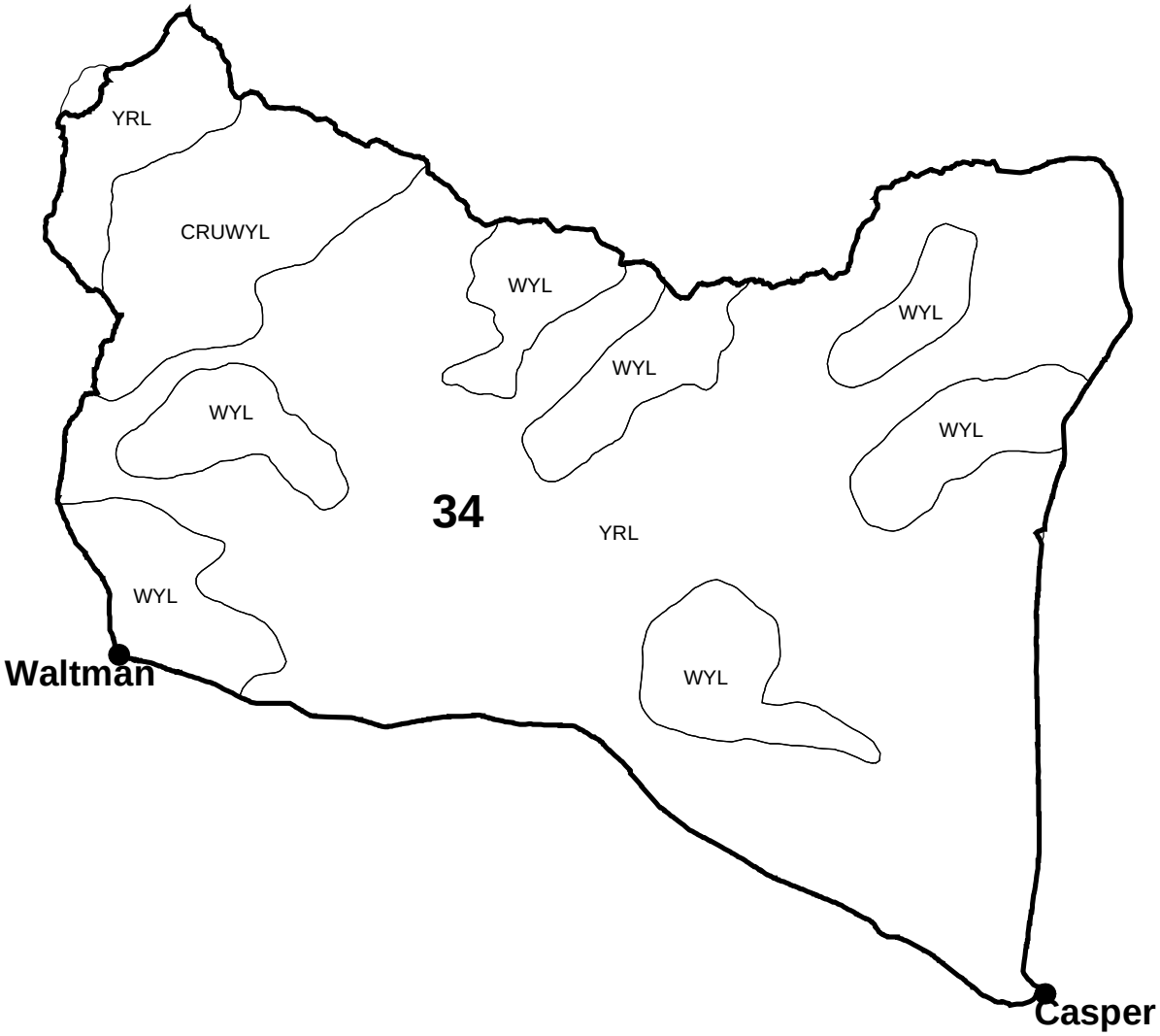






Comments:

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



2014 - JCR Evaluation Form

SPECIES: White tailed Deer
PERIOD: 6/1/2014 - 5/31/2015

HERD: WD706 - BLACK HILLS

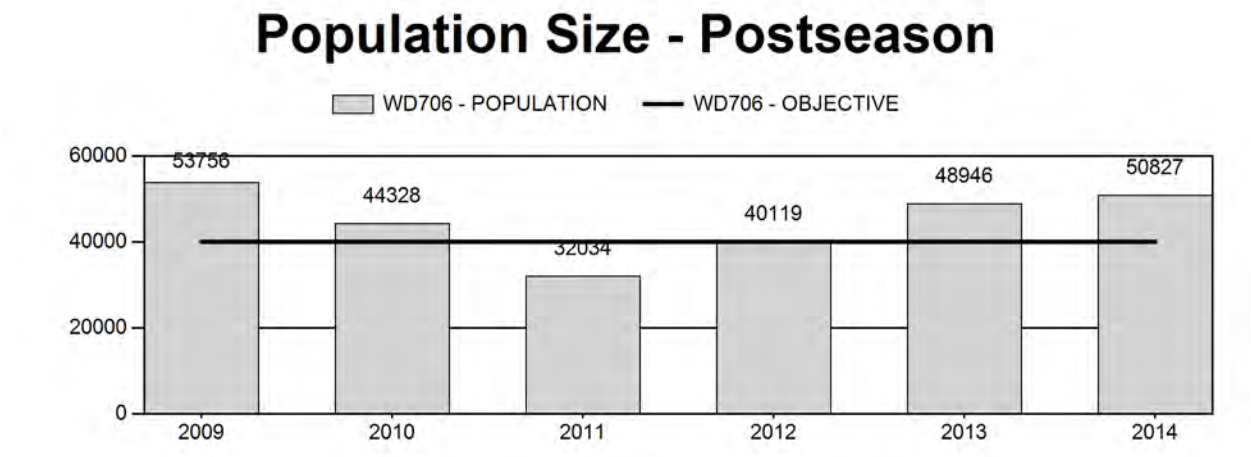
HUNT AREAS: 1-6
PREPARED BY: JOE SANDRINI

	2009 - 2013 Average	2014	2015 Proposed
Population:	43,837	50,827	55,128
Harvest:	4,181	4,143	5,885
Hunters:	7,418	6,616	8,640
Hunter Success:	56%	63%	68 %
Active Licenses:	7,816	7,030	9,700
Active License Success:	53%	59%	61 %
Recreation Days:	31,224	30,305	40,000
Days Per Animal:	7.5	7.3	6.8
Males per 100 Females	26	32	
Juveniles per 100 Females	67	79	

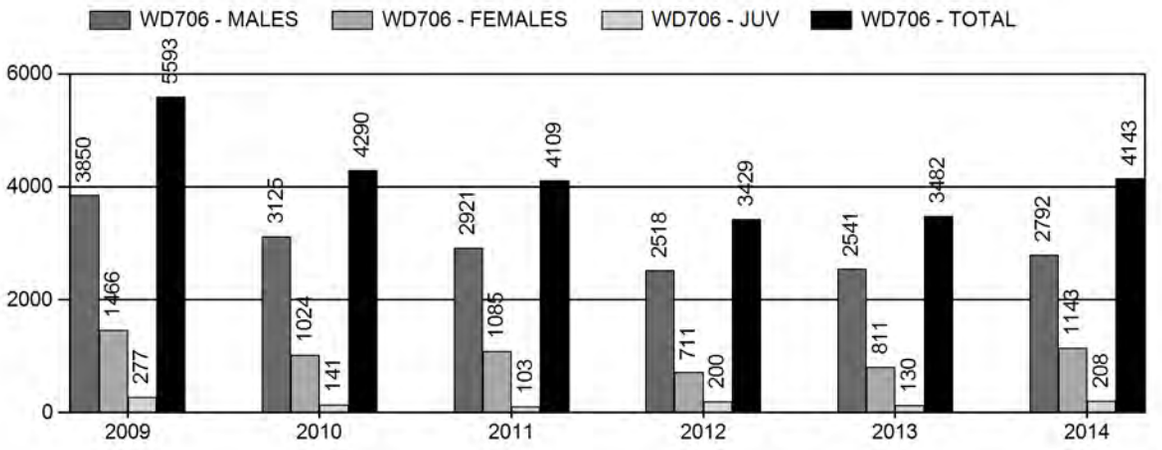
Population Objective (± 20%) :	40000 (32000 - 48000)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	27%
Number of years population has been + or - objective in recent trend:	2
Model Date:	02/18/2014

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

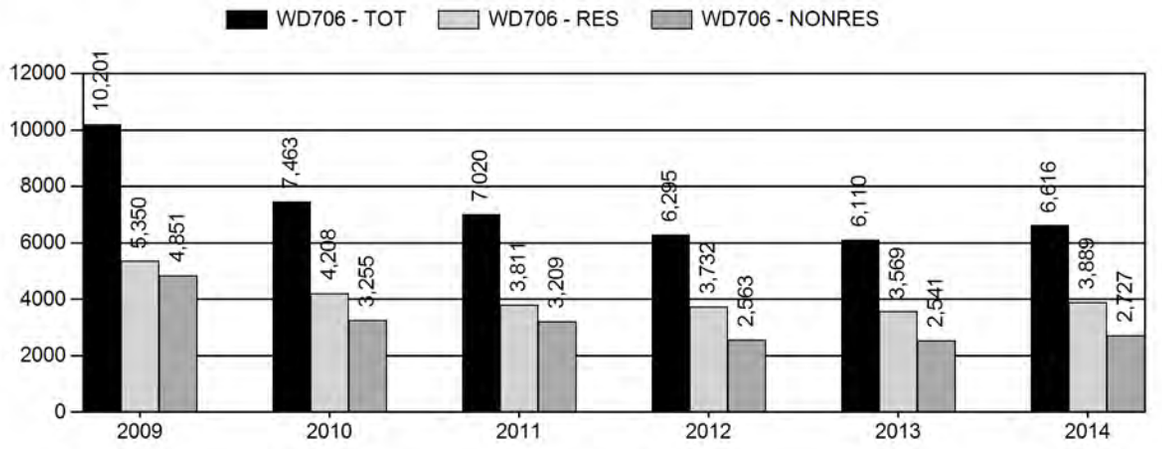
	JCR Year	Proposed
Females ≥ 1 year old:	3.9%	29.6%
Males ≥ 1 year old:	31.5%	5.0%
Juveniles (< 1 year old):	0.9%	1.1%
Total:	8.2%	10.5%
Proposed change in post-season population:	+ 18.7%	+8.5%



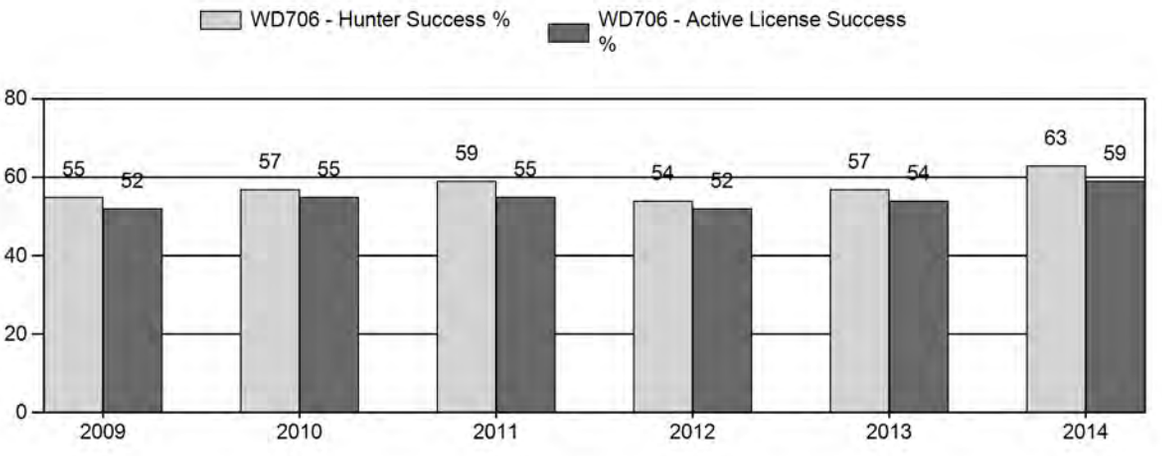
Harvest



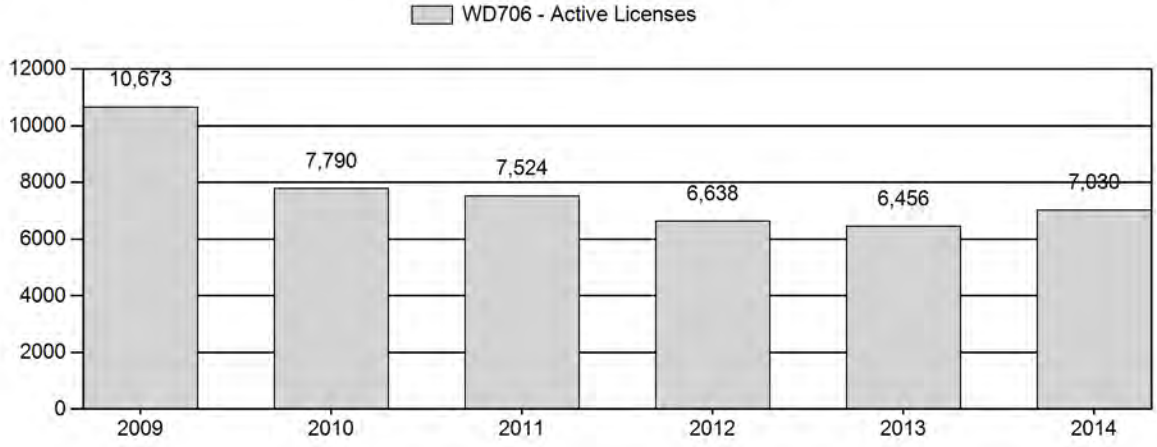
Number of Hunters



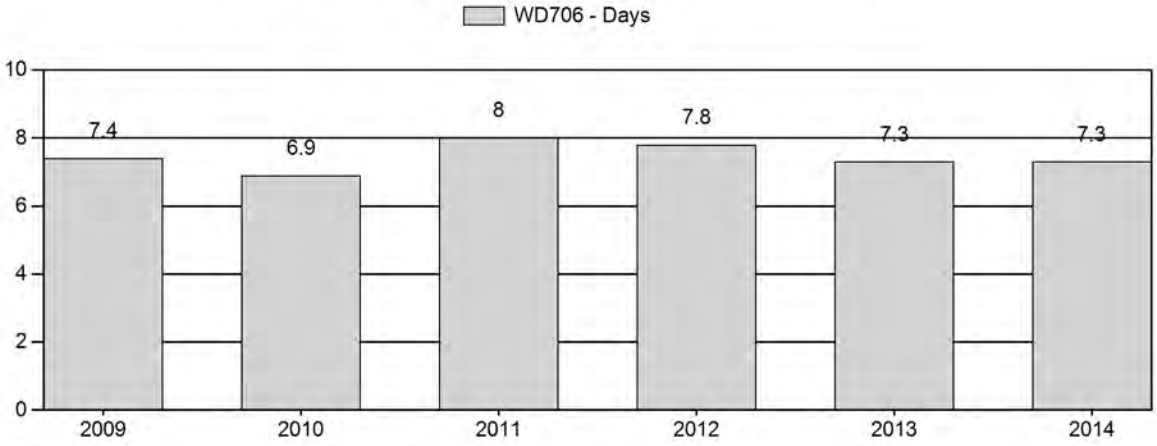
Harvest Success



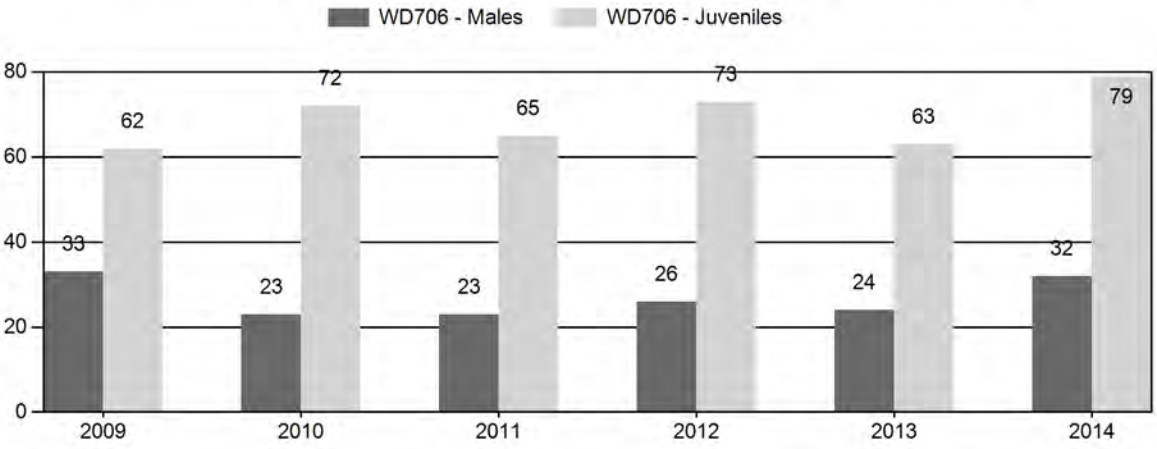
Active Licenses



Days Per Animal Harvested



Preseason Animals per 100 Females



2009 - 2014 Preseason Classification Summary

for 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	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	59,908	131	224	355	17%	1,079	51%	672	32%	2,106	1,260	12	21	33	± 0	62	± 0	47
2010	49,047	93	232	325	12%	1,407	51%	1,016	37%	2,748	1,536	7	16	23	± 0	72	± 0	59
2011	36,554	48	149	197	12%	856	53%	559	35%	1,612	1,278	6	17	23	± 0	65	± 0	53
2012	43,891	93	143	236	13%	919	50%	675	37%	1,830	1,590	10	16	26	± 0	73	± 0	58
2013	52,709	163	153	316	13%	1,303	53%	827	34%	2,446	1,232	13	12	24	± 0	63	± 0	51
2014	55,385	111	198	309	15%	980	47%	778	38%	2,067	1,894	11	20	32	± 0	79	± 0	60

2015 HUNTING SEASONS
BLACK HILLS WHITE-TAILED DEER HERD (WD706)

Hunt Area	Type	Dates of Seasons Opens	Closes	Quota	License	Limitations
1		Nov. 1	Nov. 30		General	Antlered white-tailed deer off private land; any white-tailed deer on private land
1, 2, 3	8	Nov. 1	Nov. 30	2000		Doe or fawn white-tailed deer valid on private land
2		Nov. 1	Nov. 30		General	Antlered deer off private land; any deer on private land
2	6	Nov. 1	Nov. 30	250	Limited quota	Doe or fawn valid on private land
3		Nov. 1	Nov. 30		General	Antlered deer off private land; any deer on private land
4		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land, except the lands of the State of Wyoming's Ranch A property shall be closed
4	6	Nov. 1	Nov. 20	200	Limited quota	Doe or fawn valid on private land
5		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land
5	6	Nov. 1	Nov. 20	50	Limited quota	Doe or fawn
6		Nov. 1	Nov. 20		General	Antlered deer off private land; any deer on private land
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Region A Nonresident Quota: 3,500

SUMMARY OF CHANGES IN LICENSE NUMBER[1]

Hunt Area	License Type	Quota change from 2014
1,2,3	8	+800
2	6	See MD751
Herd Unit Totals	**8**	**+800**
	Region A	**See MD751**

[1] Type 6 and Region A quota changes for Hunt Areas 1-6 are captured in the MD751 JCR

Management Evaluation
Current Management Objective: 40,000
Management Strategy: Recreational
2014 Postseason Population Estimate: ~ 50,800
2015 Proposed Postseason Population Estimate: ~ 55,100
2014 Hunter Satisfaction: 75% Satisfied, 16% Neutral, 9% Dissatisfied

HERD UNIT ISSUES: The management objective of the Black Hills White-Tailed Deer Herd Unit was set in 1983 for an estimated post-season population of 40,000 white-tailed deer. The herd is managed under the recreational management strategy. It is apparent the current objective is not commensurate with newer population estimates relative to landowner and hunter desires. Thus, the management objective and strategy are currently under review, and a proposed new objective of 55,000 will be taken out for public comment during the spring of 2015.

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

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

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

Whitetails are the most numerous deer species in HA's 2 and 4, whereas more equal proportions or greater numbers of mule deer occupy HA's 1, 3, 5, and 6 depending upon habitat type. A high proportion of white-tailed deer in the herd unit reside on private land. This results in their management being strongly influenced by landowner sentiments. Field personnel report white-tailed deer numbers are now growing close to local tolerance. A survey of about 450 Black Hills landowners at the end of 2014 revealed about half of the respondents (52%) having whitetails on their property believed their numbers to be "about right;" while just over a third (35%) reported their numbers to be "too low;" and only 13% felt whitetail numbers were "too high." Over the past four years, many landowners and the hunting public have expressed the desire to see more deer, and now those longings are beginning to be addressed as this population has begun to rebound.

WEATHER: Drought conditions, which were generally persistent throughout the Black Hills between 2000 and 2006, began to moderate some in 2007. Between 2007 and 2011, annual temperatures were generally near or below the previous 30-year average and annual precipitation each year was at or above average (http://www.ncdc.noaa.gov/cag/time-series/us). Notably, 2010 was colder and wetter than both the 30-year and 100-year averages; and the winter of 2010-11 was severe. Since the late 1890's, only five other winters were as cold and snowy.

Drought returned to the Black Hills in 2012, with above normal summer temperatures and little rainfall during the growing season. Forage production that year was very poor, and the dry conditions led to several large wildfires in the southern half of the herd unit. The warm and dry conditions that beset the area in April of 2012 continued through the 2012-13 winter (http://www.ncdc.noaa.gov/cag/time-series/us). April of 2013 finally saw a break in this pattern when temperatures dropped well below normal for the entire month and good precipitation was again received. Through the remainder of the growing season, temperatures were slightly above average and precipitation well above normal. This resulted in excellent forage growth. In early October, 2013 winter storm Atlas blanketed the Black Hills with anywhere from about a foot of wet heavy snow near Newcastle, to three feet on the Bearlodge, and over five feet near Cement Ridge. No large scale die-offs of white-tailed deer were witnessed from this storm, but some white-tailed deer mortalities on the National Forest south of I-90 were discovered. This storm also displaced a large number of white-tailed deer from higher elevations on the BHNF to lower elevation private lands. The remainder of the fall and the 2013-14 winter brought very close to average temperatures and snowfall, which resulted in continuous snow cover over much of the Black Hills until late May, and elevated spring run-off. Spring weather was similar to the previous year with temperatures just below normal and about 20% more precipitation than average. This was followed by a summer with close to average temperatures and precipitation about 25% above normal, resulting in a second year in a row of excellent forage production and ultimately improved fawn production. To date, the 2014-15 winter has been mild with below normal snowfall in most locations.

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

annual recruitment of fawns in to the adult population. However, with favorable conditions the past two years, productivity and survival have increased.

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

FIELD DATA: Preseason age and sex classifications are conducted in this herd unit during the second half of October each year along standardized routes. Most of these routes have been used for over 40 years. In 2013, classifications were not conducted along the routes due to difficult travel conditions created by winter storm Atlas. Instead, ground based classifications were conducted in areas where personnel could meet required sample sizes. Standard route classifications were resumed in 2014.

During the past three decades, fawn production and survival (based upon preseason classification counts) has been well below that observed in most white-tailed deer herds, and at times fluctuated dramatically. The underlying cause is thought to be related to nutritional condition of does (pers. Comm. SDGF&P). However, over the last 10-years observed fawn:doe ratios have trended towards improvement, likely a result of vegetative responses to fire enhancing forage conditions. Further, observed fawn:doe ratios during this timeframe did not fluctuate as drastically as during the previous decade and a half. On the other hand, observed preseason buck:doe ratios over the past ten years have been generally stable ($mean_{(04\text{-}14)}$ = 27:100; SD = 4.0), but have shown a slight, overall decline. Stability in the buck:doe ratio the past few years is thought to be the result of substantial reductions in buck hunting pressure while this population declined and non-hunting mortality increased. For example, 2010-11 over-winter mortality was significant given weather conditions and the 2011 observed yearling buck:doe ratio of 6:100. Overall, this herd's observed, preseason buck:doe ratios are at the lower end of the Department's recreational management criteria. It should be noted, however, that classifications are made outside the rut, and because whitetails are secretive, we have always modeled this herd's preseason buck:doe ratio about 30% above observed values. This corrective factor was determined from historical modeling efforts with POP-II and the inflation in buck:doe ratios needed to get those models to run given harvest levels of bucks. Additionally, there have been occasional years when observed buck ratios inexplicably jumped about the same amount (something attributed to intermittently enhanced sightability).

HARVEST DATA: In the Black Hills, deer management entails regulating both mule deer and whitetail harvest under a single, General License season structure, across a variety of habitats and habitat conditions, and with serious deference given to landowner desires. Historical analysis of harvest information suggests hunter number has the greatest impact on buck harvest.

Therefore, buck harvest has been regulated by altering non-resident hunter participation via changes in the Region A quota, while resident buck hunter participation can only be limited by shortening the season – notably by inclusion or removal of the Thanksgiving Day weekend and the days following in November (due to the large influx of hunters during this period when buck deer are highly vulnerable to harvest). With more conservative hunting season structures in place between 2010 and 2013, harvest of both antlered and antlerless whitetails dropped. In 2014, as this herd began to recover, doe/fawn license issuance was increased and buck harvest climbed some even though General License seasons and Region A license issuance remained limited. As a result, the total harvest in 2014 was about 8% above that of 2013. Between 2009 and 2013, harvest success was fairly consistent before increasing in 2014, while hunter effort climbed significantly between 2010 and 2011 when it peaked before declining. Overall, harvest statistics generally support population model assertions that this population peaked in 2006, declined substantially into 2011, and is now beginning to rebound. However, there is some disparity relative to bio-year 2010, as the model indicates that year to be the population nadir, while harvest statistics and field observations suggest bio-year 2011 was when the population hit its low point.

Hunting seasons between 2010 and 2014 reduced harvest of whitetail bucks on average about 30% from that experienced during the traditional November season the preceding four years. Comparing these time periods, resident harvest of white-tailed bucks dropped about 20%, while non-resident harvest of white-tailed bucks dropped closer to 40%. During this same time, harvest of mule deer bucks declined more precipitously (see MD751). Despite these trends, preseason whitetail buck:doe ratios held fairly stable and deer hunter satisfaction essentially remained unchanged between 2011 and 2013, with about 68% of hunters of both deer species reporting they were either satisfied or very satisfied with their Black Hills deer hunt, and only around 15% indicating they were either dissatisfied or very dissatisfied – regardless of species. Notably, satisfaction measures improved in 2014 with 75% of both mule deer and white-tailed deer hunters reporting they were satisfied with their Black Hills deer hunt, and only 10% reporting negative satisfaction – again regardless of species. It can be inferred from the inherent correlation between harvest success and hunter satisfaction that the increases in deer hunter success rates in the Black Hills during 2013 and 2014 influenced increases in hunter satisfaction both years.

POPULATION: As noted above, population modeling of this herd has always been difficult and fraught with problems. In 2014, the spreadsheet model for this herd was reconstructed and re-initiated after correcting errors detected in the previous model and experimenting with models of various construction. The present model was set to solve only on years for which field data were available (1993-2014), but used to project 2015 populations.

Of the final three competing spreadsheet models, the Semi-Constant Juvenile / Semi-Constant Adult survival (SCJ SCA) model was selected to estimate the population. While the Constant Juvenile / Constant Adult survival (CJ CA) model will function with this herd's observed data set, it produces an essentially stable population of about 83,000 deer since 1993, which does not dovetail with field observations or harvest statistics. The AICc of this model is about double that of the competing models and it most poorly fits observed data. On the other hand, the Time Sensitive Juvenile / Constant Adult survival model (TSJ CA) yielded the lowest AICc value and best fit. However, this model was rejected because in order to get it to function, juvenile survival rates had to be allowed to vary down to 0.25, a value the model constrained itself to in 5 out of

22 years. Additionally, this model was not correlated well with trend data or harvest statistics. Alternatively, the SCJ SCA model is 75% correlated with preseason trend counts (Figure 1), and the trends it produces are generally congruent with field personnel and landowner observations. However, it does indicate a substantial decline in the population in 2009 that was not actually realized until after the 2010/11 winter. Further, changes in the preseason population estimates produced by the SCJ SCA model are not correlated with changes in hunter effort, while the TSJ CA model exhibits a slight inverse correlation. With regards to changes in hunter success, the SCJ SCA model is best correlated (67%) while the TSJ CA model is more poorly correlated (37%) with these estimates. Finally, the SCJ SCA model estimates 29% to 59% (mean = 38%) of the bucks have been harvested from the preseason population each year since 1993, while the TSJ CA model exhibits about half as much variation in the estimated percentage of bucks harvested annually, and estimates a mean buck harvest percentage value of 28% (something more tenable). Therefore, due to the variety of factors identified, we consider the chosen model to be of poor quality, but better than the competing models.

According to the current spreadsheet model, this population grew 154% between 2001 and 2007. The population then declined 50% to its nadir in 2010 (22% below current objective), before rebounding nearly 62% through 2014. This projected peak, subsequent decline, and rebound in the population reflects overall field observations. However, as previously noted, by all accounts this population dropped steadily from 2007 through 2010, before dipping significantly in 2011 – a trend shown one year antecedent in the model's projections. If population estimates produced by the spreadsheet model are close to accurate, then our current objective is well below landowner and hunter desires. This is evident as about one-third of landowners and many hunters have noted white-tailed deer numbers are presently below what they would like to see.

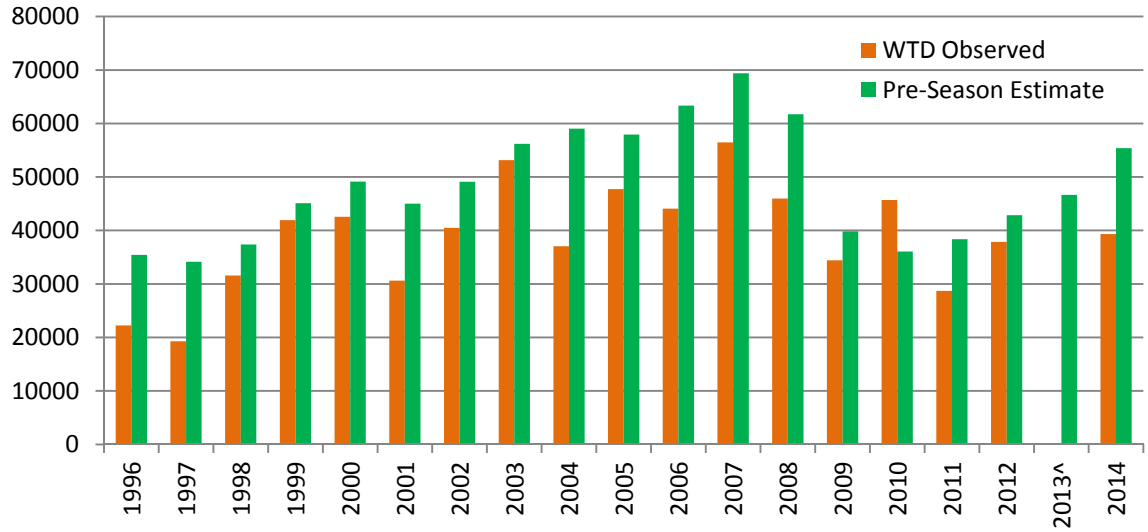


Figure 1. 1996-2014 white-tailed deer, estimated preseason population and trend count data, increased by a factor of 10. *^ trend count not completed 2013.*

Beginning in 2002, hunting seasons in this herd unit were structured to retard growth, something with which we were only mildly successful. Population growth was reversed in 2007, but this directional change was due primarily to increased non-hunting mortality rather than enhanced harvest. Reductions in survival rates being most ostensibly attributed to increased over-winter

mortality caused by late spring blizzards in 2008 & 2009 and an unusually severe winter in bio-year 2010, along with EHDV outbreaks between 2008 and 2013 - all of which acted to increase annual mortality in all sex and age classes of deer. Between 2007 and 2010, evidence also suggests the mountain lion population in the Black Hills reached historically high levels. As a result, elevated harvest, weather conditions, disease and increased predation acted in concert to reduce this population substantially. In response, hunting seasons have been conservative since 2010, allowing this herd to increase the past three years. This trend in season structure has been reversed for 2015 in order to begin to temper herd growth once again.

MANAGEMENT SUMMARY: Changes to the 2015 white-tailed deer hunting season in the Black Hills were designed to allow more liberal harvest of bucks and increased take of antlerless white-tailed deer. Changes included moving the closing date back to the traditional November 30th closing date (from November 21st) in Hunt Areas 1, 2, and 3 while retaining the traditional November 20th closing date in HA's 4, 5, & 6. Although, mule deer hunting will be closed on November 20th in hunt area 1 (see MD751). Whitetail buck numbers are improving, and based upon classification data and population estimates there should be a good cohort of 1, 2 and even some 3 year-old bucks available for hunters in 2015, but reduced numbers of 4 & 5 year-old bucks. As such, it seems prudent to liberalize buck harvest, something that also attracts more hunters into the area, many of whom also harvest does. White-tailed doe harvest needs to be encouraged now as we must begin to slow the growth of this population. It is projected the 27% increase in Region A license issuance and 30-day season north of Interstate Highway 90 will increase buck harvest about 30% above the levels witnessed with more conservative hunting season structures the past several years. Even with this increase in buck harvest, the preseason buck:doe ratio should at minimum remain stable, if not increase some.

In order to help limit herd growth and allow landowners to be proactive in curbing increases in whitetail numbers, issuance of Type 8 doe/fawn white-tailed deer licenses valid on private land in HA's 1, 2, & 3 has been increased 67% for 2015 - this following a 50% increase in 2014. Issuance of Type 6 doe/fawn licenses in HA 2, which are valid for both mule deer and white-tailed deer on private lands, have also been increased from 50 to 250, while similar license types in HA 4 and HA 5 have been increased from 150 to 200 and 25 to 50, respectively. The ten Type 6 licenses valid and HA 6 & 9 issued in 2014 have been eliminated.

The 2015 hunting season is expected to yield an estimated 2015 postseason population of about 55,120 white-tailed deer, which represents an 8% increase in the current post-season population. These projections assume over-winter survival will be good and summer losses to EHDV minimal. Provided the change in population is reached, this herd would be 38% above objective, but hopefully get us close to a number of deer most hunters and landowners would like to see, and near the value of a revised objective.

INPUT	
Species:	White-Tail Deer
Biologist:	Sandrini
Herd Unit & No.:	Black Hills 706
Model date:	02/18/15

☑ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	389	398	☐ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Adult Survival**	146	203	☑ SCJ,SCA	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	50	172	☐ TSJ,CA Model	

Population Estimates from Top Model

Year	Pre-Rifle Pop Pop Est		Trend Count	Pre-Archery Season Population (year i)			Total	Pre-Rifle Season Population (year i)			Total	Predicted Posthunt Population (year *i*)			Total	Objective
	Field Est	Field SE		Juveniles	Total Males	Females		Juveniles	Total Males	Females		Juveniles	Total Males	Females		
1993				11831	6802	**18302**	**36935**	11831	6802	18302	**36935**	11116	3071	14721	**28907**	40000
1994				10805	6264	**16764**	**33833**	10805	6264	16764	**33833**	10710	3213	16212	**30135**	40000
1995				9640	6403	**18352**	**34395**	9640	6403	18352	**34395**	9561	3739	17721	**31020**	40000
1996			2225	9647	6506	**19293**	**35447**	9647	6506	19293	**35447**	9605	4180	18934	**32719**	40000
1997			1930	6748	6958	**20433**	**34140**	6748	6958	20433	**34140**	6724	4384	19955	**31063**	40000
1998			3158	10993	6090	**20313**	**37396**	10993	6090	20313	**37396**	10951	3791	19956	**34698**	40000
1999			4194	14137	8108	**22851**	**45096**	14137	8108	22851	**45096**	14103	6522	22621	**43246**	40000
2000			4256	13018	10750	**25375**	**49142**	13018	10750	25375	**49142**	12951	7064	24746	**44760**	40000
2001			3061	7556	10624	**26844**	**45024**	7556	10624	26844	**45024**	7443	7274	25962	**40678**	40000
2002			4050	14334	8857	**25923**	**49114**	14334	8857	25923	**49114**	14261	5437	25428	**45126**	40000
2003			5314	18624	9641	**27925**	**56190**	18624	9641	27925	**56190**	18392	5559	26928	**50878**	40000
2004			3705	17222	11139	**30680**	**59041**	17222	11139	30680	**59041**	17067	7252	29644	**53963**	40000
2005			4773	17143	11873	**28929**	**57944**	17143	11873	28929	**57944**	16949	7705	27513	**52167**	40000
2006			4408	20140	12551	**30654**	**63345**	20140	12551	30654	**63345**	19890	8227	28913	**57030**	40000
2007			5647	22420	14050	**32925**	**69395**	22420	14050	32925	**69395**	22225	9560	30872	**62657**	40000
2008			4597	19454	11420	**30846**	**61720**	19454	11420	30846	**61720**	19245	6939	28496	**54680**	40000
2009			3441	11878	8897	**19072**	**39847**	11878	8897	19072	**39847**	11573	4662	17459	**33695**	40000
2010			4571	12694	5800	**17580**	**36074**	12694	5800	17580	**36074**	12539	2362	16453	**31355**	40000
2011			2870	12621	6414	**19327**	**38363**	12621	6414	19327	**38363**	12508	3201	18134	**33843**	40000
2012			3785	15173	7017	**20658**	**42849**	15173	7017	20658	**42849**	14953	4247	19876	**39077**	40000
2013				14678	8862	**23127**	**46667**	14678	8862	23127	**46667**	14535	6067	22235	**42837**	40000
2014			3932	19926	10359	**25100**	**55385**	19926	10359	25100	**55385**	19697	7287	23843	**50827**	40000
2015				19994	13263	**28344**	**61601**	19994	13263	28344	**61601**	19620	9254	26254	**55128**	40000
2016																40000
2017																40000
2018																40000
2019																40000
2020																40000
2021																40000
2022																40000
2023																40000
2024																40000
2025																40000

Survival and Initial Population Estimates

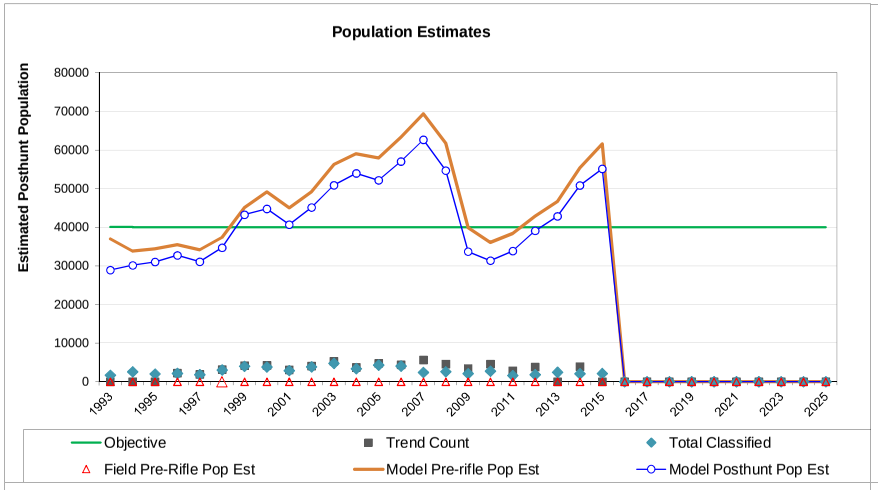
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.72			0.90		
1994	0.72			0.90		
1995	0.72			0.90		
1996	0.72			0.90		
1997	0.72			0.90		
1998	0.90			0.90		
1999	0.72			0.90		
2000	0.72			0.90		
2001	0.72			0.90		
2002	0.72			0.90		
2003	0.72			0.90		
2004	0.90			0.73		
2005	0.72			0.90		
2006	0.72			0.90		
2007	0.30			0.90		
2008	0.90			0.41		
2009	0.37			0.90		
2010	0.74			0.90		
2011	0.72			0.90		
2012	0.72			0.90		
2013	0.72			0.90		
2014	0.72			0.90		
2015	0.72			0.90		
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

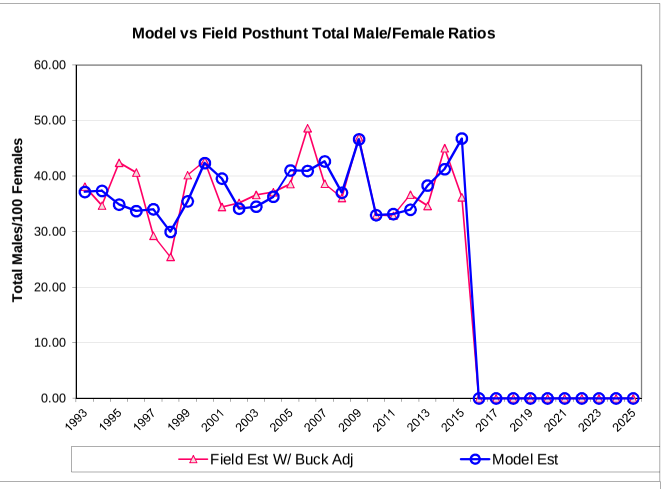
Parameters:	Optim cells
Juvenile Survival =	0.715
Adult Survival =	0.900
Initial Total Male Pop/10,000 =	0.680
Initial Female Pop/10,000 =	1.830

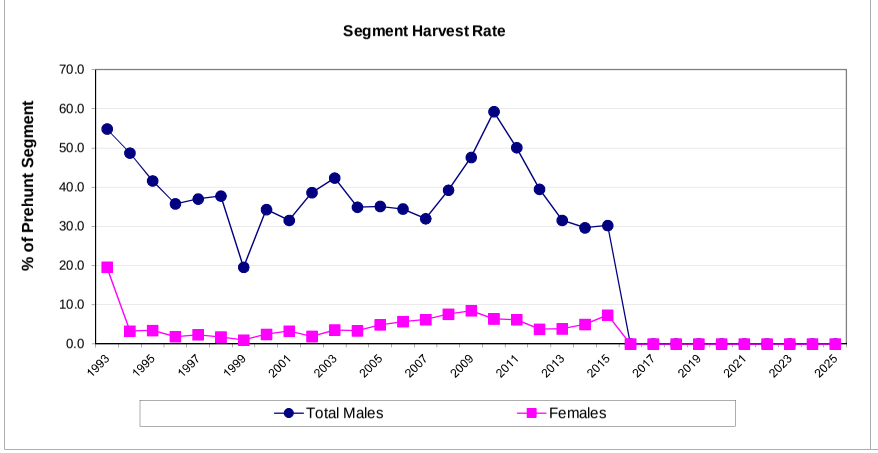
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Buck Adjustment Factor	70%

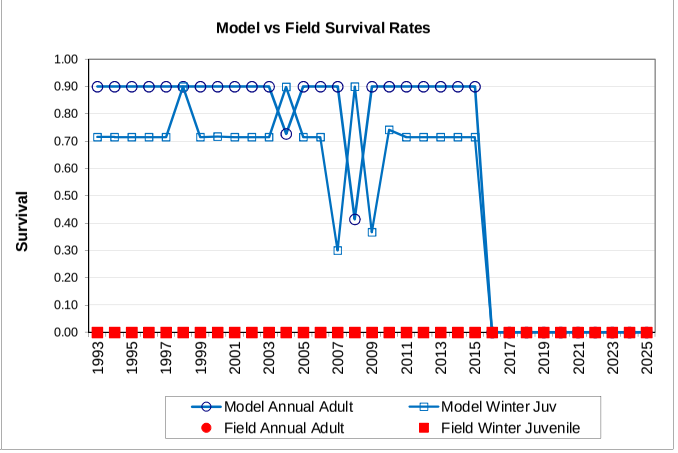
Classification Counts							Total Harvest (Rifle+Archery)					
Year	Juvenile/Female Ratio			Total Male/Female Ratio							Segment Harvest Rate (% of	
	Derived Est	Field Est	Field SE	Derived Est	Field est w/ buck Adj	Field SE	Juv	Males	Females	Total Harvest	Total Males	Females
1993		64.64	3.46	37.17	38.13	1.95	650	3392	3256	7298	54.9	19.6
1994		64.45	2.78	37.37	34.72	1.49	86	2774	502	3362	48.7	3.3
1995		52.53	2.69	34.89	42.42	1.86	72	2422	574	3068	41.6	3.4
1996		50.00	2.49	33.72	40.68	1.74	38	2115	327	2480	35.8	1.9
1997		33.03	1.92	34.05	29.29	1.44	22	2340	435	2797	37.0	2.3
1998		54.12	2.17	29.98	25.48	1.09	38	2090	324	2452	37.8	1.8
1999		61.87	2.18	35.48	40.20	1.31	31	1442	209	1682	19.6	1.0
2000		51.30	1.92	42.36	42.73	1.36	61	3351	572	3984	34.3	2.5
2001		28.15	1.38	39.58	34.47	1.26	103	3046	802	3951	31.5	3.3
2002		55.30	2.00	34.17	35.20	1.20	67	3109	450	3626	38.6	1.9
2003		66.69	2.12	34.52	36.65	1.14	211	3711	907	4829	42.3	3.6
2004		56.14	2.17	36.31	37.14	1.33	141	3534	941	4616	34.9	3.4
2005		59.26	2.02	41.04	38.60	1.22	176	3789	1287	5252	35.1	4.9
2006		65.70	2.31	40.95	48.65	1.50	227	3931	1583	5741	34.5	5.7
2007		68.09	3.04	42.67	38.66	1.67	177	4082	1866	6125	32.0	6.2
2008		63.07	2.73	37.02	36.10	1.51	190	4074	2136	6400	39.2	7.6
2009		62.28	3.06	46.65	47.00	2.01	277	3850	1466	5593	47.6	8.5
2010		72.21	2.97	32.99	33.00	1.42	141	3125	1024	4290	59.3	6.4
2011		65.30	3.55	33.19	32.88	1.82	103	2921	1085	4109	50.1	6.2
2012		73.45	3.72	33.97	36.69	1.87	200	2518	711	3429	39.5	3.8
2013		63.47	2.82	38.32	34.65	1.52	130	2541	811	3482	31.5	3.9
2014		79.39	3.81	41.27	45.04	2.06	208	2792	1143	4143	29.6	5.0
2015		70.54	3.32	46.79	36.20	1.70	340	3645	1900	5885	30.2	7.4
2016												
2017												
2018												
2019												
2020												
2021												
2022												
2023												
2024												
2025												

FIGURES









Comments:

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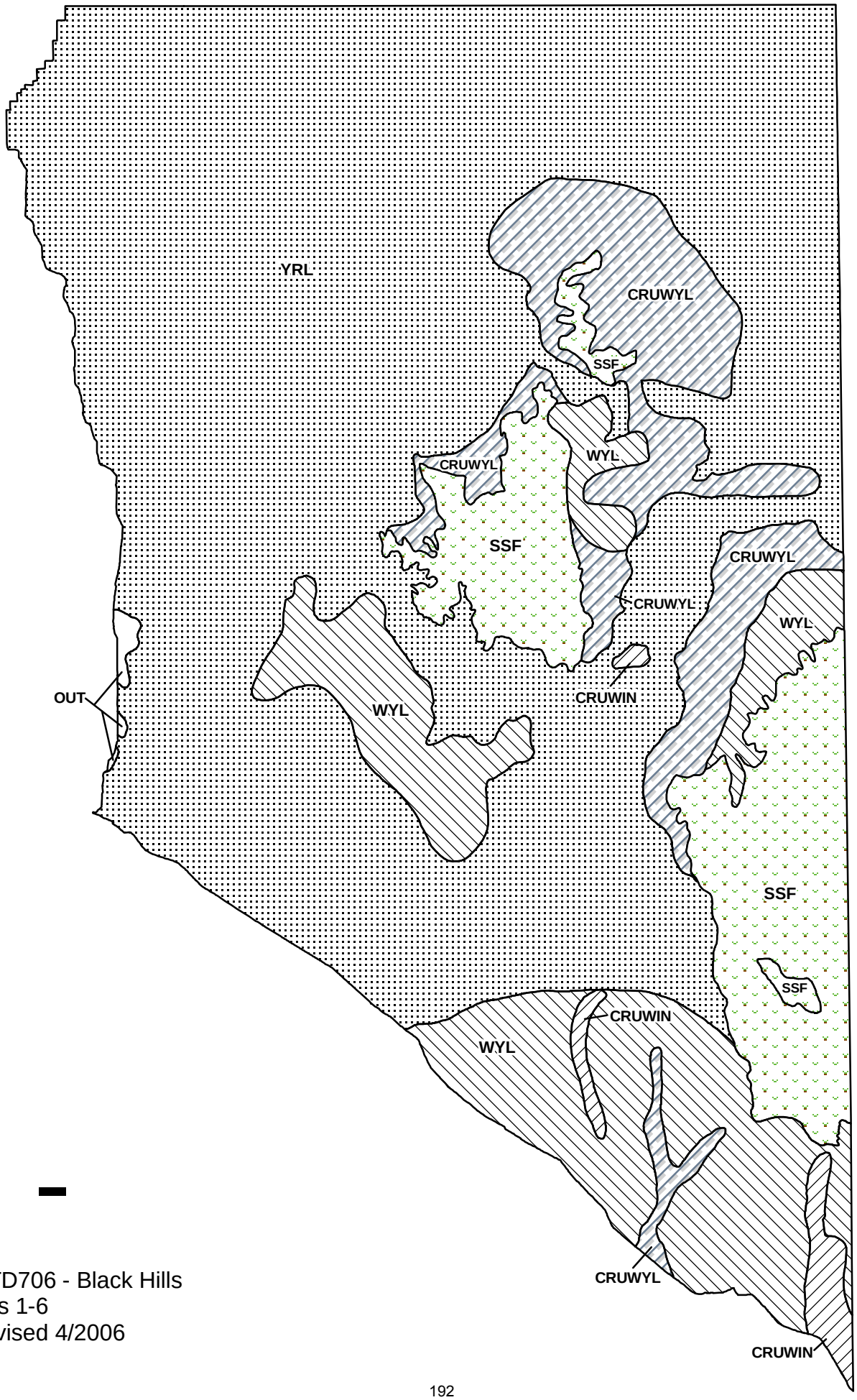


WTD706 - Black Hills
HAs 1-6
Revised 4/2006

2014 - JCR Evaluation Form

SPECIES: White tailed Deer
PERIOD: 6/1/2014 - 5/31/2015

HERD: WD707 - CENTRAL

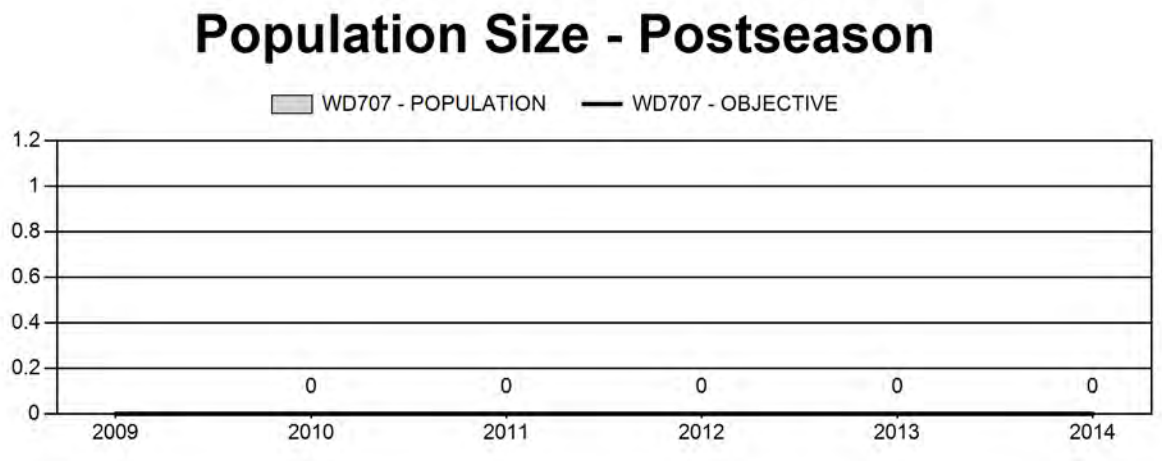
HUNT AREAS: 7-14, 21-22, 34, 65-67, 88-89
PREPARED BY: WILLOW HIBBS

	2009 - 2013 Average	2014	2015 Proposed
Population:	0	N/A	N/A
Harvest:	1,377	783	425
Hunters:	2,890	1,921	1,000
Hunter Success:	48%	41%	42%
Active Licenses:	3,299	2,214	1,200
Active License Success:	42%	35%	35%
Recreation Days:	13,767	10,238	5,000
Days Per Animal:	10.0	13.1	11.8
Males per 100 Females	35	35	
Juveniles per 100 Females	62	80	

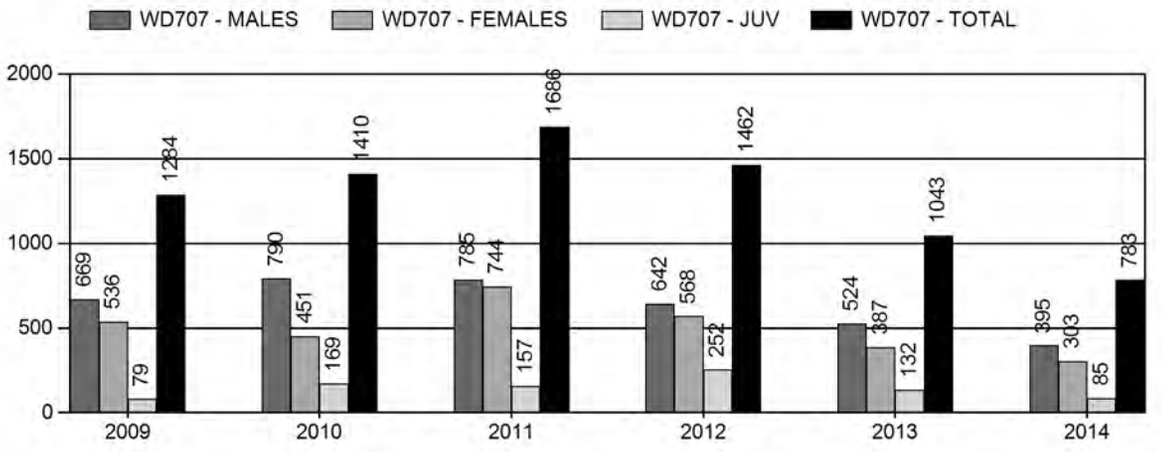
Population Objective (± 20%) :	0 (0 - 0)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	N/A%
Number of years population has been + or - objective in recent trend:	0
Model Date:	None

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

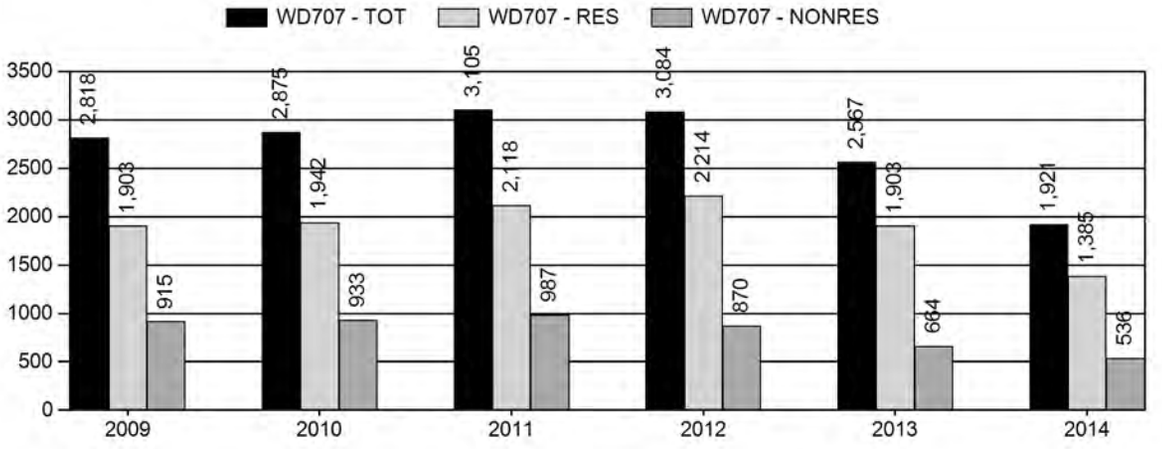
	JCR Year	Proposed
Females ≥ 1 year old:	0%	0%
Males ≥ 1 year old:	0%	0%
Juveniles (< 1 year old):	0%	0%
Total:	0%	0%
Proposed change in post-season population:	0%	0%



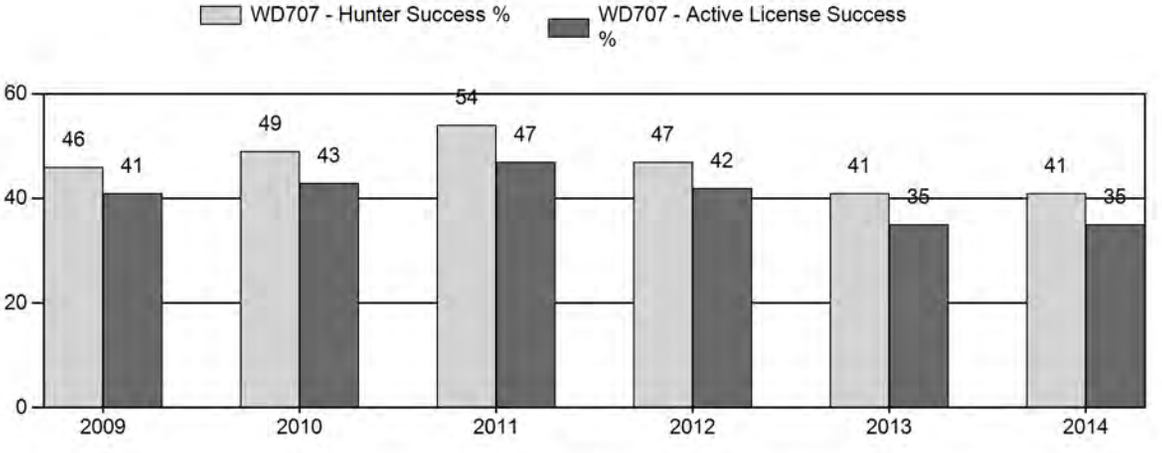
Harvest



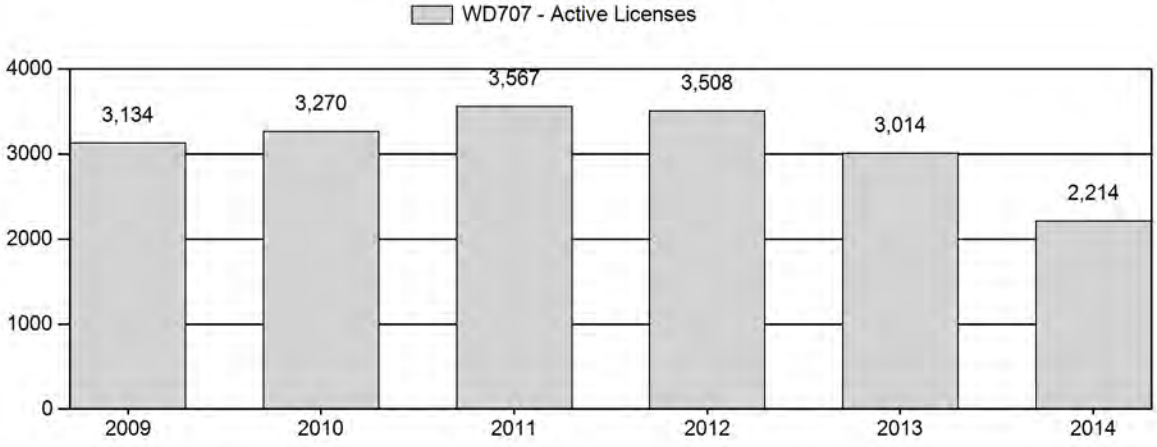
Number of Hunters



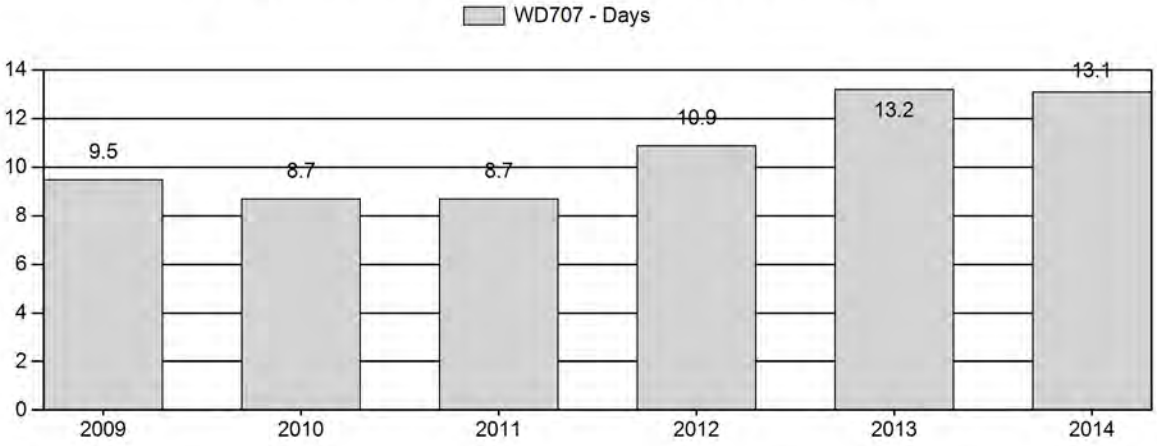
Harvest Success



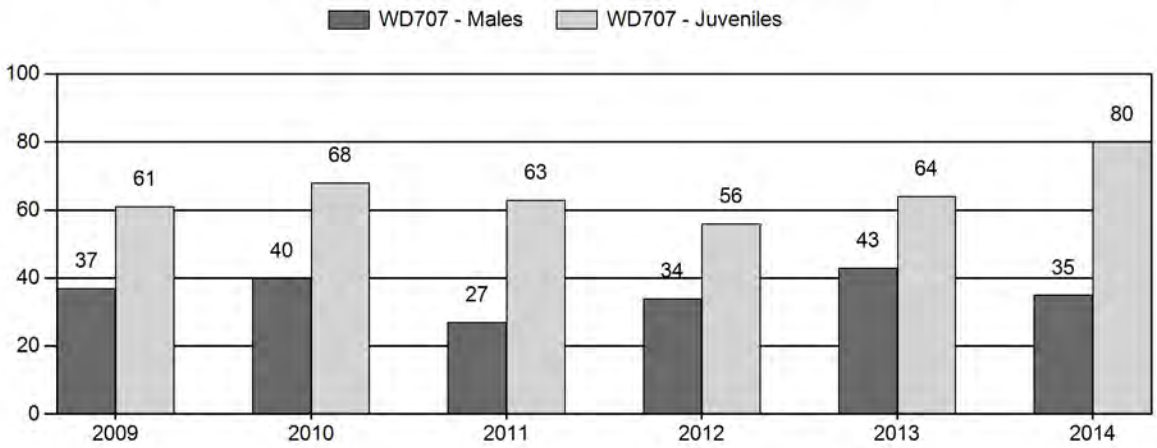
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 Postseason Classification Summary

for White tailed Deer Herd WD707 - CENTRAL

		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
2009	0	49	108	157	19%	430	51%	261	31%	848	0	11	25	37	± 0	61	± 0	44
2010	0	60	87	147	19%	372	48%	253	33%	772	0	16	23	40	± 0	68	± 0	49
2011	0	45	81	126	14%	467	53%	292	33%	885	0	10	17	27	± 0	63	± 0	49
2012	0	54	76	130	18%	381	53%	212	29%	723	0	14	20	34	± 0	56	± 0	41
2013	0	19	61	80	21%	188	48%	121	31%	389	0	10	32	43	± 0	64	± 0	45
2014	0	11	24	35	16%	100	47%	80	37%	215	0	11	24	35	± 0	80	± 0	59

2015 HUNTING SEASONS
CENTRAL WHITE-TAILED DEER (WD707)

Hunt Area	Type	Date of Seasons Opens	Closes	Quota	License	Limitations
10,11,12 13,14	3	Oct. 1	Nov. 30	300	Limited quota	Any white-tailed deer
	8	Oct. 1	Nov. 30	300	Limited quota	Doe or fawn white-tailed deer
		Oct. 16	Nov. 30		General	Any white-tailed deer
22	3	Oct. 1	Nov. 30	50	Limited quota	Any white-tailed deer
	8	Oct. 1	Nov. 30	25	Limited quota	Doe or fawn white-tailed deer
34	3	Oct. 15	Nov. 30	25	Limited quota	Any white-tailed deer
	8	Oct. 15	Nov. 30	25	Limited quota	Doe or fawn white-tailed deer
65, 66	3	Oct. 15	Nov. 30	200	Limited quota	Any white-tailed deer
	8	Oct. 15	Nov. 30	100		Doe or fawn white-tailed deer
88,89	3	Oct. 15	Nov. 30	25	Limited quota	Any white-tailed deer, also valid in Area 66
88,89	8	Oct. 15	Nov. 30	25	Limited quota	Doe or fawn white-tailed deer, also valid in Area 66
Archery						Refer to license type and limitations in Section 2

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

Hunt Area	License Type	Quota Change from 2014
10, 11, 12, 13, 14	3	-100
34	8	-25
65, 66, 88, 89	3	-300
	8	-400
65, 66	3	+200
	8	+100
88, 89, 66	3	+25
	8	+25
Herd Unit Total	**3**	**-175**
	8	**-300**

Management Evaluation

Current Management Objective: ≥ 20 bucks:100 does postseason
Management Strategy: Recreational
2013 Postseason Population Estimate: NA
2014 Proposed Postseason Population Estimate: NA
2014 Hunter Satisfaction: 55% Satisfied, 20% Neutral, 25% Dissatisfied

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

Herd Unit Issues

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

Weather

In addition to EHD outbreaks, white-tailed deer likely experienced increased mortality in recent years due to the harsh winter conditions of 2010-2011 and the 2012 drought. Such weather conditions were also not conducive to good fawn productivity/survival over this time frame. Conditions improved in 2013 with adequate precipitation throughout the growing season and moderate winter conditions. Weather conditions throughout 2014 produced above average precipitation, especially during the growing season, which resulted in excellent forage production throughout the herd unit. Improved forage, coupled with low competition for resources due to low white-tailed deer densities, yielded good fawn production and excellent body condition of white-tailed deer going into winter. The 2014-2015 winter has been moderate to date with several sub-zero cold snaps and precipitation events occurring earlier in the season, and warmer conditions with mild precipitation realized later in the season. Following more substantial precipitation events earlier in the year, warm conditions often occurred in between cold snaps which allowed for a high degree of mobility and access to forage throughout the winter. Therefore, winter survival should be normal over this bio-year.

Habitat

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

Field Data

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

Buck ratios for the Central White-tailed Deer Herd historically average in the mid 30s per 100 does, but occasionally swell into the 40s or drop into the 20s. In 2014 the observed buck ratio was 35 per 100 does. Observed ratios may vary from year to year due to differing levels of effort or success in sampling white-tailed deer during post-season classification surveys. Buck ratios vary widely across the large variety of habitats in this herd unit as well. Additionally, white-

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

Harvest Data

License success in this herd unit is typically in the 40-50th percentile, and was 41 percent in 2014. License issuance varies greatly between the many hunt areas contained within the herd unit. Hunters can typically take white-tailed deer on general licenses and also purchase additional limited quota licenses valid for any white-tailed deer or doe/fawn white-tailed deer. In recent years, reductions in limited quota white-tailed deer licenses have been made due to low deer densities, declining hunter success, and few complaints regarding damage on private lands.

White-tailed deer hunting opportunity peaked in 2011 with a total of over 3,100 hunters afield. Since then license issuance has been gradually reduced, as the population, and hunting access, have decreased. From 2011-2013, harvest success declined 24%, while hunter effort increased 52%. Hunter comments in 2013 also reflect reduced access resulting from declining numbers of white-tailed deer in the herd unit. Many phone calls were received by Casper Region personnel from hunters seeking access for white-tailed deer hunting, as landowners with fewer deer turned hunters away. Additional comments were received via harvest surveys from hunters expressing their dissatisfaction as opportunity to hunt white-tails on private lands was low. Observations from field personnel, landowners, harvest statistics, and hunter comments all indicate this herd has declined considerably. Only 55% of hunters reported being “very satisfied” or “satisfied” with their hunt. Consequently, license issuance will be further reduced within this herd unit for 2015.

Population

Currently there is no population model that accurately represents this herd. Therefore, management is based on maintaining postseason buck ratios with a goal of $\geq$20 bucks per 100 does. While field data indicates that buck ratios exceed this goal, this population has experienced significant declines in the past 5 years. However, field personnel believe that this population has the potential to rebound rapidly in the near future.

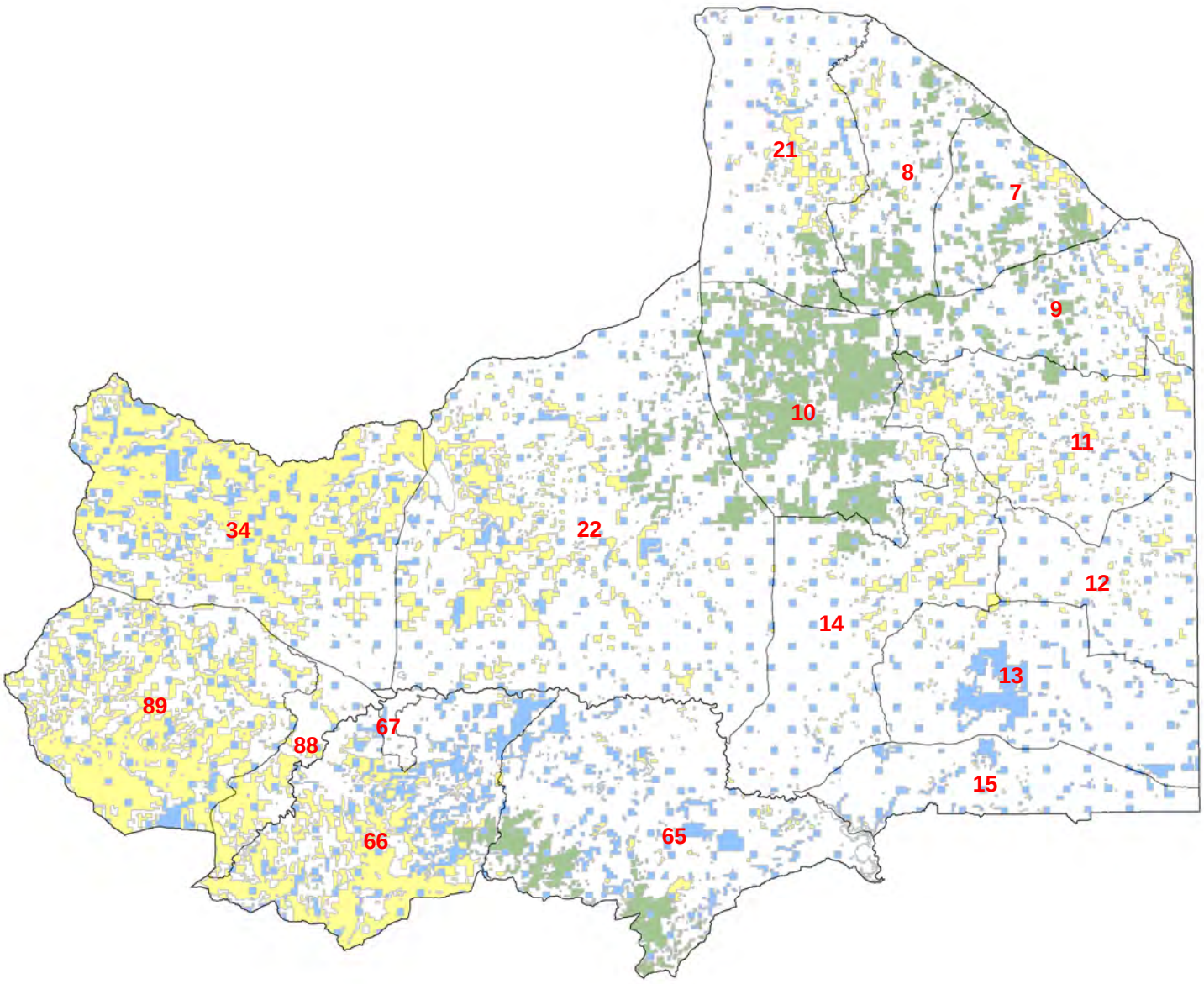
Management Summary

Traditional season dates in this herd vary from one hunt area to the next. Generally, white-tailed deer seasons run concurrently with October mule deer seasons, and are extended into November

to maximize hunter opportunity and harvest. The 2015 season includes 600 Type 3 licenses, 475 Type 8 licenses, and additional opportunities to harvest white-tailed deer on General, Type 1, and Type 6 licenses. Type 3 and Type 8 licenses were reduced by 175 and 300 respectively, to address a decrease in access to white-tailed deer throughout the herd unit. Goals for 2015 are to maintain buck ratios, improve hunter opportunity, afford landowners the opportunity to address agricultural damage on private lands if necessary, and generally allow for population increase.

If we attain the projected harvest of 725 with fawn production/survival similar to the five-year average, buck ratios should be maintained above 20 per 100 does.

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

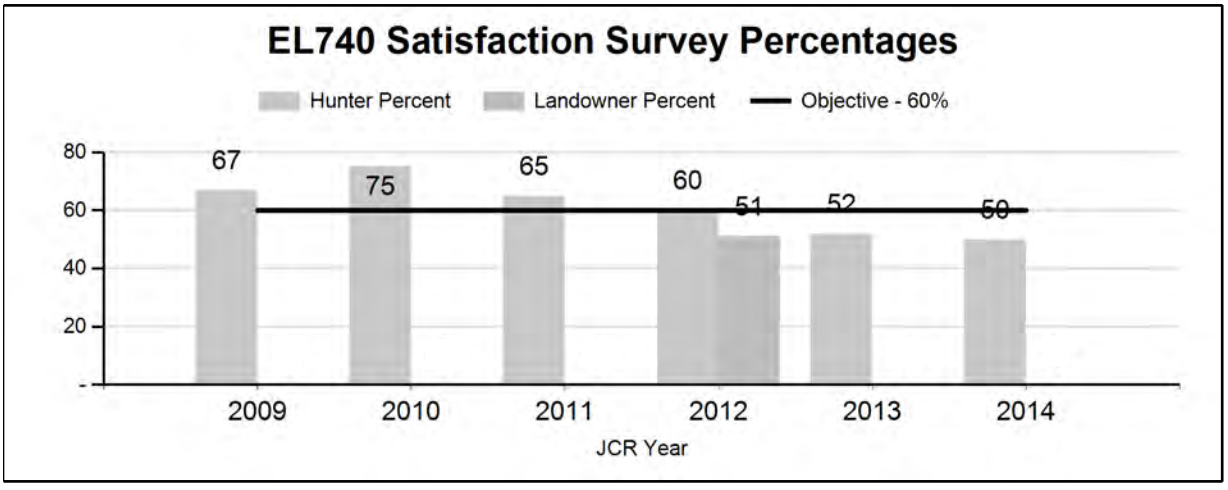


2014 - JCR Evaluation Form

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

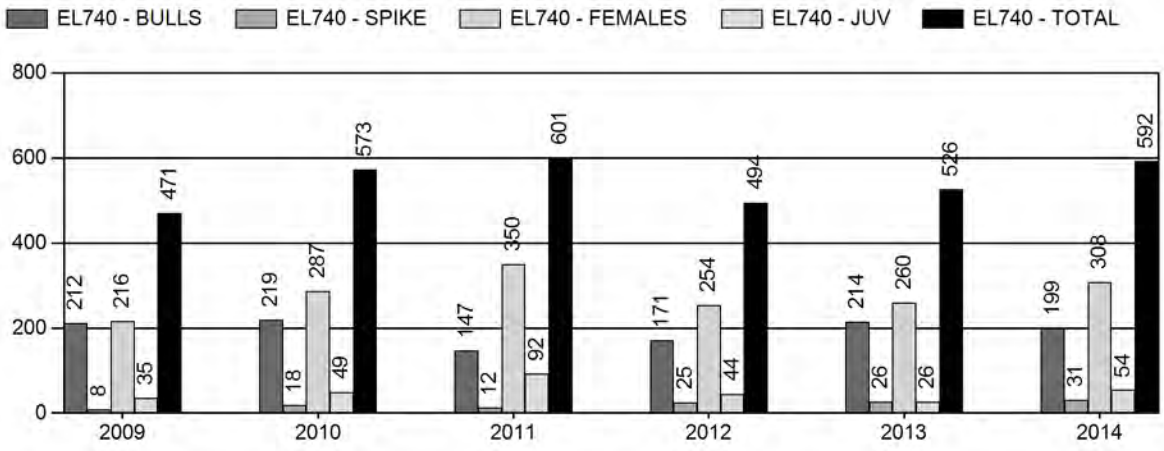
PERIOD: 6/1/2014 - 5/31/2015
PREPARED BY: JOE SANDRINI

	2009 - 2013 Average	2014	2015 Proposed
Hunter Satisfaction Percent	62%	50%	60%
Landowner Satisfaction Percent	51%	48%[1]	50%
Harvest:	533	592	600
Hunters:	1,257	1,740	1,750
Hunter Success:	42%	34%	34%
Active Licenses:	1,309	1,848	1,850
Active License Success:	41%	32%	32 %
Recreation Days:	13,648	18,220	18,000
Days Per Animal:	25.6	30.8	30
Males per 100 Females:	29	*n/a*	
Juveniles per 100 Females	33	*n/a*	
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:			

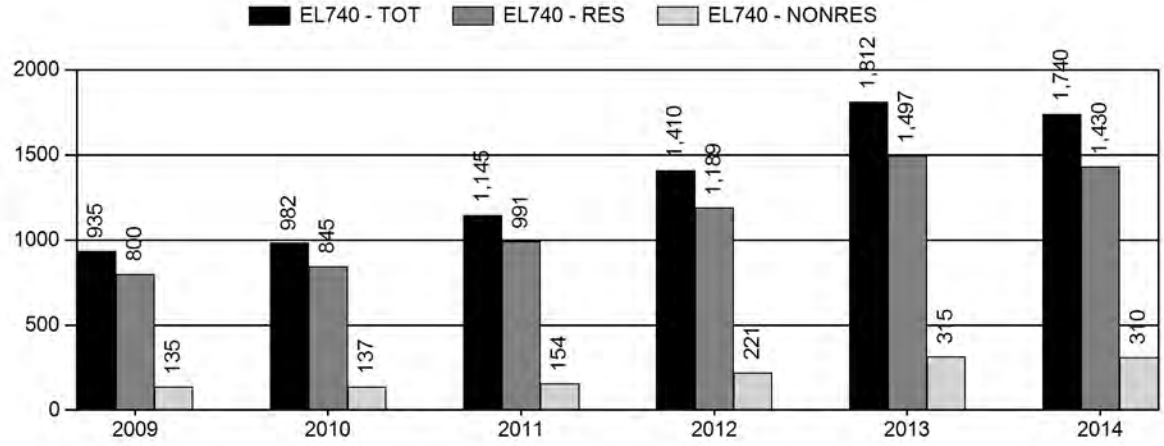


[1] *Based upon individual contacts with 30 Landowners in Jan. & Feb. 2014*

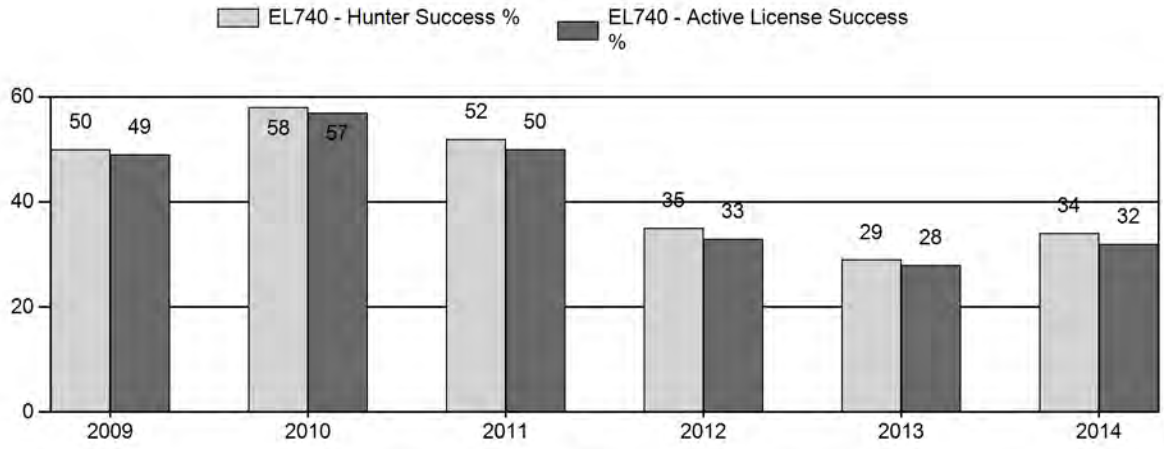
Harvest



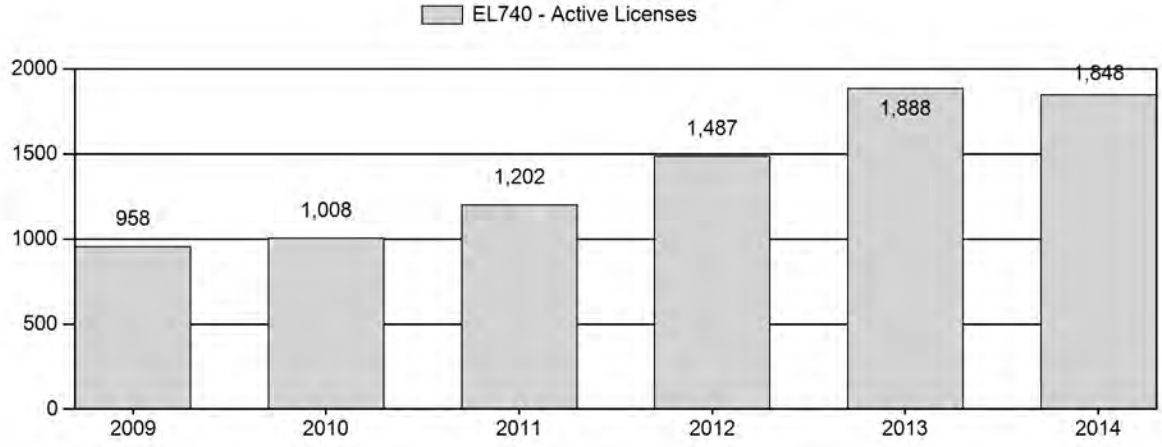
Number of Hunters



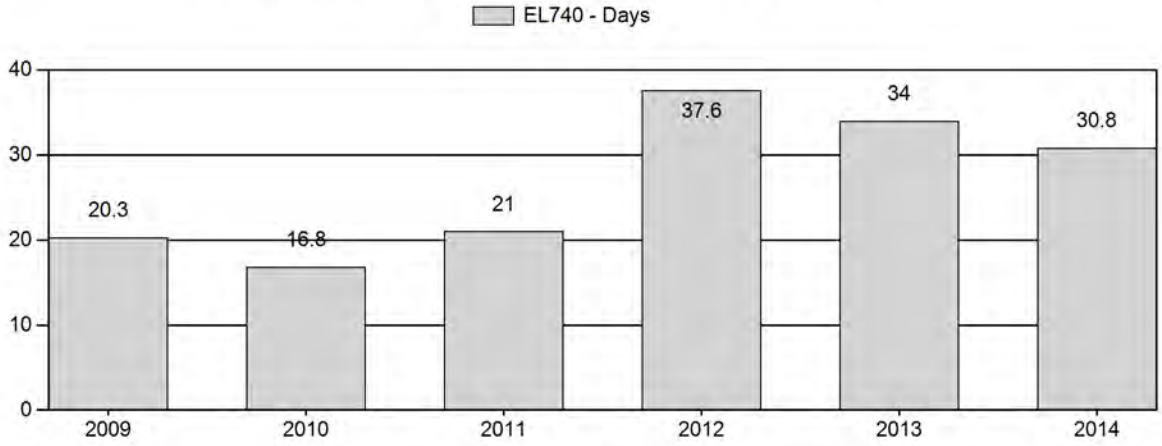
Harvest Success



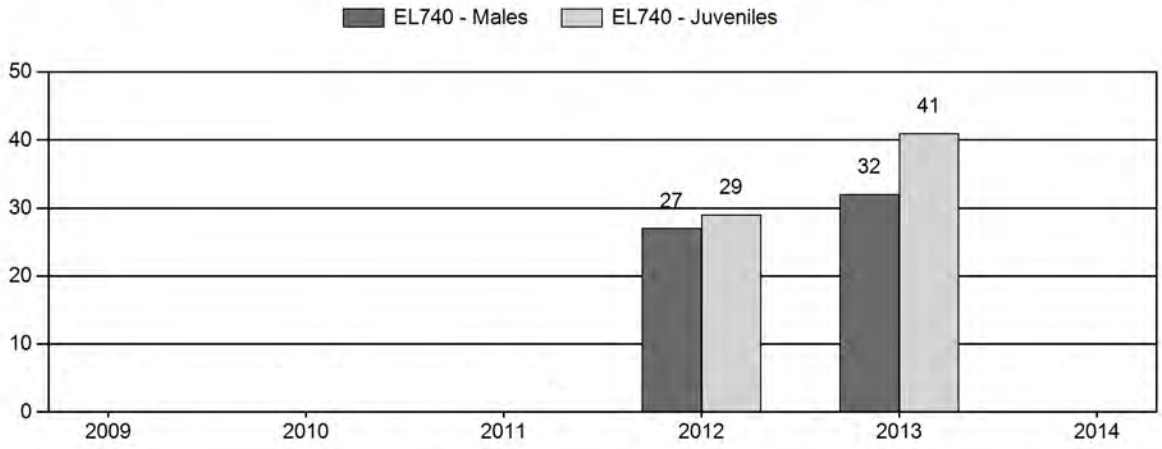
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2015 HUNTING SEASONS
BLACK HILLS ELK HERD (EL740)

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

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

SUMMARY OF CHANGES IN LICENSE NUMBER

Hunt Area	Type	Change from 2014
Herd Unit Totals	1	none
	4	none
	6	none
	8	none

Management Evaluation

Current Hunter/Landowner Satisfaction Management Objective: 60% landowner & hunter
Management Strategy: Private Land
Secondary Management Strategy: Age distribution of harvested bulls

2014 Hunter Satisfaction Estimate: 50%
2014 Landowner Satisfaction Estimate: 48% [1]

Most Recent 3-year Running Average Hunter Satisfaction Estimate: 54%
Most Recent 3-year Running Average Landowner Satisfaction Estimate: 50%

2014 Postseason Population Estimate: *~ 2,500 (Field Estimate)*
2015 Proposed Postseason Population Estimate: *~ 2,500 (Field Estimate)*

HERD UNIT ISSUES: The Black Hills Elk Herd Unit has a management objective for 60% or greater landowner and hunter satisfaction. The management strategy is private land, with a secondary management objective seeking an annual bull harvest (based upon tooth age data) comprised of 20% that are ½ to 2 years old; 60% that are 3 to 5 years old; and 20% that are 6 years old, or older (± 5% in all categories). These management objectives and strategies were adopted in 2013.

We can neither construct a population model, nor generate a population estimate for this herd as the Department has never been able to collect adequate classification data. Additionally, radio collar data show substantial numbers of elk regularly cross the Wyoming / South Dakota Stateline violating the closed population assumption of population models. Consequently, no attempts have been made to model this population since 1996. Instead, this herd was managed in an ad hoc fashion over the past decade and a half to provide ample recreational opportunity and address depredation complaints. Across the herd unit, elk management has been hampered due to constrained access to private land for elk hunting. Consequently, non-numerical management objectives were adopted in 2013. Field personnel anecdotally estimate Wyoming's Black Hills elk population to have numbered about 2,500 at the close of the 2014 hunting season.

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

[1] Based upon recorded contacts with 30 landowners in Jan. & Feb., 2014.

Landowner satisfaction with elk numbers was first quantified in the spring of 2013, as we prepared to move the herd unit objective away from a numerical value. At that time, 167 Black Hills landowners, who had elk on their property at least occasionally, were mailed a short survey with a prepaid return envelope to gauge their satisfaction with elk numbers and support for moving to a non-numerical objective. A total of 71 landowners responded, and 60% noted they were satisfied, very satisfied, or neutral with respect to elk numbers in the Black Hills. However, Department criteria for satisfaction at the time did not consider "neutral" respondents, which is unfortunate because these individuals are not expressing specific dissatisfaction with elk numbers. Therefore, a value of 51% was recorded as the 2012 bio-year landowner satisfaction measure. During the first two months of 2014, 30 large landowners who regularly harbor elk, allow some level of hunting and often experience conflict with elk were contacted individually by Department personnel. In all, 48% of these landowners reported being either satisfied or very satisfied with elk numbers. In this survey, respondents were given the choice of "no opinion" instead of "neutral." While the widespread mail sample of 2013 captured many non-traditional landowners and folks who experience little in the way of elk damage, one on one visits in 2014 focused on more traditional, ranching landowners.

The criteria used to gauge landowner satisfaction have recently been modified. During bio-year 2014, Wildlife Division Administration formalized measurement of satisfaction for landowners by deciding that those reporting elk numbers are at, or about at, desired levels are satisfied, while those reporting numbers to be above or below desired levels are unsatisfied. No landowner satisfaction survey data meeting these standards were collected during bio-year 2014. The adopted management framework for this herd indicates all landowners receiving landowner elk licenses and other landowners whose property see regular elk use, or have expressed an interest in elk management will receive a mail survey with prepaid response envelopes every three years; and annual, documented one on one visits, or an annual meeting with "key" landowners are to be conducted on non-survey years.[2]

In this herd unit, it is difficult to broadly quantify landowner satisfaction because numerous properties are small by Wyoming standards, and many not dependent on agriculture for profit. A significant portion of these type of landowners enjoy having elk around and would like to see more, as would other non-traditional landowners who have purchased larger tracts for hunting. On the other hand, there are more traditional ranching landowners negatively impacted by elk and frustrated with the damage they cause. As such, these two contingents are diametrically opposed in what they desire in the way of elk numbers. The end result is conflict not only between the disparate positions, but with Department satisfaction criteria based desired elk numbers, as both situations contribute equally to quantified dissatisfaction.

In the normal course of duties, Department field personnel contact landowners on an almost daily basis. While these visits did not quantify Department satisfaction criteria specific to elk numbers during bio-year 2014, no strong feelings relative to changing elk management were expressed. In fact, no elk damage claims were made in either the Sundance or Moorcroft game warden districts. To the south, the two claims filed in the Newcastle district were essentially continuations of previous, similar claims spawned in retaliation for law enforcement actions.

[2] See "Final Black Hills Herd Unit and Population Review" adopted by the Dept. and Commission in 2013.

Overall, field personnel report landowners to be rather ambivalent about elk in 2014; with some noting occasional conflicts with elk; others expressing real satisfaction with numbers and hunt quality; and a fair number north of I-90 noting changes in distribution that led to fewer elk in traditional locations and elk where none have been previously seen. To sum it up, the Department did not get any serious complaints from landowners about the elk numbers or season structure. Damage concerns exist in some places, but with elk moving onto unhunted private land adjacent to damage areas, or moving into South Dakota, this low level situation is unlikely to change.

The Black Hills elk herd unit boundary has been revised several times over the past 30 years as hunt area boundaries were altered. The most recent change came in 2013, when HA 116 was expanded in order for the herd unit to encapsulate the Wyoming Black Hills ecosystem, and allow general license hunting. Future changes in hunt area boundaries are not anticipated. The herd's seasonal range map was updated in February, 2014 using field observations, contacts with landowners, and the knowledge of local Game & Fish personnel to delineate ranges. Delineation of crucial winter and winter ranges were not made at this time due to the lack of data required to define them.

WEATHER: Drought conditions, which were generally persistent throughout the Black Hills between 2000 and 2006, began to moderate some in 2007. Between 2007 and 2011, annual temperatures were near or below the previous 30-year average and annual precipitation each year was at or above that average (http://www.ncdc.noaa.gov/cag/time-series/us). Notably, 2010 was colder and wetter than both the 30-year and 100-year averages, and the winter of 2010-11 severe. Overall, the predominant weather pattern between 2007 and 2011 was characterized by generally cool summers, more persistent snow cover in late fall and winter, and above normal spring moisture. This combination of average winter weather and fair forage conditions seemed to have been neither detrimental, nor beneficial for Black Hills elk; but did result in some localized depredation complaints in late December and early January each year.

Drought returned to the Black Hills in 2012, with well above normal summer temperatures and little rainfall during the growing season. Forage production that year was very poor, and the dry conditions led to several large wildfires in the southern half of the herd unit. These warm and dry conditions continued through the 2012-13 winter (http://www.ncdc.noaa.gov/cag/time-series/us). Spring of 2013 finally saw a break in this pattern when temperatures dropped below normal and good precipitation was again received. As the growing season progressed, temperatures were above average and precipitation well above normal. This resulted in excellent forage growth. In early October, 2013 winter storm Atlas blanketed the Black Hills with anywhere from about a foot of wet heavy snow near Newcastle, to over five feet near Cement Ridge. The remainder of the 2013 fall and the 2013-14 winter brought very close to average temperatures and snow fall, which resulted in continuous snow cover over much of the Black Hills until late May. Spring weather in 2014 was similar to the previous year with temperatures just below normal and about 20% more precipitation than average. This was followed by a summer with close to average temperatures and precipitation about 25% above normal. This yielded a second year in a row of excellent forage production. To date, the 2014-15 winter has been generally mild with below normal to near normal amounts of snowfall in most locations.

Based on weather and habitat conditions over the past seven years, elk have likely entered the winter in good condition, except during 2012. This assertion is supported by data collected from radio collared cow elk along the Wyoming / South Dakota Stateline that revealed calf survival was lower in 2012 (0.65, n = 37, SE = 0.04) compared to 2013 (0.76, n = 34, SE = 0.08); and pregnancy rates of cow elk were significantly reduced in 2013 compared to 2012 [0.93 (n=40) in 2012 and 0.66 (n=43) in 2013] (Simpson unpublished). Overall, closer to average winter temperatures and precipitation since 2007, punctuated by occasional severe weather, has likely increased winter stress on elk compared to the previous 8-year period (2000-2007). In summary, recent weather patterns have been generally favorable for elk. However, fluctuations in weather patterns such as the 2012 drought and a few significant snow events have exacerbated elk damage at times.

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

Elk habitat quantity and quality are good, but security areas may be decreased or lacking in areas due to high road densities. High road densities, along with vast tracts of commercially thinned ponderosa pine stands, do not provide what is usually considered classic, good elk habitat. Despite the lack of cover in areas and numerous roads, the elk population significantly expanded through the 1990's and into the early years of the next decade. Several factors have benefited this population. First, herbaceous forage is abundant, and wildfires have increased this forage. Second, despite high road densities, much of the land inhabited by elk is privately owned. This private land experiences limited human activity, so roads there may not significantly impact elk. Many of these same private land areas provide elk refuge from hunting pressure during the fall. The USFS has also increased the number of road closures on the Black Hills National Forest over the past 10-years, and adopted a revised travel management plan in 2010, although enforcement of closures is lax.

FIELD DATA: Collection of classification data was suspended in 1996, and only occasionally are limited classification data garnered during other field activities. In December of 2013, 230 elk were classified in HA 117 yielding a calf:cow ratio of 41:100; a mature bull:cow ratio of 18:100 with a yearling bull:cow ratio 12:100 and total bull:cow ratio of 30:100. A similar sample in 2012 revealed an almost identical mature bull:cow ratio and a slightly reduced yearling bull:cow ratio, but a 30% lower calf:cow ratio. These data mirror larger samples collected in the Black Hills of South Dakota by SDGF&P, and are pretty similar to the other, limited and incidental classification data collected in Wyoming over the past decade. SDGF&P collects preseason

classification data on elk in the Black Hills every year, and since 2003 these data have consistently yielded calf:cow ratios near 50:100, and more variable bull:cow ratios, which have averaged 30:100 (South Dakota Department of Game, Fish and Parks, 2015).

While classification data are lacking, tooth age data have been collected from harvested elk since 1987.[3] Tooth age data can estimate annual recruitment by considering the percentage of yearlings in the female segment of the harvest (Figure 1). Since 1987, this figure has averaged[4] 16.4% (std. dev. 8.0%) suggesting 10 to 20 yearling bulls and 10 to 20 yearling cows are normally added per 100 adult cows into this population annually. However, recruitment of yearling elk has declined since 2000. Between 1987 and 1999, as this herd grew rapidly, older age classes of female elk were well distributed throughout the harvest and there was an increasing percentage of yearling cows represented in the harvest. However, this trend reversed itself beginning in 2000 (Figure 1). A Student's T-Test indicates yearling recruitment was significantly higher between 1987 and 1999 when there were an average of 20% yearlings in the female harvest, versus an average of 11% after 2000 ($p=0.0002$).[5] Since 2000, with significantly increased license issuance and extended hunting seasons, there has been a general increase in the percentage of harvested female elk over age 5 and a decline in the percentage of young ($\leq$ 2 years old) females taken, while the relative percentage of mid-aged cows has remained fairly stable (Figure 2). This trend, while less pronounced, has generally continued over the past five years.

Of course there is greater hunter selectivity when it comes to take of bulls. Since 2000, tooth age data have revealed a slight decline in the relative percentages of both middle-aged (3-5 year old) and young ($\leq$ 2 years old) males in the bull harvest, with a slight increase in the percentage of older bulls (6^+ years old) harvested (Figure 3). However, since 2008, this trend has begun to shift, as a greater proportion of younger bulls ($\leq$ 5 years old) have been harvested. Over the past 10 years, bull hunter success has remained unchanged in HA 117 (where the bulk of the tooth age data are returned) while antlerless hunter success has generally increased. Taken with the disparate increases in any elk versus antlerless elk license issuance here, it makes sense that we have impacted the antlerless segment of the herd more than the mature bull segment. This is evident in the shift towards harvesting older cows and could be elevating bull:cow ratios. If this population has stabilized or is declining, one would expect to see an increase in the percentage of younger aged bulls harvested, as availability of older bulls declines, while bull:cow ratios remain static or increase. It does appear we may be shifting harvest pressure on to younger-aged bulls (Figure 3 & Table 1). If these recent trends continue, our ability to meet our secondary objective may become difficult without reductions in Type 1 license issuance.

[3] Budgetary constraints prevented tooth age data collection in 2002 & 2003.
[4] Omitting 1990 data reduces this average to 15.3% with a std. dev. 6.2%.
[5] Including 1990 data in T-test yields a significant difference ($P= 0.0002$) with $Mean_{(1987\text{-}1990)}$ of 22%; and $Mean_{(2000\text{-}2013)}$ of 10.8%.

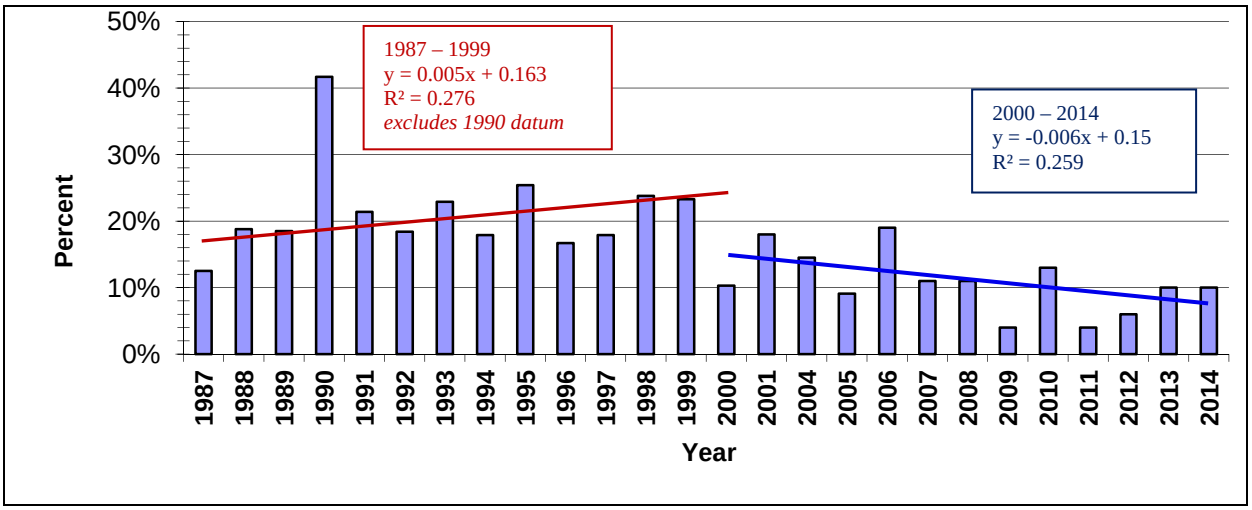


Figure 1. Percentage of yearlings in the female segment of the elk harvest (1987 – 2014).

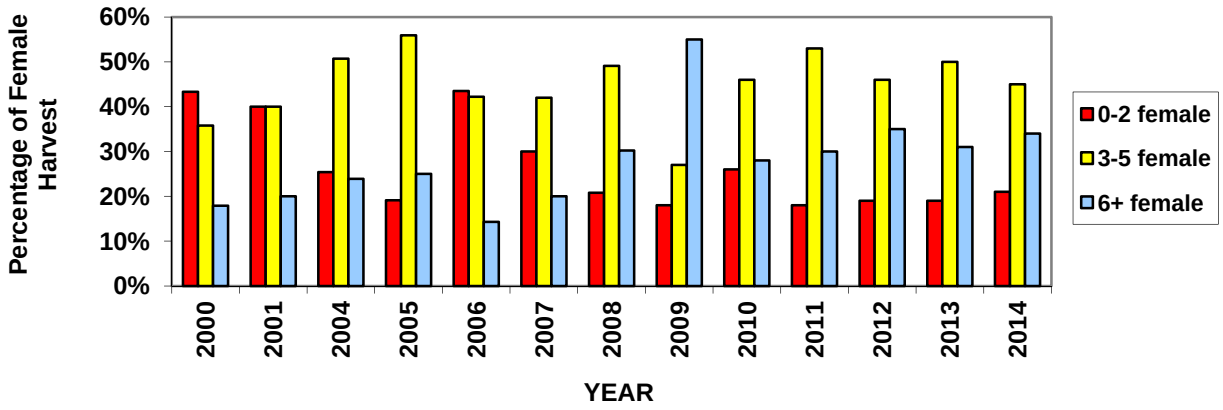


Figure 2. Relative percentages of various age classes of female elk harvested (2000 – 2014).

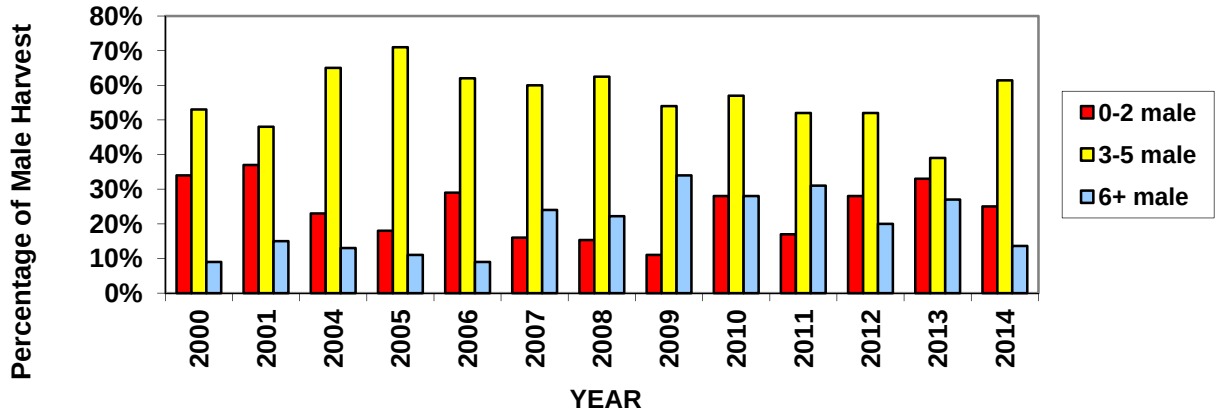


Figure 3. Relative percentages of various age classes of male elk harvested (2000 – 2014).

HARVEST: The low number of yearling females present in the harvest in recent years suggests reduced recruitment, as does the fact elk are not pioneering into unoccupied habitats as they once were. However, while adequate harvest may be achieved some years south of I-90, poor success by hunters pursuing female elk in HA 116 is likely allowing that portion of the herd to grow. This stems from a few landowners restricting access to the majority of elk during the hunting season. However, between 2008 and 2012 it was difficult to gauge total take and the potential rate of increase north of I-90 because a substantial portion the herd unit moved into general license HA 129. Due to harvest survey constraints, there was no way to determine how many elk were harvested from that part of the herd unit formerly included in HA 129, which is now in general license HA 116. Conservative elk management in South Dakota, coupled with known interstate movements, further confound these data. Consequently, over the years, the bulk of tooth age data have returned from HA 1 and 117, any decrease in recruitment should only be ascribed south of I-90.

Segment of Bull Harvest	Objective	2012	2013	2014
Bulls 0-2 yrs. old	20%	28%	33%	25%
		3 yr. mean		29%
Bulls 3-5 yrs. old	60%	52%	39%	61%
		3 yr. mean		51%
Bulls 6+ yrs. old	20%	20%	27%	14%
		3 yr. mean		20%

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

Limited quota license issuance and harvest are positively correlated within this herd unit. Between 1992 and 2002, license issuance increased exponentially while harvest increased more linearly. Between 2002 and 2010 changes in harvest were not as disparate with changes in license issuance. But, over the past three years, license issuance again has substantially outpaced increases in harvest. Consequently, hunter success has dropped. Overall, active hunting licenses have increased about 250% since 1999, while harvest increased a bit more than 100% (Figure 4). Access to private land for hunting remains limited and field personnel have great difficulty placing the increased number of hunters, many of whom make repeated phone calls to local game managers and landowners without securing a place to hunt.

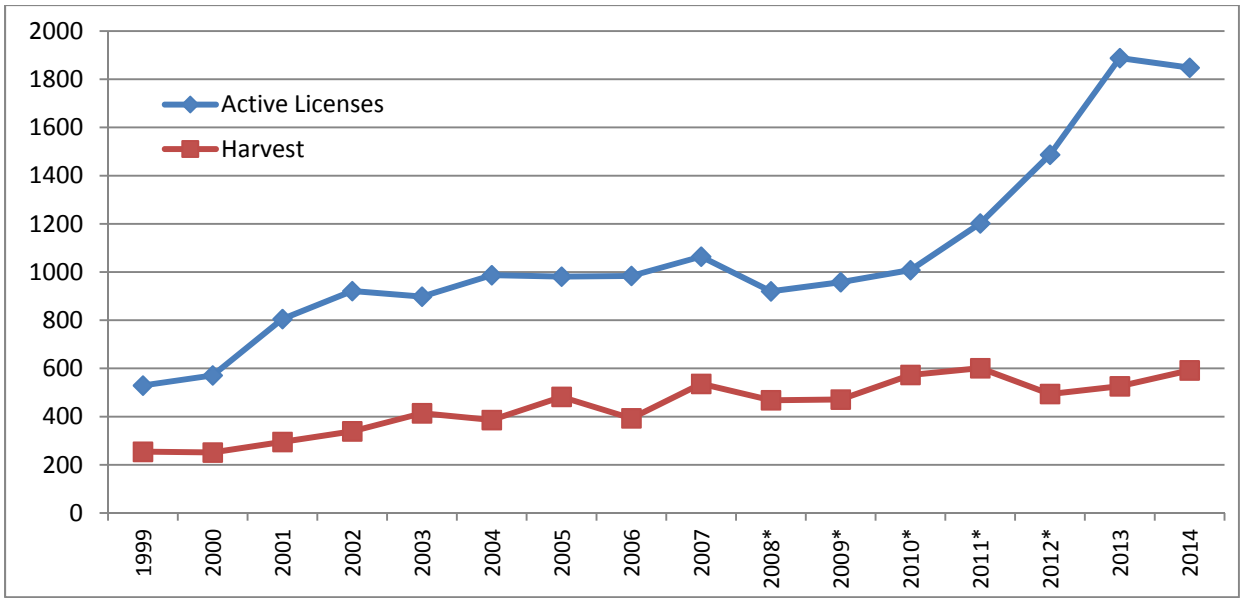


Figure 4. Active hunting licenses & elk harvest in the Black Hills Herd Unit (1999 – 2014). **Note, between 2008 and 2012 large portions of Hunt Areas 116 & 117 were put into General License Hunt Area 129 and active license numbers not captured. In 2013 these areas were included in Hunt Area 116.*

Elk harvest bounced back to predicted levels in 2014, as weather conditions allowed hunters easier access to elk compared to 2013, which was severely impacted by winter storm "Atlas." We believe the approximately 25% relative increase in hunter success in 2014 compared to 2013 was due more to this than any changes in elk number.

Statewide, at the herd unit level, elk hunter success is highly correlated with reported hunter satisfaction (84% in 2013, and over 90% in previous years). In 2013, HA 116 moved from limited quota license hunting to a liberal general license season combined with a significant number of reduced priced cow/calf licenses, which did not sell out in the draw. This resulted in a large number of license holders hunting the small amount of accessible public land, where few elk reside or were harvested. This same scenario played itself out in 2014. Consequently, hunter success on general licenses was only 17% in 2013 and 15% in 2014; and active license success on all cow/calf licenses about 42% in 2014, with total active license success in Hunt Area 116 running about 22% each of the past two years. These poor success rates are reflected in low hunter satisfaction in HA 116. Only 47% of the HA 116 elk hunters reported being satisfied or very satisfied with their hunt in 2013.[6] These figures bias the herd unit hunter satisfaction numbers low as well, since about 55% of the hunters at the herd unit level were sampled from HA 116. In contrast, during 2013, hunter satisfaction in HA 1 and HA 117 was 63% and 56%, respectively. In these two hunt areas, hunter satisfaction was within a couple percentage points of that reported in 2012, but these values were still below the 64% reported for both areas in 2011, when hunter satisfaction and success were the highest in recent years.

Given average yearling recruitment of 30 yearling elk per 100 cows (based upon 15% yearling cows in total cow elk harvest) and assuming a pre-season herd composition of 40 bulls per 100

[6] 2014 hunter satisfaction data not available until 19 March, 2015

cows and 47 calves per 100 cows (based on SDGF&P data), the 2014 estimated harvest of 624 total elk (including 582 adult elk) would have removed the annual recruitment of yearlings from a total population of just over 3,600 elk. Therefore, based upon anecdotal population estimates, the 2014 harvest should have at minimum kept the number of adult elk in this herd at its current level, or reduced it. However, several hundred elk (perhaps nearly 1,000 head) regularly cross the Stateline, and a significant number of these winter in South Dakota making it difficult to determine what effect harvest is having on our post-season population.

POPULATION: Despite the lack of a population estimate, indications are elk numbers increased quite a bit over the past 30 years. The population appeared to increase rapidly during the 1990's and early part of the next decade when elk significantly expanded their distribution. Silvicultural practices and wildfires throughout the region have created habitat favorable for elk. Although habitat changes have continued to favor elk in recent years, they have not continued to pioneer into previously unoccupied areas. Harvest statistics and tooth age data also suggest population growth may have been curbed recently, at least south of Interstate Highway 90 (I-90). Given the high quality habitat in the region and limited access to hunt elk on private land, this population will likely continue to exhibit growth potential in areas where limited hunter take, due to access constraints, thwarts efforts to obtain adequate harvest.

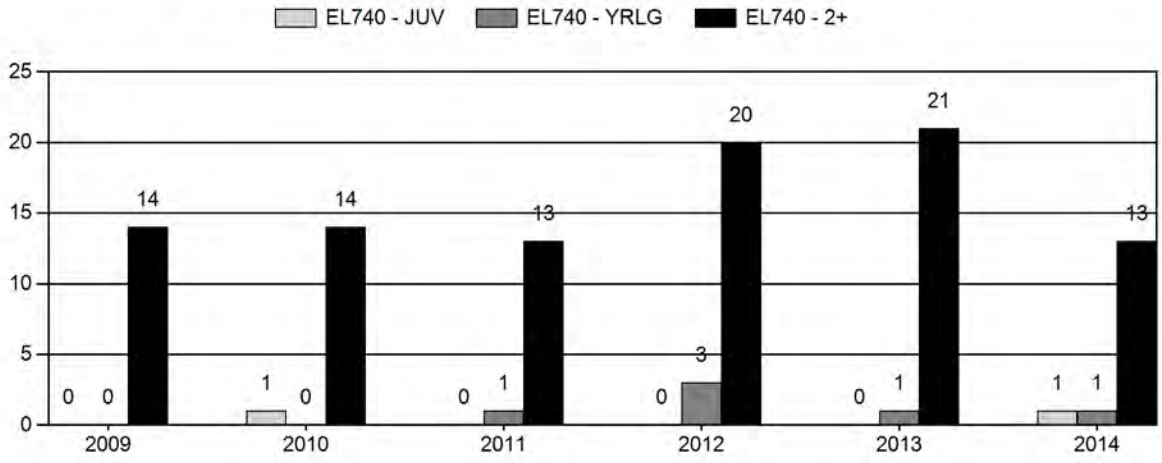
MANAGEMENT SUMMARY: Changes implemented during the 2013 Black Hills elk hunting season included expanding HA 116 to include all of the lands within Wyoming's Black Hills ecosystem previously enrolled in HA 129, and hunting this area under a combination of General and Type 6 and 8 cow/calf licenses. Also, because hunter success and satisfaction had dropped south of I-90, issuance of all license types in HA 1 and HA 117 were reduced as well. It is also important to note that while only 48% of the landowners surveyed in 2014 were satisfied with elk numbers, a whopping 82% did not want a change in license numbers and several expressed dissatisfaction with the long hunting season. This statistic bears out the fact that while many traditional landowners complain about elk numbers, few are willing to allow hunting at the levels needed to significantly reduce this population. As a result, no changes to the hunting season structure have been implemented since 2013. This strategy seems to be reducing or holding elk numbers in check where there is adequate access for hunting, but may be allowing subherds in areas without adequate hunter access to increase.

Given mean hunter participation and success rates over the past decade and a half, the 2015 harvest should result in about 600 elk. This harvest estimate is predicated on a similar number of elk being harvested from HA 116 on general licenses and continued average success rates in other hunt areas. However, the long season for antlerless elk hunting in HA's 116 and 117 (five and a half months) could increase antlerless harvest above predicted values if access to elk improves. If projected harvest levels are reached, elk numbers should decline south of I-90, while elk numbers north of the Interstate may stabilize or increase. Based on an estimated preseason herd composition of 47:100:40 (calf:cow:bull) and a recruitment rate of 30 yearling elk per 100 cows, a harvest of 600 total elk (or about 550 adult elk), would remove the annual yearling recruitment from a herd of about 3,400 elk (all age classes), a number well above what field personnel believe to be present at this time.

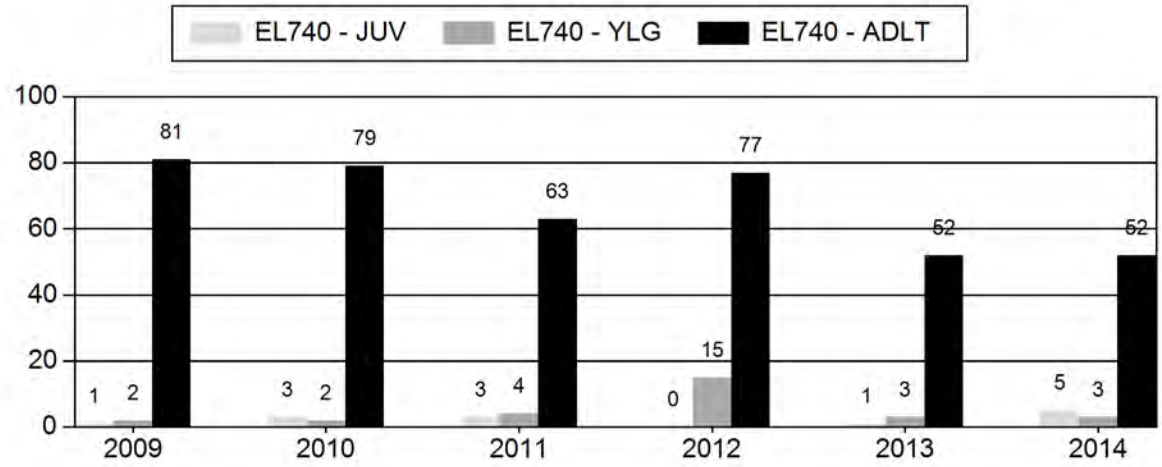
Literature Cited

South Dakota Department of Game, Fish and Parks. 2015. South Dakota Elk Management Plan 2015-2019. Completion Report 2015-01. South Dakota Department of Game, Fish and Parks, Pierre, South Dakota, USA.

Age Structure of Field Checked Males



Age Structure Data (Field and Laboratory) - Male



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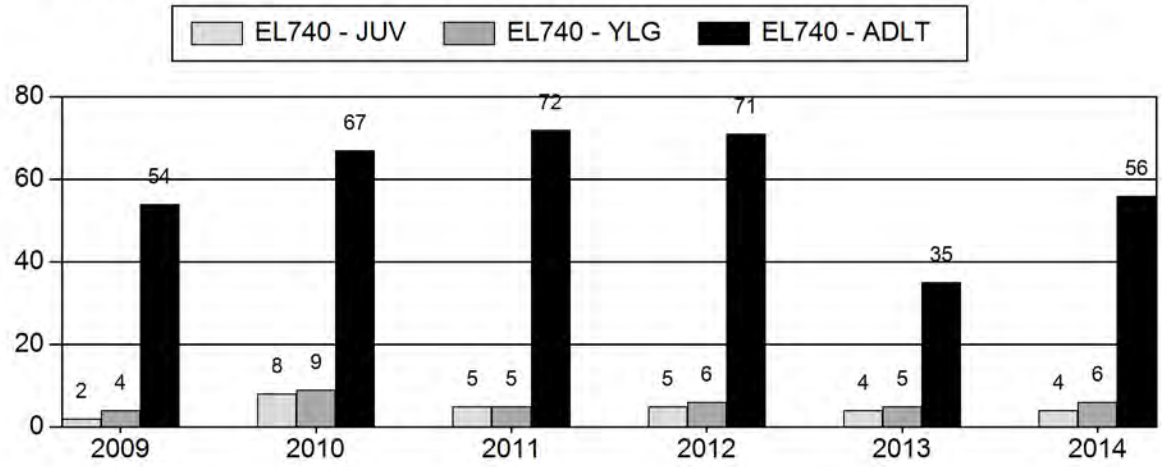


2014 - JCR Evaluation Form

SPECIES: Elk

PERIOD: 6/1/2014 - 5/31/2015

HERD: EL741 - LARAMIE PEAK/MUDDY MOUNTAIN

HUNT AREAS: 7, 19

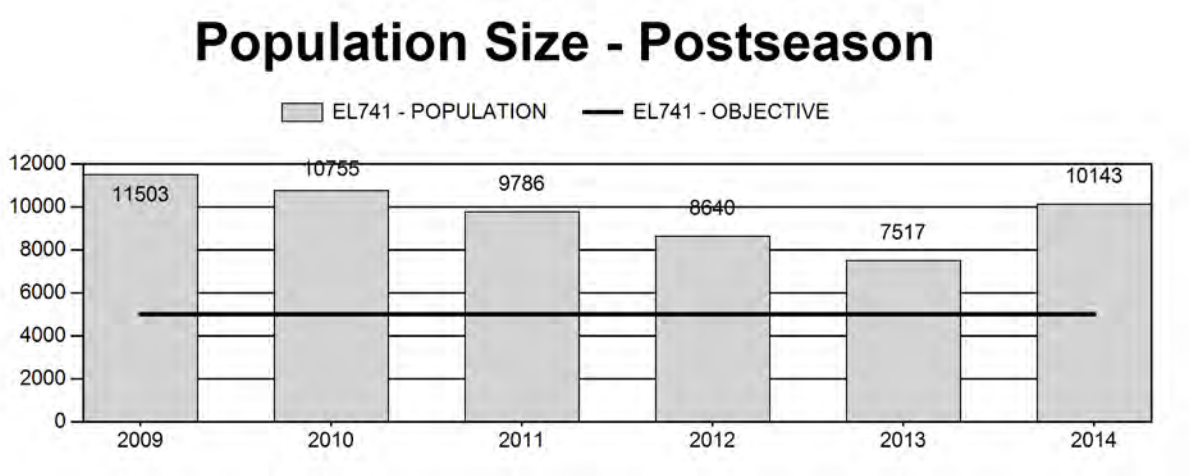
PREPARED BY: HEATHER O'BRIEN

	2009 - 2013 Average	2014	2015 Proposed
Population:	9,640	10,143	8,420
Harvest:	2,293	2,561	2,295
Hunters:	4,529	4,728	4,500
Hunter Success:	51%	54%	51%
Active Licenses:	4,607	4,824	4,600
Active License Success:	50%	53%	50%
Recreation Days:	36,346	35,110	36,400
Days Per Animal:	15.9	13.7	15.9
Males per 100 Females	34	25	
Juveniles per 100 Females	37	37	

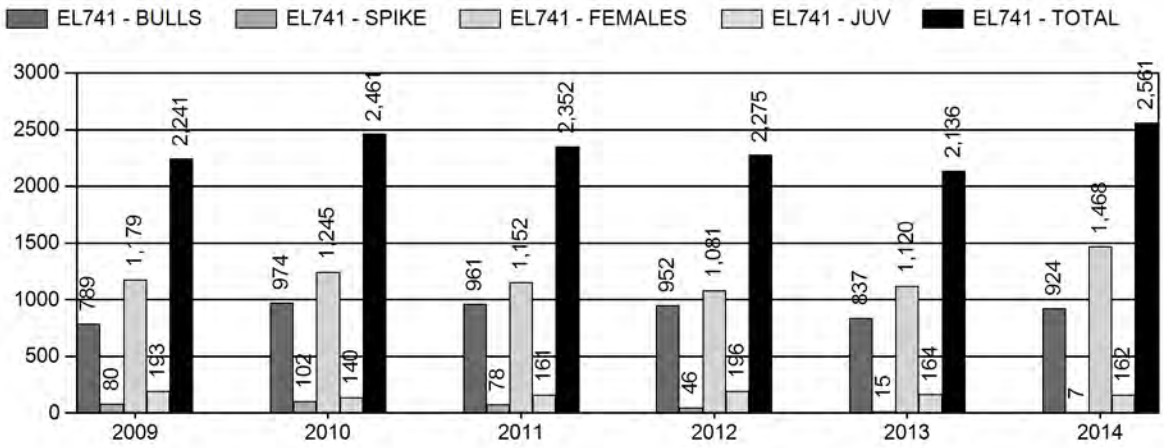
Population Objective (± 20%) :	5000 (4000 - 6000)
Management Strategy:	Special
Percent population is above (+) or below (-) objective:	103%
Number of years population has been + or - objective in recent trend:	14
Model Date:	3/10/2015

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

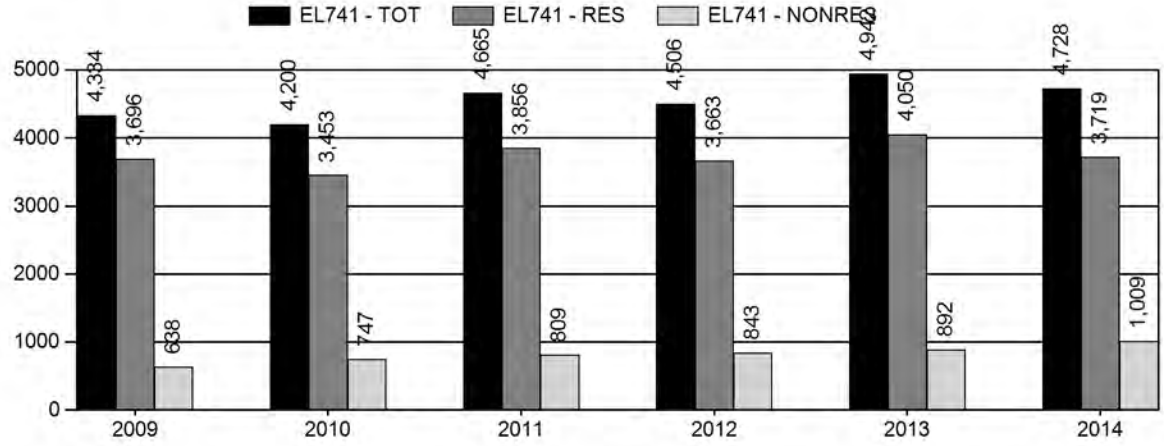
	JCR Year	Proposed
Females ≥ 1 year old:	20.5%	20.0%
Males ≥ 1 year old:	27.5%	32.0%
Juveniles (< 1 year old):	6.7%	8.4%
Total:	19.7%	21.0%
Proposed change in post-season population:	-14.5%	-17.0%



Harvest



Number of Hunters



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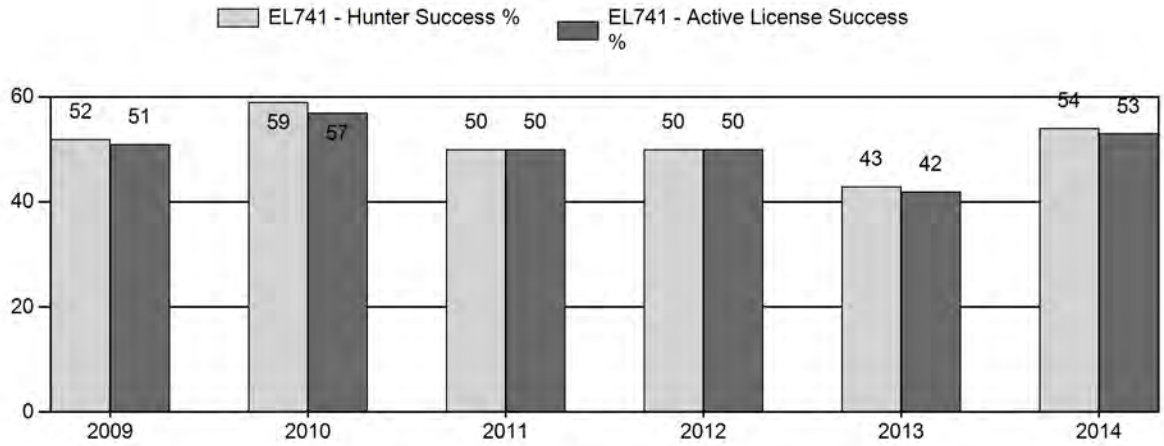
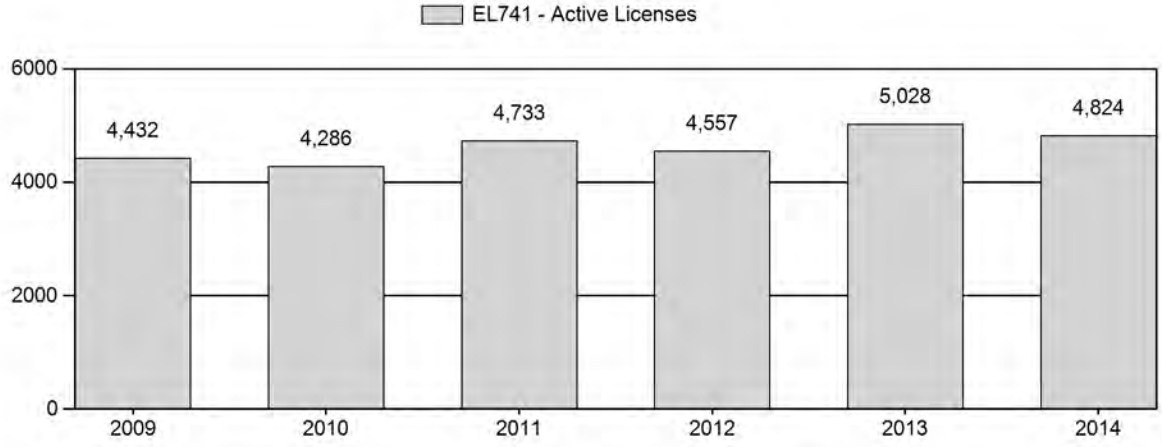
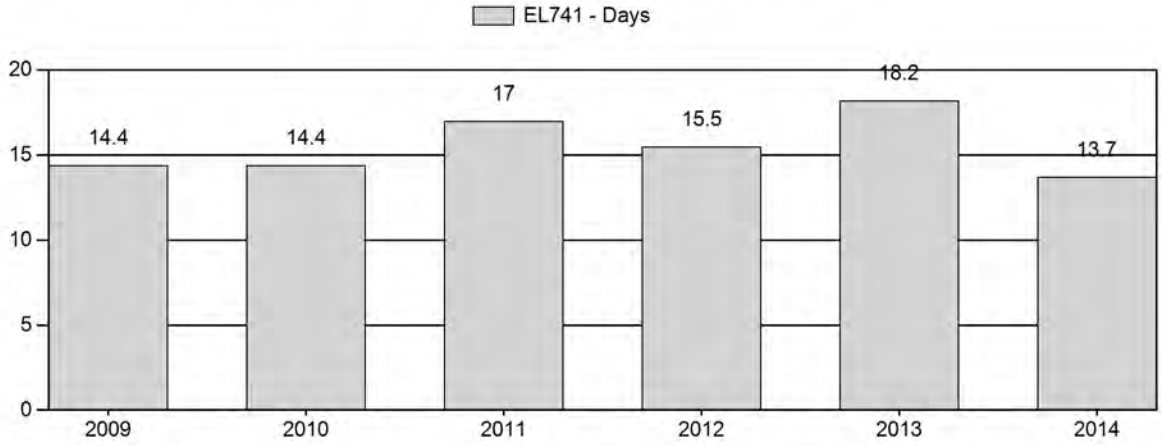


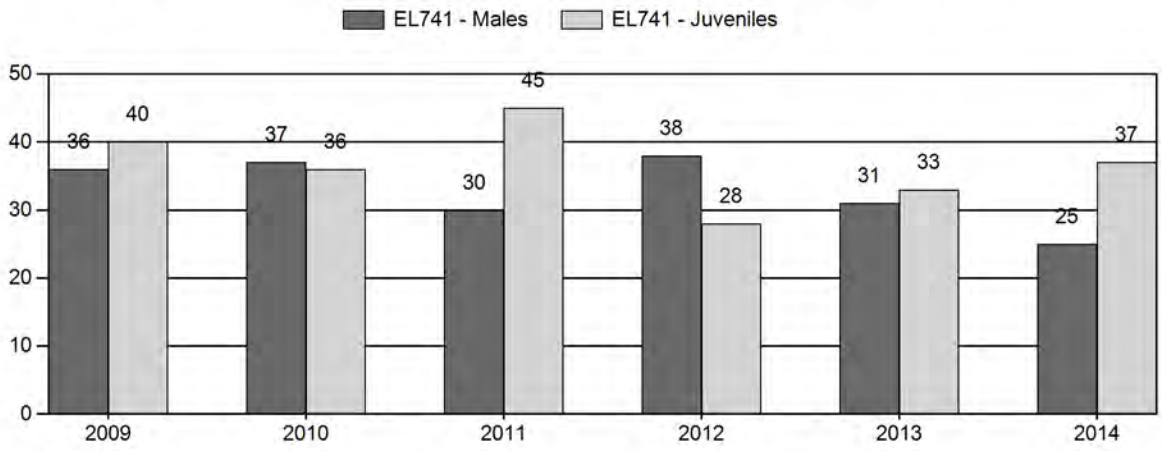
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2009 - 2014 Postseason Classification Summary

for Elk Herd EL741 - LARAMIE PEAK/MUDDY MOUNTAIN

		MALES				FEMALES		JUVENILES				Males to 100 Females				Young to		
Year	Post Pop	Ylg	Adult	Total	%	Total	%	Total	%	Tot Cls	Cls Obj	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2009	11,503	259	572	831	21%	2,281	57%	908	23%	4,020	607	11	25	36	± 2	40	± 2	29
2010	10,755	475	639	1,114	21%	3,020	58%	1,094	21%	5,228	545	16	21	37	± 1	36	± 1	26
2011	9,786	324	548	872	17%	2,890	57%	1,298	26%	5,060	539	11	19	30	± 1	45	± 1	35
2012	8,640	143	362	505	23%	1,334	60%	379	17%	2,218	617	11	27	38	± 2	28	± 2	21
2013	7,517	328	487	815	19%	2,605	61%	869	20%	4,289	535	13	19	31	± 1	33	± 1	25
2014	9,743	383	468	851	15%	3,454	62%	1,270	23%	5,575	592	11	14	25	± 1	37	± 1	30

2015 HUNTING SEASONS
LARAMIE PEAK MUDDY MOUNTAIN ELK (EL741)

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
7	1	Oct. 15	Nov. 20	1,500	Limited quota	Any elk
		Nov. 21	Dec. 31			Unused Area 7 Type 1 licenses valid for antlerless elk
	4	Oct. 15	Dec. 31	800	Limited quota	Antlerless elk
	6	Aug. 15	Oct. 14	2,200	Limited quota	Cow or calf valid in Platte County and on private land in Albany and Converse Counties
		Oct. 15	Dec. 31			Unused Area 7 Type 6 licenses valid in the entire area
	7	Jan. 1	Jan. 31	500	Limited quota	Cow or calf
19	1	Oct. 1	Oct. 14	150	Limited quota	Any elk
	2	Nov. 1	Nov. 20	150	Limited quota	Any elk
	4	Oct. 1	Oct. 14	125	Limited quota	Antlerless elk
	5	Nov. 1	Jan. 31	125	Limited quota	Antlerless elk
	6	Oct. 1	Oct. 14	225	Limited quota	Cow or calf
		Nov. 1	Jan. 31			Unused Area 19 Type 6 licenses
		Nov. 21	Jan. 31			Unused Area 19 Type 1, Type 2 and Type 4 licenses valid for antlerless elk
Archery		Sep. 1	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2014
7	1	0
	4	-450
	6	+450
	7	0
19	1	0
	2	0
	4	0
	5	0
	6	0
Total	1	**0**
	4/5	**-450**
	6	**+450**
	7	**0**

Management Evaluation

Current Postseason Population Management Objective: 5,000
Management Strategy: Special
2014 Postseason Population Estimate: 10,100
2015 Proposed Postseason Population Estimate: 8,400
2014 Hunter Satisfaction: 68% Satisfied, 17% Neutral, 14% Dissatisfied

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

Herd Unit Issues

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

there is potential for the expansion of wind energy development. Chronic Wasting Disease is present in this herd at low prevalence (8% in 2012 hunter-harvested elk).

Weather & Habitat

The summer of 2012 was the driest on record since 1904 in much of Wyoming. Extensive wildfires displaced and redistributed elk, especially in the east-central portion of the herd unit. The severe drought and resulting wildfires likely impacted calf survival, as post-season ratios were markedly low at 28 calves per 100 cows. The winter of 2012 continued to be dry, with very low snow accumulation and snow pack, allowing wide distribution of elk at higher elevations. April of 2013 finally saw a break in the drought, when temperatures dropped below normal for the entire month and significant precipitation was received. This cooler and wetter pattern continued through the summer of 2013 in much of the herd unit. In early October 2013, winter storm "Atlas" blanketed the area with 12-36" of wet snow, with greater depths at higher elevations. The snow and resulting muddy conditions forced the cancellation of hunting for some license holders, and made accessing elk difficult in many locations. Travel conditions improved for late seasons, but by then it was apparent winter storm Atlas had a negative impact on early hunter participation and harvest success. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. Grass and forb growth were excellent, making 2014 the best growing season the region had seen in years. The spring and summer of 2014 undeniably produced improved range conditions that benefitted elk across the Laramie Range. Winter 2014-2015 was generally mild, and cow hunters had fairly easy access to much of the herd unit. For detailed weather data see http://www.ncdc.noaa.gov/gac/time-series/us.

Field Data

Calf ratios are typically in the 40s per 100 cows for the Laramie Peak / Muddy Mountain Elk Herd. While calf survival can vary from year to year, adult elk in this herd are thought to have rather high rates of survival as there are few natural predators and little mortality from disease and winter weather. Prior to 2005, antlerless license issuance was not adequate to keep up with the production of this herd. Since then, antlerless license issuance has continued to increase, and the population has stabilized or begun to decrease as harvest pressure on cows has greatly intensified. In 2014, the calf ratio was below average for the third year in a row, with 37 calves per 100 cows. Cow harvest continues to remain high, and late-season access to hunt was generally good in the herd unit for 2014. While the low calf production/survival of 2012-2014 will stem population growth, continued high license issuance and harvest of cows will be necessary to further reduce this herd toward objective.

Bull ratios for the Laramie Peak / Muddy Mountain Herd historically average in the mid-30s per 100 cows, though there have been years where the ratio has dropped below special management limits into the 20s. It should be noted that the accuracy of bull ratios can change from year to year in this herd. While the herd is covered thoroughly during post-season classifications, changes in distribution of elk, ability to locate large cow/calf groups, and concealment of bulls in timber during January can skew results from year to year. Issuance of Type 1 any elk licenses consistently increased in the herd unit along with population growth, and has remained high since 2009. From 2010-present, Type 1 license has fluctuated between 1,500 and 1,750 licenses, depending upon hunter, landowner, and manager perceptions of bull quality. Tooth-age and antler-class data collected annually show a slight decrease in average bull age and of Class-II antlered bulls in 2014, though landowner perceptions are that bull quality remained high (see Appendix A). Observed bull ratios in 2014 were very high in Area 19 (57 per 100 cows) and very low in Area 7 (19 per 100 cows) as a result of poor classification conditions and disproportionate number of cow/calf groups found in open habitats. Thus these data are not considered an accurate representation of true bull ratios. Regardless, hunters, landowners, and managers seem to be satisfied with current bull ratios and quality within the herd unit. Consequently, Type 1 license issuance will be maintained as in Area 7.

Harvest Data

License success in this herd unit is typically in the 50th percentile. Hunter days per animal have generally increased since 2008, as the population has dropped in size and more effort is necessary to harvest an elk. Hunter crowding on public lands with higher license issuance may be another factor that contributes to higher hunter days per animal. It should also be noted that days per animal can be high in this herd unit as hunters have high expectations regarding bull quality, and will exert more effort in finding a mature bull. Archery hunting has also become more popular in the herd unit, as hunters want to maximize their time in the field to harvest a mature bull. Days per animal improved in 2014 compared to 2013, when weather conditions resulted in poor access during September and October. Habitat and access conditions were both much improved during the 2014 hunting season by comparison. Overall harvest success in 2014 (54%) was higher than the average harvest success of the previous ten years (52%). Total harvest also improved in 2014, with the highest cow harvest (1,468) and overall harvest (2,561) on record for the herd unit. Total harvest of cows and calves was exceptional in both hunt areas for 2014. In Area 19, 200 cows and calves were harvested, while in Area 7 over 1,300 were harvested. Both totals represent the highest cow/calf harvests on record for the herd unit, and maybe be attributed to good weather, improved access, and increased license numbers in 2014. Area 7-Type 7 harvest success was outstanding, as over 225 cows and calves harvested over the January season.

Population

The 2014 postseason population estimate was approximately 10,100 and trending downward from an estimated high of 12,300 elk in 2005, though the model is considered to be of poor quality. Postseason classification data and harvest data are applied to the model to predict population size and trends for this herd. Since 2014 postseason bull ratios were considered inaccurate due to survey conditions and timing, long-term averages were applied to the model. No sightability or other population estimate data are currently available to further align the model.

The "Constant Juvenile Survival, Constant Adult Survival" (CJ,CA) spreadsheet model was selected to represent the Laramie Peak / Muddy Mountain Herd Unit for 2014. In 2012 & 2013, the "Time-Specific Juvenile Survival – Constant Adult Survival" (TSJ,CA) spreadsheet model was selected. The TSJ,CA model is no longer considered an accurate representation of the herd, as the model estimates the post-season population in 2014 to be nearly identical to the total number of elk observed during classification surveys. This is certainly not true, as a fair proportion of occupied elk habitat within the herd was not surveyed. The CJ,CA model seems the more representative of herd trends, though it selects the lower constraint for calf survival and the upper constraint for adult survival. The SCJ,CA model is similar to the TSJ,CA model in that it predicts a post-season population size that is nearly identical to the total number of elk observed during helicopter surveys, which is not realistic. The TJS,CS,MSC model was not considered for the Laramie Peak / Muddy Mountain Herd, since it does not have a high level of natural predation. The other three models produce trends that seem representative for this herd, but the SCJ,CA and TSJ,CA models estimate a population size that is unrealistically low. All models score similarly so the difference in AIC is unimportant in model selection for this herd. The CJ,CA model is currently the best representation of the herd, and follows trends with license issuance and harvest success. Additional population estimate and/or survival data would help to better align this model. Overall, this model is of poor quality.

Management Summary

Season dates for this herd have changed from year to year, and in general have been liberalized over time to maximize harvest and reduce damage on agricultural fields. Meetings with Area 7 and Area 19 landowners were held to discuss ideas to maximize female harvest and maintain bull quality. Season dates and limitations will be similar for the 2015 season, with two minor changes. A total of 450 Type 4 licenses will be converted to Type 6 licenses in Area 7, as managers would like to shift toward more additional cow/calf licenses to potentially reduce hunter crowding. For Area 19, unused licenses will be valid for antlerless elk through January, to extend hunter opportunity and maximize cow harvest. All other license types will be maintained with the same season dates and quotas as in 2014. Currently, access is predicted to

be similar in 2015 compared to previous years. If additional access is secured in Area 19, increased license issuance will be considered by managers. Goals for 2015 are to continue reduction of the herd toward objective, maintain bull ratios within special management limits, maintain good harvest success, and reduce elk damage to agricultural fields.

If we attain the projected harvest of 2,295 elk with average calf ratios, this herd will decline further toward objective. The predicted 2015 postseason population size of the Laramie Peak / Muddy Mountain Elk Herd is approximately 8,400 animals, which is 68% above objective.

INPUT	
Species:	Elk
Biologist:	Heather O'Brien
Herd Unit & No.:	EL741 Laramie/Muddy
Model date:	02/27/15

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	370	379	☑ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	371	380	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	215	341	☐ TSJ,CA Model	
TSJ,CA,MSC	**Time-Specific Juv, Constant Adult Survival, Male survival coefficient**	184	322	☐ TSJ,CA,MSC Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population			Total	Predicted Posthunt Population			Total	Objective
	Field Est	Field SE		Juveniles	Total Males	Females		Juveniles	Total Males	Females		
1993				3889	991	6904	11784	3808	602	6611	11022	5000
1994				3278	1542	7431	12251	3203	1203	7068	11475	5000
1995				2929	1980	7728	12637	2874	1580	7451	11904	5000
1996				3265	2267	8020	13552	3194	1867	7461	12522	5000
1997				3609	2628	8110	14348	3473	2039	7821	13333	5000
1998				3910	2866	8533	15309	3777	2382	7971	14130	5000
1999				3576	3279	8756	15610	3490	2780	8260	14530	5000
2000				3981	3597	8967	16545	3845	3041	8432	15317	5000
2001				4489	3941	9225	17655	4415	3378	8819	16612	5000
2002				3733	4414	9746	17894	3627	3709	9262	16598	5000
2003				4290	4541	9984	18815	4101	3768	9488	17356	5000
2004				4376	4718	10323	19417	4255	4078	9829	18162	5000
2005				4959	5060	10696	20715	4828	4345	9895	19068	5000
2006				4176	5465	10904	20545	4012	4518	10142	18672	5000
2007				4862	5431	10942	21235	4522	4503	9925	18950	5000
2008				4643	5544	10857	21044	4318	4362	9722	18402	5000
2009				3918	5354	10607	19879	3706	4399	9310	17414	5000
2010				3299	5237	10050	18586	3145	4053	8681	15879	5000
2011				3782	4759	9293	17833	3605	3616	8026	15246	5000
2012				2368	4445	8767	15580	2153	3347	7577	13077	5000
2013				2426	3818	7964	14208	2246	2881	6732	11859	5000
2014			5313	2416	3385	7159	12960	2238	2361	5544	10143	5000
2015				2079	2873	5993	10944	1886	1861	4673	8420	5000
2016												5000
2017												5000
2018												5000
2019												5000
2020												
2021												
2022												
2023												
2024												
2025												

Survival and Initial Population Estimates

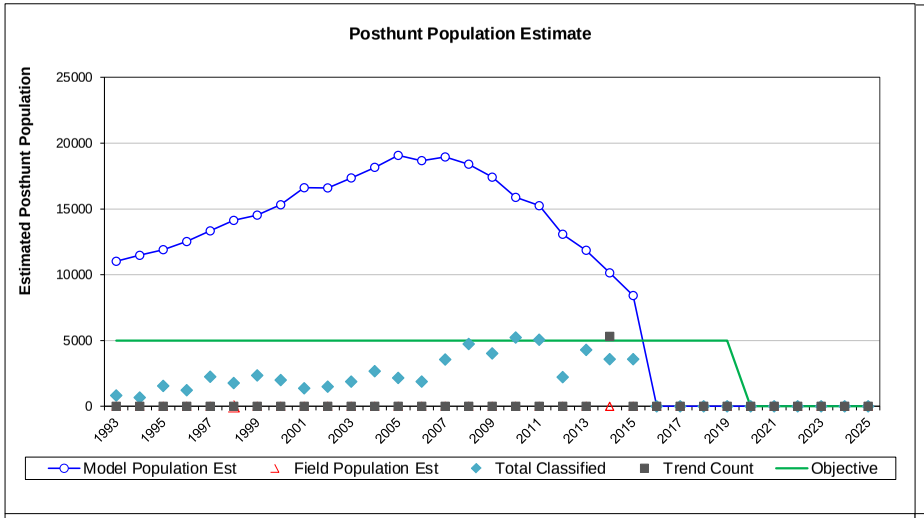
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.50			0.98		
1994	0.50			0.98		
1995	0.50			0.98		
1996	0.50			0.98		
1997	0.50			0.98		
1998	0.50			0.98		
1999	0.50			0.98		
2000	0.50			0.98		
2001	0.50			0.98		
2002	0.50			0.98		
2003	0.50			0.98		
2004	0.50			0.98		
2005	0.50			0.98		
2006	0.50			0.98		
2007	0.50			0.98		
2008	0.50			0.98		
2009	0.50			0.98		
2010	0.50			0.98		
2011	0.50			0.98		
2012	0.50			0.98		
2013	0.50			0.98		
2014	0.50			0.98		
2015	0.50			0.98		
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

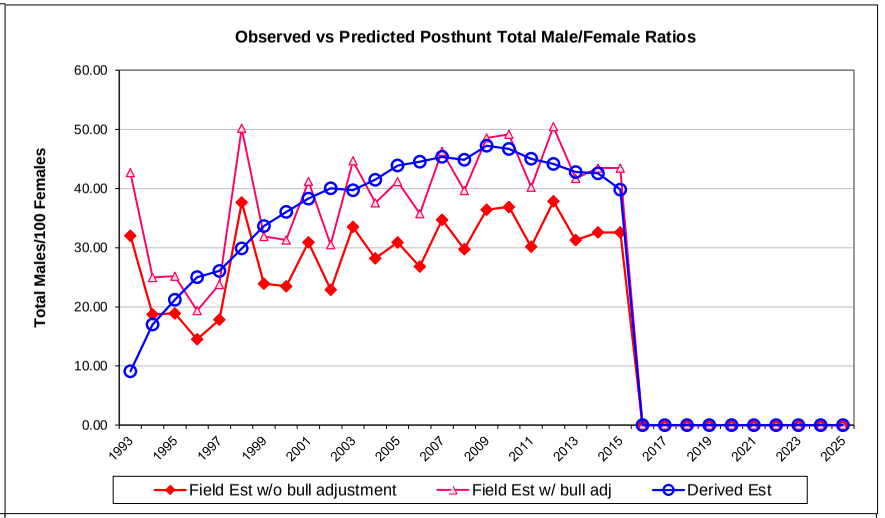
Parameters:	Optim cells
Juvenile Survival =	0.500
Adult Survival =	0.980
Initial Total Male Pop/10,000 =	0.060
Initial Female Pop/10,000 =	0.661

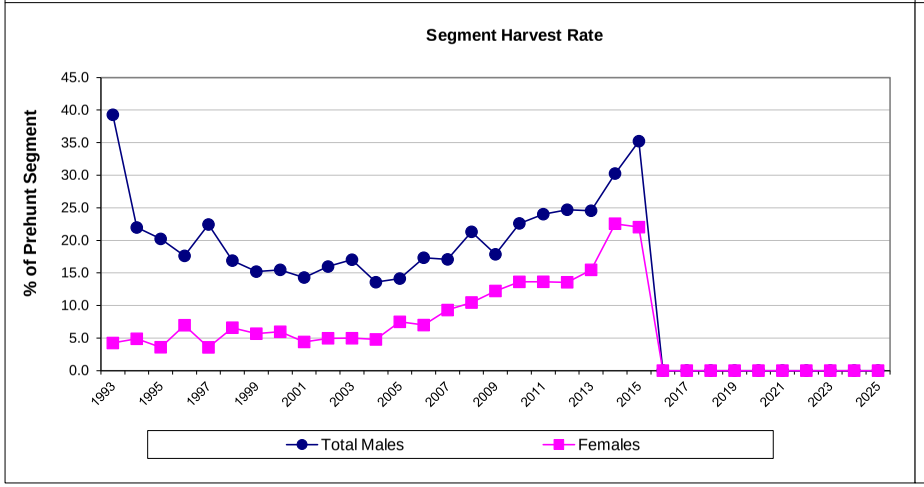
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Total Bulls Adjustment Factor	75%

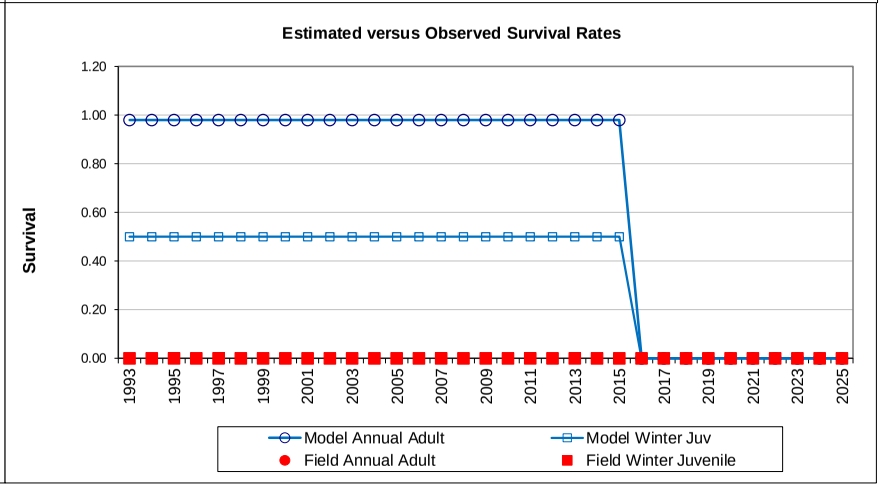
Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio				Harvest					Segment Harvest Rate (% of Prehunt Segment)	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/ bull adj	Field Est w/o bull adj	Field SE	Juv	Yrl males	2+ Males	Females	Total Harvest	Total Males	Females
1993		57.60	4.57	9.10	42.70	32.03	3.12	73	105	249	266	693	39.3	4.2
1994		45.32	4.03	17.02	24.96	18.72	2.34	68	73	235	330	706	22.0	4.9
1995		38.58	2.33	21.20	25.18	18.88	1.51	50	50	314	252	666	20.2	3.6
1996		42.80	2.80	25.03	19.37	14.52	1.46	65	35	328	508	936	17.6	7.0
1997		44.40	2.15	26.07	23.78	17.83	1.23	124	42	494	263	923	22.4	3.6
1998		47.38	2.70	29.89	50.21	37.66	2.33	121	98	342	511	1072	16.9	6.6
1999		42.25	2.06	33.66	31.89	23.92	1.45	78	68	385	451	982	15.2	5.7
2000		45.59	2.37	36.06	31.30	23.47	1.57	124	112	394	486	1116	15.5	6.0
2001		50.07	3.15	38.30	41.22	30.91	2.31	67	91	421	369	948	14.3	4.4
2002		39.15	2.43	40.04	30.51	22.89	1.75	97	71	570	440	1178	16.0	5.0
2003		43.22	2.41	39.72	44.70	33.52	2.05	172	61	642	451	1326	17.0	5.0
2004		43.29	2.00	41.49	37.59	28.20	1.52	110	54	528	449	1141	13.6	4.8
2005		48.79	2.46	43.91	41.19	30.89	1.83	119	103	547	728	1497	14.1	7.5
2006		39.56	2.21	44.55	35.75	26.81	1.73	149	54	807	693	1703	17.3	7.0
2007		45.57	1.83	45.37	46.29	34.72	1.54	309	86	757	925	2077	17.1	9.3
2008		44.41	1.54	44.87	39.66	29.74	1.19	296	55	1019	1032	2402	21.3	10.5
2009		39.81	1.56	47.25	48.58	36.43	1.48	193	80	789	1179	2241	17.9	12.2
2010		36.23	1.28	46.70	49.18	36.89	1.29	140	102	974	1245	2461	22.6	13.6
2011		44.91	1.50	45.05	40.23	30.17	1.17	161	78	961	1152	2352	24.0	13.6
2012		28.41	1.65	44.17	50.47	37.86	1.98	196	46	952	1081	2275	24.7	13.6
2013		33.36	1.31	42.79	41.71	31.29	1.26	164	15	837	1120	2136	24.5	15.5
2014		40.37	1.65	42.58	43.46	32.59	1.44	162	7	924	1468	2561	30.3	22.6
2015		40.37	1.65	39.82	43.46	32.59	1.44	175	20	900	1200	2295	35.2	22.0
2016														
2017														
2018														
2019														
2020														
2021														
2022														
2023														
2024														
2025														

FIGURES









Comments:

APPENDIX A:
Tooth-Age and Antler Class Data for Laramie Peak / Muddy Mountain Elk

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

Tooth age data from the Laramie Peak / Muddy Mountain herd have been collected in nearly all years from 1997-2014. Tooth samples are solicited from both bull and cow elk hunters, as female age data is more representative of a random sample across age classes, while bull age data is potentially biased towards hunter preferences for more mature age classes. Sample size has varied from year to year depending upon hunter response rates. In 2014, a total of 800 "any elk" hunters and 975 antlerless elk hunters in the herd unit were solicited for tooth samples. Of those solicited, 164 returned teeth from bulls and 137 returned teeth from cows. Samples received from calf elk were removed from resulting totals so as not to skew statistics on adult age classes.

Average tooth age of sampled adult males has slowly increased from 1999-2013, while average tooth age of female elk has remained relatively stable (see Figures 1 & 2). In 2014, the average age of female elk sampled rose to 5.88, while the average age of male elk declined slightly from 6.07 to 6.02. Median age of both males and females was 5.5 years old. Of those bulls sampled, 52% were age 2-5 and 45% were age 6-10. Of those cows sampled, 53% were age 2-5 and 33% were age 6-10. This disparity between harvested bull age versus harvested cow age illustrates hunter preferences for older aged bulls, though the gap between male and female age was not as divergent in 2014 as previous years.

Percentage of bulls aged 6-10 gradually increased from 2001-2013, indicating that older age-class bulls have been increasingly available for harvest. This contradicts some years of observed antler class data during the same time period that shows a decline of Class II (6 points on a side or better) bulls in the herd (see Figure 3). This disparity may be due to increased selectivity of hunters for older age-class bulls, compared to the more random sample of bulls surveyed during postseason classification flights. In addition, hunters submitting teeth may be biased towards older age class bulls, as hunters who are pleased with the quality of their animals may be more likely to submit samples. Percentage of bulls aged 6-10 decreased slightly from 2013 to 2014, but was still a higher percentage compared to data collected from 2008-2012. Bulls harvested in 2013 were on average older, though it is not apparent why this was the case. Regardless, one

must assume inherent biases within this sampling scheme apply equally across years. Thus, emerging trends in mean and median ages of sampled bulls warrant discussion.

The increasingly high percentage of older age-class bull elk is a surprising trend, considering that managers believe this herd has been stable or slightly decreasing since 2009. License issuance has remained high, and one would expect it to become more and more difficult to find and harvest older age-class bulls in a declining population. At the same time, average tooth age of sampled cows has slowly increased, while license issuance and season length have been liberalized. This seems to suggest that females are still able to reach older age classes in the herd before they are harvested, indicating that perhaps the herd is not decreasing in size as much as managers were expecting.

Trends in antler class of classified bull elk are more difficult to interpret on their own. The percentage of Class II bulls declined from 2008-2011, but then increased in 2012 and 2013. During the same time period, average tooth-age of harvested bulls increased steadily from 5.01 to 6.07. The divergence between the two data sets in 2012-2013 suggests antler quality is not always correlated positively with bull age for this herd. Factors such as nutrition, genetics, or classification biases may also be contributing to antler quality. In 2014, both percentage of Class II bulls observed and average tooth-age of harvested bulls declined slightly. However, harvest success and hunter days for Type 1 licenses were similar to 5-year averages, indicating hunters did not have increased difficulty finding mature bulls in 2014. Years of consistent pressure in this herd may require future reductions of Type 1 licenses in order to maintain trophy bull quality, if the population is begins to decline. Studies of the tooth-age dataset certainly temper any assumptions made regarding changes in the antler class dataset and aid in making sound management decisions for this herd. Collectively, these data seem to indicate this herd can continue to support the current number of any-elk licenses for the 2015 season without compromising bull ratios or bull quality. Managers will need to further scrutinize harvest data and hunter feedback in 2015 and perhaps begin to reduce issuance of Type 1 licenses.

Figure 1. Tooth-age data analysis for adult bull elk harvested within the Laramie Peak/Muddy Mountain Herd Unit, 1997 - 2014.

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

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

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

Figure 2. Tooth-age data analysis for adult female elk harvested within the Laramie Peak/Muddy Mountain Herd Unit, 1997 - 2014.

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

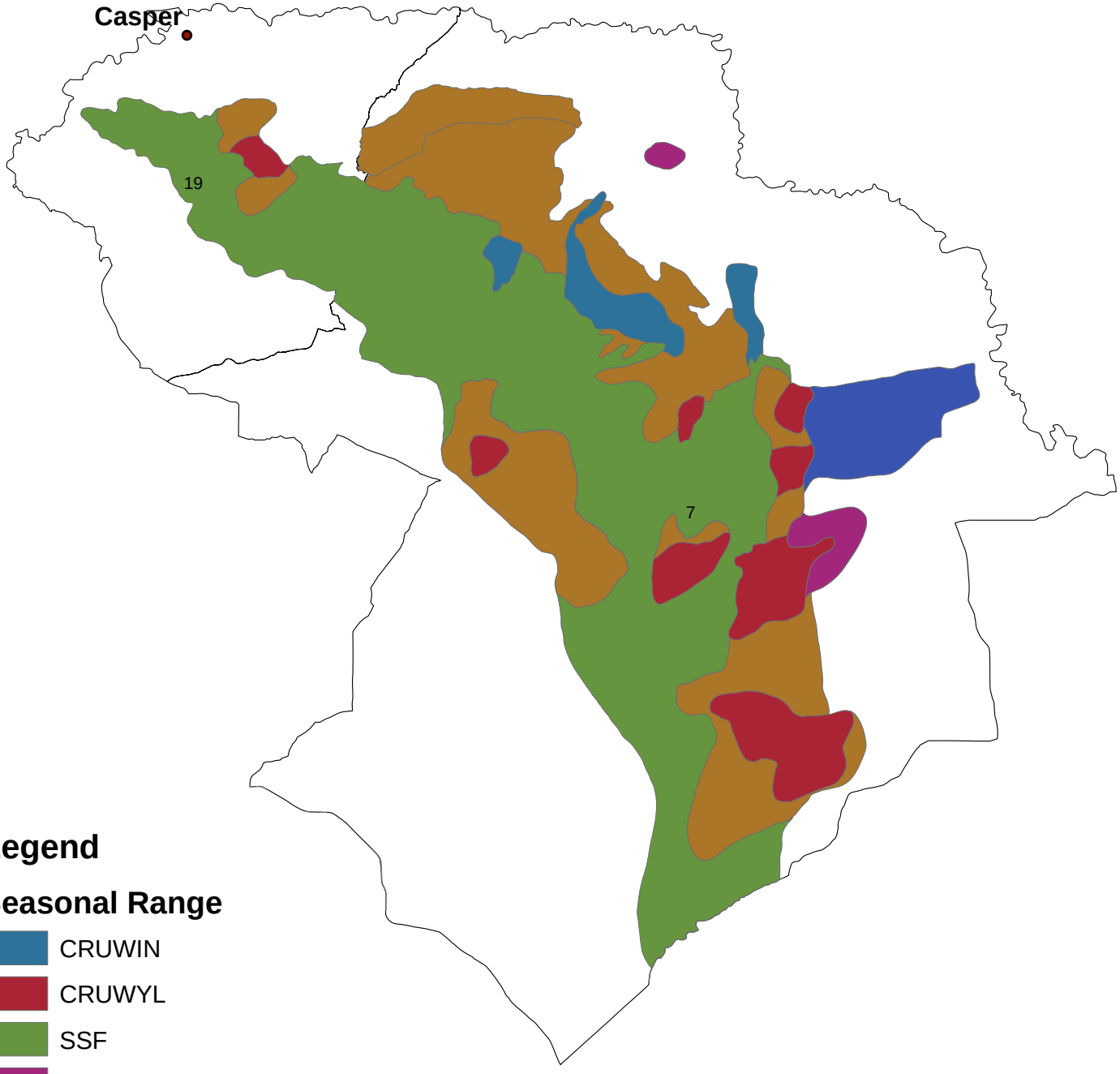
Year	**1**	**2-5**	**6-10**	**11-12**	**13+**	**N**	**Avg Age**
1997	8	22	6	3	0	39	**4.38**
1998	3	36	17	2	2	60	**4.90**
1999	14	66	25	11	5	121	**5.02**
2000	19	77	27	7	5	135	**4.61**
2001	11	65	32	6	1	115	**4.84**
2004	8	33	14	1	0	56	**4.27**
2005	26	108	55	10	9	208	**5.16**
2007	4	57	34	7	6	108	**5.97**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

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

Figure 3. Antler classification of bull elk from the Laramie Peak/Muddy Mountain Herd Unit, 2008-2014.

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

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



Legend

Seasonal Range

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

2014 - JCR Evaluation Form

SPECIES: Elk

PERIOD: 6/1/2014 - 5/31/2015

HERD: EL742 - RATTLESNAKE

HUNT AREAS: 23

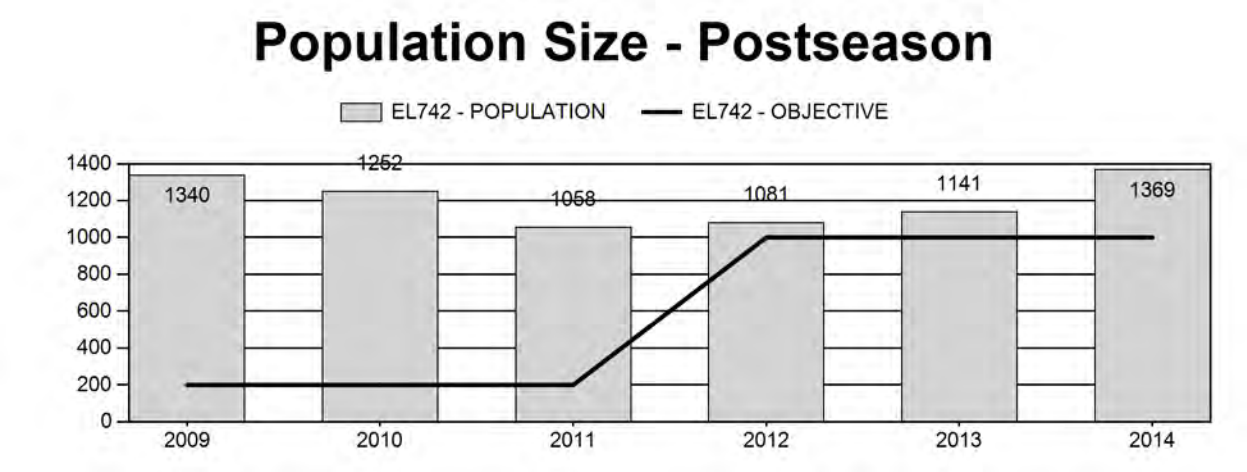
PREPARED BY: HEATHER O'BRIEN

	2009 - 2013 Average	2014	2015 Proposed
Population:	1,174	1,369	1,273
Harvest:	155	210	170
Hunters:	353	374	360
Hunter Success:	44%	56%	47%
Active Licenses:	374	411	400
Active License Success:	41%	51%	42%
Recreation Days:	3,173	3,587	3,200
Days Per Animal:	20.5	17.1	18.8
Males per 100 Females	42	180	
Juveniles per 100 Females	37	56	

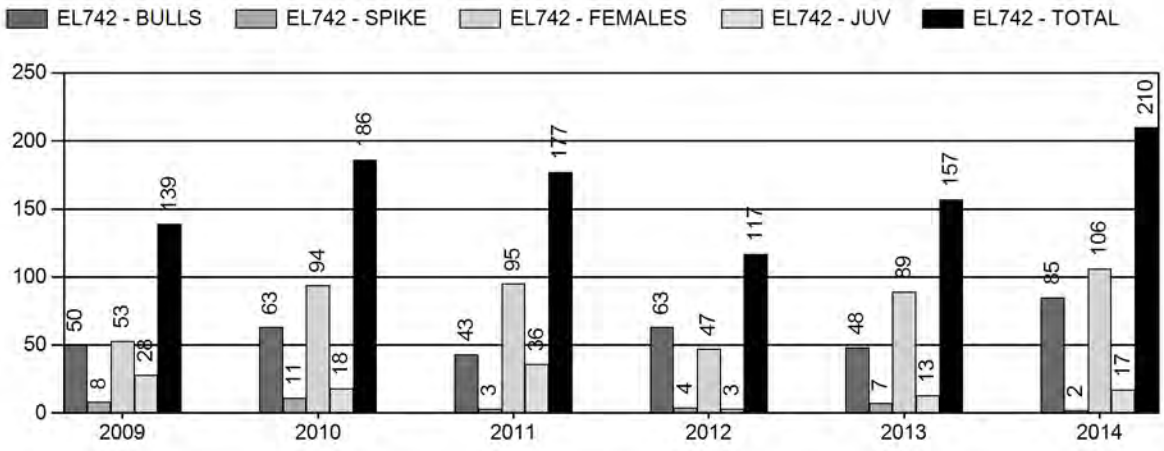
Population Objective (± 20%) :	1000 (800 - 1200)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	37%
Number of years population has been + or - objective in recent trend:	24
Model Date:	3/10/2015

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

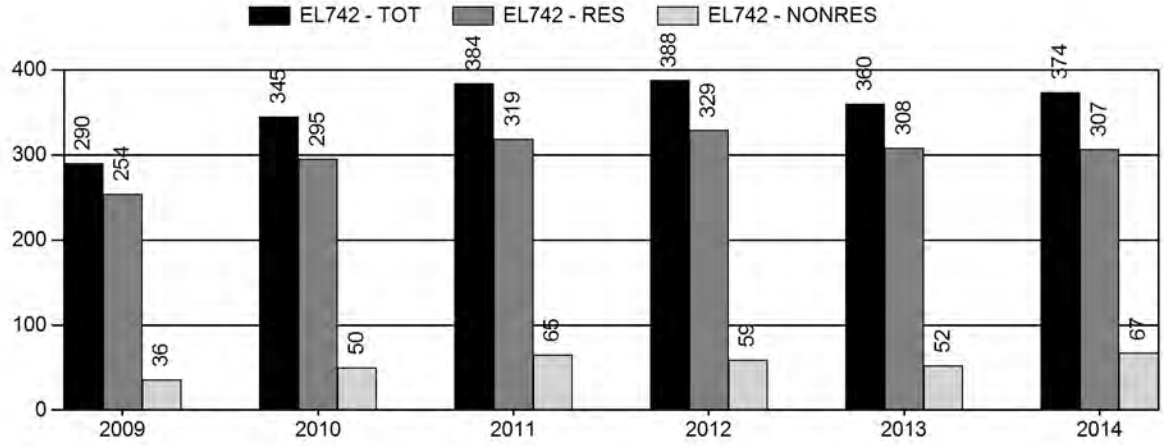
	JCR Year	Proposed
Females ≥ 1 year old:	12.0%	11.1%
Males ≥ 1 year old:	21.5%	18.1%
Juveniles (< 1 year old):	5.4%	5.2%
Total:	13.1%	11.6%
Proposed change in post-season population:	-9.2%	-7.0%



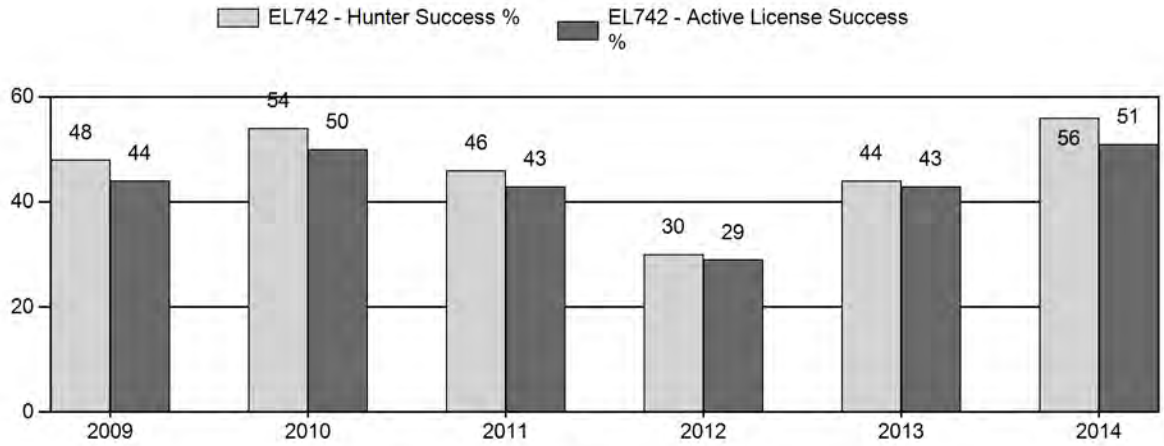
Harvest



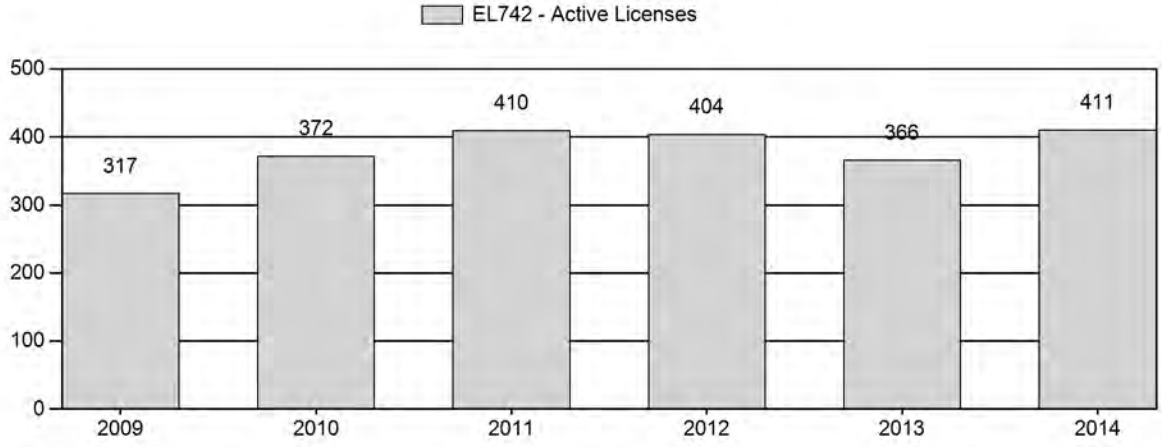
Number of Hunters



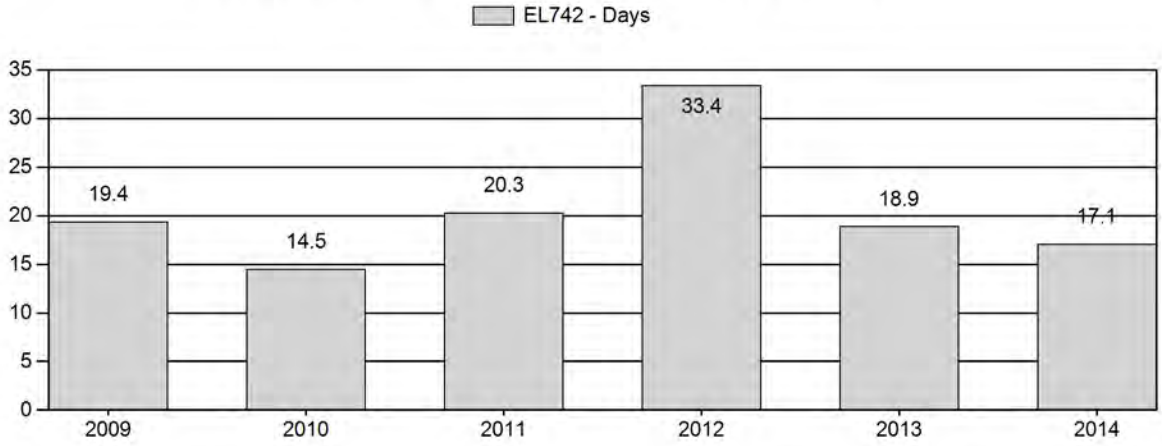
Harvest Success



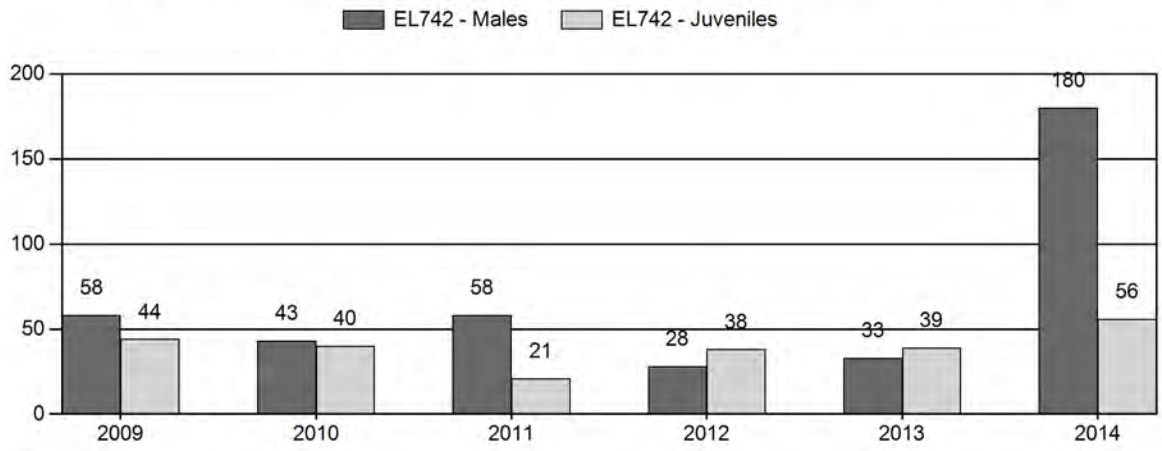
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2008 - 2014 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	Yling	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2008	1,286	38	34	72	21%	195	58%	68	20%	335	375	19	17	37	± 6	35	± 5	25
2009	1,340	27	84	111	29%	192	49%	85	22%	388	579	14	44	58	± 7	44	± 6	28
2010	1,252	24	47	71	23%	166	55%	66	22%	303	415	14	28	43	± 7	40	± 6	28
2011	1,058	17	90	107	32%	185	56%	38	12%	330	443	9	49	58	± 7	21	± 4	13
2012	1,081	26	32	58	17%	204	60%	77	23%	339	384	13	16	28	± 4	38	± 5	29
2013	1,141	26	102	128	19%	390	58%	153	23%	671	479	7	26	33	± 3	39	± 3	30
2014	1,360	35	113	148	54%	82	30%	46	17%	276	406	43	138	180	± 28	56	± 12	20

2015 HUNTING SEASONS
RATTLESNAKE ELK (EL742)

Hunt Area	Type	Season Dates Opens	Season Dates Closes	Quota	License	Limitations
23	1	Oct. 1	Oct. 31	125	Limited quota	Any elk
		Nov. 15	Dec. 15			Unused Area 23 Type 1 license
	4	Oct. 1	Oct. 31	125	Limited quota	Antlerless elk
		Nov. 15	Dec. 15			Unused Area 23 Type 4 license, also valid in Area 128
	6	Oct. 1	Oct. 31	200	Limited quota	Cow or calf
		Nov. 15	Dec. 15			Unused Area 23 Type 6 licenses, also valid in Area 128
	7	Dec. 1	Dec. 15	25		Cow or calf, also valid in Area 128
Archery						Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2014
23	1	0
	4	0
	6	0
	7	+25

Management Evaluation

Current Postseason Population Management Objective: 1,000

Management Strategy: Recreational

2014 Postseason Population Estimate: 1,400

2015 Proposed Postseason Population Estimate: 1,300

2014 Hunter Satisfaction: 68% Satisfied, 21% Neutral, 12% Dissatisfied

The Rattlesnake Elk Herd Unit has a postseason population management objective of 1,000 elk. The herd is managed using the recreational management strategy, with a goal of maintaining postseason bull ratios of 15-29 bulls per 100 cows. The objective and management strategy were revised in 2012 from a postseason population objective of 200 to 1,000 elk. The old objective was antiquated, unreasonable, and inadequate to meet the expectations of hunters, landowners, and managers.

Herd Unit Issues

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

Weather

The winter of 2010-2011 was severe throughout the herd unit, although no significant elk mortality was detected. Conditions were warm and dry for the herd unit in 2011 and forage production was below average. Snow pack and resulting spring moisture were below average for the winter of 2011-2012 which likely had a negative impact on lactating cows and their calves. The summer of 2012 was the driest on record since 1904 in much of Wyoming, and the winter of 2012 continued the trend with very low snow accumulation and snow pack. The spring of 2013 was cool with significant precipitation, and average rainfall over the summer as well. Still, habitat conditions appeared to be poor for much of the growing season. Heavy precipitation during the fall of 2013 caused a beneficial late green-up, but also made travel very difficult for hunters. The 2013-2014 winter brought temperature and precipitation conditions near the recent 30-year average, and the growing season of 2014 brought a much-needed break in drought conditions. Grass and forb growth was excellent, making 2014 the best growing season the region had seen in years. The spring and summer of 2014 undeniably produced improved range conditions that benefitted elk. For detailed weather data see http://www.ncdc.noaa.gov/gac/time-series/us.

Habitat

This herd unit has no established habitat transects that measure production and/or utilization on vegetation that are preferred by elk. Anecdotal observations and discussions with landowners in the region indicate that summer and winter forage availability for elk was very good in 2014. Herbaceous forage species were observed to be in very good condition in 2014 compared to previous years, and elk appeared to be in excellent body condition by winter 2014. Healthier range conditions may have also improved distribution of elk, and in turn influenced higher harvest success observed in 2014.

Field Data

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

Observed bull ratios are also highly erratic as a result of variable survey conditions and levels of effort from year to year. Since 2001, observed bull ratios have ranged from as low as 13 to as high as 58 per 100 cows. Years with low observed bull ratios were followed by years with much higher observed ratios; indicating bulls were likely missed during classification surveys in some years, or elk are immigrating/emigrating to and from adjacent hunt areas. 2014 classification results were highly skewed in favor of bulls, as large cow/calf groups were missed during survey flights. Again, license issuance and season structure changes in this herd are not typically made based on observed bull ratios. Instead, seasons are designed to maximize cow harvest and maintain relatively good license success without overcrowding hunters.

Harvest Data

License success in this herd unit is typically in the 40^{th} percentile and is fairly consistent, indicating that opportunity has remained relatively similar across years. Hunter days per animal fluctuate from year to year, but this may be a function of changes in access due to weather and road conditions. The persistence of unattainable elk in the aforementioned private land refugia most certainly contributes to increased hunter days and reduced harvest success in most years. In 2014, weather conditions were mostly favorable and access to elk was good. This was reflected in improved overall harvest success of 56%, which is the highest harvest success since 1996. The new split season in 2013 & 2014 also facilitated movement of elk off of private refugia. Elk have moved off refuge areas on private land and back onto public during the closure in both

years. Late-season licenses were also valid for use in the adjacent Hunt Area 128. Field personnel continue to receive positive comments from hunters and landowners who are pleased with both of these changes to the hunting season. Overall harvest has increased significantly in 2013 & 2014 compared to previous years, and was the highest on record in 2014 .

Population

The 2014 postseason population estimate was approximately 1,400 and decreasing. Postseason classification data and harvest data are applied to the model to predict population size and trends for this herd. No sightability or other population estimate data are currently available to further align the model.

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

Management Summary

Opening day of hunting season in this herd is traditionally October 1st, and closing dates have differed with changing harvest prescriptions from year to year. Season structure has also changed to include a split season in recent years, in an attempt to maximize cow harvest. For 2013 & 2014, season dates were also extended significantly for bull hunting. Total elk harvested was the highest on record in 2014, and harvest success was at an 18-year high. Since this has worked well, the same season is being implemented for 2015, with the addition of 25 late-season

cow/calf licenses. Goals for 2015 are to continue high harvest pressure on cows, extend late-season cow hunting opportunity, continue extended opportunity to hunt bulls, and maintain/improve overall harvest success.

If we attain the projected harvest of approximately 170 elk and assuming average calf production/survival, this herd will decrease to slightly above objective. The predicted 2015 postseason population estimate for the Rattlesnake Elk Herd is approximately 1,300 animals, or 30% above objective.

INPUT	
Species:	Elk
Biologist:	Heather O'Brien
Herd Unit & No.:	Rattlesnake
Model date:	02/27/15

☐ Clear form

MODELS SUMMARY		Fit	Relative AICc	Check best model to create report	Notes
CJ,CA	**Constant Juvenile & Adult Survival**	346	355	☑ CJ,CA Model	
SCJ,SCA	**Semi-Constant Juvenile & Semi-Constant Adult Survival**	371	380	☐ SCJ,SCA Mod	
TSJ,CA	**Time-Specific Juvenile & Constant Adult Survival**	203	329	☐ TSJ,CA Model	
TSJ,CA,MSC	**Time-Specific Juv, Constant Adult Survival, Male survival coefficient**	189	327	☐ TSJ,CA,MSC Model	

Population Estimates from Top Model

Year	Posthunt Population Est.		Trend Count	Predicted Prehunt Population			Total	Predicted Posthunt Population			Total	Objective
	Field Est	Field SE		Juveniles	Total Males	Females		Juveniles	Total Males	Females		
1993				291	136	872	1299	284	98	852	1234	200
1994				462	153	892	1506	457	114	881	1452	200
1995				362	203	955	1520	361	166	935	1462	200
1996				274	235	989	1498	272	180	967	1418	200
1997				458	231	1002	1690	455	179	972	1606	200
1998				733	266	1043	2043	729	221	1013	1963	200
1999				352	363	1138	1853	343	323	1052	1718	200
2000				487	385	1100	1972	455	308	1011	1774	200
2001				269	393	1082	1744	245	323	1020	1587	200
2002				363	365	1049	1777	341	311	997	1649	200
2003				461	373	1045	1879	450	322	1003	1775	200
2004				405	405	1073	1884	395	338	1024	1757	200
2005				559	410	1082	2052	552	355	1061	1968	200
2006			786	411	458	1151	2020	398	394	1066	1857	200
2007			544	330	465	1124	1920	317	397	1046	1760	200
2008			385	359	453	1089	1900	354	371	1016	1741	200
2009			858	477	435	1066	1978	446	371	1008	1825	200
2010			899	407	453	1077	1937	387	371	974	1732	200
2011			1037	233	441	1032	1706	188	390	916	1494	200
2012			912	337	419	936	1692	334	346	884	1563	1000
2013				342	406	933	1680	328	345	835	1508	1000
2014			957	312	404	884	1600	293	308	767	1369	1000
2015				289	360	811	1460	272	289	712	1273	1000
2016												1000
2017												1000
2018												1000
2019												1000
2020												1000
2021												1000
2022												
2023												
2024												
2025												

Survival and Initial Population Estimates

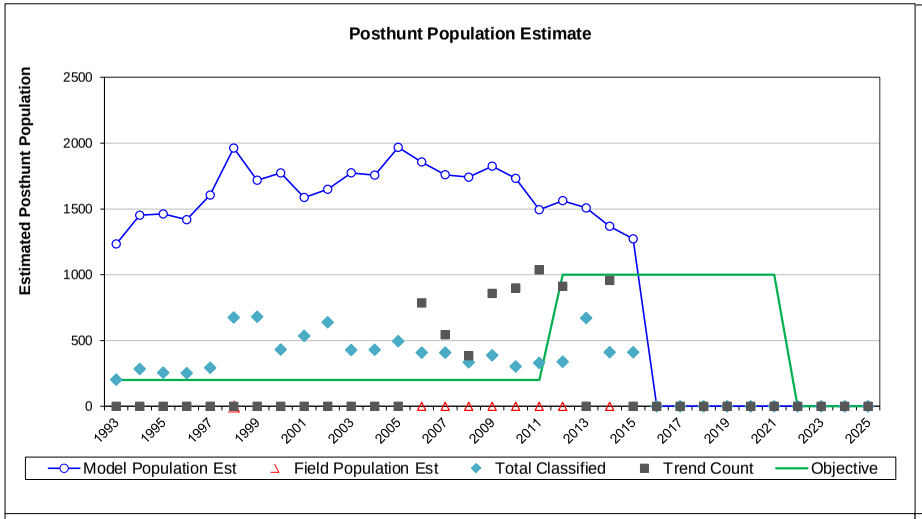
Year	Annual Juvenile Survival Rates			Annual Adult Survival Rates		
	Model Est	Field Est	SE	Model Est	Field Est	SE
1993	0.40			0.98		
1994	0.40			0.98		
1995	0.40			0.98		
1996	0.40			0.98		
1997	0.40			0.98		
1998	0.40			0.98		
1999	0.40			0.98		
2000	0.40			0.98		
2001	0.40			0.98		
2002	0.40			0.98		
2003	0.40			0.98		
2004	0.40			0.98		
2005	0.40			0.98		
2006	0.40			0.98		
2007	0.40			0.98		
2008	0.40			0.98		
2009	0.40			0.98		
2010	0.40			0.98		
2011	0.40			0.98		
2012	0.40			0.98		
2013	0.40			0.98		
2014	0.40			0.98		
2015	0.40			0.98		
2016						
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						

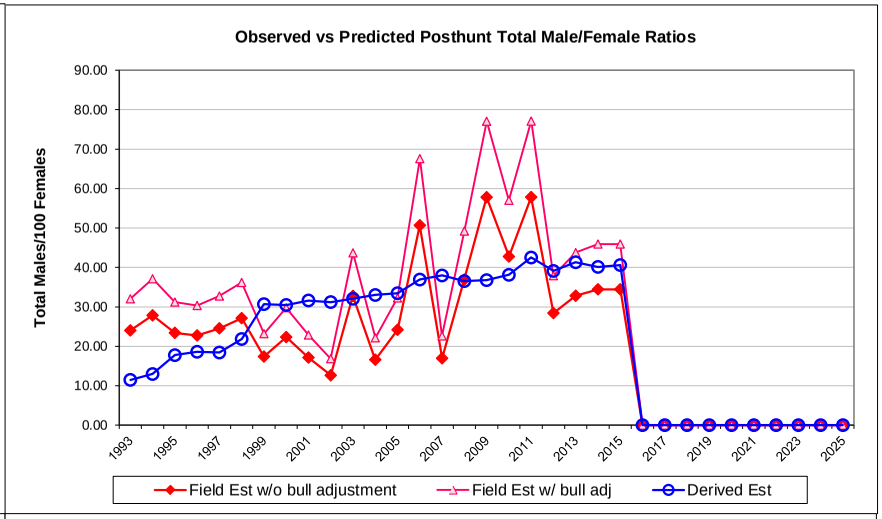
Parameters:	Optim cells
Juvenile Survival =	0.400
Adult Survival =	0.980
Initial Total Male Pop/10,000 =	0.010
Initial Female Pop/10,000 =	0.085

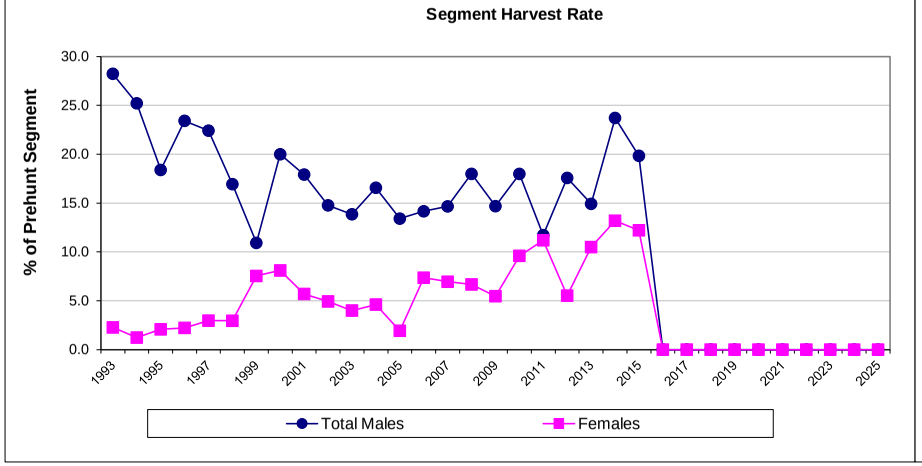
MODEL ASSUMPTIONS	
Sex Ratio (% Males) =	50%
Wounding Loss (total males) =	10%
Wounding Loss (females) =	10%
Wounding Loss (juveniles) =	10%
Total Bulls Adjustment Factor	75%

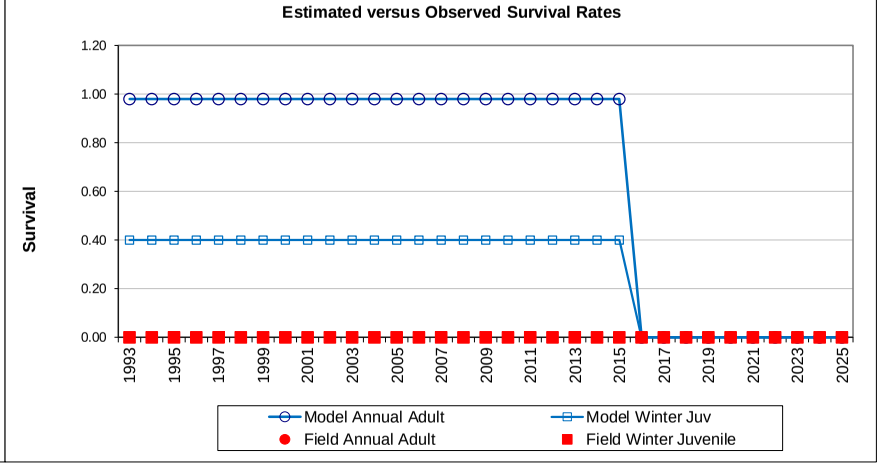
Year	Classification Counts: Juvenile/Female Ratio			Classification Counts: Total Male/Female Ratio				Harvest					Segment Harvest Rate (% of Prehunt Segment)	
	Derived Est	Field Est	Field SE	Derived Est	Field Est w/ bull adj	Field Est w/o bull adj	Field SE	Juv	Yrl males	2+ Males	Females	Total Harvest	Total Males	Females
1993		33.33	5.87	11.48	32.04	24.03	4.81	6	10	25	18	59	28.2	2.3
1994		51.90	7.06	12.97	37.13	27.85	4.75	4	5	30	10	49	25.2	1.2
1995		38.61	5.82	17.75	31.22	23.42	4.28	1	10	24	18	53	18.4	2.1
1996		28.14	4.65	18.61	30.34	22.75	4.09	2	13	37	20	72	23.4	2.2
1997		46.78	6.34	18.41	32.75	24.56	4.23	3	28	19	27	77	22.4	3.0
1998		71.98	6.04	21.85	36.18	27.14	3.19	4	4	37	28	73	16.9	3.0
1999		32.60	3.09	30.69	23.20	17.40	2.12	8	5	31	78	122	10.9	7.5
2000		45.00	5.03	30.48	29.79	22.34	3.26	29	0	70	81	180	20.0	8.1
2001		24.01	2.80	31.62	22.87	17.15	2.30	22	11	53	56	142	17.9	5.7
2002		34.25	3.25	31.22	16.86	12.64	1.81	20	4	45	47	116	14.8	4.9
2003		44.81	5.19	32.04	43.71	32.78	4.25	10	16	31	38	95	13.9	4.0
2004		38.63	4.40	33.01	22.14	16.61	2.64	9	6	55	45	115	16.6	4.6
2005		51.96	5.30	33.47	32.27	24.20	3.27	7	2	48	19	76	13.4	1.9
2006		37.33	4.86	36.92	67.59	50.69	5.93	12	2	57	77	148	14.2	7.4
2007		30.32	3.78	37.96	22.62	16.97	2.68	12	0	62	71	145	14.7	6.9
2008		34.87	4.91	36.53	49.23	36.92	5.09	4	0	74	66	144	18.0	6.7
2009		44.27	5.77	36.78	77.08	57.81	6.89	28	8	50	53	139	14.7	5.5
2010		39.76	5.79	38.12	57.03	42.77	6.07	18	11	63	94	186	18.0	9.6
2011		20.54	3.66	42.51	77.12	57.84	7.02	41	3	44	105	193	11.7	11.2
2012		37.75	5.05	39.11	37.91	28.43	4.23	3	4	63	47	117	17.6	5.5
2013		39.23	3.74	41.31	43.76	32.82	3.34	13	7	48	89	157	14.9	10.5
2014		38.24	4.71	40.13	45.94	34.45	4.41	17	2	85	106	210	23.7	13.2
2015		38.24	4.71	40.60	45.94	34.45	4.41	15	5	60	90	170	19.8	12.2
2016														
2017														
2018														
2019														
2020														
2021														
2022														
2023														
2024														
2025														

FIGURES



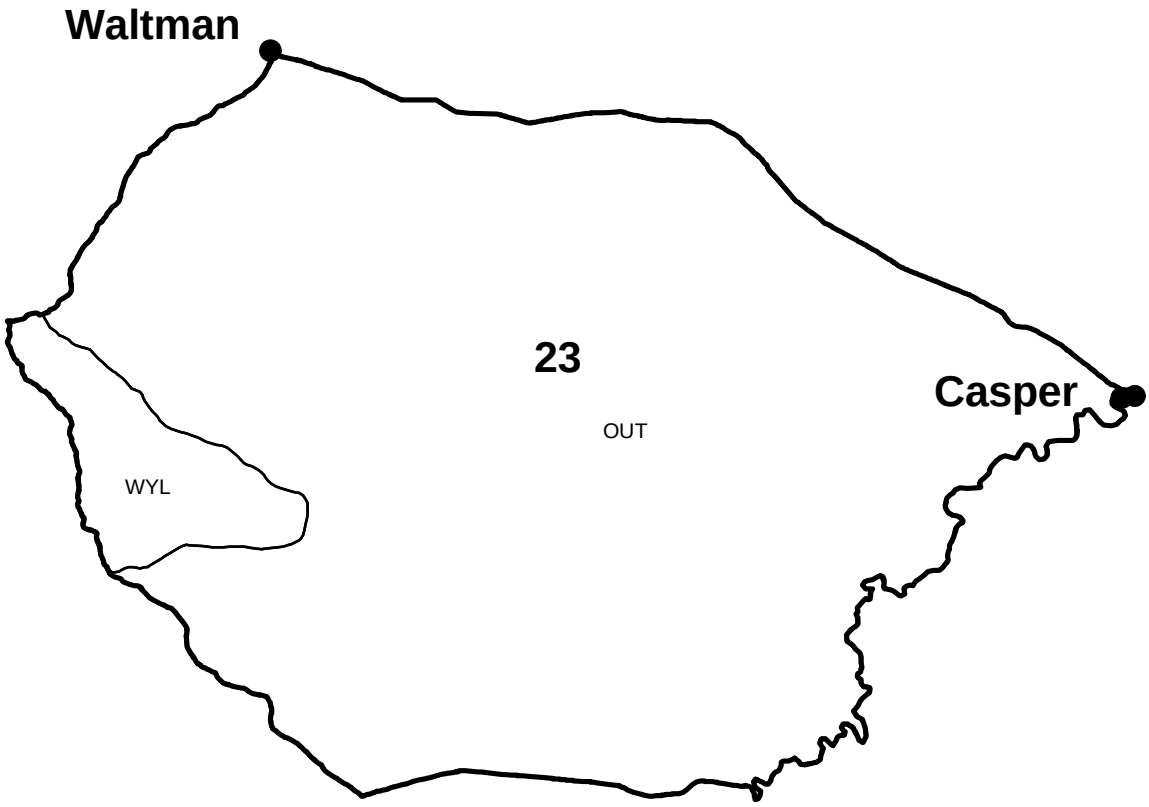






Comments:

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

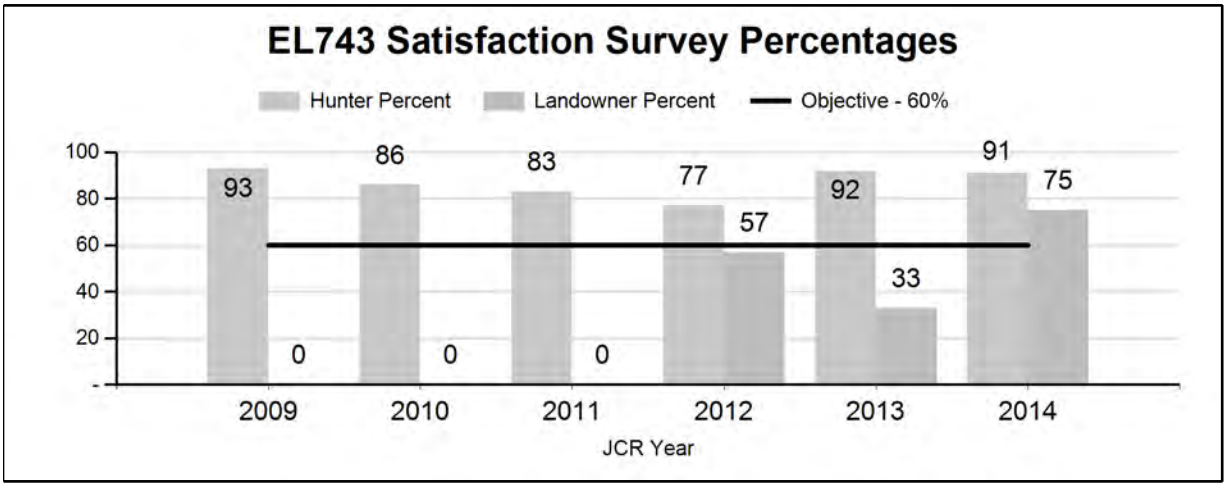


2014 - JCR Evaluation Form

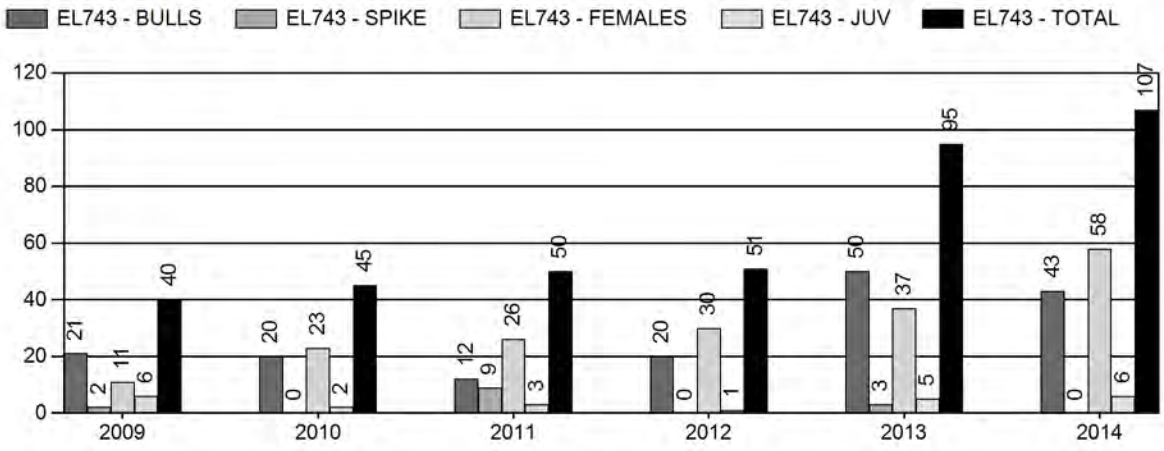
SPECIES: Elk
PERIOD: 6/1/2014 - 5/31/2015
HERD: EL743 - PINE RIDGE
HUNT AREAS: 122
PREPARED BY: WILLOW HIBBS

	2009 - 2013 Average	2014	2015 Proposed
Hunter Satisfaction Percent	87%	91%	90%
Landowner Satisfaction Percent	46%	75%	75%
Harvest:	56	107	120
Hunters:	78	136	150
Hunter Success:	72%	79%	80%
Active Licenses:	83	143	155
Active License Success:	67%	75%	77%
Recreation Days:	380	629	750
Days Per Animal:	6.8	5.9	6.2
Males per 100 Females:	0	0	
Juveniles per 100 Females	0	0	

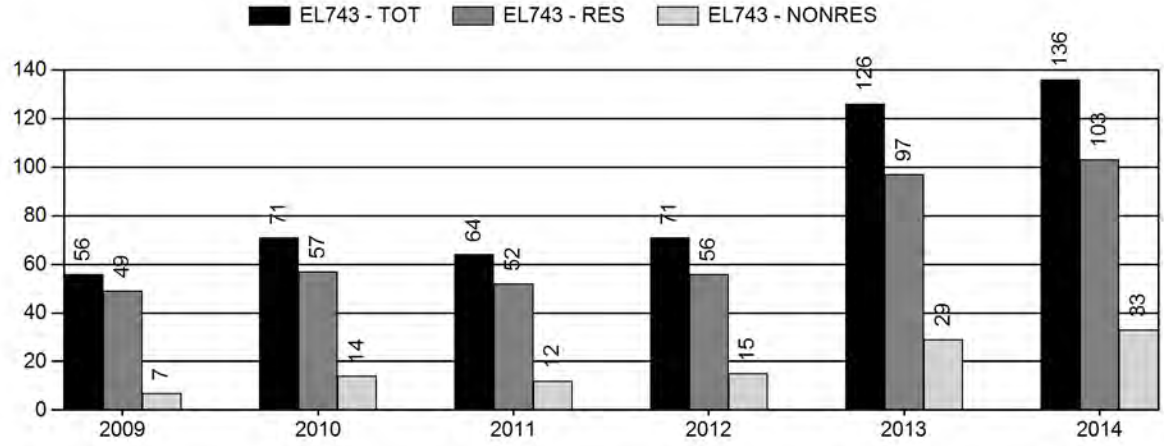
Satisfaction Based Objective	60%
Management Strategy:	Private Land
Percent population is above (+) or (-) objective:	23%
Number of years population has been + or - objective in recent trend:	0



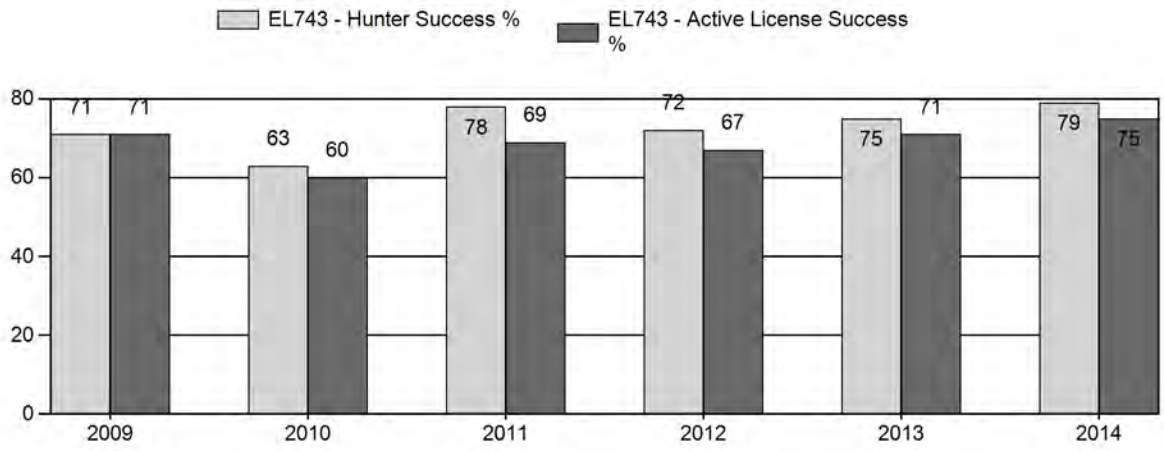
Harvest



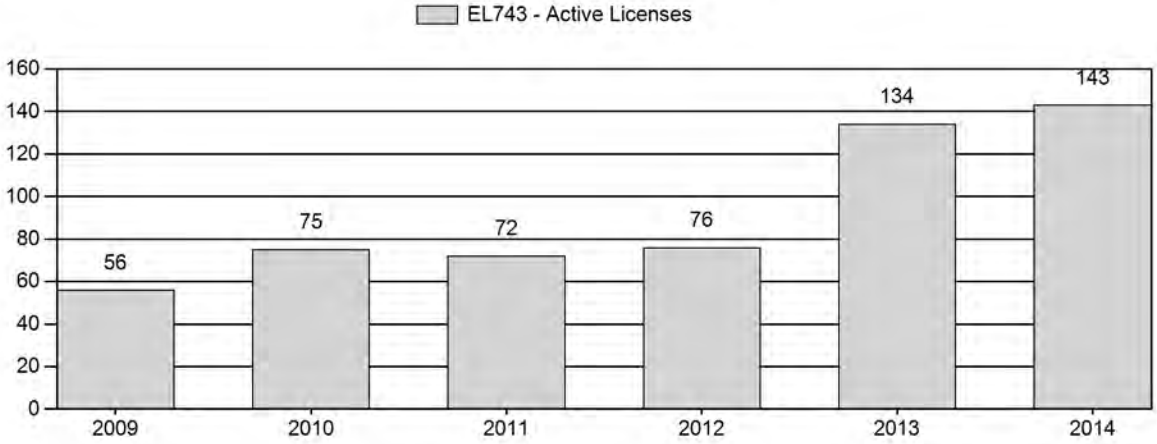
Number of Hunters



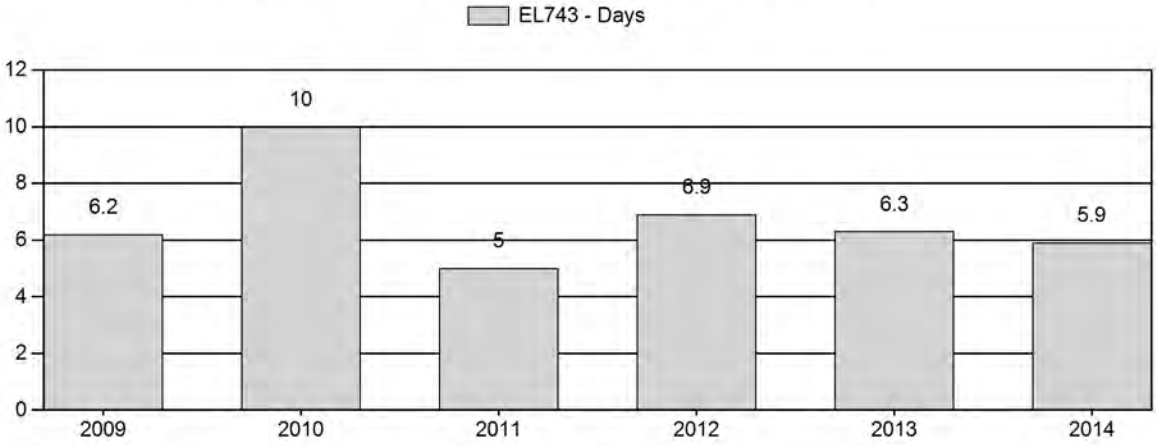
Harvest Success



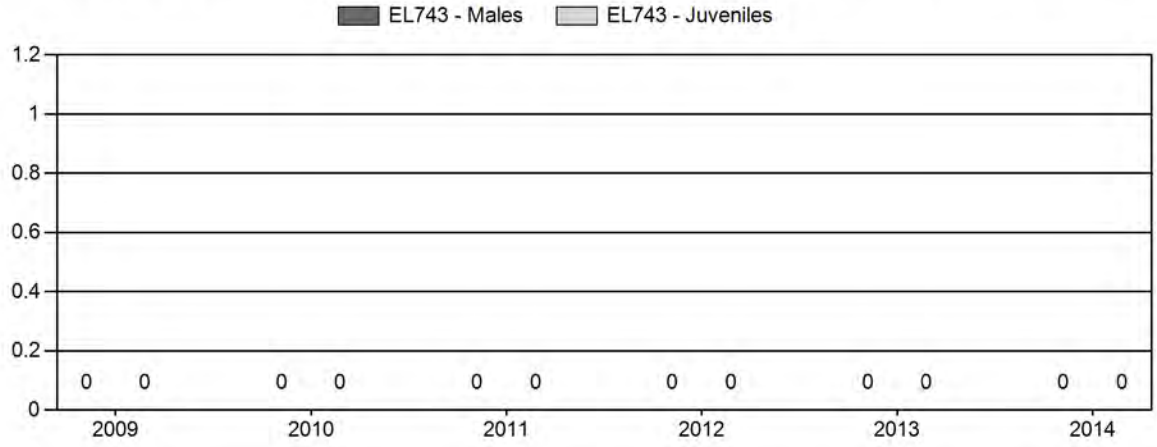
Active Licenses



Days per Animal Harvested



Postseason Animals per 100 Females



2015 HUNTING SEASONS
PINE RIDGE ELK HERD (EL743)

Hunt Area	Type	Date of Seasons Opens	Closes	Quota	License	Limitations
122	1	Oct. 15	Nov. 30	75	Limited quota	Any elk
		Dec. 1	Dec. 15			Unused Area 122 Type 1 licenses valid for antlerless elk
	6	Oct. 15	Dec. 15	125	Limited quota	Cow or calf
Archery		Sep. 1	Sep. 30			Refer to license and type limitations in Section 2

Hunt Area	Type	Quota change from 2014
122	6	+25

Management Evaluation

Current Hunter/Landowner Satisfaction Management Objective: 60% hunter/landowner satisfaction; bull quality
Management Strategy: Private Land
2014 Hunter Satisfaction Estimate: 89%
2014 Landowner Satisfaction Estimate: 75%
Most Recent 3-year Running Average Hunter Satisfaction Estimate: 86%
Most Recent 3-year Running Average Landowner Satisfaction Estimate: 55%

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

Herd Unit Issues

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

expressed complete satisfaction with elk numbers and management. However, this past year, some landowners have begun to express concern regarding elk numbers and associated issues such as fence damage, competition with livestock, and access to elk during the hunting season. As a result, the Department again held a landowner meeting in February 2015 to discuss elk management on the Pine Ridge (Appendix II: February 2015 Pine Ridge Elk Landowner Meeting Attendance). Despite concerns being voiced by some landowners during routine field contacts, general satisfaction with elk numbers and management direction was again expressed by landowners attending this meeting.

Weather & Habitat

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

Field Data

Fixed-wing winter trend counts are conducted in the herd unit as budget and weather conditions allow. Past trend counts of this herd typically found between 150 and 350 elk. In 2013, a winter trend count conducted under optimum conditions found a total of 840 elk, indicating this herd was larger than previously believed. A trend count conducted in February 2014 found a total of 454 elk; however snow conditions were not ideal and elk were difficult to see bedded amongst exposed rocks and shrubs. In February 2015, a trend count yielded only 276 elk despite good survey conditions and thorough coverage. It is assumed the elk moved away from the Pine Ridge prior to the flight. Based on past observations and landowner input, managers still estimate that there are likely 900-1,000 elk in this herd.

Landowner and hunter satisfaction surveys are used to gauge management of the Pine Ridge Elk Herd. Annual survey results must show that at least 60% of hunters were either "satisfied" or "very satisfied" with the previous year's hunting season. In addition, landowner surveys must show that at least 60% or more respondents are satisfied with elk numbers in their area (Appendix I: 2014 Pine Ridge Elk Landowner Survey Results). Should these satisfaction thresholds not be met, changes in management should be prescribed to address reasons for dissatisfaction. A secondary objective is also used in the Pine Ridge Elk Herd Unit to anchor the results of satisfaction surveys to a population parameter. In this case, age class targets are determined from the harvest survey and used as a measure of bull quality. The percentage of mature branch-antlered bulls in the male portion of the annual harvest is used, with a 3-year trend average of 60% minimum being the threshold for management action. In 2014, 75% of

landowners (N=5) believed the elk herd to be “at or about at desired levels”, while 89% of hunters who returned surveys were “satisfied” or “very satisfied” with their hunting experience in the Pine Ridge Elk Herd Unit. Unfortunately, landowner survey response rates have been very poor the past two years. As a result, field personnel will continue to make concerted efforts to increase landowner outreach to better gauge their desired management approach. For the secondary objective, the three-year average for mature bulls in the harvest was 98%. Landowner satisfaction, hunter satisfaction, and the percentage of mature bulls in the harvest all exceeded the 60% threshold for bio-year 2014.

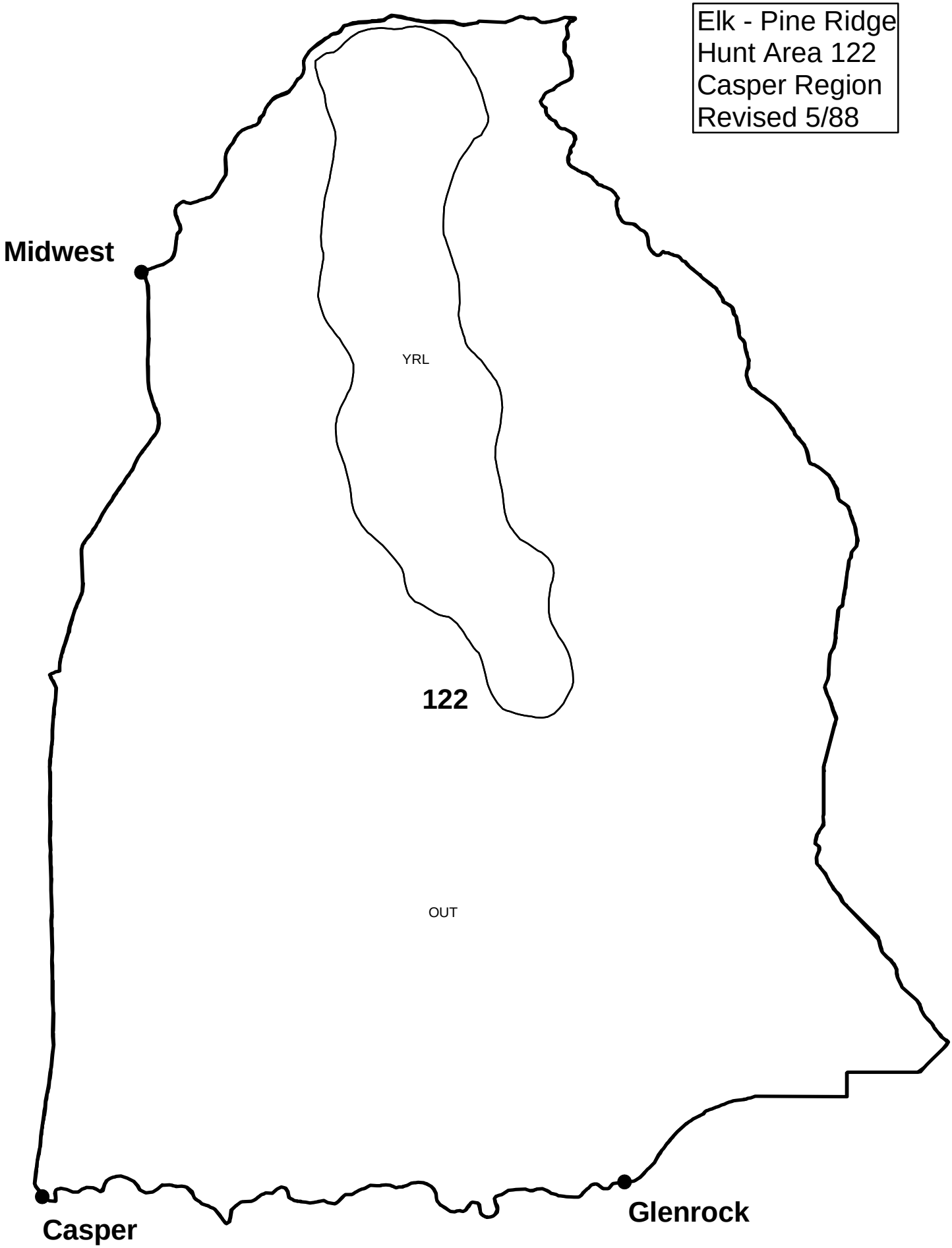
Harvest Data

Hunter success in this herd unit is typically in the 50-70th percentile and fluctuates with access and license issuance. Hunter success has remained high for the last 5 years, but in the past, antlerless elk licenses have typically remained undersubscribed as landowners have been unwilling to allow access for cow hunters. While a majority of cow licenses were available as leftovers in 2014, they were all eventually sold. This is most likely due to increased efforts by landowners to harvest cow elk. The harvest survey reports a harvest of 58 cows; however, during the 2015 landowner meeting, over 80 harvested cows were accounted for based on landowner recollection. Due to a newfound willingness to allow more cow hunting, landowners requested an increase in Type 6 licenses in an attempt to better manage this herd and maintain it at current levels.

Perceived loss of bull quality was also a concern amongst certain landowners in the past. While some landowners initially requested a reduction in Type 1 licenses to address bull quality within the survey, those landowners attending the 2015 meeting agreed that bull quality was still high and that the 2014 quota of 75 was desirable.

Management Summary

The hunting season in this herd unit opens on October 15th following the close of deer seasons. In more recent years, closing dates have been extended as landowners have agreed to somewhat liberalize access for cow elk hunting later in the season. Similar season dates will be used for 2015 and Type 1 license issuance will remain at 75. Type 6 license issuance was increased by 25 to accommodate increased access now being provided by landowners.


Elk - Pine Ridge
Hunt Area 122
Casper Region
Revised 5/88
Midwest
YRL
122
OUT
Casper
Glenrock

APPENDIX I:
2014 PINE RIDGE ELK LANDOWNER SURVEY RESULTS

2014 Satisfaction w/ Pine Ridge Elk Population Size	2015 Bull Hunting Recommendation	2015 Antlerless Hunting Recommendation	2015 Season Length Recommendation	Additional Comments
At or about at desired levels	Less licenses	About the same licenses	Extended season length (earlier)	We should lengthen the season and give fewer tags. This should allow for more elk being harvested without the problem of people drawing tags without permission to hunt. I strongly oppose giving out more tags, it only creates more problems.
Left blank	Less licenses	More licenses	Extended season length (for cows)	I don't think the numbers of elk can be controlled by taking more bulls. The quality of bulls has decreased and the number of cows have greatly increased to the extent they are now ranging to Hwy 387 and causing traffic problems.
At or about at desired levels	Less licenses (less resident, more non-resident)	More licenses	The same season length	
Above desired levels	More licenses	More licenses	Shorter season length	We are having trespass problems and hunter vandalism/ property damage. This year we had two gates damaged and one cow killed during the season. Poor behavior by sportsmen makes it difficult to allow more hunting. We need alternatives to hunting to control the population of elk.
At or about at desired levels	Less licenses	More licenses	Shorter season length (Nov 1 – Nov 30 Bulls; Nov 1 – Dec 14 Cows)	Less G&F input; they tell hunters there's lots of elk and leave out that it's hard to access.

SURVEY TOTALS (population size)	
At or about at	3
Above	1
Below	0
Total	4
% At or about at	**75%**
% Above	**25%**

APPENDIX II:
FEBRUARY 2015 PINE RIDGE ELK LANDOWNER MEETING ATTENDANCE

PLEASE SIGN IN!

PINE RIDGE ELK
Landowner Meeting
February, 2015

ATTENDANCE

NAME	ADDRESS
Shannon Wheeler Perri Wheeler	P.O Box 270 Edgerton. WY. 82635
Scott Hornbuckle	1558 Ross Rd. Douglas, WY 82633
Doug Cooper	1025 S. Durbin Casper, WY 82601
Josh Moore	4095 Ross Rd Douglas WY 82633
Kerri Paddock	2421 Ross Rd Douglas WY 82633
Keith Moore	3493 Ross Road Douglas, WY 82633
David Moore	3493 Ross rd Douglas, WY 82633
Bart & Gaylynn Byrd	2775 Ross Rd, Douglas, WY 82633