

2018 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2018 - 5/31/2019

HERD: PR745 - RATTLESNAKE

HUNT AREAS: 70-72

PREPARED BY: HEATHER O'BRIEN

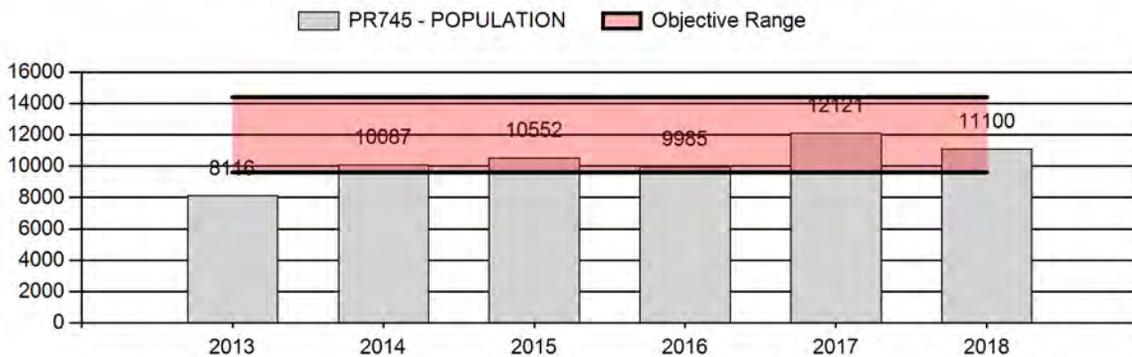
	<u>2013 - 2017 Average</u>	<u>2018</u>	<u>2019 Proposed</u>
Population:	10,172	11,100	10,165
Harvest:	544	821	1,215
Hunters:	582	822	1,300
Hunter Success:	93%	100%	93%
Active Licenses:	655	936	1,400
Active License Success:	83%	88%	87%
Recreation Days:	1,977	2,134	3,900
Days Per Animal:	3.6	2.6	3.2
Males per 100 Females	45	58	
Juveniles per 100 Females	72	66	

Population Objective (± 20%) : 12000 (9600 - 14400)
 Management Strategy: Special
 Percent population is above (+) or below (-) objective: -7.5%
 Number of years population has been + or - objective in recent trend: 2
 Model Date: 02/25/2019

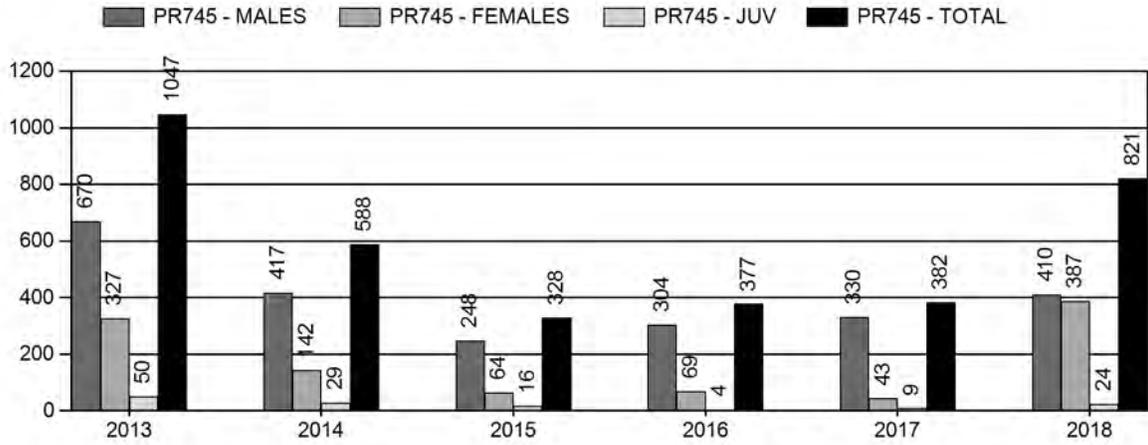
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	8.0%	14.3%
Males ≥ 1 year old:	14.4%	18.5%
Total:	6.8%	10.6%
Proposed change in post-season population:	3.1%	8.4%

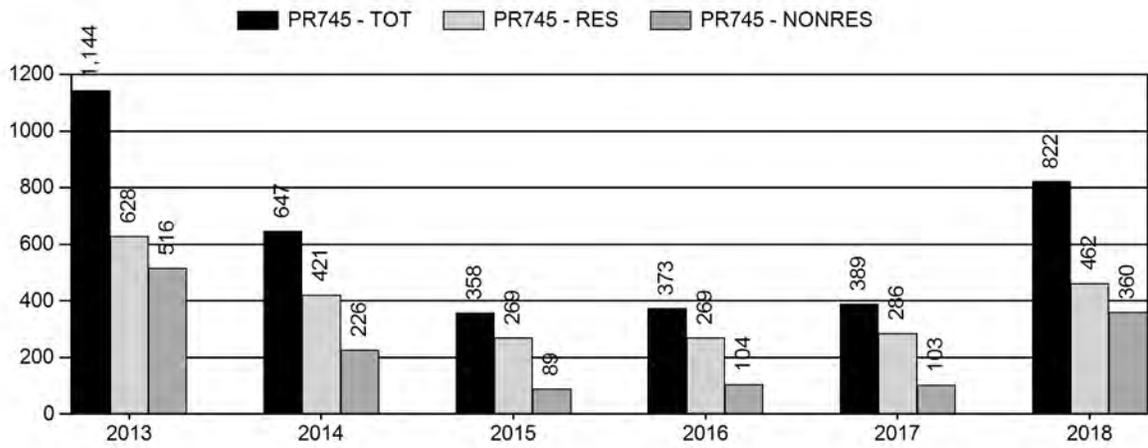
Population Size - Postseason



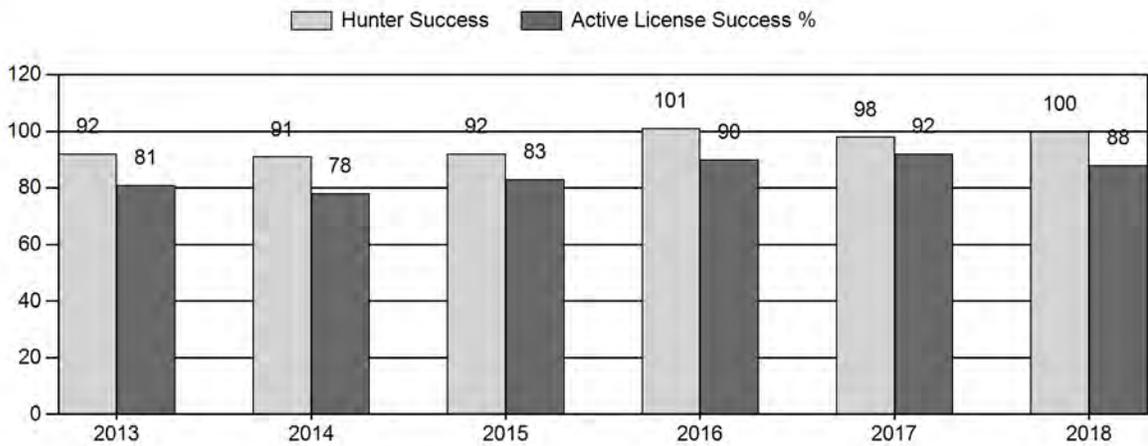
Harvest



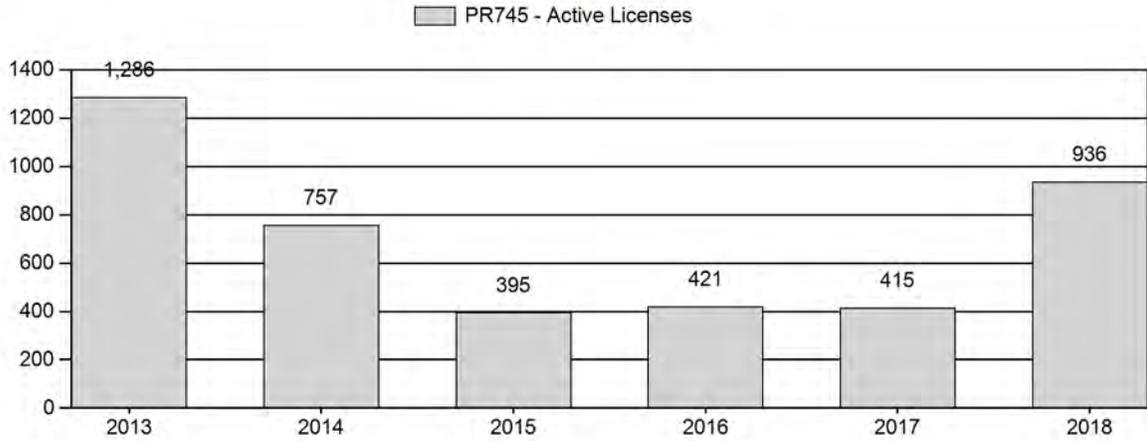
Number of Active Licenses



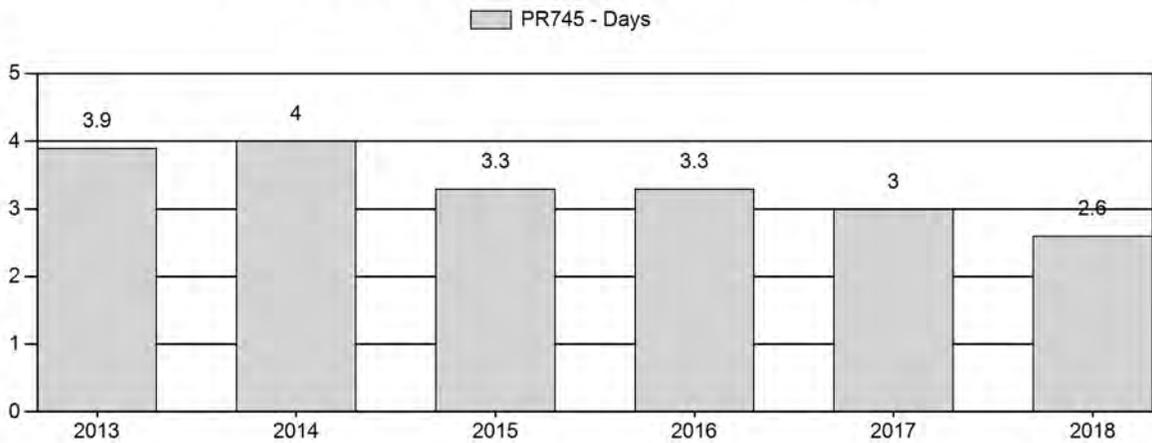
Harvest Success



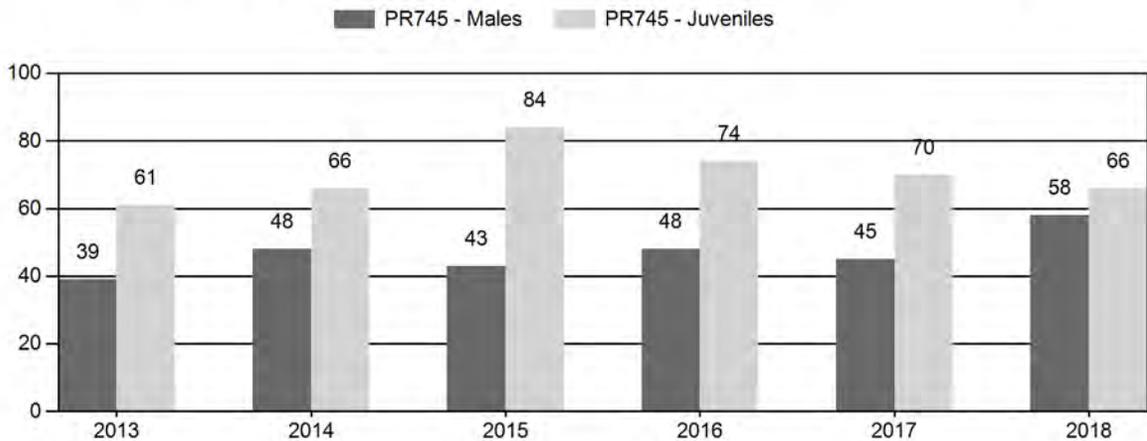
Active Licenses



Days Per Animal Harvested



Preseason Animals per 100 Females



2013 - 2018 Preseason Classification Summary

for Pronghorn Herd PR745 - RATTLESNAKE

Year	Pre Pop	MALES				FEMALES		JUVENILES		Tot CIs	Cls Obj	Males to 100 Females				Young to		
		Ylg	Adult	Total	%	Total	%	Total	%			YIng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2013	9,268	45	199	244	20%	624	50%	381	31%	1,249	1,901	7	32	39	± 5	61	± 6	44
2014	10,921	111	191	302	22%	634	47%	416	31%	1,352	1,734	18	30	48	± 5	66	± 6	44
2015	10,913	160	243	403	19%	947	44%	796	37%	2,146	2,231	17	26	43	± 4	84	± 6	59
2016	10,400	178	281	459	21%	965	45%	711	33%	2,135	2,635	18	29	48	± 4	74	± 5	50
2017	12,541	202	324	526	21%	1,173	46%	824	33%	2,523	2,185	17	28	45	± 3	70	± 5	48
2018	13,130	236	452	688	26%	1,187	45%	785	30%	2,660	2,290	20	38	58	± 4	66	± 4	42

**2019 HUNTING SEASONS
RATTLESNAKE PRONGHORN HERD (PR745)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
70	1	Sep. 15	Oct. 31	100	Limited quota	Any antelope
	6	Sep. 15	Oct. 31	150	Limited quota	Doe or fawn antelope
71	1	Sep. 15	Oct. 31	100	Limited quota	Any antelope
	6	Sep. 15	Oct. 31	50	Limited quota	Doe or fawn antelope
72	1	Sep. 15	Oct. 31	500	Limited quota	Any antelope
	6	Sep. 15	Oct. 31	500	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 2018
70	1	+25
	6	+50
71	1	No Change
	6	No Change
72	1	+100
	6	+200
Total	1	+125
	6	+250

Management Evaluation

Current Management Objective: 12,000

Management Strategy: Special

2018 Postseason Population Estimate: ~11,100

2019 Proposed Postseason Population Estimate: ~10,200

2018 Hunter Satisfaction: 95% Satisfied, 4% Neutral, 1% Dissatisfied

The Rattlesnake Pronghorn Herd Unit has a post-season population management objective of 12,000 pronghorn. The herd is managed using a mix of recreational and special management strategies, with the goal of maintaining preseason buck ratios between 30-59 bucks per 100 does in Area 70, and 60-70 bucks per 100 does in Areas 71 & 72. The objective and management strategy were formerly 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 at a higher level relative to pronghorn densities 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 2018.

The southwest boundary of Area 70 was changed in 2017. The new boundary follows an irrigation canal, and is easier to identify than the former boundary that followed a hydrographic divide. The boundary change also shifts tracts of public lands into Area 69, which has similar proportions of public lands.

Weather

From 2013 to the present, weather trends have been generally favorable, and pronghorn have fared well within the herd. Range conditions were particularly good from 2013 to 2015, when spring and summer moisture improved and winters were mild. The winter of 2015 was fairly average, though some areas experienced prolonged periods of persistent snow. The spring of 2016 had above average precipitation but summer was extremely dry, causing rangeland habitats to cure early. Fortunately, precipitation in October resulted in a late surge of plant growth, which may have provided big game with a boost in nutrition going into the winter months. While there were several notable snow storms and cold snaps during the winter of 2016-2017, there were also periods of warm weather and high winds that melted and drifted snow to expose forage. The 2017 growing season was very similar to the previous year, with ample spring moisture followed by a dry summer with little precipitation. Moisture improved during the fall, though there was little snow to speak of over the winter of 2017-2018. Precipitation was below average for the 2018 growing season, and many reservoirs became dry by late summer. Sparse rain events provided some moisture during the fall months, but the 2018-2019 winter has been mild to average in the herd unit. Thus far, the region has received average snowfall combined with many windy days. Snow has melted or drifted to open habitats for pronghorn to move freely on winter ranges and access forage. 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 growth and moisture during the spring of 2018 were average, but the summer of 2018 was dry. Pronghorn became more concentrated in areas where moisture and green forage persisted during this time period, and may have overbrowsed preferred plant species in some cases. Fall precipitation resulted in a mild fall green-up of forage that likely benefitted pronghorn nutritionally prior to the winter of 2018-2019. However, spring storms could still cause localized mortalities should they occur in the region.

Field Data

Fawn ratios for the Rattlesnake herd were historically low for the herd unit in 2012 and 2013, following a harsh winter in 2011 and severe drought conditions in 2012. Habitat conditions improved in 2013 & 2014 and fawn ratios recovered, but were still not as high as those recorded in adjacent herds. This suggests the carrying capacity for the herd unit was still suppressed despite improved precipitation. Native habitats were likely still recovering from the very high pronghorn numbers of 2004-2010 and prolonged drought conditions. Fawn ratios finally improved from 2015-2017 to levels of production which had not been observed within the herd unit since 2005. Overwinter survival was good during the same time period, and low harvest pressure allowed the herd to grow to its objective. In 2018, fawn ratios seemed to dip again, with 66 fawns per 100 does observed during pre-season classification surveys. At the same time, recruitment of yearlings was high (20 yearling bucks per 100 does). Consequently, a higher proportion of yearling does without fawns may have suppressed the observed fawn ratio in the herd.

Buck ratios for the Rattlesnake herd have varied widely from year to year, from the mid 40s to mid 70s per 100 does. Overall buck ratios for the herd unit can appear low due to variation in management strategies and access in Area 70 versus Areas 71 & 72. Buck ratios are most commonly in the upper 50s for the herd unit, just below the lower limit for special management. Still, hunters have developed high expectations for buck numbers and quality within this herd. In more recent years, buck ratios dropped to the mid-40s as a result of low fawn recruitment and moderate harvest pressure on a slowly recovering population. In 2013, the buck ratio for the Rattlesnake Pronghorn Herd reached a 22-year low of 39:100 does. Since then buck ratios have gradually improved with reduced harvest pressure and improved overwinter survival, with 58 bucks per 100 does observed in 2018. Higher fawn survival/recruitment over the past three years and increased doe harvest should further improve the buck ratio in 2019, while maintaining the population near objective.

The 2018 post-season population estimate was approximately 12,200, which is slightly lower than the 2017 population estimate following increased harvest pressure. Line transect surveys conducted in 1998, 2000, 2003, 2007, and 2014 provide end-of-year population estimates and serve to align the population model. The 2014 survey yielded good results, with a reasonable standard error that aligns well with the population model. 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 that is not accounted for in the model. However, a merged dataset of the Rattlesnake and Beaver Rim Herds tested in 2015 did not show adequate 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. Despite drastic reductions in license issuance, success declined from 2012-2014 to near the 80th percentile. In 2014, active license success reached a 12-year low of 78% with 588 antelope harvested, and reported hunter satisfaction for the Rattlesnake Herd Unit was the lowest in the state. Following further reductions in license issuance, harvest success for active licenses improved, but harvest was only 328 animals in 2015. As the herd began to grow and recover license issuance was increased, and harvest success has improved steadily. By 2018, the population estimate was near objective, with a harvest of 821 animals and overall harvest success of 99%. Hunter satisfaction improved steadily since 2015 as well, and was 95% in 2018. After six years of conservative management, this herd has grown steadily and has been near its objective of 12,000 for the past two years. Managers will strive to maintain the herd at this level utilizing increased doe harvest, with additional goals of sustaining high hunter satisfaction and harvest success while improving buck ratios.

Population

The “Semi-Constant Juvenile Survival – Semi-Constant Adult Survival” (SCJ,SCA) spreadsheet model was chosen for the post-season population estimate of this herd. This model seemed most representative of the herd, as it selects a moderate juvenile and adult survival rate across years other than 2011, when both juvenile and adult survival were constrained to reflect severe winter mortality. The CJ,CA model is similar, but does not adequately account for the severe winter and associated mortality observed in 2010-2011. While the TSJ,CA model accounts for low overwinter survival in 2010-2011, it does not track with improved fawn production/survival and observed population growth from 2016-present. None of the models track very well with the three early line transect estimates, but all three models align very well with the 2014 line transect estimate. While the AIC for the SJC,SCA model is the lowest of the three, all models are still well within one level of power of one another. The SCJ,SCA 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 for all hunt areas. License increases are prescribed for Area 70 and Area 72 in the herd unit for 2019. Because Area 71 has difficult access and had lower harvest success, licenses will be maintained but not increased for 2019. Area 70 and Area 72 Type 1 licenses will be increased to allow for increased opportunity in a growing herd, while still striving to achieve special management buck ratios in Area 72. Doe/fawn licenses will be liberalized in Area 70 to maintain a low density of antelope in agricultural areas, and in Area 72 to curb population growth and maintain the herd near its objective. The 2018 season includes a total of 700 any-antelope and 700 doe/fawn licenses. Goals for 2018 are to increase doe harvest to curb population growth, improve buck ratios consistent with special management strategy, and maintain hunter success.

If the projected harvest of 1,215 pronghorn is achieved and fawn production/survival is moderate in 2019, this herd should remain near its objective. If fawn survival is above average, this herd should increase slightly. The predicted 2019 post-season population estimate for the Rattlesnake Pronghorn Herd assuming moderate fawn survival is approximately 10,200 animals, which is 7% below objective.

2018 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2018 - 5/31/2019

HERD: PR746 - NORTH NATRONA

HUNT AREAS: 73

PREPARED BY: HEATHER O'BRIEN

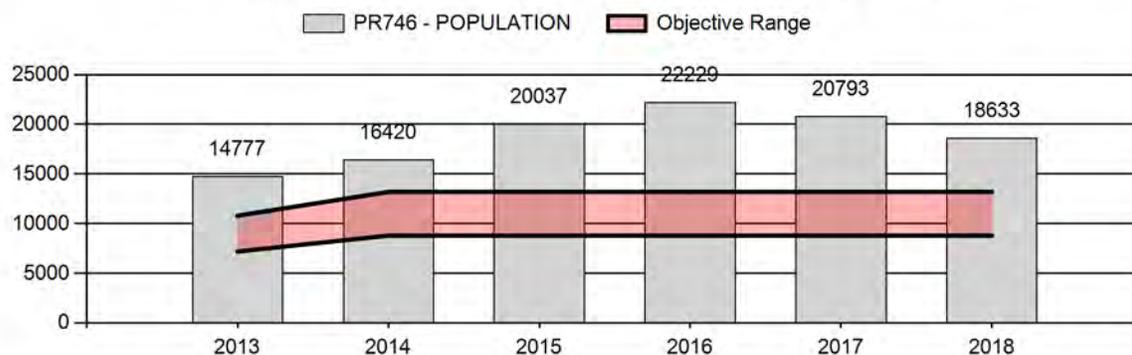
	<u>2013 - 2017 Average</u>	<u>2018</u>	<u>2019 Proposed</u>
Population:	18,851	18,633	17,091
Harvest:	1,018	2,145	2,170
Hunters:	1,080	2,241	2,300
Hunter Success:	94%	96%	94%
Active Licenses:	1,133	2,267	2,300
Active License Success:	90%	95%	94%
Recreation Days:	3,768	4,922	6,500
Days Per Animal:	3.7	2.3	3.0
Males per 100 Females	55	54	
Juveniles per 100 Females	81	66	

Population Objective (± 20%) :	11000 (8800 - 13200)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	69%
Number of years population has been + or - objective in recent trend:	6
Model Date:	2/27/2019

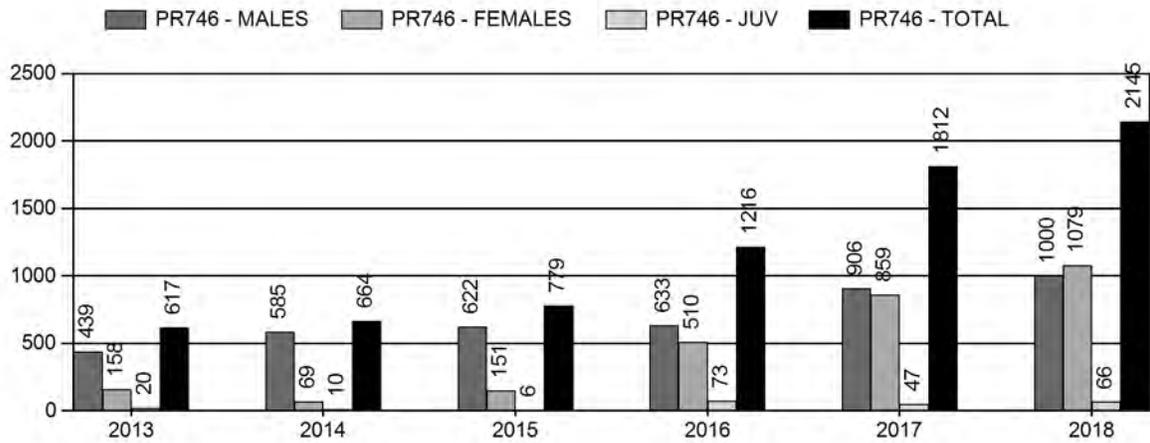
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females ≥ 1 year old:	13.3%	14.7%
Males ≥ 1 year old:	19.4%	20.5%
Total:	10.2%	11.1%
Proposed change in post-season population:	-10.4%	-8.3%

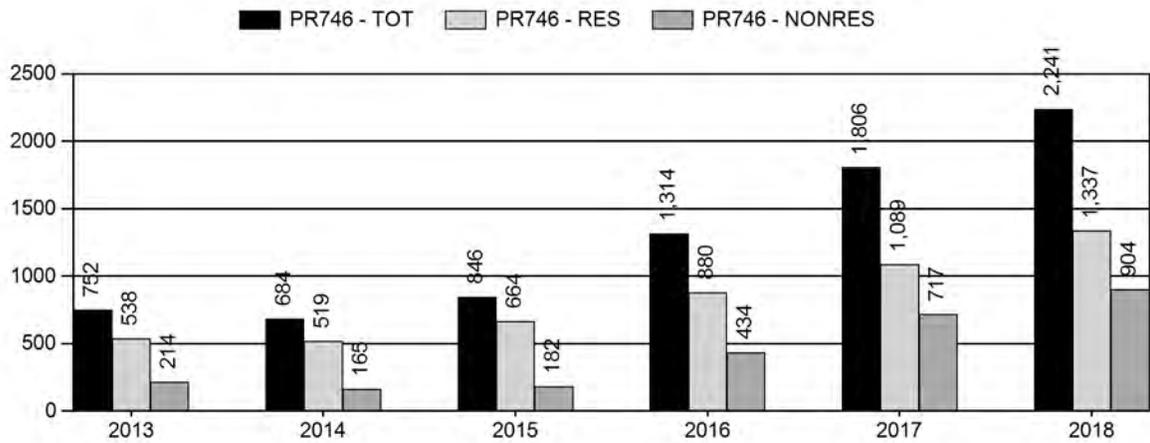
Population Size - Postseason



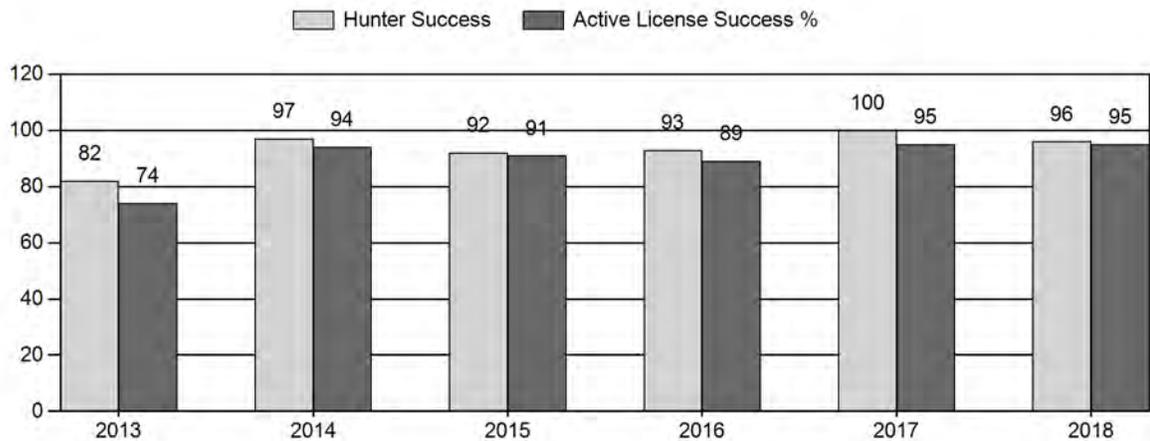
Harvest



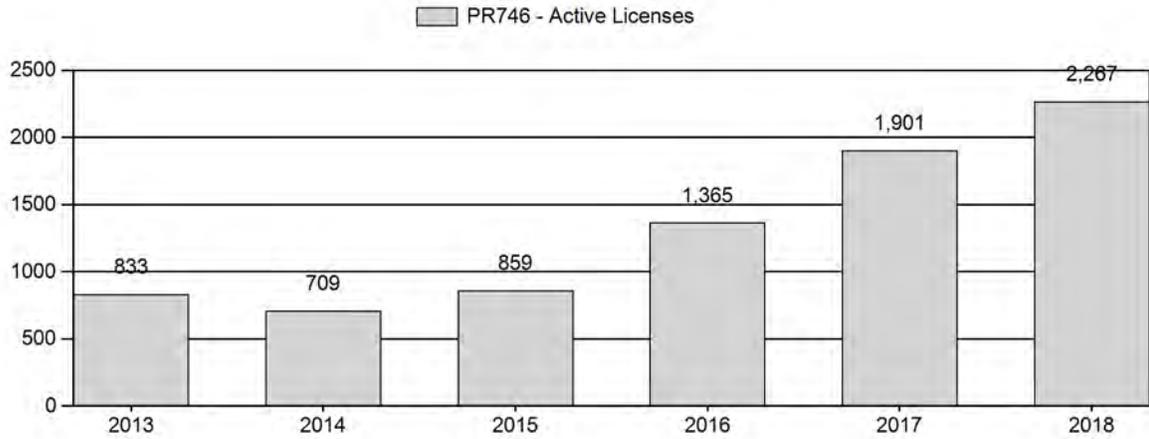
Number of Active Licenses



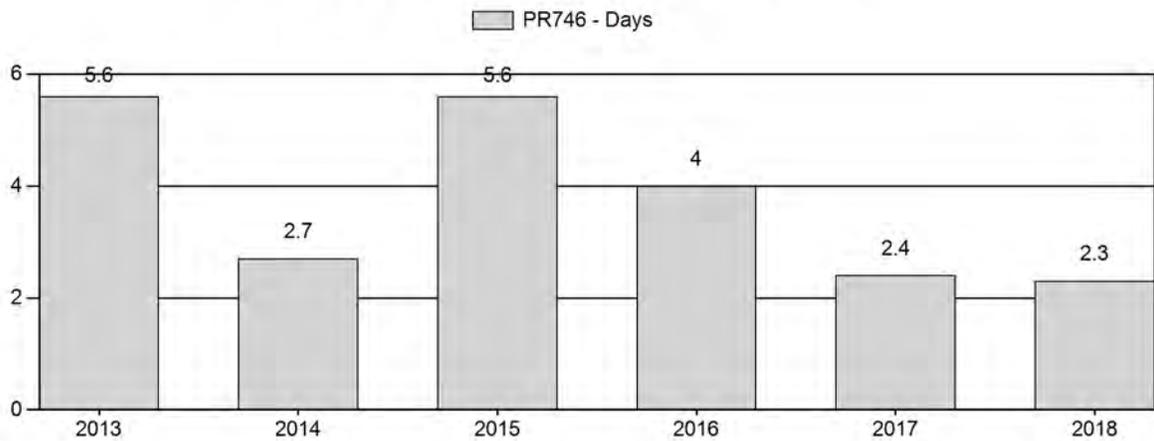
Harvest Success



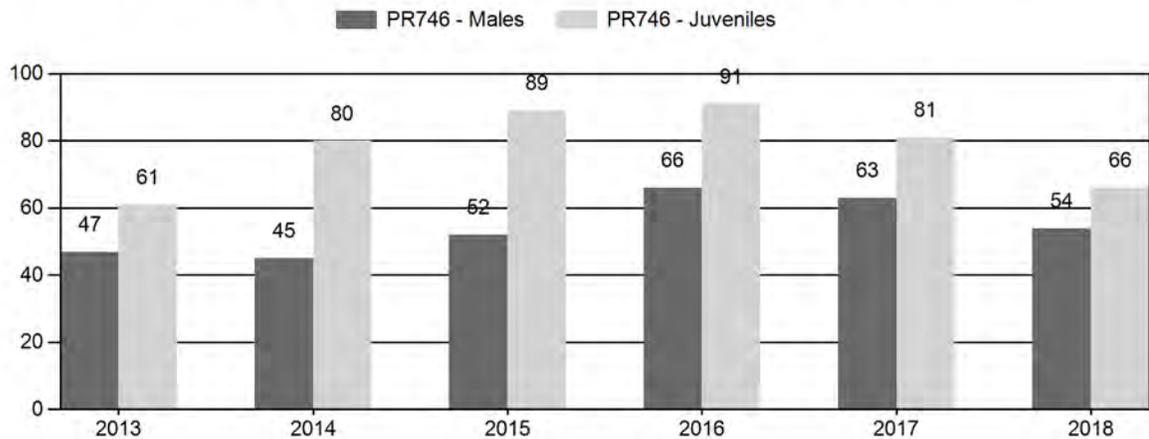
Active Licenses



Days Per Animal Harvested



Preseason Animals per 100 Females



2013 - 2018 Preseason Classification Summary

for Pronghorn Herd PR746 - NORTH NATRONA

Year	Pre Pop	MALES				FEMALES		JUVENILES		Tot Cls	Cls Obj	Males to 100 Females				Young to		
		Ylg	Adult	Total	%	Total	%	Total	%			Ylng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
2013	15,455	69	318	387	23%	817	48%	497	29%	1,701	1,832	8	39	47	± 5	61	± 5	41
2014	17,151	85	210	295	20%	650	44%	520	35%	1,465	1,915	13	32	45	± 5	80	± 7	55
2015	20,894	215	268	483	21%	936	42%	835	37%	2,254	2,729	23	29	52	± 4	89	± 7	59
2016	23,567	319	281	600	26%	905	39%	820	35%	2,325	2,409	35	31	66	± 5	91	± 7	54
2017	22,787	221	375	596	26%	953	41%	768	33%	2,317	3,371	23	39	63	± 5	81	± 6	50
2018	20,993	183	396	579	24%	1,080	45%	716	30%	2,375	2,947	17	37	54	± 4	66	± 5	43

**2019 HUNTING SEASONS
NORTH NATRONA PRONGHORN HERD (PR746)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
73	1	Sep. 15	Oct. 31	1,200	Limited quota	Any antelope
	6	Sep. 15	Oct. 31	1,200	Limited quota	Doe or fawn antelope
	7	Sep. 15	Oct. 31	50	Limited quota	Doe or fawn antelope valid on or within one (1) mile of irrigated land
Archery		Aug. 15	Sep. 14			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2018
73	1	No Change
	6	No Change
	7	No Change

Management Evaluation

Current Postseason Population Management Objective: 11,000

Management Strategy: Recreational

2018 Postseason Population Estimate: ~18,600

2019 Proposed Postseason Population Estimate: ~17,100

2018 Hunter Satisfaction: 98% Satisfied, 2% 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.

Herd Unit Issues

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

unit. 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 2018.

The population objective and management strategy for the herd were formerly reviewed in 2014. At that time, the population objective was revised from 9,000 to 11,000. For the 2019 review, we are maintaining the current objective and management strategy based on internal discussions and conversations with constituents. Population status and habitat data included in this document were evaluated, and a change is not warranted at this time. The herd objective will be reviewed again in 2024. If the situation arises in the interim and a change is warranted, a review and proposal will be submitted as needed.

Weather

From 2013 to the present, weather trends have been generally favorable, and pronghorn have fared well within the herd. Range conditions were particularly good from 2013 to 2015, when spring and summer moisture improved and winters were mild. The winter of 2015 was fairly average, though some areas experienced prolonged periods of persistent snow. The spring of 2016 had above average precipitation but summer was extremely dry, causing rangeland habitats to cure early. Fortunately, precipitation in October resulted in a late surge of plant growth, which may have provided pronghorn with a boost in nutrition going into the winter months. While there were several notable snow storms and cold snaps during the winter of 2016-2017, there were also periods of warm weather and high winds that melted and drifted snow to expose forage. The 2017 growing season was very similar to the previous year, with ample spring moisture followed by a dry summer with little precipitation. Moisture improved during the fall, though there was little snow to speak of over the winter of 2017-2018. Precipitation was below average for the 2018 growing season, and many reservoirs became dry by late summer. Sparse rain events provided some moisture during the fall months, but the 2018-2019 winter has been mild to average in the herd unit. Thus far, the region has received average snowfall combined with many windy days. Snow has melted or drifted in at low elevation, opening habitats for pronghorn to move freely on winter ranges and access forage. For detailed weather data see <http://www.ncdc.noaa.gov/gac/time-series/us>.

Habitat

Eight sagebrush utilization transects were established within this herd in 2014 as part of the population objective review. These transects were measured for utilization in spring 2014-2016,

and in 2018 (see Table 1). Utilization was light to moderate on all eight transects in 2018. Anecdotal observations and discussions with landowners in the region confirm summer and winter forage availability for pronghorn was relatively average in 2018. Additionally, pronghorn appeared to be widely distributed across suitable habitat. This suggests current pronghorn population size and the revised objective are sustainable given available habitat.

Year	Average Utilization
2014	15.38%
2015	9.50%
2016	6.38%
2018	13.9%

Table 1. Average utilization of big sagebrush (*Artemisia tridentata* Nutt. Subsp. *wyomingensis*) for eight transects within the North Natrona Pronghorn Herd unit, 2014-2016 & 2018.

Field Data

Fawn ratios were below average in 2013 as the herd was recovering from the harsh winter and drought conditions of 2011-2012. Overall precipitation and forage quality were much improved from 2013-2017, and the population grew during this time period. Fawn ratios improved greatly from 2014-2017 and averaged 85 per 100 does. Overwinter survival was very high during this time frame as well, as evidenced by very high yearling buck ratios. License issuance did not keep pace with population growth, and the herd grew well above objective by 2016. License numbers were increased significantly from 2016-2018, with a considerable increase in doe/fawn licenses. The preseason fawn ratio was 71 per 100 does in 2018, which was a drop from previous years. The yearling buck ratio was lower as well at 18 per 100 does. These more typical ratios coincided with average winter conditions and spring moisture. Managers continued to observe high densities of pronghorn during ground classifications in 2018, and the winter of 2018-2019 has been average so far. Managers expect normal overwinter mortality and recruitment in a population that is over objective, and thus recommend continued liberal harvest pressure to manage towards objective.

Buck ratios for the North Natrona Herd historically average in the mid-50s:100 does. Buck ratios were below average in 2013 and 2014, but improved steadily every year from 2012-2016. The yearling buck ratio in 2013 was extremely low following severe drought conditions in 2012. Yearling buck ratios were very high from 2014-2017, indicating consecutive years of excellent overwinter fawn survival. Typically buck ratios for the herd unit are easily maintained within the target range for recreational management, but have exceeded that range in 2016 and 2017. Following a significant increase in license issuance, the buck ratio dropped back within recreational management parameters in 2018, with 57 bucks per 100 does observed. Ultimate

management goals for 2019 are to maintain harvest opportunity on available bucks and 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 2012-2013 as population size was also low. Total harvest dropped to only 617 in 2013 as total license issuance was reduced. In 2014, license issuance reached a 10-year low, but pronghorn numbers also began to recover. Thus, hunters enjoyed much improved harvest success in the 90th percentile, but overall antelope harvest was still under 700 total. From 2014-2016, hunter satisfaction remained high as buck availability increased. By 2017, high yearling recruitment from the previous three years created a high adult buck ratio, and opportunity to harvest mature bucks was exceptional. Harvest success for Type 1 licenses was its highest since 2007, and hunter satisfaction was the highest on record for the herd, and the highest in the state. At the same time, doe/fawn licenses were increased to address a population growing over objective, and overall harvest rose to over 1,800 animals. License issuance was increased again in 2018 to further address population growth. Success on Type 1 and Type 6 licenses has remained in the 90th percentile the past two years, despite an increase to 2,450 total licenses in 2018. License success on Type 7 licenses was lower at 85%, possibly due to access limitations and/or lower hunter effort. In total, hunters harvested 1,000 bucks and over 1,100 does and fawns in 2018 and overall satisfaction was 95%.

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 the most representative of the herd, as it selects for higher juvenile survival during the years when field personnel observed mild winter conditions, particularly from 2003-2008 when drought conditions persisted and overwinter precipitation was minimal. The simpler models (CJ,CA and SCJ,CA) select for very low juvenile survival rates and very high adult survival rates across years, which does not seem feasible for this herd. All three models follow a trend that seems representative for the herd unit. However, the CJ,CA and SCJ,CA models estimate population peaks in 2016 that are unrealistically high compared to the perceptions of field personnel and landowners. 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. One confounding issue with the TSJ,CA model is its selection of the lower constraint for juvenile survival for the last three years of simulation, which does not correspond

to high yearling ratios from classification surveys. Still, the model in general appears to be the best representation relative to the perceptions of managers on the ground for all other years, while following trends with license issuance and harvest success. Overall the model is considered to be good in representing dynamics of the herd.

The three models each align partially to four early line-transect estimates – each model aligning through some but not all line-transect estimate confidence intervals. 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. The 2016 line transect resulted in an extremely high estimate with a wide standard error. This estimate was left out of the model, as managers have low confidence in its accuracy and impact to the model. An additional line transect survey was conducted in 2018 (Appendix A). While the resulting population estimate is also high, managers feel the estimate and standard error from this survey are more realistic. Adding this estimate to the model changes the population estimate by nearly 10,000 animals. The model increases but does not align exactly with the estimate, as it also must take into account classification and harvest data. Historically high license issuance, high harvest success, and high classification totals the past two years corroborate the survey and seem to confirm this herd is well above objective. Therefore managers feel comfortable including the 2018 line transect results in the model, though further review is being conducted to verify the accuracy of the survey.

Management Summary

Traditional season dates in this herd run from September 15th through October 31st. Season dates will remain the same for 2019, with no change in Type 1 and Type 6 license issuance. Licenses have been increased substantially the last two years to provide additional hunting opportunity and address rapid population growth above objective in the herd. This herd should continue to decrease in size given the same number of licenses as 2018. A small number of Type 7 licenses will be maintained this year as well, to address concentrations of antelope on irrigated agricultural lands in the southeastern part of the herd unit. The 2019 season includes 1,200 Type 1 licenses, 1,200 Type 6 licenses, and 50 Type 7 licenses. Goals for 2019 are to further reduce the pronghorn population toward objective, and to maintain current buck ratios, hunter success, and hunter satisfaction.

If we attain the projected harvest of 2,170 pronghorn with average fawn production, this herd will be reduced from 69% to 55% above the objective. The predicted 2019 post-season population size of the North Natrona Pronghorn Herd is approximately 17,100 animals.

APPENDIX A

North Natrona Pronghorn Herd Unit Line Transect 2018 – Distance Analysis

Estimators:

```

-----
Estimator 1
Key: Uniform
Adjustments - Function      : Hermite polynomials
              - Term selection mode : Sequential
              - Term selection criterion : Akaike Information Criterion (AIC)
              - Distances scaled by   : W (right truncation distance)
  
```

Estimator selection: Choose estimator with minimum AIC

Cell i	Cut Points	Observed Values	Expected Values	Chi-square Values	
1	0.000	21.8	120	72.25	31.563
2	21.8	49.0	103	87.90	2.593
3	49.0	87.2	75	113.04	12.801
4	87.2	147.	103	135.27	7.699
5	147.	206.	62	54.54	1.021

Total Chi-square value = 55.6779 Degrees of Freedom = 3.00

Probability of a greater chi-square value, P = 0.00000

```

Effort      : 855.7406
# samples   : 39
Width      : 206.0000
Left       : 0.0000000
# observations: 463
  
```

```

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

Parameter	Point Estimate	Standard Error	Percent Coef. of Variation	95% Percent Confidence Interval
DS	10.067	0.68636	6.82	8.7827 11.539
E(S)	1.6777	0.47822E-01	2.85	1.5864 1.7744
D	16.890	1.2481	7.39	14.581 19.564
N	21416.	1582.6	7.39	18489. 24807.

Measurement Units

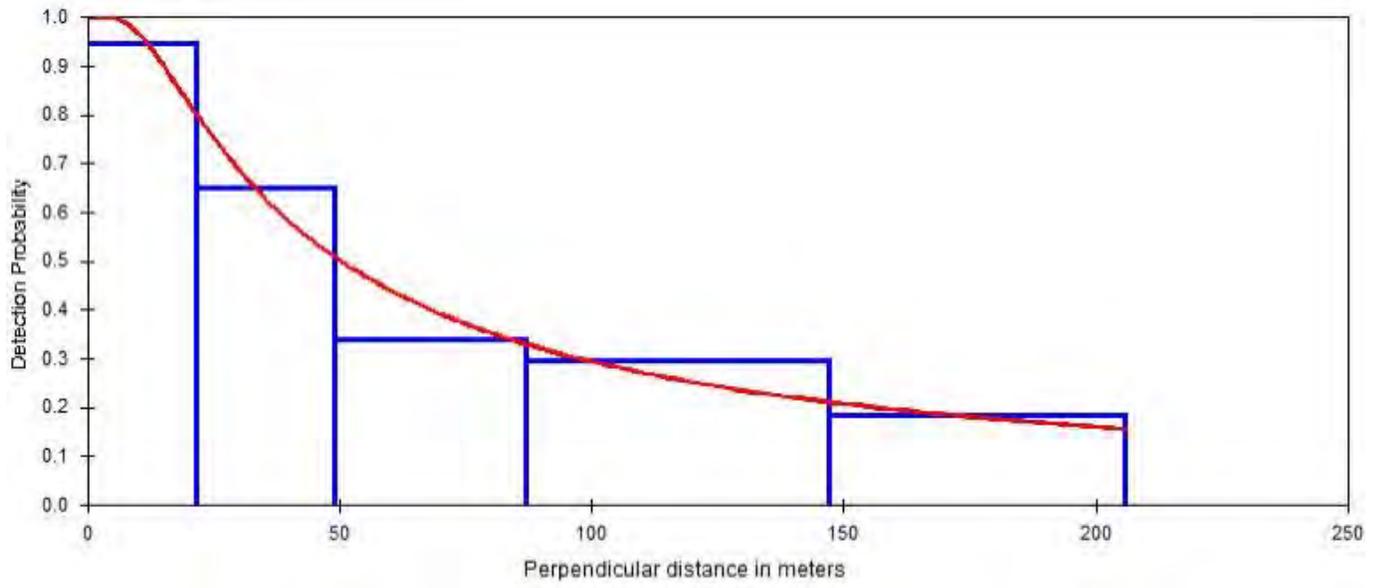
```

-----
Density: Numbers/Sq. miles
ESW: meters
  
```

Component Percentages of Var(D)

```

-----
Detection probability : 14.5
Encounter rate       : 70.6
Cluster size         : 14.9
  
```



2018 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2018 - 5/31/2019

HERD: PR748 - NORTH CONVERSE

HUNT AREAS: 25-26

PREPARED BY: WILLOW BISH

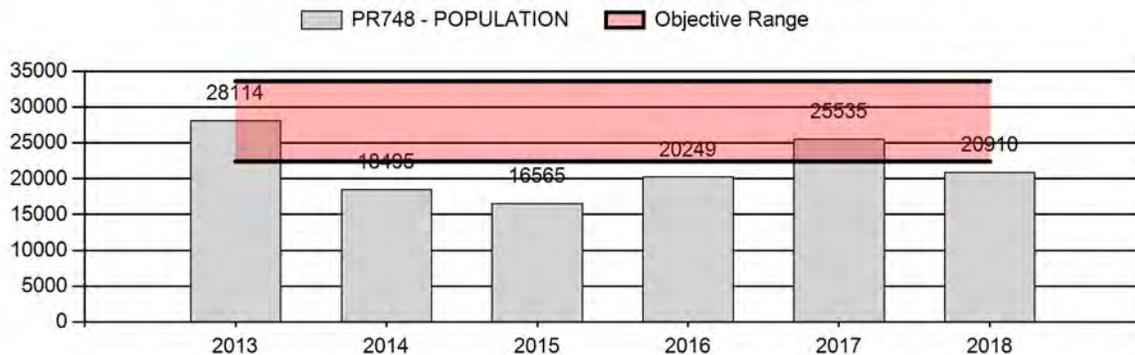
	<u>2013 - 2017 Average</u>	<u>2018</u>	<u>2019 Proposed</u>
Population:	21,792	20,910	22,591
Harvest:	1,772	2,502	2,675
Hunters:	1,957	2,615	2,750
Hunter Success:	91%	96%	97%
Active Licenses:	2,078	2,763	2,900
Active License Success:	85%	91%	92%
Recreation Days:	6,055	7,188	7,300
Days Per Animal:	3.4	2.9	2.7
Males per 100 Females	57	54	
Juveniles per 100 Females	81	77	

Population Objective (\pm 20%) :	28000 (22400 - 33600)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-25.3%
Number of years population has been + or - objective in recent trend:	8
Model Date:	02/04/2019

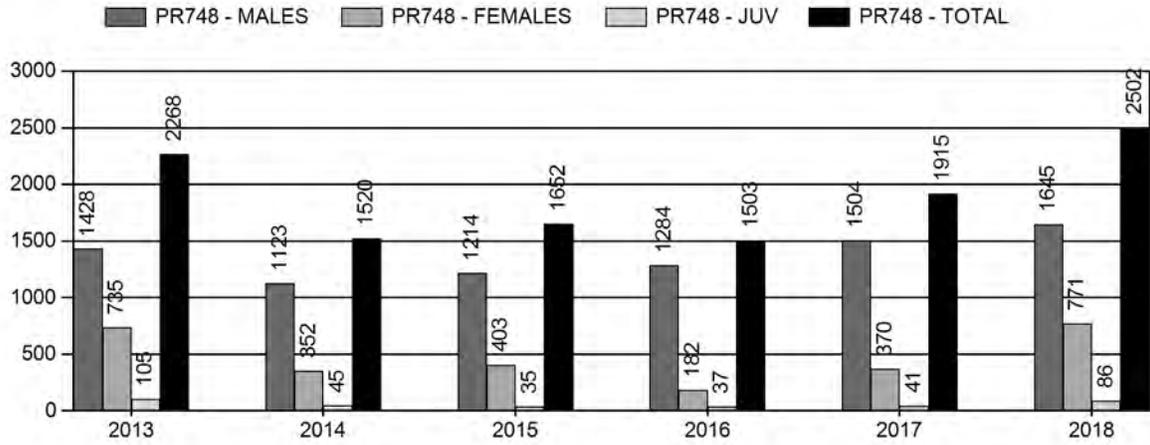
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females \geq 1 year old:	8.3%	8.3%
Males \geq 1 year old:	32.2%	32.6%
Total:	40.5%	40.9%
Proposed change in post-season population:	-11.6%	-11.6%

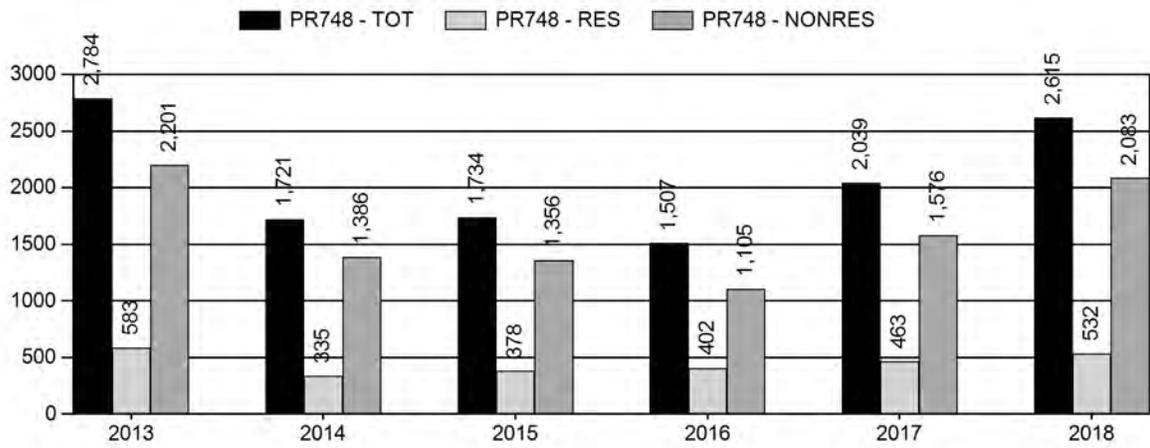
Population Size - Postseason



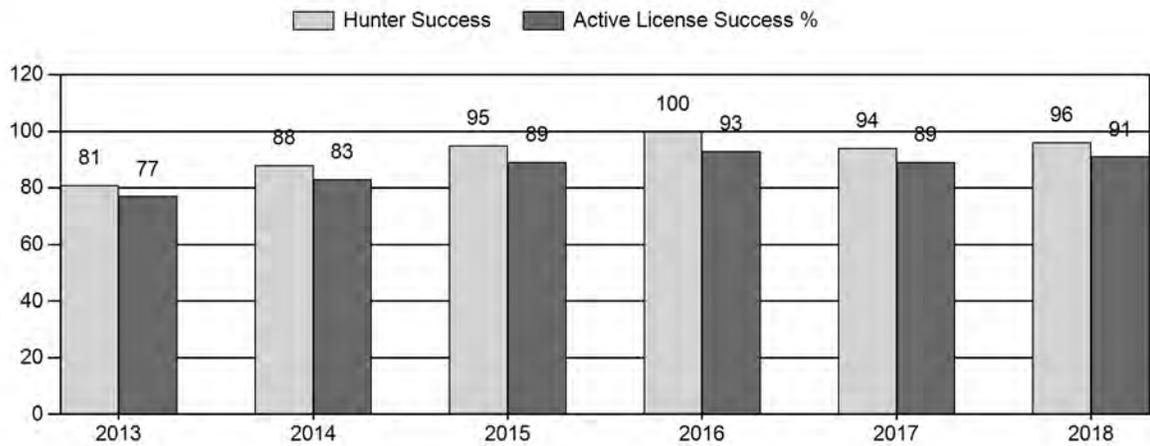
Harvest



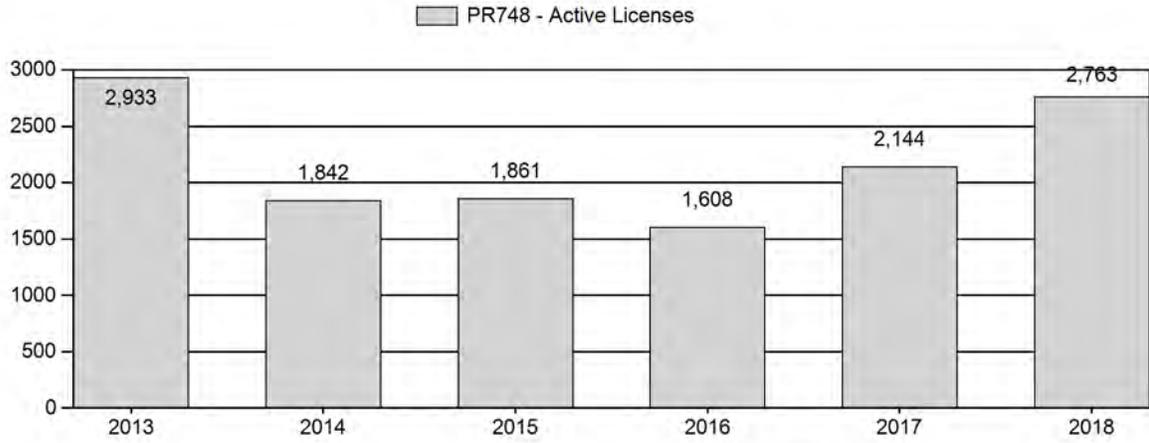
Number of Active Licenses



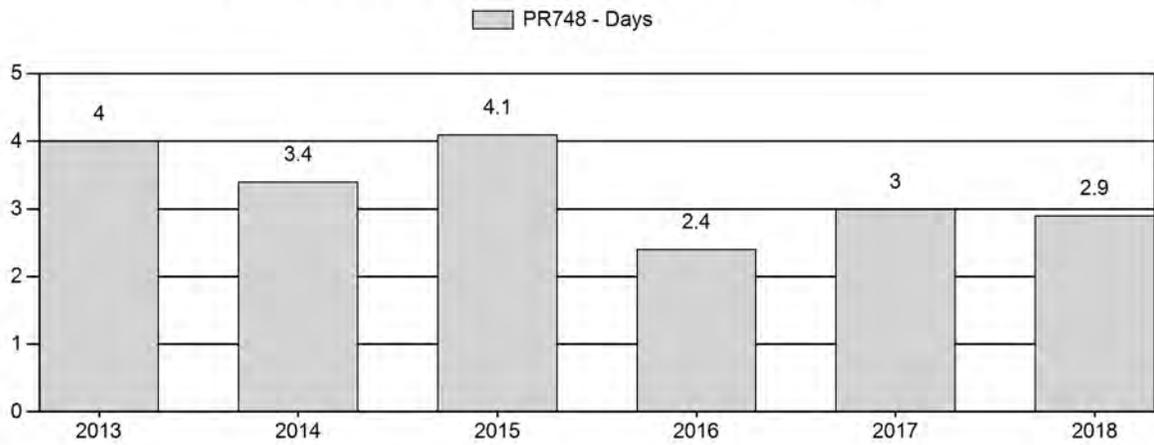
Harvest Success



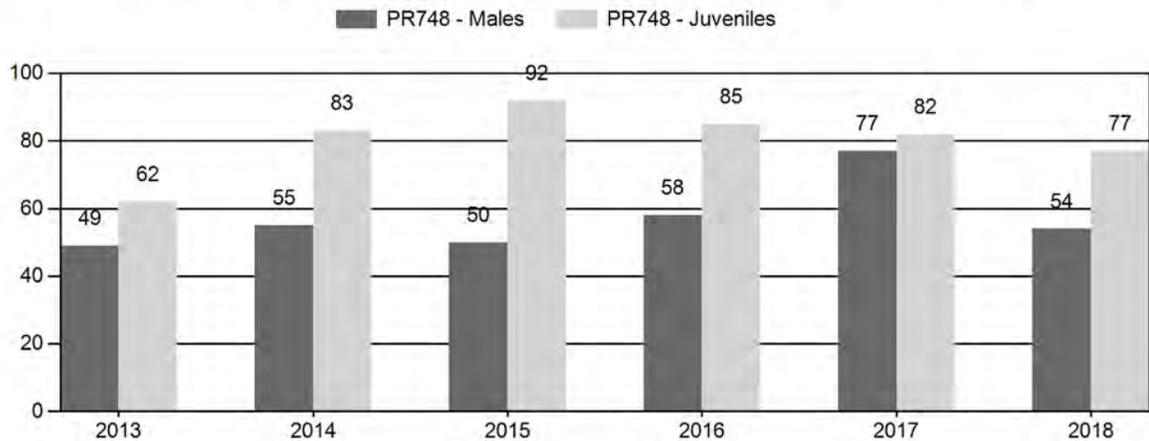
Active Licenses



Days Per Animal Harvested



Preseason Animals per 100 Females



2013 - 2018 Preseason Classification Summary

for Pronghorn Herd PR748 - NORTH CONVERSE

Year	Pre Pop	MALES				FEMALES		JUVENILES		Tot Cls	Cls Obj	Males to 100 Females				Young to		
		Ylg	Adult	Total	%	Total	%	Total	%			Yng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
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	18,382	196	251	447	21%	896	41%	820	38%	2,163	3,717	22	28	50	± 4	92	± 7	61
2016	21,902	197	216	413	24%	716	41%	609	35%	1,738	3,480	28	30	58	± 6	85	± 7	54
2017	27,642	154	329	483	30%	624	39%	510	32%	1,617	3,643	25	53	77	± 7	82	± 8	46
2018	23,662	189	336	525	23%	968	43%	748	33%	2,241	2,980	20	35	54	± 5	77	± 6	50

**2019 HUNTING SEASONS
NORTH CONVERSE PRONGHORN HERD (PR748)**

Hunt Area	Type	Season Dates		Quota	License	Limitations
		Opens	Closes			
25	1	Oct. 1	Oct. 14	900	Limited quota	Any antelope
	6	Oct. 1	Oct. 14	450	Limited quota	Doe or fawn
26	1	Sep. 24	Oct. 14	1,300	Limited quota	Any antelope
	6	Sep. 24	Oct. 14	500	Limited quota	Doe or fawn
Archery		Aug. 15	Sep. 30			Refer to license type and limitations in Section 2

Hunt Area	Type	Quota change from 2018
25	1	+100
25	6	+50
Herd Unit Totals	1	+100
	6	+50

Management Evaluation

Current Postseason Population Management Objective: 28,000

Management Strategy: Recreational

2018 Postseason Population Estimate: ~20,900

2019 Proposed Postseason Population Estimate: ~ 22,600

2018 Hunter Satisfaction: 92% Satisfied, 4% Neutral, 4% 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 2015.

Hunting access on public lands is poor within this herd unit, with only small tracts of accessible public land interspersed within predominantly private lands. However, there is enough accessible public land that many hunters enjoy this hunt area. 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, two large-scale Environmental Impact Statements are currently being developed that are partially within this herd unit. The Converse County and Crossbow Oil and Gas EIS's combined propose to develop up to 6,500 wells on 1,600 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

Total precipitation in 2018 was slightly above average which was similar to 2017. However, the bulk of the precipitation was received throughout the summer months (May-July) with less than average precipitation through spring and fall. Due to the relatively dry spring, forage production occurred later in the season than normal but precipitation throughout the summer months supported good forage growth for the year. The 2018-2019 winter has been relatively mild to date, however, there were some cold snaps and snow accumulation in November which may have influenced animal movements and foraging capabilities. Given the relative mildness of the rest of the winter and less than average snowfall received, pronghorn have likely experienced normal over-winter survival this year.

Habitat

There are no habitat transects in this herd unit due to the preponderance of private land. Habitat conditions are variable in this herd unit due to some past wildfires which have removed portions of sagebrush habitat. The past five years have produced above average to average precipitation, resulting in a general trend of good forage production. These conditions have been effective in allowing rangelands to recover from the extreme drought in 2012. Sagebrush plants are recruiting in some areas of this herd unit, which may lead to higher quality forage availability in the future.

Field Data

It has been 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 2018, the adequate sample size was about 3,000 animals, yet only about 2,200 pronghorn were classified despite intensive ground coverage. There is limited public road access throughout this herd unit. Given this, field personnel requested access to classify antelope on private land two-tracks in addition to public roads in order to increase coverage.

Fawn production in 2018 was similar to the previous 5-year average (81 per 100 does) with a ratio of 77 fawns per 100 does. From 2008-2013 there was an average of 69 fawns per 100 does. From 2014-2018, the average was 84 fawns per 100 does, demonstrating the marked improvement in fawn production in recent years. Correspondingly, recruitment has increased. Yearling buck ratios averaged 17 per 100 does from 2008-2013 versus 22 yearling bucks per 100 does from 2014-2018. The population increase realized in recent years is attributed to increased fawn production and recruitment.

Preseason buck ratios in 2018 (54 per 100 does) were similar to the previous 5-year average of 58, and are within the upper limits of management strategy criteria. Historically buck ratios often exceed the management strategy maximum due to limited hunter access and widespread outfitting. Therefore, managers are content with current buck ratios given past challenges with remaining within management criteria. However, with buck ratios very near the upper limits of management criteria, some increased opportunity is warranted for the 2019 season.

Harvest

Hunt Area 25 had higher total success (101%) than Hunt Area 26 (92%), which can mostly be attributed to lower resident success in Hunt Area 26 (71%) over Hunt Area 25 (89%). This reduction in resident success may be due quota increases in 2018 as the resident success rate in 2017 in Hunt Area 26 was 100%. Field managers in Hunt Area 26 experienced a high volume of calls and inquiries from hunters in 2018 requesting information on hunting locations and access. Given the marked increase of inquiries in 2018 over recent years, field managers believe license issuance in Hunt Area 26 is near saturation and that increased license issuance would decrease hunting quality and potentially further decrease resident success.

Total harvest increased significantly in 2018 (2,502 pronghorn), and was well above that of 2017 (1,915). Total harvest success (95.7%) was similar to 2017 (93.9%) but the overall harvest increase can be attributed to quota increases last year. Given current trends, this population has regained the ability to accommodate harvest at higher levels. However, managers are sensitive to license issuance saturating public land availability. In addition, based on input from private lands that allow outfitted or trespass fee hunts, license issuance is nearing the saturation point on private lands as well. Based on past experience in this herd unit, increasing license issuance for these two areas far beyond current levels will result in further overcrowding of limited public lands as landowners become unwilling to accommodate more hunters, which could potentially decrease harvest rates despite higher license issuance while also leading to more hunter dissatisfaction. Regardless, recent high hunter satisfaction, excellent harvest success and high buck ratios all indicate a modest increase in opportunity is warranted.

In 2018, 92% 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. 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 2018 post-season population estimate is approximately 20,900 pronghorn, which is 25% below objective. While this population was historically above objective, the 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 significant improvements began in 2014. License issuance remained conservative in 2015 because managers were concerned about unreported hemorrhagic disease and stagnation in population growth despite high fawn production. However, field data and observations from

2016-2018, as well as the current population trend, show this herd is rebounding. In years past, high fawn productivity coupled with limited access has allowed this herd to exceed the objective very readily. Therefore managers began to increase license issuance in 2016 to slow the growth of this population. Rather significant increases were made in 2018, with only slight increases proposed for 2019 given concerns with hunter saturation.

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. However, this model has not been anchored to past end-of-year abundance estimates as multiple Line Transect surveys have yielded unusable results with widely fluctuating point estimates and high coefficients of variation.

Management Strategy

The traditional season dates in this herd unit are from October 1 to October 14 in Hunt Area 25 and from September 24 to October 14 in Hunt Area 26. These season dates have typically been adequate to meet landowner desires while accommodating a reasonable harvest. For 2019, herd unit-wide Type 1 license issuance will be 2,200 licenses, and Type 6 license issuance will be 950 licenses. This is an overall increase of 100 Type 1 licenses and 50 Type 6 licenses from 2018.

In 2013, the post-hunt population estimate was 53% below objective. From 2013 to 2017, the population increased by 40%, and is now 25% below objective, showing this population’s potential for rapid growth. Due to the high percentage of private land within this herd unit and limited hunter access, this population can easily increase above the objective. Therefore, relatively high license issuance is warranted, however the population has not yet met the objective and managers have concerns with public land saturation. Given trends in recent years, managers intend to slow the growth of this population to prevent it from going over objective too quickly, which would then necessitate even higher license issuance to achieve objective. If we attain the projected harvest of ~2,675 pronghorn and realize normal fawn recruitment, this population is projected to increase to about 22,500 pronghorn, which is 20% below objective.

2018 - JCR Evaluation Form

SPECIES: Pronghorn

PERIOD: 6/1/2018 - 5/31/2019

HERD: PR750 - BLACK THUNDER

HUNT AREAS: 4-9, 24, 27, 29

PREPARED BY: JOE SANDRINI

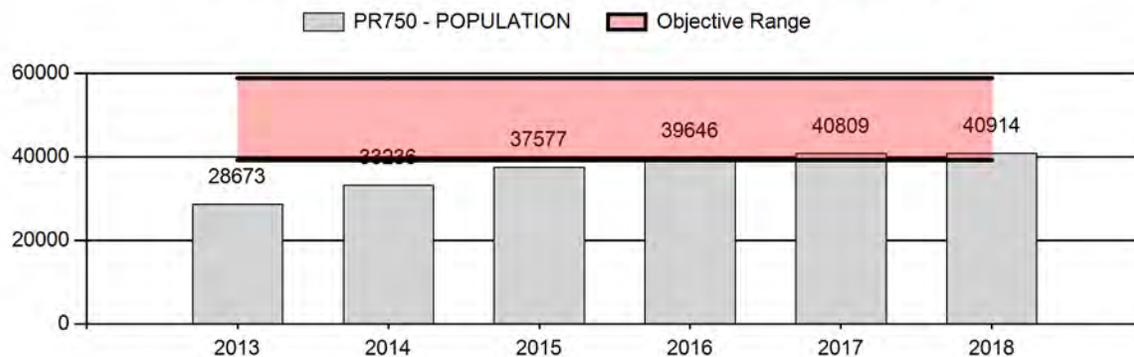
	<u>2013 - 2017 Average</u>	<u>2018</u>	<u>2019 Proposed</u>
Population:	35,988	40,914	45,543
Harvest:	3,694	4,520	4,580
Hunters:	4,315	4,896	4,980
Hunter Success:	86%	92%	92%
Active Licenses:	4,666	5,365	5,400
Active License Success:	79%	84%	85%
Recreation Days:	14,024	14,322	14,500
Days Per Animal:	3.8	3.2	3.2
Males per 100 Females	47	48	
Juveniles per 100 Females	79	58	

Population Objective (\pm 20%) :	49000 (39200 - 58800)
Management Strategy:	Recreational
Percent population is above (+) or below (-) objective:	-16.5%
Number of years population has been + or - objective in recent trend:	10
Model Date:	01/24/2019

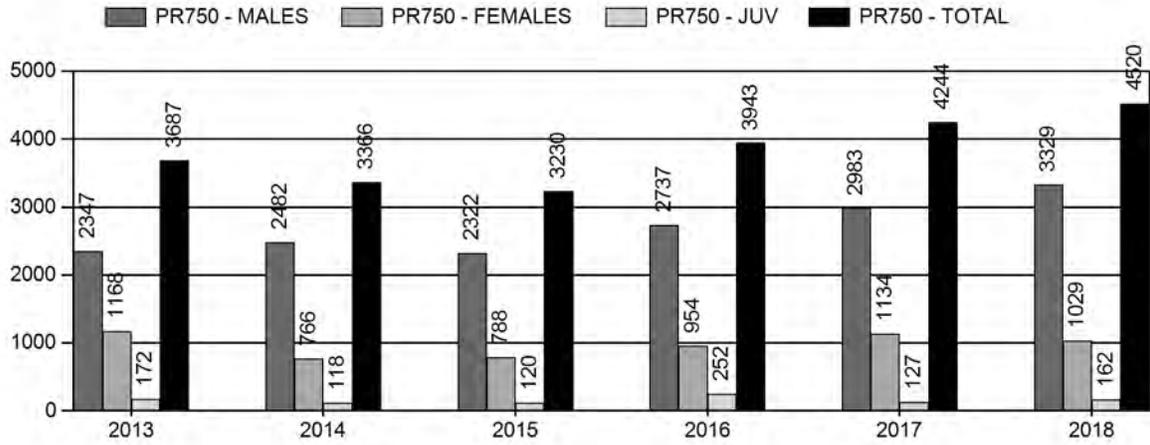
Proposed harvest rates (percent of pre-season estimate for each sex/age group):

	<u>JCR Year</u>	<u>Proposed</u>
Females \geq 1 year old:	5.1%	5.2%
Males \geq 1 year old:	34.2%	35.5%
Total:	10.8%	10.0%
Proposed change in post-season population:	-1.1%	+10.0%

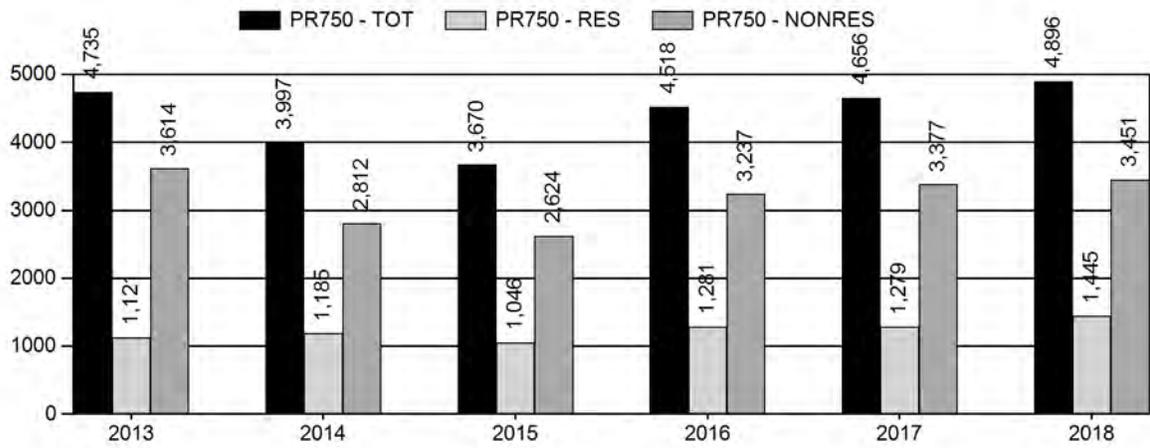
Population Size - Postseason



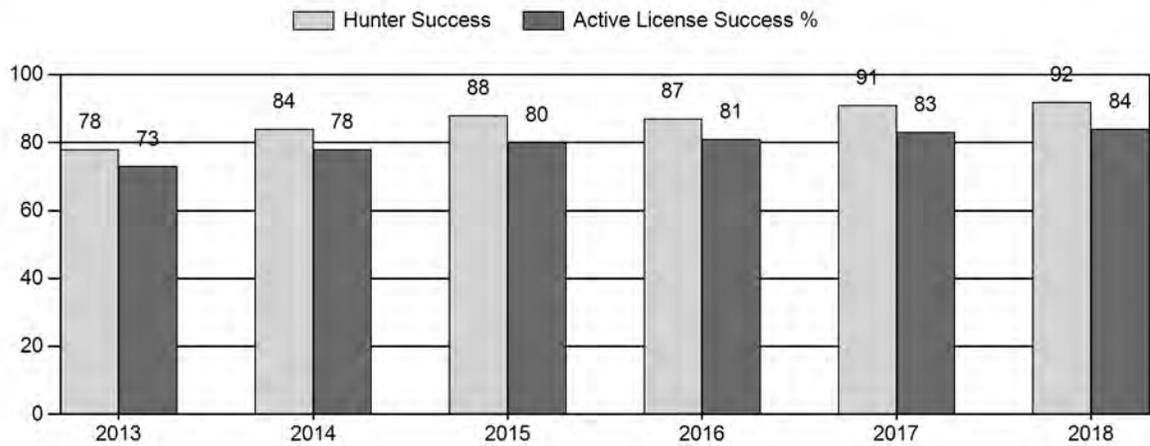
Harvest



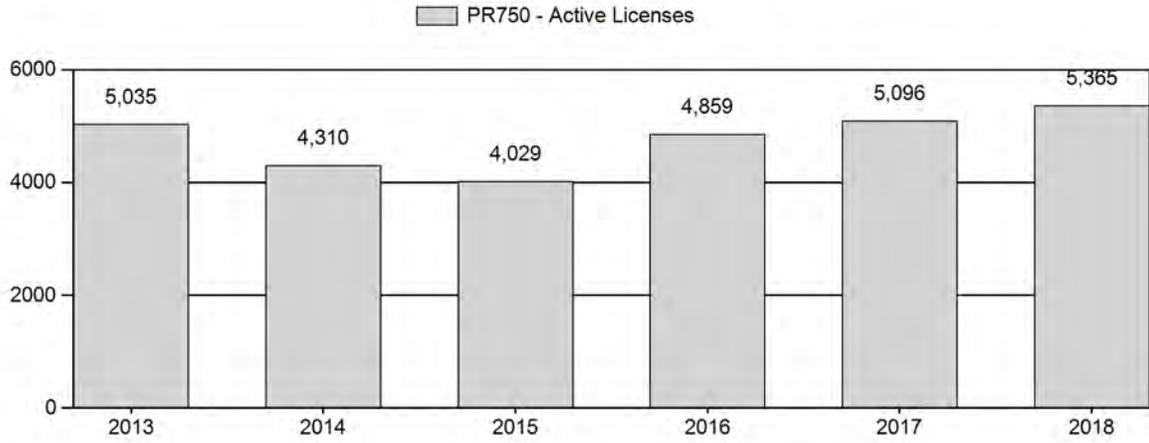
Number of Active Licenses



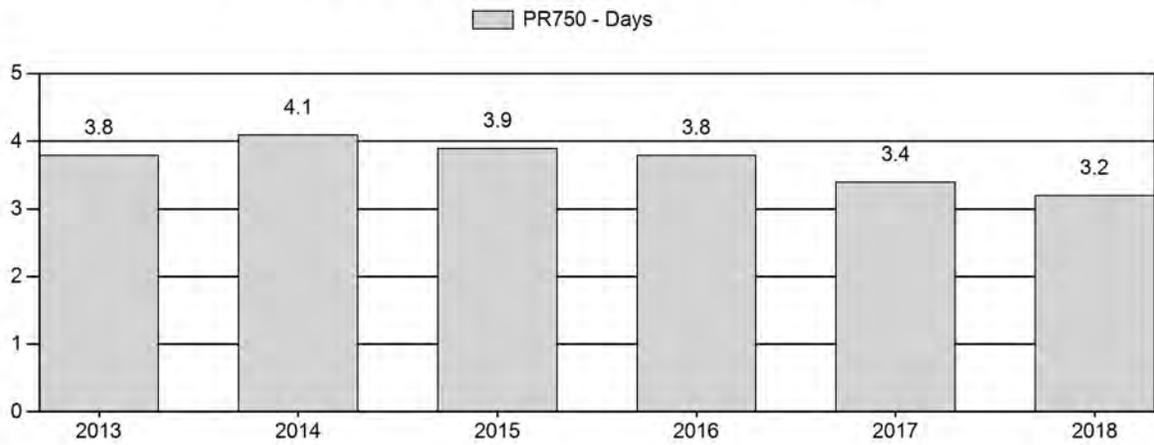
Harvest Success



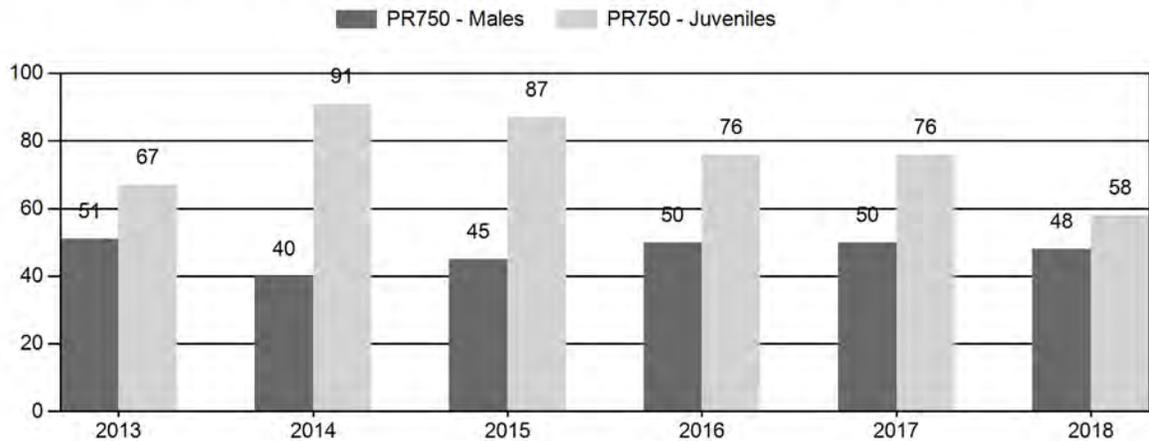
Active Licenses



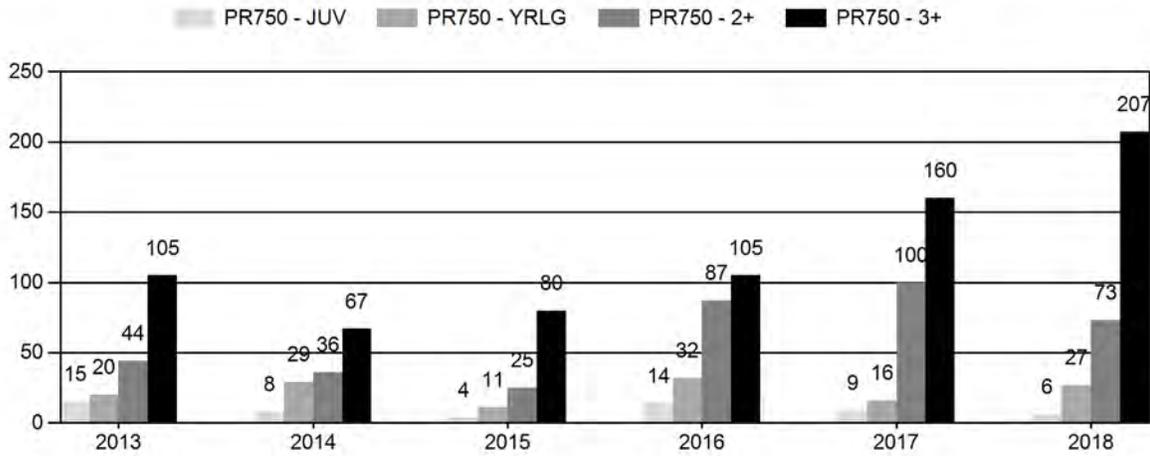
Days Per Animal Harvested



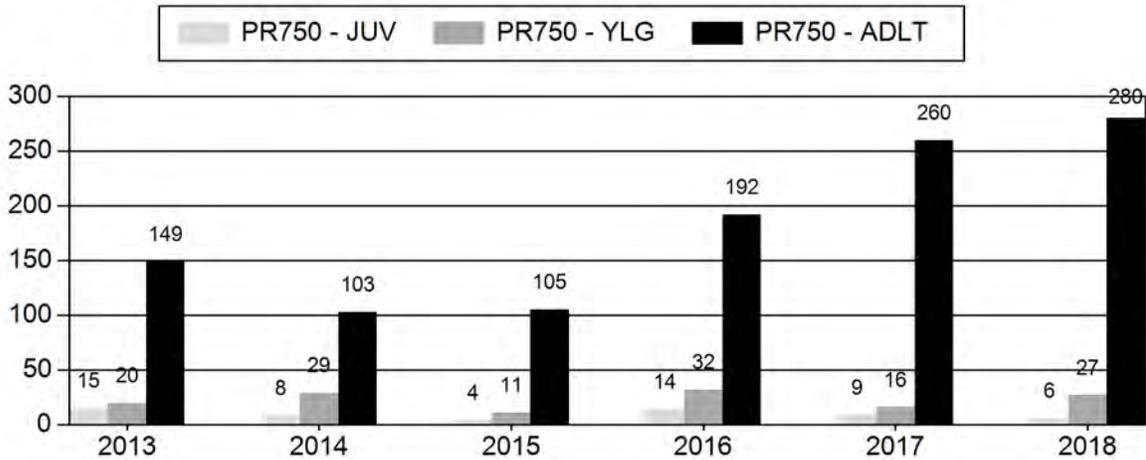
Preseason Animals per 100 Females



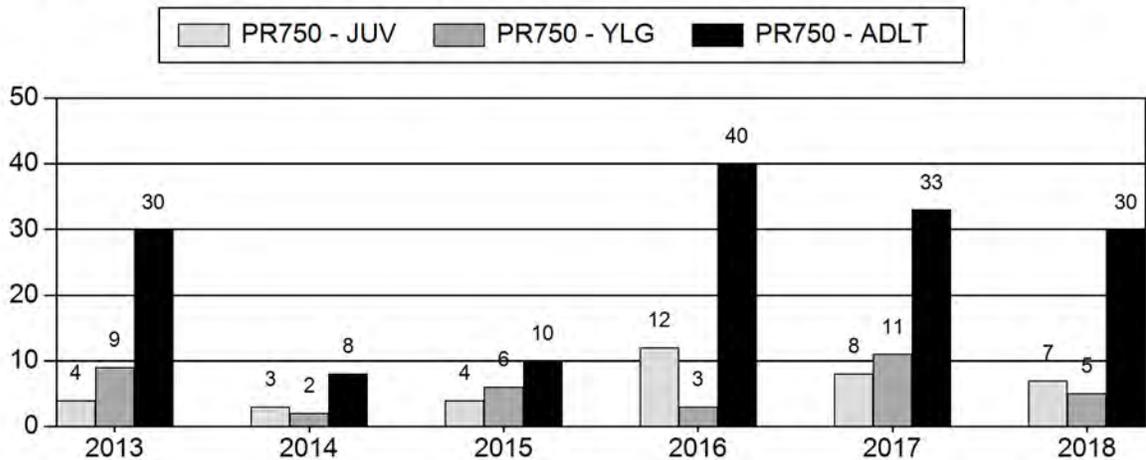
Age Structure of Field Checked Males



Age Structure Data (Field and Laboratory) - Male



Age Structure Data (Field and Laboratory) - Female



2013 - 2018 Preseason Classification Summary

for Pronghorn Herd PR750 - BLACK THUNDER

Year	Pre Pop	MALES				FEMALES		JUVENILES		Tot Cls	Cls Obj	Males to 100 Females				Young to		
		Ylg	Adult	Total	%	Total	%	Total	%			YIng	Adult	Total	Conf Int	100 Fem	Conf Int	100 Adult
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	41,130	482	659	1,141	19%	2,558	43%	2,235	38%	5,934	3,717	19	26	45	± 2	87	± 4	60
2016	43,983	617	763	1,380	22%	2,770	44%	2,096	34%	6,246	3,046	22	28	50	± 3	76	± 3	51
2017	45,477	631	1,033	1,664	22%	3,343	44%	2,526	34%	7,533	3,069	19	31	50	± 2	76	± 3	50
2018	45,886	413	908	1,321	23%	2,766	49%	1,613	28%	5,700	1,957	15	33	48	± 2	58	± 3	39

**2019 HUNTING SEASONS
BLACK THUNDER PRONGHORN HERD (PR750)**

Hunt Area	Type	Dates of Seasons		Quota	License	Limitations
		Opens	Closes			
4	1	Oct. 1	Nov. 20	225	Limited quota	Any antelope
	6	Oct. 1	Nov. 20	200	Limited quota	Doe or fawn
5	1	Oct. 1	Nov. 20	125	Limited quota	Any antelope
	7	Oct. 1	Nov. 20	100	Limited quota	Doe or fawn valid on private land
6	1	Oct. 1	Oct. 15	350	Limited quota	Any antelope; also valid on private land in that portion of Area 8 in Weston County
	6	Oct. 1	Oct. 15	50	Limited quota	Doe or fawn; also valid on private land in that portion of Area 8 in Weston County
7	1	Oct. 1	Oct. 15	700	Limited quota	Any antelope
	6	Oct. 1	Oct. 15	150	Limited quota	Doe or fawn
8	1	Oct. 1	Oct. 15	375	Limited quota	Any antelope
	7	Oct. 1	Oct. 15	75	Limited quota	Doe or fawn valid on private land
9	1	Oct. 1	Oct. 31	650	Limited quota	Any antelope; also valid in that portion of Area 11 in Converse or Niobrara counties
	6	Oct. 1	Oct. 31	500	Limited quota	Doe or fawn; also valid in that portion of Area 11 in Converse or Niobrara counties
24	1	Oct. 1	Oct. 31	300	Limited quota	Any antelope
	2	Oct. 1	Oct. 31	500	Limited quota	Any antelope valid on private land
	6	Oct. 1	Oct. 31	100	Limited quota	Doe or fawn
	7	Oct. 1	Oct. 31	300	Limited quota	Doe or fawn valid on private land

(continued on next page)

27	1	Oct. 1	Oct. 15	350	Limited quota	Any antelope
	7	Oct. 1	Oct. 15	75	Limited quota	Doe or fawn valid on private land
29	1	Oct. 1	Oct. 15	150	Limited quota	Any antelope
	2	Oct. 1	Oct. 31	600	Limited quota	Any antelope valid on private land
	7	Oct. 1	Oct. 31	350	Limited quota	Doe or fawn valid on private land
	8	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 2018
5	6	-100
5	7	+100
8	7	+ 75
29	6	- 350
29	7	+ 250
29	8	+ 100
Herd Unit Total	1	0
	2	0
	6	- 450
	7	+ 425
	8	+ 100

Management Evaluation

Current Postseason Population Management Objective: 49,000

Management Strategy: Recreational

2018 Postseason Population Estimate: ~ 40,900

2019 Postseason Population Estimate: ~ 45,500

2018 Hunter Satisfaction: 89% Satisfied, 7% Neutral, 4% 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 and accounts for about 10% of the annual, statewide harvest of antelope. 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 mi², of which slightly more than 7,100 mi² are delineated as occupied pronghorn habitat. This figure was revised in 2016 to better quantify unsuitable and unoccupied habitat (2016 PR750 JCR). The largest blocks of unoccupied habitat are found in Hunt Areas (HA's) 4 and 5 and generally 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 publically accessible to hunters are part of the Thunder Basin National Grassland (TBNG) and located in HA's 5, 6, 7, 27, and 29. HA 27 contains the largest contiguous 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 legally accessible by the general 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, farming, and timber harvest. There are several oil and gas fields, 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 and 27 and limit legal access to public lands. Farming 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 Sundance and Lusk.

We are maintaining this herd at the current objective and management strategy based on internal discussions and conversations with our constituents. We evaluated and considered population status and habitat data included in this document and a change is not warranted at this time. We

will review this herd objective again in 2024. However, if the situation arises that a change is required, we will review and submit a proposal as needed.

WEATHER: The winters of bio-year 2010 and 2011 were tough to severe in most of the Cheyenne and Niobrara River drainages, and resulted in above average over-winter mortality. These winters were followed by severe drought in 2012. The combination of which led to continued reductions in fawn productivity and survival. Bio-year 2013 was a transition year when drought moderated yielding good forage growing conditions followed by a relatively normal winter. Weather conditions between 2014 and 2016 fostered increased productivity and survival, resulting in a rebounding population of pronghorn. In 2014 & 2015, spring and summer temperatures were near long-term averages, while growing season precipitation was above average. Consequently, forage production during this period was excellent. Overall, winter conditions in 2014 and 2015 were not detrimental to pronghorn. During the spring and summer of both 2016 & 2017, drought hit most of the herd unit, and was fairly intense in some areas. In many locations, cool season forage production was nominal both years and warm season production limited. Overall, range conditions were generally fair to poor going into both the 2016-17 and 2017-18 winters. The 2016-17 winter saw a return of more normal winter weather with temperatures generally close to average and precipitation slightly above normal. The 2017-18 winter was notably cooler than that of the previous year, but average monthly precipitation a bit reduced. Over-winter mortality in both the 2016 and 2017 biological years is thought to have been about average to slightly elevated, with greater mortality realized during the 2018 biological year, as temperatures were below average and precipitation above normal. The combination of summer drought in 2016 & 2017 coupled to average to severe winter weather since 2016 has acted in concert with harvest to temper herd growth. Weather summary details are available at <http://www.ncdc.noaa.gov/cag/>.

HABITAT: This wide ranging herd unit is largely characterized by stands of Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) and silver sagebrush (*Artemisia cana*) interspersed with mid-prairie grasses such as wheatgrasses (*Agropyron* spp.), grama grasses (*Bouteloua* spp.), and needle grasses (*Stipa* spp.). Other areas are dominated by grasslands with less sage influence and more agricultural production, notably near the towns of Douglas, Lusk, Gillette, Newcastle, Upton, and Sundance. In addition, there are several major drainages throughout the herd unit dominated by plains cottonwood (*Populus deltoides*) and greasewood (*Sarcobatus vermiculatus*). These drainages include the head waters of the Belle Fourche River in the north and those of the Niobrara River in the south; while the Cheyenne River drainage (including Beaver Creek, Black Thunder Creek, Antelope Creek, Old Woman Creek, Hat Creek, Lance Creek, and Lightning Creek) make up the bulk of the herd unit. Steep canyons in the southern and central Black Hills are found in the northeast corner of the herd unit, where vegetation consists generally of ponderosa pine (*Pinus ponderosa*) forest and its associated savannah.

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 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 surface coal mining, and to a lesser extent bentonite 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.

After about a decade of collecting annual Wyoming big sagebrush leader growth and utilization data in this herd unit, the Department suspended these efforts. This was because it had been demonstrated annual leader production was generally proportional to the amount of spring and early summer moisture received; while over-winter browsing of shrubs could be fairly well gauged through causal observation. During 2014 and 2015 wet spring and summer conditions combined with low numbers of pronghorn and mule deer to yield excellent leader growth and low levels of winter use. Observations in 2016 and 2017 indicated little in the way of cool season grass and forb production and reduced leader growth on shrubs, which likely compromised the reproductive potential of the herd. The summer of 2018 saw a return to good growing season moisture and forage production. Given the responses observed in fawn production and survival the past several years, it appears this population is still below carrying capacity when range conditions are good, and about at carrying capacity in poor weather years. As such, it can likely be permitted to continue to grow towards objective.

FIELD DATA: This population last peaked in 2007 and declined through 2012. That decline was accentuated by the winter of 2010-2011 and subsequent drought of 2012. During this time, low fawn:doe ratios persisted and were accentuated by Epizootic Hemorrhagic Disease (EHDV) in 2013. In 2014, fawn production and survival increased substantially with a pre-season fawn:doe ratio of 91:100 being observed, a value not seen in a decade. This was followed by a second year of great fawn production and survival, even with significant numbers of yearling does in the population. Fawn production and survival in 2016 & 2017 dropped to slightly above average levels with 76 fawns per 100 does being observed each year. In 2018, the observed fawn:doe ratio plummeted to 58:100. This was the third lowest value observed since 1991, and it was not the result of bias created by significant numbers of yearling does. It is speculated low fawn production was the result of drought conditions during the 2016 and 2017 growing seasons that preceded colder and wetter than normal winter and early spring conditions each year. As a result, the reproductive potential of does and survival of fawns declined. Consequently, the post season population of this herd dropped slightly in 2018 after experiencing an average annual increase of about 11% between 2014 and 2017.

Over the last 25⁺ years, annual productivity of this herd, as measured by pre-season fawn:doe ratios, while experiencing cyclic fluctuations, appears to have trended lower (Figure 1). Transient declines in annual, and perhaps long-term fawn:doe ratios are thought to be the result of weather

conditions coupled with a gradual reduction in habitat quantity and quality through succession, aging of sagebrush, and over-browsing at times by both domestic livestock and wildlife.

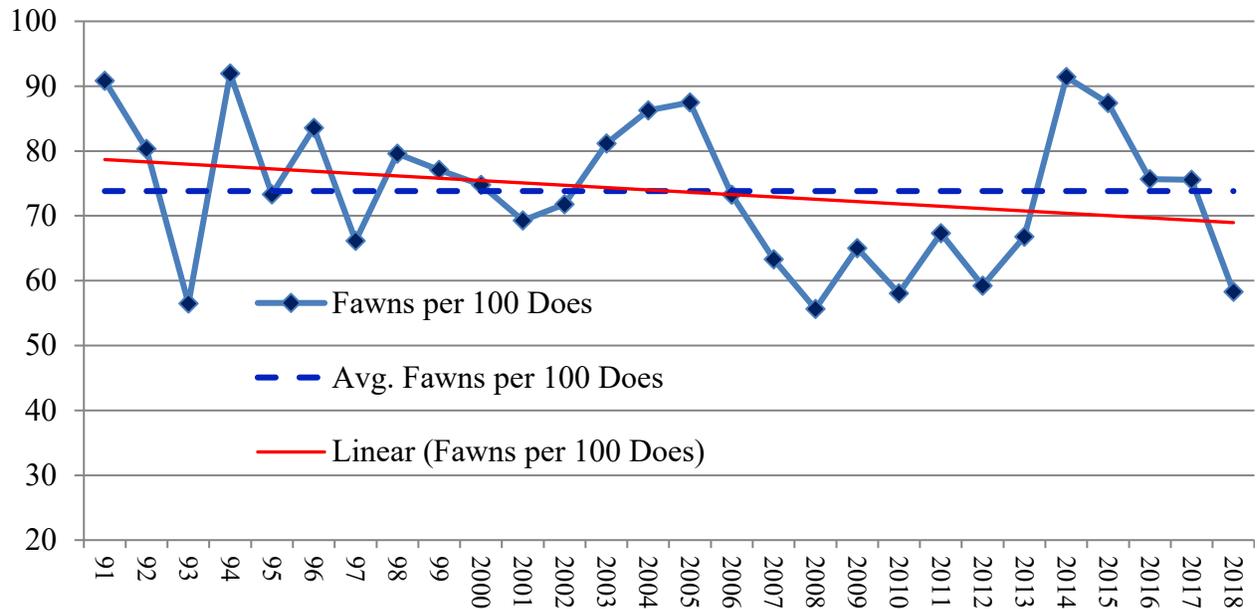


Figure 1: Observed Annual and Average Preseason Fawn:Doe Ratios in the Black Thunder Pronghorn Herd Unit (1991 – 2018) with Trend Line.

As this population grew during the early and mid 2000’s, preseason buck:doe ratios generally rose. Then, as this population dropped and the percentage of bucks harvested from the population increased each year, preseason buck:doe ratios declined - dropping to a low of about 40:100 in 2014. With generally conservative buck hunting in place and enhanced fawn production and survival, the observed preseason buck:doe ratio increased to 45:100 in 2015 and 50:100 in both 2016 and 2017. With the recruitment declining after 2014 and liberalization of harvest the past three years, the preseason buck:doe ratio dropped slightly in 2018 to 48:100. In 2019, on the heels of poor fawn recruitment, the preseason buck:doe ratio is expected to decline to 45:100, which is the mid-point of management criteria.

HARVEST DATA: Hunter success dropped while effort remained fairly consistent between 2010 and 2013 as this population declined. In both 2014 and 2015, with conservative hunting seasons in place and a growing pronghorn population, hunter success improved each year while hunter effort fluctuated around 4 days per animal harvested. These harvest statistics remained essentially unchanged in 2016, as seasons were liberalized to moderate population growth. With the continued increase in the preseason population and only moderate increases in license issuance, hunter success increased and effort declined in 2017 and 2018. The number of harvested pronghorn field checked was also significantly greater in 2017 (N=285) and increased again in 2018 (N=313), although this in part may have been due to the use of a new automated field check application all personnel deployed from their smart phones.

After several years of hunter success below that normally observed and desired for pronghorn hunting in Wyoming, most hunt areas in the herd unit have witnessed a return to historic success levels since 2015. However, there have been some notable exceptions. In 2018, hunter success on doe/fawn licenses ranged from a low of 54% in HA 29 (on Type 7 licenses) to a high of 94% in HA 6, with the mean success rate for doe/fawn hunters being 79%, which was identical to last year. These figures do not include the reported 0% success reported for HA 6 Type 6 tags used in that portion of HA 8 where they were valid, which suggests bias or undetected errors in the harvest survey data. Hunter success on Type 1 and 2 licenses ranged from 69% in HA 5 to 97% in HA 6 (with a mean of 87%). Except for HA 5, hunter success on any antelope tags was above 80% in all other hunt areas. Continued low hunter success on both license types in HA 5 is likely due to persistent low buck:doe and fawn:doe ratios, which have averaged 37:100 and 70:100 since 2000, respectively.

Hunter success dropped steadily between 2010 and 2013, and remained low until 2015 when pronghorn numbers noticeably increased while license issuance remained conservative. Since then, total hunter success has trended upwards peaking at 92% in 2018. In 2015, hunter satisfaction rose about 8 percentage points with 81% of the hunters reporting they were very satisfied or satisfied. Hunter satisfaction then rose slightly in 2016 and improved more substantially in 2017 as 89% of the hunters reported they were very satisfied or satisfied. This level of overall satisfaction continued in 2018. In 2018, total satisfaction was lowest in HA's 5 & 9 at 79% and 80%, respectively. However, resident participation can bias satisfaction numbers for a couple of reasons. First of all, there are relatively greater expectations and demands exhibited by resident hunters compared to their non-resident counterparts, which results in residents expecting more from a quality antelope hunt and generally reporting lower satisfaction. Secondly, resident hunter participation in most of the hunt areas where private land predominates is significantly lower than that of non-residents, and very few residents are surveyed, which can impact reported values. For example, HA 5 had the highest proportion of residents surveyed (51%), while only four resident hunters were surveyed in HA 8 (5%) and eight in HA 9 (7%). So, while HA 5 had the lowest overall satisfaction, non-resident satisfaction there was 92%. As such, a case can be argued that the lowest overall satisfaction is strongly present in HA 9 where 93% of the respondents were non-residents who voiced an overall satisfaction rating about equal to HA 5.

POPULATION: Following the creation of this herd, an official population model was constructed in February, 2015 (see 2015 PR750 JCR for details). As has been the case since, the "Semi Constant Juvenile & Semi Constant Adult" (SCJ SCA) spreadsheet model was again chosen this year to estimate the herd's population. All three competing models generally simulate a population rise between 2000 and 2006 or 2007, followed by a decline through 2012 or 2013 and then an increase through 2017, with a small decline in 2018. All three models also produce post-season population estimates for 2014 within 2% of each other and within about 10% in 2015 and 2016. However, the SCJ SCA model begins to diverge from the competing models and produces a 2018 post-season population estimate about 18% above the CA CJ and 11% above the TSJ CA. However, the SCJ SCA model exhibits an AICc value about 25% lower than the competing models and a lack of fit value midway between the competing models without appearing to over parameterize modeled buck:doe ratios. Finally, the magnitude of population trends produced by

SCJ SCA model dovetail better with general trends in harvest statistics and perceptions of local game managers, landowners, and hunters.

The competing models all fit line transect (LT) estimates well enough, although the chosen model does give the highest estimate above the LT figure for end of bio-year 2016. It should be noted that corrections were made to the end of bio-year 2014 LT due to an error that was detected in calculations combined with use of revised occupied habitat figures. As a result, all of the models now track LT estimates better than previously reported, without substantially changing population estimates generated by the models.

The current model seems to function well because it allows for modeling the significantly 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 very reasonable. Consequently, the model is considered fair to good overall because it has over twenty 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.

The Black Thunder pronghorn population is projected to have increased steadily from the late 1990's through 2006-07, when it reached a plateau and peaked about 30% above objective. During this timeframe, above average doe:fawn ratios were observed, while doe/fawn harvest was limited by our inability to sell all available licenses. After this peak, the postseason population declined through 2012 and remained essentially unchanged in 2013 at 45% below objective. Some of this decline was due to increased harvest following regulatory and license issuance changes that increased doe/fawn licenses sales. 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 EHD. Fairly conservative hunting seasons, excellent fawn production and favorable weather allowed this population to increase substantially between 2014 and 2017. Increased harvest and low productivity then caused this population to drop slightly post-harvest 2018 to 20% below objective.

MANAGEMENT SUMMARY: Hunting seasons between 2012 and 2015 were quite conservative. Beginning in 2016, harvest was liberalized each year through 2018 to slow population growth in response to very good productivity. However, doe/fawn harvest remained significantly reduced from historic levels. This year, in response to poor fawn production in a population below objective, license issuance has not been significantly adjusted, except for the addition of 75 type 7 tags in HA 8. This being done to initiate some limited doe/fawn harvest at the behest of landowners in an area that has not had doe/fawn tags issued the last six years.

In HA 29, as a response to complaints from landowners and hunters about low pronghorn numbers and hunter success on public land, the bulk of any-antelope licenses will continue to be issued as Type 2 (valid on private land only). Additionally, the season length for this tag along with the Type 7 licenses is being extended to October 31 at the request of several landowners. Changes made in this hunt area over the past several years have been well received by many landowners and have significantly reduced harvest pressure on public land in the northern part of HA 29. Another modification being made in this hunt area (and in HA 5) is changing Type 6 licenses to Type 7 to standardize doe/fawn tags valid on private land only as Type 7. As such the former

Type 7 licenses in HA 29 (portion of the area) are now designated as Type 8. Similarly, in HA 24 Type 2 and Type 7 licenses are continuing to be issued.

In 2019, total harvest should be close to, or slightly exceed, 2018 levels. Given average preseason age and sex ratios observed over the past 5 years, normal survival rates, and the predicted harvest of ~ 4,580 pronghorn, the 2019 hunting season suggests the post-season population of this herd will grow 10% to about 45,500 pronghorn, which is 7% below objective. However, given the winter losses observed in this herd this year, it is more likely herd numbers will stabilize or drop slightly.