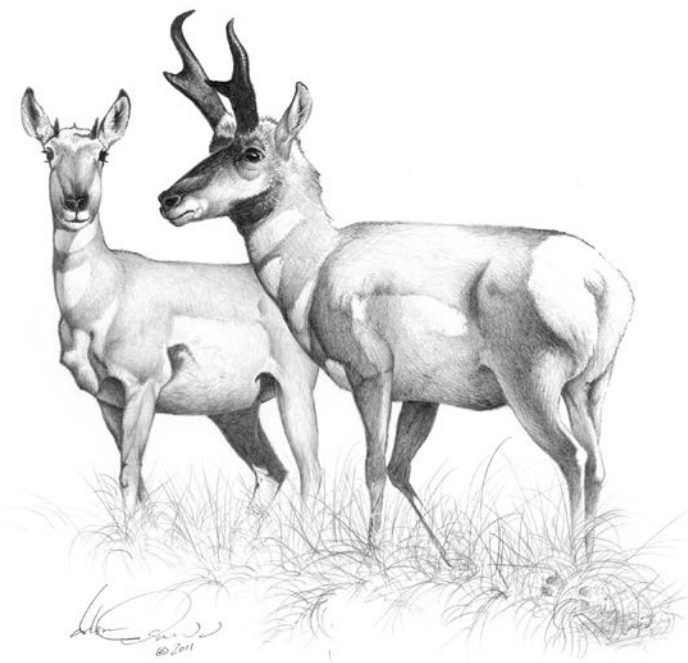


# PRONGHORN MANAGEMENT PLAN FOR SOUTH DAKOTA



**SOUTH DAKOTA DEPARTMENT OF GAME, FISH AND PARKS  
PIERRE, SOUTH DAKOTA**

**WILDLIFE DIVISION REPORT 2014-08**

**SEPTEMBER 2014**

This document is for general, strategic guidance for the Division of Wildlife and serves to identify what we strive to accomplish related to **Pronghorn Management**. This process will emphasize working cooperatively with interested publics in both the planning process and the regular program activities related to pronghorn management.

This plan will be utilized by Department staff on an annual basis and will be formally evaluated at least every 5 years. Plan updates and changes, however, may occur more frequently as needed.

## ACKNOWLEDGEMENTS

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All text and data contained within this document are subject to revision for corrections, updates, and data analyses.

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# South Dakota Pronghorn Management Plan 2014

## INTRODUCTION

The pronghorn (*Antilocapra americana*) is the only member of the family Antilocapridae and is native only to North America. In the 1804 journals of the Lewis and Clark expedition, it was noted that pronghorn occurred in vast numbers over most of the Dakota Territory. In 1841 Maximillean recorded pronghorn as wintering west of the Missouri River along the Cheyenne River and during the spring they would swim the river to summer in the Coteau des Prairie. In the 1879 Yankton Daily Press, pronghorn were reported as abundant on the prairies east of the James River (SDGFP 1965). It has been estimated that over 700,000 pronghorn ranged in South Dakota prior to 1800.

Today pronghorn populations in South Dakota persist at substantially lower numbers than were historically present. Pronghorn densities are greatest in the western rangelands of the state but herds exist in most counties west of the Missouri river and some counties directly east of the river. Public demand for hunting opportunities is strong, with approximately 13,000 rifle hunters and 2,000 archery hunters purchasing licenses at recent peak population levels in 2008. Current populations are affected by weather extremes of drought and severe winters, decreasing available habitats due to conversion to agriculture, predation, and landowner tolerance.

The South Dakota Department of Game, Fish, and Parks (SDGFP) manages wildlife and associated habitats for their sustained and equitable use, and the benefit, welfare and enjoyment of the citizens of this state and its visitors. South Dakota's wildlife resources demand prudent and increasingly intensive management to accommodate numerous and varied public demands and growing impacts from people. This plan provides important historical background and significant biological information for the formulation of sound management. Current survey methods and management tools are presented, along with a thorough discussion of objectives and strategies to guide management of this important resource into the future. This plan is intended to guide managers and biologists, and also aid in the decision-making process of our Division of Wildlife (DOW) and SDGFP Commission. It also serves to inform and educate the sportsmen and women, landowners, and other publics of South Dakota to whom it will ultimately benefit.

## HISTORICAL BACKGROUND

Historically, pronghorn ranged west of the Mississippi River from southern Canada south through Mexico as far as present day Mexico City. Some wildlife historians estimated pronghorn numbers to be equal to or exceed those of the American bison

(*Bison bison*). By the early 1900's it was estimated that numbers in the central range had diminished greatly and the northern and southern ranges were nearly void of any pronghorn with a decline by more than 99% due to fencing, habitat loss, and unregulated hunting (O'Gara and Yoakum 2004). It has also been reported that the mobility of pronghorn was partially dependent upon the snow trampling of bison which provided lanes of travel and food during severe winter storms. Thus, the near extermination of bison has also been suggested as partially responsible for the rapid decline of pronghorn. A fatal epizootic that reportedly killed 75 to 90 percent of pronghorn between the Yellowstone and Missouri rivers may have also contributed to the decline of pronghorn (SDGFP 1965).

Similar to much of western North America, pronghorn in South Dakota were considered extirpated east of the Missouri River by 1909, with a small population holding on west of the river. Alarmed by the decline in numbers, the South Dakota House passed Bill No. 7 on January 7, 1911, making it unlawful to kill pronghorn in South Dakota.

Although available literature does not pinpoint the person or parties responsible for the conception of the Pronghorn Reserve in Harding County, Peter Norbeck (as governor of the State and later Senator in Washington) was chiefly responsible for the establishment of the Pronghorn Reserve in the Slim Buttes area on Jan. 3, 1921 (USDA 1925). The original reserve was justified primarily to save pronghorn from extinction, secondarily to act as a refuge for deer and game birds, and also as a planting site for bison and elk (*Cervus elaphus*). The original reserve included 20,800 acres but was later reduced to an area of about 8 - 10,000 acres. Because the original plan for the reserve called for fencing of Forest Service lands, special legislation was needed. Senator Norbeck introduced an enabling act in the 68<sup>th</sup> Congress which would authorize the withdrawal of public domain for the protection of pronghorn and other game animals and birds. This act passed in 1924 and in 1925 President Coolidge signed a proclamation completing the withdrawal on the Pronghorn Reserve. It appears only 360 acres are included under this protection. In 1924, SDGFP also purchased 1,120 acres of private lands within the reserve.

The Pronghorn Reserve originally contained approximately 50 animals, but a few additional pronghorn moved in from adjacent herds as the fence was being constructed (Popowski 1959). The winter of 1936-37 nearly decimated the herd, and after a storm in 1949 it was reported that only 7 pronghorn were left in the Reserve. The fence later deteriorated allowing unimpeded animal movement in and out of the Reserve (Popowski 1959). There are no indications that the Pronghorn Reserve was responsible for the increase of pronghorn in western South Dakota, rather it seems range expansion from Montana and herd growth of existing local herds likely occurred.

An estimate made by the Bureau of Biological Survey in 1924 placed the pronghorn population at 680 animals in eleven bands within twelve counties in the state. During 1941, a census estimated 11,000 pronghorn mostly located in Harding and Butte counties, and in 1942 SDGFP issued 500 permits for the first regulated pronghorn season (SDGFP 1965). License sales and harvest records have been collected and

monitored since the first pronghorn season (Table 1). Annual pronghorn seasons have continued to present day with the exception in 1945 and 1949 being closed.

In order to re-establish populations within the historic range of pronghorn in the state, limited numbers of transplants have occurred. Prior to transplanting animals SDGFP staff evaluated numerous factors to determine the suitability of proposed areas to sustain pronghorn populations. Factors evaluated included 1) distribution of cultivated lands, 2) winter range, 3) amount and distribution of woven wire fence, 4) predation, 5) land ownership, and 6) class of livestock (Bever unpublished report). In some areas private landowners requested transplants as demonstrated by a Department report for Tripp County (Bever 1949) that states "almost 100% of farmers and ranchers living within or near the areas inspected have signed a petition requesting the introduction of pronghorn". A similar unpublished report of landowners surveyed in Haakon County stated that 100% of landowners contacted were in favor of releasing pronghorn, even after being informed of potential crop damage issues.

The first record of restocking in South Dakota took place in 1914 when the Boone and Crockett Club purchased 13 pronghorn in Alberta and released them in Wind Cave National Park (WICA;USDA 1925). In 1950, 30 pronghorn were released in Weta Basin of Jackson County and 24 in Tripp County. In 1952, 16 pronghorn were released in the Pronghorn Reserve in Harding County, 13 were released west of Buffalo in Harding County, 8 were released in Custer State Park, and 30 southeast of Kadoka in Jackson County (Berner 1952). Brief memos and notes in Department files mention that in 1961 approximately 40 pronghorn were released in Mellette County, 40 northeast of Hamill (Tripp County), and approximately 20 at the Scenic Bombing range (Shannon County). In 1962, sixty-two animals were released in Grant and McPherson counties. Additional pronghorn were put in McPherson County in 1964, in addition to a new transplant site near Lake City in Marshall County. The last transplant occurred in South Dakota in 1985 when 104 pronghorn trapped in Wyoming were transplanted on the Crow Creek Indian Reservation in Buffalo County.

Aerial inventory of pronghorn was first initiated in 1941. A review of the aerial survey method in South Dakota in 1951 suggested a 33 percent sample of the unit (where pronghorn density was about 1 pronghorn per square mile), with observers counting pronghorn ¼ mile out on each side of the plane, usually produced population estimates with an error of less than or equal to 10 percent (Bever 1951a). Another report (Robbins 1964) later similarly suggested that 33 1/3 percent of units should be flown when pronghorn densities are 1 or more per square mile, and further recommended 50 percent of the unit should be flown when densities are between 0.3 to 0.99 per square mile, and 100 percent if densities are less than 0.3 per square mile.

## **PRONGHORN RESEARCH IN SOUTH DAKOTA**

The Pronghorn Reserve, created in Harding County in 1921 to save pronghorn from extirpation, remained under private operation until 1947 when it was leased to the State

College for livestock, pronghorn, and range management experiments. In May of 1947, 750 sheep and 60 head of cattle were placed on the reserve. In 1949, at the suggestion of the State College, the reserve was cross-fenced by SDGFP into a series of 16 experimental pastures. A study of the vegetation in the reserve (Bever 1951) found that between 1947 and 1950 forage production declined 36% for grasses, 44% for browse, and 33% for forbs. By 1952, pronghorn research within the Pronghorn Reserve was eliminated, and SDGFP memos suggest pronghorn were more or less removed from the overall management of the reserve.

Bever (1950) necropsied 14 pronghorn in Harding and Butte counties and reported parasite counts of 14 species of nematodes and cestodes; *Actinomyces* sp. and *Actinobacillus* sp. were the only bacterial infections identified, and one pronghorn death was attributed to hemorrhagic septicemia. Fawn mortality was estimated at 30-60% and was believed to be caused by internal parasites. Bever (1950) further concluded that no bacterial, protozoan, or filterable virus disease has been diagnosed in pronghorn of South Dakota. SDGFP (1965) reported that the use of phenathiozine salt blocks and abandonment of close herding prior to the completion of this project temporarily cured the sheep-pronghorn parasite problem. Moore et al. (1968) discovered insecticide residues in pronghorn and reported that residue levels were of little significance with regard to human consumption of pronghorn.

Bever (1957) examined hunter harvested pronghorn and reported that 91% of pronghorn harvested from overgrazed domestic sheep ranges were infected with parasites, as compared to 48% from properly grazed cattle ranges. On cattle ranges, the degree of infestation (index) was reported as 5.7 and 1.9 for *Haemonchus contortus* and *Nematodirella* sp., respectively, whereas on sheep ranges the degree was 18.2 and 48.5. A similar study in North Dakota found that 97% of examined pronghorn ( $n = 95$ ) were parasitized, with those in ranges grazed by sheep having more abomasal parasites while those on ranges grazed by cattle having more intestinal worms (Goldsby and Eveleth 1954). Bever (1957) examined harvested pronghorn from 1952-1956 and found that 75% of specimens were infected with some species of intestinal parasites. One fawn was reported to have died from rabies after being bitten by a skunk (Wempe 1976). Reed et al. (1976) discovered calf diarrhea, a reovirus-like agent, in 3 pronghorn fawns captured on cattle ranches in Butte and Meade counties ( $n = 7$ ). Furthermore, Lucker and Dikmans (1945) identified about 810 specimens of *Pseudosteragia bullosa* in the abomasums of one pronghorn, and several new records of nematodes.

The most common diseases that could likely affect pronghorn in South Dakota are epizootic hemorrhagic disease (EHD) and blue tongue. Both are viruses, with outbreaks of the disease starting in late summer and lasting until the first frost. The vector for the disease is the gnats of the genus *Culicoides* that occur during wet springs with dry summers. EHD outbreaks are common in South Dakota in white-tailed deer but no significant die-offs have been documented in pronghorn.

During 1959, a research study conducted in Harding and Butte counties looked at wounding loss that occurred during the hunting season. It was determined that



wounding loss that year was 8.2% which was lower than the reported loss of 19.2% that occurred in Fall River county during the 1948 hunting season (Hart 1960). SDGFP (1965) reported that hunters with scope sighted rifles killed about 8% more bucks than hunters with iron sights; hunters with scoped rifles also averaged 4 shots to kill a pronghorn, while those with iron sights averaged 13 shots. A report on how to care for harvested pronghorn (Bever 1949a) reported that pronghorn can be successfully kept in the field for about 6 days if they are carefully skinned and exposed to direct sunshine; the sun causes the formation of a thick rind which makes the development of the blow-fly larvae impossible.

Research on pronghorn forage consumption, preference, and competition with livestock in South Dakota started back in the 1940s. Bever (1948) completed stomach analyses on 87 pronghorn and concluded that seasonal food habitats varied considerably and two sage brush species (*Artemesia tridentate* and *A. cana*) were the most important food sources. Stomachs with >10% agricultural food sources were removed from the analyses. Competition between domestic sheep and pronghorn on sagebrush was an issue at the time, since it was believed that sagebrush was a major food source during severe winters for both pronghorn and domestic sheep. Kohler (1950) reported that both domestic sheep and pronghorn consumed sagebrush, however, pronghorn ate the finer parts, the florets and leaves, while domestic sheep ate the courser stems, leaving the florets.

Later research focused on pronghorn depredation on agricultural fields interspersed within the sagebrush/grasslands that typically dominated the pronghorn range in western South Dakota. Messenger and Schitoskey (1980) identified 32 plants in fecal pellets from pronghorn in Harding County and reported big sagebrush (*A. tridentata*) was the only plant consumed in every month of the year. Other commonly used shrub species identified were fringed sage (*A. frigida*), silver sage (*A. cana*); common forbs were yellow sweet clover (*Melilotus officinalis*) and gold aster (*Chrysopsis villosa*); and the most commonly used grass was blue grama (*Bouteloua gracilis*). Forbs constituted 44-68% of pronghorn diets between May and September, shrubs 69% in November and 95% or more from December to April, and grasses were relatively unimportant. Terwillinger (1946) compiled data collected from South Dakota to conclude that the year-long average browse, forb, and grass percent of samples was 66, 23, and 11, respectively.

Berner (1949) reported that pronghorn utilized all available agricultural crops, and listed order of preference from most to least as follows: late flax, alfalfa, corn, sorghums, wheat, oats, barley, and rye. He also reported that small, widely scattered tracts of cultivated land within pronghorn range are subject to greater depredation than blocks of farm land adjacent to pronghorn range. Berner (1949) recommended techniques to reduce crop damage such as early planting and harvesting of flax and other crops, and increasing height and density of planted corn. Messenger and Schitoskey (1980) did not find cultivated small grain crops to be a major food source for pronghorn. Griffin (1991) did find pronghorn using alfalfa fields in March-April, and July-August in greater proportion than availability, with use of small grain fields during May-June and

recommended an increase in the use of the Conservation Reserve Program to alleviate depredation on agricultural fields. Jacques et al. (2006) identified blue grama, common juniper (*Juniperus communis*), and northern bedstraw (*Galium boreale*) as important food items in WICA, and documented annual diets included 42% grasses, 31% shrubs, and 27% forbs. Total forage production in WICA was 72% grass, 4% shrubs, and 23% forbs; pronghorn exhibited strong dietary selection for shrubs.

Jacques (2006) studied habitat use of neonates in the northwest and southwest portions of South Dakota and found significantly greater shrub cover and density at neonate bed sites in Harding County versus Fall River County, while distance to nearest concealment cover was also lower. Overstory height was greater and distance to concealment cover was less at bed site locations than at random locations in both study areas. Jacques (2006) recommended management of rangelands that maximizes overstory height of grasses and shrubs, understory height, and distribution of clumped, vertical structure to provide neonates with adequate concealment cover for protection from predators. In WICA, mean height of vegetation at fawn bed sites was greater ( $P=0.05$ ) than vegetation height at random locations (Jacques et al. 2007). Research in Custer State Park (Lehman et al. 2009) discovered that fawns during the hiding phase (1-28 days old) selected dry prairie-semi-natural mixed grassland, while fawns in the group phase (29-60 days old) selected similar areas but also prairie dog dominated grasslands. Group phase fawns also selected bed sites that had greater forb cover and overstory canopy cover of ponderosa pine trees compared to random sites.

An observational study (Maher 2000) conducted in WICA and another site in Montana suggested that plant productivity has a powerful role in determining pronghorn territoriality, more so than pronghorn density and herd sex ratio. Bromley (2003) reported a dominance hierarchy existed among territorial bucks at WICA, with these bucks claiming areas for territories with the greatest abundance of preferred food.

Jacques and Jenks (2006) classified 56% of fawns as dispersers, with most (84%) dispersers departing natal home ranges in late October, occupying winter home ranges for 102-209 days, then dispersing to permanent home ranges in April. Fawn dispersal distances from natal ranges to permanent home ranges varied from 6-276 km, while permanent home range size was documented to range from 16-166 km<sup>2</sup>. Adult females monitored were predominantly non-migratory and 10% were conditional migrators (Jacques et al. 2009). Mean distance between summer and winter range was 23 km. In southwest North Dakota, 55% of pronghorn made seasonal movements (defined as >15 km) for an average distance of 71 km (Kolar et al. 2011). Mean winter and summer home ranges were 56 km<sup>2</sup> and 20 km<sup>2</sup> in Harding county and 127 km<sup>2</sup> and 66 km<sup>2</sup> in Fall River County (Jacques et al. 2009). Winter and summer home ranges of 67 km<sup>2</sup> and 55 km<sup>2</sup>, respectively, were documented in WICA (Sievers 2004).

Research in WICA found low summer fawn survival rates ranging from 22%-42%, and adult female survival of 86-88% with coyote (*Canis latrans*) predation being the major cause of mortality (Sievers 2004). However, outside of the national park, hunting was the primary cause of mortality, attributing for 26% of adult female deaths (Jacques et al.

2007a). Adult pronghorn annual survival averaged 86-87% with 12-week fawn survival ranging from 92% in the northwest to 62% in the southwest portions of the state (Jacques 2006). Predation has been documented as the primary cause of fawn mortality, with coyote being responsible for most identifiable events. Jacques and Jenks (2008) reported a visual observation of bobcat predation on an adult female pronghorn in 2002 in Harding County.

Research on a declining population of pronghorn in WICA (Jenks et al. 2006) found similar levels of observed heterozygosity and low inbreeding coefficients when compared with other populations in western South Dakota, indicating that genetic variability was not the primary factor in the decline of pronghorn in the Park.

A recent study evaluating landowner attitudes towards various wildlife species (Longmire 2014) revealed that 85% of landowners who reported pronghorn on their property (n = 370) felt that pronghorn numbers on their property were either too few or just about right.

## **CURRENT MANAGEMENT**

South Dakota has the 5<sup>th</sup> largest pronghorn population in North America with an estimated 34,200 animals in 2011 (Walker 2012). Due to the overall high annual adult survival rates and varied fawn recruitment rates, management surveys are critical in order to address the current issues and concerns with pronghorn within South Dakota. Numerous surveys are completed by SDGFP in order to manage this important resource for both consumptive and non-consumptive users.

### **Surveys**

Population surveys in South Dakota for pronghorn include hunter harvest surveys, fall recruitment surveys, and spring aerial surveys (Tables 1 and 2) for twenty-seven pronghorn game management units (Figure 1).

The pronghorn harvest survey is conducted annually via report cards (Figure 2) and the internet. Currently hunters are surveyed for each of the pronghorn seasons available; firearm, archery, landowner, mentored youth, and Custer State Park. Hunter survey cards are mailed to a portion of license holders in order to estimate hunter success, pronghorn harvest and related information for each season (Table 1). Sampling intensity is dependent on hunting season, number of licenses sold, and license types available. Randomly selected hunters receive a survey card or email at the end of the season followed by three subsequent mailings/emails at 12-14 day intervals in order to maximize response rate and precision by limiting non-response bias. The minimum response rate target has been established as 85% of the sample providing harvest estimates within  $\pm 15\%$  of the sample statistics.

The pronghorn fawn/doe ratio survey is conducted from 01 August through 30 September via random opportunistic ground counts throughout the pronghorn range. A

sample size of 10% of the estimated doe population is recommended per game management unit to obtain accurate fall recruitment ratios.

The spring aerial survey is conducted 01 May through 15 June. The survey consists of a 33 ⅓ percent sample, completed on ½ mile width transects systematically spaced 1 ½ miles apart. Pronghorn within ¼ mile of the transect centerline are counted and classified by sex; sightability is assumed to be 100%. In lower density units of the eastern part of the pronghorn range, the entire unit is surveyed. Aerial surveys are conducted to determine numbers of adult pronghorn (fawns are not counted) within each game management unit. To account for the variability of pronghorn densities within a unit confidence intervals are formulated by calculating density estimates for individual transects within each unit. Standard errors for the mean pronghorn/mi.<sup>2</sup> are calculated for each unit using:

$$SE_{\bar{x}} = \frac{s}{\sqrt{n}}$$

Where:

s = the sample standard deviation of individual transects within each unit

n = the number of transects within each unit.

To formulate spring adult population estimates, the average unit pronghorn density (calculated from surveyed transects) is multiplied by the total area of each hunting unit. Upper and lower bound population estimates are derived from the standard error of the mean density estimate for that unit. To estimate fawn recruitment into the fall population, doe projections for each unit obtained through spring aerial surveys are multiplied by the respective fawn/doe ratios from fall herd composition surveys. Total fall population projections are the sum of spring adults and fall recruitment, with no adjustment to adult survival between June – September.

Due to time and personnel constraints, aerial surveys are conducted biennially; during years of no surveys, population models are used to estimate pronghorn numbers. Population and rate of change ( $\lambda$ ) estimates are formulated using the previous year's spring aerial adult estimate, which are entered into the SDGFP population projection spreadsheet model. Regional fall herd composition data are applied to estimate pre-hunt age and sex ratios. Adult female (0.80, SE= 0.04) and adult male (0.75, SE = 0.04) annual survival rates from pronghorn research conducted in western South Dakota over the last 10 years are used as input variables. To quantify annual recruitment, overwinter fawn survival of 0.85 (SE= 0.04) is applied. Confidence intervals for population estimates are derived using Markov chain Monte Carlo (MCMC) simulation methods in Program R. Standard errors are calculated for all survival input variables using the maximum likelihood estimator and sex and age ratio standard errors are calculated using the binomial proportion confidence interval estimator. MCMC simulations then generate one million random inputs for each input variable from a probability distribution over the domain of each standard error. The results of the simulation are then aggregated to formulate the confidence interval for the population estimate of interest.

Severe winter weather can have detrimental impacts on populations of pronghorn in South Dakota. Substantial declines in pronghorn densities have been observed following severe winters in the late 1970s, mid 1980s, late 1990s, and 2008-2010 (Figure 3). Although not as easily detected, lower recruitment in subsequent years has also been observed in some areas. Spring aerial surveys conducted subsequent to severe winters provide sufficient data to predict impacts to pronghorn populations. In years when no aerial surveys are conducted, however, SDGFP uses winter severity indices (WSI) to quantify impacts of severe winters. Monthly WSI's are calculated for each pronghorn management unit using the following formula:  $WSI = T * (-0.1 + 1) * S$ ; where (T) = the mean average temperature and (S) = the accumulative snow fall for that designated month. The monthly values (November- April) are then summed together to get a cumulative WSI value for the year. The cumulative WSI value is entered into a logistic regression model that predicts adult over-winter survival based on the severity of the winter. Adult aerial estimates from 1996-2013 were used in determining the relationship between over-winter survival and the cumulative WSI value. The regression analysis indicated as WSI increases, over-winter survival decreases. If a severe winter does occur, the model is used to adjust the adult survival estimates that are used in the projection model.

### **Management options**

When determining population objectives, SDGFP staff review and analyze recruitment rates, population estimates, harvest levels, hunter success, hunter comments, depredation complaints, and landowner and public input. Once population objectives are defined, SDGFP staff develops season recommendations that strive to provide the most hunting opportunity, while shifting the population towards management objectives. The SDGFP has defined unit-specific population objectives (Table 3), which are based on input from sportsmen, landowners, and other publics of South Dakota. Methods used to collect public input include hunter opinion surveys, landowner opinion surveys, harvest report cards, regional advisory panels, regional open houses, commission meetings, and staff contacts (personal, phone, email). It is important to note that the biological and social considerations used to develop these population objectives are not static and may change over time.

Depending on population densities within each pronghorn management unit, SDGFP staff utilizes harvest strategies in Table 4 to guide management decisions. This table is presented as a guide to appropriate harvest options available for local herds based on unit objectives and herd status. This table defines harvest strategies presently available and will be modified as needed if other options become available in the future.

### **POPULATION STATUS**

Pronghorn population numbers have varied in South Dakota in recent times from a low of 680 in 1924 to a high of approximately 81,690 in 2008 (Table 2). Within the last 30 years there have been several significant die-offs occurring during the severe winters of 1985-1986, 1996-1997, and 2008-2009 (Figure 3). Calculations of winter severity

indices also suggest higher than normal overwinter mortalities likely occurred in the winters of 2000-2001, 2009-2010, and 2010-2011 (Figure 4). Recovery from severe winter mortalities is affected by the direct loss of animals and often subsequent reduced fawn recruitment the year following a harsh winter (O’Gara and Yoakum, 2004). Statewide pronghorn populations can fluctuate widely year-to-year depending on annual fawn recruitment (Table 2).

The pre-season statewide population objective is 68,000  $\pm$  10,000 total pronghorn (Figure 3), which is the sum of all management unit objectives (Table 3). Pronghorn densities will vary by management unit, but the overall average throughout the pronghorn range in the state will be 1.65 pronghorn per square mile when goals are reached (Table 3). Population objectives may fluctuate due to landowner tolerances, which are often influenced by winter severity, crop rotation, and changing habitat conditions due to drought and/or livestock grazing. During 2007 and 2008 fall populations were above the statewide objective and population recruitment could not be controlled through hunter harvest. Record harvest levels combined with the impacts of the severe winters of 2008-2009, 2009-2010, and 2010-2011 reduced pronghorn populations below management objectives in most management units. In addition to direct winter mortality and reduced recruitment, pronghorn populations in game management units can decrease or increase due to winter migrations of herds to avoid deep snow. This presumably occurred most recently during the 2008-2009, 2009-2010, and 2010-2011 winters, which caused populations of some units in the northern range to decrease while some populations in the southern range were stable or increased due to the influx of migrating pronghorn.

### **Population Estimate**

In 2013, based on aerial surveys and fall recruitment, the pronghorn preseason population was estimated at 36,280. This was substantially lower than the recent record population of 81,690 in 2008 (Table 2). The use of annual density maps recently developed by SDGFP can be a useful tool in understanding pronghorn distributions and the potential effects of harvest, weather, and habitat conditions (Figure 5). The majority of South Dakota’s pronghorn population is found in Harding, Butte, western Perkins, southwestern Fall River, and central Meade counties.

Aerial surveys were not conducted in 2014, but the winter of 2013-2014 was average and populations are expected to increase. Assuming recruitment rates are similar to those documented in 2013, preliminary results using the SDGFP projection model suggest approximately 41,600 pronghorn will be available pre-season in 2014. Densities will vary by management unit, but overall pronghorn densities will average 1.01 animals per square mile (Table 3). Final estimates for 2014 will be calculated and tables updated after the 2014 fall recruitment surveys have been conducted.

### **Recruitment**

SDGFP staff classified 7,167 does and fawns in August and September of 2013 to produce an estimate for fall recruitment of 59 fawns per 100 does (weighted average; Table 2). Unit estimates of fawn:doe ratios in 2013 ranged from a low of 16:100 in unit

20A (Corson,  $n = 56$  does) to a high of 113:100 in unit 35A (West Harding,  $n = 390$ ). The 2013 fall recruitment rate of 59 fawns per 100 does was the lowest recorded in survey history and substantially lower than the previous 10-year average of 85 fawns per 100 does.

## **Harvest**

Hunting is the primary tool used for controlling pronghorn populations and maintaining population densities at acceptable social carrying capacities. SDGFP has developed several regulated hunting seasons in South Dakota to offer recreational opportunities to harvest pronghorn and to ensure adequate harvest to maintain the population.

### Firearm Pronghorn

A total of 3,225 resident licenses were available by lottery application for the 2013 Firearm pronghorn hunting season. Licenses which permitted landowners to hunt only land they owned or leased were unlimited. A total of 3,467 licenses were sold representing 4,006 total tags (Table 1).

The 2013 season was open 16 days from September 28 through October 13. A random sample of 2,896 hunters was taken from total license sales and 2,320 surveys were returned for an 80% response rate. Approximately 68% of surveyed hunters responded through the Internet. Respondents reported hunting an average of 1.76 days each, which projected to 6,102 total recreation days for the season. Of those responding, 17.9% reported they did not hunt at all. Average hunter satisfaction was 4.72 and was based on a numerical scale from 1 (very dissatisfied) to 7 (very satisfied), 4 being neutral.

The projected harvest for the 2013 season was 1,398 adult bucks, 427 adult does, 56 kid bucks, and 53 kid does for a total of 1,935 pronghorn (Table 1). The projected overall success for the season was 48%. Harvest and success have decreased in recent years (Figure 6). Harvest densities are greatest in the northwest and southwest units of the state (Figure 7).

### Archery Pronghorn

There were 1,444 single-tag archery pronghorn licenses issued in 2013 (1,164 resident and 280 nonresident). All license holders were sampled and the survey response rate was 67%, with 75% of hunters responding over the Internet.

The overall success rate for the archery season was estimated to be 23%, with 282 bucks, 37 does, 10 buck-kids, and 1 doe-kid harvested. Archery harvest peaked in 2008 but has decreased the last several years (Figure 8). The archery season ran from August 17 through October 31, except when and where a state firearm pronghorn season was open. Of the 23 management units where pronghorn were reported harvested, the Harding and Butte units accounted for just over 57% of all harvest (Figure 9).

Average hunter satisfaction was 4.97 and was based on a numerical scale from 1 (very dissatisfied) to 7 (very satisfied), 4 being neutral.

### Mentored Youth Pronghorn

There were 350 resident single-tag doe/kid licenses issued for the 2013 Mentored Youth pronghorn hunting season. All mentors/hunters were sampled and 246 responses (70%) were received to a combination of electronic and paper surveys.

The Mentored Youth licenses were valid during the Archery and Firearm Pronghorn seasons. The Archery season ran from August 17 through October 31, except when and where a state firearm pronghorn season was open. The Firearm Pronghorn season was open 16 days from September 28 - October 13. Respondents reported hunting an average of 1.32 days each, which projected to 462 recreation days for the season.

Projections for the season estimated that a total of 14 buck kids, 80 doe adults and 14 doe kids were harvested. The estimated total harvest for the Mentored Youth Pronghorn season was 108, and the overall success rate was 31%. The five units with the highest reported harvest were Harding W (35A), Butte/Lawrence (15B), Butte NW (15A), Meade N (49A), and Jackson (39A). The average satisfaction rating for those responding (1 being very dissatisfied and 7 very satisfied) was 5.35.

## **ISSUES, CONCERNS, AND OPPORTUNITIES**

### **Habitat conversion**

Throughout pronghorn range in the western United States, it is estimated that 53% of pronghorn populations occur on grasslands, 47% on shrub steppes, and <1% on deserts (O'Gara and Yoakum 2004). In South Dakota, a majority of the pronghorn population occurs in sagebrush habitat interspersed with grasslands with lower densities occupying rolling grasslands habitat. In the western portion of the pronghorn range, public lands controlled by the Bureau of Land Management, or the United States Forest Service hold a considerable number of pronghorn. Within these public lands habitat protection and enhancement can occur for the benefit of pronghorn.

The central and eastern portions of the pronghorn range in South Dakota consist of grasslands/agricultural mix. The conversion of rangeland landscapes to more agriculture row-crops decreases available habitat for pronghorn, although pronghorn may utilize limited agriculture crops during some seasons. Of additional consideration is that conversion of prairie to agriculture decreases social tolerance levels of pronghorn by private landowners and decreases the ability of SDGFP to manage for abundant pronghorn resources on the landscape.

Classen et al. (2011) estimated that 770,000 acres (1 percent) of 1997 rangeland acreage in the Northern Plains were converted to cultivated crops by 2007. No comprehensive and current source of information exists on the conversion of grassland to cropland or on the resulting farm program payments for newly converted land.



However, the data that are available show a decline in private grassland ownership nationwide, continuing conversion of native grassland to cropland in some areas of the country, and that certain farm program incentive payments made to producers in South Dakota counties experiencing high conversion rates, were significantly higher than payments in other counties (USGAO 2007).

### **Habitat management**

Ranching in South Dakota is important to maintaining native rangelands critical to the conservation of pronghorn and numerous other wildlife species. Lands utilized by ranching operations are not cultivated for farming nor lost to urbanization or other non-wildlife supportive land conversions.

Early livestock grazing programs often encouraged the overstocking of western rangelands, however, current management practices exist today for private and public land managers that can be compatible with multiple wildlife species and ranching. Grazing regimes that avoid year-long use of rangelands, practice seasonal rotation of grazing pressure, avoid overstocking, annually rest some areas from grazing, protect riparian habitats, and maintain some residual vegetative cover provide important habitat for pronghorn, other wildlife species, and livestock.

Natural vegetative communities of pronghorn rangeland contain a variety of grasses, forbs and shrubs, and range improvements that best suit pronghorn are those that produce mixed forage classes (O’Gara and Yoakum 2004). Pronghorn thrive on rangelands in subclimax vegetative conditions and habitat manipulations such as fire, mechanical treatment, and grazing at times are beneficial to the species. Fires on native mixed grasslands of the Great Plains are important for maintaining vegetative structure and function.

Shortgrass prairies are considered the most productive extant habitats for pronghorn but tallgrass prairies, however, must be managed for decreased height of herbaceous vegetation in order to meet pronghorn habitat requirements (Lee et al. 1998). Habitat projects focused to control shrub species should not eradicate all shrubs because many shrubs (e.g., low sagebrush, winterfat) are preferred and highly nutritious forage for pronghorn. During the winter, shrubs are highly nutritious and may be the primary forage available, and in spring shrubs provide concealment cover important to neonates (O’Gara and Yoakum 2004).

### **Energy development**

The implications of energy development on pronghorn are largely unknown, but several recent studies and reports are revealing alarming concerns. Ellenberger and Byrne (2011) suggest that further loss and fragmentation of habitat due to energy development in the Colorado/Wyoming state line area is very likely to cause additional declines in big game populations, or make it very difficult for populations to recover to anywhere near the numbers that occurred in the past.

Dyke et al. (2011) reported in North Dakota that as of May 2010, 6,800 acres of habitat were directly lost due to oil pad construction and 17% of all square mile sections within

pronghorn range have oil and gas development. Although the direct loss or alteration of habitat is always a concern, it is the cumulative effects (infrastructure, roads, increased vehicular traffic, fragmentation, fences) of oil and gas development that are of concern for reducing suitability of pronghorn habitat. In a recent study in North Dakota, Kolar (2009) reported that during summer, pronghorn were twice as likely to use areas that were > 2 km from primary roads, and were 2 times more likely to use areas > 3 km from secondary roads than areas < 1 km of secondary roads. Pronghorn avoided secondary roads in the winter and were 7.5 times less likely to select areas within 1 km from secondary roads than they were to select areas beyond 1 km. Gavins and Komers (2006) also found that pronghorn in Alberta spent a higher proportion of time foraging at sites > 300 m from roads.

Results from year 4 of an ongoing study in Wyoming indicate migrating pronghorn avoid the more densely developed areas (oil well pads and roads) of the Pinedale Anticline and Jonah fields (Beckmann and Seidler 2009), implicating that habitat loss and fragmentation caused by energy development may result in a decline in the quantity and quality of habitat available to pronghorn.

Based on Wyoming Game and Fish Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats (2010), adverse effects of oil and gas development can be divided into 7 categories: 1) direct loss of habitat; 2) physiological stress to wildlife; 3) disturbance and displacement of wildlife; 4) habitat fragmentation and isolation; 5) alteration of environmental functions and processes (e.g., stream hydrology, water quantity/quality); 6) introduction of competitive and predatory organisms; and 7) secondary effects created by work force assimilation and growth of service industries.

### **Depredation**

Depredation by pronghorn varies from year to year depending on winter severity, spring temperatures, and precipitation amounts and timing. As winter severity increases, landowner tolerance for wildlife often decreases and pronghorn frequently form large herds on windswept agricultural fields. During cool springs with little precipitation, pronghorn reside longer on green winter wheat fields causing depredation concerns. During early warm springs with normal precipitation, pronghorn leave the winter wheat fields and spread out onto the grasslands relieving depredation complaints.

Landowner tolerance of pronghorn is also considerably affected by pronghorn population densities. During recent record population highs in 2008, pronghorn complaints were common and many landowners demanded the population be lowered. A survey completed by Longmire (2014), however, found that 85% of landowners who reported pronghorn on their property (n = 370) felt the populations were either just about right or too few in 2012. Thus only 15% of landowners that have pronghorn on their farm/ranch actually felt population levels were too high in 2012. The results of this survey were likely influenced by lower pronghorn populations in 2012, which were actually only about 43% of population densities found in 2008.

## **Fences/Movements**

From 2002 – 2005 in South Dakota, 84% of radio-collared pronghorn did not migrate from established summer ranges to winter ranges and 10% were conditional migrates (Jacques et al. 2009). However, severe winter weather can cause pronghorn to move out of established ranges to new areas looking for forage that is not covered in snow. SDGFP (1965) reported that a large western influx of pronghorn from Montana and Wyoming occurs in the excellent winter range found in Butte County. It was also suggested interstate movement occurs from west to east during some summers as the rangeland vegetation dries; movements were reported from Wyoming to Fall River County, Fall River County to Nebraska. Therefore, certain types of fences can cause major problems on pronghorn range. Woven wire fences used to contain domestic sheep are a major obstacle to pronghorn movement. Fences can restrict seasonal movements, and during severe winters may cause substantial mortality of pronghorns by preventing southerly migrations to areas with less snow. Fences can also prevent access to water and feeding areas. The most compatible fence design to allow pronghorn movement consists of three strands of wire, a smooth bottom wire 16-18 inches above ground, and a total height of no more than 36 inches (Autenrieth et al. 2006). SDGFP currently provides financial assistance to private landowners to replace woven wire fences with pronghorn-friendly fence designs.

South Dakota Codified Law 43-23-4 describes a legal partition fence, where landowners do not agree upon a different sort of fence, as “.... at least four strands of ordinary commercial barbed fencing wire, the lower strand to be eighteen inches, the next twenty-eight inches, the third thirty-eight inches, and the fourth forty-eight inches from the earth...”. This statute would be more compatible with pronghorn management if specifications of the partition fence were changed to a 3 strand fence with the lowest strand comprised of smooth wire.

## **Hunting Season Setting Process**

Under the present SDGFP commission season setting schedule, proposals for pronghorn seasons and license numbers are made in June of every year. On years when aerial surveys are not completed, modeled estimates of pronghorn populations will be produced prior to the commission meeting. Because aerial surveys are completed in May and the first half of June, however, on those years when aerial surveys are conducted season regulations are sometimes proposed before densities of adult pronghorn can be estimated for every management unit. Although proposed license numbers can be adjusted during rule finalizations at the July commission meeting, and thus after all units have been surveyed, regulations are set well before fall fawn:doe surveys are completed in August and September. Fawn:doe surveys provide data necessary to estimate annual recruitment rates, and are critical in calculating total pronghorn population estimates. The inability to estimate fall recruitment prior to setting season regulations can lead to possible over/under harvest of pronghorn herds, thus challenging SDGFP’s ability to meet population objectives.

## GOALS, OBJECTIVES & STRATEGIES

The following statements have guided the development of the pronghorn management goal and objectives and reflect the collective values of the DOW in relation to management of pronghorn in South Dakota:

- that wildlife, including pronghorn, contributes significantly to the quality of life in South Dakota and therefore must be sustained for future generations.
- that pronghorn play an important role in the grassland ecosystem.
- in providing for and sustaining the diversity of our wildlife heritage for present and future generations.
- in management of pronghorn in accordance with biologically sound principles.
- in providing accurate and timely information to the public concerning pronghorn and recreational opportunities in South Dakota.
- that the future of pronghorn in South Dakota depends on a public that appreciates, understands and supports pronghorn and their habitats.

**PRONGHORN MANAGEMENT GOAL:** The Division of Wildlife will manage pronghorn populations and habitats consistent with ecological, social, aesthetic, and economic values of South Dakota citizens while addressing the concerns and issues of both residents and visitors of South Dakota.

### Objectives and Strategies

Objective 1: Maintain rangeland (native grasslands, CRP, shrub steppe, pasture) acreages at the highest level possible.

- Strategy A.* Advocate for current and future USDA Farm Bill programs and policies that provide incentives for native rangeland preservation, protection, and enhancement.
- Strategy B.* Advocate for land use policies and procedures, including local zoning and property tax assessment, which preserve and protect native rangeland functions and values.
- Strategy C.* Maintain support for Conservation Reserve and Grassland Reserve Programs in federal farm legislation through continued cooperation with the Governor's Office, USDA, other state and federal agencies, non-governmental conservation organizations, coalition groups, landowners and agricultural groups.
- Strategy D.* Maintain existing partnerships with Pheasants Forever, NRCS, the Sage Grouse Initiative, and SDGFP to fund a minimum of eight Farm Bill Biologists in NRCS Offices to assist private landowners with technical assistance and in the promotion of all habitat programs, with special emphasis given to pronghorn habitat requirements in central and western South Dakota.

*Strategy E.* Support USFWS acquisition of grassland easements within the pronghorn range, and acquisitions from other agencies and non-governmental organizations such as the Mule Deer Foundation, the Rocky Mountain Elk Foundation, and the National Wild Turkey Federation.

Objective 2: Advocate management of rangelands to enhance quantity and quality of pronghorn habitats on private and public lands.

*Strategy A.* Participate and facilitate periodic meetings with private landowners and personnel from USFS, BLM, USDA, USFWS, Tribal entities, and other agencies to discuss and address habitat issues related to pronghorn.

*Strategy B.* Support the increased use of planned range management through USDA's EQIP program, as well as other partnership efforts involving the USFWS Partners for Fish & Wildlife Program, South Dakota Grassland Coalition and local conservation districts to enhance range conditions on native range and tame pastures.

*Strategy C.* Recommend that 100% of voluntary USDA grassland easement funding is allocated to perpetual easements.

*Strategy D.* Promote rangeland fence construction/modification to allow for pronghorn dispersals and seasonal migrations by providing technical and financial assistance to private landowners through the DOW's private lands section.

*Strategy E.* Maintain and improve habitats, primarily in western South Dakota, for pronghorn on state Game Production Areas and other lands with management responsibility or long-term habitat/access leases.

*Strategy F.* Implement grazing stewardship practices through department cost-share programs, including managed grazing systems designed to measurably benefit wildlife and long-term sustainable use of native rangelands and tame pastures for livestock production.

*Strategy G.* Use current research findings and conduct research as needed to guide collaborations with energy developers to minimize impacts on pronghorn populations.

Objective 3: Engage and collaborate with the public to manage pronghorn populations and determine unit-specific objectives.

*Strategy A.* Annually meet with concerned individuals, NGOs, Tribal agencies, local sportsman's groups, and private landowners to facilitate discussions about pronghorn populations and management.

*Strategy B.* Involve SDGFP Regional Advisory Panels with further development of this plan and with future issues related to pronghorn management.

*Strategy C.* Annually gather public input on game management unit objectives through Regional Public Open-houses, local press releases, and field staff contacts.

Objective 4: Manage for a biologically and socially acceptable statewide pronghorn population.

*Strategy A.* Assess and monitor population levels and trends by biennially completing spring aerial surveys in all management units.

*Strategy B.* Model population changes in years with no annual aerial survey data.

*Strategy C.* Annually conduct and assess summer/fall recruitment surveys.

*Strategy D.* Annually survey hunters to estimate pronghorn harvest levels and distribution, number of hunters, hunter success, and hunter satisfaction.

*Strategy E.* Annually assess unit management goals and utilize necessary harvest management tools to ensure objectives are met as outlined in Table 4.

*Strategy F.* Based on habitat conditions and population size, in concert with public input, periodically evaluate if adjustments to unit objectives are warranted.

*Strategy G.* Monitor pronghorn disease by collecting and sampling all reported or observed sick or dead pronghorn demonstrating disease symptoms of concern.

*Strategy H.* By June of 2015, develop biologically meaningful data analysis units (DAUs) across the pronghorn range in South Dakota to facilitate data collection and analyses.

Objective 5: Manage and abate pronghorn depredation to agricultural crops and other private property.

*Strategy A.* Respond to all pronghorn depredation complaints on private land in a timely manner.

*Strategy B.* Annually evaluate effectiveness of depredation abatement techniques used by the Department.

*Strategy C.* As needed, research new methodology to minimize damages to private property caused by pronghorn depredation.

*Strategy D.* Periodically ensure sufficient materials and supplies are maintained and available to address depredation complaints.

*Strategy E.* Use depredation pool hunts (ARSD 41:06:46) and kill permits (as a last resort) (SDCL 41-6-29) to address pronghorn depredation complaints.

*Strategy F.* Expand harvest opportunity when possible to address pronghorn depredation on private land.

Objective 6: Provide the public with access to private and public land for quality hunting opportunities.

- Strategy A.* Promote the Wildlife Division's Walk-In Area Program with private landowners, with special emphasis on well managed rangelands in central and western South Dakota where high densities of pronghorn exist.
- Strategy B.* Provide up-to-date public land layers available for free download to be used in conjunction with compatible GPS units.
- Strategy C.* Annually explore methods to increase the quality of pronghorn hunting opportunities on public land.
- Strategy D.* Coordinate and assist other public land managers with posting property boundaries.

Objective 7: Evaluate research and management needs and prioritize on an annual basis.

- Strategy A.* Periodically collaborate with stakeholders to collect and assess research and management needs and ideas.
- Strategy B.* Periodically review pronghorn survey protocol and discuss changes that could improve data collection efficiency and accuracy.
- Strategy C.* The SDGFP will send at least one staff member to the biennial Pronghorn Workshop. This meeting facilitates the exchange of information between states on survey techniques, harvest regulations, research and habitat management.
- Strategy D.* The SDGFP will consider sending a representative to scientific meetings that will exchange information related to pronghorn management.

Objective 8: Promote public, landowner, and conservation agency awareness of pronghorn and habitat management issues of highest conservation concern.

- Strategy A.* By October of 2014, make available paper and electronic copies of "Pronghorn Management Plan for South Dakota 2014" to all interested conservation partners, the public, and private landowners.
- Strategy B.* Periodically include articles about pronghorn and pronghorn habitat in the SD Conservation Digest and other popular magazines, journals, and media outlets.
- Strategy C.* Add a web page about pronghorn under the outdoor learning section of the department website which includes descriptions and pictures of pronghorn in South Dakota.

Objective 9: Review and evaluate the South Dakota Pronghorn Management Plan.

*Strategy A.* Formally evaluate Pronghorn Management Plan at least every 5 years. Plan updates and changes, however, may occur more frequently as needed.



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**Table 1.** Total pronghorn harvest and firearm hunter success estimates from hunter surveys, in comparison with total number of hunting licenses sold and statewide population estimates, 1941-2013, South Dakota.

Year	Population Estimate	Total Harvest	Firearm Hunter Success (%)	Total Licenses Sold
1941	11,000	<i>no season</i>	<i>no season</i>	<i>no season</i>
1942	<i>no data</i>	480	96	500
1943	7,973	976	98	1,000
1944	5,370	480	96	500
1945	6,721	<i>season closed</i>	<i>season closed</i>	<i>season closed</i>
1946	9,442	609	87	700
1947	14,800	1,875	94	2,000
1948	13,000	2,371	93	2,549
1949	7,425	<i>season closed</i>	<i>season closed</i>	<i>season closed</i>
1950	10,920	759	89	850
1951	14,356	3,151	94	3,350
1952	16,608	7,880	94	8,350
1953	15,090	4,750	91	5,244
1954	16,756	5,196	91	5,700
1955	16,664	4,281	88	4,850
1956	19,374	5,616	90	6,266
1957	16,885	3,885	88	4,415
1958	16,235	2,900	88	3,300
1959	20,272	4,950	89	5,569
1960	23,330	6,037	90	6,708
1961	27,480	7,990	93	8,596
1962	26,382	6,152	88	6,991
1963	27,658	7,280	90	8,090
1964	24,566	6,050	81	7,470
1965	27,286	6,776	77	8,750
1966	20,954	4,244	85	4,965
1967	23,400	4,847	74	6,547
1968	22,142	2,419	75	3,229
1969	23,595	2,880	66	4,382
1970	25,100	3,807	78	4,850

Table 1. Continued.

Year	Population Estimate	Total Harvest	Firearm Hunter Success (%)	Total Licenses Sold
1971	34,690	5,452	78	7,004
1972	34,894	6,370	88	7,225
1973	33,128	6,831	88	7,770
1974	41,358	8,542	84	10,114
1975	43,083	10,331	85	12,139
1976	33,505	6,722	81	8,340
1977	40,390	7,592	81	9,335
1978	28,425	4,714	81	5,849
1979	18,333	2,473	79	3,128
1980	25,402	4,408	84	5,236
1981	37,277	6,530	84	7,804
1982	53,934	11,145	80	13,899
1983	67,281	14,697	84	17,439 <sup>a</sup>
1984	61,644	16,999	76	15,388 (22,456 tags)
1985	48,741	12,601	77	12,656 (16,320 tags)
1986	14,570	953	64	1,484
1987	15,753	1,271	75	1,690
1988	20,836	1,779	78	2,274
1989	34,943	3,702	84	4,433
1990	31,476	4,408	78	5,104 (5,645 tags)
1991	46,668	7,542	83	7,138 (8,537 tags)
1992	49,010	8,796	78	8,391 (11,212 tags)
1993	49,270	9,367	77	9,506 (13,872 tags)
1994	43,205	7,254	65	7,568 (11,1537 tags)
1995	53,765	8,752	69	8,721 (12,707 tags)
1996	36,266	5,501	71	6,472 (7,726 tags)
1997	20,518	1,984	68	2,901 (2,901 tags)
1998	19,897	1,828	66	2,749 (2,749 tags)
1999	29,695	2,627	72	3,651 (3,752 tags)
2000	33,322	3,376	71	4,165 (4,705 tags)

<sup>a</sup> Includes 4,000 bonus doe/fawn tags.

Table 1. Continued.

Year	Population Estimate	Total Harvest	Firearm Hunter Success (%)	Total Licenses Sold
2001	33,420	4,656	70	4,965 (6,634 tags)
2002	29,258	4,444	68	4,813 (6,495 tags)
2003	40,788	5,948	70	5,795 (8,505 tags)
2004	40,134	7,032	71	6,231 (9,866 tags)
2005	48,870	9,140	64	7,809 (13,850 tags)
2006	57,512	11,799	67	9,352 (17,602 tags)
2007	74,623	13,669	62	11,244 (21,898 tags)
2008	81,690	17,870	50	15,046 (36,816 tags)
2009	63,597	14,912	44	15,130 (36,931 tags)
2010	51,432	9,520	49	12,087 (22,213 tags)
2011	34,156	4,917	50	8,037 (11,312 tags)
2012	34,893	3,084	53	5,748 (6,719 tags)
2013	36,280	2,373	48	5,261 (5,800 tags)

**Table 2.** Statewide pronghorn population estimates, sex ratios, and age ratios derived from aerial surveys, population modeling, and fall recruitment surveys, 1968-2013, South Dakota.

Year	Population Estimate	Bucks: 100 Does	Fawns: 100 Does
1968	22,142	64	95
1969	23,595	60	94
1970	25,100	60	96
1971	34,690	42	91
1972	34,894	41	101
1973	33,128	52	87
1974	41,358	42	87
1975	43,083	40	83
1976	33,505	47	93
1977	40,390	38	97
1978	28,425	35	82
1979	18,333	38	71
1980	25,402	42	85
1981	37,277	41	88
1982	53,934	41	96
1983	67,281	44	90
1984	61,644	37	88
1985	48,741	31	94
1986	14,570	16	64
1987	15,753	28	82
1988	20,836	32	91
1989	34,943	38	102
1990	31,476	37	87
1991	46,668	38	97
1992	49,010	44	110
1993	49,270	43	86
1994	43,205	39	106
1995	53,765	<i>no data</i>	<i>no data</i>
1996	36,266	39	111
1997	20,518	35	74



Table 2. Continued.

Year	Population Estimate	Bucks: 100 Does	Fawns: 100 Does
1998	19,897	43	89
1999	29,695	48	92
2000	33,322	43	92
2001	33,420	54	85
2002	29,258	52	81
2003	40,788	47	91
2004	40,134	42	92
2005	48,870	55	91
2006	57,512	43	86
2007	74,623	55	104
2008	81,690	62	97
2009	63,597	45	75
2010	51,432	41	79
2011	34,156	39	67
2012	34,893	41	71
2013	36,280	45	59

**Table 3.** Population objectives and 2014 preliminary population estimates for pronghorn management units in South Dakota.

Management Unit	Unit #	2014 Population	Population	Population Objective		Densities (unit/sq mile)	
		Estimate	Objective	Range (+/- 15%)		2014 Estimate	Popn Objective
Pennington	02A	1,841	2,000	1,700	2,300	1.46	1.58
Bennett/Shannon	11A	1,990	2,000	1,700	2,300	0.60	0.61
NW Butte	15A	1,224	2,500	2,130	2,880	1.96	4.01
Butte	15B	4,051	8,000	6,800	9,200	2.24	4.42
Corson	20A	1,044	2,250	1,910	2,590	0.41	0.89
Custer	21A	2,671	2,500	2,130	2,880	2.02	1.89
Dewey (North)	24A	670	1,200	1,020	1,380	0.40	0.72
Fall River	27A	4,469	5,000	4,250	5,750	2.02	2.26
Haakon	31A	1,429	2,000	1,700	2,300	0.78	1.09
West Harding	35A	3,232	8,000	6,800	9,200	2.39	5.92
East Harding	35B	2,305	6,000	5,100	6,900	1.73	4.50
Hughes	36A	260	225	190	260	0.16	0.14
Jackson	39A	1,384	1,500	1,280	1,730	0.74	0.80
Jones	41A	503	950	810	1,090	0.54	1.03
Lyman	45A	102	550	470	630	0.07	0.37
FPNG	45B	108	450	380	520	0.29	1.21
North Meade	49A	4,207	6,000	5,100	6,900	2.44	3.48
South Meade	49B	1,854	2,000	1,700	2,300	1.09	1.17
Mellette	50A	582	800	680	920	0.44	0.61
North Perkins	53A	1,206	4,000	3,400	4,600	0.89	2.94
South Perkins	53B	2,591	5,000	4,250	5,750	1.62	3.13
Stanley	58A	812	850	720	980	0.58	0.61
Sully	59A	170	210	180	240	0.16	0.20
Tripp	60A	169	375	320	430	0.10	0.23
Walworth/Potter	63A	138	210	180	240	0.08	0.13
Ziebach	64A	2,282	3,000	2,550	3,450	1.16	1.52
CSP	CSP	289	250	210	290	2.63	2.27
<b>Total</b>		<b>41,583</b>	<b>67,820</b>	<b>58,000</b>	<b>78,000</b>	<b>1.01</b>	<b>1.65</b>

**Table 4.** Harvest management strategies used by SDGFP managers and biologists dependent on unit objectives and population estimates.

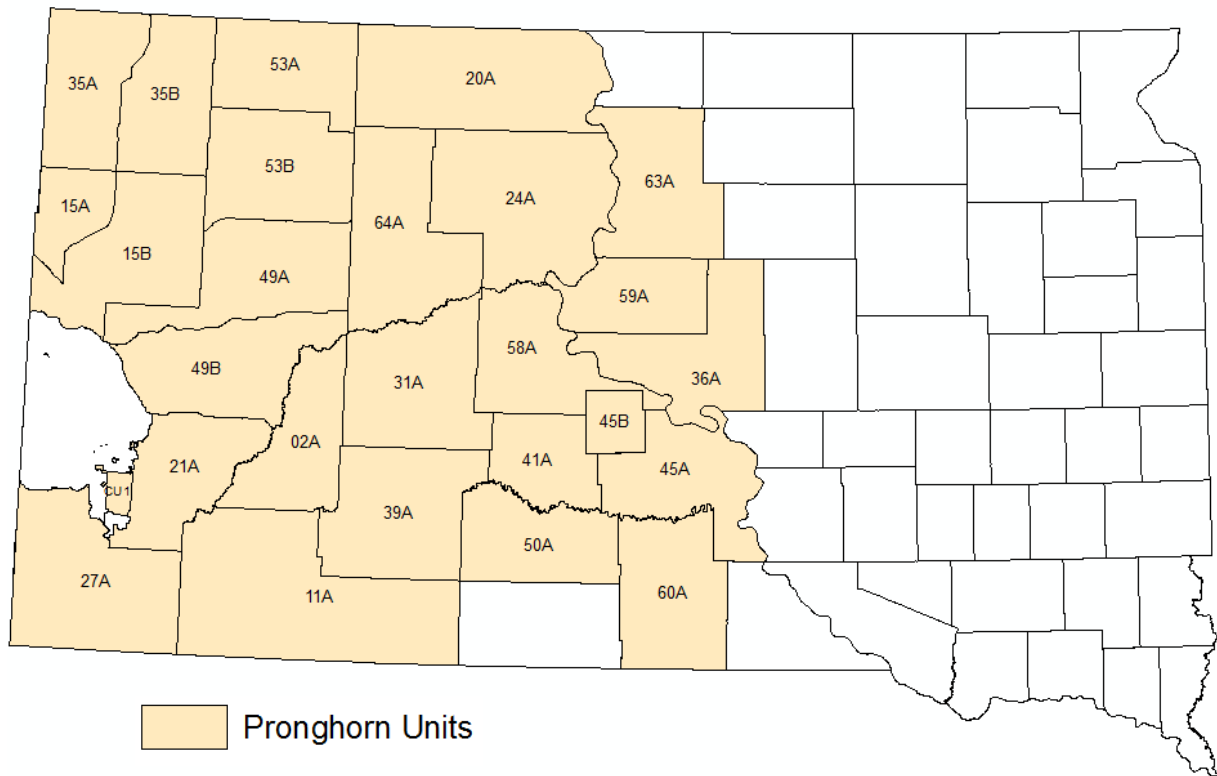
“TOOLS”	RESTRICTIVE	MODERATE	LIBERAL
	<i>Increase Popn Objective</i>	<i>Maintain Popn Objective</i>	<i>Decrease Popn Objective</i>
Harvest rate	0-10% of total popn estimate	10-20% of total popn estimate	20-40% of popn estimate
License numbers	None – limited	Moderate	Liberal
License types	Any pronghorn Buck only Single tag	Any pronghorn Doe/kid Single/double tag	Any pronghorn Doe/kid Single/double/triple tags
Firearm license eligibility	Residents and Nonresidents (2%)	Residents and Nonresidents (4%)	Residents and Nonresidents (8%)
Season structure	Single season Closed season	Single season	Single season Split seasons
Extra seasons	None	None	Doe/kid legal during deer season
Archery <sup>1,3</sup>	Limited archery <sup>2</sup>	Unlimited archery	Unlimited archery
Mentored Youth <sup>1</sup>	Unlimited youth	Unlimited youth	Unlimited youth

<sup>1</sup> Archery and mentored youth seasons will be closed in units closed to firearm.

<sup>2</sup> Archery hunters limited to 1 single-tag (any-pronghorn) license.

<sup>3</sup> Archery hunters eligible for double-tag (any-pronghorn and doe-fawn pronghorn) license when >50% of management units are using moderate and liberal strategies.

**Figure 1.** Game Management Units established for the Firearm Pronghorn Season.



Unit Number	Unit Name
02A	Pennington
11A	Bennett/Shannon
15A	NW Butte
15B	Butte
20A	Corson
21A	Custer
24A	Dewey (North)
27A	Fall River
31A	Haakon
35A	West Harding
35B	East Harding
36A	Hughes
39A	Jackson
41A	Jones

Unit Number	Unit Name
45A	Lyman
45B	FPNG
49A	North Meade
49B	South Meade
50A	Mellette
53A	North Perkins
53B	South Perkins
58A	Stanley
59A	Sully
60A	Tripp
63A	Walworth/Potter
64A	Ziebach
CU1	CSP

**Figure 2.** Hunter harvest survey card used to survey hunters for the 2013 Firearm Pronghorn season.

### 2013 FIREARM ANTELOPE HARVEST SURVEY

Please complete and return within 5 days following the season's closure or receipt of this card.

**Dear Hunter:**  
 Please consider completing this survey online at:  
[gfp.sd.gov/surveys](http://gfp.sd.gov/surveys)

You have been chosen to take part in a survey of Firearm Antelope hunters for the 2013 season. This is an opportunity for you to make a personal contribution to big game management in South Dakota. The information you provide will allow us to tell how many antelope and of what type were harvested, along with other vital information. As well as summarizing this hunting season, the information we gain lays the groundwork for next year.

PLEASE RESPOND at your soonest convenience. Our goal is to receive a response from each survey recipient. We will provide follow up mailings to those who don't respond so returning this survey now will save you from repeat mailings of this same card. Thanks to you, we believe we have one of the most accurate harvest surveys in the nation.

Thank you for being a part of wildlife management in South Dakota.  
 Sincerely, *Department of Game, Fish and Parks*

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COUNTY/UNIT AREA: \_\_\_\_\_

HUNTER ID: \_\_\_\_\_ SURVEY ID: \_\_\_\_\_

1. Did you hunt the 2013 South Dakota Firearm Antelope season in the county/unit area listed above?  
 NO - Check here and mail card back.  
 YES - Continue to Question 2.

2. Number of days you hunted in the County/Unit area listed above: \_\_\_\_\_

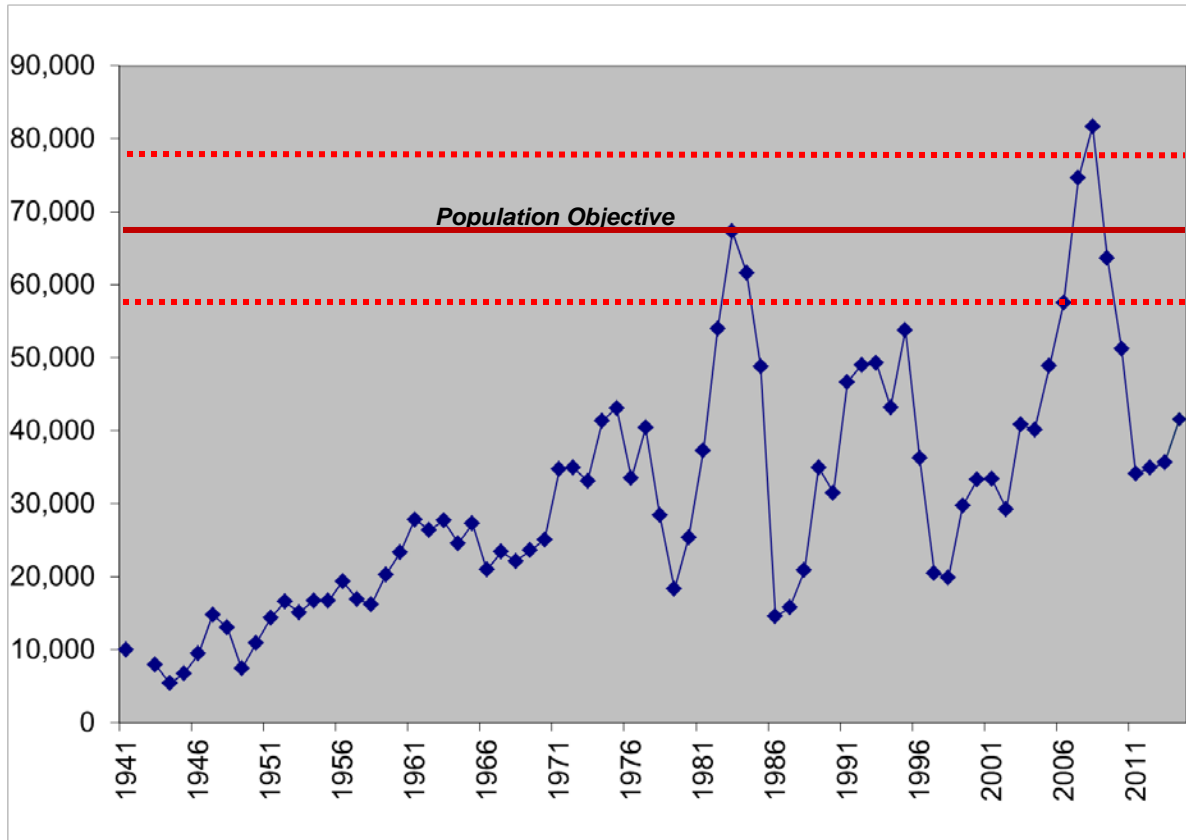
3. Check here  if you did not harvest any antelope during the Firearm season in the County/unit listed above, and skip ahead to #4.  
If you did harvest an antelope in the County/unit listed above, please enter the number of each type of antelope that you harvested.

[ ]  Adult Buck(s)  
 [ ]  Adult Doe(s)  
 [ ]  Buck Kid(s)  
 [ ]  Doe Kid(s)

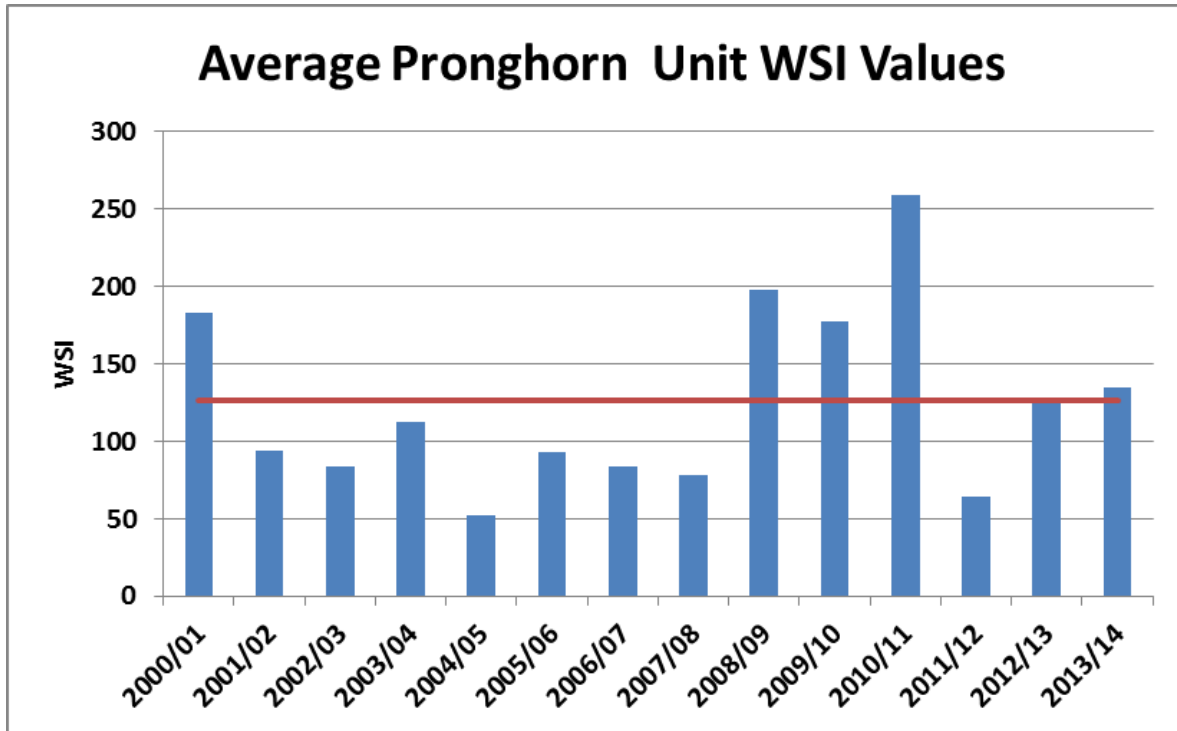
4. Considering all factors, how satisfied/dissatisfied were you with your Firearm Antelope hunting experience? (Circle One Number)

Very Dissatisfied	1	2	3	4	5	6	7	Very Satisfied
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**Figure 3.** South Dakota pronghorn population estimates trend and current statewide population objective of approximately 68,000 ( $\pm 15\%$ ), 1941 – 2014 (2014 is a preliminary estimate).



**Figure 4.** Average winter severity indices for the pronghorn range in South Dakota,, 2000-2014.



**Figure 5.** Adult pronghorn density estimates derived from spring aerial surveys in South Dakota, 2013.

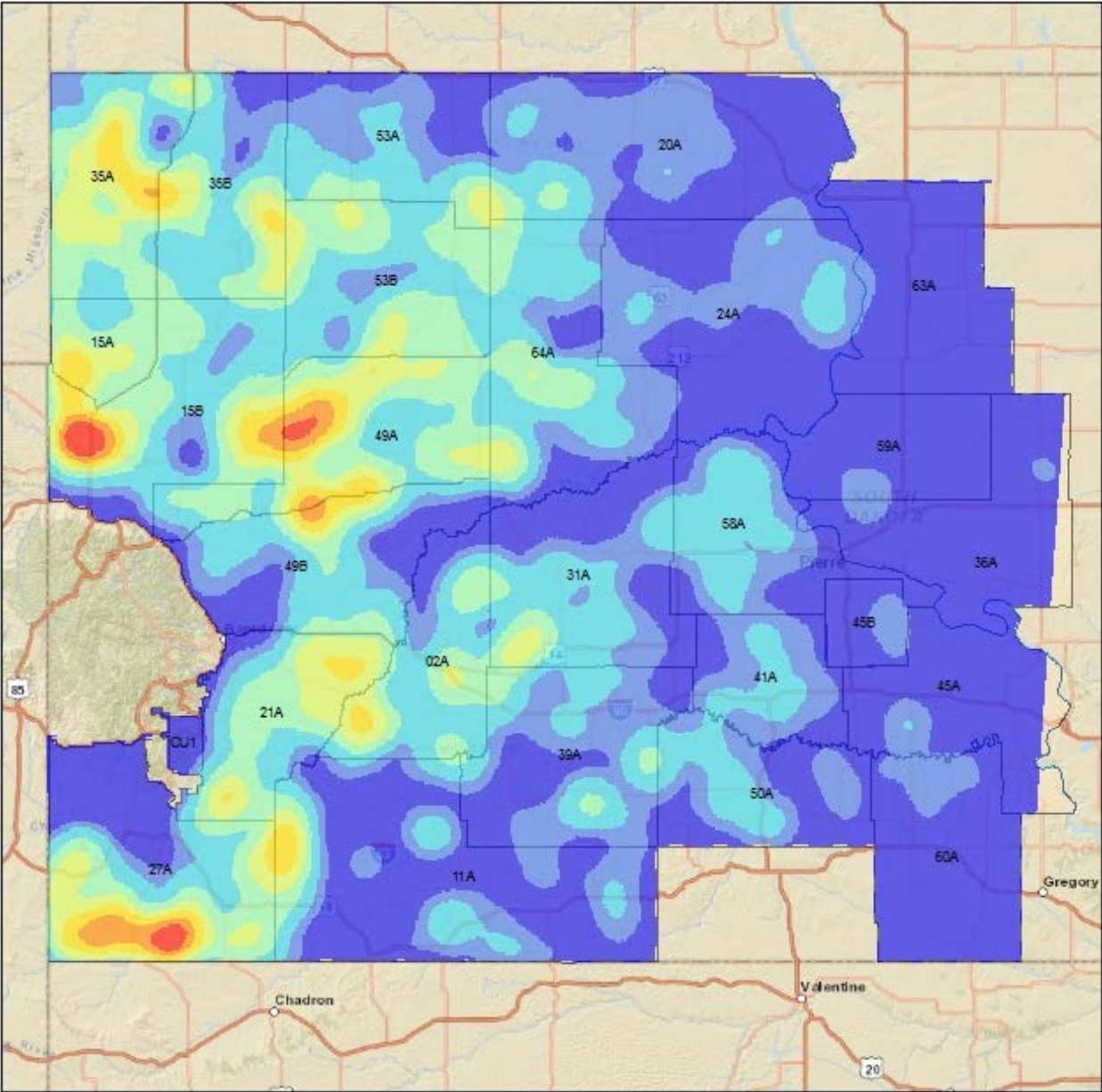
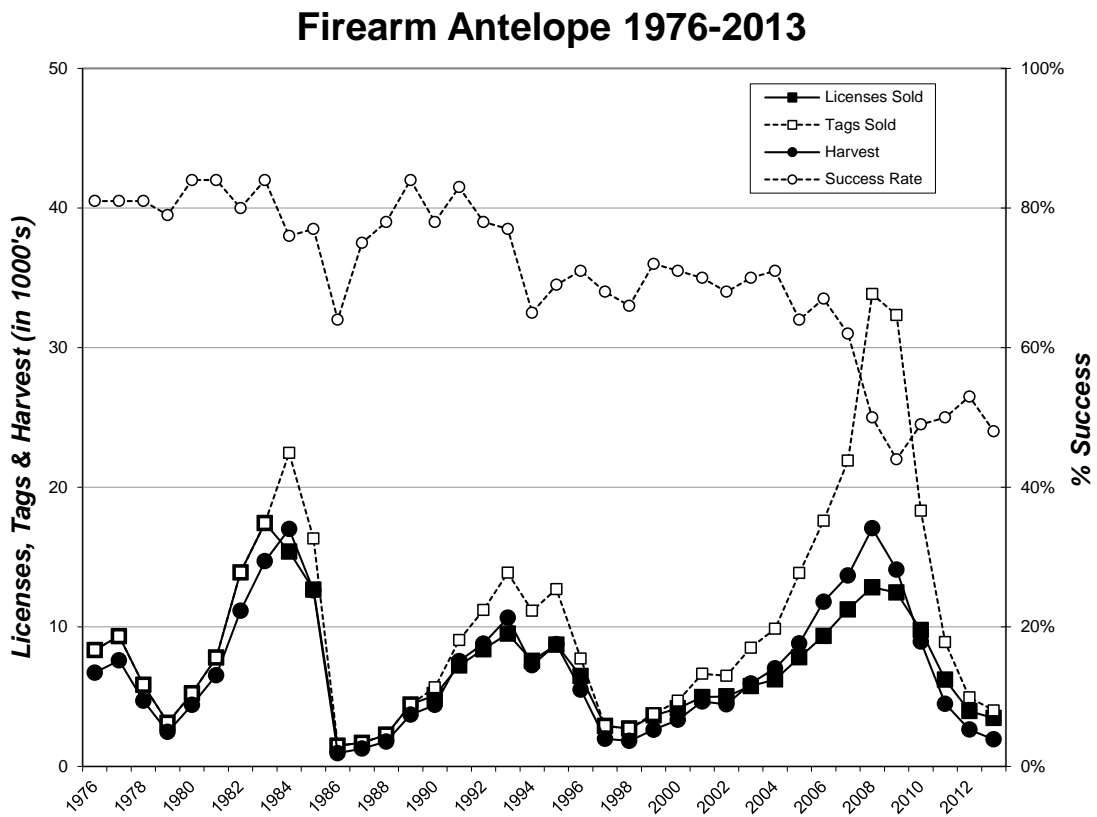
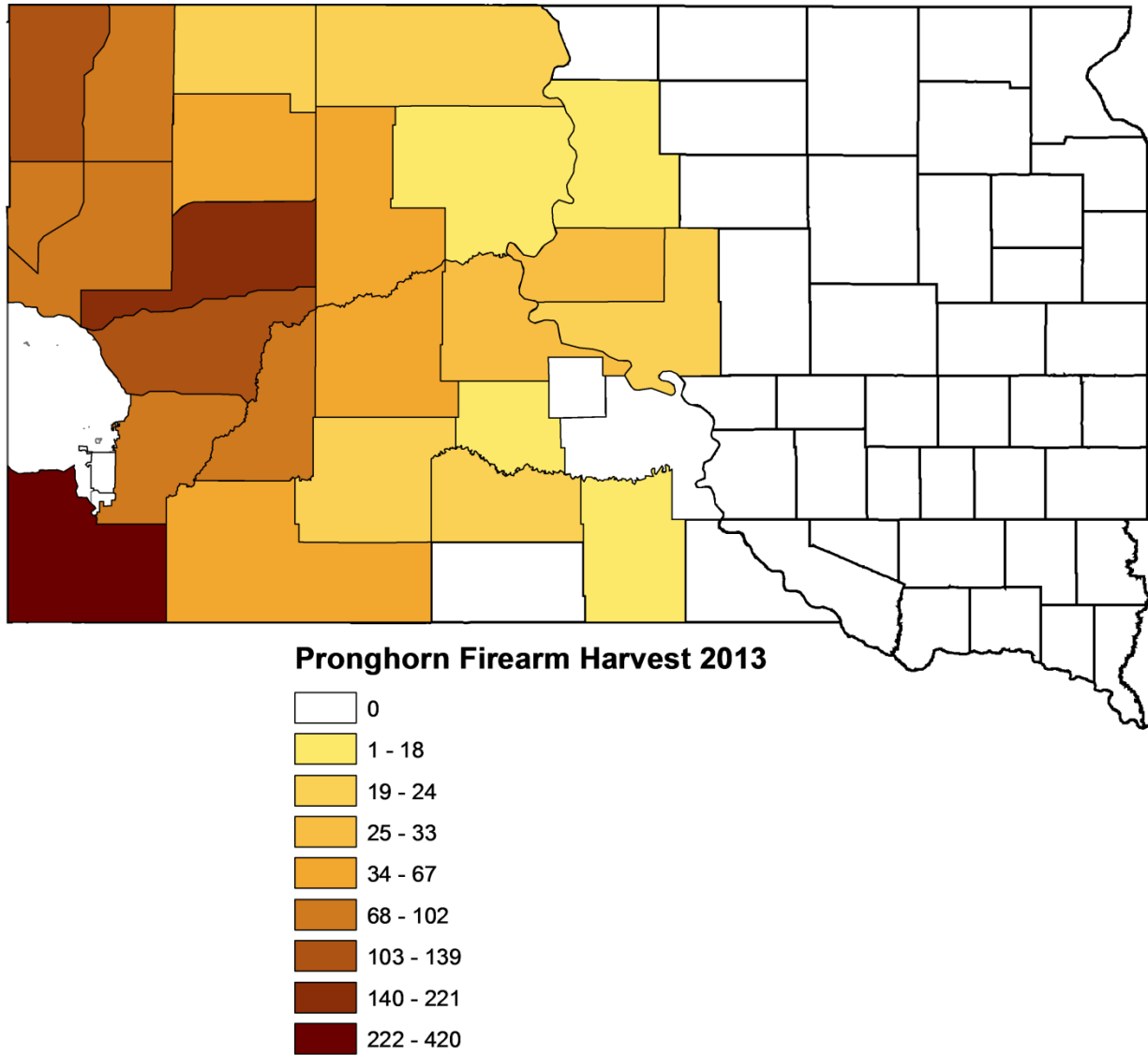




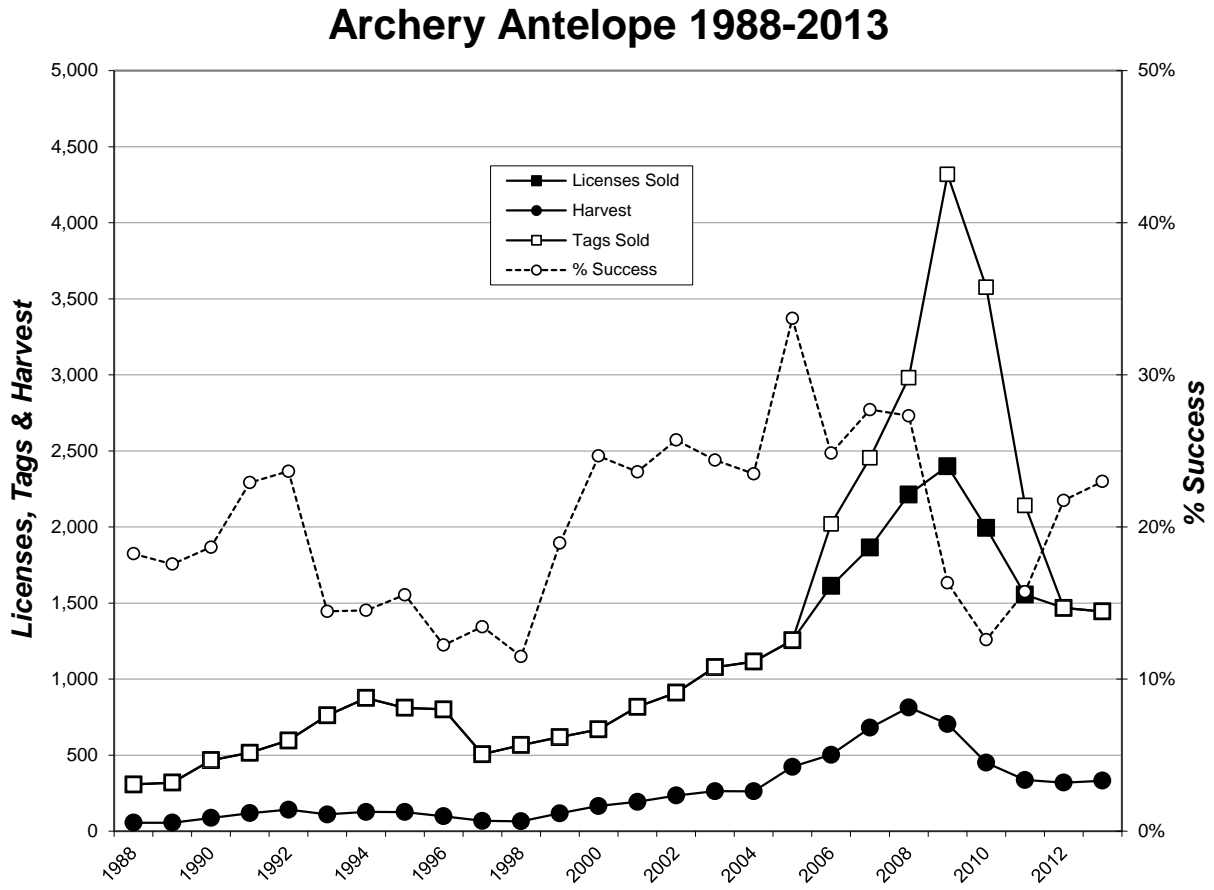
Figure 6. Firearm Pronghorn Harvest Survey Results, 1976-2013.



**Figure 7.** Distribution of pronghorn harvest during the 2013 firearm season for each game management unit in South Dakota.



**Figure 8.** Archery pronghorn harvest survey results, 1988-2013.



**Figure 9.** Distribution of archery harvest in the 2013 pronghorn archery season.

