PRAIRIE GROUSE MANAGEMENT PLAN FOR SOUTH DAKOTA 2017–2021

Sharp-tailed Grouse

Greater Prairie-Chicken

SOUTH DAKOTA DEPARTMENT OF GAME, FISH AND PARKS

PIERRE, SOUTH DAKOTA

WILDLIFE DIVISION REPORT 2017–03

JUNE 2017

ACKNOWLEDGMENTS

This plan is a product from hours of discussion, debate, effort and input of many wildlife professionals. In addition, those comments and suggestions received from private landowners, hunters, and those who recognize the value of prairie grouse and their associated habitats were also considered.

This document is for general, strategic guidance for the Division of Wildlife (DOW) and serves to identify the role that the DOW plays, how we function, and what we strive to accomplish related to prairie grouse management. By itself this document is of little value; the value is in its implementation. This process will emphasize working cooperatively with interested publics in both the planning process and the regular program activities related to prairie grouse management. This plan will be utilized by Department staff and Commission on a regular basis and will be formally evaluated at least every five years. Plan updates and changes, however, may occur more frequently as needed.

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

Management Plan Coordinator—Travis Runia, South Dakota Department of Game, Fish and Parks (SDGFP).

SDGFP Management Plan Team— Nathan Baker, Paul Coughlin, Josh Delger, Jacquie Ermer, Casey Heimerl, John Kanta, David Mallett, Mark Norton, Tim Olson, Brian Pauly, Alex Solem, and Chad Switzer.

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LIST OF ACRONYMS

CRP	Conservation Reserve Program
CREP	Conservation Reserve Enhancement Program
DOW	Division of Wildlife
FPNG	Fort Pierre National Grassland
NRCS	Natural Resources Conservation Service
SDGFP	South Dakota Department of Game, Fish and Parks
SDSU	South Dakota State University
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service

EXECUTIVE SUMMARY

Sharp-tailed grouse (*Tympanuchus phasianellus*) and greater prairie chickens (*T. cupido*), collectively hereafter referred to as prairie grouse, are the most abundant grouse species in South Dakota (SD). The vast expanses of open grassland found throughout much of SD provide ideal habitat for these two game birds. Although slight differences in micro and macro habitat requirements exist between these two species, management strategies are similar enough to warrant a single management plan for prairie grouse in SD.

As prairie obligates, prairie grouse are dependant upon grasslands for nearly all annual life cycle needs. Although weather can influence prairie grouse demographics from year to year, habitat quantity and quality have the primary influence over prairie grouse distribution and abundance. The "Prairie Grouse Management Plan for South Dakota 2017−2021" focuses on issues related to the abundance and quality of grassland habitat. This management plan also provides overview information including the history of prairie grouse in SD, general ecology, monitoring and current status, hunting season structure and authority, hunter and harvest trends, habitat trends, research and issues, and challenges and opportunities facing prairie grouse, private landowners, and wildlife managers.

The South Dakota Department of Game, Fish and Parks' (SDGFP) goal for prairie grouse management in SD is to maintain or expand sustainable prairie grouse populations by fostering partnerships, promoting grassland habitat stewardship, and applying biological and social sciences. Objectives and strategies have been developed to guide implementation of this plan.

INTRODUCTION

South Dakota is home to two species of true prairie grouse, the sharp-tailed grouse and greater prairie-chicken, hereafter prairie-chicken. Prairie grouse are medium sized (16−18 inches long, 1.3−2.2 pounds) round-bodied and short-legged game birds native to grasslands, steppe, and mixed-shrub habitats of North America. Their cryptic coloration functions as camouflage and allows the birds to blend into the grassland habitat, reducing detection from predators. The unique feathering of the legs and nostrils make them especially adapted to cold and snowy climates found in SD. The feathering of the legs and feet is more pronounced in sharp-tailed grouse, whereas the feet of prairie-chickens appear nearly featherless. Although most prominent in sharp-tailed grouse, an additional adaptation to winter weather in both species is the lateral pectinate scales on their feet which perform like snowshoes.

The primary differentiating feature between the two species of prairie grouse is the shape of the tail. Sharp-tailed grouse, like the name suggests, have tail feathers which come to a sharp point while tail feathers of prairie-chickens are gently rounded. The distinct dark barring over much of the body of a prairie-chicken also differs from the generally non-barred dark colored dorsal and light colored ventral coloration of sharp-tailed grouse. The long pinnae, or ear feathers which are erected during male courtship displays, are absent on sharp-tailed grouse. Both species of male prairie grouse have colored external air sacs located on each side of the neck which are inflated during courtship. These air sacs are purple for sharp-tailed grouse and orange for prairie-chickens.

As their name suggests, prairie grouse are found primarily within landscapes dominated by grassland habitat. The unique behavior and habitat use of prairie grouse make them an exciting game bird and valued watchable wildlife species. Most hunting occurs on open grasslands with the aid of dogs, often pointing breeds. The explosive flush of prairie grouse attracts thousands of hunters to SD each year. In 2015, nearly 13,000 hunters harvested about 50,000 prairie grouse. South Dakota is one of the few states where both species of prairie grouse can be harvested under liberal hunting regulations. Hunting is authorized from the third Saturday of September through the first Sunday in January with a combined daily bag limit of three prairie grouse.

The unique lekking behavior of prairie grouse (described below) attracts numerous wildlife viewers each year. Several viewing blinds are annually available for public use on the Fort Pierre and Buffalo Gap National Grasslands as well as Custer State Park. The amazing sight and sound of the prairie grouse courtship display is an annual sign that spring is soon to arrive on the prairies. Prairie grouse are an indicator of a functioning prairie ecosystem which suggests landscape-level habitat exists for other prairie obligate species. Prairie grouse are considered "flagship" species for conservation of prairie habitat throughout their range and in SD.

This management plan identifies and provides detailed objectives and strategies which will be used to meet the goal for prairie grouse management in SD. The future of prairie grouse in SD is primarily dependent upon prairie habitat, thus the bulk of this plan focuses on prairie habitat management. Because important prairie grouse habitat intersects many ownership boundaries, this plan addresses issues related to both public and private land. Without a doubt, many prairie-dependent species, both game and nongame, will benefit from the implementation of this plan.

HISTORICAL INFORMATION AND CURRENT DISTRIBUTION

Prior to European settlement, SD's landscape was a rolling sea of mixed and tallgrass prairie which likely supported sharp-tailed grouse nearly statewide. Sharp-tailed grouse are considered a landscape species which requires substantial grassland habitat at a landscape level to persist (Hanowski 2000). Mass conversion of grassland to cropland has reduced the distribution of sharp-tailed grouse particularly in southeastern SD. The current distribution of sharp-tailed grouse includes nearly all of western SD and about half of the eastern portion of the state (Figure 1). Although sharp-tailed grouse still occur in every county west of the Missouri River, conversion of prairie to cropland has undoubtedly reduced their abundance west river and statewide.

Prairie-chickens may have been native to portions of eastern and central SD in limited numbers prior to European settlement (summarized in Flake et al. 2010). While conversion of prairie to cropland strictly reduced the distribution and abundance of sharp-tailed grouse, prairie-chickens actually expanded in distribution and increased in abundance when portions of the landscape were converted to cropland. Prairie-chickens benefit greatly when waste grain from agricultural fields is available in northern states such as SD. As European settlement and associated agriculture marched north and west across the prairies, prairie-chicken populations exploded and "followed the plow" all the way to prairie Canada (Johnsgard and Wood 1968, Houston 2002). During the early 1900s prairie-chickens could be found nearly statewide in SD. It is likely that

they benefited from the extirpation of bison which resulted in the associated temporary increase in vegetation height across the state. The distribution and abundance of prairie-chickens probably peaked at the turn of the 20th century (Johnsgard and Wood 1968). It became quite apparent that a landscape dominated by grasslands with interspersed cropland provided ideal habitat for prairie-chickens.

The range of prairie-chickens quickly declined as agriculture became too intense and cattle grazing reduced grass height over much of their newly acquired range. As prairie-chickens are also landscape species, their current distribution occurs where large tracts of native prairie remain, mostly in central SD (Figure 2). Prairie-chickens are thought to be limited within SD by lack of grassland habitat in the east and grass height in the west.

Although prairie grouse are primarily birds of the open prairies in SD, one exception is the Black Hills National Forest. Sharp-tailed grouse do occur in the Black Hills, primarily within herbaceous openings such as those created by wildfires or timber harvest. The Black Hills were historically less wooded and probably had greater amount of suitable habitat for sharp-tailed grouse.

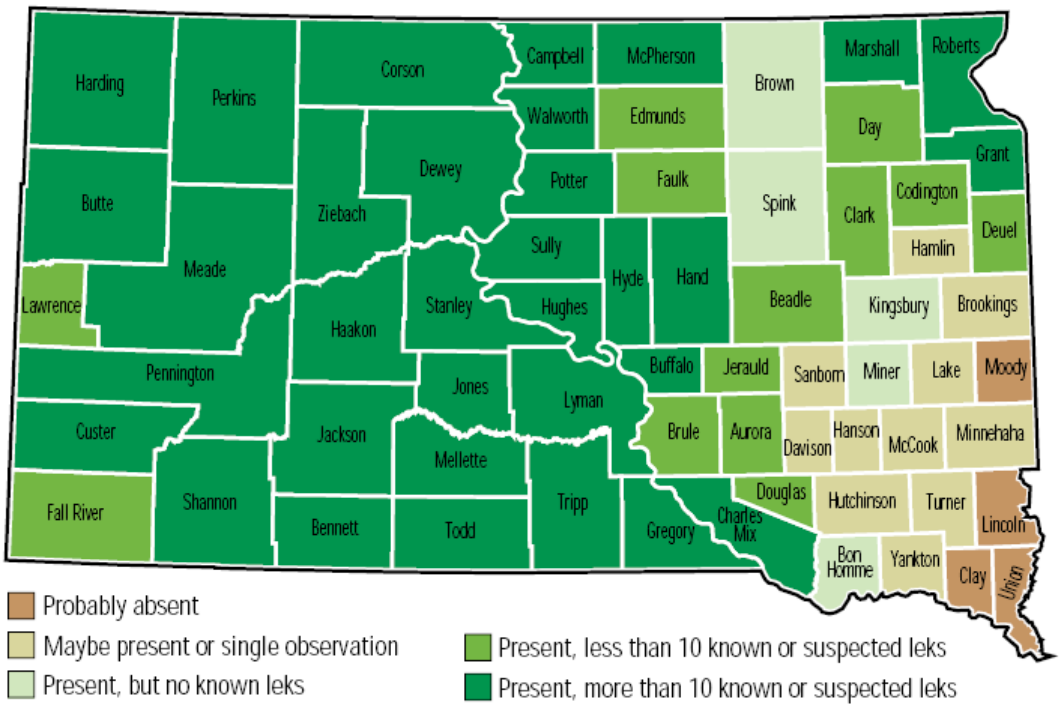

Figure 1. Distribution and general abundance of sharp-tailed grouse in South Dakota (Flake et al. 2010).

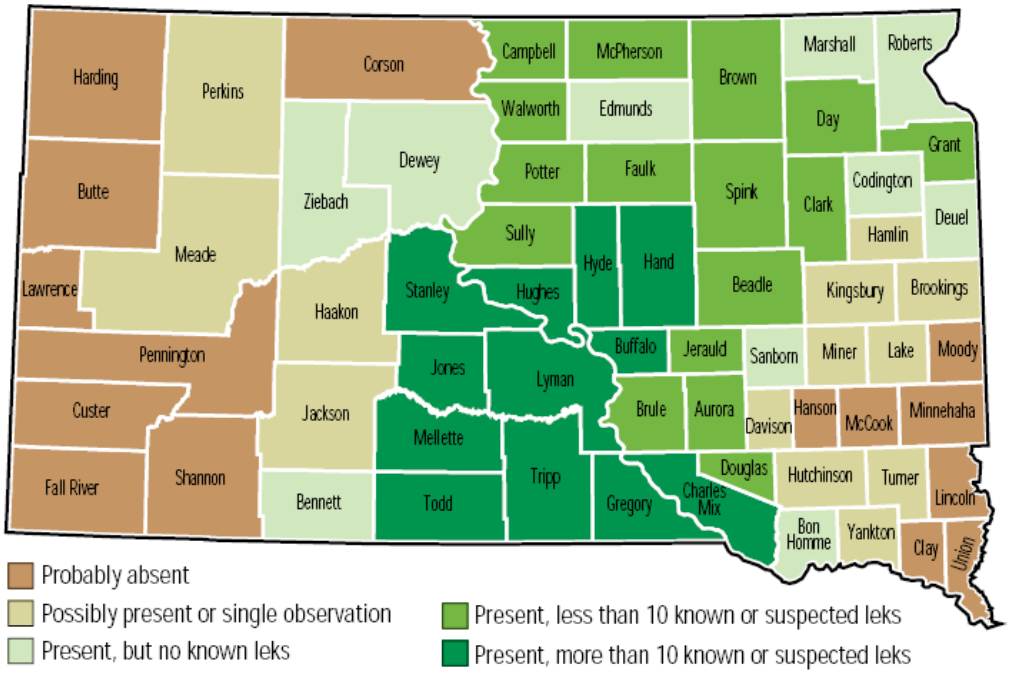

Figure 2. Distribution and general abundance of greater prairie-chickens in South Dakota (Flake et al. 2010).

PRAIRIE GROUSE ECOLOGY

Leks, also known as "dancing grounds" for sharp-tailed grouse and "booming grounds" for prairie-chickens, are located in areas of high breeding potential and typically exist within centers of large tracts of suitable prairie habitat (Merrill et al. 1999, Niemuth 2000, Hanowski et al. 2000). Leks are the focal point for reproductive ecology and behavior in prairie grouse. Prairie grouse leks are typically located on knolls or on a gentle rise, although prairie-chicken leks are sometimes located on flat bottomlands such as a dry wetland. Males gather on leks primarily during spring to defend territories and attract females during the breeding season. While it is not unusual for hens to visit several leks during a single season, males typically attend one lek each year and likely return to the same lek year after year.

In SD, male prairie grouse begin defending territories on leks as early as late February with peak activity coinciding with peak hen attendance in early April. Sharp-tailed grouse display behavior involves rapid foot stomping, rapid tail vibrations (tail rattling), inflation of purple air sacs, and aggressive face-off behavior with other males. Prairie-chickens raise their pinnae and tail feathers while producing loud booming noises by inflating their orange external air sacs. Aggressive behavior between males is common, with some males even leaping several feet in the air during face-offs. The booming noise made by male prairie-chickens can be heard from several miles away during calm conditions.

Lekking activity can start well before daylight and last for several hours. Leks are attended during evening, although duration and display behavior is usually less intense. Male sharp-tailed grouse may also defend territories on leks during fall, although duration and intensity of display behavior is minimal. Lek attendance during fall is thought to be important in recruiting young males that did not establish a territory during the previous spring.

Hen prairie grouse may attend several leks before selecting a male for copulation. After breeding, hen prairie grouse will not visit a lek again unless her nest is destroyed. Most hen prairie grouse will initiate a nest within a few miles of the lek they visited for breeding, although some may nest 10 mi away or farther. Nest initiation typically occurs within several days to a week after copulation.

Mean nest initiation date was April 22 during a 3-year study on the Fort Pierre National Grassland (FPNG) (Norton 2005). First nests of the year are usually located in residual grass or herbaceous vegetation, and sometimes under a small shrub such as western snowberry (*Symphoricarpos occidentalis*), as green up has yet to occur (Eng et al. 1988). First nest clutches typically contain 14 dull brown eggs (Norton 2005). Incubation begins before the last 1−2 eggs are laid and continues for 23 days. Nest success has been found to be higher when residual cover conceals the nest and the landscape consists of primarily intact grasslands (Frederickson 1995, McCarthy et al. 1998, Ryan et al. 1998,). Mammalian predators are the primary cause of nest loss, although nest success of 80% has been documented on the ideal and intact habitat of the FPNG (Norton 2005). Hens may re-nest up to three times if previous nests are destroyed, but clutch size and egg size decreases with subsequent nesting attempts.

Although incubation begins before the last egg is laid, all eggs hatch concurrently after 23 days of incubation. Newly hatched chicks will remain in the nest bowl for about a day before the hen leads the brood to habitats containing plentiful insects, primarily areas with abundant forbs such as non-native sweet clover (*Melilotus spp.)* and other native wildflowers. By 10 days of age, young grouse are capable of short flights and by 8−10 weeks they resemble adults in size. Chick survival was found to be about 36% during a 3-year study on the FPNG (Norton 2005). Young-of-the-year grouse will remain in loose family groups well into the fall. Only female prairie grouse provide parental care for nests and young.

During spring and summer, adult prairie grouse spend a majority of their time in grasslands including grass and alfalfa hay fields. Their diet consists of plant material such as seeds, berries, and buds but can also include insects. During fall, prairie grouse form flocks which may contain both species and remain together through winter. Prairie grouse also utilize waste grain from agricultural fields, mostly during fall and winter. Waste grains from agricultural crops are used by sharp-tailed grouse, but are not necessary for winter survival; however, waste grains likely contribute to prairie-chicken survival and persistence in some landscapes. In SD, prairie-chickens likely rely on waste grains during winter and remain within 1−2 mi of this food source during the entire winter. The interaction between agriculture and prairie-chicken distribution and abundance is described in detail in the historical information section.

Prairie grouse are well-adapted to survive severe winter weather in open grassland habitat. During winter, prairie grouse use woody cover for shelter or simply roost in the snow. This

unique behavior of snow roosting protects prairie grouse from harsh winds and blowing snow in open habitats. Sharp-tailed grouse will occasionally roost in trees during winter. As winter transitions to spring, large flocks of prairie grouse disperse across the landscape in preparation for the breeding season.

SURVEYS AND MONITORING

Traditional Lek Surveys

The most widely used method to survey prairie grouse throughout their range is the spring lek survey. Male attendance on leks is relatively stable throughout the breeding season while female attendance is highly variable and exhibits distinct peaks. In SD, observers search established survey areas which are approximately 40 mi^2 for prairie grouse leks and count all males attending each lek. The number of males/mi^2 is tracked from year to year and is considered an index to the spring population. Currently, 10 traditional surveys (Figure 3) are conducted annually throughout the state. These surveys have been conducted since the 1940s, although consistent protocol and routes were not established until the early 1950s. From that time forward, direct comparisons can be made (Figure 4).

Occupancy Modeling

Data collection began in 2014 to develop a spatially explicit habitat-based occupancy model. Results of the model will be used to develop an expected distribution map for prairie grouse which could be used to focus conservation efforts and prioritize certain geographic areas. The model will be developed by determining presence or absence of prairie grouse leks on 1 mi^2 sample units across the state. Samples were spatially balanced across the state and occurred along a gradient of landscape-level grassland availability. Each 1 mi^2 area is searched 2−3 times per year and the final presence/absence data set will be used in conjunction with landscape level covariates to develop an occupancy model. A total of 423 sections were searched from 2014−2016 field seasons. Results from this modeling effort could also be used to develop an improved monitoring framework. A final report for data collected from 2014−2016 is expected in 2018.

Age Ratio Surveys

Wings from hunter harvested prairie grouse are also collected during the first two weeks of the season at wing collection boxes located west of the Missouri River. (http://www.gfp.sd.gov/hunting/small-game/prairie-grouse-wing-boxes.aspx). Hunters are encouraged to place one wing from each harvested grouse in 1 of 18 collection boxes. Each wing is identified to species (sharp-tailed grouse or greater prairie-chicken) and aged (adult or hatch year) to determine species harvest distribution and age ratios. The ratio of hatch year to adult grouse can be used to gauge production during that specific year (Figure 5). Biologists use these data to relate grouse production to weather variables to predict grouse production in future years.

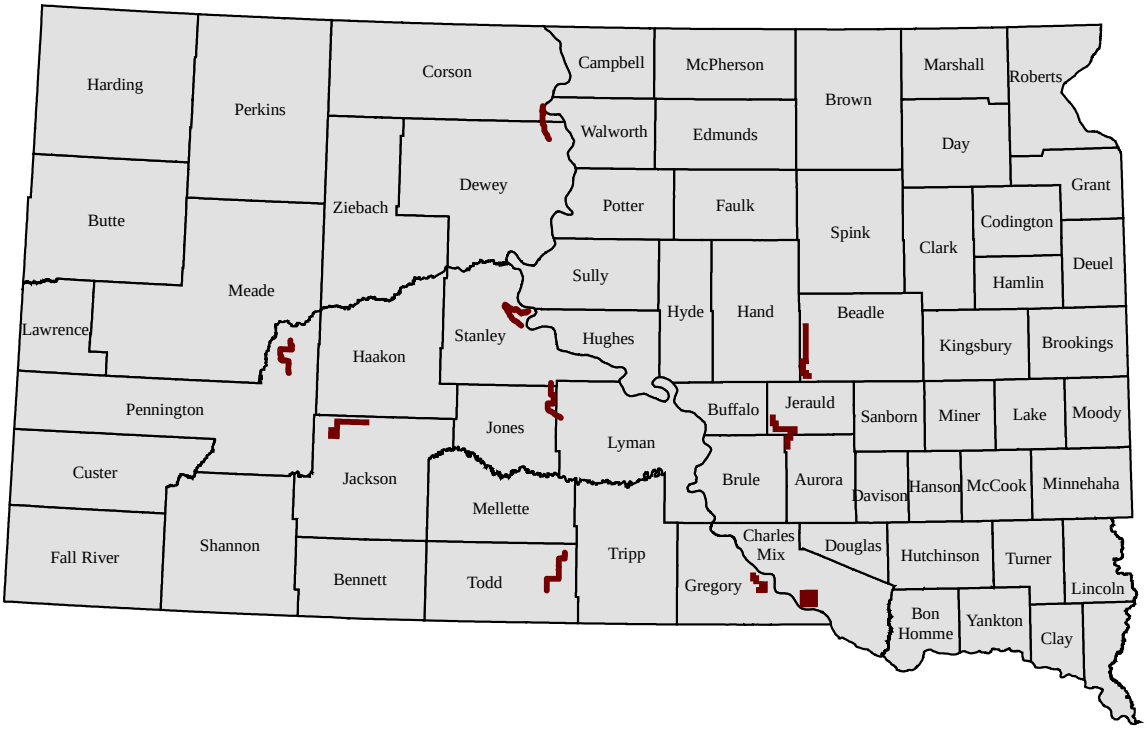

Figure 3. Prairie grouse traditional lek survey areas.

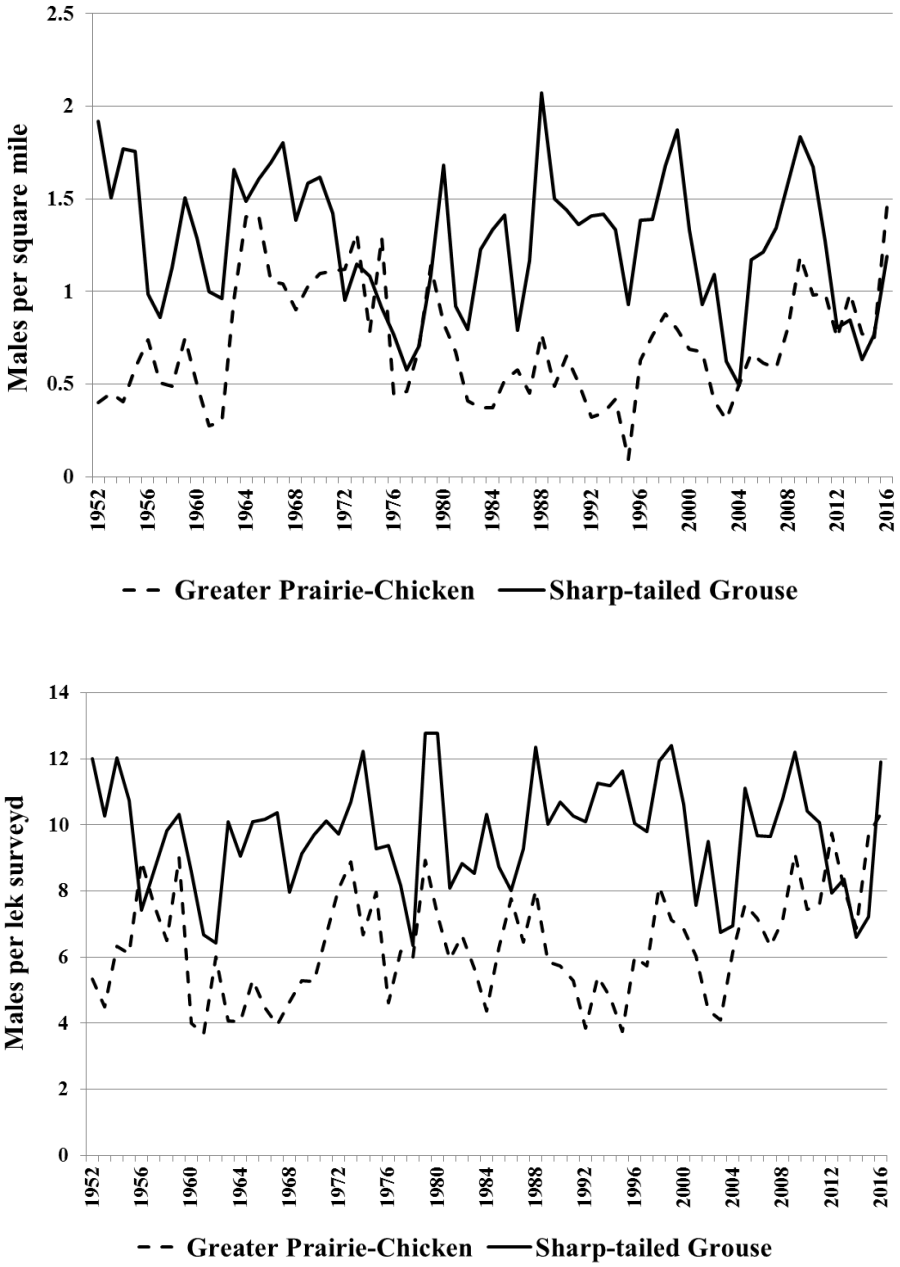

Figure 4. Results of prairie grouse traditional lek surveys 1952−2016.

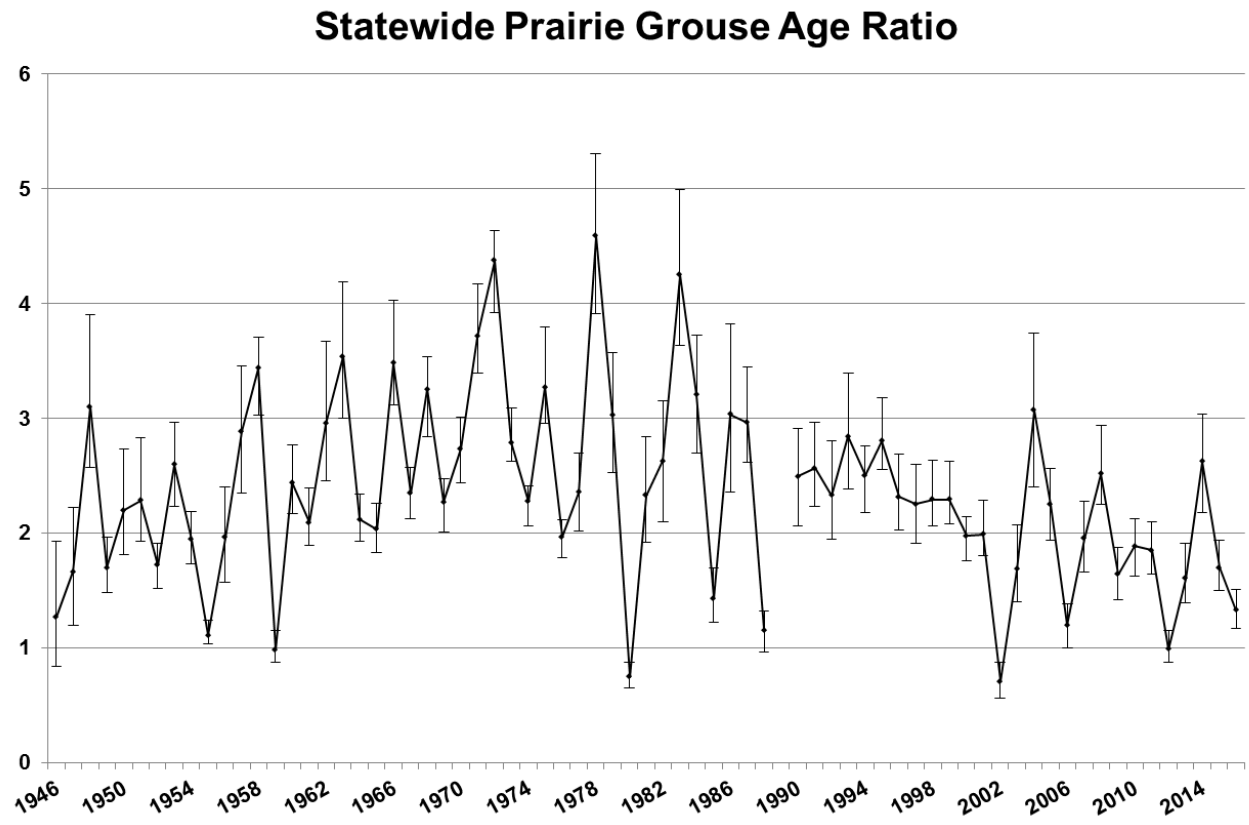

Figure 5. Statewide prairie grouse age ratio (± 95% confidence interval) from fall hunter-harvested sharp-tailed grouse and greater prairie-chickens 1946−2016.

PRAIRIE GROUSE RESEARCH

Rice and Carter (1982) investigated the relationship between grassland management practices and their subsequent influence on prairie grouse populations on the FPNG from 1974−1978. Specifically, they evaluated grazing regimes and resulting residual grass available to nesting grouse. Comparisons were made among rest-rotation, deferred-rotation, winter pasture, bull pasture, and wildlife areas. Prairie grouse production was compared among systems and related to available grass cover. Rest-rotation systems included a series of pastures in which one pasture was rested for an entire year. The pasture grazed last was the rested the following year. The deferred-rotation systems consisted of a series of pastures, which were all rotationally grazed once during the growing season. The wildlife area was not grazed during the study. Bull pastures were stocked at very low density. The winter pasture was not grazed during the growing season.

The rest-rotation ungrazed pastures, winter pastures, and bull pastures yielded the most nests-broods/acre and also possessed the highest amount of residual cover for nesting. Even when grazed rest-rotation pastures were included in analyses, rest-rotation pastures had more nest-broods/acre than deferred rotation pastures. The wildlife area study plots had among the highest

amounts of residual grass, but much of the grass was produced on lowland sites which prairie grouse avoided for nesting.

The key finding of this study was that grazing systems which produced at least 900 lbs/acre of forage provided adequate residual cover for prairie grouse nesting and brood rearing. The authors recommended rest-rotation and winter grazing systems be used on the FPNG as a way to boost local prairie grouse populations.

Fredrickson (1995) evaluated the success of a prairie-chicken reintroduction effort during 1985−1989. Prairie-chickens were captured on the FPNG and Lower Brule Indian Reservation and released in south-central McPherson County during 1986−1988. Birds were fitted with radio collars and tracked to determine survival, home range, and habitat use. The reintroduction effort was deemed unsuccessful as no prairie-chickens were observed in the release area for 5 years (1989−1993) following the last year of releases. Cause for the lack of success in the release area was attributed to habitat deficiencies, particularly during winter. Most of the released prairie-chickens traveled up to 20 mi during winter to find adequate croplands for winter food that were adjacent to high quality grassland for roosting. Within the release area, adequate grass cover was lacking near available crop fields. Most of the migrating prairie-chickens were killed by predators before they could return to the release area after each winter.

Norton (2005) estimated prairie-chicken and sharp-tailed grouse brood habitat use, nest success, and hen and brood survival on the FPNG during 2003−2005. Overall combined nest success was approximately 75%, which is one of the highest estimates ever recorded. Breeding season hen survival was approximately 82% during the three-year study. Brood survival was also an astonishing 85% and chick survival was estimated at 36%. Prairie grouse broods avoided the use of smooth brome and selected for forb cover such as sweet clover. This study demonstrated how prairie grouse can exhibit very high reproductive potential in landscapes dominated by well managed grasslands.

Kirschenmann (2008) studied the spatial ecology and harvest of prairie grouse on the FPNG during 2003−2005. Mean home range size for hens with broods was 184 ha for sharp-tailed grouse and 174 ha for prairie-chickens. Mean distance from lek of capture to nest sites was 1.98 km for prairie-chickens and 2.03 km for sharp-tailed grouse. Hens of both species selected pastures that were not grazed the previous year. Only 17 of 209 (8.1%) marked adult prairie grouse were reported as harvested by hunters during the 3-year study. Dog training had minimal impacts on prairie grouse behavior. Flushing distance was similar between areas open and closed to dog training. Results of this study indicate repeated flushes from dog training did not cause prairie grouse to exhibit more "wild" behavior during the hunting season.

Runia (2009) investigated how large-scale land use affects the distribution and abundance of prairie grouse in northeastern SD with an emphasis on the influence of CRP. Land use surrounding prairie grouse leks was compared to land use surrounding non-lek locations at several spatial scales. Landscapes surrounding prairie grouse leks contained higher proportions of pasture and CRP at several spatial scales. Spatially explicit habitat suitability models also were developed in a geographic information system to predict which landscapes are most likely to support prairie grouse leks. Strongest models occurred at the 1 mile scale which is similar to

other similar studies (Merrill et al. 1999, Niemuth 2000). A similar study documented landscape level habitat characteristics associated with prairie-chicken leks on the extreme eastern fringe of their range (Orth 2012). Orth (2012) documented the need for a higher proportion of grassland on the landscape needed for lek locations, as well as, the avoidance of trees and wetlands within ½ mile of the lek location.

A recently completed research project collected base line data on a pre-construction wind energy site in central SD (Runia and Solem 2015). A control site (wind energy development not anticipated) with similar landscape characteristics was used as a comparison. Annual survival was 44% and nest success was 31%. Survival and nest success were similar between sharp-tailed grouse and prairie-chickens. Prairie grouse hens selected for nest sites within grassland dominated landscapes and avoided trees when considering only macro-scale habitat variables. This study demonstrated that prairie-chickens and sharp-tailed grouse select for and are most successful in tracts of unfragmented grasslands for reproduction. The study will be repeated if wind energy development occurs.

From 2009−2015, Geaumont and Graham (2015) studied the relationship between grassland habitat attributes and sharp-tailed grouse reproductive success on the Grand River National Grassland. Similar to past studies, they found sharp-tailed grouse selected for and were more successful using areas with taller grass for nesting and brood-rearing. Estimated overall nesting success with average habitat covariate values was 52%. Brood survival to 60 days was 55% based on average habitat covariate values. Maximum grass height was 8.2 inches for nest sites and 7.3 inches at random locations. For broods less than 14 days old, maximum grass height was 8.6 inches and 8.2 inches at random locations. For broods older than 14 days old, maximum grass height was 10.0 inches and 8.9 inches at random locations.

HUNTING SEASON STRUCTURE AND AUTHORITY

Hunting is currently authorized from the third Saturday of September through the first Sunday in January (Administrative Rule 41:06:09:01) with a combined daily bag of three prairie grouse (Administrative Rule 41:06:09:03). The season and bag limit is set by the SDGFP commission on a 3-year cycle with the next two cycles occurring in 2018 and 2021.

The current hunting season structure has very little impact on the long-term population. Hunting mortality is thought to be mostly compensatory because prairie grouse are short-lived, have high reproductive potential, and are subject to a relatively low harvest rate. Only 2 out of 195 marked female prairie grouse were harvested by hunters during a 3-year study in Hyde and Hand counties (unpublished data from Runia and Solem 2015). Only 17 out of 209 marked adult prairie grouse were harvested during a 3-year study on the FPNG (Kirschenmann 2008). Hunter harvest would have very little, if any, impact on the population at these observed harvest rates (Powell et al. 2011). Prairie grouse have a large distribution in SD and local populations likely respond to environmental and local habitat conditions.

Prairie grouse hunting is most popular during the first few weeks of the season based on license sales and field staff observation. During the first few weeks of the season, prairie grouse are loosely scattered across the landscape in small coveys and family groups which is favorable for

hunting. As the season progresses, flock sizes increase and hunting success generally declines sharply. Prairie grouse hunting pressure declines after the first few weeks in response to lower success and as hunters shift effort to other upland game such as pheasants. Some broods may not be fully grown if the season started earlier in the season, and a later start date could sacrifice some of the most productive days of the season. An earlier start date could also make it more difficult to differentiate between prairie grouse and young pheasants. The current bag limit is thought to be socially and biologically acceptable. For these reasons, the SDGFP does not foresee any major recommended changes to the current hunting season structure. The SDGFP will continue to monitor the population, examine hunting statistics, and review public and SDGFP staff input when developing hunting season recommendations.

HUNTER & HARVEST TRENDS

Prairie grouse hunters and harvest have been estimated annually by analyzing response from hunter survey cards since 1945. Hunter and harvest numbers have been steadily declining since 1975 (Figure 6). In 2016, an estimated 7,879 resident and 5,386 non-resident prairie grouse hunters harvested approximately 56,888 prairie grouse. Although harvest is a summation of both species of prairie grouse, prior to 2006, 60% of the bag was thought to be sharp-tailed grouse. Much of the prairie grouse harvest occurs in the central and western portion of the state (Figure 7). In 2006, hunters were asked specifically how many of each species of prairie grouse they harvested. Results from this survey revealed the 2006 harvest was approximately 76% sharp-tailed grouse, 20% prairie-chickens, and 4% unknown.

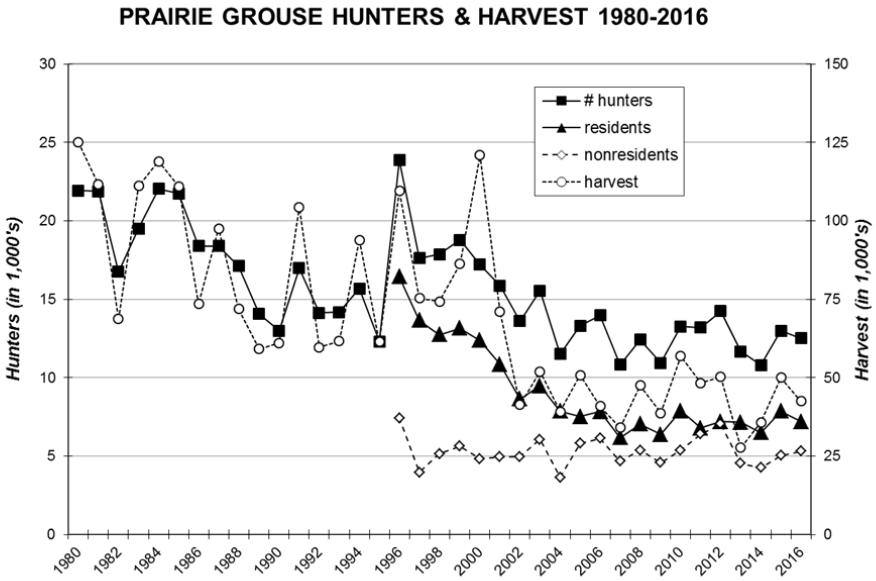

Figure 6. Prairie grouse hunters and harvest, 1980−2016.

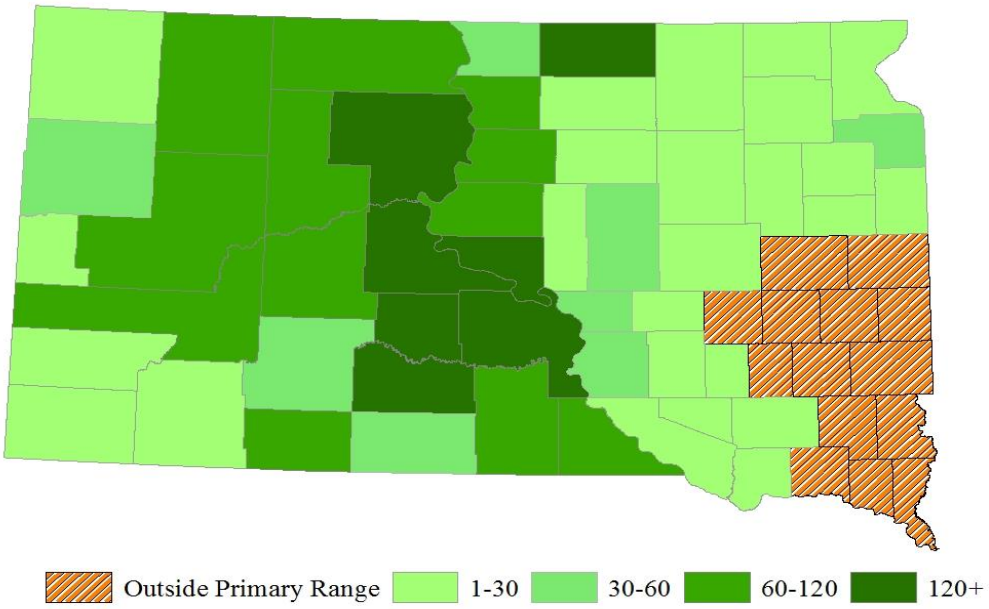

Figure 7. Average prairie grouse harvest/100 mi^2, 2006–2015.

HABITAT TRENDS

Prairie grouse require landscapes that contain a high percentage of grassland to persist (Merrill et al. 1999, Hanowski et al. 2000, Niemuth 2000). Since European settlement, grasslands have become one of the most imperiled ecosystems in the Great Plains primarily due to conversion to cropland (summarized in Samson et al. 2004). Range wide, severe loss of native grasslands has resulted in a decrease in abundance and distribution of prairie grouse (Johnsgard and Wood 1968) and these declines continue (Silvy and Hagen 2004). Sharp-tailed grouse were once found in 21 states, but habitat loss has reduced their range to portions of 11 states. Prairie grouse are prime examples of how large-scale land use changes can influence the distribution and abundance of landscape prairie obligates. Further conversion of grassland to cropland has been identified as a primary threat to prairie grouse throughout the northern Great Plains (Vodehnal and Haufler 2008).

South Dakota's landscape has changed substantially since European settlement in the late 1800s. Early settlers found the rich soils of eastern SD to be very productive for agricultural crops and quickly converted much of the grassland landscape to cropland. Conversion of grassland to cropland was more intense in the far eastern portion of the state because of higher annual precipitation. More recently, high commodity prices fueled by the ethanol industry and improvements in agricultural technology (e.g. improved crop genetics) have resulted in mass conversion of grassland to cropland in SD (U.S. GAO 2007). Total cropland in SD increased by

nearly 2.8 million acres in the last 40 years (USDA NASS 2017, Figure 8) as more land, primarily grasslands, have been converted to cropland.

During the 15-year period of 1982−1997, 1.82 million acres of grassland were converted to cropland (U.S. GAO 2007). A more recent study found 1.84 million acres of grassland were lost, primarily to conversion to cropland, from 2006–2012 (Reitsma et al 2014). Wright and Wimberly (2013) estimated 450,000 acres of grassland were converted to corn or soybeans between 2006 and 2011. Grassland to cropland conversion continues at a rate of approximately 50,000 acres per year (Stubbs 2007) and the rate of conversion appears to be accelerating (Rashford et al. 2011). Using these statistics, it is reasonable to say that SD has lost an estimated 4.5 million acres of grassland to cropland conversion since the early 1980s. Much of the recent conversions are occurring within the Missouri Coteau (Stubbs 2007, Stephens et al. 2008) which also represents the eastern fringe of the prairie grouse range in SD. This region contains vast grasslands that are vulnerable to future conversion (Stephens et al. 2008, Rashford et al. 2011).

Bauman et al. (2016) recently completed a fine-scale inventory of all undisturbed grasslands in eastern South Dakota delineating remaining tracts of native sod grasslands, which are potentially important prairie grouse habitat on the fringe of their range. Overall, 5,488,025 acres (24.2%) of the approximately 22.6 million acres in eastern SD were designated as potentially undisturbed. Nearly 1 million acres of the approximately 5.5 million acres of undisturbed land (17.5%) had some level of permanent conservation protection status. In total, they identified 962,734 acres of undisturbed habitat that is protected from future conversion, representing only 4.3% of eastern SD's total land base. While all grassland represent prairie grouse habitat, undisturbed grasslands are particularly important, especially when the diverse native plant community still persists.

While grasslands are being converted to cropland at alarming rates, there is interest by landowners to keep land in grassland in perpetuity. In fact, as of October 2015, 650 landowners representing 203,000 acres were on the waiting list to enroll their land in a perpetual grassland easement through the U.S. Fish and Wildlife Service (USFWS; Bill Mulvaney, personal communication). Recent funding allows for approximately 21,813 acres of enrollment annually and 903,589 acres are currently protected by grassland easements in SD.

Conversion of grassland to cropland has been substantial, but the Conservation Reserve Program (CRP) authorized under the 1985 Farm Bill has returned some cropland to grassland (Figure 9). Through this program, landowners receive an annual rental payment to convert eligible cropland to perennial cover (mostly grass) for 10−15 year contracts. As of October 1, 2016, SD had 972,000 acres of CRP. As much as 1.77 million acres of CRP has been enrolled at one time in SD which occurred in 1995. Although CRP can benefit prairie grouse (Rodgers and Hoffman 2005, Nielson et al. 2006, Runia 2009), it represents a short-term solution to a long term habitat loss problem.

In addition to declines in grassland habitat quantity, invasive plant species have also reduced grassland habitat quality across SD. Non-native grasses such smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), and crested wheatgrass (*Agropyron cristatum)* compete with native grasses and provide lower quality habitat than native plant communities. Moreover, invasive weeds such as Canada thistle (*Cirsium arvense*) and leafy spurge (*Euphorbia esula*) are

difficult to control and can become dominant if not managed. Fire suppression also has allowed encroachment of woody species such as eastern red cedar (*Juniperus virginiana*) into otherwise open grasslands, thereby reducing or even eliminating prairie grouse habitat. Loss of grasslands to invasive eastern red cedar along the Missouri River breaks and in similar landscapes along its larger western tributary rivers (e.g. White River and Cheyenne River) has gotten the attention of both the ranching community and wildlife managers.

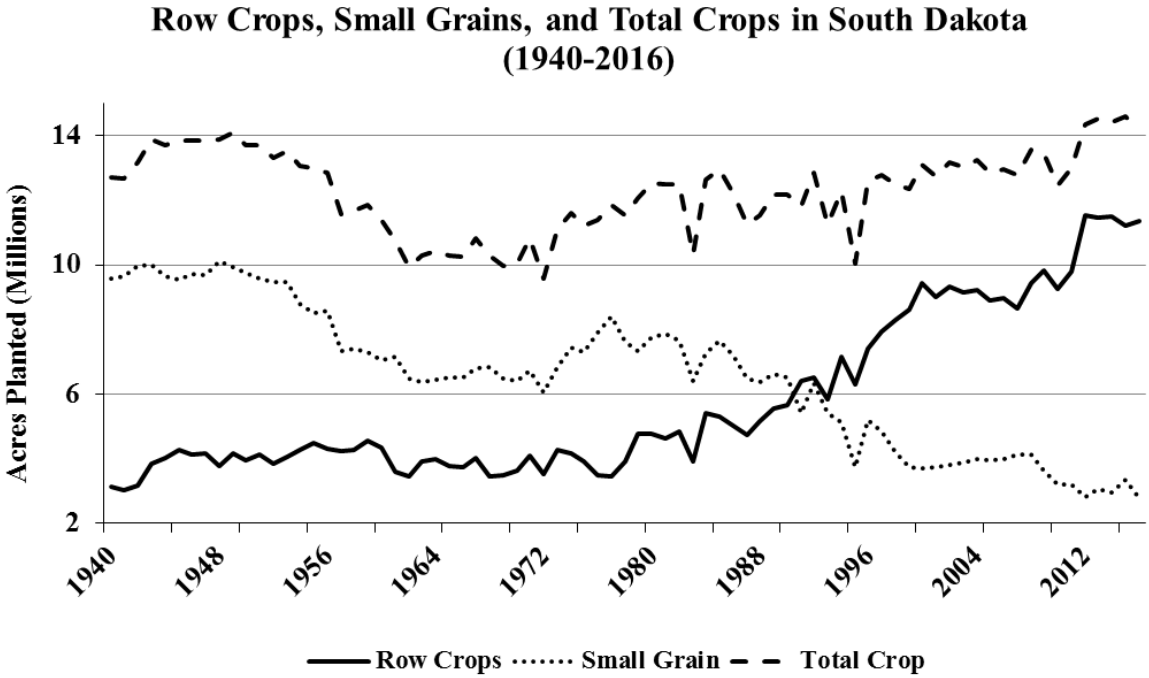

Figure 8. Total cropland in South Dakota 1940−2016 (USDA NASS 2017).

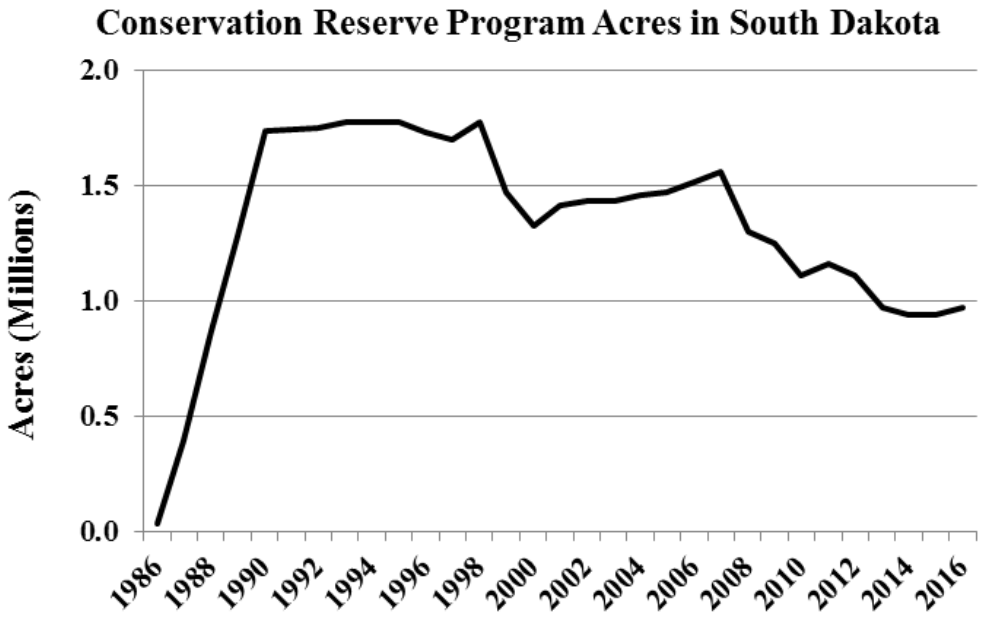

Figure 9. Total Conservation Reserve Program acres in South Dakota 1985−2016.

HABITAT BEST MANAGEMENT PRACTICES

Prairie grouse require large blocks of unfragmented grassland to persist. Prairie grouse use grasslands during all seasons, but they are particularly critical during the breeding, nesting, and brood-rearing season. The following Best Management Practices apply primarily to occupied prairie grouse habitat, but some could also be applied to areas where there is a desire to restore suitable habitat in currently unoccupied areas. Occupied habitat can be difficult to define, but areas within 5 mi of active leks, especially grasslands, could generally be expected to be occupied by prairie grouse. Best Management Practices for prairie grouse habitat may not be Best Management Practices for all wildlife species. The following list was developed using best available science and expert opinion.

- Maintain existing grasslands as grasslands (e.g., do not convert to cropland), especially unfragmented tracts within occupied prairie grouse range.

- Restore grasslands within occupied range and in areas where current grassland availability does not support prairie grouse.

- Use high diversity mixes of native grasses, forbs and shrubs for restorations and establishments. Some introduced forbs may be appropriate for some ecological sites but should be selected judiciously.

- Manage existing grasslands with disturbance regimes (grazing, fire) that encourage growth of diverse communities of native grasses, forbs and shrubs. Livestock grazing, particularly when part of a well-designed rotation or system that results in multiple levels of vegetation height and structure, is compatible with prairie grouse habitat needs. Management regimes that result in 8−12 inches of maximum residual grass height during normal conditions are adequate for providing concealment for nesting and slightly taller growing vegetation for brood rearing. Rotational grazing could be designed to provide adequate residual cover on at least some pastures or paddocks within a larger operation. Local climate, weather, and ecological conditions may limit site-specific forage production, which could make residual cover goals less practical or even unattainable during some years or in some locations.

- Use spot spraying herbicide application in lieu of field-level herbicide applications to control noxious weeds.

- Delay grassland haying until after the primary nesting season (after July 30). Haying is generally less effective at maintaining plant diversity and desirable nesting and brood rearing habitat structure than managed grazing or prescribed fire.

- Cropland retirement programs such as CRP are beneficial to prairie grouse. Short-term cropland retirement programs such as CRP should be prioritized to the current breeding range, or areas where the addition of grassland is expected to expand the range. Periodic management such as prescribed fire once every 3 years and/or grazing once every other year should occur to maintain plant diversity and desirable nesting and brood rearing habitat structure.

- Avoid establishing trees within large blocks of existing grasslands, especially native prairie within the occupied range. Remove encroaching trees from grasslands, especially ecological sites within native prairie where trees did not historically occur.

- Remove abandoned buildings which could harbor mammalian nest predators.

- Avoid activities near (~ 2 mi) lek sites that could interrupt lekking and nesting activity from March 1–July 30. If disruptive activities cannot be avoided, limit disruptive activities to three hours after sunrise to one hour before sunset. Disruptive activities could include but are not limited to well drilling and operation (water or energy development), burying pipeline or other utilities, building roads, vehicle traffic, direct disruption by human presence, wind tower construction and operation, or low flights by air craft or drones.

- Avoid development (e.g., roads, power lines, structures, energy development) in grasslands within occupied range, especially within 1 mi of lek sites. Where development occurs within occupied range, leks within 5 mi of development should be monitored indefinitely.

ISSUES, CHALLENGES, AND OPPORTUNITIES

Loss of grassland habitat, primarily through conversion to cropland, is currently and will be the primary threat to prairie grouse in SD. History has demonstrated how prairie grouse population declines are linked to landscape level land use changes. Because SD's landscape changes are driven by many factors, it will be challenging to slow these habitat trends. With challenges also come opportunities, and many opportunities do exist to maintain, manage, and restore prairie grouse habitat on private and public land in SD.

Partnership-based programs and initiatives which promote sound stewardship of grasslands on private lands are essential to management of prairie grouse habitat. The partnerships among SDGFP, USFWS, Ducks Unlimited, Pheasants Forever, Bird Conservatory of the Rockies, and the Natural Resources Conservation Service (NRCS) to station biologists in NRCS and USFWS service centers has been a successful way to expedite delivery of grassland conservation programs. It will be imperative to continue to support the efforts of the SD Grassland Coalition in their mission to improve stewardship of grasslands through sustainable and profitable management. It is important for the SDGFP to continue to promote grazing stewardship practices through cost-share for department programs. For further information about SDGFP programs and other habitat resources, visit the Habitat Pays web site (http://habitat.sd.gov/).

There are opportunities to promote and advocate for local, state, and national policies which would be favorable to prairie grouse habitat. Federal policies, particularly Farm Bill provisions, can have huge influences on landuse decisions. Participation in a variety of technical committees, working groups, joint ventures, advisory boards, and associations will assure prairie grouse habitat needs are included in decision making processes. It is critical to sustain working relationships with other public land management agencies, such as U.S. Department of Agriculture Forest Service, US Bureau of Land Management and SD School and Public Lands, to foster similar land use goals which benefit prairie grouse and other prairie obligate species.

South Dakota has been identified as one of the top geographic locations for wind energy development within the United States. According to the U.S. Department of Energy, SD's resource potential for wind energy includes vast areas with wind power classifications of good to superb (Figure 10). As of February 21, 2017, SD had 13 operational wind energy projects capable of generating 884 MW of power (SD PUC 2017). Many of SD's large intact grasslands occur in areas of high wind potential such as the Missouri Coteau and vast areas of western SD. Wind energy development has occurred in occupied prairie grouse habitat and future development is likely. It will be imperative to work with wind energy developers to minimize potential impacts on prairie grouse habitat from wind energy development.

The impacts of wind energy on greater prairie-chickens are generally equivocal and the impacts on sharp-tailed grouse have not been studied. Greater prairie-chicken lek persistence was ~0.5 for leks <0.62 mi from a turbine, ~0.9 for leks 1.86 mi from a turbine, and >0.95 for leks ≥3.73 mi from a turbine during the 3-year post-construction period for a study in Kansas (Winder et al. 2015a). The rate of lek abandonment was 3× higher for leks <4.97 mi from a turbine compared to leks ≥4.97 mi from a turbine (22% vs 8%) supporting the USFWS's 4.97-mi buffer zone for wind energy development (Manville 2004). The increased rate of lek abandonment within 4.97

mi of wind turbines is concerning because female prairie-chicken activity centers are nearly always centered within 3.1 mi of active leks (Winder et al. 2015b). Although previous research found female greater prairie-chickens avoid turbines in their space use and movements, turbines did not negatively affect nest-site selection, nest survival, or adult survival (McNew et al. 2014, Winder et al. 2014a, Winder et al. 2014b). An unpublished study from a 36 turbine wind farm in an unfragmented Nebraska landscape found no influence of wind energy development on nesting, brood-rearing, or special ecology of greater prairie-chickens (Harrison 2015).

There is also evidence that other forms of development within occupied habitat could have a negative impact on prairie grouse. Greater prairie-chickens were found to avoid power lines by 330 ft in Oklahoma (Pruett et al. 2009). A habitat-based greater prairie-chicken lek site model revealed a weak avoidance effect of roads at a 3.1-mi scale in Kansas (Gregory et al. 2011). A similar modeling effort in Minnesota suggests road density at a 2-mile scale was a negative predictor of lek presence (USFWS HAPET 2010). Significantly more roads occurred within 1,640 and 3,280 ft of inactive sharp-tailed grouse leks when compared to active leks in Minnesota (Hanowski et al. 2000).

The SDGFP occasionally receives comments of concern about the effect of dog training on prairie grouse hunting opportunity. Dog training on wild game birds is allowed from August 1 through the Friday preceding the third Saturday in September. See the SDGFP Hunting Handbook for all restrictions. Research has shown dog training has very little influence on prairie grouse behavior and is not expected to detrimentally impact hunting opportunity. The SDGFP will continue to consider public comments, staff input and emerging research when considering changes to dog training rules.

There are also opportunities to further inform the public about prairie grouse behavior, habitat needs and trends, and hunting/viewing opportunities. The SDGFP has many media available to further inform the public about prairie grouse and encourage them to participate in hunting or viewing opportunities. The SDGFP's recently published "Grouse of Plains and Mountains" book is an excellent resource for information related to all grouse species in SD and is available at https://gfp.sd.gov/shopping/Catalog.aspx?cat=6 . With increased public awareness of the challenges facing prairie grouse, more interest in the preservation of these great birds and their habitats may occur.

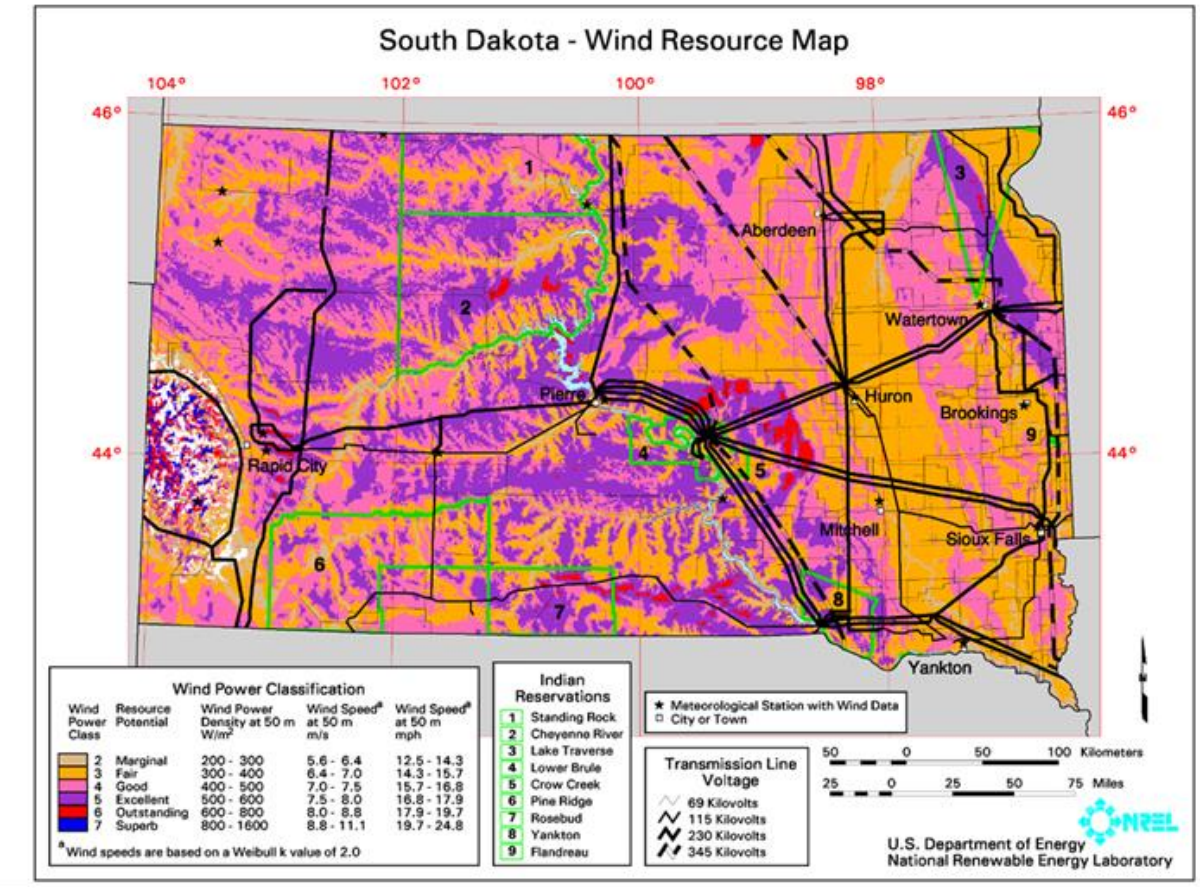

Figure 10. Wind energy classification classes for South Dakota (U.S. Department of Energy 2010).

GUIDING PHILOSOPHY

Vision – Who Do We Strive To Be?

The South Dakota Game, Fish and Parks will conserve our state's outdoor heritage to enhance the quality of life for current and future generations.

Mission – What Do We Do?

The South Dakota Game, Fish and Parks provides sustainable outdoor recreational opportunities through responsible management of our state's parks, fisheries and wildlife by fostering partnerships, cultivating stewardship and safely connecting people with the outdoors.

GOALS

Provide outdoor recreational opportunities – Optimize the quantity and quality of sustainable hunting, fishing, camping, trapping and other outdoor recreational opportunities.

Serve as stewards of our state's outdoor resources – Maintain and improve our outdoor resources to ensure sustainability.

Inspire confidence – Instill trust from the people we serve through transparency and accountability.

Foster professional excellence – Develop and empower highly engaged and well-trained staff.

VALUES

Excellence – We believe in a culture of professionalism and accountability to meet the expectations of our customers and empower staff to succeed.

Stewardship – We believe in applying biological and social sciences to conserve and respectfully manage our state’s outdoor resources for current and future generations.

Integrity – We believe in being transparent and honest by promoting high ethical standards.

Compassion – We believe in the dignity of each person and genuinely care for the people we serve.

PRAIRIE GROUSE MANAGEMENT GOAL

Maintain or expand sustainable prairie grouse populations by fostering partnerships, promoting grassland habitat stewardship, and applying biological and social sciences.

OBJECTIVE 1: Promote and implement responsible stewardship of prairie grouse habitat on public and private lands.

STRATEGIES

1.1 Advocate for current and future United States Department of Agriculture (USDA) Farm Bill programs and policies in the Commodities, Conservation, Energy, and Crop Insurance titles that incentivize native grassland preservation, protection, and enhancement.

1.2 Maintain support for Conservation Reserve Program (CRP) in federal farm legislation through continued cooperation with the Governor's Office, USDA, other state and federal agencies, non-governmental conservation organizations, coalition groups (e.g. Northern Great Plains Working Group, Association of Fish & Wildlife Agencies), landowners and agricultural groups.

1.3 Advocate for land use policies and procedures, including local zoning and property tax assessment which preserve and protect native grassland functions and values in a fair and equitable manner. Note: the South Dakota legislature created the Agricultural Land Assessment Implementation and Oversight Advisory Task Force to provide guidance to the Department of Revenue on the implementation of the productivity system of assessing agricultural land. The Task Force holds meetings during the legislature's interim calendar to review assessment information and make recommendations to the legislature for potential revisions to the productivity system.

1.4 Continue to advocate for strategic use of existing and new continuous CRP practices that provide quality prairie grouse habitat (West River SAFE, Grasslands CRP). Use designated prairie grouse priority areas (Vodehnal and Haufler 2008) and results of the occupancy modeling project to guide specific CRP advocacy.

1.5 Annually seek and provide assistance to landowners with expiring CRP contracts, by providing re-enrollment options into general and continuous CRP, or other programs that are available for maintaining all or a portion of this grassland habitat. At the appropriate times, use direct mailings to producers with expiring CRP contracts.

1.6 Maintain existing partnerships with Pheasants Forever, Natural Resources Conservation Service, Bird Conservatory of the Rockies, and Ducks Unlimited to fund partnership biologists to assist private landowners with technical assistance and the promotion of grassland-related conservation programs. Continually assess the need for technical services provided by partnership biologists and staff the appropriate positions as budgets allow.

1.7 Continue to provide financial commitment to the 81,000 acres enrolled in the Conservation Reserve Enhancement Program (CREP) and utilize funding sources as they become available to enroll the project goal of 100,000 acres in the CREP.

1.8 Continue to support perpetual conservation easements and fee title acquisitions of grassland habitat by other public and private entities.

1.9 Remain engaged with the Governor's Habitat Conservation Initiative and the Habitat Conservation Board.

1.10 Continue to promote grassland habitat stewardship and sustainability through the Habitat Pays initiative, and through support of landowner-based conservation stewardship interests such as the South Dakota Grassland Coalition and South Dakota Soil Health Coalition. (http://habitat.sd.gov/workshops/default.aspx).

1.11 Continue to be involved in providing technical assistance for and participation in state-level policy making processes related to Farm Bill delivery through the State Technical Committee, Sub-Committees, and Working Groups.

1.12 Maintain support for the vision and mission of the Prairie Pothole Joint Venture and Northern Great Plains Joint Venture to implement grassland stewardship by serving on appropriate management boards and technical committees.

1.13 Continue to promote grazing stewardship practices through department private lands cost-share programs, partner programs, and other initiatives when and where appropriate.

1.14 Continue to financially support and advocate for completion of South Dakota State University (SDSU) Extension's inventory of undisturbed (native) lands in western South Dakota.

1.15 Utilize SDSU Extension's inventory of undisturbed (native) lands across the state to better target SDGFP's private lands technical and financial assistance programs on native sod areas in high priority landscapes.

1.16 Continue to participate in public scoping opportunities with federal agencies that manage native grasslands and convey recommendations which support public land uses that best maintain or enhance prairie grouse habitats.

1.17 Where prairie grouse are the primary habitat management species, best management practices for prairie grouse habitat management (page 16 of this plan) will be used with discretion to guide development and updates of Game Production Area management plans within fiscal, biological, and land use constraints.

1.18 Continue to use all available prairie grouse research findings to guide the environmental review process of proposed development projects (e.g. communication towers, wind energy, oil and gas, livestock grazing and allotment revisions, livestock infrastructure, recreational sites, trails, roads, prescribed fire, post-fire land management, etc.) where the

SDGFP has the opportunity to provide environmental review. Use Habitat Best Management Practices to guide environmental review process.

1.19 Participate in the greater prairie-chicken and sharp-tailed grouse interstate working group and assist in the development of a national prairie grouse conservation plan.

1.20 Explore the feasibility of using grass banking as a way to cooperatively and concurrently manage grassland habitat on Game Production Areas and nearby private lands.

OBJECTIVE 2: Monitor prairie grouse abundance, harvest, hunter numbers and hunter satisfaction.

STRATEGIES

2.1 Annually conduct traditional lek surveys and summarize data to determine changes in population status.

2.2 Periodically review prairie grouse lek survey protocol and discuss changes that could improve data collection efficiency and accuracy.

2.3 Annually conduct and summarize results of hunter harvest surveys to project prairie grouse harvest, number of prairie grouse hunters, and hunter satisfaction.

2.4 Continue to collect wings from hunter harvested prairie grouse in western South Dakota to evaluate age ratio and species composition of harvested grouse. Continue to collaborate with Forest Service biologists to relate weather variables to prairie grouse production on federal lands and other areas using wing data. Ensure that information gathered is shared among SDGFP and other participating agencies.

2.5 Continue to annually coordinate with federal land management agencies to collect prairie grouse habitat information, population/trend data and hunter-harvest statistics. Ensure that information gathered is shared among SDGFP and other participating agencies.

OBJECTIVE 3: Evaluate research needs and prioritize on an annual basis.

STRATEGIES

3.1 Annually collaborate with stakeholders and summarize research needs and ideas.

3.2 By December 2018, prepare completion report for prairie grouse occupancy modeling project.

3.3 At least one staff member will attend the semi-annual meeting of the Prairie Grouse Technical Committee meeting. This meeting facilitates the exchange of information

between states on survey techniques, harvest regulations, research and habitat management.

3.4 Continue to attend scientific meetings that will exchange information related to prairie grouse management.

OBJECTIVE 4. Provide prairie grouse hunting opportunities on private and public land

STRATEGIES

4.1 Use all available biological and social data to develop 3-year hunting season recommendations for SDGFP Commission consideration.

4.2 Continue to enroll large blocks of well managed grasslands into the walk-in area program, especially in central and western South Dakota where high density prairie grouse populations exist.

4.3 Collaborate with SD School and Public Lands and the Bureau of Land Management to provide public access to land-locked public lands through access agreements and easements.

4.4 Continue to provide the South Dakota Hunting Atlas in print, as a pdf document, interactive map within the department's website, as a smartphone application, and as a map file for certain GPS units.

4.5 Annually prepare a prairie grouse hunting forecast based on spring lek counts and the production model based on weather variables.

OBJECTIVE 5. Promote public, landowner, agency and industry awareness of prairie grouse and habitat management issues of highest conservation concern.

STRATEGIES

5.1 Provide an electronic copy of "Prairie Grouse Management Plan for South Dakota 2017-2021" on the SDGFP web site. Printed copies will be available upon request.

5.2 Periodically include articles about prairie grouse and prairie grouse habitat in the SD Conservation Digest and Landowners Matter Newsletter.

5.3 Develop a prairie grouse habitat best management practices fact sheet for SD landowners.

5.4 By 2019, add a web page about prairie grouse under the outdoor learning section of the department website which includes descriptions, videos and pictures of prairie grouse display behavior.

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