Management Plan and Conservation Strategies For Greater Sage-Grouse In North Dakota

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INTRODUCTION

Currently the distribution of Greater sage-grouse (*Centrocercus urophasianus)* includes 11 western states and 2 Canadian provinces with federal lands making up approximately 72% of the total range of the species (Connelly et al. 2004a, Schroeder et al. 2004). Home ranges of sage-grouse are typically characterized as large areas and, in many populations, separate seasonal habitats requiring annual movements of 75 km or more (Dalke et al. 1963, Connelly et al. 1988). Thus, sage-grouse are considered a landscape-scale species. Given their reliance on big sagebrush, sage-grouse distribution is largely defined by the distribution of big sagebrush-occupied and dominated landscapes (Knick and Connelly 2011). Such habitats have been reduced to approximately 55% of their historic area (Connelly et al. 2004b) and correspondingly, greater sage-grouse are estimated to occupy about 56% of their historic range (Schroeder et al. 2004). Recent census data obtained by the ND Game and Fish Department show a decreasing trend in total males counted over the last 30 years (Figure 3).

Sage-grouse continue to be considered a species of significant conservation concern by the public and scientific communities (Connelly and Braun 1997, Schroeder et al. 1999a, Schroeder et al. 2004). On March 23, 2010, the U. S. Fish and Wildlife Service (FWS) determined that the Greater sage-grouse and the Bi-state (California/Nevada) Distinct Population Segment (DPS) of the sage-grouse warranted the protections of the Endangered Species Act of 1973, as amended, 1531 *et seq*. (ESA). However, the FWS also found that listing was precluded due to other higher priority actions, thereby making the sage-grouse and the Bi-state DPS candidates under the ESA. Subsequently, the FWS entered into a court-approved settlement agreement with environmental groups which set a schedule for making listing determinations on over 200 candidate species nationwide, including the sage-grouse and its DPSs. The schedule indicated that a decision (proposed listing rule or withdrawal) on the Bi-state DPS was due by FY2013 (September 2013) and a decision on the sage-grouse range-wide was due by FY2015 (September 2015).

In December 2011, Wyoming Governor Matt Mead and Secretary of the Interior Ken Salazar co-hosted a meeting to address coordinated conservation of the Greater sage-grouse across its range. Ten states within the range of the sage-grouse were represented, as were the U.S. Forest Service (FS), the Natural Resources Conservation Service (NRCS), and the Department of the Interior (DOI) and its Bureau of Land Management (BLM) and U.S. Fish and Wildlife Service (FWS). The primary outcome of the meeting was the creation of a Sage-Grouse Task Force chaired by Governors Mead (WY) and Hickenlooper (CO) and the Director of the FWS. The Task Force was directed to develop recommendations on how to best move forward with a coordinated, multi-state, range-wide effort to conserve the sage-grouse, including the identification of conservation objectives to ensure the long-term persistence of the species.

As a step in implementing a range-wide strategy to benefit sage-grouse, Secretary Salazar invited the states impacted by a potential sage-grouse listing to develop state-specific plans to conserve the species and preclude the need for listing that could be considered as an alternative in the BLM and USFS management plan revision process. *See* Press Release, Salazar, Mead Reaffirm Commitment toward Development of Landscape Level Greater Sage-Grouse Conservation Strategy in the West (Dec. 9, 2011).

Additionally the Task Force developed the “Conservation Objectives Team” (COT) made up of sage-grouse experts. The COT was tasked with identifying steps necessary to ensure the long-term conservation of the species through threat amelioration, and not simply species persistence. The

approach included retention to the maximum extent practicable populations and habitats necessary to provide essential conservation parameters – redundancy, representation, and resiliency – for this species. Additionally, the COT wanted to identify ways to incorporate a fourth parameter, resistance, which would indicate that populations and habitats are healthy and robust even in the presence of threats. The resulting report "Greater Sage-grouse *(Centrocercus urophasianus)* Conservation Objectives: Final Report" (2013) outlined 6 general conservation objectives which are targeted at maintaining redundant, representative, and resilient sage-grouse habitats and populations.

COT General Conservation Objectives

1) Stop population declines and habitat loss.
2) Implement targeted habitat management and restoration.
3) Develop and implement state and federal sage-grouse conservation strategies and associated incentive-based conservation actions and regulatory mechanisms.
4) Develop and implement proactive, voluntary conservation actions.
5) Develop and implement monitoring plans to track the success of state and federal conservation strategies and voluntary conservation actions.
6) Prioritize, fund, and implement research to address existing uncertainties.

Purpose of the Plan

The purpose of this plan is to meet the objectives outlined in the COT report and fulfill the mission of the North Dakota Game and Fish Department to protect, conserve and enhance fish and wildlife populations and their habitat for sustained public consumptive and appreciative use. The Game and Fish Department operates under a series of legal mandates, comprised of legislation and legislative intent that dictate the Department's responsibilities and authorities in carrying out these responsibilities. The *Management Plan and Conservation Strategies for Sage-grouse in North Dakota* was developed to fulfill the mission statement as it relates to sage-grouse in North Dakota.

Goal of the Plan

The goal of the "Management Plan and Conservation Strategies for Sage-grouse in North Dakota" is to provide for long-term conservation and enhancement of big sagebrush steppe/mixed-grass prairie habitats in North Dakota in a manner that will support a self-sustaining sage-grouse population, a diversity and abundance of other wildlife species, and human uses.

The North Dakota Game and Fish Department recognizes that the conservation measures outlined in Section IV are primarily voluntary actions. We further recognize that this plan cannot provide sufficient assurances of achieving the conservation objectives stated in the February 2013 Great Sage-grouse Conservation Objectives: Final Report (COT Report) due to the voluntary nature of the plan. Nevertheless we believe this plan should be used as the conservation framework to minimize impacts to sage-grouse in North Dakota across all landownership.

This plan provides biological information from the most recent peer-reviewed scientific literature. It is meant to be adaptive in allowing for the incorporation of new information into conservation actions and is intended to be flexible enough to adapt to local situations. It establishes a format to achieve objectives established by the plan for both sage-grouse populations and their habitat and to guide local management. It lays out a framework allowing for local and public input that will be instrumental in

implementing conservation actions and delineates possible sources for securing funding and resource information related to sage-grouse and their habitats.

Given the close proximity and association of sage-grouse populations in North Dakota with populations in Montana and South Dakota this plan attempts to recognize problems and conservation efforts that reflect our local situations but will remain compatible with conservation efforts being implemented in those states.

Avoidance First Strategy

There is a degree of uncertainty that limit our ability to prescribe a precise conservation action plan that will ensure amelioration of threats to sage-grouse. This is not only true for North Dakota but range-wide as well. Stochastic events which are not particularly understood or recognized can have severe impacts on sage-grouse populations. Ten years ago we did not understand or recognize the threat of West Nile virus on sage-grouse until it was too late. Climate change is another issue that we do not fully understand.

In view of these significant uncertainties, activities that have the potential to impact sage-grouse and their habitats should be avoided to the maximum extent possible to retain conservation options. We outline conservation objectives and strategies in section IV of this plan. The most severe threats are outlined first, followed by lower ranking threats. The plan is organized using an avoidance first strategy to reduce or avoid continuing declines of sage-grouse in North Dakota, as well as limiting further reduction in big sagebrush habitat. When avoidance is not possible, meaningful minimization and mitigation of the impacts should be implemented, conservation measures should be adapted to maximize effectiveness as new knowledge is obtained. We define this approach a hierarchical conservation strategy.

SECTION I: STATUS OF SAGE-GROUSE IN NORTH DAKOTA

GEOGRAPHIC DISTRIBUTION

North America

The greater sage-grouse is the largest North American grouse species and one of only two species that rely solely on big sagebrush steppe habitats of western North America. Their distribution closely follows that of big sagebrush, primarily Wyoming big sagebrush (*Artemisia tridentate*) (Braun 1998). Throughout this document the word sagebrush refers to big sagebrush in most instances. Prior to European settlement in the 19th century, sage-grouse inhabited 13 western states and three Canadian provinces (Schroeder et al. 2004). Sage-grouse presently occur in 11 western states and two provinces (Fig. 1), having disappeared from scattered areas around the periphery of its original range. It is unclear how much the species population has declined from pre-settlement due to anecdotal data, but currently sage-grouse only occupy 56 percent of its estimated historic range (Braun 1998, Knick and Connelly 2011, Schroeder et al. 2004; Figure 1).

North Dakota

The sage-grouse are the largest member of the North American grouse family and second only to the wild turkey in size of all the gallinaceous birds in North America. In pioneer times sage-grouse were the leading upland game bird in nine western states. The species was never widespread in North Dakota and is presently confined to the southwestern portion of the state (Johnson and Knue 1989). The North Dakota population is not isolated but is contiguous with sage-grouse populations in Montana and South Dakota. Currently genetic analysis is being conducted to determine the connectivity between fringe populations and populations in the core of the sage-grouse range (Knick, personal communication).

Credit for first visual sighting of the sage-grouse has been extended to the Lewis and Clark Expedition. Although these men apparently did not see the bird in North Dakota they did report it in the vicinity of the Marias River in Montana on June 5, 1805. They later reported it to be common west to the plains of the Columbia River.

Unlike sharp-tailed grouse there has been meager prehistoric and historic evidence to suggest that sage-grouse were ever present in North Dakota beyond their current distribution. Currently sage-grouse occur in southwestern North Dakota where scattered populations are found in three counties; Bowman, Slope, and Golden Valley (Figure 2).

Archeologists report sage-grouse remains have been found at only two of 29 sites where sharp-tailed grouse remains were found in numerous digs made in the Dakotas the past 25-30 years. The two sites where they were found were in the Indian village, Like-A-Fishhook, and the white man's Fort Stevenson military post. Both sites are in McLean County and date from the second half of the 19th century. Based on the sample size of only a few birds at both sites it's highly probable the birds were killed on a hunt farther to the west of both village sites. In the case of the Indian village they may have been killed and their feathers saved to be used on ceremonial fetes (Johnson op. cit.).

Although Audubon himself did not see sage-grouse, members of the 1843 expedition on the Missouri River sighted the bird (Johnson op.cit.)

Over 100 years later Johnson and Knue (1989) in their treatise on upland birds in North Dakota offered their view on the future status of the sage-grouse within the state when they said: "The "cock of the plains" is not destined to become an important game bird in North Dakota. Neither will he ever come under severe criticism by ranchers of the Badlands. Because the wastelands are his element it has been thought he would never be put under stress of habitat destruction. But there is one final reminder which might be kept in mind. Within recent years man has speeded up his efforts to locate new sources of organic and mineral materials – examples being oil, oil shale, coal, uranium, and copper. Much of this activity is in the western U.S. and where it occurs it has been destructive to sage-grouse and big game habitat. Conservationists must be continually on the lookout for the changes this activity may make on sage-grouse populations." Nearly 20 years later Naugle et al. (2011) conducted a meta-analysis of seven studies that reported negative impacts of energy development on sage-grouse. These recent studies suggest that development in excess of one pad/1 sq. mile resulted in impacts to breeding populations (Holloran 2005), and impacts at conventional well densities (8 pads/1 sq. mile) exceeded the species' threshold to persist (Holloran 2005, Walker 2007, Doherty et al. 2008).

In North Dakota oil and gas activity has increased exponentially in the past 10 years alone. New technology such as hydraulic fracturing has allowed oil companies the ability to extract oil that previously was unavailable to develop. The Cedar Creek anticline currently being developed in ND sage-grouse range is producing a significant amount of oil and natural gas.

Figure 1. Sage grouse management zones and Priority Areas for Conservation (PACs) including the current (occupied since the late 1990s) and historic (maximum distribution from the 1800s to early 1990s) range of the greater sage-grouse (Schroeder et al. 2004).

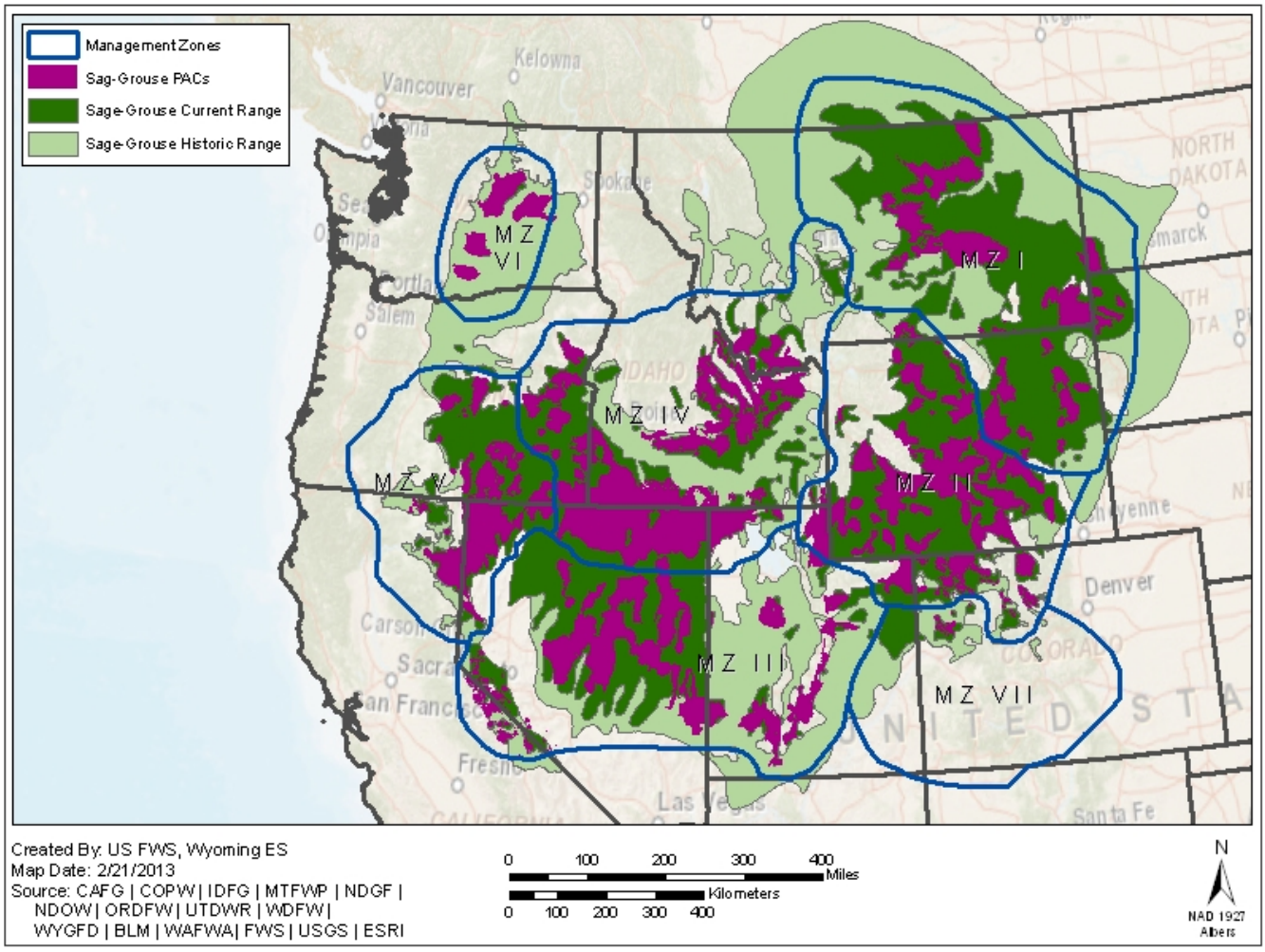
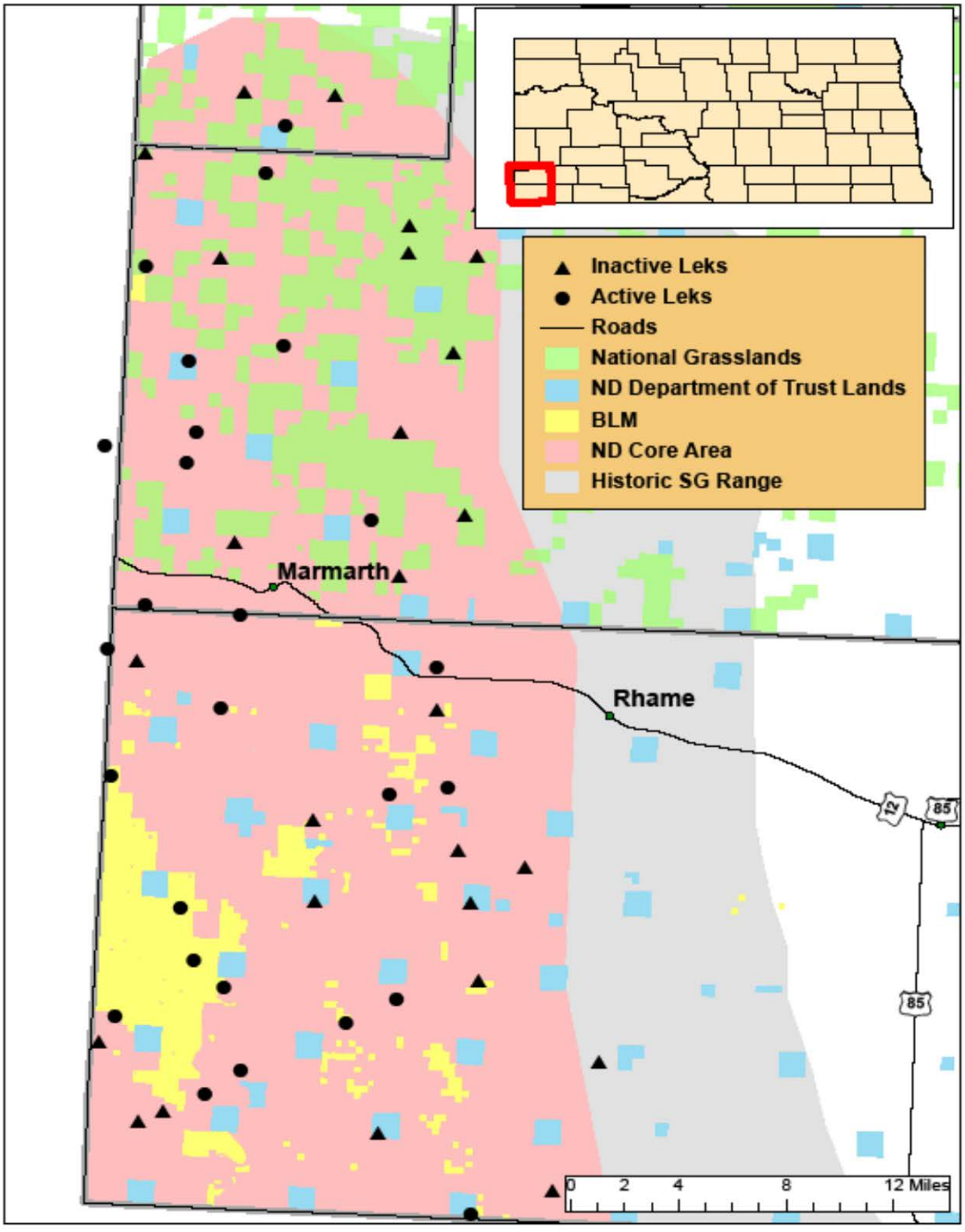


Figure 2. Active and inactive greater sage-grouse leks locations in North Dakota, 2013.



Core Sage-grouse area

In March 2010, the U. S. Fish and Wildlife Service (FWS) published its listing decision for the Greater Sage-Grouse as "Warranted but Precluded" (75 Federal Register 13910, March 23, 2010). Inadequacy of regulatory mechanisms was identified as a major threat in the FWS finding on the petition to list the Greater Sage-Grouse under the Endangered Species Act (ESA). The FWS identified the principal regulatory mechanism for protecting sage-grouse for the BLM as conservation measures in RMPs. Based on the identified threats to the sage-grouse and the FWS timeline for making a listing decision on this species, the BLM needs to incorporate objectives and adequate conservation measures into RMPs in order to conserve sage-grouse and avoid a potential listing as a threatened or endangered species under the ESA. In partial response to this effort the BLM requested that the states delineate core areas or in BLM terms (Priority Habitat, and General Habitat). Biologist from NDGF and BLM identified a core area that contains 100% of the known breeding population of sage-grouse in the North Dakota. The core area was determined based on analyses by Doherty et al. (2009) using breeding densities of sage-grouse. Leks were used to determine known breeding population areas. In the majority of the sage-grouse range across the 11 western states, leks were buffered by 6.4 km (4.0 mi) to delineate breeding areas. This distance was chosen because 79% of nesting females initiate nests within a 6.4-km radius from lek-of-capture (Table B-1 in Colorado Division of Wildlife 2008). In North Dakota buffers were extended to 8.5 km (5.3 mi) to account for lower population density areas and fragmented habitats. Sage-grouse populations on the peripheral of the range experience greater risk of extirpation than within the core of the species' range (Aldridge 2008). Aldridge (2008) also discovered that populations were predicted to persist if they were > 30 km form the edge of the historical range and where > 25% of the landscape was within a 30 km radius from habitat dominated by big sagebrush. Thus in North Dakota extending the buffer for our core area map provided a more realistic estimate of the area needed to protect these breeding populations, which are at high risk of extirpation. North Dakota is unique in comparison to most of the other states in sage-grouse range because roughly 74% of North Dakota's core sage-grouse range is private land with federal land encompassing roughly 22% of core and state lands accounting for the remaining 4% (Table 1).

Table 1. Summary of landownership in ND Core Sage-grouse area, Priority Conservation Areas (PCA), and the remaining % of landownership available as PCA.

Surface Ownership	**ND Core Sage-Grouse area**		**Priority Conservation Areas (PCA)**		**Remaining % of Land within PCA**
BLM-administered lands	33,482	7.25%	11,530	5.5%	35%
Forest Service	66,703	14.4%	43,017	20.5%	65%
ND Department of Trust Lands	21,887	4.75%	12,982	6.2%	59%
Private Lands	339,214	73.6%	142,516	67.8%	42%
Total Area in Acres	**461,286**		**210,045**		**46%**

Habitat Status

A clear-cut example of the importance of habitat to a wildlife species is illustrated by the life history of the sage-grouse. They depend on a variety of shrub steppe habitats throughout their life cycle, and are considered obligate users of several species of sagebrush (e.g., *Artemisia tridentata* ssp. *wyomingensis* (Wyoming big sagebrush), *A. t.* ssp. *vaseyana* (mountain big sagebrush), and *A. t. tridentata* (basin big sagebrush)) (Braun *et al.* 1976; Connelly *et al.* 2000; Connelly *et al.* 2004; Miller *et al.* 2011). Sage-grouse also use other sagebrush species (which can be locally important) such as *A. arbuscula* (low sagebrush), *A. nova* (black sagebrush), *A. frigida* (fringed sagebrush), and *A. cana* silver sagebrush (Schroeder *et al.* 1999; Connelly *et al.* 2004). In North Dakota and other areas of western United States, sage-grouse distribution is strongly correlated with the distribution of big sagebrush habitats (Schroeder *et al.* 2004). Many early travelers noted the grouse-sagebrush relationship. Roosevelt wrote that the bird was found "only where the tough, scraggly wild sage abounds, and it feeds for most of the year on sage leaves." Another early observer, Captain Bendire, believed the sage plant to be important to the bird but quoted other people who thought the plant important only when other more desirable foods were lacking (Johnson op. cit.).

The bird utilizes the sage plant for both food and cover. Most nests are found in this cover and over 75 percent of its annual food supply comes from the plant. In winter the grouse feeds almost entirely on sage. Young birds in the first three or four months of life feed on insects, but by their first autumn have turned to the plant for their sustenance (Johnson op. cit.). As a result of this diet Johnson also noted that late in the season the flesh of the bird takes on a "sagey tang" which is particularly noticeable in mature grouse. Many early observers believed sage-grouse to be unique because they did not have a gizzard which made their dependence on soft leafy vegetation more important. But, although the organ is relatively undeveloped compared with other game birds, it is present. Since the sage-grouse feed primarily on the herbaceous leaves of the sage plant, and does not require grit in its diet, there is no need for a highly developed gizzard.

The bird is restricted to extreme southwestern North Dakota because big sage is found only in significant acreage in that area. In 1963 a letter from the state's Dean of Botanists, Dr. O. A. Stevens of North Dakota State University stated:

> "The distribution of *Artemisia tridentata* in North Dakota has not changed materially since 1880....I still cannot map it accurately.....It seems to occupy mainly the severely eroded places or sometimes wash from such places; essentially limited to the Badlands, especially the southern part."

Sage-grouse are dependent on large areas of contiguous big sagebrush (Patterson 1952, Connelly et al. 2004a, Wisdom et al. 2011) and large-scale characteristics (e.g. agricultural conversions) within surrounding landscapes influence sage-grouse habitat selection (Knick and Hanser 2011) and population persistence (Aldridge *et al*. 2008; Wisdom *et al*. 2011). Sagebrush is the most widespread vegetation in the intermountain lowlands in the western United States (Young et al. 2000); however, big sagebrush is considered one of the most imperiled ecosystems in North America due to continued degradation and lack of protection (Knick et al. 2003).

Beck (2000) investigated impacts to sage-grouse from overgrazing by livestock on the rangelands of the western United States. In some cases it was determined that grazing was a limiting factor on sage-grouse at a localized level. Grazing on public lands was unregulated during this period with unlimited numbers

of cattle and sheep in undesignated areas the range degraded quickly. Number of livestock increased from 4,100,000 cattle and 4,800,000 sheep in 1870 to 19,600,000 cattle and 25,100,000 sheep in 1900 (Donahue 1999). It wasn't until 1934 when the Taylor Grazing Act created grazing districts on public lands and established a permit and fee system to limit numbers of livestock, and developed regulated grazing of public lands under the United States Grazing Service, which became the BLM in 1946 (Poling 1991).

Recent analysis of sage-grouse range in North Dakota suggests the loss of habitat for sage-grouse has remained somewhat static since the early 1970's (Smith et al. 2004). Smith stated:

> "Based on analysis of the current (i.e., 1999) satellite imagery, tilled ground appears to be playing a role in the abandonment of leks in North Dakota. However, when I looked at this relationship, using early satellite imagery (1972-1976) and more recent imagery (1999-2000) there was no increase in the amount of tilled ground associated with the inactive areas since the early to mid-1970's. If tilled ground is a factor in the abandonment of leks, its effects likely began previous to 1972."

Since 1980 there has been a slowdown in big sagebrush eradication attempts. Much of this is due to education and a lack of funds from private and governmental sources, plus a stepped-up interest by various conservation-minded groups for protecting all types of wildlife habitat. There is always a possibility of a renewed interest in an eradication program for big sagebrush in the future. If it should occur sage-grouse populations in those specific areas would be depleted (Johnson and Knue 1989).

POPULATION DYNAMICS

Winter Population Surveys

From 1946 through 1951, sage-grouse population surveys consisted of observers walking through big sagebrush areas and noting numbers of sage-grouse flushed. This provided a crude index of sage-grouse population numbers on an annual basis. Several large big sagebrush areas in Bowman and Slope Counties were walked annually in winter (usually February) (ND Game and Fish Department Data Files). In addition to the population data, information was recorded on big sagebrush distribution.

Spring Lek Counts

In 1951 a new census method was initiated to track population trends. Birds were located and counted while they were on their leks in March and April. A lek is defined as a traditional courtship display area attended by male sage-grouse in or adjacent to sagebrush dominated habitat. A lek is designated based on observations of two or more male sage-grouse engaged in courtship displays. A site where less than five males are observed strutting should be confirmed active for two years before meeting the definition of a lek (Connelly et al 2000, Connelly et al. 2003, 2004). Leks were located by individuals driving through the sage-grouse range and making periodic listening stops. Some leks had been located earlier incidental to other work and landowners reported some leks. Two years later, in 1953, an aircraft was used to locate leks and make spring counts. Most counts were then made by air until the 1960's when a gradual shift was made from air to ground counts. Today all counts are made from the ground while surveys (searching for leks) are made by air. Aircraft continue to be used to locate leks that have moved.

Currently there are approximately 17 leks censused each spring and numbers of male sage-grouse recorded has varied from 542 in 1958 to 31 in 2014. Over the past thirty-four years (1980 through 2014) total males counted has varied from 31 to 380. The average numbers of males per lek has varied from 32.3 in 1952 to 4.1 in 2009. Over the last thirty-four years the average number of males per lek peaked at 16.6 per ground in 2000 and was at a low in 2009 at 4.1 males. These counts serve as indicators of the size and trend (increasing or decreasing) of the overall population, data are compared on a year-to-year basis for management purposes (Table 2).

The sage-grouse range, within the boundaries determined in 1950 in North Dakota, has been searched by aircraft in its entirety twice in the last 32 years, in 1980 and again in 1999 and partially searched in 2006 and 2008 using a helicopter. Prior to 1980 not all sage-grouse leks had been located, thus trend data from 1980 to the present are more reliable. Data from the past 32 years show a significant decrease in total numbers of males, additionally a decrease in males per strutting ground and total number of active leks (Figure 3). North Dakota Game and Fish Department along with BLM personnel have always conducted the counts during the third week of April. Counts have extended into the fourth week of April when weather disrupted counts during the third week. During all annual surveys each strutting ground is censused at least twice with some being censused three times. Summing the highest number of males seen on each ground determines the "Total Males" censused for year to year (Table 2).

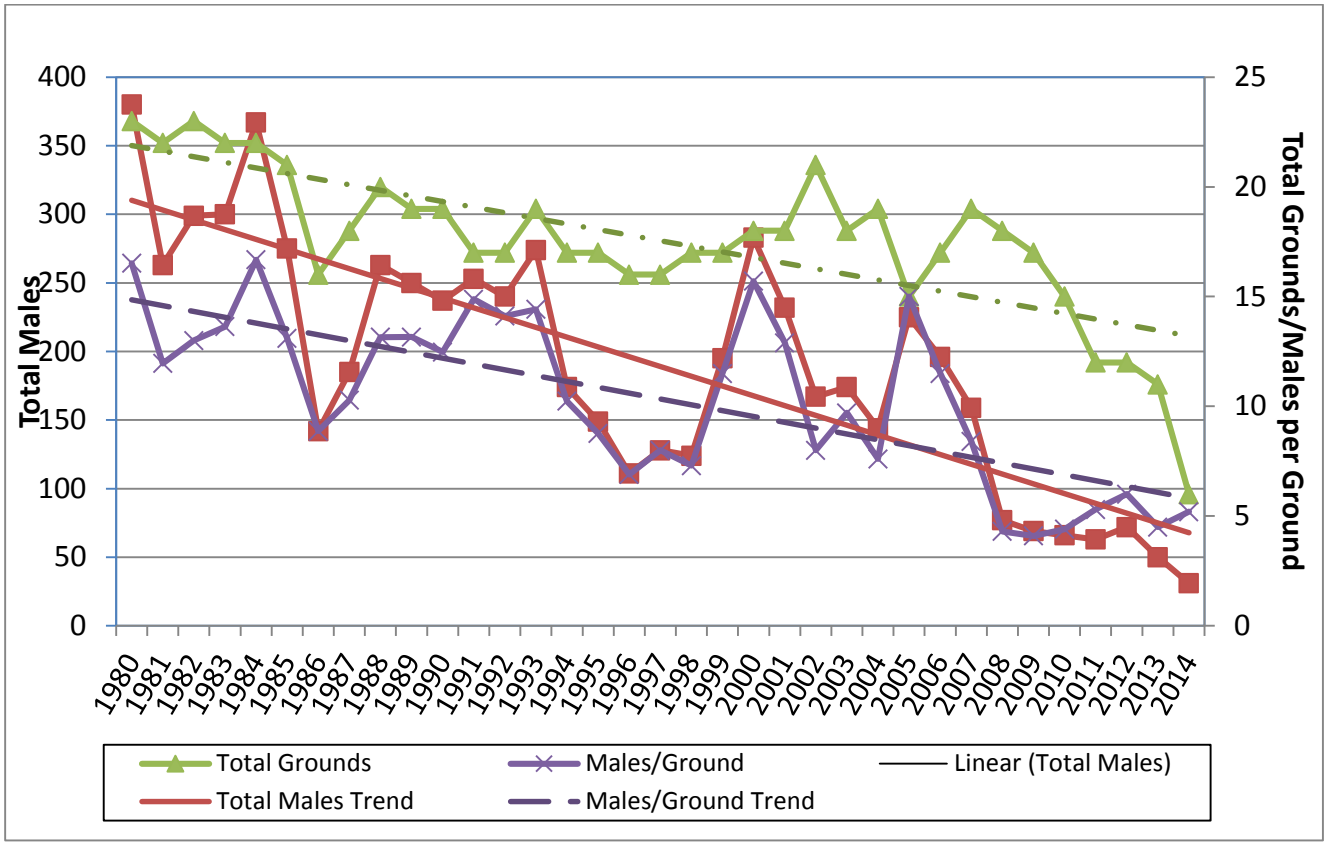
In 2008 NDGF biologist documented a significant decline in the sage-grouse population in North Dakota. The spring male count in 2007 was 159 males followed by a 50% declined to 77 males in 2008. The sage-grouse population declined steadily at a rate of around 5% a year during 2009-2011.
The decline in male grouse numbers from 2007 to 2008 was attributed to West Nile virus, which was documented in various regions in the sage-grouse range (Walker and Naugle 2011) and verified from radioed female sage-grouse in North and South Dakota (Jensen, personal communication).

Table 2. Summary of long-term sage-grouse lek surveys in North Dakota, 1951-2014.

YEAR	TOTAL MALES	TOTAL LEKS	MALES/GROUND
1951	353	11	32.1
1952	388	12	32.3
1953	542	18	30.1
1954	297	15	19.8
1955	---	---	---
1956	353	18	19.6
1957	251	18	13.9
1958	306	20	15.3
1959	332	20	16.6
1960	---	---	---
1961	255	14	18.2
1962	---	---	---
1963	302	14	21.6
1964	285	18	15.8
1965	204	21	9.7
1966	183	19	9.6
1967	240	17	14.1
1968	236	15	15.7
1969	413	15	27.5
1970	291	17	17.1
1971	277	16	17.3
1972	298	16	18.6
1973	294	17	17.3
1974	270	16	16.9
1975	169	15	11.3
1976	181	18	10.1

1977	213	16	13.3
1978	209	17	12.3
1979	131	13	10.1
1980	380	23	16.5
1981	263	22	12.0
1982	299	23	13.0
1983	300	22	13.6
1984	367	22	16.7
1985	275	21	13.1
1986	142	16	8.9
1987	185	18	10.3
1988	263	20	13.2
1989	250	19	13.2
1990	237	19	12.5
1991	253	17	14.9
1992	240	17	14.1
1993	274	19	14.4
1994	174	17	10.2
1995	149	17	8.8
1996	111	15	7.4
1997	128	15	8.5
1998	124	16	7.8
1999	195	16	12.2
2000	283	17	16.6
2001	232	16	14.5
2002	167	17	9.8
2003	174	15	11.6
2004	144	16	9.0
2005	225	15	15.0
2006	196	17	11.5
2007	159	15	10.6
2008	77	18	4.3
2009	69	17	4.1
2010	66	15	4.4
2011	63	12	5.3
2012	72	12	6
2013	50	11	4.5
2014	31	6	5.2

Figure 3. Summary of greater sage-grouse lek trends in North Dakota from 1980 - 2014.



Harvest and Harvest Surveys

During early Dakota territorial and statehood years annual sage-grouse seasons were opened concurrently with sharp-tailed grouse and prairie chickens. As might be expected, early seasons were very liberal. Until 1887 there was no limit on the number of birds that could be taken and until 1890 hunters could hunt all of Dakota Territory which included South Dakota. A limit of 25 was initiated in 1887; the season was reduced from 103 days to 73 days in 1897, and reduced further to 43 days in 1899.

Daily limits were reduced from 25 to 10 in 1909, and then to 5 in 1917. The season on sage-grouse was closed in 1923.

The sage-grouse hunting season was reopened in 1964 and except for 1979 remained open until 2007. The season in 1988, though scheduled for three days, was only open for ½ day due to an extreme fire danger situation. From the early 1960's the season was open for 3 days, always opening on Monday and closing on Wednesday with both daily and possession limits being one sage-grouse. The season traditionally opened on the Monday following the opening of the sharp-tailed grouse season; however in 2004 it opened two weeks later to try and reduce the harvest of adult females (ND Game and Fish Department Data Files). The reason for these regulations (short season, one bird limit, week-day season) is to limit hunter participation and thus harvest, while still allowing anyone the opportunity to hunt sage-grouse. This system has been in place since 1964, and has allowed the Game and Fish Department to avoid the cost and work load of conducting a lottery for a very limited number of sage-grouse permits.

Wing data have been collected annually since the season was reopened in 1964. Most wings have been collected by department personnel through contact with hunters in the field but additional wings have been collected through use of wing barrels and a wing envelope survey. From 1964 through 2002, data have been collected on 1,426 sage-grouse wings (Table 3). The small population and Department regulations to restrict harvest results in a very limited sage-grouse wing collection. Numbers of wings collected each year do not provide a large enough sample to make accurate determinations of annual age ratios, sex ratios, and numbers of young per adult hen in either the fall bag or the fall population. The sample of immature wings collected from 1964 through 2002 that could be aged is 701. From these wings a mean hatch date of June 8 was calculated (Table 4).

Table 3. Composition of age and sex classes for sage-grouse, North Dakota 1964-2004.

Year	Adult Males	Adult Females	Immature Males	Immature Females	Total Birds	Age Ratio	Young/ Adult Hen
1964	16 (62%)	4 (15%)	3 (12%)	3 (12%)	26	0.30	1.50
1965	6 (32%)	6 (32%)	3 (16%)	4 (21%)	19	0.58	1.17
1966	2 (6%)	5 (15%)	14 (43%)	12 (36%)	33	3.71	5.20
1967	12 (20%)	20 (33%	11 (18%)	17 (28%)	60	0.88	1.40
1968	13 (21%)	11 (18%)	19 (31%)	18 (30%)	61	1.54	3.36
1969	15 (23%)	22 (34%)	11 (17%)	16 (25%)	64	0.73	1.23
1970	11 (16%)	18 (27%)	28 (42%)	10 (15%)	67	1.31	2.11
1971	20 (26%)	13 (17%)	20 (26%)	24 (31%)	77	1.33	3.38
1972	20 (17%)	28 (24%)	37 (32%)	31 (27%)	116	1.42	2.43
1973	6 (9%)	27 (41%)	14 (21%)	19 (29%)	66	1.00	1.22
1974	5 (8%)	19 (32%)	10 (17%)	26 (43%)	60	1.50	1.89
1975	21(32%)	17 (26%)	14 (21%)	14 (21%)	66	0.74	1.65
1976	4 (10%)	12 (31%)	13 (33%)	10 (26%)	39	1.44	1.92
1977	13 (62%)	3 (14%)	2 (10%)	3 (14%)	21	0.31	1.67
1978	2 (4%)	19 (41%)	15 (33%)	10 (22%)	46	1.19	1.32
1979			No season				
1980	5 (24%)	15 (71%)	1 (5%)	0	21	0.05	.07
1981	4 (13%)	6 (20%)	13 (43%)	7 (23%)	30	2.00	3.33
1982	5 (12%)	18 (42%)	9 (21%)	11 (26%)	43	0.87	1.11
1983	6 (9%)	20 (28%)	20 (28%)	25 (35%)	71	1.73	2.25
1984	11(22%)	15 (31%)	11 (22%)	12 (25%)	49	0.88	1.53
1985	1 (17%)	1 (17%)	2 (33%)	2 (33%)	6	2.00	4.00
1986	4 (12%)	7 (21%)	10 (30%)	12 (36%)	33	2.00	3.14
1987	3 (17%)	6 (33%)	4 (22%)	5 (28%)	18	1.00	1.50
1988			No wings collected				
1989	6 (22%)	11 (41%)	6 (22%)	4 (15%)	27	0.59	.91
1990	0 (0%)	3 (23%)	2 (15%)	8 (62%)	13	3.33	3.33
1991	5 (31%)	3 (19%)	7 (44%)	1 (6%)	16	1.00	2.67
1992	7 (32%)	7 (32%)	7 (32%)	1 (4%)	22	0.57	1.14
1993	5 (36%)	5 (36%)	2 (14%)	2 (14%)	14	0.40	.80
1994	3 (38%)	2 (25%)	1 (12%)	2 (25%)	8	0.60	1.50
1995	3 (20%)	4 (27%)	6 (40%)	2 (13%)	15	1.14	2.00
1996	3 (11%)	7 (26%)	8 (30%)	9 (33%)	27	1.70	2.43
1997	3 (13%)	6(25%)	6 (25%)	9 (37%)	24	1.67	2.50
1998	4 (14%)	8 (28%)	9 (31%)	8 (28%)	29	1.42	2.13
1999	2 (8%)	8 (32%)	8 (32%)	7 (28%)	25	1.50	1.88
2000	4 (7%)	23 (41%)	14 (25%)	15 (27%)	56	1.07	1.26
2001	2 (10%)	14 (70%)	2 (10%)	2 (10%)	20	0.25	.29
2002	1 (3%)	17 (57%)	6 (20%)	6 (20%)	30	0.67	.71
2003	0 (0%)	3 (38%)	2 (25%)	3 (38%)	8	1.67	1.67
2004	3 (43%)	1 (14%)	2 (29%)	1 (14%)	7	0.75	3.00
Totals	256(18%)	434(30%)	372(26%)	371(26%)	1,433	1.08	1.71

To measure hunter success, post cards are mailed and/or handed out to known sage-grouse hunters prior to the hunting season and are also handed out to all hunters contacted in the field. The post cards request data pertaining to days hunted, area hunted, and success for the entire season (Table 5). While this survey works for measuring hunter success (birds/hunter, days/hunter, and county of harvest), it cannot be used to determine the total number of sage-grouse hunters. To make that determination, a small game hunter questionnaire is mailed to a sample of both resident and non-resident hunters each fall following close of the hunting season. This questionnaire is used to determine total harvest and hunter participation for a number of waterfowl and upland game species, including sage-grouse.

Here again, small numbers of hunters, and few questionnaires from sage-grouse hunters, mean large confidence intervals for number of hunters and total harvest. Estimates over the last seventeen years indicate averages of 73 hunters per year and 24 sage-grouse harvested per year which is a hunter success of about 32%. The harvest is less than 4% of the estimated fall population which falls well below the 10% maximum suggested by Connelly et al. (2000).

In 2008 the NDGF closed the sage-grouse season because the population fell below the minimum 100 male threshold established in the "Management Plan and Conservation Strategies for Greater Sage-grouse in North Dakota." (McCarthy and Kobriger 2005). The season has remained closed since 2008.

Table 4. The distribution of estimated hatching dates for immature sage-grouse shot during hunting seasons in North Dakota, 1964-2004.

	1964-2004	
Weekly Period	**Birds**	**%**
2. May 8-14	1	.1
3. May 15-21	12	1.7
4. May 22-28	59	8.2
5. May 29-June 4	145	20.2
6. June 5-11	165	22.9
7. June 12-18	160	22.3
8. June 19-25	90	12.5
9. June 26-July 2	58	8.1
10. July 3-9	21	2.9
11. July 10-16	8	1.1
Total	719	100.0
Mean	6.47	
Mean Hatch Data	June 8	

Table 5. Sage-grouse hunting statistics collected during sage-grouse seasons in North Dakota, 1991-2007, *postcard surveys only*.

	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07
# Hunting Parties	26	32	34	41	40	47	57	69	59	61	61	53	74	30	22	26	19
# Hunters	47	46	48	46	50	66	92	96	103	108	112	84	122	43	54	49	84
#Hunter Days	62	66	86	93	94	108	149	178	174	168	181	143	215	67	25	26	36
Hours Hunted/Hunter Day	5.4	4.8	5.0	4.8	5.2	5.5	5.8	6.3	6.2	5.2	6.2	5.7	7.1	6.6	6.0	7.1	2.5
Sage-grouse Harvested	18	32	13	12	13	36	33	33	29	58	30	22	15	12	20	9	21
Sage-grouse/ Hunter	.38	.70	.27	.26	.26	.55	.36	.34	.28	.54	.27	.26	.12	.28	.37	.18	.25

Sage Grouse Research in North Dakota

Prior to 2001, no research had been done on sage-grouse in North Dakota. Smith (2004) compared peripheral microhabitat and landscape characteristics to identify possible reason for lek abandonment. He found that big sagebrush density has a positive effect on greater sage-grouse lek size and that land use changes such as tilled ground was greater within abandoned areas with active areas in North Dakota. Herman-Brunson (2007) studied the reproductive ecology of sage-grouse from 2005-2006. Swanson (2009) studied the survival, movements, and winter habitat use of sage-grouse in North and South Dakota. Details about the results of the above studies are included throughout this report.

Reproduction

Due to a limited population in North Dakota, few broods are reported each year, and in some years, no broods are reported. The population simply does not lend itself to any type of brood survey with the exception of reporting incidental brood observations. Not enough of these are recorded in any one year to be statistically meaningful.

Other states with large populations and large wing samples can ascertain reproduction through examination of age ratios from the wing sample. North Dakota wing samples are too small to make these determinations with an average of less than 40 wings per year. Exceptional years, as 1980, when the sample of 21 wings included only one immature (Table 2) can indicate little or no reproduction.

Herman-Brunson (2007) studied nesting and brood-rearing habitat selection of sage-grouse and associated survival of hens and broods in North Dakota. Overall nest initiation was 92% for adults and yearlings during 2005 -2006. Nest survival averaged 31% from 34 female sage-grouse nests (21 in 2005, 18 in 2006). Models that contained percent grass cover and grass height from Robel pole readings has substantial support to explain nest survival. The average hen survival for the two year study was 72% from capture date through the brood-rearing season. Average distance from nest to the lek where the hen was captured was 4.94 km and average distance from nest to the nearest lek was 2.66 km.

Mortality

Juvenile Mortality – Juvenile mortality during the first few weeks after hatching is typically high, and nearly 40 percent of the young hatched in a given year die by early September (Wallestad and Eng 1975). Herman-Brunson (2007) found that the greatest period of chick mortality occurred from hatch to 3 weeks of age. Canid predation was the largest direct cause of mortality on chicks though determining cause of mortality is difficult do to scavenging. Juvenile mortality rates can increase when drought reduces availability of insects and forbs for food, and important escape cover (herbaceous understory) is limited by poor growing conditions which can be exacerbated by grazing.

Over a 10-year period, Wallestad and Watts (1973) documented an average mortality rate of 56 percent in central Montana from the egg-laying period in April to the opening of the upland bird season in September. This included an average nest mortality of 30 percent and an average juvenile mortality of 37 percent by September 1. The authors assumed a juvenile mortality rate from September 1 to April 1 (fall-winter) was equal to that of yearling hens (65 percent). This would yield an annual juvenile mortality rate of 85 percent.

Adult Mortality – Survival rates for adult sage-grouse are generally considered to be high. Swanson (2009) indicated that adult and juvenile annual survival was (34% to 73%), except during the late-brood rearing season 16 July – 31 October were survival was (< 50 %). The following, taken from the Range-wide Conservation Assessment for Greater Sage-grouse and Sagebrush Habitats (Connelly et al. 2004) illustrates this point:

> Zablan (2003) estimated survival for 6,021 banded sage-grouse in Colorado using bands recovered from hunters. They estimated survival to be 59.2% (95% CI, 57.1 – 61.3%) for adult females, 77.7% (95% CI, 71.8 – 75.3%) for yearling females, 36.8% (95% CI, 35.4 – 44.8%) for adult males, and 63.5% (95% CI, 56.9 – 64.6%) for yearling males. They recovered 1 female = 9 years old, 3 females = 8 years old, and 3 males = 7 years old. Females had higher survival than males and adults had lower survival than yearlings. Wittenberger (1978) and Bergerud (1988) suggested that yearling males remain inconspicuous during their first year and thus have a better chance of surviving to adulthood. Male survival was estimated to be 59% in Wyoming (June 1963), 58-60% in Idaho (Connelly et al. 1993, Wik 2002), and 29.6% in Utah (Bunnell 2000). In contrast, female survival was estimated to be 67-78% in Wyoming (June 1963, Holloran 1999), 48-75% in Idaho (Connelly et al. 1993, Wik 2002), 57% in Alberta (Aldridge and Brigham 2001), 60.6% in Colorado (Hausleitner 2003) and 36.8% in Utah (Bunnell 2000).

In contrast, pheasant populations usually have turnover rates that may approach more than 80% annually. Pheasant hen mortality rates greater than 80% have been recorded as a result of severe climatic conditions, predation, and other factors (Dumke and Pils 1973, Warner and David 1982, Perkins et al. 1997).

Predation – Both avian and mammalian predators take sage-grouse. Bull snakes are also considered an effective nest predator in some areas (Montana Sage-grouse Work Group 2004). Predators destroyed 13 percent of known nests on the Yellow Water Triangle in Montana (Wallestad and Pyrah 1974). Nest predators included coyotes (*Canis latrans*), badgers (*Taxidea taxis*), and magpies (*Pica pica*). In the same study, nearly 40 percent of juvenile sage-grouse succumbed to some form of mortality between hatching and early fall, although the proportion attributable to predation was unknown. Golden eagles (*Aquila chrysaetos*) and hawks, including the marsh (*Circus cyaneus*), Swainson's (*Buteo swainsoni*), red-tailed (*B. jamaicensis*), and rough-legged (*B. lagopus*) posed the most probable threat to young birds (Wallestad 1975).

Adult hens are most vulnerable to predation during the nesting period, and low quality nesting cover increases the risk of predation. Adult males are most vulnerable during the spring breeding season while associated with the leks (Wallestad op. cit.). Habitat alterations in the vicinity of leks, especially the construction of power poles or other perch sites for raptors, can affect male survival. Increased perch sites can also affect habitat security in brood rearing and wintering areas. Fragmented habitat may increase predation pressure on adult sage-grouse by forcing birds into more marginal areas for foraging, travel, or roosting. (Connelly et al. 2000)

Dynamics of many predator populations are determined largely by abundance of their primary prey species, which are usually rodents or rabbits rather than grouse (Angelstam 1986, Bump et al. 1947, Fedy and Doherty 2011, Myrberget 1988). Environmental conditions that influence changes in primary prey populations, e.g. rodent populations decline as a result of drought, can affect changes in foraging strategies of both mammalian and avian predators, thereby increasing encounters with grouse or grouse nests.

Disease and Parasites – Sage-grouse are highly susceptible to West Nile virus (WNv). During late summer 2003 WNv was detected for the first time in sage-grouse in Montana, Wyoming and Alberta (Naugle et al. 2004). Swanson (2009) confirmed west Nile virus in 7% (n = 10) of known mortalities in North and South Dakota. The average date of confirmed West Nile virus death was August 21. Mosquitoes (especially *Culex tarsalis*) are thought to be the principal vectors of the disease and migratory birds appear to be the major introductory host. The presence of a large sample of radio-marked sage-grouse on several research study sites provided an opportunity to detect eight mortalities in Wyoming, four in Montana and five in southeastern Alberta (Walker et al. 2004). Future monitoring will be necessary to document the impact on population trends and the role of the virus in terms of observed mortality rates in subsequent years.

Simon (1940) described parasites commonly found in sage-grouse in Wyoming. The incidence and infestation of all parasites except the protozoan *Tritrichomonas* was higher in young birds than in adults. Most sage-grouse were infected with tapeworms but exhibited no serious ill effects. He found two species of coccidia that infect sage-grouse, *Eimeria angust* and *E. centrocerci.* Outbreaks of coccidiosis may locally decimate populations of sage-grouse.

SECTION II: POPULATION AND HABITAT OBJECTIVES

POPULATION OBJECTIVES:

Population objectives for sage-grouse in North Dakota are twofold. The first deals with distribution of the population across their range in the State and the second with density or numbers of males surveyed on lek during the annual spring census.

Distribution

There has been meager prehistoric or historic evidence (see Section I) published to suggest that sage-grouse were ever present in North Dakota beyond their present range (Johnson and Knue 1989).

In 1950, active sage-grouse leks were found over approximately 800 square miles in North Dakota (Bowman, Slope, and Golden Valley Counties). In early years, there was no attempt to locate all sage-

grouse lek but efforts concentrated east of the Little Missouri River. It is believed that there were probably none, or very few lek east of those leks located during the early years (1951-1955). As census efforts were intensified, more leks were located in the interior and western edges of the sage-grouse range, but leks along the eastern fringe began to disappear. The distribution of active sage-grouse leks currently covers approximately 398 square miles of range. This is about a 40% reduction from a 644 square mile area where leks have been found historically (Figure 4). Big sagebrush habitat has not been totally eliminated in the abandoned area, but has been degraded and fragmented to a level that may be unsuitable for sage-grouse.

Distribution Objectives:

(1) Maintain the current distribution, and stop the shrinkage of the sage-grouse range and distribution; (2) Develop and improve habitat conditions in the former range by restoring sage brush and providing connectivity to those sagebrush areas still remaining. Programs to accomplish these goals can be found in Section V.

Numbers

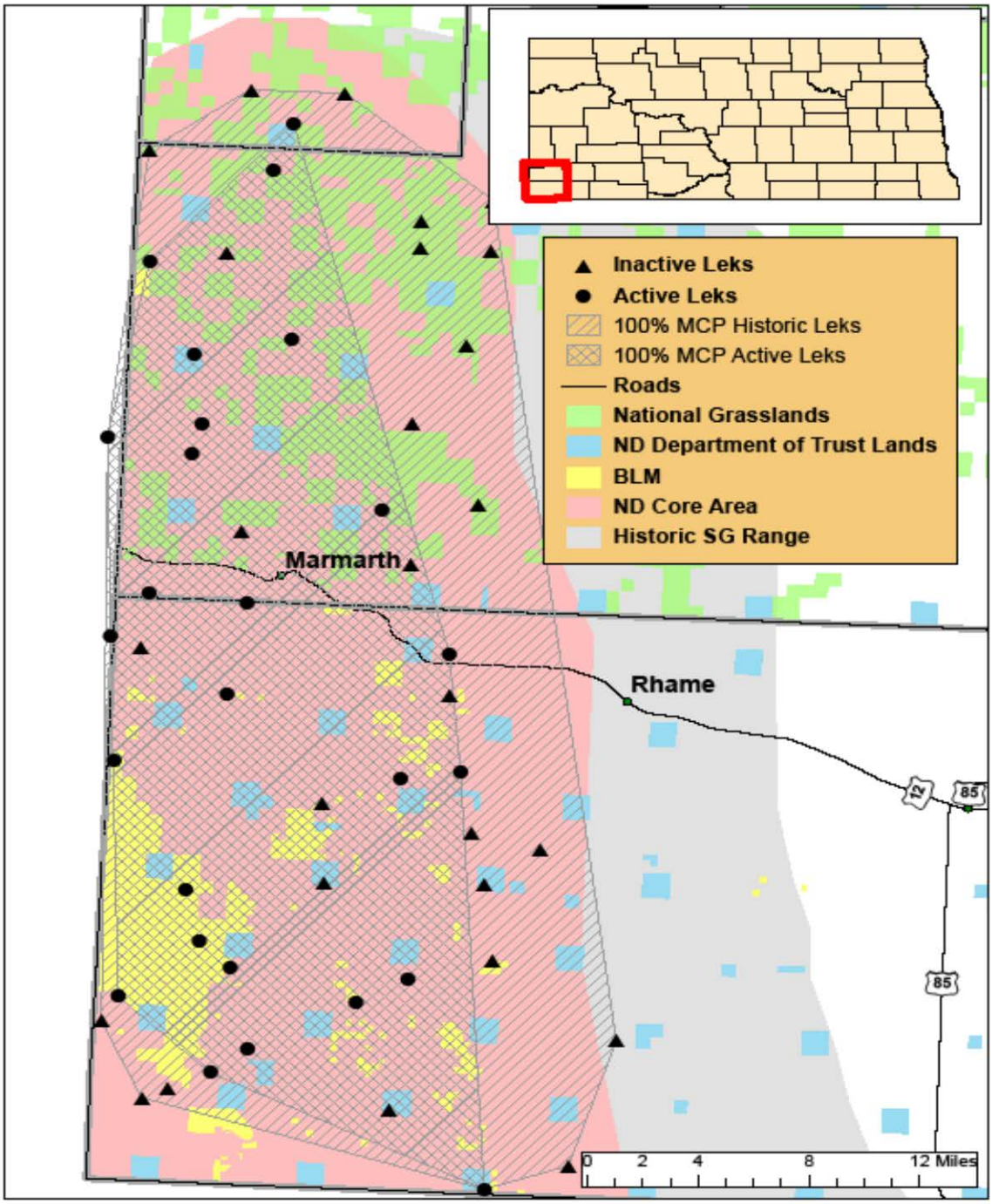
Early counts of sage-grouse that were made during winter were total numbers of birds. As the census evolved to a strutting ground count, males were differentiated from females and counts were compared annually using just the number of males. The number of active lek has varied from a high of 23 in both 1980 and 1982 to a low of 6 in 2014. Recently the total number of leks where males were actively strutting was 12 in 2011 and 2012. The total number of strutting ground locations, including active, inactive, and historical is 52. From 1951 through 1979, no effort was made to locate all leks in North Dakota. The first aerial survey was made in 1980 and seven new locations were found with strutting sage-grouse, but none were found outside the existing sage grouse range. During early years (early 1950's) all the leks located were large leks (ten or more males). Many leks during recent years have fewer than ten males and while there were undoubtedly some of those leks present in the 1950's, none were censused.

In the 2005 Management Plan and Conservation Strategies for Greater Sage-grouse in North Dakota (McCarthy and Kobriger 2005) the population objective for the number of male sage-grouse counted in the spring was 250. This goal was last reached in 2000, and the average number of males counted has steadily decreased over the past 30 years. The average number of males counted the past 10 years has been 128, when looking back 20 years that number increases to 158 average males counted and over the last 30 years there has been an average of 190 males.

Numbers Objective:

The numbers objective will initially remain at 250 males surveyed during the spring census. This is the target goal but due to the fragmented habitat it may be an unrealistic goal. The following must occur to achieve 250 males: (1) habitat improvement in the current sage-grouse range to increase nesting habitat and juvenile recruitment targeted at maintaining the Priority Conservation Areas (Figure 8). By improving habitat conditions at both the local scale and landscape scale, the number of leks may increase and the number of males per ground may also increase; (2) increasing connectivity between available habitats between PCA will help establish leks in the historical sage-grouse range; 3) protect current PCA's that have not been fragmented.

Figure 4. Distribution of active and inactive sage-grouse leks in SW North Dakota. Leks were considered active if ≥ 2 males were actively displaying 2 of the previous 5 years.



Habitat Objectives

Examining landscape patterns of sagebrush, e.g., distribution of patches, patch size and connectivity, helps us understand ecosystem processes, disturbance regimes, and current versus historical conditions. Combining information about landscape patterns with data about the structure, composition, and ecological condition of sagebrush communities gives us the ability to assess whether conditions are favorable to sage-grouse and other sagebrush-dependent species (Figure 6). Sage-grouse habitats that are identified as healthy enough to support stable or increasing populations would carry a priority for maintenance. Recent efforts to reclassify sagebrush cover using improved remote sensing technology and training data offer a tool to assess habitat quality (Figure 6).

Within this context, habitat objectives for sage-grouse in North Dakota are:

1) A big sagebrush shrub cover capable of supporting the life history requirements of sage-grouse should be present across the range of the species. This should include a variety of big sagebrush patch sizes that emphasize areas with a central core of habitat in large contiguous blocks. Patches of habitat should be well dispersed throughout the range. Patches may be configured in blocks, islands, corridors, and mosaic patterns, but they should be arranged such that connectivity is maintained. Sage-grouse are considered a landscape species, but conclusive data are unavailable on minimum patch sizes of sagebrush necessary to support viable populations of sage-grouse.

2) The shrub cover should include a mix of height classes with an herbaceous understory adequate for meeting seasonal habitat requirements of sage-grouse.

    a) In habitats consisting of predominately silver sagebrush (*A. cana*) manage ecological sites with the potential to support this species of sagebrush in a manner that maintains at least 50 percent of those areas in canopy cover of >0 to 25 percent.
    b) In habitats that include predominately Wyoming big sagebrush, manage ecological sites with potential to maintain sagebrush over at least 60 percent of those areas in a canopy cover of 5 to >25 percent.

3) Maintain an herbaceous understory emphasizing multiple species of native forbs and grasses.

4) Emphasize restoration and rehabilitation of sagebrush in areas with ecological sites capable of supporting big sagebrush and contribute to the distribution and connectivity of patches. As an example sagebrush patches used by broods averaged 86 ha in early summer (June and July) in central Montana but diminished to 52 ha later in the summer(August and September; Wallestad 1971). However, brood use areas are relatively small compared to areas used on a year-round basis and thus only partially representative of the broader landscape needs of the species during the year.

At more localized scales the desired condition relies on ecological site potential, ability of the site to meet seasonal needs of sage-grouse, and/or other available information. Measurements of shrub and herbaceous cover are often required to determine if the desired condition is being met and/or maintained.

Wildlife objectives for sagebrush communities will be determined based on: 1) local knowledge about current habitat use; 2) potential to support a variety of species including sage-grouse; 3) existing native shrub cover patterns and sagebrush-associated characteristics; 4) existing herbaceous cover and condition; 5) frequency and reasonably foreseeable likelihood of disturbance, e.g. oil and gas

development; 6) locations of seeding's or condition of shrub cover on adjacent areas; and 7) importance of the area to seasonal needs of sage-grouse.

The following should be considered in setting management objectives at the local level.

1) Based on local knowledge about current habitat use by sage-grouse, the vegetation characteristics and desired condition of the area may vary depending on the seasonal use by sage-grouse, other wildlife species, and/or other resource values, e.g. livestock grazing.

2) Emphasize restoration and rehabilitation of sagebrush communities in areas that are capable of supporting big sagebrush and contribute to the distribution and condition of habitat for seasonal uses. For example, crucial winter habitats, which typically are a fraction of the sagebrush available on wintering areas, carry a high priority for maintenance or restoration.

3) Modify activities and management actions on public land and/or private land under federal or state-funded programs to reduce or minimize habitat loss if such actions would degrade or fragment sage-grouse habitat (see Section V).

Desired Conditions for Sage-Grouse Habitats

Based on studies done in North Dakota and other western states the following are presented as the range of desired conditions that are currently believed to be most suitable for sage-grouse habitats. Research conducted in North Dakota is presented as the available habitat condition.

Breeding Habitat

Nesting cover and food availability are key components of breeding habitat suitability. Generally, sagebrush stands with a robust understory of grasses and forbs provide excellent sage-grouse habitat.

Table 6. Nesting and early brood-rearing habitat features.

Habitat Feature	Indicator	Sage-grouse Nest Site Selection in North Dakota[2]	Range-wide Suitable Habitat	Range-wide Marginal Habitat	Range-wide Unsuitable Habitat
Nesting Cover	Big sagebrush canopy foliar cover	**≥ 8%**	≥ 15% but ≤ 25%	10-14% or 26-35%	<10% or >35%
Nesting Cover	Big sagebrush height	**15.85 inches**	12-30 inches	10-14 inches or 31-40 inches	<10 inches or > 40 inches
Nesting Cover	Big sagebrush growth form	**Spreading form, few if any dead branches**	Spreading form, few if any dead branches	Mix of spreading and columnar growth forms present	Tall, columnar growth form with dead branches
Nesting Cover	Herbaceous perennial grass and forb height	**≥ 6.3 inches**	≥ 7 inches	5 - <7 inches	< 5 inches

Nesting Cover & Food	Perennial grass foliar canopy cover	**≥ 27%**	≥ 15%	5 - 14%	<5%
Nesting Cover & Food	Forb foliar canopy cover	**≥ 15%**	≥ 10%	5 - <10%	<5%
Food	Forb richness[1]	**High**	High	Low	Very low

[1]Relative to ecological site descriptions.
[2]Data collected in 2005 – 2006 on radio marked sage-grouse (Herman-Brunson 2007).

Late Brood-Rearing Habitat

Food availability (forbs) in proximity to good escape cover is an important habitat feature of sage-grouse brood-rearing areas. Healthy riparian, wet meadow and upland plant communities are important as these areas provide brood-rearing habitat. Abundance, diversity, and availability of forbs are crucial. Agricultural fields with good escape cover nearby can provide important sage-grouse brood-rearing habitat (Connelly et al. 2000). In these cases, sagebrush cover on adjacent lands will be an important habitat component.

Table 7. Late brood-rearing habitat features.

Habitat Feature	Indicator	Suitable Habitat	Marginal	Unsuitable Habitat
Food	Riparian and wet meadow plant community	Mesic or wetland plant species dominate wet meadow or riparian area	Xeric plant species invading wet meadow or riparian area	Xeric plant species along water's edge or near center of wet meadow
Cover and Food	Riparian and wet meadow stability	No erosion evident; some bare ground may be evident but vegetative cover dominates the site	Minor erosion occurring and bare ground may be evident but vegetative cover dominates the site	Major erosion evident; large patches of bare ground
Food	Forb availability in uplands and wetland areas	Succulent forbs are readily available in terms of distribution and plant structure	Succulent forbs are available through distribution is spotty or plant structure limits effective use	Succulent forbs are not available due to site condition or plant structure
Cover	Proximity of sagebrush cover	Sagebrush cover is adjacent (< 100 yards) to brood-rearing area	Sagebrush cover is in close proximity (100 - 300 yards) of brood-rearing areas	Sagebrush cover is unavailable (> 300 yards).

Table 8. Vegetation characteristics for brood sites used by sage-grouse hens in southwestern North Dakota from 2005 – 2006. Percentages are derived from 130 different brood locations of radio marked sage-grouse (Herman-Brunson 2007).

Vegetative Cover (%)	74
Grass Cover (%)	29-34
Forb Cover (%)	6-16
Sagebrush (Artemisia spp.) (%)	5
Bare ground Cover (%)	17
Site-VOR (in)	3
Sagebrush Density (acre)	930
Sage (%)	5
Vegetation height/site (in)	12

Winter Habitat

Sagebrush cover and availability are the most important habitat indicators for food and cover needs of sage-grouse during winter.

Table 9. Winter habitat features.

Habitat Feature	Indicator	Sage-grouse Winter Site Selection in North Dakota[1]	Suitable Habitat	Marginal Habitat	Unsuitable Habitat
Cover and Food	Sagebrush canopy cover	**15%**	10-30%	5- 9%	< 5%
Cover and Food	Sagebrush height	**7.9 inches**	Normal height relative to site potential	Hedged shrubs, slightly shorter relative to site potential	Severely hedged shrubs and short relative to site potential

[1]Data collected in 2005 – 2007 on radio marked sage-grouse (Swanson 2009).

SECTION III: THREATS TO SAGE-GROUSE

Sage-grouse in North Dakota are faced with threats that are common across the range of the species in the western United States. The following section describes activities that are believed to pose the most serious threats to long term viability of sage-grouse within their current range. Prioritization of the severity of the current threats facing North Dakota's sage-grouse population is outlined in section IV. It is important to note that the following discussion is meant to analyze threats that are present on the landscape and is not intended to assign culpability or responsibility to any individual, entity or industry. The North Dakota Game and Fish Department acknowledges the existing rights of landowners and pre-existing mineral leases held in trust by private entities. The intention of this discussion is to identify the most serious threats to the species and to promote actions that will help ameliorate these threats. Specific issues associated with these threats in North Dakota, as well as mitigation measures to help address them, are discussed in Section IV.

Loss of Habitat Effectiveness

Sage-steppe habitats are decreasing and being degraded at an alarming rate across the Western United States. Fragmentation and loss of sagebrush landscapes is a primary cause of the decline of sage-grouse

populations (Patterson 1952; Connelly and Braun 1997; Braun 1998; Johnson and Braun 1999; Connelly *et al*. 2000). Human activities resulting in fragmentation of sage-grouse habitat will lead to reductions in lek persistence, lek attendance, population recruitment, yearling and adult annual survival, female nest site selection, nest initiation, and complete loss of leks and winter habitat (Holloran 2005; Aldridge and Boyce 2007; Walker *et al.* 2007; Doherty *et al*. 2008). Indirect habitat loss and fragmentation will also occur resulting in sage-grouse avoidance of areas due to human activities, including noise, even though sagebrush remains intact (Blickley *et al*. 2012). In an analysis of population connectivity, Knick and Hanser (2011) demonstrated that in some areas of sage-grouse range, populations are already isolated and at risk for extirpation due to genetic, demographic, and stochastic (i.e., unpredictable) events such as lightning caused wildfire. Habitat loss and fragmentation contribute to the population's isolation and increased risk of extirpation.

Habitat can be lost to the species through a number of activities. The extent (acres) and spatial locations relative to seasonal habits of such losses and duration of time before sagebrush returns to the landscape are two of the factors that must be considered when mitigating for such activities. When large, long term losses of sagebrush-grasslands occur due to any circumstance, proximity of remaining habitat becomes much more important to long term viability of sage-grouse populations. Activities and rangeland treatments at levels that reduce the base acreage or effectiveness of those remaining acres of sage-steppe become much more significant to the viability of local sage-grouse populations (Braun 1998, Schroeder et al. 2000).

Energy Development and Infrastructure

Sage-grouse populations have minimal tolerance of energy development resulting in significant reductions and localized extirpation (Walker et al. 2007). Oil and gas development structures, roads, pipelines, storage facilities, mines, electrical generation facilities (wind turbines), transmission lines and other infrastructure associated with industry can decrease the available habitat base and/or effectiveness of habitat (Braun et al. 2002, Doherty et al. 2008, Holloran 2005, Lyon and Anderson 2003). Both transmission lines and fences provide perches for raptors and have been found to increase the risk of collision mortalities (Aldridge 1998, Borell 1939, Stevens et al. 2012). The overall effect of structures such as fences can have negative impacts on a population; additionally sage-grouse use of an area has been shown to increase with distance from power lines (Braun 1998).

Roads related to oil and gas development have been associated with a reduction in nesting success, increased disturbance to grouse on leks and during brood rearing (Braun 1998). In Wyoming, sage-grouse hens with successful nests were found to locate their nests further from roads in oil and gas fields than unsuccessful hens (Lyon and Anderson 2003). In the interior Columbia Basin, increased road density has been found to be related to increased human population, loss of habitat, increased agriculture and increases in invasive plant species (Wisdom et al. 2002).

Conversion of Habitat and Rangeland Alterations

Sage-grouse are dependent on large areas of contiguous sagebrush (Patterson 1952; Connelly *et al.* 2004; Connelly *et al.* 2011; Wisdom *et al.* 2011) and large scale alterations of habitat including sagebrush conversion, livestock grazing regimes, and agricultural practices in the surrounding landscapes influence sage-grouse habitat selection (Knick and Hanser 2011) and population persistence (Aldridge *et al*. 2008; Wisdom *et al*. 2011). Sagebrush is considered one of the most imperiled

ecosystems in North America due to continued degradation and lack of protection (Knick *et al.* 2003; Miller *et al.* 2011).

Plowing generally results in long term loss of habitat as big sagebrush will not recover under continuous cropping. Plowing often takes place on areas having deep soils and little topographical relief, which are also areas favored as wintering sites for sage-grouse. Losses of winter ranges, which usually make up a small portion of yearlong ranges, have been shown to result in long term losses of populations (Doherty et al. 2008, Swenson et al. 1987).

Mechanical and chemical treatments have been used in the past to remove large blocks of sagebrush in some western states. These two types of treatments have been used on smaller sites where control, removal or enhancement of sagebrush has been determined to be in the best interest of the sagebrush community. Current research has indicated only modest positive impacts and in most cases the benefit is minimal (Dahlgren et al. 2006).

Burning and spraying of sagebrush has been shown to reduce or alter both the understory and canopy cover of treated communities (Connelly et al. 2000, Wambolt et al. 2002). Effects of fire as a treatment vary with the species of sagebrush and size of areas being treated. Sagebrush species that regenerate from seed such as Wyoming big sagebrush can take more than 30 years to recover from a fire (Welch 2005) and can be eliminated if the site treated is too large. Species that re-sprout from crowns and roots, e.g., silver sagebrush, three-tip sagebrush (*A. tripartita*) and some forms of mountain big sagebrush, can re-establish if the fire intensity is not too high.

Timing and scale of herbicide application reduces sagebrush and/or the forb component and could reduce production and survival of grouse through reduced nutritional levels and increased predation. Indirect effects of persistent application of herbicides are an alteration of the composition and diversity of plant species and may be significant enough to affect availability and quality of the insect component. Any significant loss of a food source critical to early survival of chicks also may have a long-term effect on populations (Potts 1986). Available literature on effects of herbicide application on sage-grouse is almost entirely limited to effects of sagebrush reduction or removal.

Grazing

Livestock grazing is the most widespread land use across the sage-rouse range. Less than 2% of the sagebrush-steppe in the Intermountain West I remain ungrazed (Noss et al, 1995). Sagebrush communities often provide quality grazing opportunities for a variety of wildlife and livestock. Native vegetation associated with sagebrush-grasslands in North Dakota did evolve with grazing by a number of herbivorous species. However grazing does have the ability to alter composition, productivity, and structure of any vegetative community. Thus timing, duration and intensity of grazing can and does influence effectiveness of the sagebrush community for sage-grouse. Grazing directly affects plants within sagebrush-grassland habitats and can alter soil and microclimate within the plant community (Yates et al. 2000). Similar rates of grazing can have different effects on sage-grouse depending on whether it occurs on nesting, brood rearing or winter ranges.

Beck and Mitchell (2000) identified both positive and negative direct effects of livestock grazing on sage-grouse habitat. Grazing systems can improve both quantity and quality of summer forage, i.e., forbs, for sage-grouse. Heavy to severe grazing reduces habitat quality, which may lead to increased nest

predation or nest desertion, and may pre-empt use of a site by grouse altogether. Residual grass cover following grazing is essential to maintaining quality of nesting habitat.

Noxious Weeds and Invasive Plants

Noxious weeds and the spread of non-native plant species have become widespread across the range of sage-grouse over the last 50 years. Infestations of some invasive species as club moss (*Selaginella densa*, cheatgrass (*Bromus tectorum*), and bluegrass *Poa sp.*) has resulted in reduced densities of native species within sagebrush-grasslands of North Dakota (NRCS file data). The extent to which these undesirable species have affected sage-grouse in North Dakota is unknown but Great Basin states have documented the loss of millions of acres of sagebrush to cheatgrass and subsequent fires. In North Dakota noxious weeds are those that are difficult to control, easily spread, and injurious to public health, crops, livestock, land and other property. Chapter 63.01.1-01 of the North Dakota Century Code states: It shall be the duty of every person in charge of or in possession of land in this state, whether as a landowner, lessee, renter or tenant, under statutory authority or otherwise, to eradicate or to control the spread of noxious weeks on those lands (Anonymous 1998). Noxious weeds currently posing problems in the sage-grouse range in North Dakota are leafy spurge (*Euphorbia esula)*, Canada thistle *(Cirsium arvense*), and in certain instances, field bindweed (*Convolvulus arvensis*), Rocky Mountain juniper (*Juniperus scopulorum*). A recent invader that needs close monitoring and control is salt cedar (*Tamarix* spp.). Introduction and spread of invasive species occurs through several means, the most common being along transportation routes and waterways. Disturbed ground often serves as an initial point for establishment and the level of disturbance is directly proportional to the susceptibility of an area to invasion. Grouse and deer could possibly disperse very low numbers of viable leafy spurge seeds, whereas turkeys are not likely vectors (Wald 2003).

Human activities are the most common source for these disturbances. Roads, agriculture, and natural resource development often result in establishment of new weed beds. Natural elements can also play a role in both establishing and spreading of invasive species. Wildfires, floods and prolonged drought can disturb topsoil and cause plant losses over large areas. Burrowing activities of small animals and localized over-use by livestock and/or wild ungulates can also contribute to establishment and consequential spread of invasive weed species. Off road travel by motor vehicles has the potential to spread weed seeds.

Isolated/Small Population

Sage-grouse in North Dakota are on the eastern fringe of the species range. They occur in a transition zone between a sage-steppe habitat and grassland habitat of the northern plains. They are not completely isolated as they are connected with populations to the west in Montana, on the eastern side they are disconnected. Due to this semi-isolation and depressed population size they are considered high risk of extirpation. In an analysis of population connectivity, Knick and Hanser (2011) demonstrated that in some areas of the sage-grouse's range, populations that are isolated are at high risk for extirpation due to genetic, demographic, and stochastic (i.e., unpredictable) events such as lightning caused wildfire or an outbreak of West Nile virus. Habitat loss and fragmentation from energy activities occurring in North Dakota are contributing to the population's isolation and increased risk of extirpation.

PHYSICAL THREATS TO SAGE-GROUSE

Recreation

Off-highway vehicle (OHV) use occurs predominantly on unpaved roads and single-track and two-track trails. Off-highway vehicle use and corresponding impacts have not been well-documented in sagebrush ecosystems. Sage-grouse are sensitive to many types of disturbance and recreational activities such as viewing of leks, riding off road vehicles (OHV's) and other activities that result in concentrating recreational activities can result in disturbances to leks, nesting and brood rearing areas or winter ranges. Many activities have become more popular with the advent of "four wheelers" that allow more people access to what were formerly felt to be remote areas. These types of activities are expected to increase during the immediate future.

Recreational hunting of sage-grouse has long been a tradition within the western states and provides economic, recreational and cultural benefits. Information gathered from harvested birds provides information on annual productivity of sage-grouse and the influence of weather on productivity. Information from harvested birds also provides insight into numbers of males that will be attending leks in future years. Hunting can contribute to population declines or slower recovery of populations when combined with loss of habitat, poor weather conditions and high predation rates. Hunting seasons need to be based on good biological information and be adaptable to changing conditions. This becomes more important as habitat and populations diminish.

Predation

Over the tens of thousands of years that sage-grouse have been adapting to the sagebrush steppe in the western United States, predators have been on the scene. The role that predators play in regulating sage-grouse numbers is highly dependent on quantity and quality of habitat available to any given population of birds in conjunction with ongoing weather patterns and availability of a variety of other prey species (Braun 1998). Habitat degradation can make both nesting and brooding sage-grouse more vulnerable to both avian and mammalian predators. Degradation of the sagebrush canopy and/or understory can increase vulnerability of grouse and nests to the existing predator community may alter the predator community, or both. Mammalian predator populations in degraded habitats often shift toward species that are smaller and more numerous (red fox, raccoon, striped skunk) and away from species that have evolved with sage-grouse (coyote, badger). Similar shifts in mammalian predator communities can also accompany intensive predator control programs, e.g., red fox numbers can increase when coyote populations are controlled (Montana Sage Grouse Work Group 2004). Avian predators such as golden eagles have long co-existed with sage-grouse.

Predator control, which is expensive and only effective for a short term, has seldom been recommended for improving populations of prairie grouse (Schroeder and Baydack 2001, Knick and Connelly 2011). Biologically, long term consequences of predator control are poorly understood and under some circumstances may be counterproductive to long term viability of prairie grouse. Many avian predators of sage-grouse are now legally protected and control substances such as 1080 and other poisons have been prohibited. However, if land use changes continue to degrade sagebrush habitats and predators are shown to negatively impact sage-grouse populations, direct predator control actions may assume greater management importance (Nelson 2001). Baxter et al. (2013) found 3 features that can be manipulated by wildlife and land managers including 1) translocation, 2) habitat quality and quantity with special emphasis on nesting habitats, and 3) predator control.

Disease and Parasites

Sage-grouse are susceptible to a variety of diseases and host a number of parasites, such as coccidiosis (Schroeder et al. 1999). In the past 5 years West Nile virus (WNV) has emerged as a significant threat to sage-grouse. WNv has been documented to kill sage-grouse in every state with sage-grouse populations accept Washington (Walker and Naugle, 2011). Radio collared sage-grouse from ongoing studies in those states have been closely monitored to determine possible impacts of the virus on sage-grouse. Tests for WNv require samples from birds that have died within 24-48 hours and resistance to WNv by sage-grouse appear to be low. Impacts of severe outbreaks may be detectable from lek count data, but documenting effects of low to moderate mortality is difficult without intensive monitoring (Walker et al. 2007).

Weather

Weather patterns affect sage-grouse through a number of cause and effect relationships. Cold wet weather during hatching can result in loss of chicks to hypothermia; however wet springs often result in increased green-up and an increase in the variety of forbs, and consequently insects, on the sage-steppe thereby increasing chick survival. Hot dry weather during summer concentrates sage-grouse on riparian areas or other green sites such as alfalfa fields. Such concentrations can lead to increased predation and facilitates the spread of diseases as WNv.

Droughts and dry cycles can reduce the abundance and duration of herbaceous understory in sagebrush grasslands to levels that jeopardize sage-grouse survival. Long cold winters with deep snows that cover sagebrush plants on winter ranges can also be a threat to survival as sage-grouse are totally dependent upon sagebrush as food during winter months.

Sage-grouse managers must be aware of both annual and long term fluctuations in weather patterns. Short term fluctuations will help determine annual and near future population status while long term weather patterns have a greater effect on condition of habitats occupied by the population and will play a larger role in determining the long term trend of the population.

SECTION IV: CONSERVATION GOALS, STRATAGIES, AND ACTIONS

In the February 2013 Greater Sage-grouse Conservation Objectives Final Report (COT Report), objective 3 states "*Develop and implement state and federal sage-grouse conservation strategies and associated incentive-based conservation actions and regulatory mechanisms*". The following section outlines sage-grouse conservation strategies directed at identifying and ameliorating current threats in North Dakota. Furthermore the North Dakota Game and Fish recognizes that the following strategy is voluntary and unless an avoidance first attitude is adopted by all participating entities, (agriculture, energy, state, and federal) sufficient protections for sage-grouse cannot be accomplished.

Impacts to sage-grouse and their habitats from the following threats should be avoided to the maximum extent possible to retain conservation options. Outlined below (Tables 12-22) are conservation objectives and strategies. The most sever threats are outlined first, followed by lower ranking threats. This plan is organized using an avoidance first strategy to reduce or avoid continuing declines of sage-grouse in North Dakota, as well as limiting further reduction in big sagebrush habitat. When avoidance is not possible, meaningful minimization and mitigation of the impacts should be implemented, conservation measures should be adapted to maximize effectiveness as new knowledge is obtained. We define this approach a hierarchical conservation strategy. The specific conservation actions are presented

in the hierarchical framework, meaning that the actions at the beginning of the tables provide the best protection to sage-grouse followed by actions that are less optimal. Priority Conservation Areas (Figure 8) identify immediate areas to conserving sagebrush habitat and areas to improve connectivity. Conservation actions that appear in this section establish a framework for making to address specific threats targeting PCA and specific landownership.

As noted in the previous portions of this plan North Dakota has a relatively small population of sage-grouse occupying only a small portion of the state. These actions are proposed to be implemented within the core sage-grouse area (Figure 2) when conditions warrant such actions. Specifically conservation actions should be implemented to conserve and restore sage-steppe habitat and insure no net loss of sage-grouse populations by maintenance of stable populations trends within the core sage-grouse area (Figure 2). Not all of these threats are currently relevant to sage-grouse in North Dakota, however, they do affect sage-grouse in other states and are included in this discussion to provide land managers, and others, with the information needed to resolve or minimize conflicts associated with each should the need arise. Additionally the COT report identified 13 threats range-wide. The authors of the COT report recognized that it would be too difficult to name all threats across the range and thus determined that the main threats contributing to the 2010 decision would be sufficient. This plan breaks the current threats down to a local level by identifying the major threats and further by identifying issues of conservation concern.

Conservation Framework

In North Dakota our conservation framework consisted of (1) identifying current threats to sage-grouse, (2) developing resource selection models for key sage-grouse habitat (3) identifying priority conservation areas to focus efforts through spatially explicit threats analysis of energy development (4) developing specific goals, conservation objectives, and actions to ameliorate threats (see Tables 12-22).

Threat Ranking/Issues of Conservation Concern

Threats considered to be of major importance to sage-grouse in North Dakota are (in order from highest to lowest imminent threat):

1) Renewable and Non-renewable Energy Development (oil and gas, mining, and wind development) (Table 12).
2) Infrastructure (roads, power lines, tall structures, fences, generation facilities) (Table 13).
3) Isolated/Small Population Size (Table 14).
4) Fire (Table 15)
5) Livestock Grazing Management (Table 16).
6) Vegetation Management (agriculture conversion) (Table 17).

Issues of conservation concern include

7) Predation (Table 18).
8) Noxious Weed Management (Table 19).
9) Recreational disturbance (Table 20).
10) Harvest Management (Table 21).
11) Outreach and Education (Table 22).

Nest Site Selection Habitat Model

To properly manage habitats for sage-grouse, knowledge about resource requirements is necessary. Identifying critical habitat can inform management activities, and ensure long-term persistence for the species (Aldridge and Boyce 2007). Characterizing broad scale seasonal habitats important for sage-grouse will provide managers with the tools necessary to make informed management decisions about where and what types of management actions might be required. Disturbance from anthropogenic developments have been recognized as important drivers affecting habitat quality (Doherty et al. 2008), seasonal habitat maps will help minimize potential impacts. Greater sage-grouse are a long-lived species with relatively high survival rates compared to reproductive output. Increasing nest success has been shown to increase population growth rates (Taylor et al. 2012).

Resource selection modeling techniques (RSF) (Manly 2002) were used to characterize nesting habitats in North Dakota's core sage-grouse range. Random locations were generated across the core sage-grouse area to represent the variation in habitat availability, and to compare with nest locations. The following methods and results were used to create a RSF model of predicted nest sites in North Dakota (Figure 6).

Methods

Greater sage-grouse were captured March to early May 2005-2008 using night spotlighting and long-handled net techniques (Giesen et al. 1982, Wakkinen et al. 1992). Radio-marked sage-grouse were located ≥1 time per week with a hand-held 3-element Yagi antenna or by fixed-wing aircraft. Locations were recorded using Global Positioning System (GPS) receiver in Universal Transverse Mercator (UTM) coordinates (NAD27; UTM Zone 13). Locations were binned according to seasonal habitat use; nest site selection; nesting/breeding habitat selection occurred March 1 – June 15; brood habitat selection occurred June16 – September 15; and wintering habitat selection occurred November 1 – February 28. Researchers documented 59 nest sites within the study area from May 2005-2008. Vegetation data were collected at each nest site following published protocols (Connelly et al. 2000). These data were not used in the present analysis due to time constraints.

We used GIS land classification data from the Bureau of Reclamation's Remote Sensing and Geographic Information Team (RSGIT). Remote imagery was used to map sagebrush and other land cover in a study area around the Cedar Creek Anticline within the Williston Basin. The study area fell within portions of NW South Dakota, SW North Dakota and SE Montana representing approximately 1,126,000 acres. ADS40 digital imagery was used to classify 11 unique vegetation classes 1) Wetland 2) Open water 3) Riparian 4) Sage Riparian 5) Sage 1-10%, 10-20%, 20-30%, > 30% sagebrush 6) Agriculture 7) Conifers 8) Developed 9) Energy 10) Sparse Vegetation 11) Grasses.

Habitat variables used to model sage-grouse nest selection was quantified from the RSGIT land class data and digital elevation models (DEM). Characteristics of vegetation and topography around nest and available locations were evaluated at 5 scales (10 m, 30 m, 100 m, 400 m, 3200 m). The largest three scales were used to identify anthropogenic process thought to influence habitat selection and the smallest two scales were identified as appropriate to capture habitat heterogeneity and predation (Doherty et al. 2010). Neighborhood statistics tools in ArcMap were used to calculate the proportion of sagebrush, agriculture, grassland, slope, aspect, and ruggedness at each spatial scale.

A used-available design was employed to evaluate nesting habitat selection (Manly 2002). Logistic regression was used to test the relationship between nest sites and available sites within the core sage-

grouse range in ND. Explanatory variables for the local scale model (10 m, 30 m) included a Ruggedness metric from a 30 m moving window analysis, Sagebrush %, Agriculture %, Grass%, Slope, Aspect, Distance to Roads, and Habitat Patch size. Variables used in the landscape scale model (100 m, 400 m, 3200 m) included Ruggedness, Proportion - Grass, AG, Sagebrush, Percent - AG, Sagebrush, Grass, habitat patch size and Distance to roads at all three spatial scales. All variables were checked for correlation ($r \geq \left| 0.7 \right|$). Analysis was performed using a backward stepwise procedure to identify significant variables at each spatial scale. Table 10-11 represent the best model selected from the candidate models.

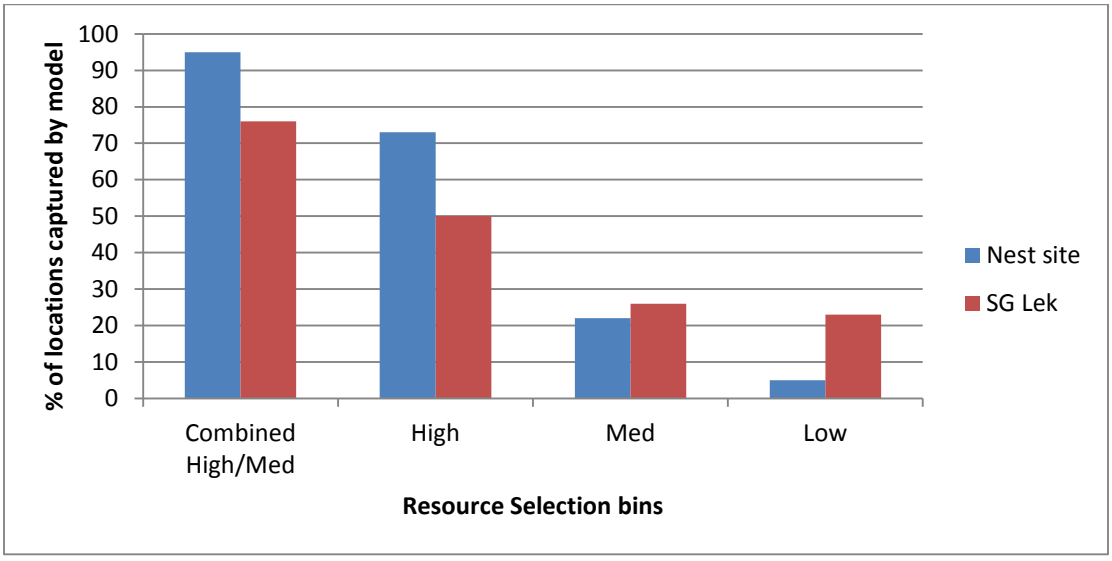
Table 10. Best approximating local-scale habitat selection model for nesting sage-grouse.

Coefficients:	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	0.2267	0.1972	1.149	0.25039
ProAg30 (Agriculture land at nest site)	-2.8841	1.1076	-2.604	0.00922 **

Table 11. Best approximating large-scale habitat selection model for nesting sage-grouse.

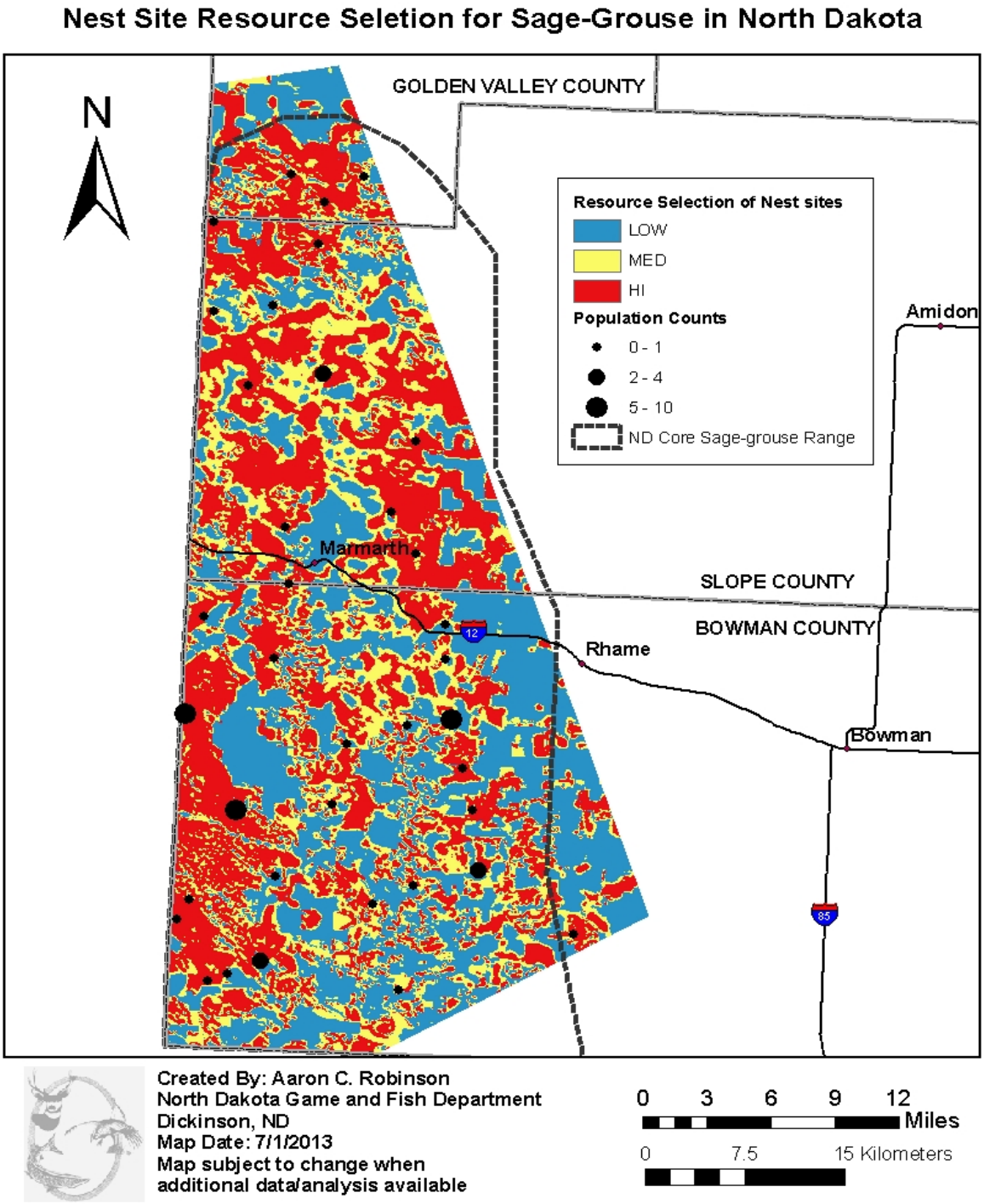
Coefficients:	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-2.4915	0.731	-3.409	0.000653 ***
ProG100 (Proportion Grass 100 m)	2.1551	0.7583	2.842	0.004486 **
ProS400 (Proportion sagebrush 400 m)	3.7178	1.0455	3.556	0.000377 ***

Figure 5. Percent of locations (nest, leks) in 3 bins that were used to build and test the occurrence model for nesting sage-grouse in North Dakota.



The results of this analysis indicate that sage-grouse are selecting for tracks of land that have adequate sagebrush cover up to 400 meters and grassland habitat within 100 meters. Additionally they avoid areas of agriculture and focus on mainly native habitats. This analysis should be used to direct management activities by targeting efforts in areas that are most likely to enhance nest success and consequently population demographics.

Figure 6. Nesting habitat in North Dakota determined by multi-scale logistic regression analysis.



Energy Threat analysis and Priority Conservation areas

Understanding the factors limiting the recovery of sage-grouse is a critical step toward conservation of the species. In the 2013 COT report, energy development is the primary threat to the overall viability and persistence of sage-grouse in North Dakota. Significant oil and gas activity has already occurred accounting for roughly 24% of North Dakota's core area having a well density > 2 wells sq/mile. Current research suggested that development in excess of one well pad per 1.5 sq. mile negatively impacts sage-grouse (Holloran and Anderson 2005, Walker 2007). Objective 3 of the conservation framework outlined above include identifying priority conservation areas to focus efforts through spatially explicit threats analysis of energy development.

Prioritization and implementation of conservation actions aimed at ameliorating threats to sage-grouse must occur in areas of high biological value and avoid areas that cannot meet minimal requirements for sage-grouse persistence because of existing energy development. As a result we developed a two-step process to delineate priority conservation areas (PCA). First, data from 59 sage-grouse nest were used to develop a resource selection model (Figure 6) that identifies high probability use areas for nesting sage-grouse (see section Nest Site Selection Habitat Model for detailed methods). Second, a spatially explicit analysis of oil and gas wells were used to map areas that are unsuitable for sage-grouse due to densities over the acceptable threshold of > 1.5 wells sq/mile (Doherty 2008, Holloran and Anderson 2005, Walker 2007) (Figure 7).

Methods

Spatial data of oil and gas wells were obtained from North Dakota Industrial Commission GIS map server (https://www.dmr.nd.gov/oilgas/). Wells that had a spud date and considered active wells were used in the analysis. If a well had a spud date but was classified as Dry or Plugged and Abandoned (PA) it was included if drilled after 1994. This date was used as a cut-off to account for habitat fragmentation caused by initial development. Inactive wells drilled prior to 1994 are typically void of a well pad and road and vegetation has been restored. Additionally, 2014 aerial photography was used to validate if well sites drilled after1994 with a status of (Dry) or (PA) had remaining well pads and associated roads. As a result 1994 was the best approximation of well pads that have been mitigated and natural vegetation restored.

A moving window analysis was used to calculate the density of well locations in North Dakota's core sage-grouse area. The Point Density tool in ArcGIS was used to calculate well density. Conceptually, a moving window analysis uses a defined neighborhood around a raster cell center, and the number of wells that fall within the defined neighborhood is totaled and divided by the area of the neighborhood. This analysis is repeated for every raster cell resulting in an output that shows the concentration of well locations (Figure 7).

Doherty (2008) identified a thresholds of 1-12 wells per 12.5 mi^2 (< 1.5 wells per square mile) as an intensity of development within which impacts to leks were indiscernible. Above this threshold (13-39 wells) the rate of lek inactivity doubled and 31-55% fewer birds remained at the affected leks. Thus a 1sq/ mile buffer was chosen as the neighborhood in the analysis. Well density was binned into four categories 1) < 1 well sq/mile 2) 1 to 2 wells sq/mile 3) 2 to 3 wells sq/mile 4) > 3 wells sq/mile.

To create the final Priority Conservation Areas (PCA) map (Figure 8), a raster layer representing nest site selection (Figure 6) was combined with a raster layer representing well density (Figure 7). Reclassification of the output layer identified areas with a well density of < 1.5 wells sq/mile that overlaid areas of high and medium nesting potential for sage-grouse. The resulting map (Figure 8) utilized the best available science to identify and prioritize conservation efforts that will provide the best conservation return. The areas delineated in the PCA map are the only remaining areas that can meet the sage-grouse seasonal habitat requirements given the extent of the current oil and gas activity. The following sections will provide conservation actions to help protect and minimize impacts from current threats in North Dakota.

Figure 7. Analysis of well density within a 1 mile buffer.

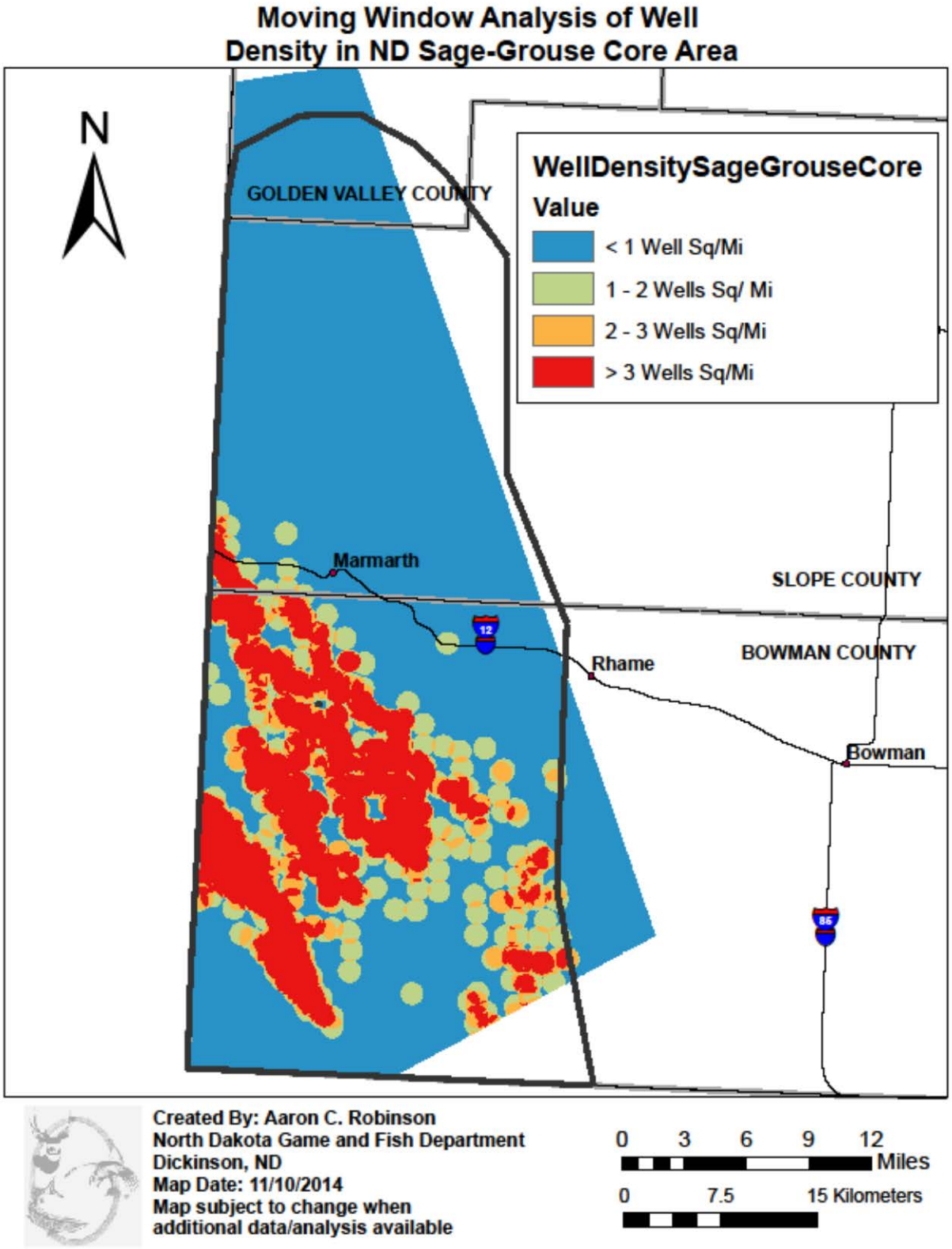
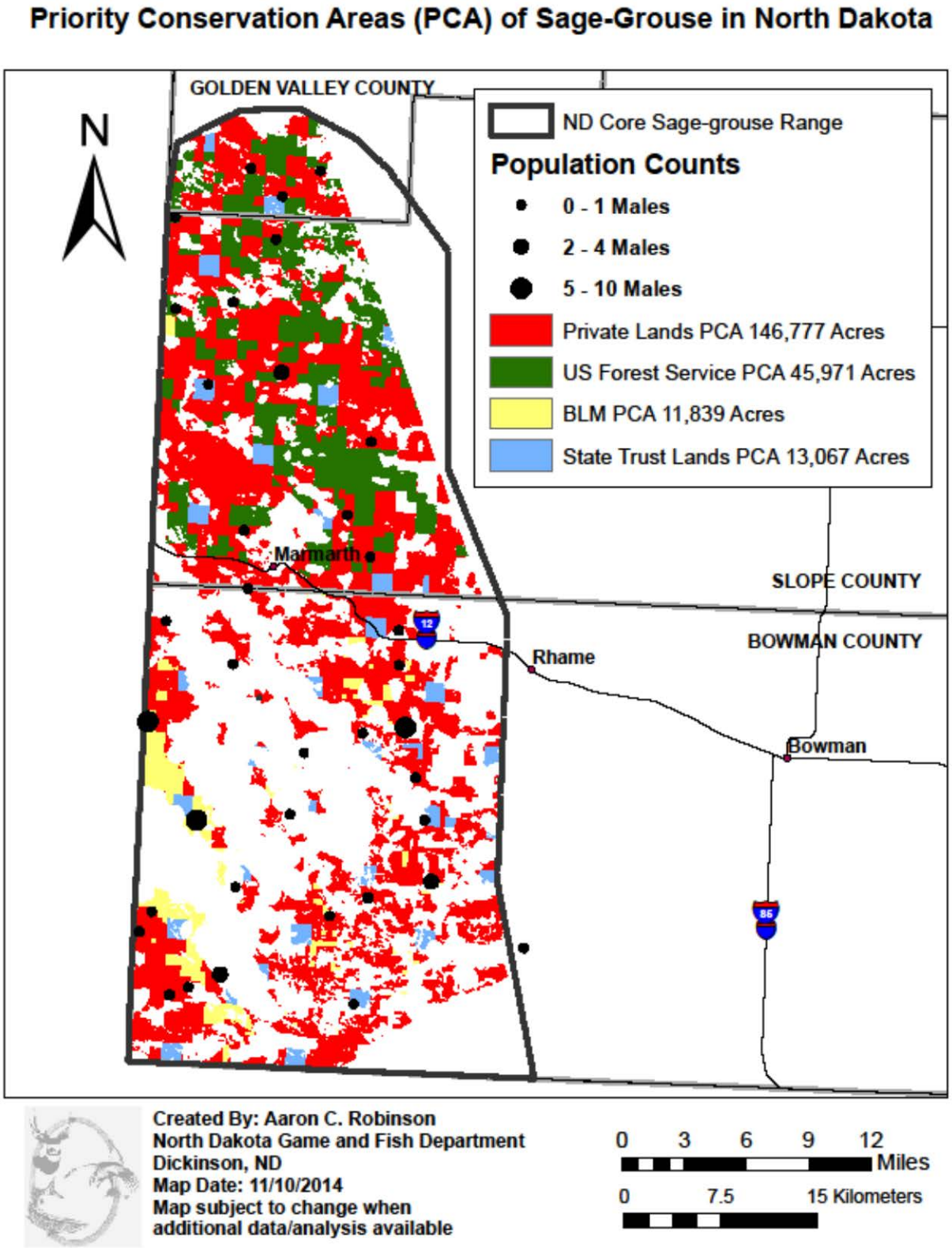


Figure 8. Spatially explicit threat analysis of well density combined with nesting resource selection, to identify priority conservation areas (PCA).



RENEWABLE AND NON-RENEWABLE ENERGY DEVELOPMENT

In the last 50 years the world demand for energy increased by > 50% and current demand for energy is projected to double by 2030 (National Petroleum Council 2007). Fossil fuels (coal, oil, and natural gas) will likely be the world's main source of energy which currently accounts for 83-87% of the total world demand. The potential for energy development to impact sage-grouse is extremely high because a significant portion of the onshore oil reserves are in the West and located under sage-grouse habitats (National Petroleum Council 2007).

In the last 8-10 years the effects of oil and gas development on sage-grouse have been studied extensively. Prior to this time the impacts of energy development was mostly unknown and limited to small-scale studies. The transition from small-scale studies (Rost and Bailey 1979, Dyke and Klein 1996) into large-scale evaluations of cumulative impacts and viability models capable of quantifying population-level impacts greatly improved our understanding of sage-grouse response to energy development (Holloran and Anderson 2005b, Johnson et al. 2005, Walker 2007, Doherty et al. 2008).

Contemporary research suggests that energy development can result in both direct and indirect impacts to sage-grouse. Development can displace sage-grouse (Doherty et al. 2008) and negatively affect survival (Holloran and Anderson 2005). Development activities can reduce reproduction (Aldridge and Boyce 2007). Direct effects are typically from human disturbance, roads and power lines that fragment habitat, placement of infrastructure in areas once free from structures. Indirect impacts typically result in alteration of vegetation composition through introduction of noxious weeds and other non-native plants, changes in predator communities, disease dynamics, and disruptive noise near leks. To date there have been no scientific studies reporting a positive influence of development on sage-grouse populations or habitats. Current research suggested that development in excess of one well pad per 1.5 sq. mile resulted in impacts to breeding populations. Impacts to leks from energy development are detectable > 3.7 mi from the lek location (Holloran and Anderson 2005, Walker 2007). Naugle et al. (2011) synthesized research studies that investigated relationships between sage-grouse and energy development from 1980 to present which detail the biological response of sage-grouse to energy development, the following recommended guidelines are derived from that synthesis.

Impact Levels from Oil and Gas Development

The following section describes features of energy development and potential impacts on sage-grouse. Three concepts are used that are useful for characterizing types of impacts. They include direct and in-direct impacts as well as impact thresholds.

Direct Impact

This type of impact is directly linked to development activity. It includes the acute habitat loss as a result of road construction or improvement (e.g. 2-track to a bladed road) or the construction of a well pad or compressor station. Another example of a direct effect is a grouse dying from vehicle impact on a road developed or expanded for development.

Indirect Impact

This type of impact results from multiple interconnected and likely cumulative effects associated with the development activity. In the case of a new road, an indirect impact would be the elevated predator presence associated with roads and a corresponding decline in grouse vital rates. In the case of the well pad or compressor station indirect impacts may result from displacement from adjacent otherwise suitable habitat due to noise, human activity/disturbance or increased predation due to elevated numbers of predators. It is important to recognize two aspects of indirect effects. First, indirect effects of energy development and infrastructure are often cumulative, ultimately summing to a greater reduction in sage-grouse numbers than might have occurred had impacts been single in occurrence. For instance, changes in habitat and changes in predator composition, when combined, have an additive impact on sage-grouse (Coats and Delehanty 2008, Dzialak et al 2012, Bui et al. 2010). Second, indirect effects are often more detrimental than direct effects because they can result in irreversible long-term changes in sagebrush ecosystems. As an example, changes in large-scale vegetation and predator composition can result from anthropogenic stressors, and simply removing infrastructures will likely not diminish the long-term changes or resulting effects on grouse populations (Knick and Hanser 2011, Naugle et al 2011a, Naugle et al 2011b, Wisdom et al 201, Johnson et al 2011).

Impact Threshold

There is a continuum of levels of impact that are categorized into thresholds. These levels of development and disturbance impair key habitat functions by directly eliminating habitat; disrupting wildlife access to, or use of habitat; or causing avoidance and stress (Wyoming Game and Fish Department 2010a). Again with regards to a new road, an impact threshold may be based on the number of vehicles travelling on the road or the density of roads within an area that result in a significant loss of habitat function. The impact thresholds are defined by measureable changes in population demographic rates or population indices and the amount of surface disturbing activities. They are related to base levels of development associated with well pad densities and/or other comparable disturbance/infrastructure that expands the human footprint.

Low to No Impact

This level of impact has < 1 well pad/mi^2 and has little to no infrastructure 4 miles from active leks. There is also no infrastructure 1 mile from an active lek.

- *Population/Demographic Impact* - This level of development impact would result in no discernible change in demographic rates (e.g. adult, yearling, and/or juvenile female survival) or other breeding population indices (e.g. lek counts) for 3-4 years (Walker et al. 2007) post-development. If changes are detected, they must mirror adjacent population demographic rates or stochastic population changes during the same time period.

- *Habitat Impact* – Direct habitat loss by surface disturbing activities would be < 3% of land surface/mi^2.

Moderate Impact

This level of impact has 1 to ≤ 2 well pads/mi^2 or up to 20-40 acres of disturbance/mi^2 within 2 miles of an active lek.

- *Population/Demographic Impact* - This level of development impact would result in a measurable decline in demographic rates (e.g. adult, yearling, and/or juvenile female survival; ≥ 10 reduction in survival) or other breeding population indices (e.g. lek counts; 30% reduction in males counted) for 3-4 years (Walker et al. 2007) post-development. These levels of decline could not extirpate the population but likely dampen increases or enhance decreased, ultimately reducing the carrying capacity. Changes could mirror adjacent population demographic rates or stochastic population changes at the population level during the same time period but could cause significant local population impacts.

- *Habitat Impact* – Direct habitat loss by surface disturbing activities would be 20 – 40 acres/mi^2 (3 – 6% of land surface/mi^2)

Justification - Connelly et al. (2000) recommended locating all energy related facilities at least 2 miles from active leks whenever possible. Holloran (2005) suggested reducing well pad densities to 1/mi^2 or less within 2 miles of a lek in order to reduce impacts. Holloran (2005) detected a negative influence on male lek attendance when densities exceeded 1 well pad/ 700 acres (1.1 mi^2) within 2 miles. Naugle et al. (2011) determined the average well pad spacing (coal-bed methane) within 2 miles of the leks that remained active was less than 1/774 acres (1.2 mi^2). Doherty (2008) detected impacts on lek activity and male attendance were not discernible in areas with ≤1 well pad/mi^2 within 2 miles. However, the rate of lek inactivity doubled when well pad densities were >1 and up to 3 well pads/mi^2. Rates of lek inactivity increased to >5-fold at densities exceeding 3 well pads/mi^2. Walker et al. (2007) reported that 84% of leks active in 1997 or later remained active in 2004-05 outside areas affected by CBNG development in the Powder River Basin. Walker (2008) classified the area within 350 m of each well pad as "developed." Walker (2008) related the percent of "developed" surface to the probability of lek persistence within natural gas fields, demonstrating that the impact extends beyond the 350 m zone he considered "developed." When 15% of the area within 2 miles of a lek was "developed," the probability of lek persistence declined to 74% (Walker 2008). (The area within 350m of a well pad is 15% of a square mile, thus 15% disturbance equates to 1 well pad /mi^2). When 30% of the area (2 well pads/mi^2) was "developed," the probability of lek persistence declined to 59%.

High Impact

This level of impact has > 2 to ≤ 3 well pad locations or 40-60 acres of disturbance/mi^2 within 2 miles of an occupied lek.

- *Population/Demographic Impact* - This level of development impact would result in a significant measurable decline in demographic rates (e.g. adult, yearling, and/or juvenile female survival; ≥ 20% reduction in survival) or other breeding population indices (e.g. lek counts; 40% reduction in males counted) for 3-4 years; Walker et al. 2007) post-development. These levels of decline would likely extirpate the population by ultimately reducing the carrying capacity. Changes would likely not mirror adjacent population demographic rates or stochastic population changes at the population level during the same time period but could likely cause significant local population extirpation.

- *Habitat Impact* – Direct habitat loss by surface disturbing activities would be 40 – 60 acres/mi^2 (6 – 9% of land surface/mi^2).

Justification - The probability of lek persistence declined to 42% when 45% of the area within 2 miles of the lek (equating to 3 well pads/mi^2) was developed (Walker 2008). Based on recent research, the impacts of well pads and road systems at this density will be difficult or impossible to mitigate onsite. Decreases in lek attendance, nesting, production, and survival are expected (Holloran 2005, Doherty 2008, Walker 2008, Naugle et al. 2011). Walker et al. (2007) determined the average well spacing (coal-bed methane) within 2 miles of leks that had become inactive was between 2 and 3 well pads/mile^2.

Extreme Impact

This level of impact has >3 well pad locations or >60 acres of disturbance/mi^2 within a 2 miles of an occupied lek.

- *Population/Demographic Impact* - This level of development impact would result in a measurable decline in demographic rates (e.g. adult, yearling, and/or juvenile female survival; ≥ 30% reduction in survival) or other breeding population indices (e.g. lek counts; 50% reduction in males counted) for 3-4 years (Walker et al. 2007) post-development. These levels of decline would likely cause the extirpation of local populations and have major reductions in the more extensive population through habitat loss and degradation. Changes would not mirror adjacent population demographic rates or stochastic population changes at the population level during the same time period would cause significant local population impacts and a high probability of extirpation.

- *Habitat Impact* – Direct habitat loss by surface disturbing activities would be > 60 ac/mi^2 (> 9% of land surface/mi^2).

Justification - Walker (2008) determined the probability of lek persistence declined from 84% to 42% when 45% of the area within 2 miles of a lek was developed, equating to 3 well pads/mile^2. This level of disturbance cannot be mitigated effectively onsite. A decline in lek attendance and eventual abandonment of most leks are expected (Holloran 2005; Walker et al. 2007a; Walker 2008; Naugle et al. 2011). Developments exceeding 3 well pads/mi^2 should be avoided within 2 miles of an occupied lek and within identified nesting and brood rearing habitats outside the 2-mile perimeter.

Table 12. Conservation goals, strategies, and actions for minimizing renewable and non-renewable energy development.

Measure of Success – Maintaining a stable population trend from spring lek counts necessary to reach the state goal of 250 males.		
Goal	**Strategies**	**Conservation Actions**
Energy resources must be designed to ensure the resulting activities will maintain stable	When valid existing rights **do not** apply (e.g. no current leases), avoid energy	1) Discontinue permitting energy development (including oil and gas exploration, surface mining, and wind development) within PCA (Figure 8)

sage-grouse population trends, necessary to reach the goal of 250 male sage-grouse and maintain no net loss of sage-grouse population numbers.	development within sage-grouse habitat. Development > **1 well pad/mi^2** will negatively impact sage-grouse populations.	2) No surface occupancy within habits that are within PCA (Figure 8). 2) No surface occupancy within 4 miles from an active lek. (Sage-grouse lek is defined as a traditional display area in or adjacent to sagebrush-dominated habitat that has been attended by ≥ 1 male sage-grouse in the previous 5 years.)
	When valid existing rights **do** apply (e.g. current mineral leases), avoid energy development within critical sage-grouse habitat.	1) Development should not exceed 1 well pad/sq. mile. 2) No surface occupancy within 2 miles of an active lek. 3) Allow no surface use in nesting and breeding habitat (figure 6) during the period 1 March –15 June (this action applies to drilling, testing and new construction projects, but does not apply to operation and maintenance of production facilities). 3) Restrict maintenance and related activities in sage-grouse breeding/nesting habitat—1 March –15 June—between the hours of 8:00 pm and 8:00 am 4) Do not allow surface use activities within crucial sage-grouse brooding areas during the period 16 June – 15 September. 5) No surface use activities within crucial sage-grouse wintering areas during 1 November - 14 March (this action applies to drilling, testing and new construction projects, but does not apply to operation and maintenance of production facilities). 6) Utilize directional drilling and unitized development. To the extent technologically practicable, develop multiple wells from single pads by employing directional or horizontal drilling technologies. The highest management priority within crucial winter range is to recover oil and gas resources with the least possible infrastructure (see Infrastructure section) and associated disturbance. Directional drilling is an extremely important tool to accomplish this. Where several companies hold smaller, intermingled leases, the cumulative impact could be reduced substantially if the companies enter a cooperative agreement (called unitization) to directional drill from common well pads.

	Minimize noise that can disrupt breeding rituals and cause abandonment of leks.	1) Use remote sensing equipment to monitor well production and minimize noise associated with traffic. 2) Pipe oil and/or water to off -site storage facilities. Pipelines should be placed along existing roadways. 3) Restrict noise levels from production facilities to 26-30 decibels (10 dba above background noise at the lek) (Patricelli et al. 2013). 4) Restrict use of heavy equipment that exceeds 30 decibels within 2 miles of a lek from 8 p.m-8:a.m. during March 1-June 15. 5) If possible locate production facilities downwind (prevailing wind direction) of lek sites to further reduce disturbance.
	Minimize the spread of noxious weeds and other nonnative plants that can alter the plant communities.	1) See conservation actions related to preventing the spread of weeds and controlling infestations of noxious weeds. 2) Engage industry as a partner to develop and establish new sources of seed of native plant species for restoration of sites disturbed by development. 3) Require native seed mixes to be planted along new road grades and reclaimed well pads. Seed mixture must contain Wyoming Big sagebrush seeds.
	Water discharge and impoundments will not be permitted due to the potential to act as a vector for West Nile Virus.	1) Remove and reclaim all discharge or water impoundments associated with energy-related activities. 2) Protect natural springs from any source of disturbance or degradation from energy-related activities.

INFRASTRUCTURE

All developments require constructing basic infrastructure that is similar regardless of the type of energy being sought. This includes roads, power or transmission lines, fences, and other anthropogenic structures. The cumulative effects of all infrastructure associated with gas development rather than any single component, caused greater declines in numbers of males attending leks and lower lek persistence in the Powder River Basin compared to regions not undergoing development (Walker et al. 2007).

Direct and Indirect effects from infrastructure are potentially the most detrimental to sage-grouse populations over longer periods of time.

Roads

Roads are constructed to deliver materials and to perform regular maintenance of facilities. Heavily travelled roads are typically graded gravel or dirt and are maintained periodically. Other smaller roads are developed for access to well pads, turbines or pipelines.

Documented or Potential Impacts - Vehicle traffic and noise disturbance on roads and well sites resulted in female sage-grouse moving greater distance from leks and had lower rates of nest initiation in areas disturbed by vehicle traffic (1-12 vehicles/day) (Lyon and Anderson 2003). The impact of roads on sage-grouse largely depend upon the type of road and the amount of traffic (Holloran 2005, Wisdom et al. 2011), but again the effects have been mixed (Johnson et al. 2011). Blickley et al. (2012) found that male sage-grouse lek attendance decreased 73% compared to paired controls when subjected to experimental road noise playback. Additionally, roads are likely important vectors for exotic vegetation to invade and replace essential sage-grouse habitat (Bradley et al. 2009). This is a long-term change that is exacerbated by other developments on the landscape.

Power Lines/Transmission Lines/Other Tall structures

Transmission and power lines are commonly associated with all forms of energy development. Utility-scale wind farms consist of turbines that generate electrical energy by converting mechanical energy into electricity at a point source. Electricity is then bulk transferred through a power transmission network to substations, which will require a network of transmission lines with supporting tall, vertical structures. Similarly, power lines must be built in order to power pumps for oil and gas facilities. Infrequently, these lines are buried if small enough, but cost often limits developers from using this practice. These linear rights of way for tall structures that intersect long tracts of sage-grouse habitat have the potential to adversely affect grouse populations as much or more than the sum of point sources, such as wind turbines in a given area.

Documented or Potential Impacts – Grouse fatality rates can be elevated as a result of collisions with towers and power lines (Connelly et al. 2000, Beck 2006). Also, overhead lines can displace nest locations of sage-grouse (Braun et al. 2002). Ellis (1984, 1985) documented displacement of a lek by 0.75 miles after a transmission line was built. Avoidance behavior has been documented in closely related species such as greater (*Tympanuchus cupido*) and lesser (*Tympanuchus pallidinctus*) prairie chickens where habitats within 1 mile of power lines were avoided (Hagen et al. 2004). The spatial distribution of sage-grouse leks in Oregon is such that 90% and 80% of leks are greater than 1 and 2 miles respectively from the nearest transmission line (ODFW 2009 *in* Hagen 2011b).

Suspended lines can also be a collision hazard for flying sage-grouse (Connelly *et al*. 2000). The bird has relatively high wing loading, given its large body size, which makes it less agile and a more likely candidate for collision compared to other birds (Bevanger 1998).

Tall structures (e.g., transmission towers or power lines) are thought to influence predator composition and abundance, resulting in elevated predation rates on sage-grouse. For example, common ravens (*Corvus corax*) are important predators of eggs (Coates et al. 2008) and raptors are predators of young and adult grouse (Schroeder et al. 1999). Tall structures provide artificial perches and nesting substrate

for raptors and ravens (Knight and Kawashima 1993). Steenhof et al. (1993) found that raptors and common ravens (*Corvus corax*) began nesting on the support structures of a 372.5 mi. transmission line in southern Idaho and Oregon within one year after construction, and within 10 years of construction, 133 pairs of raptors and ravens were nesting on the support towers. Raven numbers have increased concomitantly with availability of tall anthropogenic structures (used for nesting) and road development (provide roadkill) (Boarman and Heinrich 1999, Boarman et al. 2006). Elevated raven densities result in increased predation rates on sage-grouse eggs (Coates and Delehanty 2010). Elevated predation pressure on grouse nests can occur even when grouse populations are declining. Similarly, changes in raptor communities caused by increased infrastructure may affect vital rates of juvenile and adult grouse.

In some cases, in order to mitigate anthropogenic subsidization of raven and raptor populations, transmission lines have been retrofitted or constructed with perch deterrent devices. The effectiveness of these devices is mixed. In a small study conducted by the BLM's Kemmerer Field Office in Wyoming, researchers found no raptors on structures with perch deterrents whereas 159 raptors were documented perching on the control line (no deterrents) structures (Oles 2007). Somewhat contrary to this study, Lammers and Collopy (2007) found that deterrents reduced the probability of avian predators perching on the towers; however, avian predators overcame the deterrents to take advantage of the height of the towers where no other perches of similar height existed. Essentially, the duration of perching by avian predators was effectively reduced, but perching was not eliminated by anti-perching devices. The types of perch deterrents used in each of these studies were different and it is likely that one type may be more effective that the other.

Fences

Fences are often erected to protect facilities such as turbines, well pads, or substations from vandalism. Fences are also constructed to manage livestock grazing.

Documented or Potential Impacts - These structures can provide perch sites for raptors and can cause direct mortality through fence collisions in some locations (Stevens 2011). More than 1,000 km of fences (mostly pasture fences) were constructed annually from 1996 through 2002 and density of fences exceeds 2 km/square km in some regions on BLM lands in states supporting sage-grouse (Knick et al 2011). Potential impacts of these fences on sage-grouse are unknown but likely not considered when the fences were constructed.

Table 13. Conservation goals, strategies, and actions for minimizing infrastructure.

Measure of Success – Maintaining a stable population trend from spring lek counts necessary to reach the state goal of 250 males.		
Goal	**Strategies**	**Conservation Actions**
Avoid further fragmentation and/or loss of critical sage-grouse habitats due to infrastructure related disturbances and cumulative effects of roads, powerlines,	Minimize impacts to sage-grouse from roads. Including direct impacts (habitat fragmentation and destruction) and indirect impacts (demographic disturbances such as avoidance and reduced	1) No new construction of roads in sage-grouse core area. 2) No development of new roads within critical sage-grouse habitats PCA (Figure 8). 3) No development of new roads within 2 miles of a sage-grouse lek.

fences, pipelines, and tall structures.	productivity from noise). Cumulative surface disturbance should not exceed 3% /mi^2	4) Close all secondary roads (e.g. two-tracks) within critical seasonal habitats. 5) No travel allowed on secondary roads during March 1- June 15. (Does not apply to operating and maintenance or permitted producer. 6) No recreational OHV use within sage-grouse seasonal sage-grouse habitats (year-round). 7) If valid existing rights require construction of a new road avoid critical habitat. 8) Re-vegetate with native plant species beneficial to sage-grouse (seed mixture must contain Wyoming Big sagebrush seed). 9) Close and re-vegetate travel ways in sage-grouse habitats where appropriate.
	Minimize impacts of powerlines in sage-grouse habitat.	1) No new lines in critical sage-grouse habitat. 2) If valid existing rights exist lines should be buried within PCA (Figure 8). 3) Site new lines in existing corridors of non-sagebrush habitat wherever practicable and site power lines and pipelines along existing roads. 4) If applicable use off-grid systems such as solar, natural gas within sagebrush habitat. 5) If siting power lines on important breeding, brood-rearing, and winter habitat is unavoidable, use the best information available to minimize impacts. 6) If siting is required within 2 miles of important breeding, brood-rearing, and winter habitat (Connelly et al. 2000b), emphasize options for preventing raptor perch sites utilizing Avian Power Line Action Committee 1994 guidelines or bury a portion of the line.

		7) Prior to development of a route within core sage-grouse range, coordinate with NDGF, utilities, and cooperating landowners. 8) Restrict timing for construction to prevent disturbance during critical periods in PCA: a) breeding—1 March-15 June b) winter—1 December-31 March 9) Take appropriate measures to prevent introduction or dispersal of noxious weeds during construction and planned maintenance. 10) Re-seed transmission right-of-way with native seed mixture (including Wyoming Big Sagebrush). 11) Remove power line when use is completed if it is determined the line would not be needed in the future.
	Minimize impacts from fences on sage-grouse within sage-grouse habitat.	1) Restrict new fences within 1 mile of lek. 2) Mark fences with permanent flagging or other suitable device to reduce sage-grouse collisions on flat to gently rolling terrain in areas of moderate to high fence densities (i.e., more than one kilometer of fence per square kilometer) located within two kilometers of occupied leks. 3) Identify and remove unnecessary fences. 4) Placement of new fences and livestock management facilities should consider their impact on sage-grouse.

ISOLATED/SMALL POPULATION SIZE

Sage-grouse in North Dakota are on the eastern fringe of the species range. They occur in a transition zone between a sage-steppe habitat and grassland habitat of the northern plains. They are not completely isolated as they are connected with populations to the west in Montana; on the eastern side they are disconnected. Due to this semi-isolation and depressed population size they are considered high risk of extirpation. In an analysis of population connectivity, Knick and Hanser (2011) demonstrated that in

some areas of the sage-grouse's range, populations that are isolated are at high risk for extirpation due to genetic, demographic, and stochastic (i.e., unpredictable) events such as lightning caused wildfire or an outbreak of West Nile virus. Habitat loss and fragmentation from energy activities occurring in North Dakota are contributing to the population's isolation and increased risk of extirpation.

Table 14. Conservation goals, strategies, and actions for minimizing the threat of isolated/small population size.

Measure of Success – Maintaining a stable population trend from spring lek counts necessary to reach the state goal of 250 males.		
Goal	**Strategies**	**Conservation Actions**
Manage the sage-grouse population to achieve 250 males.	Implement conservation actions in (Tables 12-22) to support an increasing sage-grouse population	1) Implement conservation action from Tables 12-22 of sage-grouse plan. 2) Implement translocation proposal through partnerships with neighboring states to boost genetic variation and augment local population. (see Appendix II)

FIRE MANAGEMENT

Fire has always been present in sagebrush communities. Benefits and detriments to sage-grouse habitats and relative frequency of fire often are subjects of disagreement. Fire has been a factor in the loss of mature sagebrush habitat and affects sagebrush communities differently depending on the species of sagebrush. Fire management actions are divided into two categories; suppression of wildfires, and prescribed fire. Both wild and prescribed fires can have cumulative effects on sagebrush habitat and species that depend on it.

Prescribed fires are planned events with specific objectives; however, changes and variation in conditions at the site can change the actual outcome. Use of prescribed fire in the sagebrush community will result in a net loss of sagebrush and is of concern to those desiring to maintain a mature sagebrush community and associated wildlife.

Wildfires are less predictable and unplanned, and they have the most significant effect in the densest sagebrush. Suppression actions serve to protect sagebrush communities, human life, and community protection.

Table 15. Conservation goals, strategies, and actions for minimizing the threat of fire.

Measure of Success – Maintaining a stable population trend from spring lek counts necessary to reach the state goal of 250 males.		
Goal	**Strategies**	**Conservation Actions**
No net loss of sagebrush habitat from prescribed or wildfires.	Prevent fires in sage-grouse habitats.	1) Prescribed fires are not recommended within sag-grouse habitats inside the core area.

		2) Accidental fires including lightning strikes should be immediately suppressed within sage-grouse core area. 3) Manage land uses to minimize the spread of invasive species. 4) Manage big sagebrush habitat for maintenance, by restoring healthy native perennial grass in big sagebrush vegetative communities. 5) Close rangelands that are highly susceptible to fire to OHV use during the fire season. 6) When fires occur reallocate fire response resources (crew, equipment, etc.) to Priority Conservation Areas (see Figure 8). 7) Establish defensible fire lines – where the effectiveness is high, fire risk is likely to protect critical sage-grouse habitats. 8) Educate landowners and fire personnel on the need and value of protecting sagebrush areas.
	Rehabilitate and restore areas affected by wildfires in sagebrush-grasslands.	1) Retain unburned areas of sage-grouse habitat, e.g., interior islands and patches between roads and fire perimeter, unless compelling safety, resource protection, or control objectives are at risk. 2) Assure that long-term wildfire rehabilitation objectives are consistent with the desired natural plant community. 3) Re-vegetate burned sites in sage-grouse habitat within one year. Areas disturbed by heavy equipment will be given priority consideration. 4) Emphasize native plant species adapted to the site that are readily available and economically. 5) Proactive treatments that could reduce the risk of loss of habitat critical to sage-grouse. 6) Prioritize rehabilitation on the basis of risk, quality, and connectivity within sage-grouse habitats. 7) Monitor the site and treat for noxious weeds.

LIVESTOCK GRAZING MANAGEMENT

Livestock grazing is the most widespread type of land use across the sagebrush biome (Connelly et al. 2004) and almost all sagebrush areas are managed for livestock grazing (Knick et la. 2003). Sagebrush communities provide critical habitat for sage-grouse, produce a diversity of tangible commodities and satisfy many societal values that are important to the U.S. economy and the well-being of U.S. citizens. Sagebrush-dominated rangeland that is occupied by sage-grouse includes private, state and federal lands.

Rangelands in the Northern Great Plains evolved with grazing and extreme climatic disturbances. However, many western rangelands were over-stocked with livestock in the late-1800s and early 1900s, thus altering the composition and productivity of some sagebrush and other vegetative communities over time (Fleischner 1994).

Sagebrush communities typically have forage value for livestock as well as providing habitat for sage-grouse. Livestock effects on sage-grouse habitat, and on the birds, may be positive, negative, or neutral depending on the specific grazing prescription and on the ecological site. Livestock grazing has been responsible for retaining tracts of sagebrush-dominated rangeland from conversion to cropland. In terms of habitat quality, properly managed grazing can stimulate growth of grasses and forbs, and thus livestock can be used to manipulate the plant community toward a desired condition. For example, rest-rotation grazing systems designed after Hormay (1970) provide for long-term range health and, in comparison to other systems, was found to produce up to four times as many prairie grouse (i.e., sharp-tailed grouse and prairie chickens) compared with other grazing systems on the Fort Pierre National Grasslands (Rice and Carter 1982). Although that study didn't address sage-grouse directly, the effect of improved residual cover, in response to grazing management, would likely have positive implications for sage-grouse habitat. Similarly improper livestock management has been demonstrated to have negative impacts on sage-grouse seasonal habitats (Knick et al. 2001).

In response to environmental concerns, livestock operators and other land managers have developed stock water sources on uplands and have constructed fences to shift grazing from riparian to upland areas. Meeting objectives for riparian areas may increase removal of vegetation on upland sites. To minimize the potential impact of removing important understory vegetation, flexible grazing management programs need to be planned and implemented while considering needs of sage-grouse. Land managers also should consider potential effects, such as disturbance or mechanical damage to sagebrush, caused by livestock concentrations near leks during the breeding season or on key winter habitats.

Cooperative research is needed to identify and evaluate effects of various grazing management plans on the interaction of sage-grouse, commodity production, and societal values. Results should be used to develop grazing plans that eliminate or minimize potential conflicts
The management practices described in Conservation Benefits of Rangeland Practices (David Briske editor Second edition 2012) and *Best Management Practices for Grazing* (Montana Department of Natural Resources and Conservation 1999) or other texts describing best management practices for rangeland grazing can be used as guideposts to implement many grazing actions. In addition, the conservation actions in this section describe some considerations that may be specific to sage-grouse and sagebrush habitats

It has been found that wildlife species exhibit varied responses to different grazing treatments (Krausman et al in Briske 2012). In critical sage grouse habitats in core sage grouse areas, specific accommodations for sage grouse are recommended. **See Vegetation section below for specific**

recommendations on grass height and structure objectives recommended to conserve sage-grouse habitat.

Table 16. Conservation goals, strategies, and actions for minimizing the threat of livestock grazing.

Measure of Success – Maintaining a stable population trend from spring lek counts necessary to reach the state goal of 250 males.		
Goal	**Strategies**	**Conservation Actions**
Manage grazing to maintain soil conditions and ecological processes necessary for a properly functioning sagebrush community that maintains a viable sage-grouse population.	Maximize grazing regimes to improve rangeland vegetation composition and maintain residual grass	1) Use scientific data and historic information to establish baseline information when evaluating soil conditions and ecological processes and when monitoring seasonal sage-grouse habitats (Range Health Assessments). 2) Set specific habitat objectives and implement appropriate grazing management to achieve those objectives and maintain or improve vegetation condition and trends. 3) Offer private landowners incentives when and where appropriate to achieve sage-grouse objectives. 4) Establish a monitoring plan to ensure that desired ecological conditions and sage-grouse response are achieved.
	Restore sagebrush communities that have been significantly altered by past grazing management practices	1) Implement appropriate grazing management strategies and range management practices where soil conditions and ecological processes will support sage-grouse and desired commodities and societal values. 2) Establish suitable goals for sagebrush communities that have deteriorated to such an extent that livestock management alone will not be sufficient to obtain habitat objectives. 3) Offer private landowners cost share assistance and incentives when and where appropriate to achieve sage-grouse objectives.
	Minimize impacts from drought that may negatively affect the native plant communities, and reduces forage production, and thus reduces sage-grouse habitat	1) Livestock managers should have drought management strategies or plans (e.g. water facilities; forage sources) formulated for implementation during periods of drought. 2) Consider effects of livestock and wildlife distribution on sage-grouse prior to developing additional water sources. 3) Offer private landowners cost share assistance and incentives when and where appropriate to achieve sage-grouse objectives.

	Establish grazing plans that can maximize the composition and/or structure of the native plant community to benefit seasonal sage-grouse habitats.	1) Monitor the response of forbs (kinds, vigor, and production) and the compositional diversity of native species with respect to livestock grazing, evaluate the data, and make necessary adjustments. 2) Identify reasons for lack of grass and forb cover in sagebrush communities and recommend/implement practices to increase the native herbaceous understory. **(Reference ecological site descriptions for determining plant community potential)** 3) Within Priority Conservation Areas (Figure 8), adjust grazing to minimize conflict among the production of commodities and protection of societal values. 4) Develop monitoring protocols to assess the grazing management being incorporated. 5) Adjust stocking levels (up or down) or within the carrying capacity of the pasture or range. Adjustments should be based on monitoring programs evaluating plant and soil response with respect to actual livestock use, weather, wildlife use, insects, and other environmental factors. 6) Adjust duration of grazing periods within the carrying capacity of the pasture or range to maintain sage-grouse habitat. Adjustments should be based on monitoring programs evaluating plant and soil response with respect to actual livestock use, weather, wildlife use, insects, and other environmental factors.
	Conserve riparian areas (wet meadows, seeps, streams) that are important resources for sage-grouse and livestock.	1) Design and implement livestock grazing management practices (riparian pastures, seasonal grazing, development of off-stream water facilities, etc.) to achieve riparian management objectives. This may require additional water developments and/or fencing to achieve objectives. Additional two-track trails may be necessary. Decisions will be made on a case by case basis whether benefits from protection of riparian areas will be offset by additional developments. 2) Ensure the sustainability of desired soil conditions and ecological processes within upland plant communities following implementation of strategies to protect riparian areas. This can be achieved by: a) Protecting natural wet meadows and springs from over-use while developing water for livestock, b) Planning the location, design, and construction of new fences to minimize impacts on sage-grouse. c) Avoid heavy utilization of grazed pastures to compensate for rested pastures (a year of rest cannot compensate for a year of excessive use).

	Minimize potential for sage-grouse to be disturbed or displaced by concentrations of livestock near leks or winter habitat.	1) Remove concentrations of livestock on leks or other key sage-grouse habitats. a) Avoid placement of salt or mineral supplements near leks during the breeding season (Mar-Jun), b) Avoid supplemental winter feeding of livestock, where practical, on sage-grouse winter habitat and around leks. c) Offer private landowners cost share assistance and incentives when and where appropriate to achieve sage-grouse objectives. (see Implementation section V for NRCS and NDGF programs)
	Sage-grouse seasonal ranges encompass private, state, and federal land. Coordinate and prioritize habitat values across the respective ownerships that are important to sage-grouse.	1) Encourage land management practices that provide for maintaining or enhancing sage-grouse habitat on private, state, and federal land. 2) Encourage coordination of management activities on all properties to provide yearlong benefits to sage-grouse. This may require reasonable compromise in establishing management practices to achieve specific goals. 3) Offer private landowners cost share assistance and incentives when and where appropriate to achieve sage-grouse objectives. (see Implementation section V for NRCS and NDGF programs)
Minimize sage-grouse fence collisions from livestock fences.	Remove the risk of collision mortalities and/or predation on sage-grouse by hawks, eagles, and ravens by removing perches.	1) If portions of existing fences are found to pose a significant threat to sage-grouse as strike sites or raptor perches, mitigate through moving or modifying posts, etc. 2) Increase visibility of those fences by flagging. 3) Offer private landowners cost share assistance and incentives when and where appropriate to achieve sage-grouse objectives. 4) Mark fences with permanent flagging or other suitable device to reduce sage-grouse collisions on flat to gently rolling terrain in areas of moderate to high fence densities located within 1 of occupied leks. 5) Identify and remove unnecessary fences. (see Section V Implementation for NRCS and NDGF cost share programs)

	Proposal of new fences near sage-grouse leks and winter ranges.	1) Restrict new fences within 1 mile of lek, on state, federal or private lands. 2) Avoid placing fences in winter ranges on state and federal lands. 3) Offer private landowners cost share assistance and incentives when and where appropriate to achieve sage-grouse objectives.
Minimize impacts of using pesticides and herbicides to control insects and herbaceous plants that provide a food source for grouse.	Pesticides and herbicides may adversely impact the kinds and number of foods available in the form of insects and forbs and can directly affect chick survival.	1) Evaluate ecological consequences of using pesticides to control grasshoppers or other insects. 2) Evaluate ecological consequences of broadcast herbicide use on forbs and other important sage-grouse foods. 4) Minimize use of pesticides and herbicides within 1 mile of known grouse nesting areas, leks, or brood-rearing areas. 4) Develop educational materials detailing effects of pesticides and herbicides on sage-grouse.

VEGETATION

Sage-grouse require large expanses of big sagebrush habitats with healthy, diverse understories of grasses and forbs. In some areas, past management of rangelands has altered the density, structure, and composition of sagebrush communities—sometimes creating a variety of conditions that do not meet the desired condition described for sage-grouse seasonal needs. Composition of grasses and forbs, condition and densities of sagebrush, and other habitat-related conditions vary and include extremes. Variation may result from ecological site differences and environmental factors such as climate or land management practices such as fire management, grazing, weeds, and recreation. Restoring or enhancing sage-grouse habitats requires diverse strategies.

Sage-grouse habitats face the risk of sagebrush removal by prescribed burning, herbicide application, over grazing, or by conversion to cropland. Conserving sagebrush habitats on private and public lands is by far the most effective approach to assuring long-term maintenance of sage-grouse abundance and distribution. Incentive-based, voluntary programs are available for protecting privately-owned sage-grouse habitats from detrimental habitat conversion. In some areas, there are opportunities for planting cropland back to sagebrush-grassland habitat. In North Dakota survival rates for planting big sagebrush have been very successful. The NRCS evaluated the effectiveness of different big sagebrush planting techniques, including site selection and planting time (NRCS 2012, unpublished data). Results indicate that planting big sagebrush plugs had about a 90% survival rate. Furthermore big sagebrush was broadcast by hand from the back of a pickup in snow cover and in the areas where the seed was broadcast successful stands of big sagebrush now occur (see vegetation table for recommendations).

Grass and Nesting habitat

Nesting habitat requirements for sage-grouse have been extensively documented across the range of sage grouse (Gregg et al. 1994, Connelly et al. 2000, Hagen et al. 2007). Connelly (2000) published guidelines that have been accepted as the standard for both vertical and horizontal cover for nesting habitat. Recent research in both North and South Dakota identified habitat characteristics that differ somewhat from areas in other parts of sage-grouse range (Kaczor 2008, Herman-Brunson 2009). Connelly et al. (2000) recommended 15-25% sagebrush canopy coverage for nesting sage-grouse. Meta-analysis (Hagen et al. 2007) confirmed mean sagebrush canopy coverage at sage-grouse nest sites was 21.51%. In North Dakota, sage-grouse selected areas with the best sagebrush cover available (roughly 10%), but was far less than what Connelly and Hagen recommended. In contrast to sagebrush, grass structure exceeded both management recommendations (Connelly et al. 2000) and range-wide averages (Hagen et al. 2007). This suggests that sage-grouse in North and South Dakota utilize what cover is available for nest concealment but select areas with taller grass as a surrogate for shrub cover.

Being on the eastern edge of the range and in a transition zone between shrub-steppe and prairie grasslands, sage-grouse in the North Dakota select resources to meet the required concealment but utilize different vegetative structure and composition (mainly grass) compared to other areas of sage-grouse range. Furthermore the majority of resource selection studies on sage-grouse measure grass height, but measurements are taken on new growth grass following either a successful hatch or depredation event. Grass is measured at least 15-30 days post-nest initiation, which does not represent the site at time of selection and is always biased high. In order to accurately represent grass height at time of nest site selection, residual grass height must be measured. Holloran (2005) reported that taller and thicker residual grass cover characterized successful sage-grouse nesting habitat and that reducing the amount of residual grass in sagebrush habitats can negatively impact the quantity and quality of sage-grouse nesting habitat. Additionally taller grass height effectively discriminated between successful and unsuccessful nest locations in the Powder River Basin of Wyoming (Doherty et al. 2011). Taylor and Naugle (2010) reported that increasing grass height by 2 inches resulted in a 10% increase in nest success and an 8% increase in population growth rate. Holloran (2005) reported residual grass height was 37% less than new growth grass height in Wyoming.

Given the importance of grass structure in the North Dakota for nesting sage-grouse, a residual grass height following summer grazing of 6 inches is recommended. Six inches is roughly 37% less than the 10 in. height measured post-nest initiation Herman-Brunson (2009) recorded in North Dakota for sage grouse nests. During nesting season a minimum of 10 inches of height be maintained in important nesting areas, mainly areas where sagebrush stands is 10% total cover. The entire landscape does not need to meet these requirements only areas that have been designated as important nesting habitat (see Figure 6).

Table 17. Conservation goals, strategies, and actions for minimizing the threat of vegetation management.

Measure of Success – Maintaining a stable population trend from spring lek counts necessary to reach the state goal of 250 males.		
Goal	**Strategies**	**Conservation actions**

Manage sagebrush communities in a manner that results in improved health and no net loss of sagebrush habitats and where possible increasing big sagebrush habitats.	Minimize potential of privately owned sagebrush-grassland habitats at risk of being converted to cropland.	1) Provide cost share assistance and incentives for habitat conservation such as the North Dakota Game and Fish Department-administered Private Landowner Initiative (PLI), which provides cost share assistance and incentive payments to private landowners for protecting sagebrush habitats from plowing, herbicides, and burning (see Section V). 2) Promote sagebrush-grassland habitat conservation through USDA programs such as the Natural Resources Conservation Service (NRCS), Sage-Grouse Initiative and Working Lands for Wildlife programs. 3) Protect habitat by purchase of conservation easements from interested landowners.
	Prioritize and protect quality sagebrush habitats (Figure 6). .	1) Provide landowners with high quality habitat maps of important sage-grouse seasonal use areas on their land or allotments. 2) Evaluate the ecological site potential and desired condition, and develop specific objectives and management plans within specific landscapes and ownership. 3) If sagebrush is lacking < 10 % canopy. a) Develop and implement grazing practices that influence big sagebrush establishment and growth. b) Inter-seed historical breeding and winter habitats with the appropriate sagebrush species. c) Identify and promote seed sources for habitat restoration efforts, d) Encourage voluntary use of big sagebrush in habitat incentive programs, e.g., Conservation Reserve Program, and work to develop additional funding sources for such programs, e) Reclaim and/or re-seed areas where sagebrush has been lost or reduced by disturbance (fire, cropping, etc.), f) Promote sagebrush plantings on project areas occurring within sage-grouse habitats.

		4) If sagebrush is > 10% canopy. a) Develop and implement techniques to increase herbaceous diversity and density within ecological limits. b) Evaluate the ecological site potential and desired condition within the context of a larger landscape. c) Adjust livestock grazing management when necessary, to promote forb establishment and recruitment. d) Identify large areas of introduced plant species as crested wheatgrass (*Agropyron cristatum*) and determine if restoration efforts are appropriate. e) Interseed appropriate breeding habitats with forbs where necessary. f) Protect/enhance riparian areas to encourage succulent vegetation and re-establishment of shrubs if they are lacking.
	Maximize residual understory for nesting sage-grouse.	1) Develop cost share assistance and incentives to promote desired habitat conditions on private lands. 2) Manage grazing by domestic livestock to retain and promote residual cover in all breeding habitats with an emphasis on nesting areas. 3) Ensure that grazing allotment plans include objectives for sage-grouse in sage-grouse habitats. 4) Monitor USFS/BLM/State allotment plans and regulations, and promote changes where necessary.
	Restore Big sagebrush habitats that have been degraded to a level that will not support sage-grouse habitat needs.	1) Work with landowners to re-establish sagebrush-grassland habitats through programs such as the Habitat Plot Program or CRP SAFE, Sage-Grouse Initiative (SGI), Working Lands for Wildlife. 2) Big sagebrush restoration should follow the recommendations below: a) Plantings should be made during early spring or late fall.

		b) Propagate big sage-brush plugs in a greenhouse in January/February to be planted in early spring. c) Select planting sites with loam, sandy loam, or sandy surface textures to ensure good soil to root contact. d) When possible, utilize a Giddings probe with auger to drill holes for plantings. e) Hand broadcasting is a viable option to spread localized big sagebrush cover. Broadcasts should be done over snow cover in the late winter.

ISSUES OF CONSERVATION CONCERN

The following are considered to be issues of conservation concern in North Dakota. The following conservation actions should be used to minimize the potential impacts that may occur.

PREDATION

Predator populations, their effects on sage-grouse populations, and issues surrounding predator control concern landowners, wildlife managers, and the public. Some people believe that predator populations have increased due to lack of predator control and that predators are the primary factor limiting sage-grouse populations. Others contend that habitat fragmentation and degradation are the primary reasons for population declines, and that these land use changes contribute to increased rates of predation.

Predation does impact sage-grouse to varying degrees. The impact of predation can vary as changes occur in the predator/prey environment seasonally, from year to year, and geographically. Many native mammals, raptors, and other species prey upon sage-grouse eggs, juveniles, and adults. Bull snakes can be an effective nest predator. Invasive species like red fox and raccoon have expanded their range into sagebrush steppe communities and can impact success of ground nesting birds. Quality and quantity of the sagebrush habitat, composition of the predator community, and weather patterns such as drought or severe winters likely determine both annual and long-term carrying capacity for sage-grouse. Sage-grouse populations appear to cycle from low to high numbers under the current combination of habitat, predation, and weather influences.

Certain vital rates such as adult hen survival, nest success, and juvenile recruitment drive sage-grouse population dynamics. Attempting to modify these vital rates to increase populations through either direct predator control actions; or by manipulating habitat to indirectly control predation rates should be evaluated in terms of cost effectiveness and efficiency. The influence of weather patterns on these same vital rates should likewise be integrated into these discussions.

Table 18. Conservation goals, strategies, and actions for minimizing impacts from predation.

Measure of Success – Maintaining a stable population trend from spring lek counts necessary to reach the state goal of 250 males.		
Goal	**Strategies**	**Conservation Action**

Minimize predation to enhance sage-grouse survival and production where appropriate.	Reduce predator impacts on sage-grouse.	1) Assess population status and trends of important predator species (both native and invasive). 2) Developed a plan with Wildlife Services to decrease predator abundance within sage-grouse seasonal habitats. 3) Remove predators that may be reducing nest success and recruitment within breeding and brooding habitats. 4) Expand public information efforts designed to increase public awareness on the role of habitat, predation, and weather on sage-grouse population trends.
	Reduce habitat fragmentation and poor quality habitat that may be affecting mortality rates by allowing increased predation.	1) See (Vegetation section Table 17) 2) Implement actions to improve the structure and composition of sagebrush communities to meet desired conditions for sage-grouse seasonal habitats. 3) Maintain and restore sagebrush communities where appropriate for sage-grouse populations. 4) Protect existing habitats through conservation easements, incentives, or other practices such as long-term leases.
	Minimize anthropogenic alterations on the landscape that may directly facilitate increased predation.	1) See (Renewable and Non-Renewable section Table 12) 2) Reduce man-made perches in sage-grouse breeding, nesting, and wintering habitats. 3) Placement of fences should follow prescriptions detailed in the discussion of infrastructure. 4) Reduce the availability of predator "subsidies" such as human-made den sites (nonfunctioning culverts, old foundations, wood piles) and supplemental food sources (garbage dumps, spilled grain, etc.) that contribute to increased predator numbers.

NOXIOUS WEED MANAGMENT

The increase in fire frequency has been facilitated by the incursion of nonnative annual grasses, primarily *Bromus tectorum and Taeniatherum asperum*, into sagebrush ecosystems (Billings 1994; Miller and Eddleman 2001). Exotic annual grasses and other invasive plants also alter habitat suitability for sage-grouse by reducing or eliminating native forbs and grasses essential for food and cover. Annual grasses and noxious perennials continue to expand their range, facilitated by ground disturbances, including wildfire (Miller and Eddleman 2001), improper grazing (Young *et al*. 1972, 1976), agriculture (Benvenuti 2007), and infrastructure associated with energy development (Bergquist *et al*. 2007). Management of this threat is two-pronged - control (stopping the spread) and elimination of established invasive annual grasses. These activities should be prioritized in all sagebrush habitats because once established, invasives are extremely difficult to eliminate.

Certain species of plants are currently designated as "noxious" in North Dakota as well as others that are termed "troublesome" (NDSU Ext. Service 2004). "Noxious" applies only to species so designated by the North Dakota Department of Agriculture. County weed boards may add species to local lists that have not been designated by the state, but at a minimum must include those species designated by the Department of Agriculture. Resource managers, both public and private, have a statutory responsibility to develop management plans for treatment of noxious weeds on the land they own and/or manage. The magnitude of weed infestations, however, often prevents appropriate and timely treatments.
Noxious weeds and other invasive plant species, such as annual grasses, displace more desirable native plant species and cause significant adverse biological and economic effects by reducing productivity of healthy rangeland. Noxious weeds impact all classes of wildlife and domestic livestock. Plant species designated as noxious weeds are classified as either established and spreading or newly introduced--or are recognized as potential invaders. Noxious weed species present in adjoining states and provinces are a threat in North Dakota.

Although introduction and subsequent spread of weeds can occur through several means, the most pervasive occurs along transportation and floodplain corridors. One of the primary concerns of resource managers is the spread of noxious weeds by vehicles. Disturbed ground typically serves as the initial point of establishment, with the amount of disturbed ground being directly proportional to the overall susceptibility of an area to weed invasion.

Disturbance can take many forms and causes—the most common being human-caused activities, such as road building. Often overlooked, but equally important, are climatological and biological influences. Recurrent flooding and wildfires, as well as prolonged drought, can disturb plants and topsoil over large areas. Biological forms of ground disturbance include burrowing activities by small mammals and localized over-use by livestock and/or wild ungulates. These large- and small-scale disturbances provide opportunity for invasive species to become established.

Herbicide treatment is the most widely employed method to control noxious weeds. For most noxious weeds, this method of treatment provides immediate, effective results. Problems occur when weed seeds have been allowed to build up in the soil and/or surrounding land areas and left untreated. Re-establishment in such cases occurs from seed banks and off-site reinvasion. This cycle of treatment/re-establishment is expensive to treat and requires dedication and immediate action by resource managers when weeds reappear within treated areas. Prevention, which requires focused purposeful action in surrounding infested and uninfested areas, provides the most cost-effective control. Prevention works best when management strategies acknowledge a threat and prioritize efforts to eliminate potential sources of infestation and expansion.

Chemical control of noxious weeds is efficient but might pose some toxicological risk to sage-grouse and other wildlife during treatment. Pathways of exposure include absorption from treated plants, inhalation of chemical particles suspended in the atmosphere, and direct ingestion of treated plants (Montana Fish, Wildlife and Parks 1994). If properly applied, however, toxicological risks would be minimal. A reduction of forbs important to sage-grouse during brood-rearing could have more serious consequences to local populations, with the magnitude of effects dependent on the scale of treatment. However, resource managers must realize that untreated noxious weeds are ultimately more effective at competitively displacing desirable plant components than short-term, transient impacts from proper herbicide application.

Table 19. Conservation goals, strategies, and actions for minimizing the spread of noxious weeds.

Measure of Success – Maintaining a stable population trend from spring lek counts necessary to reach the state goal of 250 males.		
Goal	**Strategies**	**Conservation Actions**
Restore altered ecosystems such that non-native invasive plants are reduced to "background" species (less than 5% of the total vegetative cover) with minimal opportunity for expansion.	Identify and remove current noxious weed infestations within and adjacent to occupied sage-grouse habitat.	1) Inventory and map existing noxious weed populations within and adjacent to occupied sage-grouse habitat or suspected range. 2) Develop habitat-specific weed management plans for known sage-grouse ranges, using the inventory and map information developed in the action described above.
Maintain habitat quality for both wildlife and livestock interests through proactive weed management.		1) Promote measures that prevent the introduction and spread of weed seeds and other reproducing plant parts. 2) Develop and implement management techniques that minimize the risk of infestation. 3) Use weed seed-free livestock forage and mulch. 4) Where feasible, avoid vehicle movement through infested areas. 5) Use weed-free seed for re-establishment of vegetation. 6) Eliminate unnecessary soil disturbance and vehicle access/movement into occupied sage-grouse habitat. Limit vehicle use to established roads only. 7) Regularly monitor access points and roads for weed establishment.
Educate land managers and users (general public) about the threat noxious weeds pose to native plant communities and work together to find	Cooperative with other agencies and landowners to integrate weed management efforts to ensure critical sage-grouse	1) Develop partnerships with regional public and private land management units. Solicit involvement of local weed management specialists, private landowners, wildlife biologists, and range ecologists to share knowledge and responsibilities on noxious weed issues.

appropriate management solutions.	habitat is protected from invasive plants.	2) Establish goals and set priorities that encompass the needs of both livestock and wildlife managers so all parties are working under a similar plan. 3) Provide training to appropriate staff on the proper selection and use of herbicides, including effects that climatic conditions and soils types have on applications of herbicides. 4) Maintain proper operating herbicide application equipment as well as proper herbicide application records, according to pesticide laws. 5) Conduct monitoring and develop follow-up procedures for treated areas. 6) Participate in integrated weed management training 7) conducted by state and federal agencies, local experiment stations, and local (county) weed districts. 8) Educate all field personnel on weed identification, manner in which weeds spread, and methods of treating weed infestations.
Minimize effects of weed control treatments on non-target organisms.	Maintain viable sagebrush habitat and populations of sage-grouse while eradicating infestations of noxious weeds.	1) Employ integrated weed management treatment methods such as a combination of biological and cultural, e.g., grazing, mowing, or seeding, treatments in conjunction with herbicides to manage weeds in sage-grouse habitat. 2) Use the most selective herbicides where chemical treatment is appropriate, to minimize loss of non-target plant species. Develop cost-share guidelines for those instances when expensive selective herbicides are deemed necessary. 3) Restore plant communities with desired species adapted to ecological site, using proven management techniques where biologically feasible. A restoration program may be necessary if conditions prevent natural native plant reestablishment.
Provide the necessary funding mechanisms and dedicated labor to act immediately when new infestations are identified within sage-grouse habitat.	Identify weed management as a budget item in sage-grouse management plans.	1) Weed management costs should be an identified budget item in sage-grouse management plans. Money should be dedicated for monitoring and education as well as direct treatment expenses. 2) Establish partnerships or formal agreements with local (county) weed districts if appropriate to utilize their equipment and/or personnel.

RECREATION DISTURBIANCE OF SAGE-GROUSE

Sage-grouse are sensitive to disturbance at leks, nest sites, and in critical winter habitats. Human activity in these habitats may intentionally focus on sage-grouse (lek viewing, monitoring, photography, etc.), or may be incidental to other recreational activities (OHV use, hiking, horseback riding, etc.). Disturbances can be diminished or minimized at critical times and on seasonal ranges by concentrating use at designated times of year or day, restricting activities within 2 miles of leks (Joslin and Youmans 1999), and/or allowing certain types of use only at designated sites, e.g. viewing and/or photography at leks.

Monitoring sage-grouse populations and habitats is essential at leks and other critical habitats. Other multiple use activities may disturb leks and other habitats. Recreational and monitoring activities should be considered cumulatively with other activities as part of assessing overall levels, effects, and approaches for managing human disturbance of sage-grouse. Hunting as a recreational activity does not concentrate human use on seasonal ranges.

Table 20. Conservation goals, strategies, and actions for minimizing impacts from recreational activities.

How can we continue to provide sage-grouse viewing and other recreational opportunities while minimizing impacts to sage-grouse and sagebrush habitats?		
Goal	**Strategies**	**Conservation Actions**
Minimize impacts of recreational viewing of sage-grouse at leks.	Minimize recreational activities within sage-grouse habitats that can result in habitat loss and fragmentation (e.g. creation of off-road trails, camping facilities) and both direct and indirect disturbance to the birds (e.g. noise, disruptive lek viewing, hunting dog trials, and dispersed camping).	1) Agencies should manage where recreational viewing of leks can occur. 2) Educational materials should be developed and provided to the public indicating the effects of concentrated recreational activities and the importance of seasonal ranges to sage-grouse. 3) Establish viewing guidelines, i.e., distance, timing, approach methods, signage, parking areas, and area closures. 4) Designate particular leks for public viewing, and where appropriate, restrict viewing and photography to designated sites. 5) Determine, through the agency(ies) and the public working together, whether or not other recreational activities disturb leks, nesting, or winter habitats.
Minimize impacts of recreational activities unrelated to sage-grouse viewing.		1) Reduce disturbance of sage-grouse and degradation of sagebrush habitats through use of site-specific monitoring, and where appropriate, develop seasonally restrictive public access to specific lek, nesting, and winter habitats. 2) Consider sage-grouse needs and avoid critical seasonal habitat when developing roads and OHV management plans. 3) Encourage recreationists to avoid continuous or concentrated use within two miles of leks from 15 March to 15 June.

		4) Issue special use permits for certain activities with distance and timing restrictions to maintain the integrity of breeding habitat.

HARVEST MANAGMENT

Hunting is a direct form of mortality to sage-grouse but is compatible with healthy sage-grouse populations although some do think that "surplus birds" should not be removed from what they see as a species "at risk."

Sage-grouse abundance is affected by long- and short-term population changes. Long-term population declines have been related to loss of sagebrush habitats essential to sage-grouse (Connelly et al. 2000a). Although not irreversible in nature, conditions resulting in long-term declines are likely to persist. Within the long-term decline are short-term fluctuations in sage-grouse abundance due to variable climatic events, e.g., drought or severe winters.

Sage-grouse hunting is a recreational and culturally important tradition. Analysis of wings collected from hunters is the best source of information on annual productivity of sage-grouse and the influence of changing climatic conditions on productivity and population composition. Juvenile/adult ratios generated by wing analysis also can indicate approaching changes in male attendance on leks in subsequent years. Lek surveys determine the number of active leks while lek counts determine number of males/lek and are the best source of population trend information.

Sage-grouse exhibit relatively low productivity and high survival when compared with other upland birds. Nevertheless, sage-grouse have significantly declined in North Dakota. Loss of habitat and degradation of existing habitat is believed to be the most significant factors affecting sage grouse in North Dakota. An appropriate harvest rate has not been determined for greater sage-grouse populations but a harvest equal to 5-10% of the autumn population may be appropriate (Connelly et al. 2000b).

In 2008 the North Dakota sage-grouse hunting season was closed following a significant decline in the spring population resulting in fewer than 100 males (conservation action 1, below). In order for the season to be re-opened several factors will be considered 1) multiple years of a stable population above 100 males 2) public opinion regarding opening the season 3) habitat change and availability necessary to support a self-sustaining population 4) season structure (changing to a lottery type season with limited permits available) and 5) US Fish and Wildlife Services listing decision scheduled for 2015.

Table 21. Conservation goals, strategies, and actions for harvest management.

Measure of Success – Maintaining a stable population trend from spring lek counts necessary to reach the state goal of 250 males.		
Goal	**Strategies**	**Conservation Actions**
Manage for harvests that respond to changes in sage-grouse populations and maintain or increase sage-grouse populations.	Allow for an adaptive approach in managing sage-grouse hunting seasons.	3) The sage-grouse season will remain closed until: a) The population remains stable for a period of 3 years above 100 males counted during the spring census.

		b) Habitat availability necessary to support a self-sustaining population is assessed and considered viable. 4) If the above criteria are achieved a sage-grouse hunting season will be considered under the following criteria: a) Permits available through a lottery b) Number of permits will be based on population abundance and calculated using a population viability model. c) Season length will be two days. d) Bag/possession limits one sage-grouse. e) Season dates will be determined. 5) Continue standardized wing collection protocol to evaluate the influence of environmental conditions on sage-grouse productivity and population trends 6) Expand public information efforts designed to increase public awareness of the role of sage-grouse hunting.

OUTREACH, EDUCATION, AND IMPLEMENTATION THROUGH LOCAL SAGE-GROUSE WORKING GROUP

Public education, outreach, and "inreach" (communication within agencies and groups to increase understanding) about sage-grouse conservation should be undertaken through a partnership between state and federal agencies, non-governmental organizations, and citizens. Effective conservation of sage-grouse requires collaboration between public land managers, private landowners, wildlife professionals, extension service agents, and others to develop and implement appropriate regional protection strategies.

Implementation requires a sound biological foundation. Most information about shrub-steppe habitats and sage-grouse is contained in technical manuscripts. User-friendly information is needed to manage habitats to conserve sage-grouse and other sagebrush-associated species. Participating agencies, groups, and individuals will need to develop and provide educational materials.

Table 22. Conservation goals, strategies, and actions for improving outreach and education.

Educate and inform the public and agencies about sage-grouse populations and habitat needs, and coordinate the implementation of the conservation plan on both public and private lands? Measure of Success – No net loss of sage-grouse numbers indicated by maintaining a stable population trend from spring lek counts.		
Goal	**Strategies**	**Conservation Action**

Improve public and agency understanding about conservation of sage-grouse and sagebrush communities.	Educate general public to current information on ecological needs and methods for conserving sage-grouse and sagebrush habitats. Materials are needed to present this information.	a) Working with other agencies and local groups develop educational materials (brochure, Power Point presentation, camera-ready ads, press releases, public service announcements, event invitations and surveys, websites, newsletters, and research information). b) In cooperation with the local sage-grouse working group, present materials of sage-grouse conservation in community meetings that bring statewide technical group participants and regional agency staff together with local people.
Implement a conservation strategy for sage-grouse using the Sage-grouse Conservation Plan as a model.	Implement a Statewide plan that can cross geographical, cultural, and socioeconomic boundaries.	1) Implement a local work group. A work group includes but is not limited to agency personnel (BLM, USFS, NRCS, NDG&F, USFWS), landowners, (ranchers, farmers, grazing association), sportsmen, legislators, businessmen, media, etc. 2) Develop a list of incentive programs presently offered that could be used to prevent the loss of sage-grouse habitat. 3) Develop and distribute information on best management practices and incentives for sage-grouse and sagebrush obligates.[1] 4) Provide sage-grouse habitat maps and recommendations to county planners, public land agencies, and other interest groups and land managers. 5) Encourage county governments to offer incentives to developers who protect and enhance sage-grouse habitat.

[1] Sagebrush obligates are species that depend on sagebrush during the breeding season or year round: these include sage sparrow, Brewer's sparrow, sage thrasher, sage-grouse, pygmy rabbit, sagebrush vole, sagebrush lizard and pronghorn antelope. Many other species depend on the sagebrush community to a lesser degree. We refer to all these species as sagebrush-associated species (Paige & Ritter 1999)

SECTION V: IMPLEMENTATION

This plan was developed to fulfill the mission statement of the North Dakota Game and Fish Department, which is to protect, conserve and enhance fish and wildlife populations and their habitat for sustained public consumptive and appreciative use. Furthermore this plan was developed to identify threats to sage-grouse outlined in the 2013 COT report and implement conservation actions to ameliorate threats within state jurisdiction.

In order to be successful at conserving sage-grouse for future generation, the following goals will help achieve a stable, self-sustaining population of sage-grouse in North Dakota.

1. Improve and maintain existing sagebrush/steppe habitat.
2. Restore sagebrush/steppe habitat to areas that have been converted to cropland/tame grass.

3. Restore connectivity to existing habitat.
4. Establish sagebrush /steppe habitat capable of supporting a stable population trend from spring lek counts of 250 males.

The following sections outline the process the FWS uses to assess the effectiveness of this plan. Additionally this section identifies state and federal programs that can be utilized to achieve the above goals.

Elements of the plan as directed by the ESA and the PECE policy

The process the FWS uses for evaluating conservation efforts when making listing decisions is outlined in the Policy for Evaluation of Conservation Efforts (PECE). This is a requirement under the Endangered Species Act of 1973 (Act). While the Act requires the FWS to take into account all conservation efforts being made to protect a species, the policy identifies criteria used in determining whether formalized conservation efforts that have yet to be implemented or to show effectiveness contribute to making listing a species as threatened or endangered unnecessary. The policy applies to conservation efforts identified in conservation agreements, conservation plans, management plans, or similar documents developed by Federal agencies, State and local governments, Tribal governments, businesses, organizations, and individuals.

The following outlines the basic structure of the PECE process. FWS has established five criteria that it takes into consideration when it receives a petition for listing a species. These criteria are used in analyzing available data and threats to the species. The five categories that the FWS uses to assess populations at risk are:

1. Present or threatened destruction, modification, or curtailment of habitat or range;
2. Overuse for commercial, recreational, scientific or educational purposes;
3. Disease or predation;
4. Inadequacy of existing regulatory mechanism;
5. Other natural or manmade factors affecting the species continued existence.

In order for a conservation effort to affect the listing decision, PECE requires the FWS to ensure the effort's implementation is highly probable and will be sufficiently effective. In order to make that evaluation all proposed conservation actions must include the following:

1. To assess the certainty that the action will be implemented:
    A. Describe staffing and funding;
    B. Describe the legal authority of the parties agreeing to the conservation effort and provide proof of their commitment to proceed;
    C. Describe any legal procedure that must be followed in order to implement a project and provide proof that the requirements have been met;
    D. Describe any permits or permission that must be obtained to proceed with the effort and provide information indicating why you think these will be obtained;
    E. Provide information on who will be participating in the action and estimates of what level of participation is expected;
    F. Laws needed to implement an action must already be in place;
    G. Provide information stating why you believe the funding for the action will be forthcoming;

H. The action has a schedule to begin and end;
I. Proof all parties involved with the action are in agreement to its implementation.

2. To assess the effectiveness of the action:
   A. Describe the nature and extent of the threats and how the action will reduce those threats;
   B. Describe incremental objectives for the action and dates when they are expected to be attained;
   C. Identify the steps necessary to implement the action;
   D. Identify the scientific parameters that will be used to monitor progress and how they will be measured;
   E. Provide progress reporting schedules and parameters;
   F. Show that principles of adaptive management are incorporated in the action.

The project must have explicitly stated objectives and dates for achieving them, steps necessary to implement the efforts, and standards for measuring progress. In addition, laws and regulations necessary to implement the conservation effort must be in place and there must be a high level of certainty that funding is available to carry out the project.

CCAA (Candidate Conservation Agreements with Assurances)

Implementation of a Candidate Conservation Agreement with Assurances (CCAA) fulfills the requirements of the PECE process. A CCAA is a voluntary conservation agreement between the FWS and one or more non-Federal landowner(s). The FWS works with its partners, including local, state and federal agencies, to:

- Identify threats to candidate species, such as sage-grouse.
- Plan the measures needed to remove or reduce the threats and conserve these species
- Identify willing landowners
- Develop agreements
- Design and implement conservation measures
- Monitor their effectiveness

Benefit to Private Landowners and Private Industries

The CCAA program is only available for non-Federal landowners on non-Federal lands. A rancher's primary concern is to remain a profitable business. Despite the challenges, there are many reasons ranchers stay in the business including making their own management decisions, viewing wildlife and open spaces as well as retaining a traditional way of life. Signing a programmatic CCAA for sage-grouse is a voluntary management decision made by individual ranchers. There are several benefits of enrolling a private ranching operation in a CCAA, one of which is implementing conservation measures to help sage-grouse populations remain viable, while preventing the FWS's need to list the species on the Endangered Species Act. The FWS's top "factor" or reason for listing the sage-grouse is loss of habitat. Ranchers enrolling their operation in a CCAA assure the FWS their land will remain un-subdivided or un-fragmented. The most direct benefit provided to ranchers enrolling in a CCAA are "assurances" provided by the FWS. These assurances protect participating ranchers from additional regulatory responsibilities, in the event the sage-grouse is listed as Threatened or Endangered.

AN ASSESSMENT OF SAGE-GROUSE/SAGEBRUSH CONSERVATION PROGRAMS

Implementation of this plan will require both interagency cooperation and public input. Agencies will need to coordinate monitoring of populations and habitat and research projects related to conservation of sage-grouse. Agencies and organizations, private companies, work groups or individuals that become involved in conservation planning and projects will need to assess funding towards those projects. It provides a brief summary of state and federal programs that can be used to implement projects by organizations and individuals.

North Dakota Game and Fish Department (NDGFD)

The North Dakota Game and Fish Department has several programs under the Private Land Initiative (PLI) that can be used in the sagebrush/steppe area of southwestern North Dakota. These include: (1) CRP Cost-sharing; (2) Working Lands; and (3) Habitat Plots.

Conservation Reserve Program Cost Sharing

This program offers cost-share funds to landowners for establishing cover on acres enrolled in the USDA Conservation Reserve Program. It provides assistance in establishing grass and shrub (sagebrush) cover on lands enrolled in the program. Cost-share on seed, seeding, and seedbed preparation will be provided and can be applied to new, established, or renovation seedings. Additional signup incentive payments are also available for areas that fall within USDA's State Acres For wildlife Enhancement (SAFE) project area.

Working Lands Program

The Working Lands Program recognizes and rewards landowners for activities and resources that have a positive impact on wildlife habitat without requiring land retirement. An evaluation of the land places values on habitat features and conservation practices. Payments are made to landowners for maintaining, creating or enhancing wildlife habitat and implementing new conservation practices that benefit wildlife. Payments vary depending upon the type of habitat features present on the land, they type of conservation practices currently being used and the amount of conservation practices the landowner is willing to implement. Standard agreement length is two years with an annual payment but longer term agreements with special conservation management plans can be developed by a biologist to address specific resource concerns.

Habitat Plot Program

The Habitat Plot program is a multi-year rental program; agreements can be either a short term or long-term. The intent of the program is to provide quality nesting, wintering or other key wildlife habitat through the use of rental agreements with specific management plans. This program can be used to establish new cover, retain existing cover, or a combination of both. Agreements in the short term option range from 3-10 years while long term options range from ten to twenty years. The Department will provide a rental payment (rates vary by soils and region of the state) on newly established and existing habitat. Cost-share is also available to establish vegetative cover (including sagebrush) on existing cropland. Seed mixture will depend on soil classification and site attributes. On standard contracts, the landowner agrees to not hay or graze, however, this program can be used to develop specific management plans that include haying or grazing as a management option.

Special Projects

In addition to the three programs mentioned above, the Department utilized the Landowner Incentive Program (LIP) in recent years to implement conservation practices that benefitted sage grouse. At the time of this writing, LIP funding sources have been fully expended or obligated. The Department used LIP to implement or improve grazing management systems, cost-share on fencing and water development projects, and other rangeland practices. The Department will continue to offer assistance for these projects using PLI funds in the absence of federal funds such as LIP and will continue to seek out other sources of federal funds to replace LIP.

(Contact information for the NDGFD and these programs can be found in Attachment II)

United States Fish and Wildlife (USFWS)

Partners for Fish and Wildlife (PFW)

The USFWS Partners for Fish and Wildlife (PFW) Program Mountain-Prairie Region Strategic Plan identifies the Sage-Steppe area of North Dakota as a focus area. A PFW program priority is to assist landowners in maintaining their lands by promoting healthy rangelands, better plant diversity and invasive weed management. Other planned projects are more specific to sage-grouse management such as planting cropland to native grass-sagebrush mixes and removal of fencing and tagging fences with markers to avoid collisions near sage-grouse leks. This focus area will enhance the opportunity for the PFW program to strengthen its conservation commitment with other organizations and state agencies committed to managing greater sage-grouse and other migratory birds of concern.

PFW Sage-Steppe Focus Area Five Year Targets:
- Upland restoration: 200 acres
- Upland enhancement: 1,500 acres

Partnerships:
- Number of new landowner partners: 10 landowners
- Amount of technical assistance: 40 staff days

PFW staffs provide a significant level of technical assistance, through close coordination with USDA, North Dakota Game and Fish Department, and various NGO's, to promote and assist landowners with Farm Bill conservation programs including CRP, WHIP, EQIP, and GRP. This level of involvement is estimated to require approximately 40 staff days over the next five years.
Percentage of leveraging:
- 60% FWS Funds
- 30% Landowner Cash and In-kind
- 10% Other Partner (NGO, NDGF)

Natural Resources Conservation Service (NRCS)

Technical Assistance

NRCS' primary function is to assist private landowners in implementing conservation practices to ensure resources are managed sustainably. A unique opportunity exists to focus NRCS resources to benefit sage-grouse, improve ranch sustainability, and maintain livestock grazing as the prevailing land use to ensure the persistence of large and intact range lands. Historically, NRCS has worked successfully with landowners to implement practices that address many of the factors affecting sustainability of grazing land and sage-grouse populations

Financial Assistance

Funding preference has been regularly provided to Farm Bill program applicants that address sage-grouse concerns. In general, these projects have largely been "opportunity based" and scattered throughout the range of both sage-grouse species. Although the implemented practices result in improved habitat conditions on the scale of individual ranches, resources were not always targeted strategically to ameliorate threats to entire sage-grouse populations. The Sage Grouse Initiative (SGI) will address threats to sage-grouse in a more strategic way.

Sage Grouse Initiative (SGI)

In 2010, NRCS launched the Sage Grouse Initiative (SGI). Three programs are available to implement the SGI in North Dakota: Environmental Quality Incentive Program (EQIP) Wildlife Habitat Incentives Program (WHIP), and the Grassland Reserve Program (GRP).

EQIP: Environmental Quality Incentives Program (EQIP) is a voluntary conservation program which offers farmers and ranchers a tool to address their natural resource concerns while achieving the most environmental benefits through locally developed priority areas and natural resource concerns. Eligibility for the program is limited to persons who are engaged in livestock or agricultural production. EQIP provides practice payment incentives to encourage producers to implement structural, vegetative, and management practices.

Separate funding has been set aside by NRCS to fund EQIP contracts that are specifically designed to be beneficial for sage-grouse habitat. EQIP applicants within the sage-grouse funding pool will compete for contracts through a system that ranks the application on how well it will optimize environmental benefits for sage-grouse.

WHIP: The Wildlife Habitat Incentive Program (WHIP) is a voluntary program for developing or improving high quality habitat that supports fish and wildlife populations of National, State, Tribal, and local significance. Through WHIP, the NRCS provides technical and financial assistance to private and Tribal landowners and operators for the development of upland, wetland, aquatic, and other types of wildlife habitat.

A WHIP plan of operations is required for the area covered in the application and becomes the basis for developing the WHIP cost-share agreement. Cost-share agreements between NRCS and the participant are for a minimum of 1 year after completion of the last conservation practice, up to 10 years. Through reimbursement, NRCS will pay up to 75 percent of the cost to install conservation practices for permanent priority fish and wildlife habitat. Participants are expected to maintain the cost-shared practices for their anticipated lifespan.

Separate funding has been set aside by NRCS to fund WHIP contracts that are specifically designed to be beneficial for sage-grouse habitat. WHIP applicants within the sage-grouse funding pool will compete for contracts through a system that ranks the application on how well it will optimize environmental benefits for sage-grouse.

GRP: The Grassland Reserve Program (GRP) is a voluntary program that helps landowners and operators restore and protect grassland, including rangeland and pastureland, and certain other lands, while maintaining the areas as grazing lands. The program emphasizes: Support for grazing operations, plant and animal biodiversity, and protection of grasslands under the greatest threat of conversion.

Participants voluntarily limit future development and cropping uses of the land while retaining the right to conduct common grazing practices and operations related to the production of forage and seeding, subject to certain restrictions during nesting seasons of bird species that are in significant decline or are protected under Federal or State law. Participants may conduct fire rehabilitation and construct firebreaks and fences.

GRP rental contracts and easements prohibit crop production (other than hay) and any other activity inconsistent with maintaining grazing land. A grazing management plan is required. GRP enrollment options include:

Rental Contract. Participants may choose a 10-year, 15-year, or 20-year contract. USDA will provide annual payments in an amount that is not more than 75 percent of the grazing value established by the Farm Service Agency. Payments will not exceed $50,000 per year per person or legal entity and will be disbursed annually.

Permanent Easement. In North Dakota these easements cannot exceed 99 years by state statute. Easement compensation will not exceed fair market value, less the grazing value of the land encumbered by the easement. "Grazing value" means the financial worth of the land used for grazing or forage production. Easement compensation will be the lowest of an area-wide market survey or appraisal, a Geographic Area Rate Cap, or the landowner offer.

Sage-grouse Initiative Practice Eligibility Criteria

For the EQIP/WHIP application to be eligible for funding the applicant must install visual markers on all existing fences within ¼ mile of active lek and on all fences with known collisions. Every contract developed under SGI must include Upland Wildlife Habitat Management, or must be supported by a conservation plan that contains Upland Wildlife Habitat Management documented as either planned within the contract period or already applied on the land under contract.

Brush Management 314:

- Remove woody invasive species from prime sage-grouse habitat. Tree species that can be removed include Russian olive, juniper, and elm. Other species need prior approval from area biologist.
- Do not implement from March 1 – June 30 within 1.5 miles of active lek. Big sagebrush may not be removed. Provide conservation plan details to NRCS AO ARC who will in turn contact ND Game and Fish Department to develop site-specific installation guidelines.

Cover Crop 340 - Multiple species

- Full season: Multiple species cover crop seeded on cropland. Cover crop planted in the spring of the year, by June 1, and maintained throughout the growing season to provide sage-grouse foraging areas and to improve soil health and control erosion.
- After harvest: Multiple species cover crop seeded on cropland. Cover crop planted after harvest of current year's crop to provide sage-grouse foraging areas and to improve soil health and control erosion. Subject to practice payment cap.
- No conditions or installation timing restrictions

Windbreak/Shelterbelt Establishment 380:

- Establishment of a farmstead/feedlot windbreak consisting of trees and shrubs. Windbreak cannot be established on rangeland. Woody block wildlife plantings are not eligible.
- Practice will include 490 – Tree/Shrub Site Preparation (one-time payment -optional) and 315 – Herbaceous Weed Control (one-time payment- optional) OR 484 Mulching in conjunction with 380
- Site-specific installation guidelines must be developed in cooperation with ND Game and Fish Department. Provide conservation plan details to NRCS AO ARC who will in turn contact ND Game and Fish Department.

Fence 382:

- Electric Wire New or replacement fence- Establish a one or two wire electric fence in sage-grouse habitat to avoid sage-grouse collisions and to facilitate grazing distribution. A scenario for new fence with markers is available.
- Barbed wire: Establish a 3 wire (2 barbed, 1 smooth wire) fence to facilitate grazing distribution. A scenario for new fence with markers is available.
- Do not construct or move fences from March 1 – June 30 within 1.5 miles of active lek.
- Gate posts can be no taller than 6 feet (above ground height).
- Do not locate new fences within ¼ mile of active lek.

Riparian Herbaceous Cover 390:

- Native grass, shrub, and forb seeding designed to utilize the best suited mix according to soil types present on site including Wyoming big sage, if applicable to the site.
- No conditions or installation timing restrictions

Access Control 472:

- Protect sites from grazing to allow for introduced (limited to one growing season) and native seedings (limited to two growing seasons, herbaceous/Wyoming big sage) to establish. The payment scenario includes the cost of temporary electric fence, if needed.
- No conditions or installation timing restrictions

Obstruction Removal 500:

- Steel-Concrete or Wood Structure Removal- remove buildings and structures (from native rangeland only) which create predator habitat for sage-grouse.
- Power line Removal – removal of power lines
- Removal and Disposal of Fence, landscape – removing problem fences associated with threat #1 on the Sage Grouse Threat Checklist.
- Fill Dugout- Restore landscape to pre-existing conditions by filling dugouts. (This scenario is not cost-shared)

- Do not remove obstructions from March 1 – June 30 within 1.5 miles of active lek.

Forage Harvest Management 511:

- Delay haying/mowing: Leave a minimum of 10% of alfalfa hayland unharvested until after September 1st for sage-grouse foraging areas. Remaining hayland will be prohibited from haying/mowing during the primary nesting season April 15 to August 1.
- Improved forage quality: requires 3-4 inch remaining plant height for cool seasons and 6 inch remaining plant height for warm seasons after haying/mowing
- Both payment scenarios require a minimum of 6 inch residue height prior to freeze up. Newly installed perennial seedings will be eligible for this payment during the second growing season. Subject to practice payment caps.
- No other conditions or installation timing restrictions

Forage and Biomass Planting 512:

- Grass/Alfalfa mixtures: Seed mix consisting of 75% alfalfa (where soils permit) to provide forage (leaves and insects) for sage-grouse. Other mixes are allowed if soils will not allow for 75% alfalfa. Haying will be deferred on a minimum of 10% until after September 1st to provide brood habitat.
- No conditions or installation timing restrictions

Pipeline 516:

- Pipelines are only eligible to implement grazing systems or to facilitate the removal of livestock from sage grouse wintering habitat.
- Do not install from March 1 – June 30 within 1.5 miles of active lek.
- Do not install through active lek.

Prescribed Grazing 528:

- Prescribed Grazing (3-6 or 7or more pastures) - Prescribed grazing system with management conducted to incorporate a rotational grazing system to enhance sage-grouse habitat.
- Prescribed Grazing Habitat Mgmt-Grouse- Development and implementation of a grazing system to restore and/or enhance habitat specific to the Sage Grouse. Prescribed grazing system with management conducted to incorporate a rotational grazing system with deferment of 20% (April 1 thru July 15 of next year) of the acres to enhance sage-grouse habitat. The 20% deferment acreage will not be the same acres during the 3 years of payment incentive. Deferment is implemented under 645-Wildlife Habitat Management.
  Note: the different 528 scenarios may not be paid on the same acreage.
  Grazing systems that include deferment will include both 528 – Habitat Mgt, Grouse and 645 – Wildlife Habitat Enhancement in the contract on the same acres. Payments eligible on grazing lands only
- No other conditions or installation timing restrictions

Pumping Plant 533:

- Windmill – to be installed with new wells and watering facilities or converting electric to wind power.
- Solar - to be installed with new wells and watering facilities or converting electric to solar
- Do not install from March 1 – June 30 within 1.5 miles of active lek.
- No windmills placed within 1 mile of an active lek and all new windmills must have anti-raptor perch devices.

- No gas or propane plants within 1.5 miles of active lek.

Range Planting 550:
- Native grass, shrub, and forb seeding designed to utilize the best suited mix according to soil types present on site including Wyoming big sage.
- No conditions or installation timing restrictions

Grazing Lands Mechanical Treatment 548 – Non Cost Shared (see threat 6):
- Must meet the guidelines within North Dakota Grazing Lands Mechanical Treatment (548) standard.
- Site-specific installation guidelines must be developed in cooperation with ND Game and Fish Department. Provide conservation plan details to NRCS AO ARC who will in turn contact ND Game and Fish Department.

Heavy Use Protection 561:
- Portable Fabricated Windbreak for wind protection - To remove livestock from wintering on rangeland.
- Areas that will be using the portable windbreak will be fenced separately from native range.

Watering Facility 614:
- New watering facilities are only eligible to implement grazing systems or to facilitate the removal of livestock from sage-grouse wintering habitat. All must be installed with wildlife escape ramps (this is included in the payment scenarios).
- No wintering tanks will be placed on native rangeland.
- Do not construct during March 1 – June 30 within 1.5 miles of active lek.
- No placement allowed within 1/4 mile of active lek.

Well 642
- Only eligible to implement grazing systems or to facilitate the removal of livestock from sage-grouse wintering habitat
- Do not construct during March 1 – June 30 within 1.5 miles of active lek.
- No placement allowed within ½ mile of active lek.
- No gas or propane plants within 1.5 miles of active lek.

Upland Wildlife Habitat Mgmt 645:
- Upland Wildlife Habitat Management (Code 645) is critical to addressing the targeted resource concerns for the Initiative and achieving the desired environmental outcomes. All conservation plans used to support the Initiative must include documentation that an alternative containing the core practices was presented to the decision maker. Every contract developed under the Initiative must include Upland Wildlife Habitat Management, or must be supported by a conservation plan that contains Upland Wildlife Habitat Management documented as either planned within the contract period or already applied on the land under contract. WHIP contracts will have 645 as a non-cost shared the resource does not require a cost-shared scenario.

- Wildlife Enhancement - See 528 for use
- Foregone Income – not eligible for this initiative
- Wildlife Escape Ramps - retrofit existing stock tanks with wildlife escape ramps

- Wildlife Fence Markers - Visibility enhancement of existing fences within ¼ mile of lek to avoid sage-grouse collisions. Six inch pieces of vinyl siding will be clipped to top two wires for visibility to avoid grouse collision and mortality
- No other conditions or installation timing restrictions

NRCS Working lands for Wildlife (WLFW)

The following is an excerpt from "Working Lands for Wildlife Partnership" implementation plan. (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/me/home/?cid=stelprdb1081861)

The Working Lands for Wildlife (WLFW) Partnership is an ongoing collaborative effort between the Natural Resources Conservation Service (NRCS) and many different partners (including private landowners) to strategically target technical and financial assistance to improve habitat for declining species on private working lands and provide participating landowners with management predictability. NRCS and partners jointly identified species (sage-grouse included) and habitat whose condition could be improved and provide a win-win for agriculture and wildlife. The U.S. Fish and Wildlife Service (USFWS) and NRCS then collaborated on a Section 7 programmatic consultation that included the conservation practices used to benefit the WLFW identified priority species. The resulting protection is termed Endangered Species Act (ESA) Predictability and is available for all implemented conservation practices that follow the required conservation measures outlined in the conferencing report.
In addition to ESA Predictability, NRCS makes Farm Bill financial assistance available to assist landowners with the cost of implementing conservation practices. WLFW priority species funding may be available through existing voluntary conservation programs.

NRCS has consulted with USFWS for Section 7 of ESA using many different tools, depending on the species status. If the species is a Candidate as is the case with sage-grouse, WLFW uses a Conference Report (CR) or Conference Opinion (CO). A CO includes the same level of direction for conservation measures as found in a CR, however it also estimates the level of incidental take expected to occur. WLFW priority species that become listed as federally threatened or endangered after the species has been added to WLFW must have incidental take analyzed to determine the anticipated level of incidental take. Resulting analysis will be used to develop a Biological Opinion with an incidental take permit. WLFW species that are federally listed as threatened or endangered at the time the species is added to WLFW already have Biological Opinions with incidental take permits.

WLFW Planners

WLFW Planners are resource professionals who work with interested participants to develop and implement conservation plans. WLFW Planners are trained to understand the habitat needs and threats, and the WLFW Section 7 consultation requirements for the species. They can be NRCS, USFWS, or other partner organization field staff (e.g., state wildlife agency, conservation non-profits, and consultants). WLFW Planners must use NRCS approved habitat evaluation tools (i.e., Wildlife Habitat Evaluation Guide [WHEG], Threats Checklist) to assess the initial habitat conditions, limiting factors, and the restoration potential for a site. A conservation plan that includes conservation practices and conservation measures to address identified limitations is then developed with the landowner. Every practice designed and installed under a WLFW conservation plan and/or contract must adhere to the conservation measures and conditions identified for that practice in the programmatic consultation between NRCS and USFWS.

Endangered Species Act Predictability

The USFWS is providing predictability to all WLFW participants for all conservation practices covered in the conference report/conference opinion/biological opinion (CR/CO/BO) and implemented/maintained as described in their WLFW conservation plan, **as long as a habitat assessment is completed and at least one core practice is in the plan**. The predictability offered will protect the landowner from incidental take, if the species is listed, resulting from the installation/maintenance of the practices. A permit is not directly issued to the landowner; the landowner is covered through the WLFW agreement between USFWS and NRCS. The offered predictability is attached to the land and is transferrable to any future owner(s) as long as they continue to maintain the species habitat per the conservation plan. Predictability is offered immediately upon practice implementation. The WLFW Planner will prepare a **predictability information packet** with four different items for the landowner once the practices are implemented:

1. A form letter from USFWS that explains the predictability provided
2. Species specific predictability "Frequently Asked Questions" (if available)
3. A letter from the NRCS field office with the conservation plan name, contract number (if applicable), farm/tract/field number, priority species the practices support and a signature providing concurrence that the plan is written to meet the conservation measures in the conference report/conference opinion/biological opinion (the letter also outlines the voluntary tracking options, annual self-verification, and the five-year on-site review process)
4. The conservation plan with supporting practice specifications/job sheets

Voluntary Landowner Verification

Landowners will have the option to annually self-verify that they are maintaining and continuing to use the conservation practices in their WLFW conservation plan. Voluntary annual reports will be aggregated by NRCS (to protect individual landowner privacy information) and reported to USFWS. WLFW Planners will meet with participants at least once every five years (verbal landowner consent is required) to assess the site using the species specific WHEG or Threat Checklist and observational data. There are three specific objectives for the visit:

1. Assess the effectiveness of the implemented practices in the WLFW conservation plan
2. Suggest changes as appropriate
3. Document whether the practices are still being maintained

The visit is not to be confused with a compliance review because of the voluntary nature of the conservation and reporting. Predictability is based on the continued maintenance of the conservation practices and associated conservation measures. If changes in management are needed to preserve predictability (based on the best professional judgment of the WLFW Planner), they should be clearly presented to the landowner. While NRCS does not have the authority to determine whether predictability is maintained or lost, NRCS does have the responsibility to recommend habitat management to help the landowner preserve predictability, if desired. If there are any discrepancies between what the landowner and the WLFW Planner believes is warranted to maintain predictability, final decisions will be made by USFWS. If permission is granted to USFWS to visit the site, the visit will serve as the final determination on predictability status; final actions needed to maintain predictability can be discussed. If USFWS is not permitted on site, NRCS will no longer include the habitat data in annual reports to USFWS.

WLFW Process Summary

1. Interested landowner contacts NRCS for assistance in addressing resource concerns and meeting management objectives on their property. Planner confirms the site is within the identified priority species boundary, discusses the WLFW Partnership, and determines interest in wildlife habitat.

2. The WLFW Planner visits the landowner's property for evaluation and data collection using NRCS approved habitat evaluation tools. Potential for targeted species habitat is confirmed; otherwise landowner will be guided towards other NRCS program options.

3. The WLFW Planner develops a conservation plan for the landowner that may include Financial Assistance (FA), Technical Assistance (TA), and other funding. Practices that are covered under WLFW and included in the conservation plan (under FA or TA) are eligible for predictability. The Planner explains predictability (provides copies of the form letters and FAQ sheets as needed) and the voluntary tracking system to the interested participant.

4. If the landowner decides to participate and implements the conservation plan, the WLFW Planner returns to the site and certifies practice implementation and whether the conservation measures have been followed. Once the practices are certified, provide the landowner with the predictability information packet, including the completed NRCS form letter.

5. The WLFW Planner updates the conservation plan with the applied practice information.

6. Starting one year after verification, the landowner will receive an annual request from NRCS to voluntarily update information on their conservation activities. The update request will include:
   1) Are you maintaining or continuing to follow your conservation plan?
   2) Would you like to request a technical assistance visit from a WLFW Planner?

7. WLFW Planners will meet with participants as requested/needed and at least once every five years (verbal landowner consent is required) to assess the site using the species-specific WHEG or Threat Checklist and observational data. During update visits, the landowner has the option to add recommended practices to the conservation plan. Any additional practices that were covered in the CR/CO/BO are eligible for WLFW predictability if the associated conservation measures are followed.

WHIP is available to implement WLFW in North Dakota:

WHIP: The Wildlife Habitat Incentive Program (WHIP) is a voluntary program for developing or improving high quality habitat that supports fish and wildlife populations of National, State, Tribal, and local significance. Through WHIP, the NRCS provides technical and financial assistance to private and Tribal landowners and operators for the development of upland, wetland, aquatic, and other types of wildlife habitat.

A WHIP plan of operations is required for the area covered in the application and becomes the basis for developing the WHIP cost-share agreement. Cost-share agreements between NRCS and the participant are for a minimum of 1 year after completion of the last conservation practice, up to 10 years. Through reimbursement, NRCS will pay up to 75 percent of the cost to install

conservation practices for permanent priority fish and wildlife habitat. Participants are expected to maintain the cost-shared practices for their anticipated lifespan.

Separate funding has been set aside by NRCS to fund WHIP contracts that are specifically designed to be beneficial for sage-grouse habitat. WHIP applicants within the sage-grouse funding pool will compete for contracts through a system that ranks the application on how well it will optimize environmental benefits for sage-grouse. WLFW shares similar practice eligibility criteria as the SGI.

Plant Materials Program

The NRCS Plant Materials Program selects conservation plants and develops innovative planting technology to solve the nation's most important resource concerns. The program focuses on using plants as a natural way to solve conservation issues and re-establish ecosystem function. The program collects, selects and releases grasses, legumes, wildflowers, trees and shrubs. PMC's provide plant materials and new applied technologies for national initiatives like the SGI.

The Bismarck Plant Materials Center (PMC) has been involved in Wyoming big sage-brush seed collection on Bureau of Land Management (BLM) land in the sage grouse core area in Bowman County in November 2009. The PMC staff propagated the seed and provided Wyoming big sage plants for the reintroduction of big sage on previous disturbed areas in the spring of 2010. Disturbed areas can be cropland seeded back to rangeland, pastureland, Conservation Reserve Program (CRP). This effort will continue with the additional effort to plant Wyoming big sage brush plants on native rangeland. The areas selected for reintroduction of sage brush must have soils the will support big sage and historically supported big sage brush.

Wyoming big sage brush plants can also be made available to other agencies such as the BLM or the Forest Service, NDGF, for planting.

NRCS will work with other groups to lead the effort to reintroduce Wyoming big sage brush. Lincoln-Oaks Nursery located in Bismarck, North Dakota and Dickinson State University will be contacted to determine if there is interest in propagating Wyoming big sage brush.

NRCS will provide incentive payments for reintroduction of Wyoming big sage brush native rangeland or disturbed sites that previously supported Wyoming big sage brush.

Farm Service Agency (FSA)

<u>Conservation Reserve Program (CRP)</u>

Members of the North Dakota State Technical Committee submitted a request to USDA Farm Service Agency (FSA) in 2010 for a Conservation Priority Area (CPA) and Wildlife Zone for the Conservation Reserve Program (CRP) which included the entire sage grouse range in North Dakota. Both were approved. The CPA designation provides increased eligibility and the wildlife zone provides general signup applications with additional points in the ranking process.

<u>State Acres For wildlife Enhancement (SAFE)</u>

In 2008, conservation partners in North Dakota submitted a proposal to USDA-FSA for 1,000 acres of CRP to be allocated through the State Acres For Wildlife Enhancement (SAFE) project. SAFE allows producers to install practices that benefit high priority State wildlife conservation objectives through the use of targeted restoration of vital habitat. This cooperative conservation effort is based on locally developed conservation proposals that address the highest priority wildlife objectives in the State. The project was approved and the initial 1,000 acres was fully subscribed. In 2012, conservation partners requested an additional 2,000 acres; only an additional 1,000 acres was approved from that request in late 2012 but the lack of a farm bill after September 30, 2012 left FSA with no authorization to enroll acreage into CRP-SAFE. In late 2012, a short term extension of the farm bill was passed by Congress.

SAFE provides landowners with a 10-15 year rental contract. Soil rental rates are based on the weighted average of the three predominant soils in the offered area. One time Signup Incentive Payments (SIPs) of $100 per acres and a Practice Incentive Payment (PIPs) equal to 40% of the cost to establish cover are available. Up to 50% cost share for establishing new cover is also available.

(Contact information for the FSA can be found in Attachment II)

Bowman/Slope Soil Conservation District

The Bowman Slope Conservation District (SCD) has provided local leadership in the formation of the Grazing Ranchers about Sustainable Stewardship (GRASS). GRASS will take the leadership in the delivery of education on grazing and ranching techniques for sustainable stewardship. Sustainable ranching operations are key to maintaining and developing suitable sage-grouse habitat on working ranches.

In addition to GRASS, a local sage grouse working group was developed to help identify specific concerns and potential actions relating to sage grouse. The group is comprised of state and federal agencies, local government, a representative of energy industry, private ranchers and landowners, representatives from grazing associations, representative from GRASS, Northern Great Plains Joint Venture, NDSU Hettinger Research Center and others.

Translocation Project (to be determined)

In 2013 the North Dakota Game and Fish Department developed a proposal to translocated Greater sage-grouse from Montana to be released in North Dakota. Due to struggling populations in Montana the Montana Fish Wildlife and Parks postponed the project to a later date. There rational was to allow the source populations in Montana time to recover from current declines. The NDGFD believes that a translocation of sage-grouse could provide a boost to the current population and would help to maintain a viable self-sustaining population. Appendix II is an original proposal submitted to the Montana Fish Wildlife and Parks (See Appendix II for full project proposal).

Translocations have been used to augment and reintroduce many upland game species to areas that have suitable habitat or to areas with struggling populations (Griffith et al. 1989). Since 1933 there have been numerous attempts to translocate sage-grouse (Reese and Connelly 1997). Reese and Connelly (1997) reported that all pre-1970 efforts to reestablish or augment populations were unsuccessful because there was inadequate monitoring immediately post-release to assess short-term survival and the long-term impact of translocation. Most translocations on sage-grouse had insufficient data to determine success.

More recently Baxter et al. (2008) reported that following 3 years of translocations in Utah, peak male lek attendance was 4 times higher than pre-translocation averages. Additionally nest propensity for newly translocated grouse was 39% during the first nesting season and 79% for translocated grouse that survived one year post-release and nesting success was 67% for all translocated grouse. Survival of females translocated into the Strawberry Valley averaged 60%, which is typical for annual survival for sage-grouse across the range (Connelly et al. 2004). Taylor et al. (2012) determined that female survival and chick survival had the most influence on population growth rates, suggesting that increasing the number of females in a population can influence the abundance of sage-grouse over time. Success of translocations should be based on compatibility of courtship behavior, survival, and reproductive success of translocated birds, as well as their fidelity to the release area, integration into the extant population, and contribution to population growth. The following objective will help us determine the efficacy of augmenting the sage-grouse population in North Dakota with birds from Montana.

Objectives: Enhance the existing population of sage-grouse in North Dakota to enable the persistence of a stable population.

1) Determine annual survival of translocated grouse.
2) Determine movements of translocated grouse from the release area.
3) Determine reproductive success by monitoring nesting propensity and nest survival, and juvenile recruitment.
4) Monitor lek trends to determine population growth following translocations.

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Appendix II: Project Proposal for Sage-grouse Translocation in North Dakota.

TRANSLOCATION OF GREATER SAGE-GROUSE FROM MONTANA TO SOUTHWESTERN NORTH DAKOTA: PRELIMINARY PROPOSAL

OCTOBER 2012

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BACKGROUND

Greater sage-grouse (*Centrocercus urophasianus*) continue to be considered a species of significant conservation concern by the federal government, public, and scientific communities (Connelly and Braun 1997, Schroeder et al. 1999b, Schroeder et al. 2004). In March 2010, the U.S. Fish and Wildlife Service (USFWS) found that the Greater Sage-grouse was warranted for protection under the Endangered Species Act (ESA), but listing was precluded by higher priority listing actions (50 CFR Part 17). Shortly after the sage-grouse became a candidate species, the FWS entered into a court-approved settlement agreement with several environmental groups that would require a decision on whether to proceed with listing sage-grouse, or withdraw the warranted finding by September 2015. Since 1995, various Memorandums of Understanding have been signed by the Western Association of Fish and Wildlife Agencies (WAFWA) and/or federal l agencies with the overarching goal to "maintain and increase where possible the present distribution of sage-grouse." We propose that translocating greater sage-grouse from Montana to North Dakota will help us accomplish the above goal and help secure the future of this iconic species on the eastern fringe of its range.

Sage-grouse never widespread in North Dakota and are presently confined to the southwestern portion of the state (Fig. 1) where scattered populations are found in three counties; Bowman, Slope, and Golden Valley (Johnson and Knue 1989). The North Dakota population is on the eastern fringe of sage-grouse range, but is not isolated being connected with sage-grouse populations in Montana and South Dakota.

Approximately 17 leks are surveyed each spring and numbers of male sage-grouse recorded has varied from 542 in 1958 to 63 in 2011. Over the past thirty-two years (1980 through 2012) total males counted has varied from 63 to 380. The average numbers of males per lek has varied from 16.6 per ground in 2000 and was at a low in 2011 at 5.3 males. These counts serve as indicators of the size and trend (increasing or decreasing); data are compared on a year-to-year basis for management purposes (Figure 2).

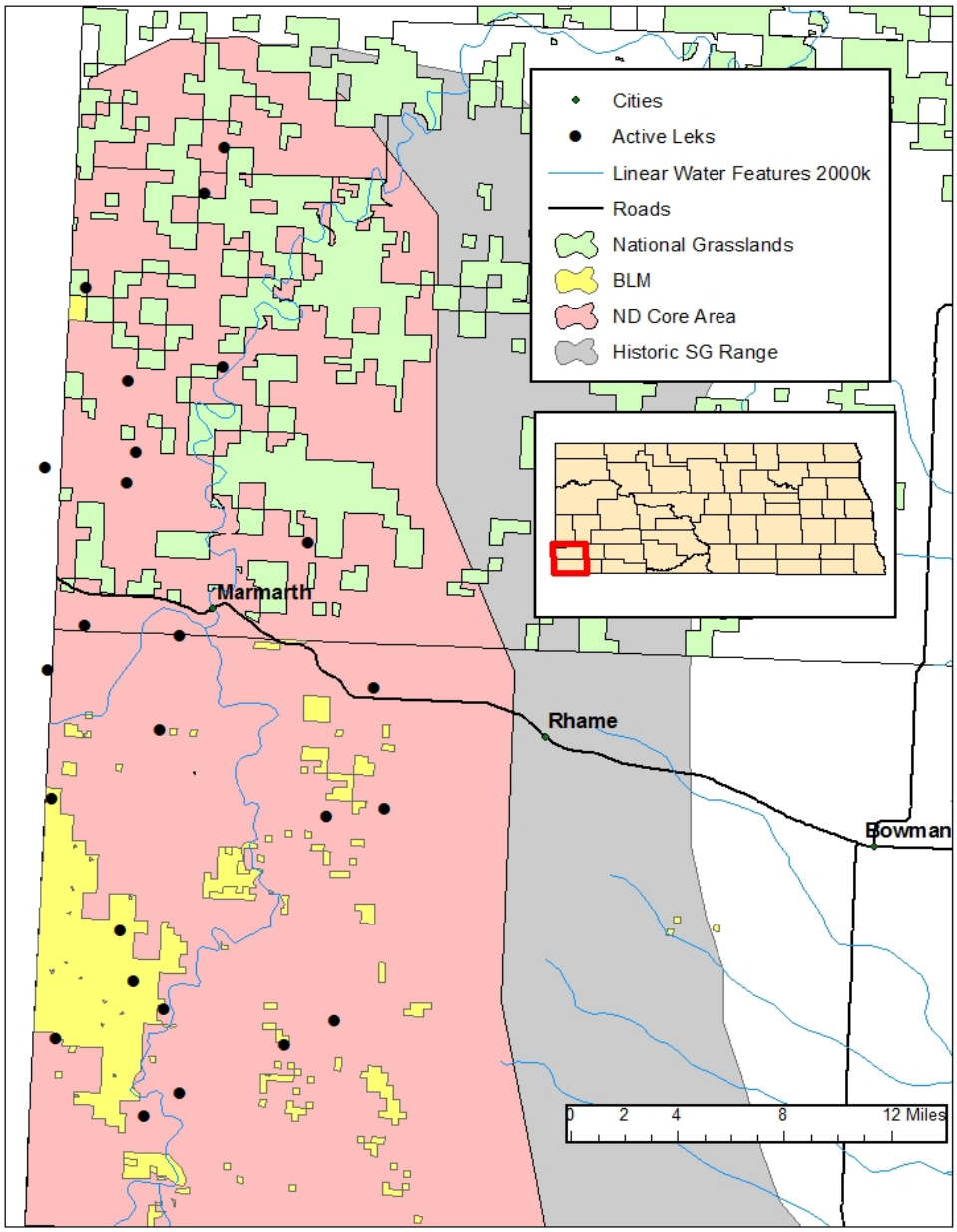

Fig . 1. Map showing greater sage-grouse core area and historic range in North Dakota.

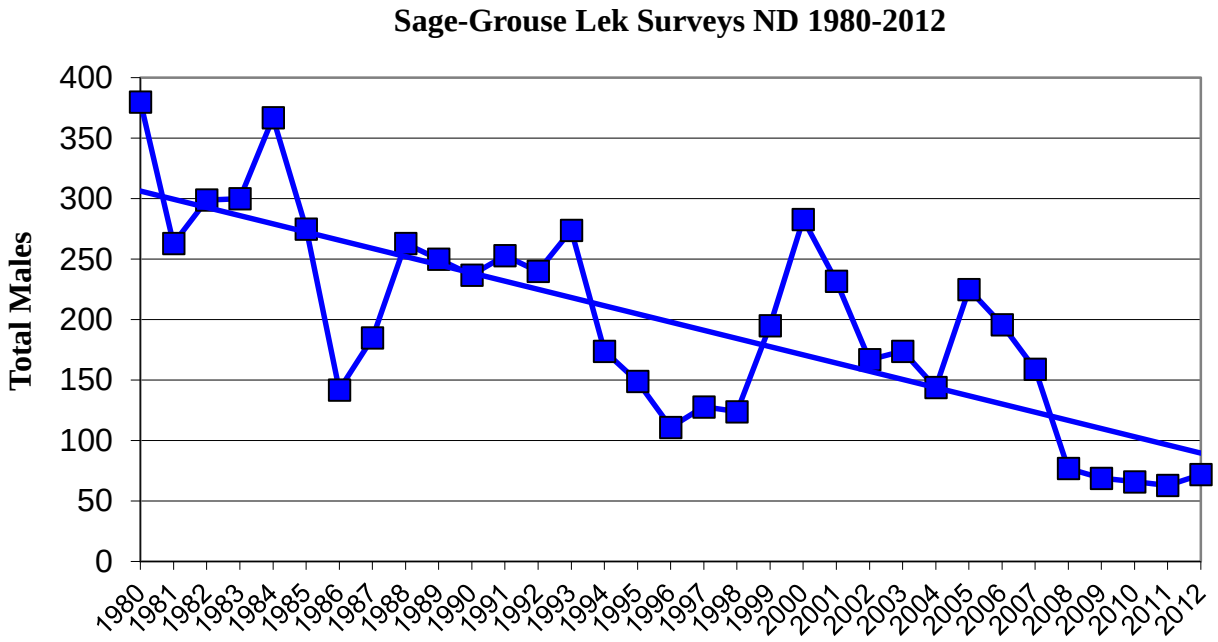

Fig. 2. Population trend for greater sage-grouse in North Dakota between 1980 and 2012.

Data from the past 30 years show a significant decrease in total numbers of males, but also indicate a cyclic trend for this fringe population. Significant declines occurred in 1986 and again in 1996 and most recently in 2008, roughly a 10 year cycle. Following a severe outbreak of West Nile Virus (WNV) in 2007, sage-grouse declined by 60% in North Dakota. Over the past 5 years, the population has declined to the lowest level on record averaging roughly 5% decline per year. Presently the population has declined to the point that reproductive output may not result in recruitment of enough birds to support mortality caused by natural events. Because sage-grouse are long lived species with low reproductive potential recovery can be very slow.

Over the past 5-8 years habitat conditions have not changed dramatically. The majority of oil and gas activity occurred in the late 1990's to early 2000's. Current oil and gas activity in sage-grouse range has nearly stopped with the majority of oil companies drilling in the northwest part of the state. There have only been 13 new wells drilled from 2005 to 2010 (Dyke et al. 2011). In 2005 the population was over 200 males indicating that the habitat can support a stable population.

PURPOSE AND NEED FOR TRANSLOCATION

Translocations have been used to augment and reintroduce many upland game species to areas that have suitable habitat or to areas with struggling populations (Griffith et al. 1989). Since 1933 there have been numerous attempts to translocate sage-grouse (Reese and Connelly 1997). Reese and Connelly (1997) reported that all pre-1970 efforts to reestablish or augment populations were unsuccessful because there was inadequate monitoring immediately post-release to assess short-term survival and the long-term impact of translocation. Most

translocations on sage-grouse had insufficient data to determine success. More recently Baxter et al. (2008) reported that following 3 years of translocations in Utah, peak male lek attendance was 4 times higher than pre-translocation averages. Additionally nest propensity for newly translocated grouse was 39% during the first nesting season and 79% for translocated grouse that survived one year post-release and nesting success was 67% for all translocated grouse. Survival of females translocated into the Strawberry Valley averaged 60%, which is typical for annual survival for sage-grouse across the range (Connelly et al. 2004a). Taylor et al. (2012) determined that female survival and chick survival had the most influence on population growth rates, suggesting that increasing the number of females in a population can influence the abundance of sage-grouse over time. Success of translocations should be based on compatibility of courtship behavior, survival, and reproductive success of translocated birds, as well as their fidelity to the release area, integration into the extant population, and contribution to population growth. The following objective will help us determine the efficacy of augmenting the sage-grouse population in North Dakota with birds from Montana.

Objectives: Enhance the existing population of sage-grouse in North Dakota to enable the persistence of a stable population.

1) Determine annual survival of translocated grouse.
2) Determine movements of translocated grouse from the release area.
3) Determine reproductive success by monitoring nesting propensity and nest survival, and juvenile recruitment.
4) Monitor lek trends to determine population growth following translocations.

The majority of historic translocation efforts were not monitored adequately and considered unsuccessful as a result. Additionally sage-grouse have high fidelity to breeding areas and translocated grouse tend to have large movements in the first year making tracking the birds difficult. We believe that the cooperative endangered species conservation fund monies will provide us sufficient funding to purchase GPS collars to adequately monitor and track the movements of translocated grouse.

APPROACH

In order to maximize the potential success of an augmentation, translocations of greater sage-grouse should include four basic stages (Griffith et al. 1989). The first stage is to identify a release site that will provide quality habitat for all seasonal demographics. The second stage is to identify a source population for translocation that will maximize genetic diversity in the resident population while maintaining local adaptations. The third stage is to design a translocation protocol that minimizes handling and transport time while maximizing survival and productivity. The fourth stage is monitoring and evaluating the success or failure of augmentation efforts. This fourth stage is typically where most translocations in the past have failed and is particularly important to provide information for future efforts.

STAGE 1: RELEASE SITE

Because of recent declines of greater sage-grouse in North Dakota following a severe outbreak of West Nile Virus in 2007, the sage-grouse population has been reduced by 60%. The population

may have reached a level that cannot reproduce at a rate greater than natural mortality resulting in consistent declines of 5% per year following WNV outbreak. Recent research on survival and reproduction of sage-grouse in ND prior to the outbreak indicated relatively normal vital rates compared to other areas in the range (Herman-Brunson 2007;2009, Swanson 2009) suggesting habitat in North Dakota can support a self-sustaining population of greater sage-grouse. North Dakota's core sage-grouse habitat is separated into two general areas (Slope County and Bowman County) split by highway 12 (Figure 1). Slope County is naturally fragmented by rough terrain and has relatively low sagebrush densities. Bowman County contains 80% of the sage-grouse population in ND and landownership is primarily federal BLM land..

Previous research on sage-grouse in southwestern North Dakota (Herman-Brunson 2007, Swanson 2009) identified an area of the Cedar Creek Anticline in Bowman County, ND and Fallon County, MT with an obvious lack of sage-grouse use. This area has the highest well densities of oil and gas within North Dakota's sage-grouse range. NDGF funded a project to develop a brood habitat model and to assess habitat suitability for sage-grouse in the Cedar Creek Anticline area (Jensen and Rumble 2011). The results indicated that the Cedar Creek Anticline is not used by sage-grouse because the habitat was unsuitable not because of oil and gas, but because vegetative conditions in this area did not provide adequate height or abundance of herbaceous vegetation for sage-grouse. We do not believe that oil and gas development in the area will prevent a successful augmentation because the birds did not use the area prior to development. We propose to release the birds over our largest known lek (Lek B – 16-N, 15 active males displaying in 2012) in Bowman County. The area contains the best available sage-grouse densities in ND and is in close proximity to nesting habitat and brood habitat.

The BLM is currently amending the Resource Management Plan (RMP) for ND to include conservation measures that protect sagebrush habitat and provide basic management practices for sage-grouse in relation to oil and gas extraction as well as grazing. This plan is intended to address and resolve many impacts to sage-grouse on federal lands; furthermore the North Dakota Game and Fish Department and Natural Resource Conservation Service are working with private landowners to implement similar land-use practices to ensure the persistence of greater sage-grouse in North Dakota.

STAGE 2: SOURCE POPULATIONS

To maximize the likelihood of successful translocation, the source population should be relatively close, abundant, and occupy similar habitat. Given these criteria, the Rosebud population in MT would be a good source population. An examination of 45 populations (Fig. 4) throughout the range of sage-grouse showed that the Dakota's were clustered separately from the Montana populations (Oyler-McCance et al. 2005). The genotypic variation between the two populations is expected to be insignificant but there are a few differences in haplotypes. Oyler-McCance et al. (2005) suggested that if management includes translocations, they should involve neighboring rather than distant populations to preserve any effects on local adaptation.

Currently the University of Montana is conducting a genetic analysis of sage-grouse populations throughout the Dakota's and Montana to determine genetic connectivity and spatial scale and relative importance of landscape features in gene flow. Using this analysis NDGF will work

closely with Montana Fish Wildlife and Parks, and University of Montana to identify specific locations to trap sage-grouse which will provide optimal genetic continuity.

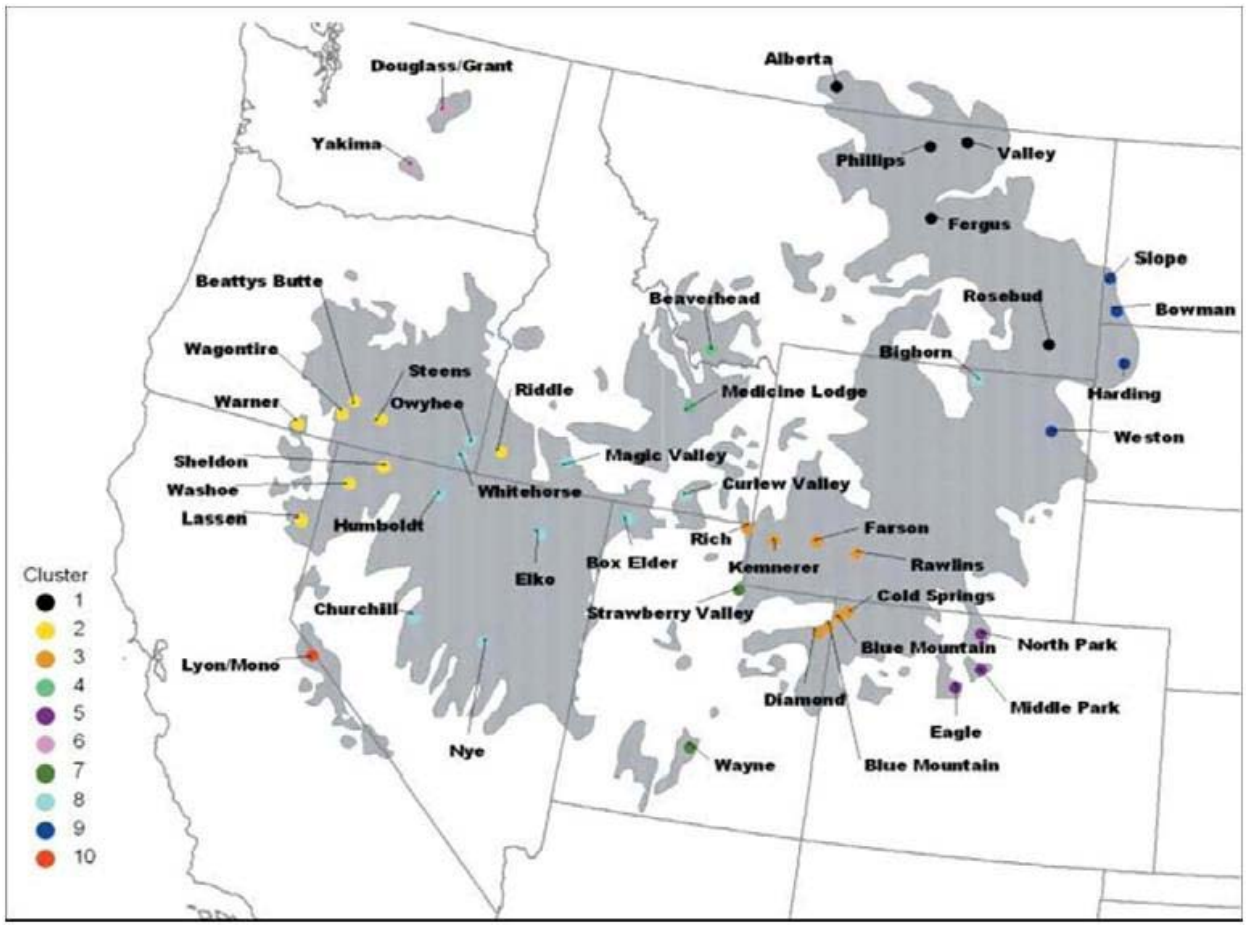

Fig. 4. Map of 45 sampling sites for a microsatellite analysis of greater sage-grouse. The populations are color coded by the cluster to which each population was assigned (Oyler-McCance et al. 2005).

STAGE 3: CAPTURE AND TRANSLOCATION

Sage-grouse will be captured during the spring breeding period (late March/early April) when conditions allow. Capture with the aid of night lighting (Giesen et al. 1982, Wakkinen et al. 1992) has proven to be very successful when birds are attending leks and spring releases have shown more successful than those during other periods (Reese and Connelly 1997, Baxter et al. 2008).

Sex and age will be determined for all captured birds (Beck et al. 1975). Blood samples will be obtained to screen for WNV and other diseases and genetic analysis. Birds will be banded with a unique numbered metal band and necklace-mounted radio transmitter. Depending on funding, we may deploy GPS radios to monitor movements and survival. Birds will be transported by plane or truck in individual boxes that are small enough to contain the bird's movement. The birds will

be released the following morning at sunrise over an active lek with displaying males. Unsuccessful translocations typically did not release birds during the spring on active leks. Baxter et al. (2008) suggested that releasing birds the follow morning post-capture in sagebrush habitat and over an active lek was a contributing factor to a successful translocation in Utah.

We propose a two year project to translocate 60 female greater sage-grouse from Montana to North Dakota. Thirty females will be translocated each year and all will be monitored via radio telemetry to evaluate survival, movements, and reproduction. Only females will be translocated because female survival and chick survival have the most influence on population growth rates, suggesting that increasing the number of females in a population can influence the abundance of sage-grouse over time (Taylor et al. 2012).

STAGE 4: MONITORING AND EVALUATION

The success or failure of the augmentation effort will be evaluated by North Dakota Game and Fish Department and Brigham Young University. A graduate student will be assigned to monitor the translocated grouse post-release to determine success. NDGF will continue to monitor lek count trends to determine long-term impacts to the population. The specific objectives include examination of movements, habitat use, productivity, survival, and population size. These evaluations provide essential information to determine whether the project effectively increases the breeding population in North Dakota.

A season report provided to all parties by September 30, 2014, 2015 which will include preliminary findings on survival, movements, and reproduction. A final report will be completed by April 30, 2016.

Budget:
Includes Salaries, Travel, Supplies, TNC indirect, and Contractual work.

	Funds Requested	Non-federal Contribution	Total
Personnel (salary and benefits)		36,000	36,000
Travel		4,000	4,000
Supplies		10,000	10,000
GPS radios*	120,000		120,000
Total	**$120,000**	**$50,000**	**$170,000**

* **The price of GPS radios of sage-grouse can vary but typical price is $4,000/each. If full funding is not available a lesser amount can still be utilized.**

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