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History of Greater Sage-grouse in the Dakotas: Distribution and Population Trends

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ABSTRACT -- The greater sage-grouse (*Centrocercus urophasianus*) has declined throughout its range and its status is of major concern to federal, state, and provincial wildlife agencies. We collected information on current and historical greater sage-grouse distribution and lek activity in western North and South Dakota. A steady decline in lek attendance by males occurred over the entire recorded period in North Dakota (1951-2002) and South Dakota (1972-2002). There was no apparent change in numbers of known active leks due to discovery of new leks, but there was an abandonment of regions once occupied by active leks.

Key words: active lek, *Centrocercus urophasianus*, greater sage-grouse, North Dakota, South Dakota.

Greater sage-grouse (*Centrocercus urophasianus*) populations in western North America once were distributed widely through 13 states as far south as Arizona and north into three provinces of Canada (Braun 1995, Connelly and Braun 1997, Schroeder et al. 1999, Young et al. 2000). The overall decline of this species

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began near the onset of the twentieth century, probably due to agricultural practices, overshooting, and increasing numbers of livestock (Patterson 1952, Dalke et al. 1963, Gill 1966). This decline continued throughout the 1900's and mainly has been attributed to decreasing amounts of sagebrush (*Artemisia* spp.) due to agriculture (i.e., cash crops), herbicides, overgrazing, energy development, fire, and/or drought (Patterson 1952, Homer et al. 1993, Gregg et al. 1994, Connelly and Braun 1997, Braun 1998, Connelly et al. 2000a). Information on historical greater sage-grouse distribution, population trends, and status is vital to understanding the bird's decline and to greater sage-grouse conservation efforts.

The distribution of greater sage-grouse in the western Dakotas is within an eastward extension of sagebrush steppe communities, including both big sagebrush (*A. tridentata*) and silver sagebrush (*A. cana*) (Schroeder et al. 1999). The objectives of our study were to: 1) review historical information on greater sage-grouse in North Dakota and South Dakota, 2) verify locations of known active and historically active strutting grounds (leks), and 3) examine overall population status and long-term trends.

METHODS

We reviewed published and unpublished records of greater sage-grouse distribution, populations, and trends in North Dakota and South Dakota. Historical (i.e., year 2000 and prior) distribution and counts of active and historically active leks in North Dakota and South Dakota were obtained from records of lek surveys conducted by the North Dakota Game and Fish (NDGF), South Dakota Game, Fish and Parks (SDGFP), and United States Geological Survey (USGS). Greater sage-grouse lek surveys conducted by NDGF and SDGFP involved at least two counts on different days within a year of all known active and historically active leks from a vehicle or on foot. Both NDGF and the SDGFP used the maximum number of males surveyed as their count for each lek. Additional verification of information was obtained from landowners and communication with state and federal natural resource personnel.

An active greater sage-grouse lek is a traditional communal display ground for breeding greater sage-grouse that "has been attended by ≥ 2 male sage grouse (sic) in ≥ 2 of the previous 5 years" (Connelly et al. 2000b:9). Locations of active and historically active leks were obtained through communication with personnel of SDGFP, NDGF, and landowners. We received lek locations as legal descriptions (i.e., township, range, section, and quarter section) and converted those locations to Universal Transverse Mercator (UTM) coordinates. Locations were plotted and overlaid on maps of North Dakota and South Dakota within a geographic information system (GIS) (i.e., ArcView 3.2a). NDGF and SDGFP representatives

familiar with the leks then verified lek locations. Big sagebrush in the study area was identified as subspecies *A. t. wyomingensis* (G. E. Larson, South Dakota State University, personal communication).

RESULTS

Historical References

The early literature documented that greater sage-grouse occurred within North Dakota and South Dakota (Bendire 1892, Judd 1905). Museum specimen collections (Table 1) also supported that its distribution extended into the Dakotas.

The historical distribution of greater sage-grouse in North Dakota was thought by McClanahan (1940) to have occurred throughout the western part of the state (Fig. 1a). More recent depictions restricted the historical greater sage-grouse range in North Dakota to the southwestern part of the state (Aldrich and Duvall 1955, Aldrich 1963, Schroeder et al. 1999; NDGF, unpublished data; Fig. 1b). Early accounts of greater sage-grouse in North Dakota supported these more recent depictions. "It doubtless is also in southwestern portions of Dakota" (Coues 1874:402); "none seen east of the Little Missouri" (Allen 1875:65); "not common at the village, Fort Berthold, McLean County, but reported more abundant farther west" (Hoffman 1882:403); "several small flocks of sage fowl (sic) at home on a great plateau or high plain, crossed by several dry creeks, which was about eight miles from the cow-camp" (Roosevelt 1885:155); "in the Missouri Valley district the sage cock (sic) is found only along the extreme western edge of Kansas, Nebraska, and Dakota" (Cooke 1888:107); and "Hon. Lewis Crawford in 1921 said that "sage grouse (sic) is plentiful about 30 miles south" of Sentinel Butte and "at one place on the Cannonball River he has seen thousands of cocks on an old prairie dog town, bulling" (Wood 1923:36). In North Dakota other early accounts of sage-grouse suggested "there were lots of them in the Marmarth area in those early days" (Harv Robinson, Badlands resident in 1891), "common in this area and I hunted them after September 1st" (G. L. Wingstrand, resident of Rhame, North Dakota in 1907), and "I have never seen over 20 to 30 sage hens (sic) around since I lived in this country. There are more of them south of here." (Charles Cornell, lived south of Medora on the old Collis Ranch in 1919; all quoted in Johnson and Knue 1989:59). J. T. Purcell, secretary of the North Dakota Game and Fish Board stated, "we have some in Bowman County, Stark, and southern part of Billings, and western part of Adams. They are getting very scarce, and civilization seems to be forcing them into Montana" (Homaday 1916:200).

By the early 1930's greater sage-grouse, as with earlier observations, were prevalent in the southwestern portion of North Dakota with no noticeable decrease in numbers (Maurek 1931, Bent 1932). During the early 1960's there were accounts of "one bird nine miles southwest of Grassy Butte in southern McKenzie County during the summer of 1962" by Wes Hardin of the United States Forest Service, "a

Table 1. Museum specimen locations of greater sage-grouse collected in North Dakota and South Dakota.

State	County	Location	Year	Catalogue #	Museum ^a
SD	-	Black Hills	1895	471753	AMNH
SD	-	Black Hills	1895	471754	AMNH
SD	-	-	1903	-	ROM
SD	-	Approx. 25 miles S of Rapid City	1888-1911	-	JM
SD	Harding	-	1912	B-329	WHOM
SD	-	Approx. 25 miles S of Rapid City	1923	B-239	WHOM
SD	Harding	-	1927	8906.1	YPMNH
SD	Harding	-	1927	8909.1	YPMNH
SD	Harding	-	1927	8910.1	YPMNH
SD	Harding	7 miles N, 2 miles E Ladner Post Office	1961	-	UKNHM
SD	Harding	-	1966	-	SDSUBC
ND	Bowman	Around Rhame	1964	-	CMNH

^aAMNH = American Museum of Natural History, ROM = Royal Ontario Museum, JM = Journey Museum in Rapid City, SD, WHOM = William H. Over Museum of Natural History, YPMNH = Yale Peabody Museum of Natural History, UKNHM = University of Kansas Natural History Museum, SDSUBC = South Dakota State University Bird Collection, and CMNH = Carnegie Museum of Natural History.

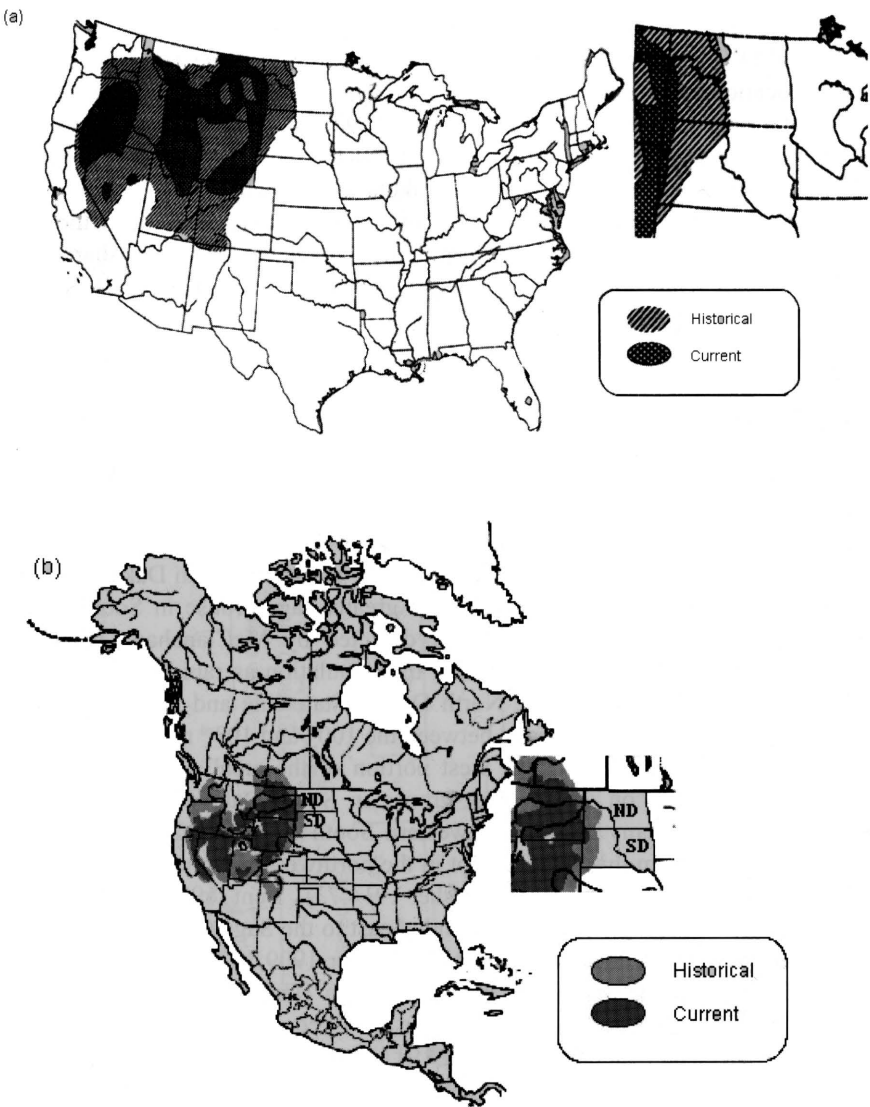


Figure 1. Historical distributions of greater sage-grouse in North Dakota (ND) and South Dakota (SD). After a = McClanahan 1940 and b = Schroeder et al. 1999.

small active strutting ground 10 miles north of Sentinel Butte in Golden Valley County” by State Game Warden Ed Bry, and “a ‘good-sized’ flock at Pyramid Park” (i.e., east of Tracy Mountain) “in Billings County” seen by ranchers Willard Porter and ‘Jiggs’ O’Connell on several occasions (Johnson and Knue 1989:60; all early account locations described are plotted in Fig. 2). In 1964, North Dakota held the first greater sage-grouse hunting season since 1922 with an estimated harvest of 200 birds from a population estimated at 4000 to 5000 birds (Kobriger 1964). Presently, greater sage-grouse in North Dakota are known to occur in Bowman, Slope, and Golden Valley counties in the extreme southwestern part of the state. There even have been documented cases of a greater sage-grouse/sharp-tailed grouse (*Tympanuchus phasianellus jamesi*) hybrid in North Dakota (Kohn and Kobriger 1986).

Historical accounts of greater sage-grouse in South Dakota indicate that the distribution was broad, occurring throughout the western half of the state (i.e., west of the Missouri River) excluding the area associated with the Black Hills (Over and Thoms 1921, 1946) or limited to the western third of the state (Aldrich and Duvall 1955, Aldrich 1963, Schroeder et al. 1999; Fig. 1). However, Aldrich and Duvall (1955) do have what seems to be an erroneous occurrence of a greater sage-grouse in the northeastern most corner of South Dakota. McClanahan (1940) depicted the historical distribution of greater sage-grouse in South Dakota between these extremes (Fig. 1). Early accounts of greater sage-grouse in South Dakota suggested a distribution resembling that depicted by McClanahan (1940) and Schroeder et al. (1999), but also depicted the population as rapidly declining. A survey by the USGS between the North Dakota state line and the first standard parallel north of the Black Hills, and between the 100th and 103rd meridians reported “the sage hen (sic) is found in the west portion of the area” (Perisho 1908:23). Another USGS report on greater sage-grouse in South Dakota stated “formerly they were found in many sections of western South Dakota and westward. The last ones recorded from this state, except in the northwestern corner, were found in Sage Creek in the badlands in 1907” (Visser 1914:73). Bent (1932) concurred that the distribution of sage-grouse once extended east to the Sage Creek area. In 1909 sage-grouse were “very locally distributed” (Visser 1909:147). The USGS report continued “by 1910 all were gone except those in Harding and Butte counties” (Visser 1914:73), but “abundant resident in areas covered with the scrub sagebrush (sic) (*Artemisia tridentata*)” (Visser 1911:10). “Now (1913), after three more years of homesteading, sage grouse (sic) are restricted in this state to the Little Missouri Valley in Harding County and the headwaters of Indian Creek in Butte” (Visser 1914:74). The USGS report continued “in a very few years they will occur in South Dakota only as a rare winter straggler from Montana” (Visser 1914:74). Locations of historic accounts are in Fig. 3. P. L. Edholm, South Dakota Deputy State Game Warden stated, “the counties of Butte, Harding, and Perkins produce a few of the sage grouse (sic), though they seem to be gradually disappearing, even

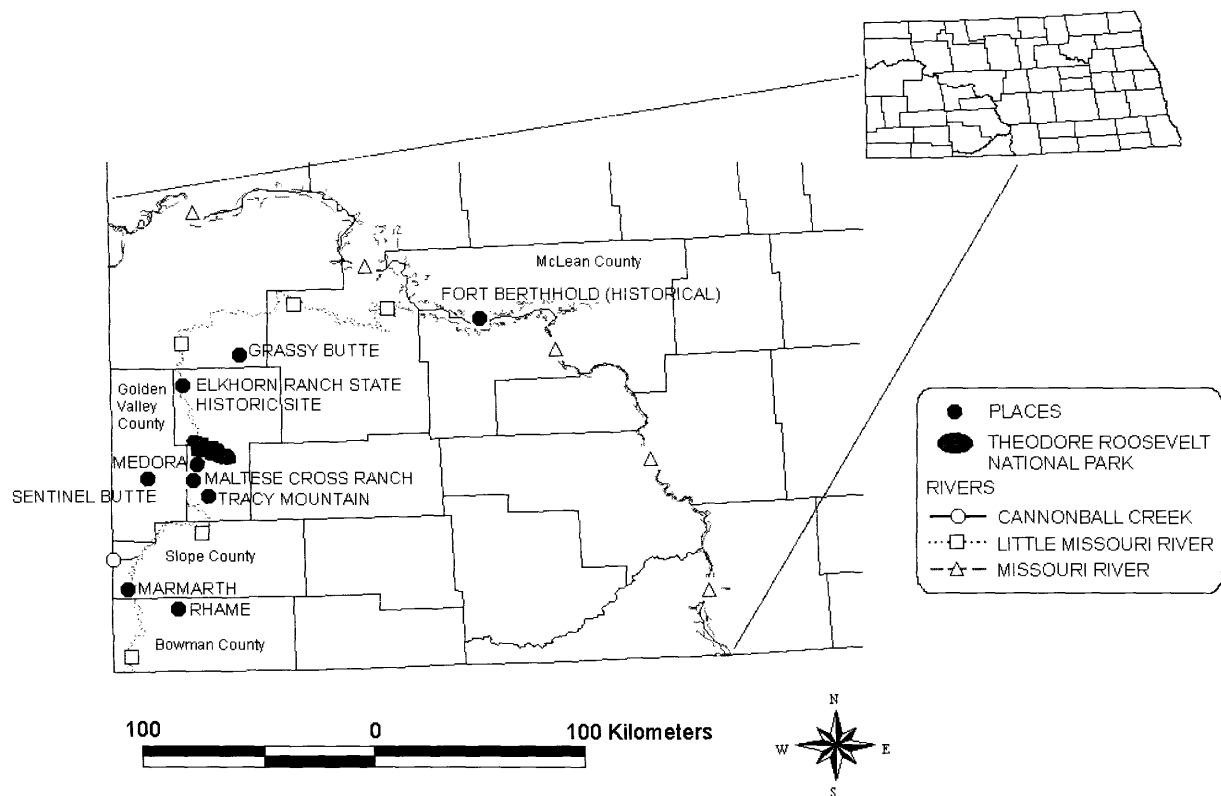


Figure 2. Sites of historical greater sage-grouse records in North Dakota. We displayed both (i.e., Elkhorn and Maltese Cross) Roosevelt Ranch locations.

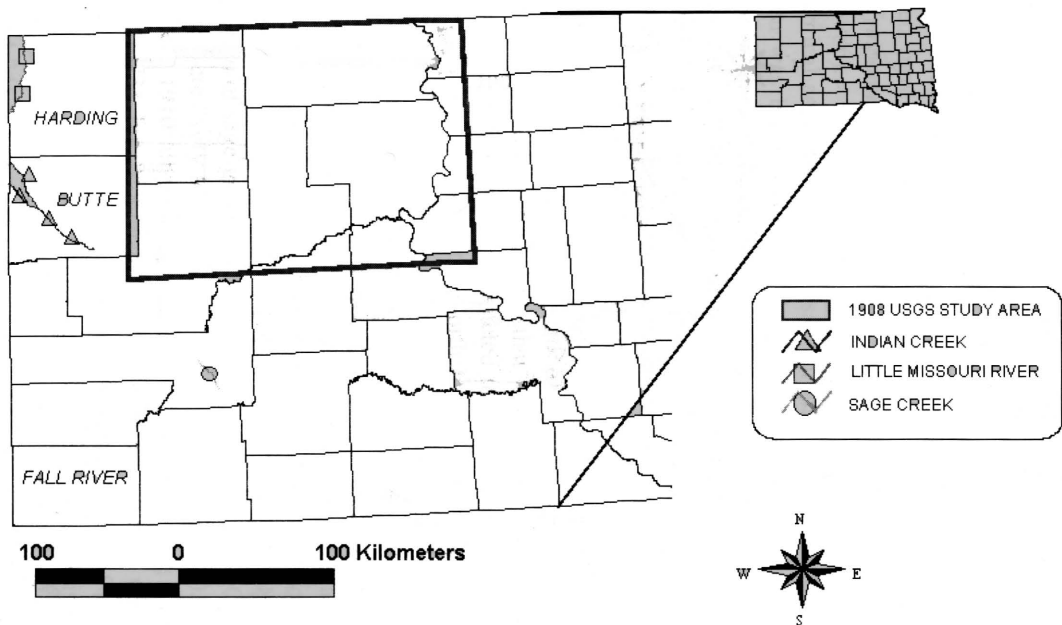


Figure 3. Sites of historical greater sage-grouse records in South Dakota.

in those localities. These are the only sections of the state (to the best of my knowledge), where these birds may now be found" (Hornaday 1916).

A report by the South Dakota State Planning Board (1935) showed greater sage-grouse as occurring in Harding, Butte, Meade, Fall River, and Stanley counties; but the Stanley County location, a county near the Missouri River, was questionable due to the lack of sagebrush cover. In 1952, greater sage-grouse in South Dakota were only documented in Harding, Butte, Perkins, and Fall River counties (Janson 1952, SDGFP 1953). SDGFP Annual Reports in the 1950's estimated the population of greater sage-grouse in South Dakota was once greater than 10,000 birds (SDGFP 1952, 1956; SDGFP, unpublished data), an ample number to support a hunting season (SDGFP 1952, 1954, 1955, 1956). After a 20 year closure, the hunting season on greater sage-grouse was reopened in 1955 in South Dakota with a kill estimated at slightly less than 1,000 birds from a population estimated at 15,000 birds (Nelson 1955; Erling Podoll, SDGFP, personal communication). Local residents of Harding County also proclaimed ample numbers of greater sage-grouse; "wild game abounds in the area, including deer, antelope, sage grouse (sic), and in certain areas pheasants and wild turkeys" (Buffalo Times-Herald 1959). However, population estimates in SDGFP (1952) and (1956) reports were based on an aerial census in winter, which leads to some skepticism of the accuracy of such a large count. One account described greater sage-grouse in the 1960's in abundance approximately 10 miles north of Camp Crook and a noticeable reduction by the 1980's (George Vandel, SDGFP, personal communication). Presently, greater sage-grouse in South Dakota occur in Harding, Butte, and Fall River counties with population levels well below 1950's estimates.

Active and Historically Active Leks

Over the past 50 years, the number of known active leks in North Dakota has ranged from 11 to 22 (NDGF, unpublished data; Fig. 4b). In South Dakota, the number of known active leks has ranged from 5 to 16 over approximately the last 30 years (Linde et al. 1975, 1976, 1977, 1978, 1979; SDGFP, unpublished data; Fig. 5b). The numbers of known active leks has remained basically the same over time in both North Dakota (Fig. 4b) and South Dakota (Fig. 5b). All known active and inactive lek locations of greater sage-grouse in North Dakota and South Dakota (Fig. 6) showed a predominance of abandonment in the eastern part of their range; this was most apparent in North Dakota.

Long-term Lek Surveys

Survey data from the past 50 years in North Dakota showed a steady decline in numbers of male greater sage-grouse counted (Fig. 4a). Total number of male greater sage-grouse counted on North Dakota leks each year ranged from 111 to 542, peaking in the early 1950's (NDGF, unpublished data; Fig. 4a). Average males per lek per year in North Dakota range from 7 to 32 (NDGF, unpublished data; Fig. 4c).

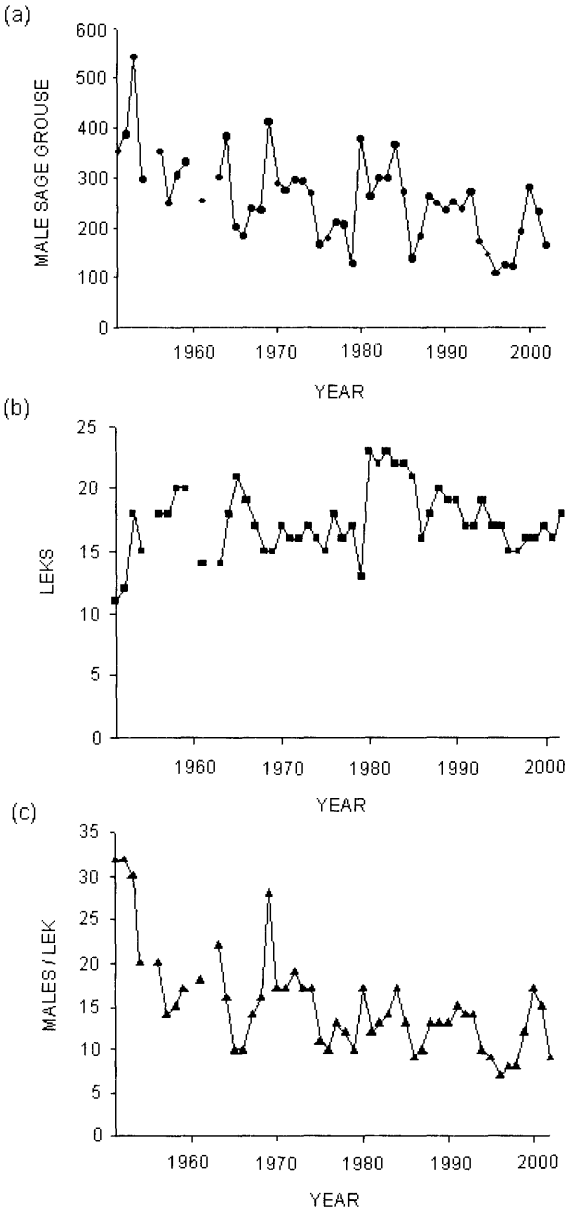


Figure 4. Trends from greater sage-grouse lek surveys in North Dakota (a = number males counted on leks, b = number of active leks, and c = average males per lek per year).

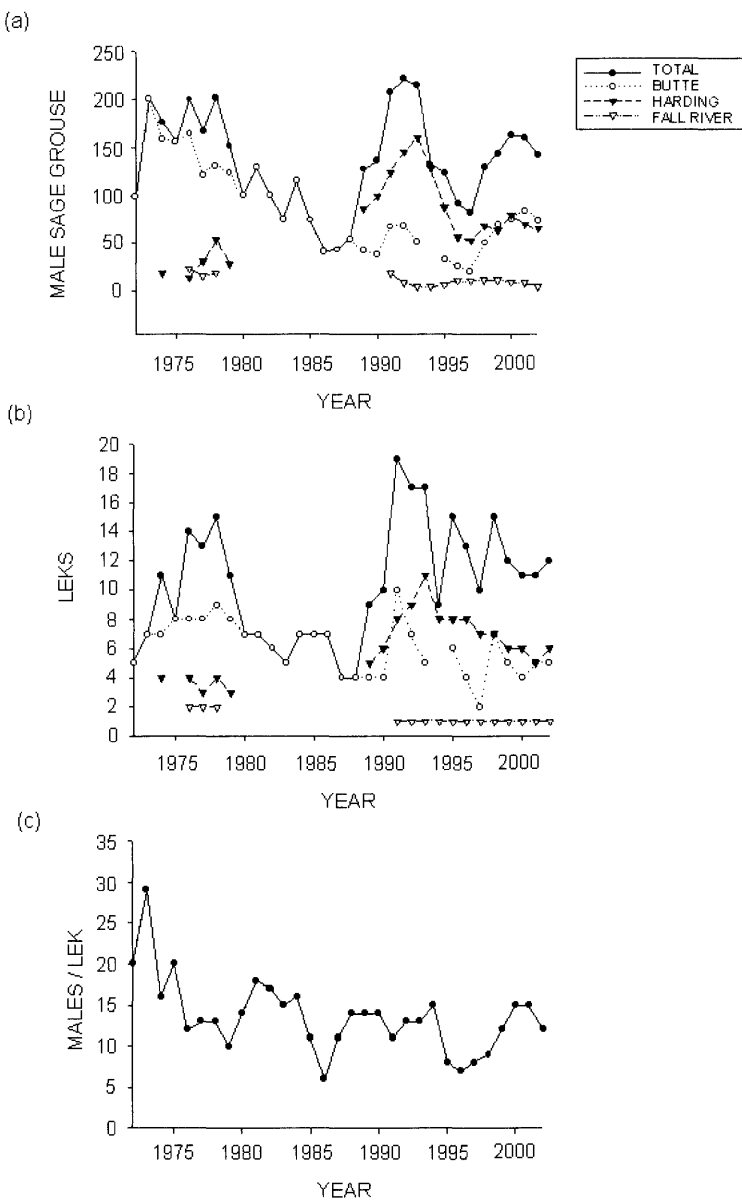


Figure 5. Trends from greater sage-grouse lek surveys in South Dakota (a = number males counted on leks, b = number of active leks, and c = average males per lek per year).

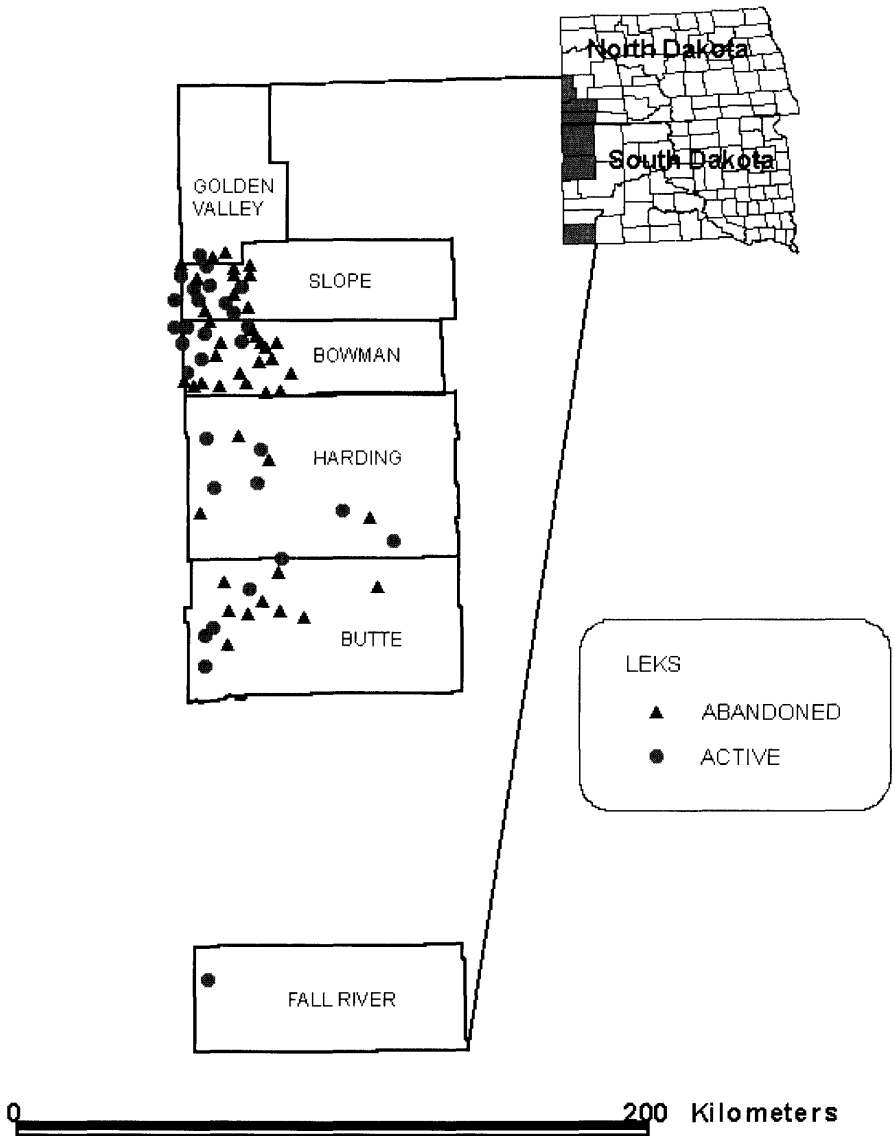


Figure 6. Locations of active and abandoned greater sage-grouse leks in North Dakota and South Dakota, 2002.

Survey data from the past 30 years in South Dakota also showed a steady decline in numbers of male greater sage-grouse counted on leks. However, survey data collected before 1989 were available consistently only for Butte County. Thus, population data for South Dakota were incomplete prior to that year and should be used with caution. Butte County, having the best long-term data, could be used as an indicator of greater sage-grouse population status in South Dakota; a decline in males counted was apparent (Fig. 5a). Survey information from Harding and Fall River counties has been collected consistently only since 1989 and 1991, respectively. Total number of male greater sage-grouse counted on South Dakota leks each year ranged from 41 to 221, peaking in the early 1990's (Linde et al. 1975, 1976, 1977, 1978, 1979; SDGFP, unpublished data; Fig. 5a). In South Dakota, average males per lek per year ranges from 6 to 29 (SDGFP, unpublished data; Fig. 5c). Only the total for South Dakota was used in Figure 5c to make the graph clearer.

DISCUSSION

Number of known active leks during 1951 to 2002 in North Dakota fluctuated and probably reflected search intensity. More leks likely were present historically, but were not located because the entire distribution was not surveyed uniformly. Extensive aerial searches (1980, 2000) conducted by the NDGF increased the number of known active leks and located leks thought to be abandoned; from spring 1979 to spring 1980 there was an increase of 10 known active greater sage-grouse leks, but aerial searches in spring 2000 were unsuccessful at increasing the number of known active leks (NDGF, unpublished data). However, there has been a steady decline in number of male greater sage-grouse counted in North Dakota.

Count data prior to 1989 in South Dakota were not as reliable as those from North Dakota. Personnel changes, occasional use of aerial surveys to count males on leks, and lack of consistent surveys in Harding and Fall River counties prior to 1989 caused difficulties in examining long-term trends in South Dakota. Using Butte County data to represent South Dakota, long-term trends indicated a steady decline in number of males from 1973 to 1997. However, lek counts in the last three years have equaled those observed almost 20 years ago. Active lek numbers in Butte County have been erratic over the past 30 years, probably from inconsistent search efforts. If applied, systematic aerial searches might be useful in locating new leks where no leks were known to be present currently in South Dakota.

Greater sage-grouse associated with one or more occupied leks in the same geographic area and separated from other leks by greater than 20 km represent a breeding population (Connelly et al. 2000b). Greater sage-grouse in North Dakota and Harding and Butte counties of South Dakota occupied leks within 20 km of leks in Montana or Wyoming. Thus, populations in North Dakota and South Dakota

are continuous with larger greater sage-grouse populations in eastern Montana and Wyoming. The greater sage-grouse breeding population in Fall River County, South Dakota might represent an isolated population, as the closest known neighboring lek in Wyoming is greater than 30 km distant.

Abandonment of leks in the eastern edge of the greater sage-grouse distribution in the Dakotas suggested that land use patterns in these areas have changed and now fail to meet greater sage-grouse needs (Connelly and Braun 1997). However, enhancement of nesting habitat in the currently occupied range could create opportunities for female greater sage-grouse (Dalke et al. 1963). This eastern edge abandonment also might be attributed to greater sage-grouse habitat declines and distribution changes within core habitat areas of Montana and Wyoming.

Consistency in lek surveys is needed for collecting useful population data (Autenrieth et al. 1982, Connelly and Braun 1997). Lek count data and all identified lek locations should be maintained in permanent records. New disturbance factors such as oil/natural gas developments, fires, spraying, and power lines that occur near lek areas should be documented for individual leks. Aerial searches for new leks, particularly in South Dakota, should be consistent at 3 to 5 year intervals. If a lek has been abandoned recently, ground searches should occur within 1 to 2 years to examine possible lek movement. Additional research using radio-marked greater sage-grouse is needed for examining movements, survival, and seasonal habitat needs of greater sage-grouse (Connelly et al. 2000b) in the Dakotas.

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