2015 MINNESOTA SPRING GROUSE SURVEYS

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SUMMARY OF FINDINGS

Each spring, the Minnesota DNR coordinates statewide ruffed grouse (*Bonasa umbellus*) and sharp-tailed grouse (*Tympanuchus phasianellus*) surveys with the help of wildlife managers, cooperating agencies, and organizations (e.g., tribal agencies, U.S. Forest Service, college wildlife clubs). In 2015, ruffed grouse surveys were conducted between 14 April and 16 May, with one route run later. Mean ruffed grouse drums per stop (dps) were 1.1 statewide (95% confidence interval = 1.0–1.3) and did not change (-1%) from the previous year.

Sharp-tailed grouse surveys were conducted between 13 March and 8 May 2015, with 2,019 birds observed at 206 leks. The mean numbers of sharp-tailed grouse/lek were 5.3 (4.3-6.4) in the East Central (EC) survey region, 10.8 (9.9–11.9) in the Northwest (NW) region, and 9.8 (8.9–10.7) statewide. Comparisons between leks observed in consecutive years (2014 and 2015) were unchanged statewide ($t = 0.7$, $P = 0.4$) and in regional comparisons ($P > 0.05$).

INTRODUCTION

The ruffed grouse (*Bonasa umbellus*) is the most popular game bird in Minnesota, with an annual harvest averaging >500,000 birds (~150,000 -1.4 million birds). Ruffed grouse hunter numbers have been as high as 92,000 during the last decade, although hunter numbers did not peak with the recent peak in grouse numbers, as they have traditionally. Sharp-tailed grouse (*Tympanuchus phasianellus*) are also popular among hunters, with an annual harvest of 6,000-22,000 birds since the early-1990s and 5,000-10,000 hunters in Minnesota.

The Minnesota DNR coordinates grouse surveys each year to monitor changes in grouse populations through time. These surveys provide a reasonable index to population trends, when the primary source of variation in counts among years is change in densities. However,

weather, habitat conditions, observer ability, and grouse behavior, also vary over time and can influence survey counts. Thus, making inferences from survey data over short time periods (e.g., a few years) can be tenuous. Nevertheless, over longer time periods and when large changes in index values occur, these surveys can provide a reasonable index to long-term grouse population trends. Spring surveys, in combination with hunter harvest statistics, provide evidence that the ruffed grouse population cycles at approximately 10-year intervals.

The first surveys of ruffed grouse in Minnesota occurred in the mid-1930s, and the first spring survey routes were established along roadsides in 1949. By the mid-1950s, ~50 routes were established with ~70 more routes added during the late-1970s and early-1980s. Since that time, spring drumming counts have been conducted annually to survey ruffed grouse in the forested regions of the state where ruffed grouse habitat occurs. Drumming is a low sound produced by males as they beat their wings rapidly and in increasing frequency to signal the location of their territory. These drumming displays also attract females that are ready to begin nesting, so the frequency of drumming increases in the spring during the breeding season. The sound produced when male grouse drum is easy to hear and thus drumming counts are a convenient way to survey ruffed grouse populations in the spring.

Sharp-tailed grouse were first surveyed in Minnesota between the early-1940s and 1960. The current survey is based on counts at dancing grounds during the spring and was first conducted in 1976. Male sharp-tailed grouse display, or dance, together in open areas to attract females in the spring. This display consists of the males stomping their feet with out-stretched wings. Females visit the dancing grounds to select males for breeding. These dancing grounds, or leks, are reasonably stable in location from year to year, allowing surveyors to visit and count individuals each spring. Surveys are conducted in openland portions of the state where sharp-tailed grouse persist, although they were formerly much more widely distributed in Minnesota at the early part of the 20th century.

METHODS

Ruffed Grouse

Surveys for ruffed grouse were conducted along 126 established routes throughout the state. Each route consisted of 10 listening stops at approximately 1.6-km (1-mile) intervals. The placement of routes on the landscape was determined from historical survey routes, which were originally placed near ruffed grouse habitat in low traffic areas. Annual sampling of these historical routes provides information about temporal changes along the routes, but may not be representative of the counties or regions where the routes occurred.

Survey observers were solicited from among state, federal, tribal, private, and student biologists. Each observer was provided a set of instructions and route location information. No formal survey training was conducted but all observers had a professional background in wildlife science, and most had previously participated in the survey. Participants were asked to conduct surveys at sunrise during peak drumming activity (in April or May) on days that had little wind and no precipitation. Each observer drove the survey route once and listened for drumming at each stop for 4 minutes. Observers recorded the number of drums heard at each stop (not necessarily the number of individual grouse), along with information about phenology and weather at the time of the survey.

The number of drums heard per stop (dps) was used as the survey index value. I determined the mean dps for each route, for each of 4 survey regions (Figure 1), and for the entire state. For each survey region, I calculated the mean of route-level means for all routes partially or entirely within the region. Routes that traversed regional boundaries were included in the means for both regions. Because the number of routes within regions was not related to any proportional characteristic, I used the weighted mean of index values for the 4 Ecological Classification Sections (ECS) in the Northeast region and the 7 ECS sections in the state. The geographic area of the section was used as the weight for each section mean (i.e., Lake Agassiz, Aspen Parklands = 11,761 km^2, Northern Minnesota and Ontario Peatlands = 21,468

km^2, Northern Superior Uplands = 24,160 km^2, Northern Minnesota Drift and Lake Plains = 33,955 km^2, Western Superior Uplands = 14,158 km^2, Minnesota and Northeast Iowa Morainal (MIM) = 20,886 km^2, and Paleozoic Plateau (PP) = 5,212 km^2). The area used to weight drum index means for the MIM and PP sections was reduced to reflect the portion of these areas within ruffed grouse range (~50%) using subsection boundaries. A 95% confidence interval (CI) was calculated to convey the uncertainty of each mean index value using 10,000 bootstrap samples of route-level means for survey regions and the whole state. Confidence interval boundaries were defined as the 2.5^{th} and 97.5^{th} percentiles of bootstrap frequency distributions.

Sharp-tailed Grouse

Wildlife Managers and volunteers surveyed known sharp-tailed grouse lek locations in their work areas in the Northwest (NW) and East Central (EC) portions of the state (Figure 2). The NW region consisted of Lake Agassiz & Aspen Parklands, Northern Minnesota & Ontario Peatlands, and Red River Valley ECS sections. The EC region consisted of selected subsections of the Northern Minnesota Drift & Lake Plains, Western Superior Uplands, and Southern Superior Uplands sections. Some leks may have been missed, but most managers believed that they included most of the leks in their work area. Given the uncertainty in the proportion of leks missed, especially those occurring outside traditional areas, the survey may not necessarily reflect sharp-tailed grouse numbers in larger areas such as counties or regions.

Each cooperator was provided with instructions and asked to conduct surveys on $\geq$1 day in an attempt to obtain a maximum count of male sharp-tailed grouse attendance at each lek. Observers were asked to conduct surveys within 2.5 hours of sunrise under clear skies and during low winds (<16 km/hr, or 10 mph) when lek attendance and ability to detect leks were expected to be greatest. Data recorded during each lek visit included the number of males, females, and birds of unknown sex.

The number of sharp-tailed grouse per dancing ground was used as the index value and was averaged for the NW region, the EC region, and statewide, using known males and birds of

unknown sex. Observations of just 1 grouse were not included in the index. Data from former survey years were available for comparison, however, survey effort and success varied among years rendering comparisons of the full survey among years invalid. Therefore, to make valid comparisons between 2 consecutive years, only counts of birds from dancing grounds that were surveyed during both years were considered. Paired t-tests were used to test the significance of comparisons among years. Confidence intervals (95%) were calculated using 10,000 bootstrap samples of lek counts for each region and statewide.

RESULTS & DISCUSSION

Ruffed Grouse

Observers from 12 cooperating organizations surveyed routes between 14 April and 28 May 2015. Most routes (96%) were surveyed between 14 April and 9 May, with the median date (April 29) earlier than last year (May 10) and more similar to recent years (April 23 and 25 in 2010 and 2012, and May 1 and 3 in 2009 and 2011, respectively). Excellent (63%), Good (31%), and Fair (6%) survey conditions were reported for 117 routes reporting conditions.

Statewide counts of ruffed grouse drums averaged 1.1 dps (95% confidence interval = 1.0–1.3 dps) during 2015 (Figure 3). Drum counts were 1.3 (1.1–1.5) dps in the Northeast (*n* = 103 routes), 1.0 (0.4–1.7) dps in the Northwest (*n* = 8), 0.7 (0.4–1.0) dps in the Central Hardwoods (*n* = 15), and 0.4 (0.2–0.6) dps in the Southeast (*n* = 8) regions (Figure 4a-d).

Statewide drum counts were similar to last year (-1% change). Although counts increased statewide last year, the spring of 2014 was very cold and wet and likely had a negative impact on production last spring. We also had comparatively little snow last year for snow roosting, which may have influenced overwinter survival.

Sharp-tailed Grouse

A total of 2,019 male sharp-tailed grouse and grouse of unknown sex was counted at 206 leks (Table 1) during 13 March - 8 May 2015. More leks (14%) were observed in 2015 than during 2014, in part due to the filling of several DNR Wildlife staff vacancies and increased

survey effort in the EC region this year. Leks with ≥2 grouse were observed an average of 1.9 times.

The statewide index value of 9.8 (8.9–10.7) was centrally located among values observed since 1980 (Figure 5). In the EC survey region, 208 grouse were counted on 39 leks, and 1,811 grouse were counted on 167 leks in the NW region. The index value (i.e., grouse/lek) was similar statewide and in both regions compared to 2014, and confidence intervals overlapped those from the last few years (Table 1). Counts at leks observed during both 2014 and 2015 were also similar ($t = 0.7$, $P = 0.4$) statewide and by region ($P > 0.05$; Table 2).

Sharp-tailed grouse population index values peaked with those for ruffed grouse in 2009, and appear to have troughed with them in 2013, although sharp-tailed grouse peaks can follow those of ruffed grouse by as much as 2 years. However, both grouse population indices did not change this year.

ACKNOWLEDGEMENTS

The ruffed grouse survey was accomplished this year through the combined efforts of staff and volunteers at Chippewa and Superior National Forests (USDA Forest Service); Fond du Lac, Leech Lake, Red Lake, and White Earth Reservations; 1854 Treaty Authority; Agassiz and Tamarac National Wildlife Refuges (U.S. Fish & Wildlife Service); Vermilion Community College; Cass County Land Department; and DNR staff at Aitkin, Baudette, Bemidji, Brainerd, Cambridge, Carlos Avery Wildlife Management Area (WMA), Cloquet, Crookston, Detroit Lakes, Fergus Falls, Grand Rapids, International Falls, Karlstad, Little Falls, Mille Lacs WMA, Park Rapids, Red Lake WMA, Rochester, Roseau River WMA, Sauk Rapids, Thief Lake WMA, Thief River Falls, Tower, Two Harbors, Whitewater WMA, and Winona work areas. I would like to thank DNR staff and volunteers at Aitkin, Baudette, Bemidji, Cambridge, Cloquet, Crookston, Karlstad, International Falls, Tower, Thief River Falls, and Thief Lake work areas, staff and volunteers at Red Lake and Roseau River WMAs, and partners at Agassiz National Wildlife Refuge for participating in sharp-tailed grouse surveys. Clarinda Wilson and Sophia Crosby

also assisted with sharp-tailed grouse surveys this year. Laura Gilbert helped enter ruffed grouse data. Gary Drotts, John Erb, and Rick Horton organized an effort to enter the ruffed grouse survey data for 1982–2004, and Doug Mailhot and another volunteer helped enter the data. I would also like to thank Mike Larson for his assistance in the transition coordinating the surveys and for making helpful comments on this report. This work was funded in part through the Federal Aid in Wildlife Restoration Act.

Table 1. Sharp-tailed grouse / lek (≥2 males) at all leks observed during spring surveys each year in Minnesota.

	Statewide			Northwest[a]			East Central[a]		
Year	Mean	95% CI[b]	*n*[c]	Mean	95% CI[b]	*n*[c]	Mean	95%CI[b]	*n*[c]
2004	11.2	10.1–12.3	183	12.7	11.3–14.2	116	8.5	7.2–9.9	67
2005	11.3	10.2–12.5	161	13.1	11.5–14.7	95	8.8	7.3–10.2	66
2006	9.2	8.3–10.1	161	9.8	8.7–11.1	97	8.2	6.9–9.7	64
2007	11.6	10.5–12.8	188	12.7	11.3–14.1	128	9.4	8.0–11.0	60
2008	12.4	11.2–13.7	192	13.6	12.0–15.3	122	10.4	8.7–12.3	70
2009	13.6	12.2–15.1	199	15.2	13.4–17.0	137	10.0	8.5–11.7	62
2010	10.7	9.8–11.7	202	11.7	10.5–12.9	132	8.9	7.5–10.5	70
2011	10.2	9.5–11.1	216	11.2	10.2–12.2	156	7.8	6.7–8.9	60
2012	9.2	8.2–10.3	153	10.7	9.3–12.3	100	6.3	5.4–7.3	53
2013	9.2	8.2–10.2	139	10.5	9.3–11.7	107	4.8	3.8–5.9	32
2014	9.8	8.8–10.9	181	10.9	9.8–12.1	144	5.4	4.5–6.4	37
2015	9.8	8.9–10.7	206	10.8	9.9–11.9	167	5.3	4.4–6.4	39

[a] Survey regions; see Figure 1.
[b] 95% CI = 95% confidence interval
[c] *n* = number of leks in the sample.

Table 2. Difference in the number of sharp-tailed grouse / lek observed during spring surveys of the same lek in consecutive years in Minnesota.

	Statewide			Northwest[a]			East Central[a]		
Comparison[b]	Mean	95% CI[c]	*n*[d]	Mean	95% CI[c]	*n*[d]	Mean	95%CI[c]	*n*[d]
2004 - 2005	-1.3	-2.2– -0.3	186	-2.1	-3.5– -0.8	112	0.0	-1.0– 1.1	74
2005 - 2006	-2.5	-3.7– -1.3	126	-3.6	-5.3– -1.9	70	-1.1	-2.6– 0.6	56
2006 - 2007	2.6	1.5– 3.8	152	3.3	1.7– 5.1	99	1.2	0.1– 2.3	53
2007 - 2008	0.4	-0.8– 1.5	166	0.0	-1.6– 1.6	115	1.2	0.1– 2.5	51
2008 - 2009	0.9	-0.4– 2.3	181	1.8	-0.1– 3.8	120	-0.8	-2.1– 0.6	61
2009 - 2010	-0.6	-1.8– 0.6	179	-0.8	-2.6– 1.0	118	-0.1	-1.2– 1.0	61
2010 - 2011	-1.7	-2.7– -0.8	183	-1.8	-3.1– -0.5	124	-1.5	-2.8– -0.3	59
2011 - 2012	-2.0	-2.9– -1.1	170	-1.7	-2.9– -0.4	112	-2.4	-3.3– -1.6	58
2012 - 2013	-0.8	-2.0– 0.4	140	0.4	-1.3– 2.3	88	-2.9	-4.2– -1.8	52
2013 - 2014	1.4	0.1– 2.7	121	1.6	-0.3– 3.5	79	1.1	-0.1– 2.3	42
2014 - 2015	-0.2	-1.0- 0.9	141	-0.3	-1.9- 1.3	102	-0.1	-1.1- 1.1	39

[a] Survey regions; see Figure 1.
[b] Consecutive years for which comparable leks were compared.
[c] 95% CI = 95% confidence interval
[d] *n* = number of leks in the sample. Here, a lek can have a 0 count in 1 of the 2 years and still be considered.

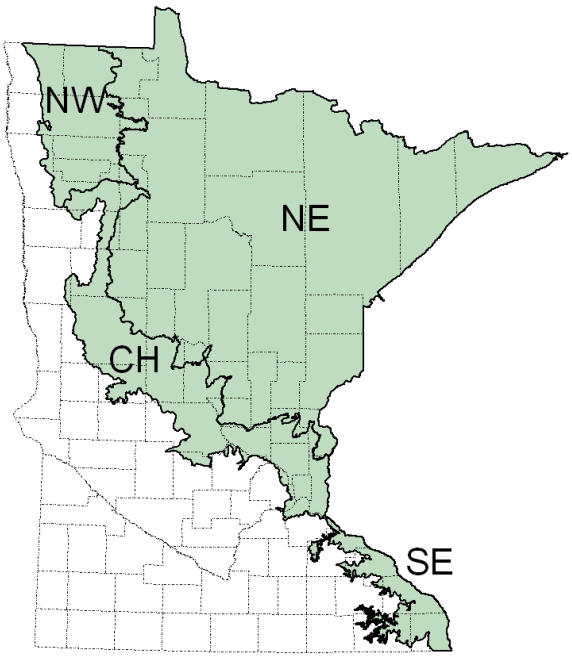


Figure 1. Survey regions for **ruffed grouse** in Minnesota. Northwest (NW), Northeast (NE), Central Hardwoods (CH), and Southeast (SE) survey regions are depicted relative to county boundaries (dashed lines) and influenced by the Ecological Classification System.

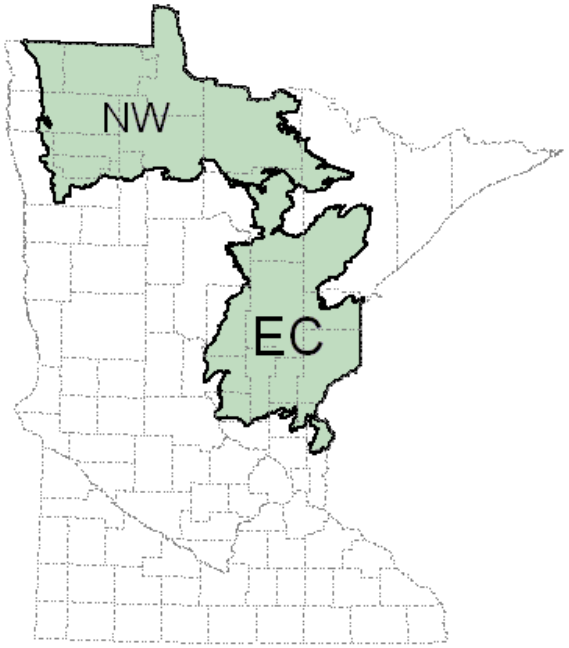


Figure 2. Survey regions for **sharp-tailed grouse** in Minnesota. Northwest (NW) and East Central (EC) survey regions are depicted relative to county boundaries (dashed lines) and influenced by Ecological Classification System Subsections boundaries.

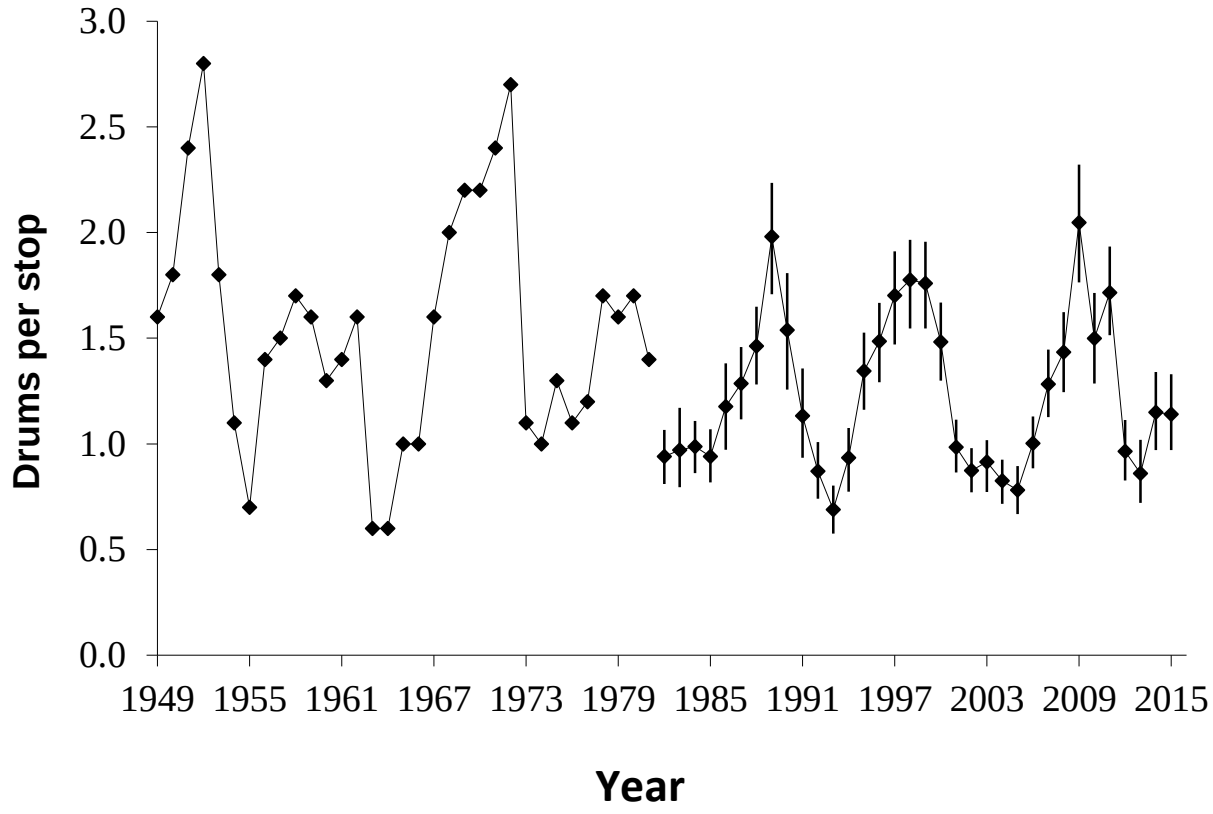
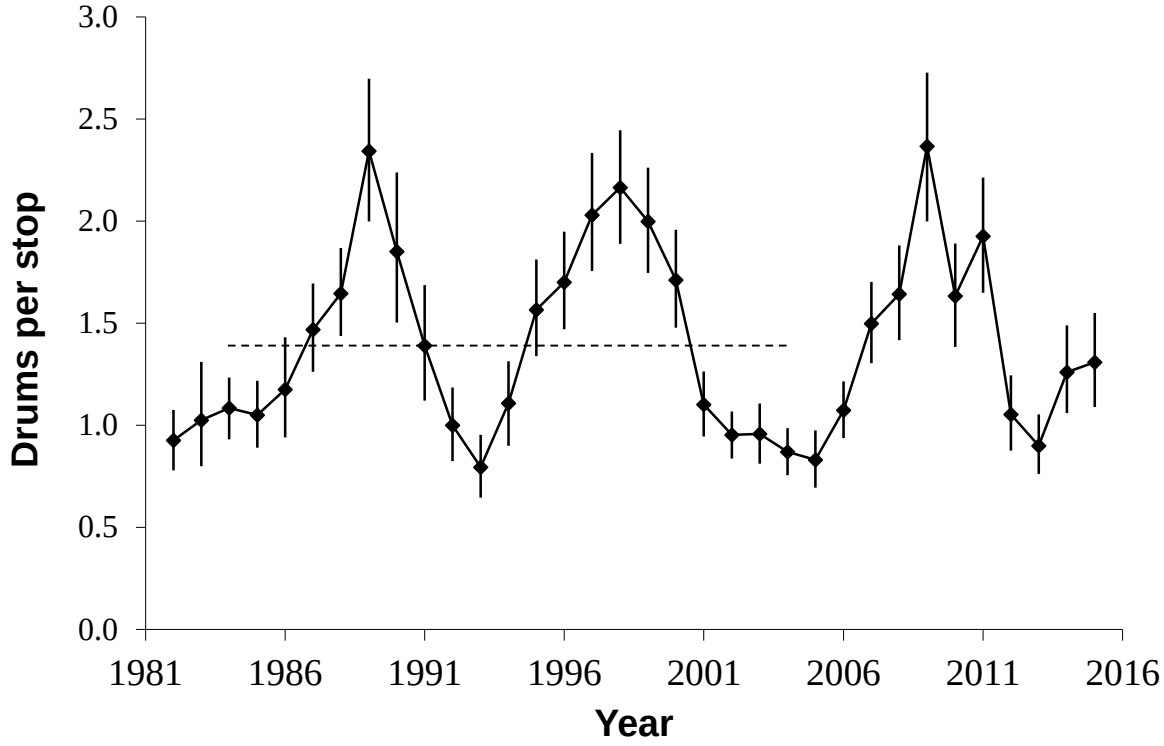


Figure 3. Statewide ruffed grouse population index values in Minnesota. Bootstrap (95%) confidence intervals (CI) are provided after 1981, but different analytical methods were used prior to this and thus CI are not available for earlier years. The difference between 1981 and 1982 is biological and not an artifact of the change in analysis methods.

a.


3.0
2.5
2.0
1.5
1.0
0.5
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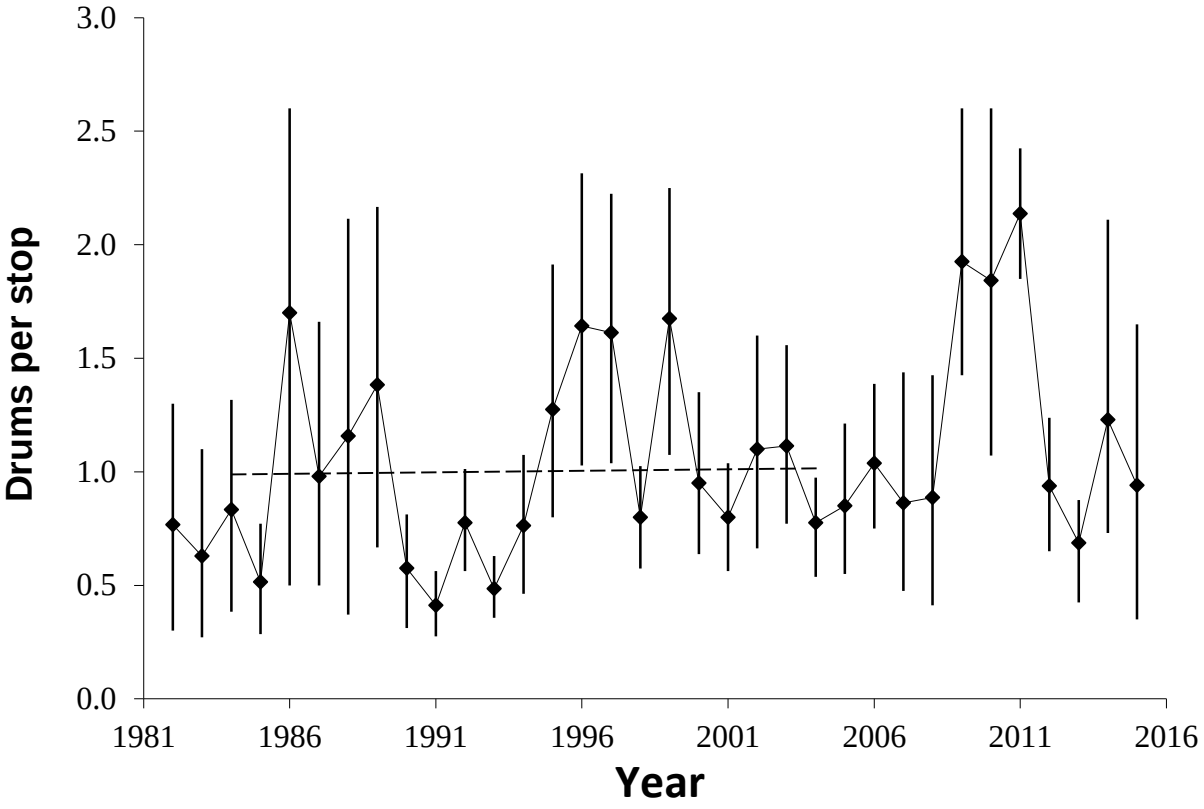
Drums per stop
1981
1986
1991
1996
2001
2006
2011
2016
Year

b.


3.0
2.5
2.0
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Drums per stop
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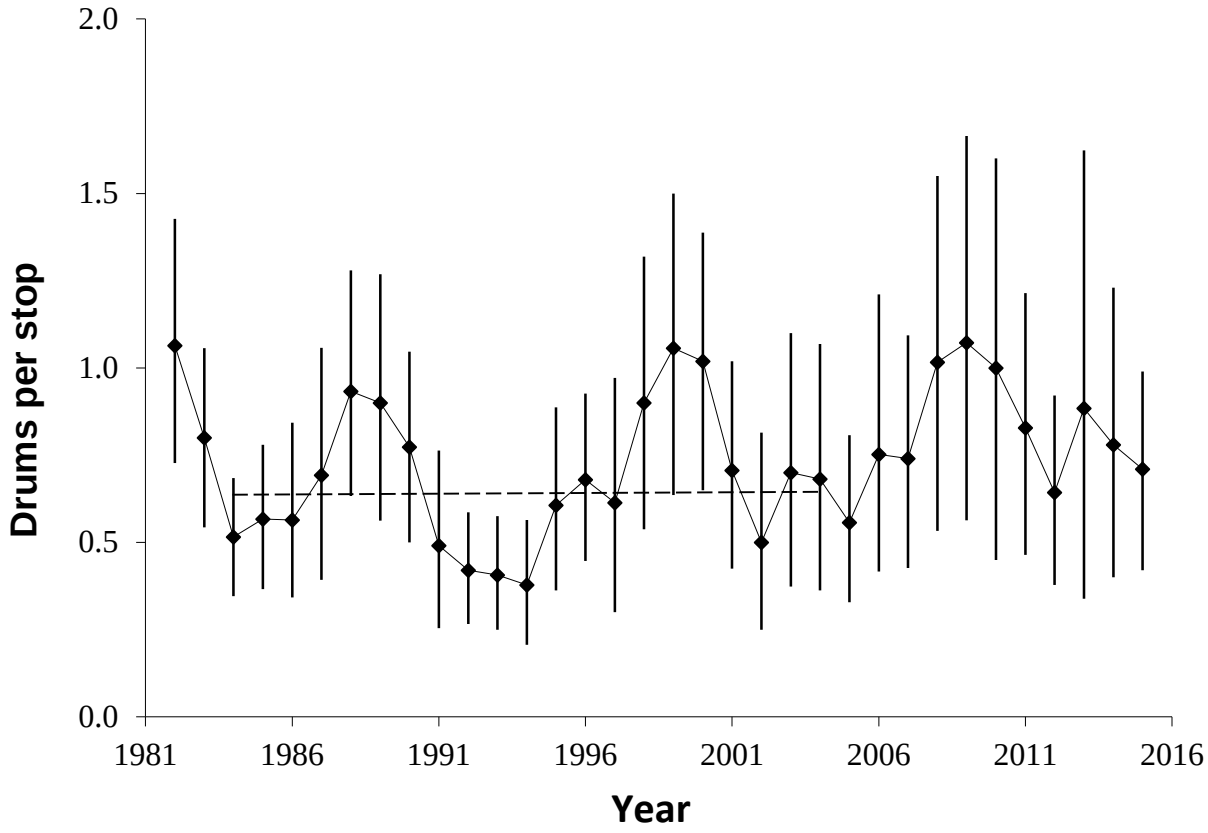
c.


2.0
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Drums per stop
1981
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d.

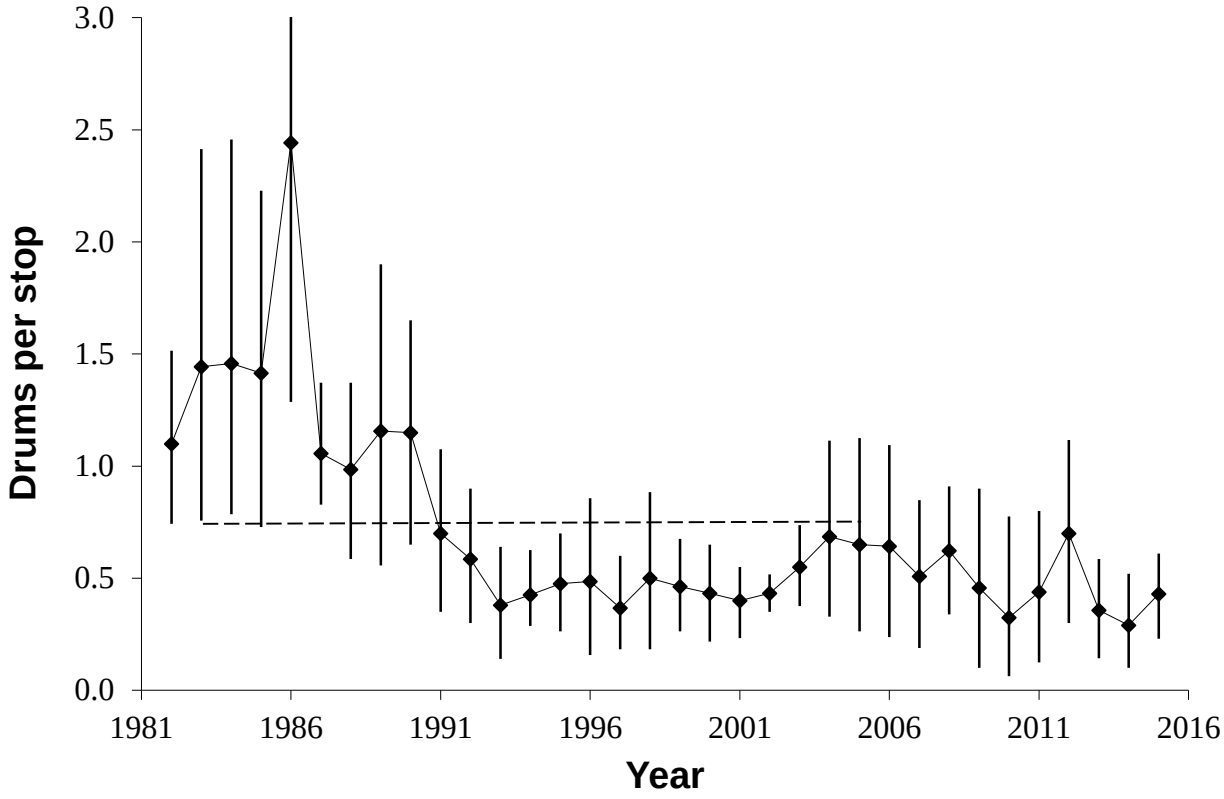

Figure 4a,b,c,d. Ruffed grouse population index values in the **Northeast** (a), **Northwest** (b), **Central Hardwoods** (c), and **Southeast** (d) survey regions of Minnesota. The mean for 1984-2004 is indicated by the dashed line. Bootstrap (95%) confidence intervals are provided for each mean. In the bottom panel, the CI for 1986 extends beyond area depicted in the figure.

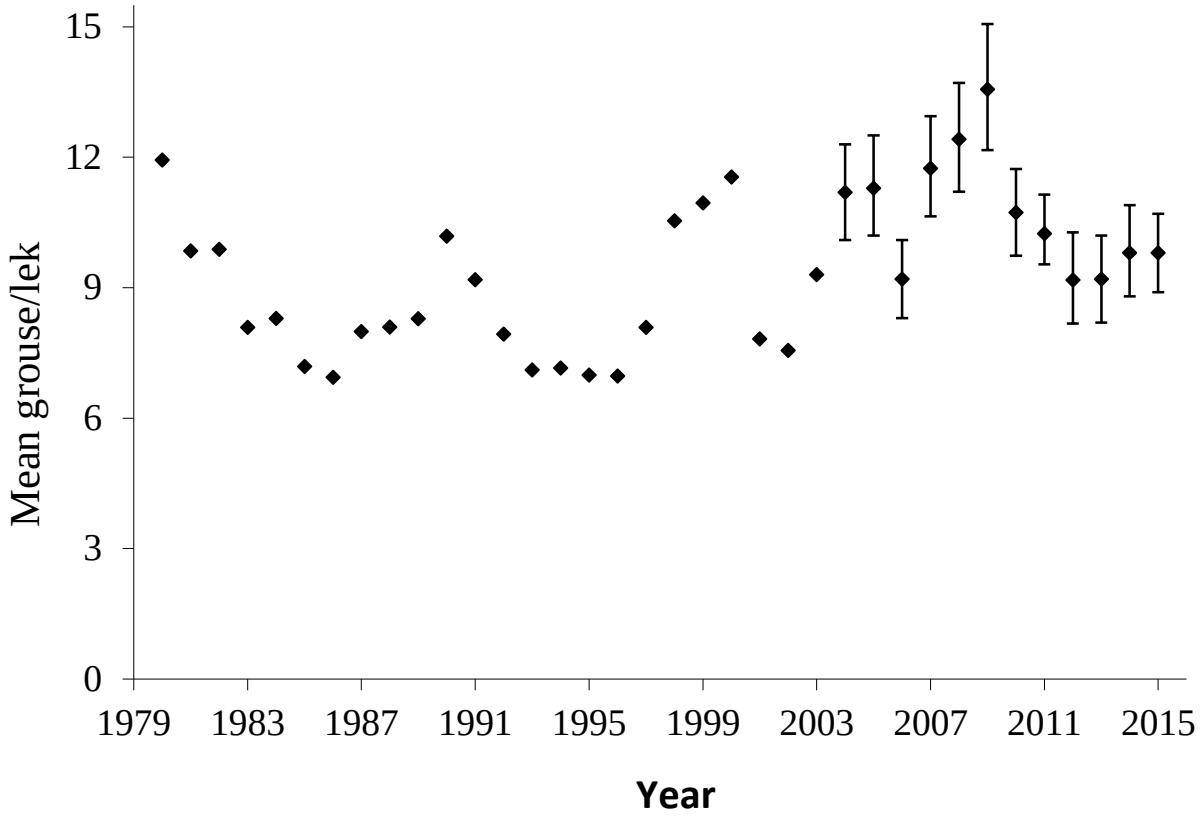

Figure 5. **Sharp-tailed grouse** counted in spring lek surveys statewide during 1980–2015. Bootstrap (95%) confidence intervals are provided for recent years. Annual means are not connected by lines because the same leks were not surveyed every year.