



2018 Minnesota Spring Grouse surveys

Charlotte Roy
Forest Wildlife Populations and Research Group
Minnesota Department of Natural Resources
Grand Rapids, Minnesota
5 June 2018

SUMMARY OF FINDINGS

The Minnesota DNR coordinates ruffed grouse (*Bonasa umbellus*) and sharp-tailed grouse (*Tympanuchus phasianellus*) surveys each spring with the help of wildlife staff and cooperating federal, tribal, and county agencies. In 2018, ruffed grouse surveys were conducted between 5 April and 15 May. Mean ruffed grouse drums per stop (dps) were 1.5 statewide (95% confidence interval = 1.3–1.7) and decreased (29%) from the previous year. High points in the population cycle occur on average every 10 years, and surveys this year indicate that the peak occurred last year, with counts similar to the previous peak in 2009. In more southern portions of ruffed grouse range, survey results were more similar to last year. Spring was very late in 2018, and it is possible that the drumming survey was conducted earlier than the peak in drumming this year. However, other factors likely also contributed to the decline in counts.

Sharp-tailed grouse surveys were conducted between 21 March and 20 May 2018, with 1,503 birds (males and birds of unknown sex) observed at 161 leks. The mean numbers of sharp-tailed grouse/lek were 7.3 (5.4–9.6) in the East Central (EC) survey region, 9.8 (8.8–10.9) in the Northwest (NW) region, and 9.3 (8.4–10.3) statewide. Comparisons between leks observed in consecutive years (2017 and 2018) indicated a 23% decline in birds/lek statewide ($t = 3.9$, $P = 0.0001$) and a 24% decline in the NW region ($t = 3.5$, $P = 0.0006$), but the 22%

decrease in the EC region ($t = 1.8$, $P = 0.09$) was not statistically significant, likely due to the smaller number of leks surveyed in that region.

INTRODUCTION

The ruffed grouse (*Bonasa umbellus*) is the most popular game bird in Minnesota, with an annual harvest averaging >500,000 birds (~150,000 to 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 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 km², Northern Minnesota and Ontario Peatlands = 21,468 km², Northern Superior Uplands = 24,160 km², Northern Minnesota Drift and Lake Plains = 33,955 km², Western Superior Uplands = 14,158 km², Minnesota and Northeast Iowa Morainal (MIM) = 20,886 km², and Paleozoic Plateau (PP) = 5,212 km²). 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 2.5th and 97.5th percentiles of bootstrap frequency distributions.

Sharp-tailed Grouse

Wildlife staff 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. In the EC region, and in eastern portions of the NW region where sharp-tailed grouse occur at low densities, most known leks are surveyed each year. Some leks may have been missed, but most managers in these regions believed that they included most of the leks in their work area, with the exception of Aitkin and Tower work areas where workloads do not permit exhaustive surveys. In the western part of the NW region, sharp-tailed grouse occur at higher densities, and thus surveying all leks is not feasible. Therefore, in the western portion of the NW region (e.g., Roseau, Thief River Falls), managers conduct surveys along 20-25 mile (32-40 km) routes. 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 ≥ 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. Observed lek size can vary as a function of population changes, lek numbers, and the timing, effort, and conditions of surveys, so it is important to consider all these factors when collecting data.

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 16 cooperating organizations surveyed 122 routes between 5 April and 15 May 2018. Most routes (98%) were surveyed between 22 April and 15 May, with a median survey date of May 3, which is similar to last year (May 3) and the median survey date for the most recent 10 years. Excellent (58%), Good (35%), and Fair (7%) survey conditions were reported for 119 routes reporting conditions.

Statewide counts of ruffed grouse drums averaged 1.5 dps (95% confidence interval = 1.3–1.8 dps) during 2018 (Figure 3). Drum counts were 1.7 (1.5–2.1) dps in the Northeast ($n = 101$ routes), 1.0 (0.5–1.5) dps in the Northwest ($n = 8$), 0.9 (0.4–1.4) dps in the Central Hardwoods ($n = 12$), and 0.9 (0.5–1.4) dps in the Southeast ($n = 7$) regions (Figure 4a-d). Statewide drum counts decreased (29%) from last year. The ruffed grouse population was in the increasing phase of the 10-year cycle and was expected to peak this year or next year. Although peaks in the cycle average 10 years, they have occurred slightly before or after 10 years. Surveys this year indicate the peak occurred last year. Some portion of the decline might have been due to the very late spring in 2018, and a lack of synchrony between calendar date and the peak of drumming activity this year. However, poor synchrony is unlikely to entirely explain the drop in counts this year.

Sharp-tailed Grouse

A total of 1,503 male sharp-tailed grouse and grouse of unknown sex were counted at 161 leks (Table 1) during 21 March to 20 May 2018. The statewide index value of 9.3 (8.4–10.3) grouse/lek was centrally located among values observed since 1980 (Figure 5). In the EC

survey region, 220 grouse were counted on 30 leks, and 1,280 grouse were counted on 130 leks in the NW survey region. One lek of 3 birds was counted just south of the NW region in Clearwater County. The grouse/lek index was similar statewide and in both survey regions compared to 2017 (Table 1). Leks with ≥ 2 grouse were observed an average of 2.1 times. Counts at leks observed during both 2017 and 2018 were 23% lower in 2018 statewide ($t = 3.9$, $P = 0.0001$) and 24% lower in the NW region ($t = 3.5$, $P = 0.0006$), but the 22% decline in the EC region was not significant ($t = 1.8$, $P = 0.09$; Table 2), likely because fewer leks were surveyed in that region (Figure 6).

Sharp-tailed grouse population index values peaked with those for ruffed grouse in 2009, and appear to have troughed with them in 2013, but sharp-tailed grouse peaks can follow those of ruffed grouse by as much as 2 years. Although decreases in the population index were not statistically significant in the EC region, 25% fewer leks were detected in the EC region this year, which diminishes statistical power to detect differences. Furthermore, a loss of small leks would tend to maintain the average lek size, while comparisons of leks surveyed in successive years would tend to decline. This is the pattern that was observed. No sharp-tailed grouse were observed in surveys in Kanabec County this year, which is the first time this has occurred in recent history, although the number of birds have dwindled slowly in this area. Sharp-tailed grouse rely on habitats that require ongoing management (e.g., prescribed fire, mowing, and shearing) for maintenance. Obstacles to successfully completing management include funding, staffing shortages, equipment, weather, and landowner permission.

In the NW region, the number of leks counted, average lek size, and comparisons between leks surveyed in successive years were all lower in 2018. Continued monitoring will document whether the NW population will continue to be a stronghold for sharp-tailed grouse in the state. During 2016–2018, the DNR allowed the capture and translocation of sharp-tailed grouse from the NW region to supplement a population of sharp-tailed grouse at Moquah

Barrens in Wisconsin. The impact of this effort, if any, has not yet been examined, but only leks with ≥ 15 birds were trapped to try to safeguard against negative impacts.

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, Grand Portage, Leech Lake, Red Lake, and White Earth Reservations; 1854 Treaty Authority; Blandin Paper, Agassiz National Wildlife Refuge (U.S. Fish & Wildlife Service); Vermilion Community College; Beltrami County and Cass County Land Departments; and DNR staff at Aitkin, Baudette, Bemidji, Brainerd, 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. Pam Coy, Alex Elliott, and Dan Ruka also helped with lek 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 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.

Year	Statewide			Northwest ^a			East Central ^a		
	Mean	95% CI ^b	<i>n</i> ^c	Mean	95% CI ^b	<i>n</i> ^c	Mean	95%CI ^b	<i>n</i> ^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
2016	9.5	8.6 – 10.5	182	10.2	9.2 – 11.4	152	6.0	4.9 – 7.3	30
2017	9.7	8.7 – 10.8	181	10.4	9.2 – 11.8	141	7.2	5.8 – 8.6	40
2018	9.3	8.4 – 10.3	161 ^d	9.8	8.8 – 10.9	130	7.3	5.4 – 9.6	30

^a Survey regions; see Figure 1.

^b 95% CI = 95% confidence interval

^c *n* = number of leks in the sample.

^dOne lek was located just south of the NW region in Clearwater County.

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

Comparison ^b	Statewide			Northwest ^a			East Central ^a		
	Mean	95% CI ^c	<i>n</i> ^d	Mean	95% CI ^c	<i>n</i> ^d	Mean	95%CI ^c	<i>n</i> ^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	-1.4 – 0.9	141	-0.3	-1.9 – 1.3	102	-0.1	-1.1 – 1.1	39
2015 – 2016	-1.3	-2.3 – -0.2	167	-1.6	-2.9 – -0.2	129	-0.2	-1.3 – 0.9	38
2016 – 2017	-0.3	-1.5 – 0.9	166	-0.3	-1.8 – 1.2	128	-0.2	-1.2 – 0.8	38
2017 – 2018	-2.2	-3.3 – -1.1	159 ^e	-2.4	-3.9 – -0.4	123	-1.4	-2.8 – 0.2	36

^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.

^eOne lek was located just south of the NW region in Clearwater County.

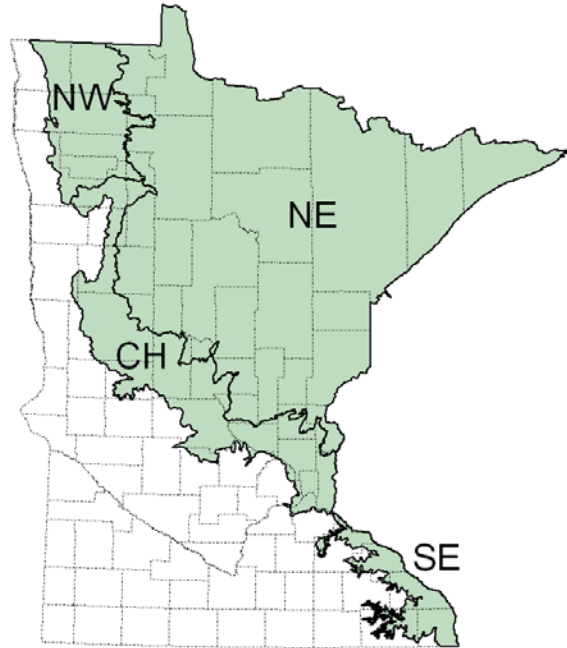


Figure 1. Survey regions for **ruffed grouse** in Minnesota. Northwest (NW), Northeast (NE), Central Hardwoods (CH), and Southeast (SE) survey regions are depicted relative to county boundaries (dashed lines) and influenced by the Ecological Classification System.

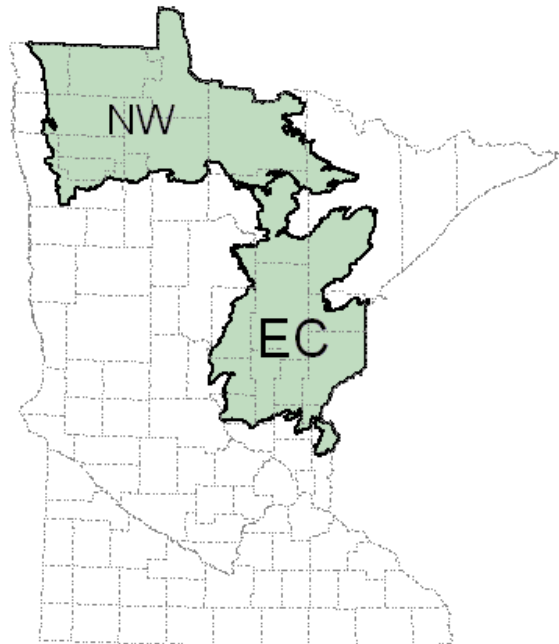


Figure 2. Survey regions for **sharp-tailed grouse** in Minnesota. Northwest (NW) and East Central (EC) survey regions are depicted relative to county boundaries (dashed lines) and influenced by Ecological Classification System Subsections boundaries.

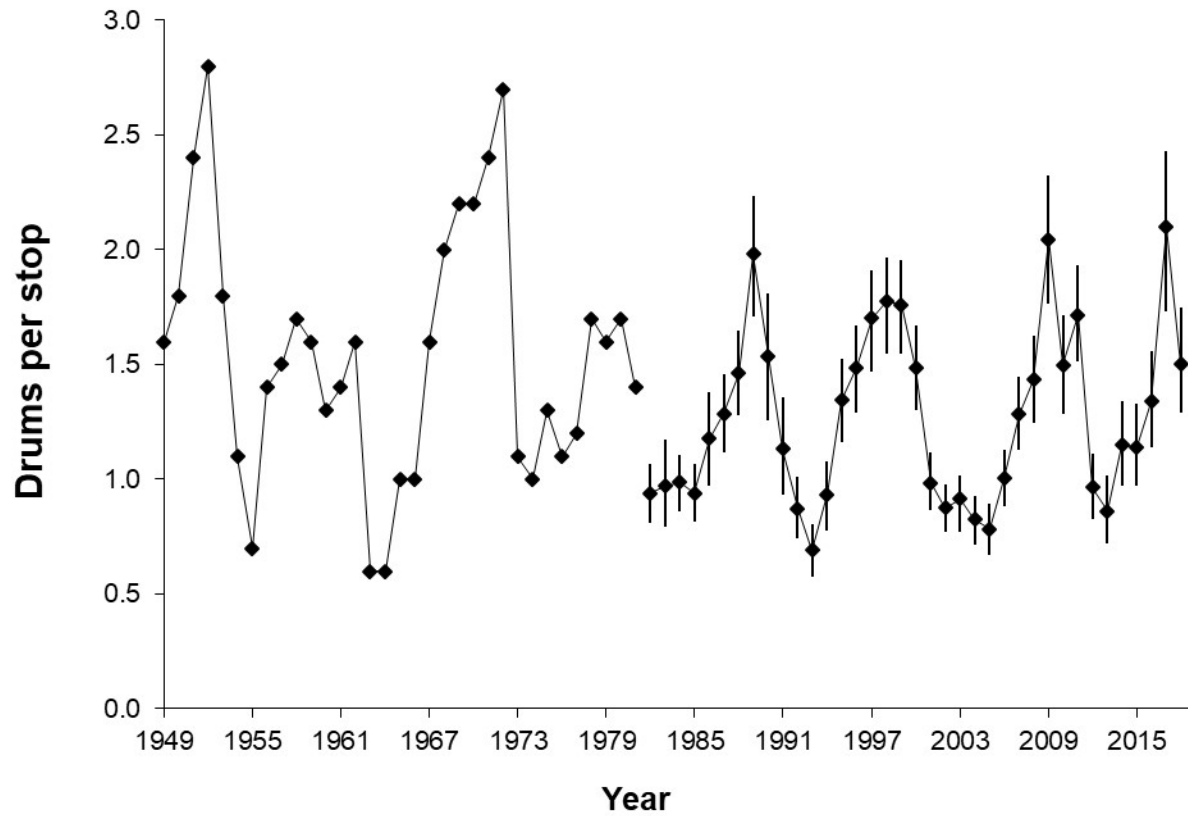
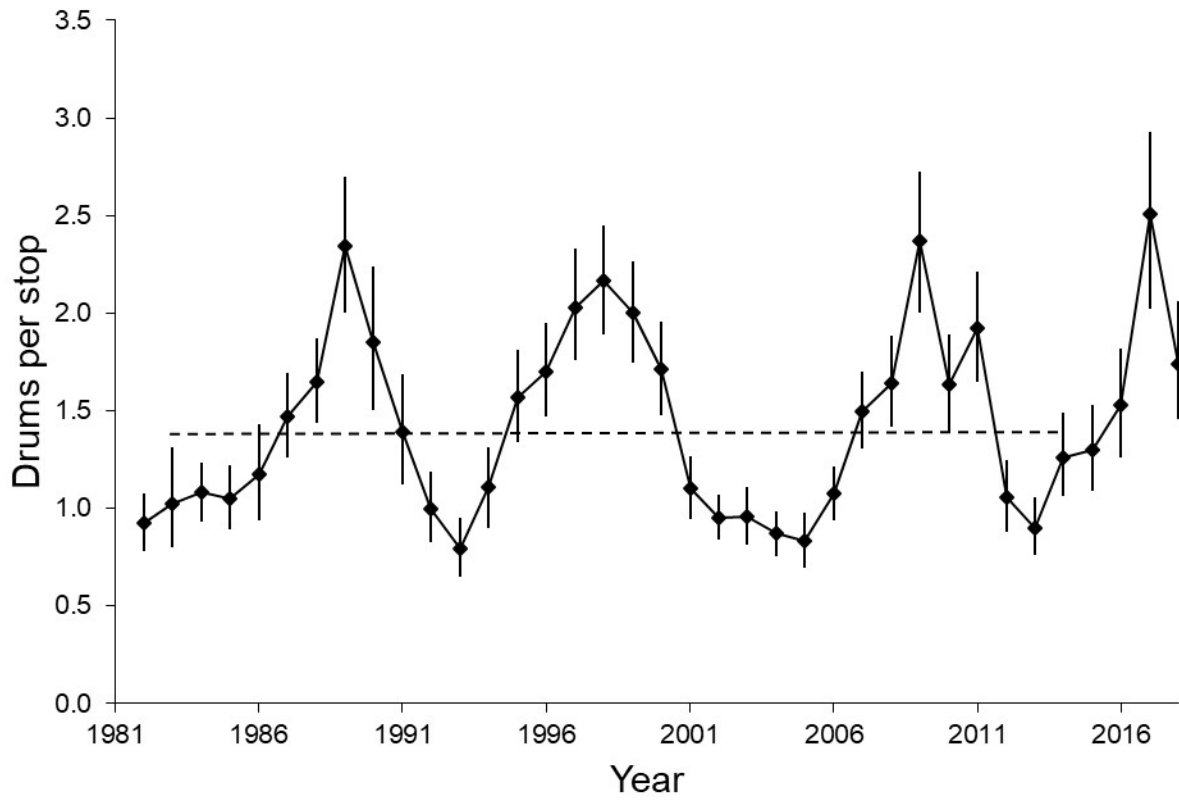
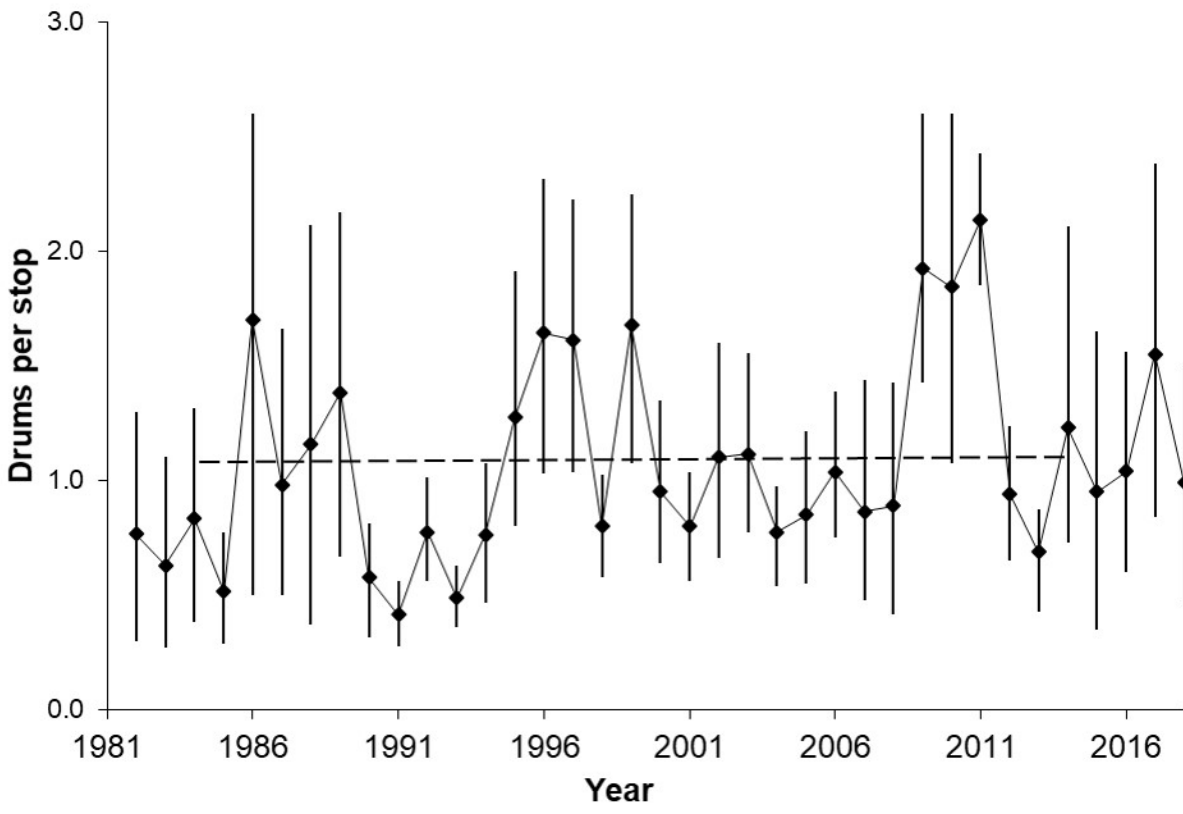


Figure 3. Statewide ruffed grouse population index values in Minnesota. Bootstrap (95%) confidence intervals (CI) are provided after 1981, but different analytical methods were used prior to this and thus CI are not available for earlier years. The difference between 1981 and 1982 is biological and not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

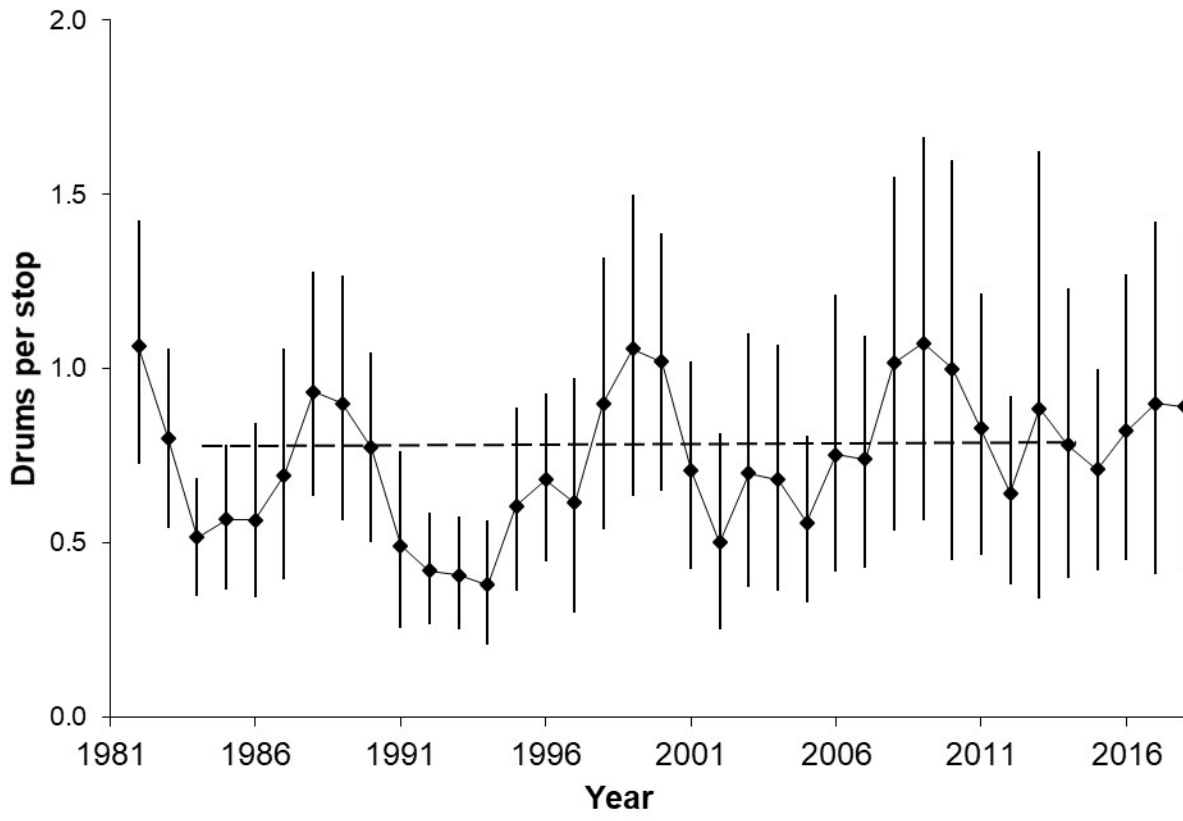
a.



b.



c.



d.

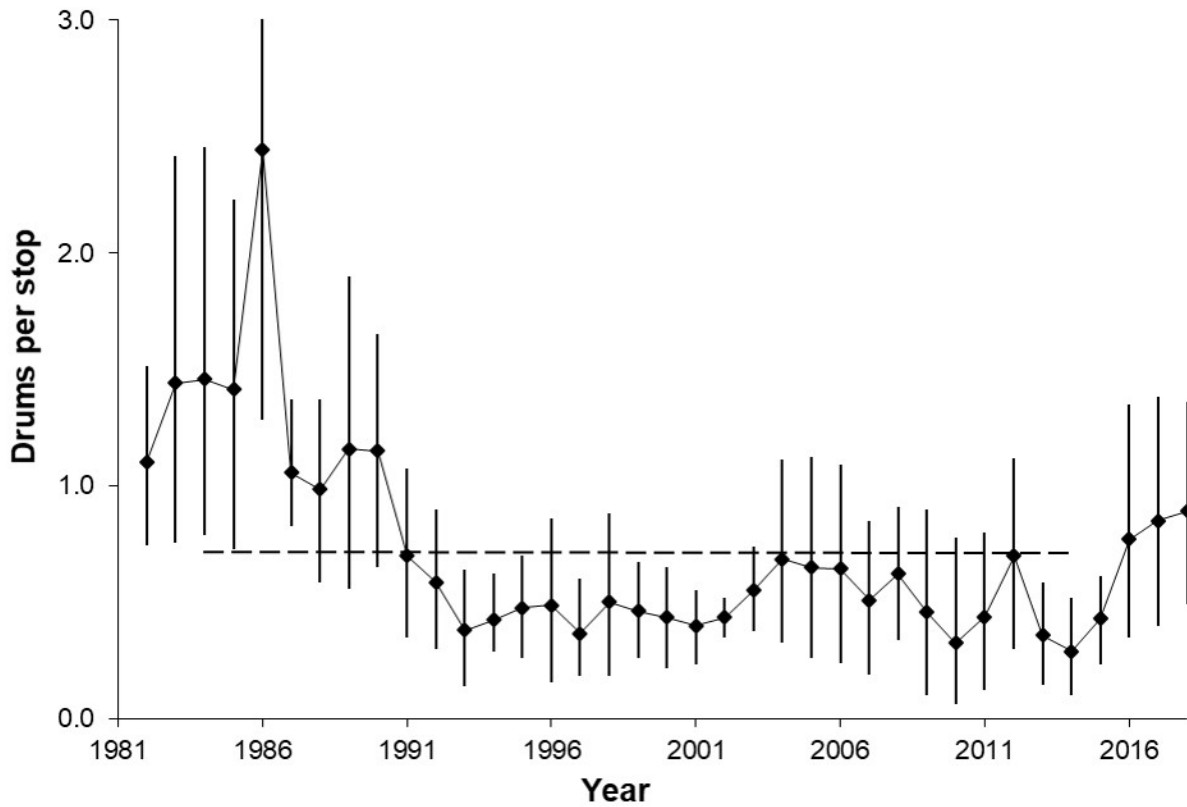


Figure 4a,b,c,d. Ruffed grouse population index values in the **Northeast** (a), **Northwest** (b), **Central Hardwoods** (c), and **Southeast** (d) survey regions of Minnesota. The mean for 1984-2014 is indicated by the dashed line. Bootstrap (95%) confidence intervals are provided for each mean. In the bottom panel, the CI for 1986 extends beyond area depicted in the figure.

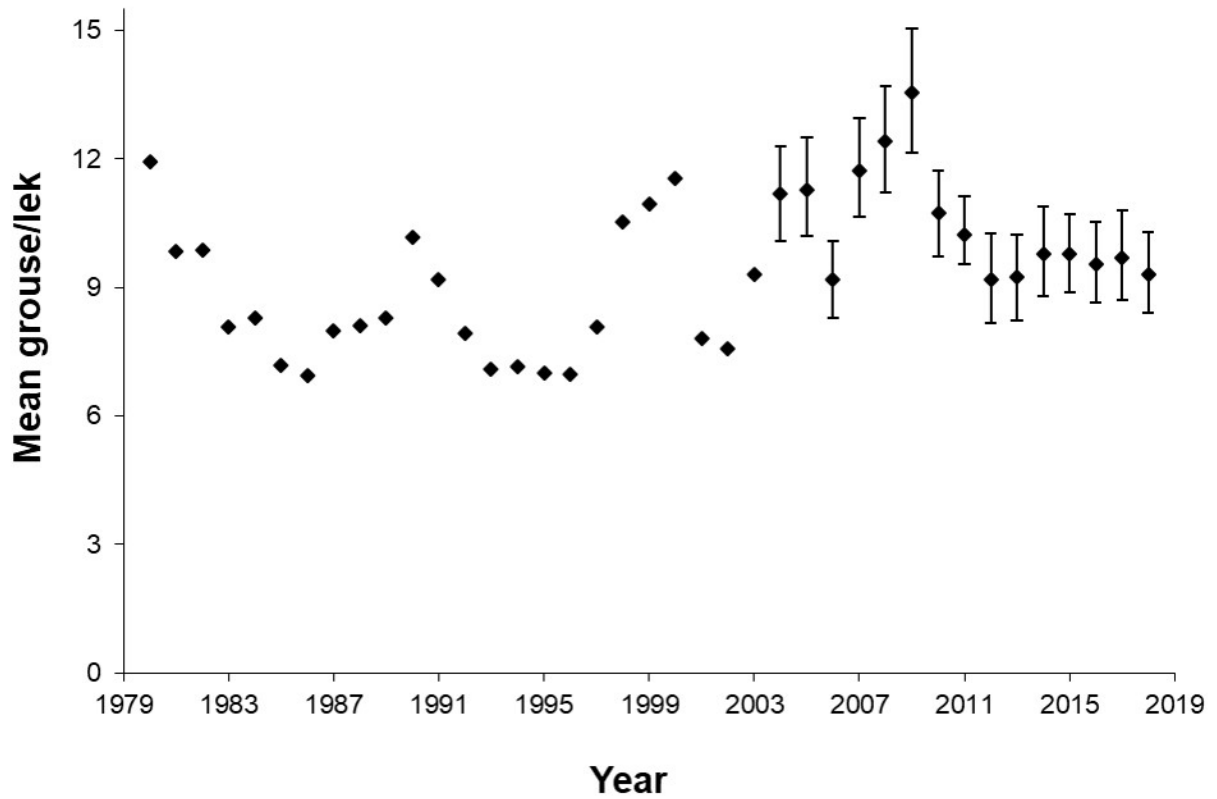


Figure 5. **Sharp-tailed grouse** counted in spring lek surveys statewide in Minnesota during 1980–2018. Bootstrap (95%) confidence intervals are provided for recent years. Annual means are not connected by lines because the same leks were not surveyed every year.

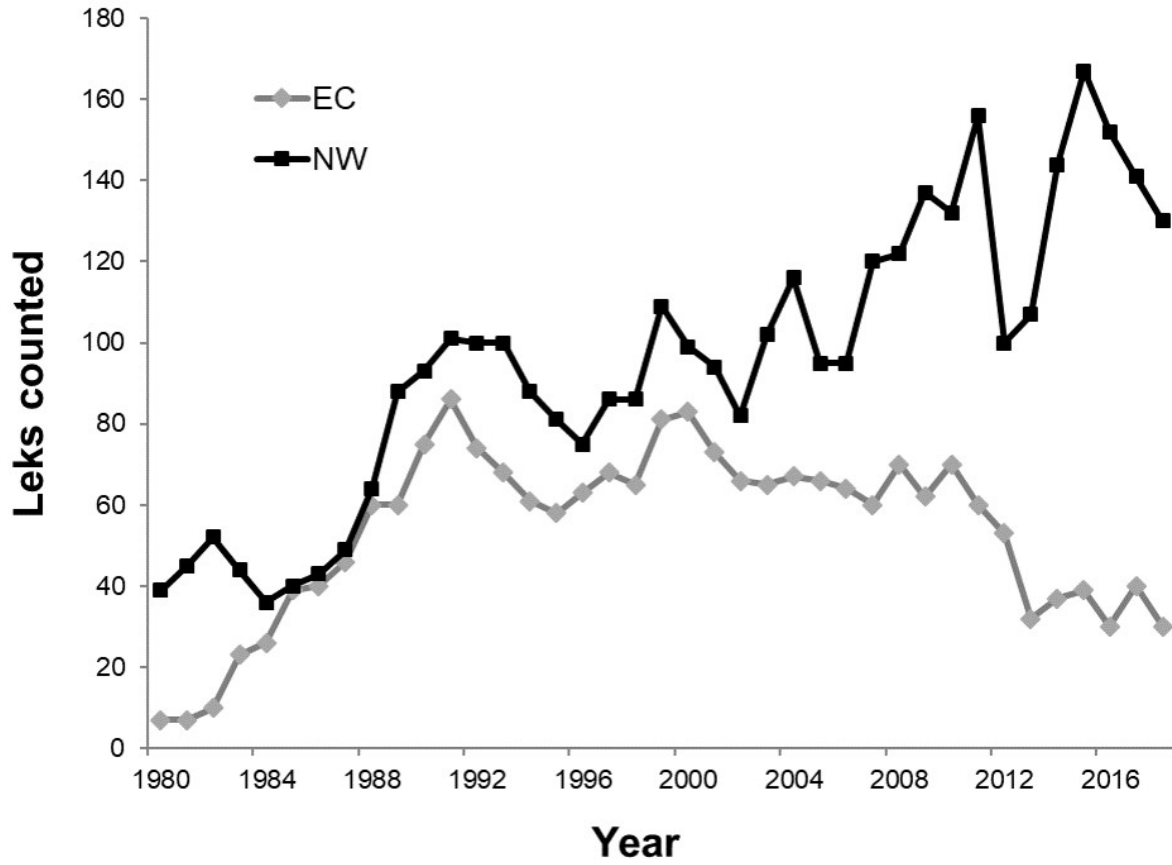


Figure 6. The number of **sharp-tailed grouse** leks counted in spring lek surveys in the Northwest (NW) and East Central (EC) survey regions of Minnesota during 1980-2018.