

GROUSE SURVEYS IN MINNESOTA DURING SPRING 2012

MICHAEL A. LARSON
Forest Wildlife Populations and Research Group
Minnesota Department of Natural Resources
Grand Rapids, Minnesota

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SUMMARY OF FINDINGS

Surveys for ruffed grouse (*Bonasa umbellus*) and sharp-tailed grouse (*Tympanuchus phasianellus*) were conducted during April and May 2012. Mean counts of ruffed grouse drums throughout the forested regions of Minnesota were 1.0 (95% confidence interval = 0.8–1.1) drums per stop (dps). That was significantly less than mean counts from the previous 4 years, indicating that the grouse population is in the declining phase of its 10-year cycle. The most recent peak in drum counts was the 2.0 (1.8–2.3) dps observed during 2009.

During the spring 2012 survey 1,404 sharp-tailed grouse were observed at 154 dancing grounds. The mean number of sharp-tailed grouse per dancing ground was 6.3 (5.4–7.3) in the East Central survey region, 10.7 (9.3–12.3) in the Northwest region, and 9.2 (8.2–10.3) statewide. Counts among dancing grounds observed during both 2011 and 2012 declined 22% (12–31%), but the statewide index value for 2012 was similar to the long-term average observed since 1980.

INTRODUCTION

Index Surveys

The purpose of surveys of grouse populations in Minnesota is to monitor changes in the densities of grouse over time. Estimates of density, however, are difficult and expensive to obtain. Simple counts of animals, on the other hand, are convenient and, assuming that changes in density are the major source of variation in counts among years, they can provide a reasonable index to long-term trends in populations. Other factors, such as weather and habitat conditions, observer ability, and grouse behavior, vary over time and also affect simple counts

of animals. These other factors make it difficult to make inferences about potential changes in wildlife populations over short periods of time (e.g., a few annual surveys) or from small changes in index values. Over longer periods of time or when changes in index values are large, assumptions upon which grouse surveys in Minnesota depend are more likely to be valid, thereby making inferences about grouse populations more valid. For example, index values from the ruffed grouse drumming count survey have documented what is believed to be true periodic fluctuations in ruffed grouse densities (i.e., the 10-year cycle).

Ruffed Grouse

The ruffed grouse (*Bonasa umbellus*) is Minnesota's most popular game bird. It occurs throughout the forested regions of the state. Annual harvest varies from approximately 150,000 to 1.4 million birds and averages >500,000 birds. Information derived from spring drumming counts and hunter harvest statistics indicates that ruffed grouse populations fluctuate cyclically at intervals of approximately 10 years.

During spring there is a peak in the drumming behavior of male ruffed grouse. Ruffed grouse drum to communicate to other grouse the location of their territory. The purpose is to attract females for breeding and deter encroachment by competing males. Drumming makes male ruffed grouse much easier to detect, so counts of drumming males is a convenient basis for surveys to monitor changes in the densities of ruffed grouse. Ruffed grouse were first surveyed in Minnesota during the mid-1930s. Spring drumming counts have been conducted annually since the establishment of the first survey routes in 1949.

Sharp-tailed Grouse

Sharp-tailed grouse (*Tympanuchus phasianellus*) in Minnesota occur in brushlands, which often form transition zones between forests and grasslands. Sharp-tailed grouse are considered a valuable indicator of the availability and quality of brushlands for wildlife. Although sharp-tailed grouse habitat was more widely distributed in Minnesota during the early- and mid-1900s, the range of sharp-tailed grouse is now limited to areas in the Northwest (NW) and East

Central (EC) portions of the state (Figure 1). Since the early-1990s annual harvest of sharp-tailed grouse by hunters has varied between 6,000 and 22,000 birds, and the number of hunters has varied between 5,000 and 10,000.

During spring male sharp-tailed grouse gather at dancing grounds, or leks, in grassy areas and fields where they defend small territories and make displays to attract females for breeding. Surveys of sharp-tailed grouse populations are based on counts of grouse at dancing grounds. The first surveys of sharp-tailed grouse in Minnesota were conducted between the early 1940s and 1960. The current sharp-tailed grouse survey was initiated in 1976.

METHODS

Ruffed Grouse

Roadside routes consisting of 10 semipermanent stops approximately 1.6 km (1 mile) apart have been established. Routes were originally located along roads with little automobile traffic that were also near apparent ruffed grouse habitat. Therefore, route locations were not selected according to a statistically valid spatial sampling design, which means that data collected along routes is not necessarily representative of the larger areas (e.g., counties, regions) in which routes occur. Approximately 50 routes were established by the mid-1950s, and approximately 70 more were established during the late-1970s and early-1980s.

Observers from the Department of Natural Resources (DNR) Area Wildlife Offices and a variety of other organizations drove along each survey route once just after sunrise during April or May. Observers were not trained but often were experienced with the survey. At each designated stop along the route the observer listened for 4 minutes and recorded the number of ruffed grouse drums (not necessarily the number of individual grouse) he or she heard. Attempts were made to conduct surveys on days near the peak of drumming activity that had little wind and no precipitation.

The survey index value was the number of drums heard during each stop along a route. The mean number of drums per stop (dps) was calculated for each of 4 survey regions and for

the entire state (Figure 2). As an intermediate step to summarizing survey results by region, I calculated the mean number of dps for each route. Mean index values for survey regions were calculated as the mean of route-level means for all routes occurring within the region. Some routes crossed regional boundaries, so data from those routes were included in the means for both regions. The number of routes within regions was not proportional to any meaningful characteristic of the regions or ECS section upon which they were based. Therefore, mean index values for the Northeast region and the state were calculated as the weighted mean of index values for the 4 and 7 ECS sections, respectively, that they included. The weight for each section mean was the geographic area of the section (i.e., AAP = 11,761 km², MOP = 21,468 km², NSU = 24,160 km², DLP = 33,955 km², WSU = 14,158 km², MIM = 20,886 km², and PP = 5,212 km²). Only approximately half of the Minnesota and Northeast Iowa Morainal (MIM) and Paleozoic Plateau (PP) sections were within the ruffed grouse range, so the area used to weight drum index means for those sections was reduced accordingly using subsection boundaries.

Stops along survey routes are a small sample of all possible stops within the range of ruffed grouse in Minnesota. Survey index values based on the sample of stops are not the same as they would be if drum counts were conducted at a different sample of stops or at all possible stops. To account for the uncertainty in index values because they are based on a sample, I calculated 95% confidence intervals (CI) for each mean. A 95% confidence interval is a numerical range in which 95% of similarly estimated intervals (i.e., from different hypothetical samples) would contain the true, unknown mean. I used 10,000 bootstrap samples of route-level means to estimate percentile CIs for mean index values for survey regions and the whole state. Limits of each CI were defined as the 2.5th and 97.5th percentiles of the bootstrap frequency distribution. I calculated mean index values and CIs for all years since 1982. Data from earlier years were not analyzed because they were not available in a digital form.

Sharp-tailed Grouse

Over time, DNR Wildlife Managers have recorded the locations of sharp-tailed grouse dancing grounds in their work areas. As new dancing grounds were located, they were added to the survey list. Known, accessible dancing grounds were surveyed by Wildlife Area staff and their volunteers between sunrise and 2.5 hours after sunrise during April and early-May to count sharp-tailed grouse. When possible, surveys were conducted when the sky was clear and the wind was <16 km/hr (10 mph). Attempts were made to conduct surveys on >1 day to account for variation in the attendance of male grouse at the dancing ground. Survey data consist of the maximum of daily counts of sharp-tailed grouse at each dancing ground.

The dancing grounds included in the survey were not selected according to a statistically valid spatial sampling design. Therefore, data collected during the survey were not necessarily representative of the larger areas (e.g., counties, regions) in which the dancing grounds occur. It was believed, however, that most dancing grounds within each work area were included in the sample, thereby minimizing the limitations caused by the sampling design.

I calculated the mean number of sharp-tailed grouse per dancing ground (i.e., index value), averaged across dancing grounds within the NW and EC regions and statewide. The number of grouse included those recorded as males and those recorded as being of unknown sex, and only leks with ≥ 2 grouse were included when calculating mean index values. It was not valid to compare the full survey data and results from different years because survey effort and success in detecting and observing sharp-tailed grouse was different between years and the survey samples were not necessarily representative of other dancing grounds. To estimate differences in sharp-tailed grouse index values between 2 consecutive years, therefore, I analyzed separately sets of data that included counts of birds only from dancing grounds that were surveyed during both years. Although the dancing grounds in the separate data sets were considered comparable, the counts of birds at the dancing grounds still were not. Many factors

can affect the number of birds counted, so inferences based upon comparisons of survey data between years are tenuous.

To account for the uncertainty in index values because they are based on a sample of dancing grounds rather than all dancing grounds, I calculated 95% confidence intervals (CI) for each mean. I used 10,000 bootstrap samples of dancing ground counts to estimate percentile confidence intervals for mean index values for the NW and EC regions and the whole state.

The current delineation between the NW and EC survey regions was based on ECS section boundaries (Figure 1), with the NW region consisting of the Lake Agassiz & Aspen Parklands, Northern Minnesota & Ontario Peatlands, and Red River Valley sections and the EC region consisting of selected subsections of the Northern Minnesota Drift & Lake Plains, Western Superior Uplands, and Southern Superior Uplands sections. The 2005 Grouse Survey Report detailed the transition from the former to the current delineation of regions.

RESULTS & DISCUSSION

Ruffed Grouse

Observers from 15 cooperating organizations surveyed 126 routes between 29 March and 16 May 2012. Most routes (91%) were run between 17 April and 10 May. The median date this year (25 April) was similar to the median during 2010 when much spring phenology occurred relatively early. The median dates during 2009 and 2011 were 1 May and 3 May, respectively. Observers reported survey conditions as Excellent, Good, and Fair on 55%, 41%, and 4% of 119 routes, respectively. The distribution of survey conditions has been consistent for at least the last 6 years.

Survey cooperators included the DNR Divisions of Fish & Wildlife and Parks & Trails; 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 and Beltrami counties; and UPM Blandin Paper Mill.

Mean counts of ruffed grouse drums throughout the forested regions of Minnesota were 1.0 (95% confidence interval = 0.8–1.1) drums per stop (dps) during 2012. Drum counts by survey region during 2012 were 1.1 (0.9–1.2) dps in the Northeast ($n = 106$ routes), 0.9 (0.7–1.2) dps in the Northwest ($n = 8$), 0.6 (0.4–0.9) dps in the Central Hardwoods ($n = 14$), and 0.7 (0.3–1.1) dps in the Southeast ($n = 6$) (Figures 3 and 4). Median index values for bootstrap samples were similar to observed means (i.e., within 0.02 dps), so no bias-correction was necessary.

The statewide mean of drum counts this spring was significantly less than the mean counts from the previous 4 years, indicating that the grouse population is in the declining phase of its 10-year cycle. The most recent peak in drum counts was the 2.0 (1.8–2.3) dps observed during 2009. Given that factors other than changes in grouse density may influence counts and the resulting index values, emphasis when interpreting results from index surveys like the drum count survey should be on large and long-term changes in counts, not on small or short-term changes.

Sharp-tailed Grouse

A total of 1,404 sharp-tailed grouse was observed at 154 dancing grounds with ≥ 2 male grouse (or grouse of unknown sex) during spring 2012. Leks with ≥ 2 grouse were visited a mean of 1.9 times. There were 334 grouse on 53 leks in the East Central survey region and 1,070 grouse on 101 leks in the Northwest region. Twenty-nine percent fewer leks were observed than during 2011, mostly due to shortages in DNR Wildlife staff in northwestern Minnesota. The index value (i.e., grouse/lek) in both regions declined slightly from 2011 (Table 1), and counts at leks observed during both years declined 22% (12–31%, Table 2).

The statewide index value of 9.2 (8.2–10.3) was near the middle of values observed since 1980 (Figure 5). The peak in population index values for sharp-tailed grouse that occurred in 2009 coincided with the peak in the abundance of ruffed grouse in Minnesota. The

spring index values for both species have followed an approximately 10-year cyclical pattern, with peaks in the sharp-tailed grouse index occurring up to 2 years after peaks in the ruffed grouse index.

ACKNOWLEDGEMENTS

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Table 1. Number of sharp-tailed grouse observed per active lek (≥ 2 males) during spring 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 |

^a Survey regions; see Figure 1.

^b 95% CI = 95% confidence interval for the mean. It is an estimate of the uncertainty in the value of the mean.

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

Table 2. Difference in the number of sharp-tailed grouse per lek on dancing grounds that were observed during consecutive spring surveys 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 |

^a Survey regions; see Figure 1.

^b Consecutive years for which comparable leks were compared.

^c 95% CI = 95% confidence interval for the mean. It is an estimate of the uncertainty in the value of the mean.

^d *n* = number of dancing grounds in the sample.

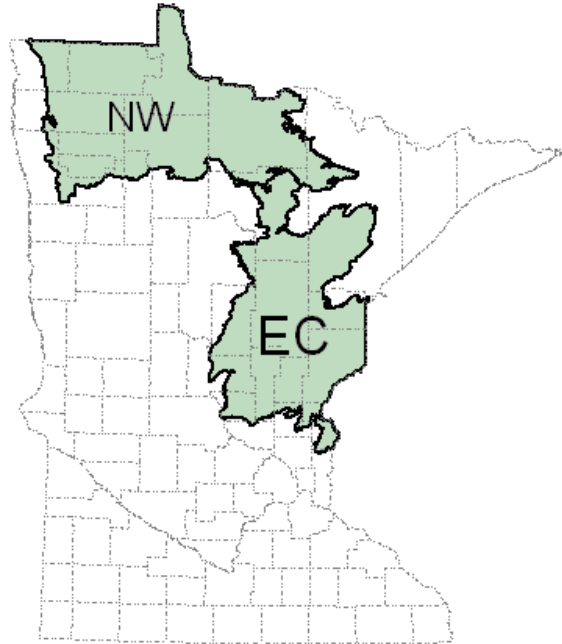


Figure 1. Northwest (NW) and East Central (EC) survey regions for **sharp-tailed grouse** relative to county boundaries in Minnesota. The regions were based largely on boundaries of ECS Subsections.

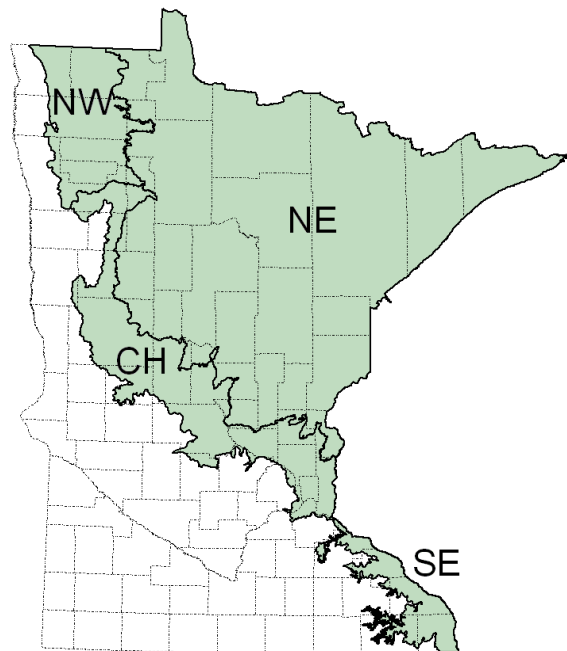


Figure 2. Survey regions for **ruffed grouse** (shaded, curved boundaries) relative to county boundaries (dashed lines) in Minnesota. The regions are based on the Ecological Classification System.

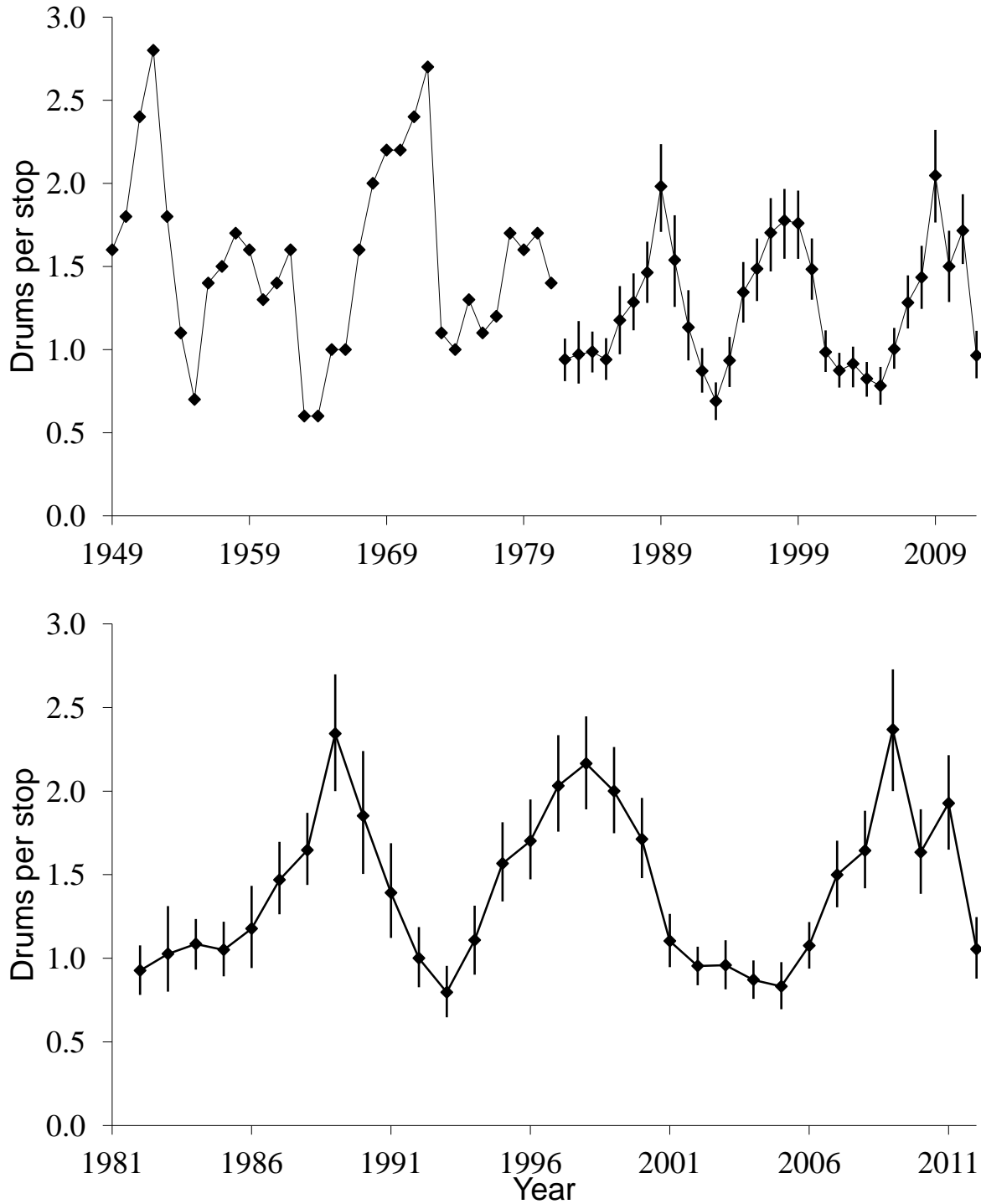


Figure 3. Ruffed grouse drum count index values in **Minnesota** (top) and just the **Northeast** region (bottom). Vertical error bars represent 95% confidence intervals based on bootstrap samples. Statewide means before 1982 were not re-analyzed with the current weighted average and bootstrapping methods, so confidence intervals were not available. The difference in index values between 1981 and 1982 reflected a real decrease in drums counted, not an artifact of the change in analysis methods.

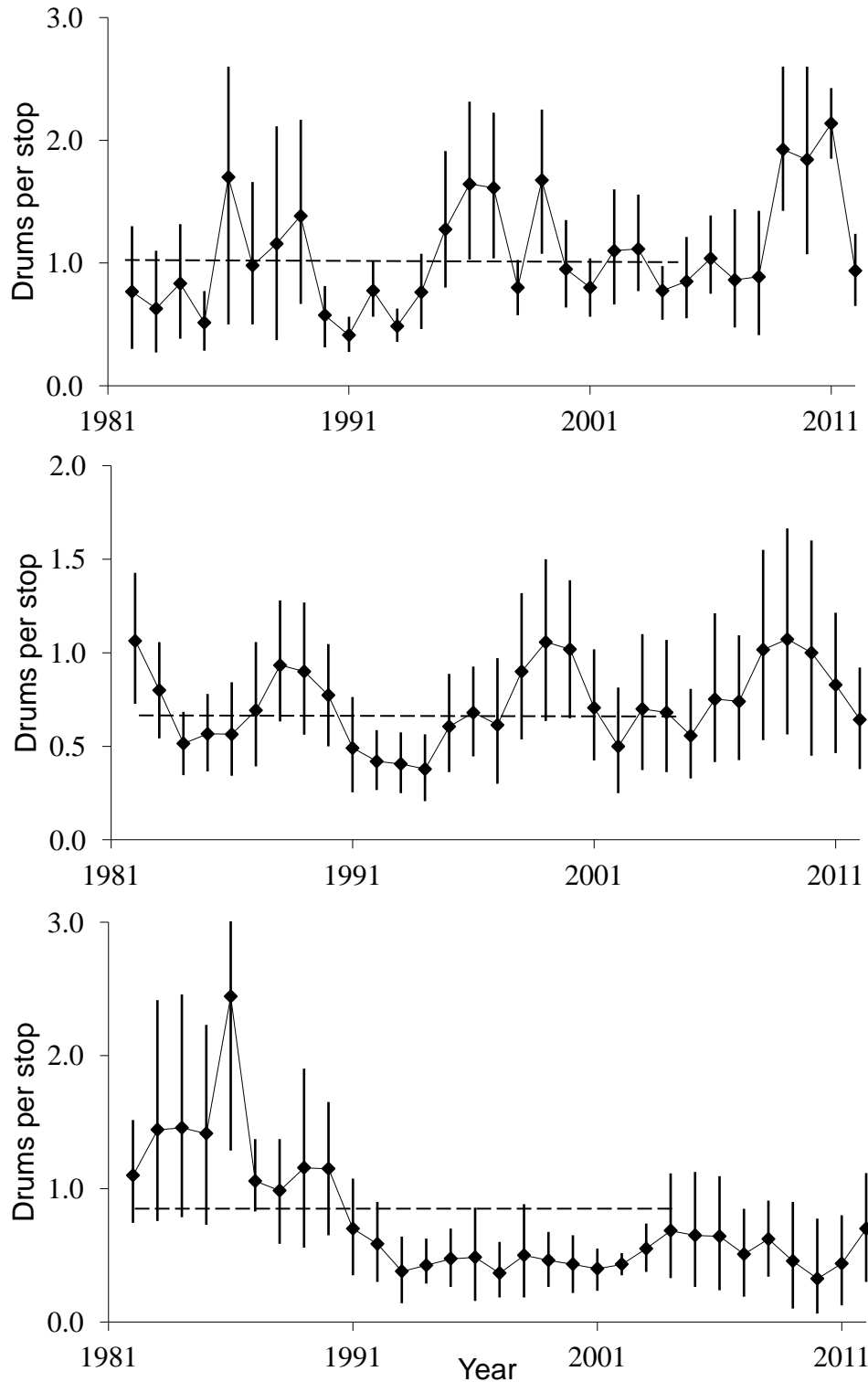


Figure 4. Ruffed grouse drum count index values in the **Northwest** (top), **Central Hardwoods** (middle), and **Southeast** (bottom) survey regions of Minnesota. Dashed horizontal lines indicate the mean from 1984 to 2004. Vertical error bars represent 95% confidence intervals based on bootstrap samples. The highest error bar in the bottom panel was truncated.

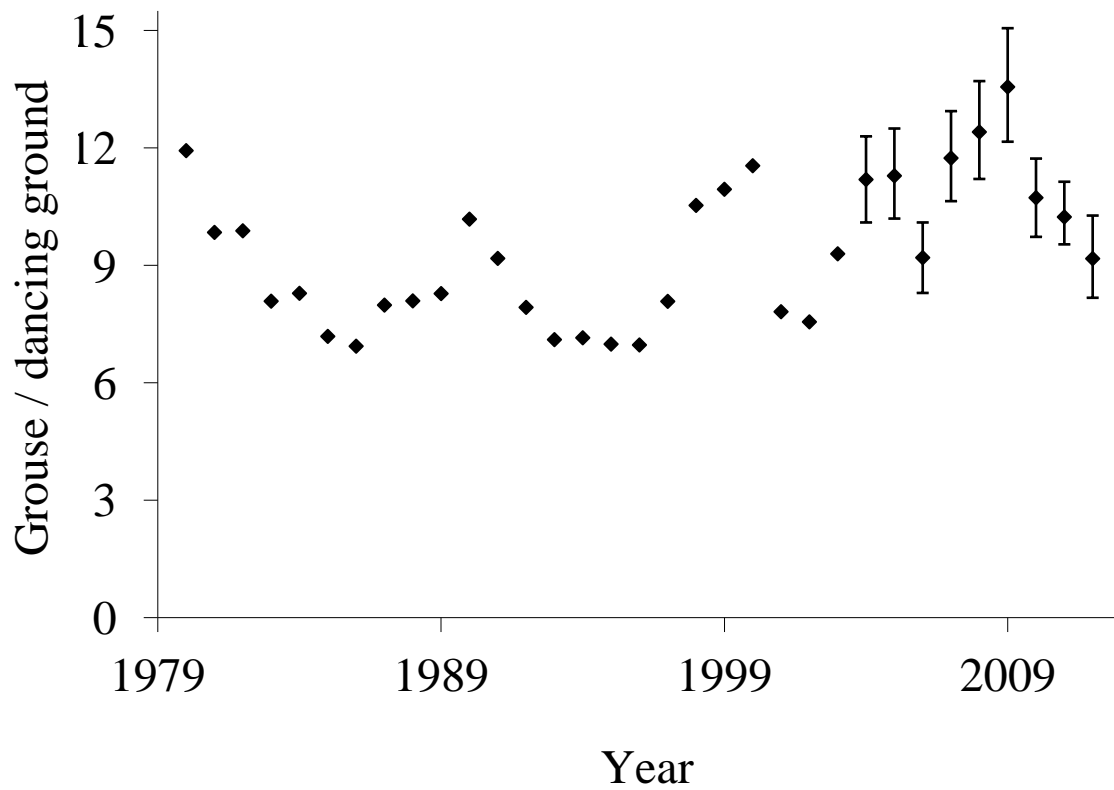


Figure 5. Mean number of **sharp-tailed grouse** observed in Minnesota during spring surveys of dancing grounds, 1980–2012. Vertical error bars, which were calculated only for recent years, represent 95% confidence intervals based on bootstrap samples. No line connects the annual means because they are not based on comparable samples of leks.