

## **GROUSE SURVEYS IN MINNESOTA DURING SPRING 2009**

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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 2009. Mean counts of ruffed grouse drums throughout the forested regions of Minnesota were 2.0 (95% confidence interval = 1.8–2.3) drums/stop (dps). That was 43% higher than the mean of 1.4 (1.2–1.6) dps observed during 2008. It was as high as counts during the last 3 peak years of the long-term population cycle (i.e., 1978, 1989, and 1998).

During the spring 2009 survey 2,699 sharp-tailed grouse were observed at 199 dancing grounds. The mean number of sharp-tailed grouse per dancing ground was 10.0 (8.5–11.7) in the East Central survey region, 15.2 (13.4–17.0) in the Northwest region, and 13.6 (12.2–15.1) statewide. Index values in the Northwest region were 15% (-1–34%) greater during 2009 than during 2008, which were greater than during any other year since 1980. Index values in the East Central region declined slightly from 2008 but remained higher than values observed during 25 of the last 27 years.

### **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 1990 annual harvest of sharp-tailed grouse by hunters has varied from 8,000 to 30,000 birds, and the number of hunters has varied from 6,000 to 13,000.

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/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, they included. The weight for each section mean was the geographic area of the section (i.e., AAP = 11,761 km<sup>2</sup>, MOP = 21,468 km<sup>2</sup>, NSU = 24,160 km<sup>2</sup>, DLP = 33,955 km<sup>2</sup>, WSU = 14,158 km<sup>2</sup>, MIM = 20,886 km<sup>2</sup>, and PP = 5,212 km<sup>2</sup>). 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 2.5<sup>th</sup> and 97.5<sup>th</sup> percentiles of the bootstrap frequency distribution. I calculated mean index values and CIs for 1982–2008. 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 for spring 2009. The number of grouse included those recorded as males and those recorded as being of unknown sex, and only leks with  $\geq 2$  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 132 routes between 8 April and 15 May 2009. Most routes (83%) were run between 22 April and 8 May. The median date this year (1 May) was similar to the most recent 10-year average (29 April). Cooperators included the DNR Divisions of Fish & Wildlife and Ecological Services; Chippewa and Superior National Forests (USDA Forest Service); Fond du Lac, Grand Portage, 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. Observers reported survey conditions as Excellent, Good, and Fair on 57%, 35%, and 8% of 129 routes, respectively. The distribution of survey conditions was within the range of results from the last 3 years.

Mean counts of ruffed grouse drums throughout the forested regions of Minnesota were 2.0 (95% confidence interval = 1.8–2.3) drums/stop (dps) during 2009. Drum counts by survey

region during 2009 were 2.4 (2.0–2.7) dps in the Northeast ( $n = 110$  routes), 1.9 (1.4–2.6) dps in the Northwest ( $n = 8$ ), 1.1 (0.6–1.7) dps in the Central Hardwoods ( $n = 15$ ), and 0.5 (0.1–0.9) dps in the Southeast ( $n = 7$ ) (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.

Increases in counts from 2008 to 2009 in the Northeast (44%) and Northwest (117%) regions were statistically significant, as was the statewide increase (43%). Changes in counts in the Central Hardwoods (+5%) and Southeast (-27%) regions were not significant. Drum counts during 2009 throughout most of the range of ruffed grouse in Minnesota were as high as counts during the last 3 peak years of the long-term population cycle (i.e., 1978, 1989, and 1998). It is currently the 4<sup>th</sup> year of an increasing phase of the cycle, which has lasted as few as 4 years and as many as 8 years during the last 4 cycles.

### Sharp-tailed Grouse

A total of 2,699 sharp-tailed grouse was observed at 199 dancing grounds with  $\geq 2$  male grouse (or grouse of unknown sex) during spring 2009. Leks with  $\geq 2$  grouse were visited a mean of 1.8 times. There were 622 grouse on 62 leks in the EC survey region and 2,077 grouse on 137 leks in the NW region. The index values for the NW region and statewide range continued an increasing trajectory since 2006 (Tables 1 and 2) to values greater than they have been since 1980 (Figure 5). Index values in the EC region declined slightly from 2008 (Tables 1 and 2) but remained higher than values observed during 25 of the last 27 years.

Table 1. Number of sharp-tailed grouse observed per active lek ( $\geq 2$  males) during spring in Minnesota.

Year	Statewide			Northwest <sup>a</sup>			East Central <sup>a</sup>		
	Mean	95% CI <sup>b</sup>	$n^c$	Mean	95% CI <sup>b</sup>	$n^c$	Mean	95% CI <sup>b</sup>	$n^c$
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

<sup>a</sup> Survey regions; see Figure 1.

<sup>b</sup> 95% CI = 95% confidence interval for the mean. It is an estimate of the uncertainty in the value of the mean.

<sup>c</sup>  $n$  = 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 <sup>b</sup>	Statewide			Northwest <sup>a</sup>			East Central <sup>a</sup>					
	Mean	95% CI <sup>c</sup>		<i>n</i> <sup>d</sup>	Mean	95% CI <sup>c</sup>		<i>n</i> <sup>d</sup>	Mean	95% CI <sup>c</sup>		<i>n</i> <sup>d</sup>
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

<sup>a</sup> Survey regions; see Figure 1.

<sup>b</sup> Consecutive years for which comparable leks were compared.

<sup>c</sup> 95% CI = 95% confidence interval for the mean. It is an estimate of the uncertainty in the value of the mean.

<sup>d</sup> *n* = number of dancing grounds in the sample.

## ACKNOWLEDGEMENTS

I sincerely appreciate the efforts of all the DNR staff, partners, and volunteer cooperators who conducted and helped coordinate the grouse surveys. The ruffed grouse survey data for 1982–2004 were entered into a database by Doug Mailhot and another volunteer through a special effort organized by Gary Drotts, John Erb, and Rick Horton. I also thank Laura Gilbert for helping with data entry and archiving and Mark Lenarz for reviewing a draft of this report.

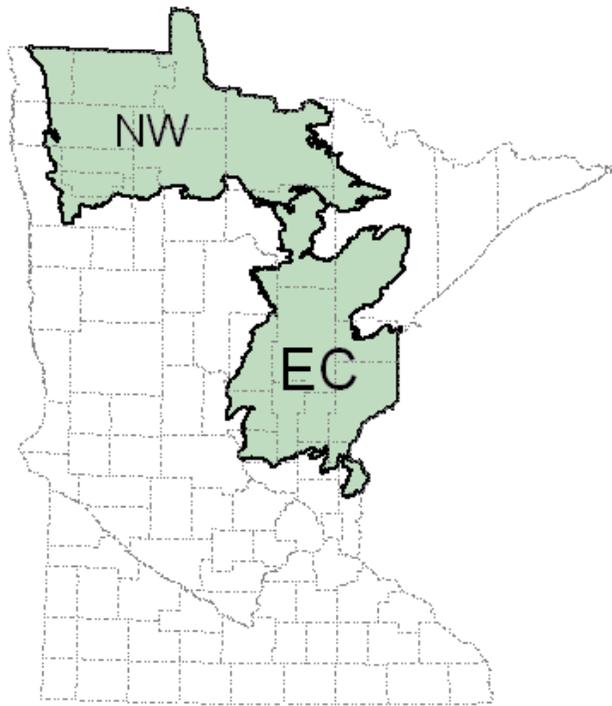


Figure 1. Northwest (NW) and East Central (EC) survey regions for **sharp-tailed grouse** relative to county boundaries in Minnesota. The regions were based largely on boundaries of ECS Subsections.

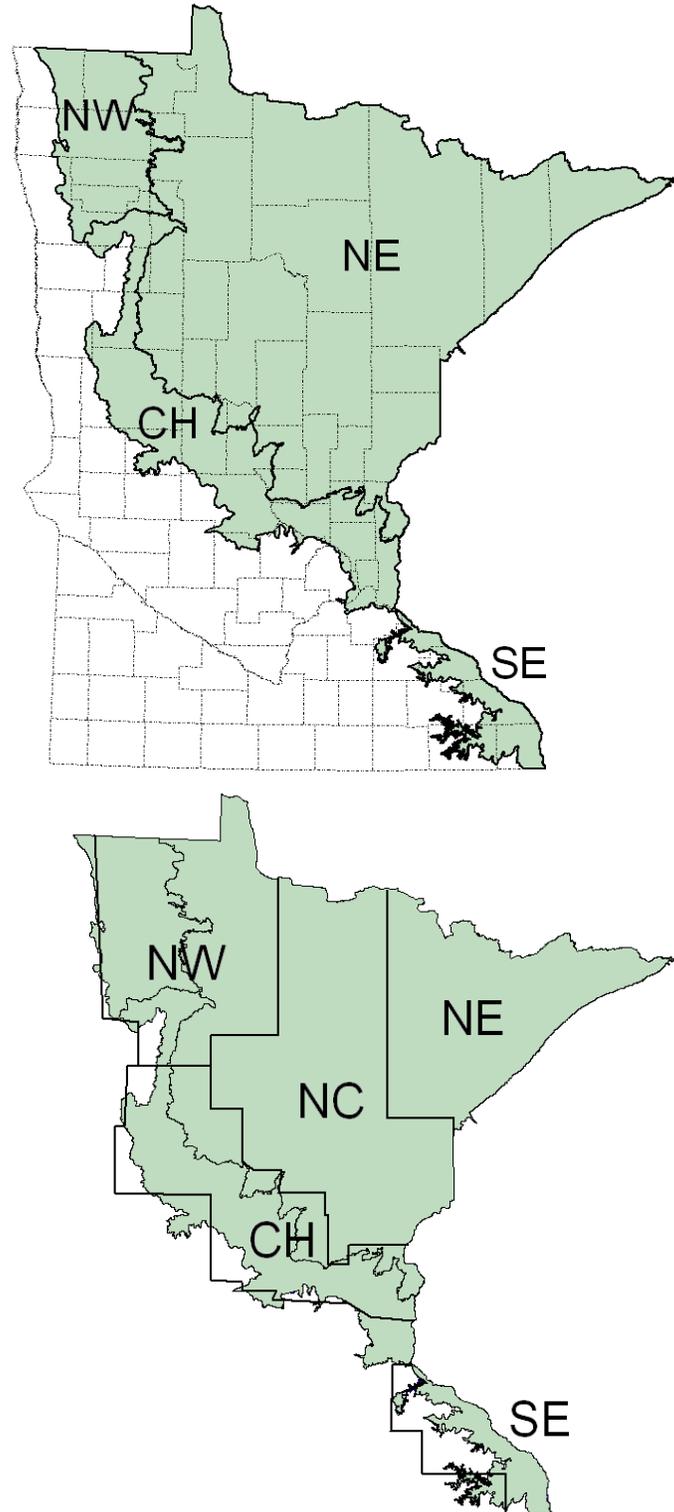


Figure 2. **Ruffed grouse** survey regions (shaded, curved boundaries) are based on the Ecological Classification System. Top panel: regions are labeled and overlaid on counties (dashed lines). Bottom panel: former survey zones (straight boundaries) are labeled and overlaid on regions.

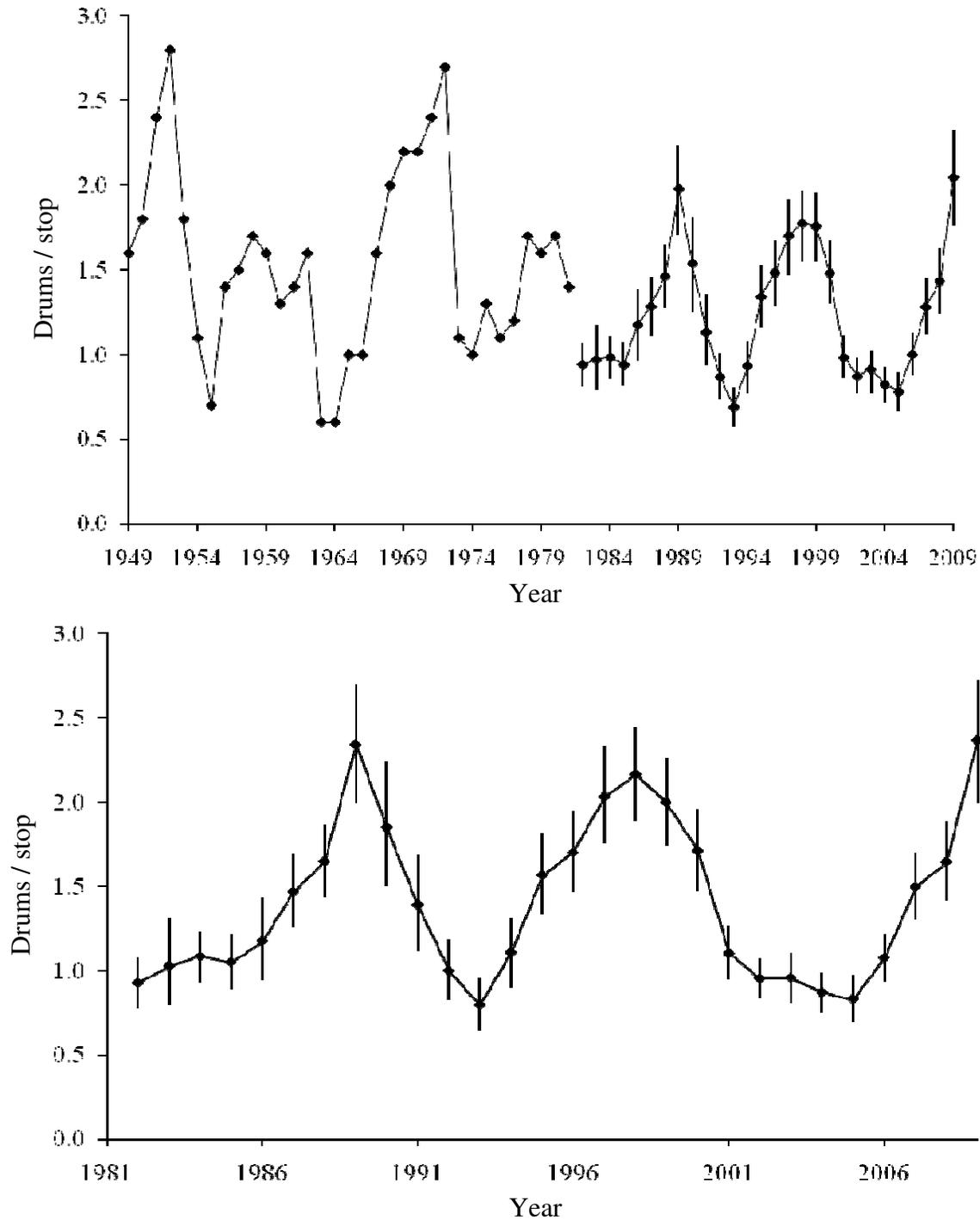


Figure 3. Ruffed grouse drum count index values in **Minnesota** (top) and just the **Northeast** region (bottom). Vertical error bars represent 95% confidence intervals based on bootstrap samples. Statewide means before 1982 were not re-analyzed with the current methods, so confidence intervals were 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.

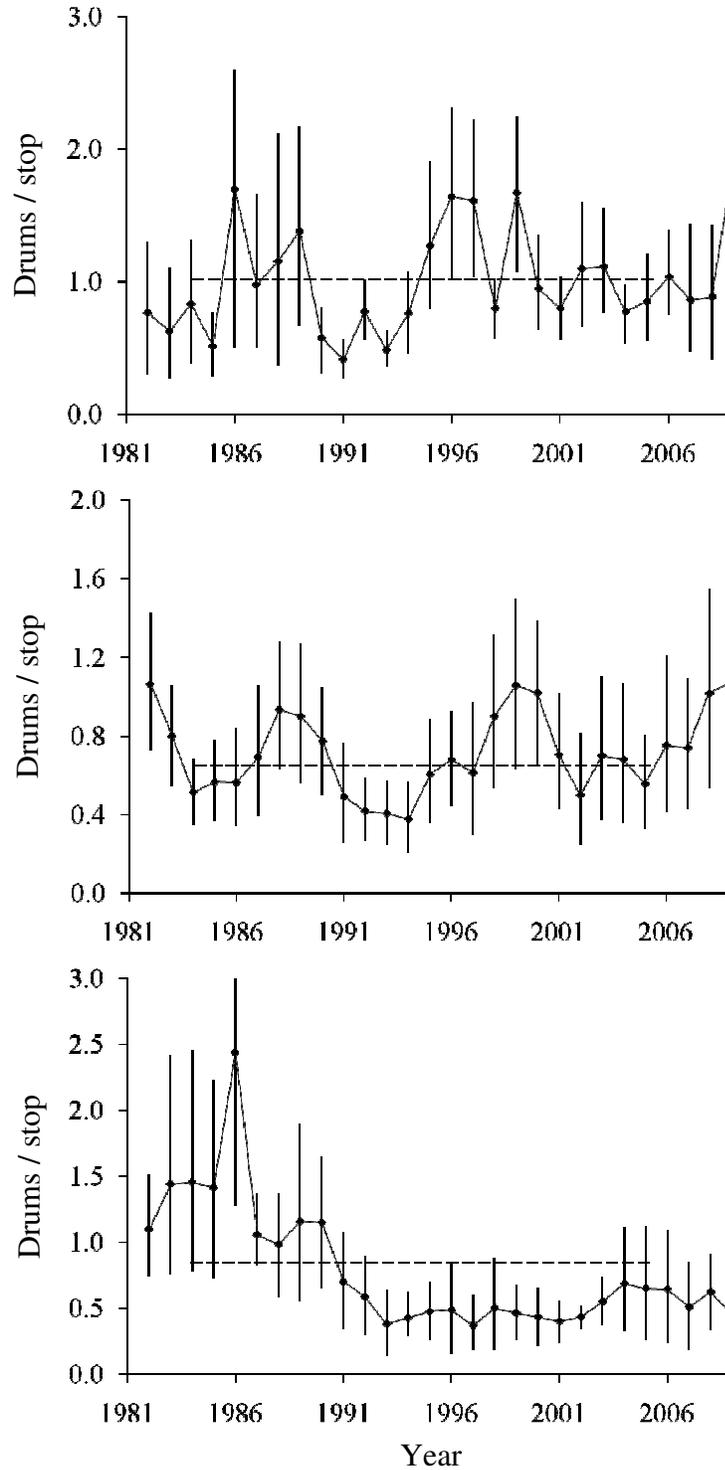


Figure 4. Ruffed grouse drum count index values in the **Northwest** (top), **Central Hardwoods** (middle), and **Southeast** (bottom) survey regions of Minnesota. Dashed horizontal lines indicate the mean from 1984 to 2004. Vertical error bars represent 95% confidence intervals based on bootstrap samples.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

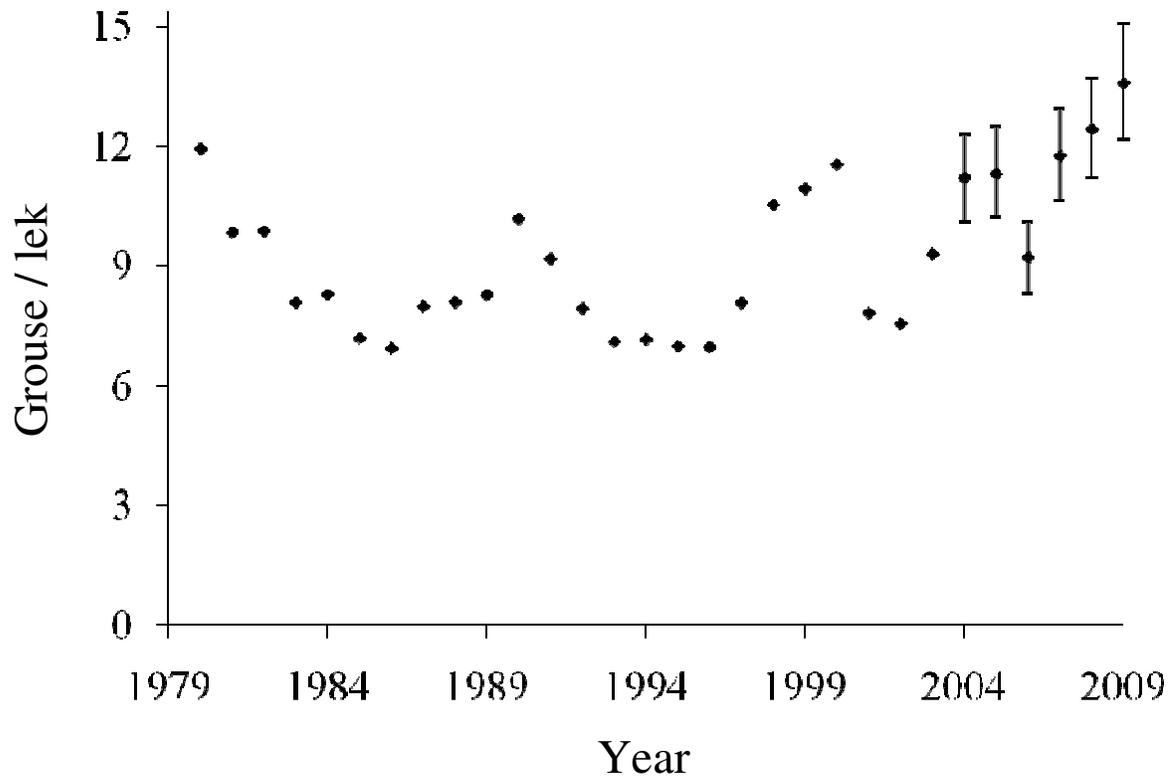


Figure 5. Mean number of **sharp-tailed grouse** observed in Minnesota during spring surveys of dancing grounds, 1980–2009. Vertical error bars, which were calculated only for recent years, represent 95% confidence intervals based on bootstrap samples. No line connects the annual means because they are not based on comparable samples of leks.