2023 MINNESOTA RUFFED GROUSE SURVEY

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SUMMARY OF FINDINGS

The Minnesota DNR coordinates ruffed grouse (*Bonasa umbellus*) drumming surveys each spring with the help of wildlife staff and cooperating federal, tribal, and county biologists. Mean ruffed grouse drums per stop (dps) were 2.1 statewide (95% confidence interval = 1.8 – 2.6), which is up from last year and similar to recent peaks in the population cycle, which usually vary from 8-11 years apart. However, dps were not up in all survey regions, and increases were most notable in the Northeast, where 1 route with particularly high dps had a large influence. Statewide counts near peak values this year might indicate that the low in the population cycle occurred in 2021 (1.3), but that the cycle did not dip as low as it has in the past. The ruffed grouse drumming survey assumes that only the number of grouse varies among years. However, we have had a lot of changes in survey observers the last few years as many observers retired and new staff were hired. New observers may differ in their ability to hear low frequency drums, which could influence counts to some degree. We have also had numerous extreme weather conditions the last 2 years including an extreme summer drought in 2021, spring flooding in 2022, and 2 successive winters of good snow roosting conditions which may have increased production and overwinter survival of ruffed grouse the last few years. Additional data collected in the upcoming years will be necessary to interpret the recent counts in the context of the population cycle. The drumming survey is useful for monitoring long-term population trends, but interpretation of 1 or a few years of data can be tenuous.

INTRODUCTION

The ruffed grouse (*Bonasa umbellus*) is the most popular game bird in Minnesota, with an annual harvest of 200,000 – 500,000 birds. Ruffed grouse hunter numbers have been as high as 92,000 during the last decade, although hunter numbers did not peak with recent peaks in grouse numbers, as they have traditionally.

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 provide evidence that the ruffed grouse population cycles at

approximately 10-year intervals. The spring survey data also correlated strongly with the fall harvest before the early 2000s, but in recent decades, this relationship has weakened.

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 then, staff and cooperators have conducted spring drumming counts 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.

METHODS

Observers conducted ruffed grouse surveys 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.

I engaged survey observers from among state, federal, tribal, private, and student biologists that had a professional background in wildlife science. Most observers had previously participated in the survey. I provided each observer a set of instructions and route location information, but did not provide formal survey training. I asked participants to conduct surveys at sunrise during peak drumming activity (in April or May) on days that had little wind and no precipitation. I provided guidance about the timing of the usual peak in drumming but allowed flexibility in timing to match the peak if it occurred outside the usual survey windows. 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.

I used the number of drums heard per stop (dps) as the survey index value. I determined the mean dps for each route, for each survey region (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 each Ecological Classification Section (ECS). 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 ECS sections in the Northeast region and the 7 ECS sections in the state. I used the geographic area of the section 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). I reduced the area used to weight drum index means for the MIM and PP sections to reflect the portion of these areas within ruffed grouse range (~50%) using subsection boundaries. I calculated a 95% confidence interval (CI) 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. I defined confidence interval boundaries as the 2.5^{th} and 97.5^{th} percentiles of bootstrap frequency distributions.

RESULTS & DISCUSSION

Observers from 13 cooperating organizations surveyed routes between 17 April and 25 May 2023. Many observers reported a later spring than usual and completed surveys when they believed the peak of drumming occurred in their local area. Most routes (94%) were surveyed between 19 April and 18 May, with a median survey date of 4 May, which is similar to most years when the median survey date is close to May 3. Observers reported Excellent (59%), Good (36%), and Fair (4%) survey conditions for 118 routes reporting conditions.

Statewide ruffed grouse drums were up from last year, although patterns were not consistent among regions, unlike last year when dps were generally up in all regions. Statewide counts of ruffed grouse drums averaged 2.1 dps (95% confidence interval = 1.8 – 2.6 dps) (Figure 2). Drum counts were 2.4 (2.0 – 3.0) dps in the Northeast (*n* = 97 routes), 1.5 (1.1 – 2.0) dps in the Northwest (*n* = 8), 1.6 (0.8 – 2.6) dps in the Central Hardwoods (*n* = 11), and 0.6 (0.3 – 1.0) dps in the Southeast region (*n* = 9) (Figure 3a-d). Although dps were highest in the Northeast, 1 route with particularly high dps had a large influence on the average, so a lower value would be more representative of the region.

The ruffed grouse population in Minnesota cycles on average every 10 years, but peaks in the cycle vary from 8-11 years apart (Figure 2). The last 2 peaks occurred during 2009 (2.1 dps) and 2017 (2.1 dps), with lows occurring during 2005 (0.8 dps) and 2013 (0.9 dps). Counts near peak values this year might indicate that the low in the population cycle occurred in 2021 (1.3 dps), but that the cycle did not dip as low as it has in the past. The ruffed grouse population survey assumes that the only variable changing among years is the number of ruffed grouse. However, several variables have changed in recent years. We have hired many new staff to fill positions vacated by retirements, and these new hires may differ in hearing ability from the recently retired staff. We have also had numerous extreme weather events including prolonged summer drought in 2021, spring flooding in 2022, and good snow roosting conditions the last 2 years that may have influenced production and survival. Warm temperatures and drought conditions may produce strong production of young birds (Bump et al. 1947, Dorney and Kabat 1960). Winter conditions favorable for snow roosting in much of the core of ruffed grouse range may improve overwinter survival (Thompson and Fritzell 1988). More years of data collection will be necessary to understand the recent counts in the context of the grouse population cycle.

ACKNOWLEDGEMENTS

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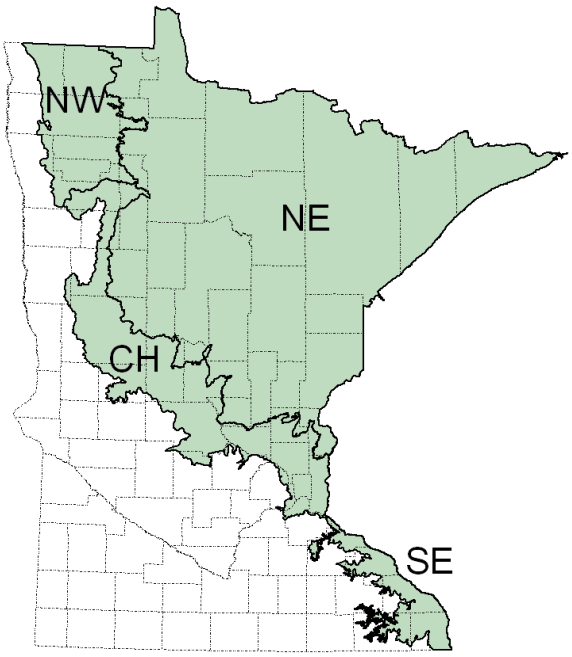


Figure 1. Survey regions for ruffed grouse in Minnesota. Northwest (NW), Northeast (NE), Central Hardwoods (CH), and Southeast (SE) survey regions are depicted relative to county boundaries (dashed lines) and influenced by the Ecological Classification System.

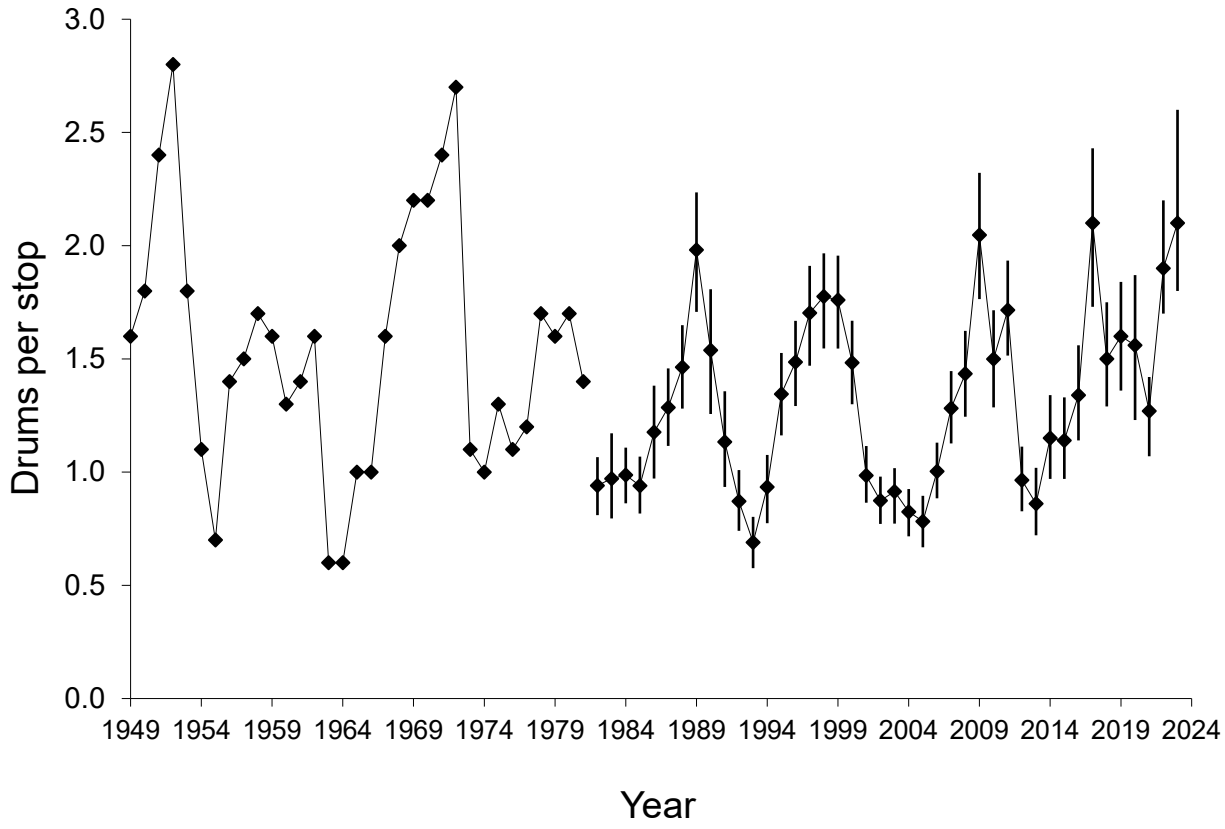
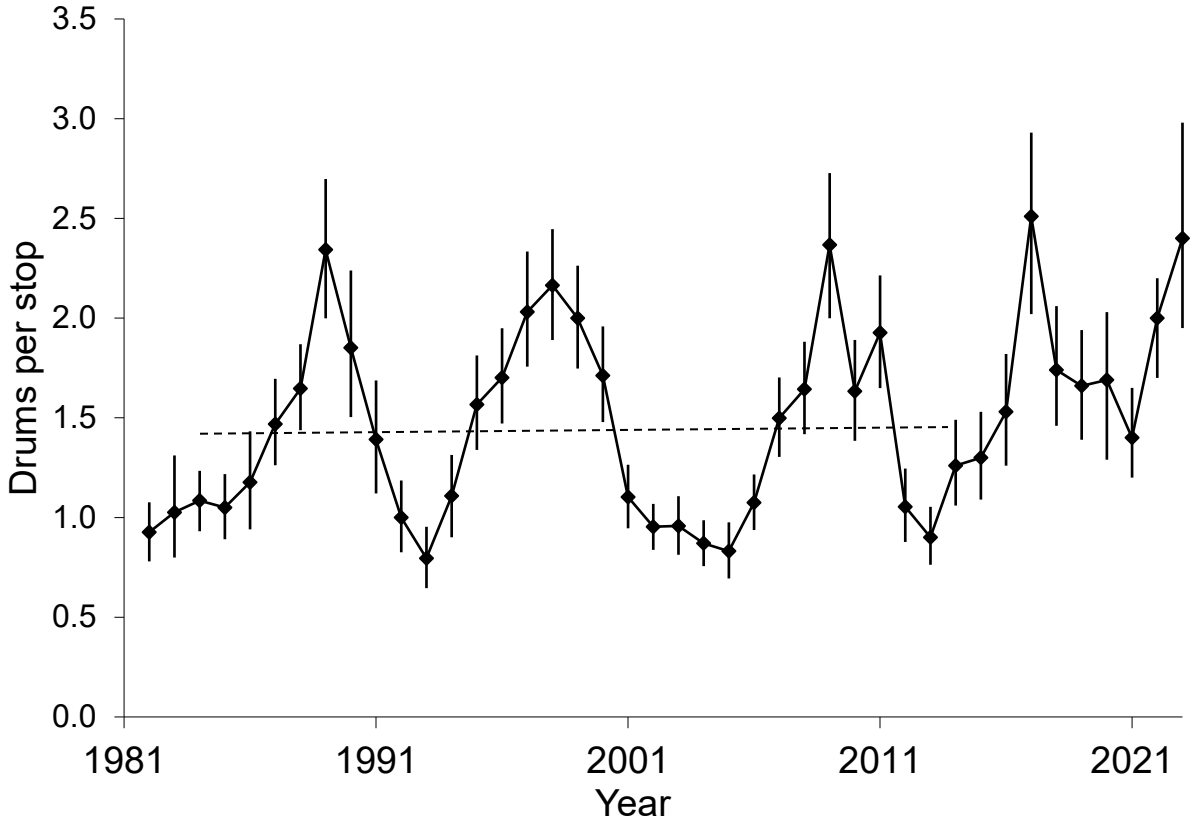
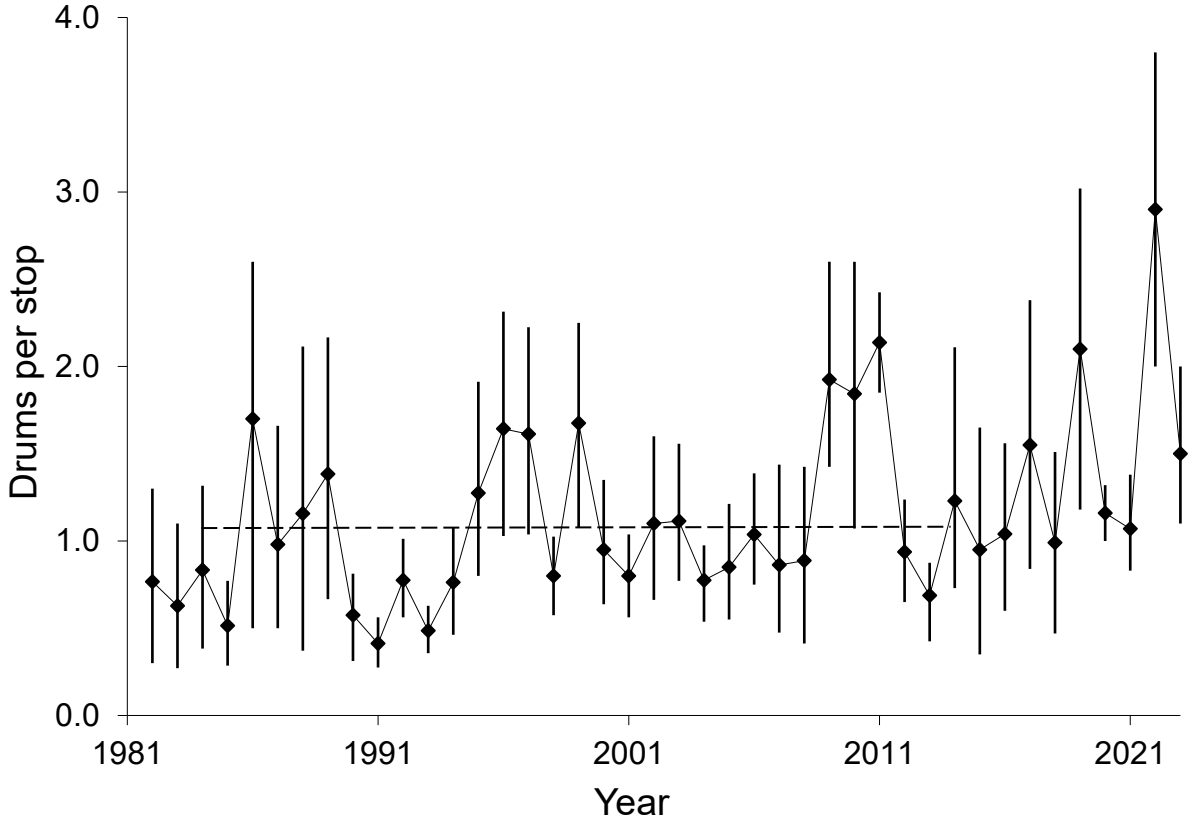


Figure 2. Statewide ruffed grouse population index values in Minnesota. Bootstrap (95%) confidence intervals (CIs) are provided after 1981, but different analytical methods were used prior to this and thus CIs are not available for earlier years. The difference between 1981 and 1982 is biological and not an artifact of the change in analysis methods.

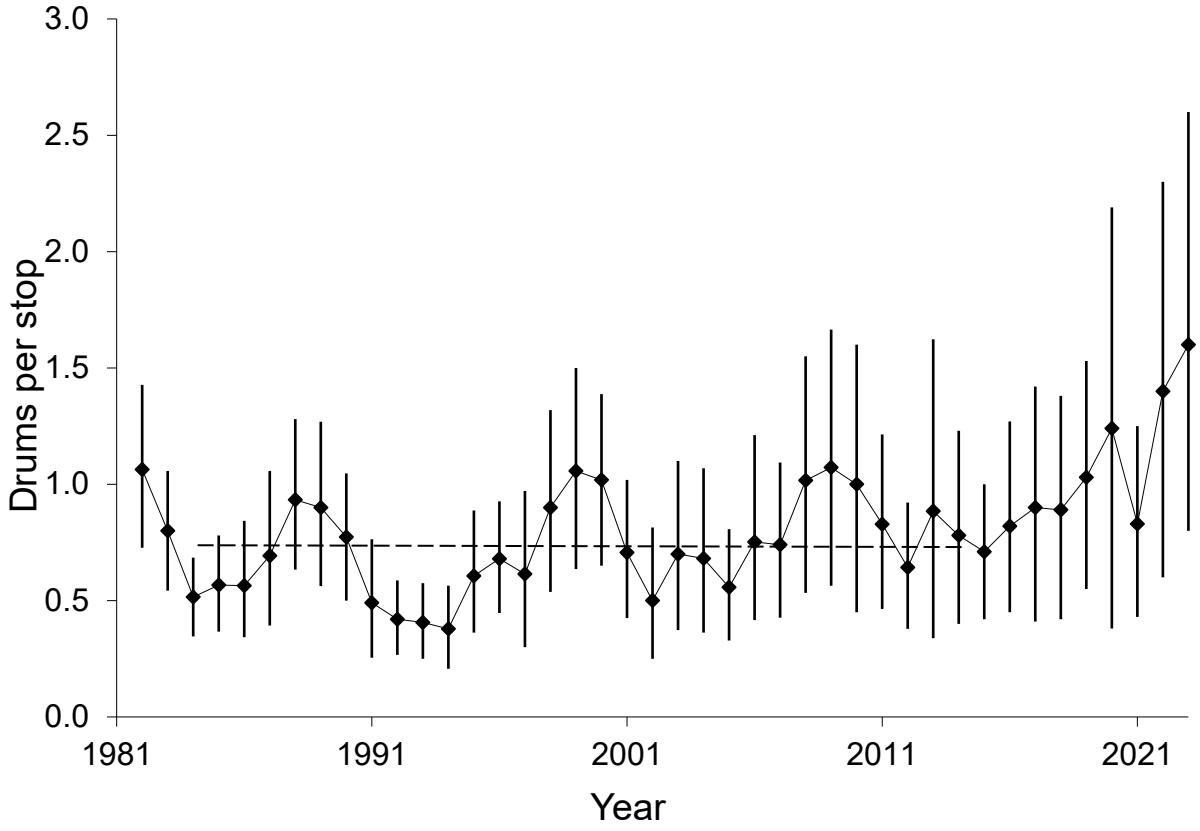
a.


3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Drums per stop
1981
1991
2001
2011
2021
Year

b.



c.


3.0
2.5
2.0
1.5
1.0
0.5
0.0
Drums per stop
1981
1991
2001
2011
2021
Year

d.

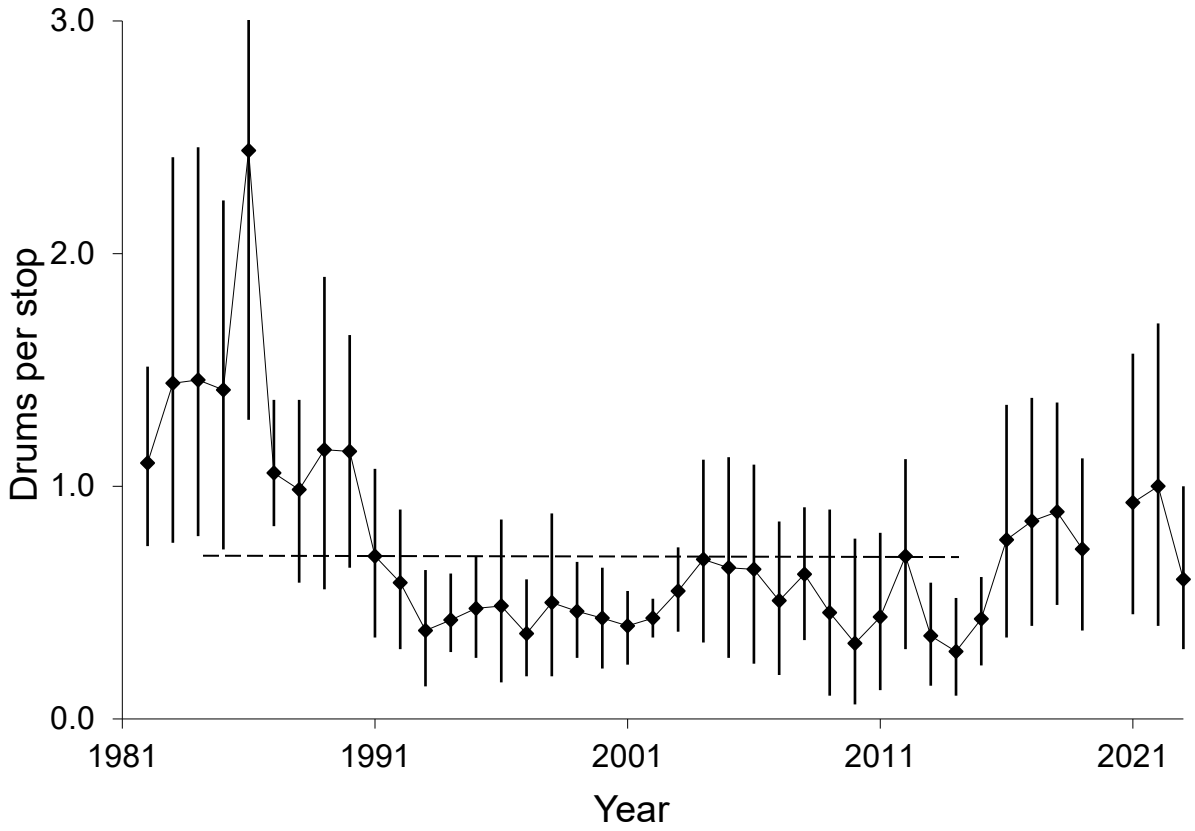


Figure 3a,b,c,d. Ruffed grouse population index values in the **Northeast** (a), **Northwest** (b), **Central Hardwoods** (c), and **Southeast** (d) survey regions of Minnesota. The mean for 1984-2014 is indicated by the dashed line. Bootstrap (95%) confidence intervals are provided for each mean. In the bottom panel, the CI for 1986 extends beyond area depicted in the figure. Data were not collected during the survey window in the Southeast during the COVID-19 pandemic in 2020.