2024 MINNESOTA RUFFED GROUSE BROOD SURVEY

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SUMMARY OF FINDINGS

The Minnesota DNR launched a new ruffed grouse (*Bonasa umbellus*) brood survey during summer 2019 that is now in its sixth year. Staff and cooperators kept a log of time spent in the forest during June, July, and August and any grouse observations while on foot or while driving. In 2024, 40 observers submitted data for grouse observed while afield, which is similar to participation last year. Participants reported observing 69 broods during 972 hrs on foot in the forest and 95 broods during 1870 hrs driving in the forest, which is about half as many observations while driving compared to last year but similar numbers while on foot (184 and 58, respectively) with comparable time spent afield both years. The total number of grouse observed was 627 compared to 1028 birds in 2023, and included 216 adults, 398 chicks, and 13 grouse of unknown age. The annual brood indices were 7.1 broods/100 person-hrs on foot (95% confidence interval [CI]: 1.4–12.8) and 5.1 broods/100 person-hrs driving (95% CI: 0.0–19.2) in 2024. Brood observations peaked in late-June/early-July this year but the peak was smaller than last year, likely due to the extremely wet June throughout much of ruffed grouse range which may have resulted in brood losses when chicks were young. A second peak in brood observations while on foot (but not while driving) occurred during August which might reflect differences in brood habitat use during the extremely wet summer and fewer birds to utilize resources. The proportion of adult grouse with broods decreased from 80.6% in June, which is the highest proportion reported in the survey to date, to 67.6% in July, and then remained steady in August at 66.7%, consistent with early loss of broods when chicks were young. The number of chicks (mean ± SE) in broods for which chick counts were attempted was 3.3 ± 0.3 in June (n = 47), 3.3 ± 0.3 in July (n = 45), and 3.6 ± 0.4 in August (n = 26), which is smaller than last year during the same period and in previous years of the survey. Counties with the most brood observations per unit of survey effort included Cook and Lake, but Carlton, Cass, Itasca and St. Louis counties also had counts above the median. Further interpretation of the observed patterns will be dependent on future data collection to determine production over several years and relationships to harvest statistics. Thus far, mean ruffed grouse harvest per active hunter reported by hunters has ranged 3.5–5.1 during 2019–2023.

INTRODUCTION

The Minnesota DNR coordinates a multi-agency spring drumming survey to monitor ruffed grouse (*Bonasa umbellus*) breeding populations. However, drumming surveys are conducted 4 months before hunting season begins and do not reflect production of young over the summer, which is an important component of the number of birds that hunters see each fall. Juvenile birds (i.e., <6 months old) typically comprise the majority of birds harvested (Dorney and Kabat 1960, Dorney 1963). In a recent West Nile virus study involving hunter-submitted grouse, juveniles comprised 64% and 71% of submitted samples in Minnesota during 2018 and 2019, respectively (Roy et al. 2020). Therefore, hunter experiences may be negatively impacted by lower production and the smaller resulting harvestable surplus. Production of young is influenced not only by weather conditions (Bump et al. 1947, Dorney and Kabat 1960), but also may be influenced by numerous other factors (e.g., disease, parasites, food availability, predators, Hewitt et al. 2001).

Between 1949 and 2005, ruffed grouse harvest in Minnesota was strongly related to the statewide drumming survey index (r = 0.77, Figure 1). Similar patterns between statewide drumming survey indices and hunting success were also documented in Michigan, Ohio, and New York (Ammann and Ryel 1963; r = 0.90 in Ohio, Stoll 1980; New York Department of Environmental Conservation 2018). Thus, hunters came to rely on the drumming survey as an indication of the upcoming season. However, since 2005 this relationship has weakened considerably in Minnesota (r = 0.35, Figure 1), which is likely influenced, in part, by reductions in hunter numbers from a high of 161,600 in 1989, to as low as 57,284 in 2021 (Minnesota Department of Natural Resources 2023). Hunter numbers used to peak with peaks in the drumming cycle, but that has not been the case for the last two cycles.

Another possible contributor to the weakening relationship between the drumming survey data and harvest is that summer production of young might have declined, despite an otherwise robust breeding population that is cycling around a stable 30-year average. Lower production would not be reflected in the drumming survey data of the same year because the drumming survey is conducted in the spring before nests hatch. Furthermore, lower production may not be reflected in the drumming survey the following year if production is still above replacement-level and hunting is compensatory, although hunters might see and harvest fewer birds in the fall during years of low production. Lower production than anticipated from the current point in the 10-year cycle would be expected to become discernable in the drumming survey data if hunting became a source of additive mortality, although this is not currently supported by the available data.

The DNR needs better information on brood production to bridge the gap between the drumming survey, which is conducted in April and May, and the time when most ruffed grouse hunters go afield in September and October. Such information may help improve the ability to forecast the hunting season and may also improve our understanding of the causal mechanisms behind the changing pattern between the drumming survey and fall harvest period. Thus, the DNR launched a new passive brood survey in 2019, which was modeled after similar efforts in Pennsylvania that have been conducted since 1981 and for which survey data exhibit a strong relationship to fall flush rates. In Pennsylvania, a strong relationship between grouse observed per day and hunter flushes per hour existed during 1981–2001 (r = 0.75), and this data informed predictions of “above average,” “average,” or “below average” fall harvests (pers. comm., L. Williams, Pennsylvania Game Commission). Since 2002, the relationship between grouse observed per day and hunter flushes weakened slightly (r = 0.65, pers. comm., L. Williams, Pennsylvania Game Commission), but is still much stronger than the recent relationship between the drumming survey data and total harvest in Minnesota.

METHODS

I asked cooperators on the ruffed grouse drumming survey, private and county foresters, and DNR Forestry, DNR Wildlife, and DNR Ecological and Water Resources staff in forested regions to keep a record of the number of broods encountered each hour afield during June, July, and August. Each observer reported hours afield on foot separately from hours driving each day in the forest (to account for partial days afield), county, the number of grouse broods seen, brood size, and the total number of adult grouse seen, as well as broods of other species observed (e.g., woodcock, turkey, spruce grouse). Observations were conducted while doing other planned field work, so did not incur additional cost or substantial time beyond recording daily observations (or lack thereof), which was reported to take ~1 min per observer per day.

I summarized the total number of broods and total number of grouse observed each day, as well as the broods/hr in a catch-per-unit-effort type of approach, where effort was defined by total observer hours in the field (e.g., broods/100 person-hrs afield). People working alongside each other in the field reported observations for 1 observer. This allowed distinction between changes in numbers of birds due to changes in time spent afield vs changes in numbers of birds due to actual changes in the number of birds. I also expected changes in the number of birds observed each month to be influenced by changes in the behavior of young birds as they mature, but assumed birds would behave similarly among years, whereas sources of mortality may vary considerably among years. If these assumptions are true, then this survey should allow meaningful comparisons of brood numbers among years.

RESULTS & DISCUSSION

Cooperators from 1854 Treaty Authority (4), Leech Lake Band of Ojibwe (1), Red Lake Nation (3), Fond du Lac Reservation (1), Superior National Forest (1), Chippewa National Forest (1), Bemidji State University (1), and Ruffed Grouse Society (1), as well as county foresters (1), private foresters (2), DNR Ecological and Water Resources staff (1), DNR Forestry staff (2), and DNR Wildlife staff (21) submitted data in 2024. Observations occurred while doing other work between 1 June and 31 August for a total of 972 hrs on foot and 1870 hrs driving in the forest. Reported time afield was 431, 255, 286 hrs on foot in June, July, and August, and 603, 655, and 612 hrs driving in the forest during June, July, and August, respectively. Consistent participation assists with interpretation of patterns over time, with observer effort this year similar to last year, but lower than in previous years.

Observers recorded 164 ruffed grouse broods and 84 broods of other species while working in the forest, including 78 turkey broods, 2 woodcock broods, and infrequent brood sightings of numerous other species. The total number of grouse observed was 627, including 216 adults, 398 chicks that could be counted, and 13 grouse of unknown age (i.e., a mix of juveniles and adults), which is half as many birds as observed last year. Most of the grouse reported to be of unknown age were reported in August, when it is more difficult to discern adults from chicks. The total number of grouse observed, including adult grouse, chicks, and grouse of unknown age, was related to survey effort over time this year (Figure 2), perhaps reflecting less consistent survey effort this year than in other years.

The brood index (broods/100 person-hrs afield) adjusts for changes in survey effort and is more appropriate for comparison of brood numbers among years than brood counts that do not take survey effort into consideration. The annual index during 2024 was 7.1 broods/100 person-hrs on foot (95% confidence interval [CI]: 1.4–12.8, Table 1) and was 5.1 broods/100 person-hrs driving (95% CI: 0–19.2). The brood index was highest in the arrowhead region with Cook and Lake counties having the most brood observations of those counties with ≥100 hrs of reported time afield (on foot and driving combined). Other counties with ≥100 hrs of reported time afield included Beltrami, Carlton, Cass, Clearwater, Crow Wing, Itasca, Lake-of-the-Woods, and St. Louis counties. All other counties had ≤100 hrs of observations submitted. Carlton, Cass, Itasca and St. Louis counties also had brood counts above the median.

Examining weekly and monthly patterns in brood metrics provides additional insights into production. The weekly brood index rose in late-June/early-July (Figure 3), after the usual peak in hatching at this latitude (mid-June, Maxson 1978, Larson et al. 2003). A drop in the weekly brood index was evident shortly thereafter, when mortality of ruffed grouse chicks is highest (Larson et al. 2001). Importantly, June 2024 was extremely wet throughout most of Minnesota (MN DNR Climate Journal) when grouse chicks are most vulnerable, likely producing widespread brood losses. While one might expect a decline in monthly brood indices over time as chicks are lost to various mortality factors, chicks are more detectable as they mature

(Godfrey 1975), which offsets detection of the actual loss of chicks and broods throughout the summer to some degree. Broods/100 hrs of driving in the forest in August was the lowest observed yet, whereas broods observed while on foot in August was the highest yet (Tables 1 and 2). These seemingly incongruous results may reflect a difference in habitat use during this very wet year with fewer surviving chicks utilizing widespread resources and spending less time near roads.

The proportion of adults reported with broods decreased with time since hatch from 80.6% in June, which is the highest proportion ever reported in this survey, to 67.6% in July after the fifth wettest month on record (MN DNR Climate Journal), and then stayed steady in August (66.7%, Table 1). The number of chicks (mean ± SE) per brood, when counted, was 3.3 ± 0.3 in June (n = 47), 3.3 ± 0.3 in July (n = 45), and 3.6 ± 0.4 (n = 26) in August. Notably these are the smallest brood sizes since the inception of this survey. A decline in brood size over time is consistent with chick mortality and partial brood loss during summer. However, brood size did not decline over the summer suggesting that chicks that survived June rainfall events and floods fared well.

The observed chick counts were lower than brood sizes reported for July (7.3 and 8.1) and August (6.2 and 6.8) in Alberta over 50 years ago (Rusch and Keith 1971) and also by Dorney and Kabat (1960) for Wisconsin (7.4 and 7.9 in July, 6.8 and 7.9 in August). However, counts observed in this survey are consistent with a previous study of a radio-marked brood of 9.0 known chicks per encounter in Minnesota that averaged 4.7 chicks observed per encounter (Godfrey 1975). Chick counts are known to underestimate the actual number of chicks and are considered very unreliable for young broods with many chicks that hide quickly because the degree of undercounting varies with many factors (Godfrey 1975, Larson et al. 2001). Moreover, observers in this brood survey were counting chicks while performing other duties, which may have produced lower counts than those of observers focused primarily on obtaining accurate counts, and potentially dedicating more time to search for chicks. Nevertheless, participants in this survey will likely have similar competing demands on their time among years, so comparisons among years of this survey are more likely to be tenable. Future data collection will be helpful to see how brood counts vary among years in Minnesota and whether they can be informative about the frequency of hunter encounters during fall.

Interpretation of the observed patterns as “above average,” “average,” or “below average” will require additional years of data collection to determine an average. I will continue to reach out to potential observers to increase participation in the survey next year to allow for more robust data comparisons among years. Strong participation is imperative to produce useful information, because variability in brood counts among years is likely to be caused by many factors and extracting meaningful patterns will require that sample sizes are sufficient to detect a meaningful signal from among the variability.

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LITERATURE CITED

Ammann, G. A., and L. A. Ryel. 1963. Extensive methods of inventorying ruffed grouse in Michigan. Journal of Wildlife Management 27:617-633.

Bump, G., R. W. Darrow, F. C. Edminster, and W. F. Crissey. 1947. The ruffed grouse—life history, propagation, management. New York State Conservation Department, Albany New York, 915pp.

Dorney, R. S., and C. Kabat. 1960. Relation of weather, parasitic disease and hunting to Wisconsin ruffed grouse populations. Wisconsin Conservation Department Technical Bulletin 20.

Dorney, R. S. 1963. Sex and age structure of Wisconsin ruffed grouse populations. The Journal of Wildlife Management 27:598-603.

Godfrey, G. A. 1975. Underestimation experienced in determining ruffed grouse brood size. Journal of Wildlife Management 39:191-193.

Hewitt, D. G., D. M. Keppie, and D. F. Stauffer. 2001. Predation effects on forest grouse recruitment. Wildlife Society Bulletin 29:16-23.

Larson, M. A., M. E. Clark, and S. R. Winterstein. 2001. Survival of ruffed grouse chicks in northern Michigan. The Journal of Wildlife Management 65:880-886.

Larson, M. A., M. E. Clark, and S. R. Winterstein. 2003. Survival and habitat of ruffed grouse nests in northern Michigan. Wilson Bulletin 115:140-147.

Maxson, S. J. 1978. A nesting study of ruffed grouse at the Cedar Creek Natural History Area, Minnesota. Loon 50:25-30.

Minnesota Department of Natural Resources. 2024. 2023 Small Game Hunter Mail Survey. Minnesota Department of Natural Resources Report. 12 pages.

New York Department of Environmental Conservation. 2018. Ruffed grouse drumming survey. Ruffed grouse drumming survey.

Roy, C., M. Carstensen, K. LaSharr, C. Humpal, and T. Dick. 2020. West Nile virus exposure and infection rates in hunter-harvested ruffed grouse in Minnesota. https://files.dnr.state.mn.us/recreation/hunting/grouse/west_nile_2019.pdf

Roy, C. 2023. 2023 Minnesota Ruffed Grouse Survey. Minnesota Department of Natural Resources Report. 9 pages. Minnesota Ruffed Grouse Survey

Stoll, R. J., Jr. 1980. Indices to ruffed grouse hunting success in Ohio. Wildlife Society Bulletin 8:24-28.

Table 1. Ruffed grouse brood observation metrics in Minnesota during 2019–2024 and harvest metrics for the fall hunting seasons the same year.

	Prop. adults with broods			Brood size (Mean ± SE)			Harvest/ hunter[3]
Timeframe	Jun	Jul	Aug	Jun	Jul	Aug	Sep-Jan
2019[1]	66.7	58.6	0.00[1]	4.1 ± 0.9	4.7 ± 0.7	4.0 ± 2.1	3.7
2020	63.6	51.8	43.5	5.5 ± 0.7	4.0 ± 0.4	3.7 ± 0.4	3.5
2021	60.7	77.4	70.1	5.0 ± 0.5	3.7 ± 0.3	3.9 ± 0.4	3.6
2022	62.6	68.8	71.6	5.7 ± 0.6	5.0 ± 0.6	4.1 ± 0.5	3.7
2023	63.0	80.5	78.8	3.9 ± 0.4	3.9 ± 0.3	4.4 ± 0.3	5.1
2024	80.6	67.6	66.7	3.3 ± 0.3	3.3 ± 0.3	3.6 ± 0.4	

[1] Effort was low the first year of the survey with only 7 adults without broods observed Aug 2019.
[2] Broods observed while driving were not included in the survey during the first year but were added in 2020.
[3] Harvest metrics are from Minnesota Department of Natural Resources (2024).

Table 2. Ruffed grouse brood indices in Minnesota by month during 2019-2024.

	Broods/100 hrs on foot				Broods/100 hrs driving[1]			
Timeframe	Jun	Jul	Aug	Summer	Jun	Jul	Aug	Summer
2019[1]	4.57	5.92	4.48	5.1	NA	NA	NA	NA
2020	3.35	3.35	3.34	3.4	3.46	5.99	5.80	5.3
2021	2.48	5.15	5.48	4.2	7.46	8.20	10.90	9.0
2022	3.57	2.60	5.06	3.7	6.02	9.37	5.79	7.1
2023	1.87	7.20	6.29	5.4	7.84	16.21	8.45	10.6
2024	6.26	5.88	9.43	7.1	5.97	6.26	3.02	5.1

[1]Records of observations of broods while driving were implemented beginning in 2020, so no data are available for 2019.

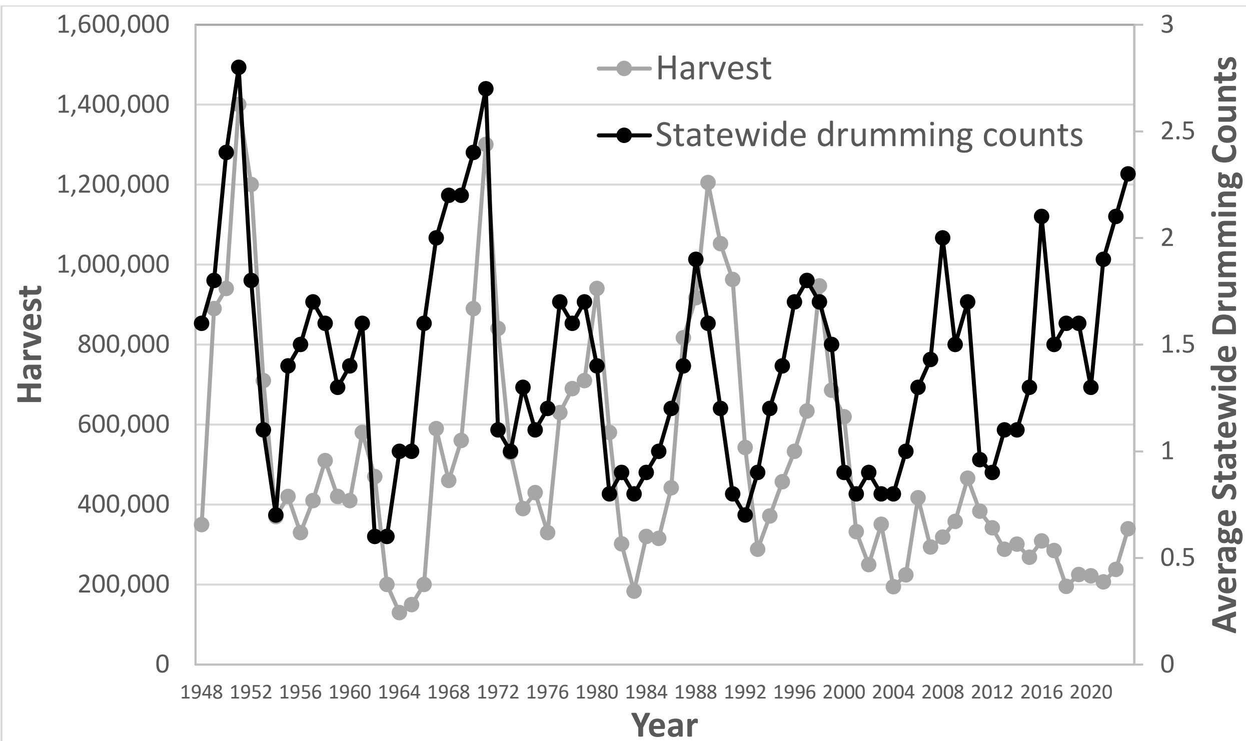

Figure 1. Comparison of average statewide ruffed grouse drumming survey data (Roy 2023) and data on harvest of ruffed grouse from the Small Game Hunter Harvest Survey (Minnesota Department of Natural Resources 2023) in Minnesota during 1948–2024. The two metrics were correlated more strongly prior to the early-2000s.

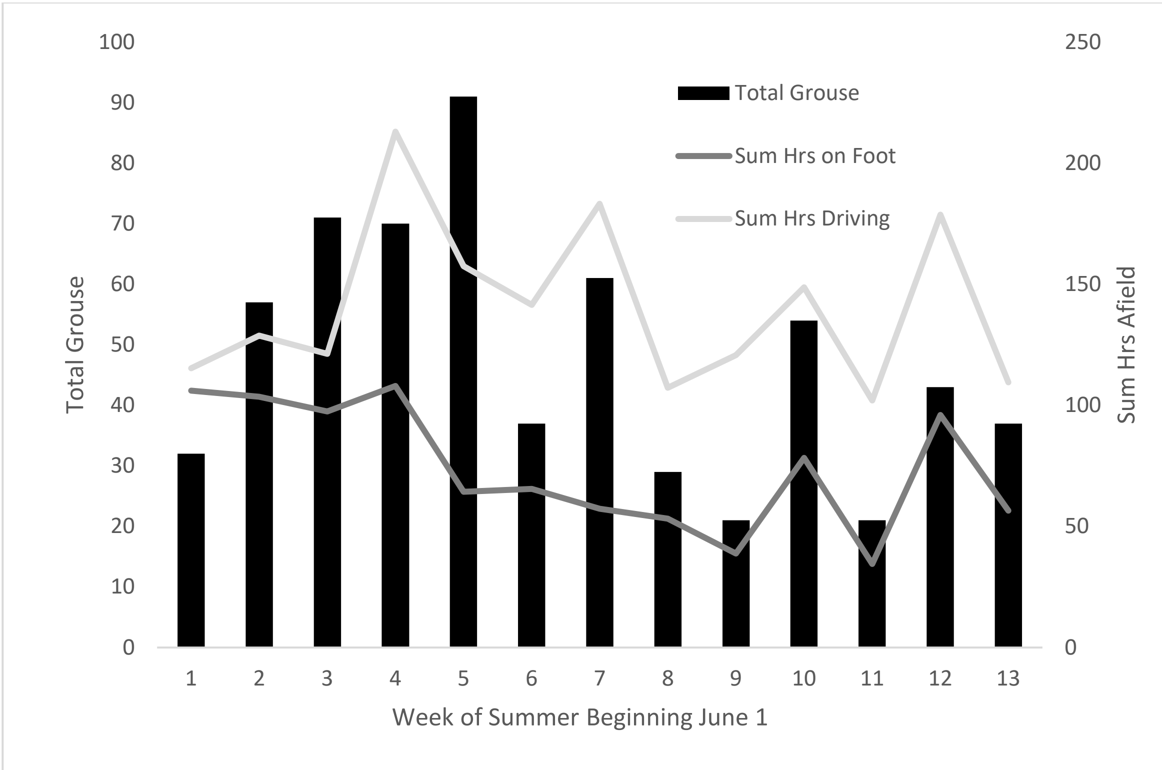

Figure 2. The chronology of ruffed grouse brood survey effort in the forest on foot and while driving and total number of grouse observed (young, adults, and birds of unknown age) by participating staff and cooperators during summer 2024 in Minnesota. Survey effort varied throughout the 13-week season.

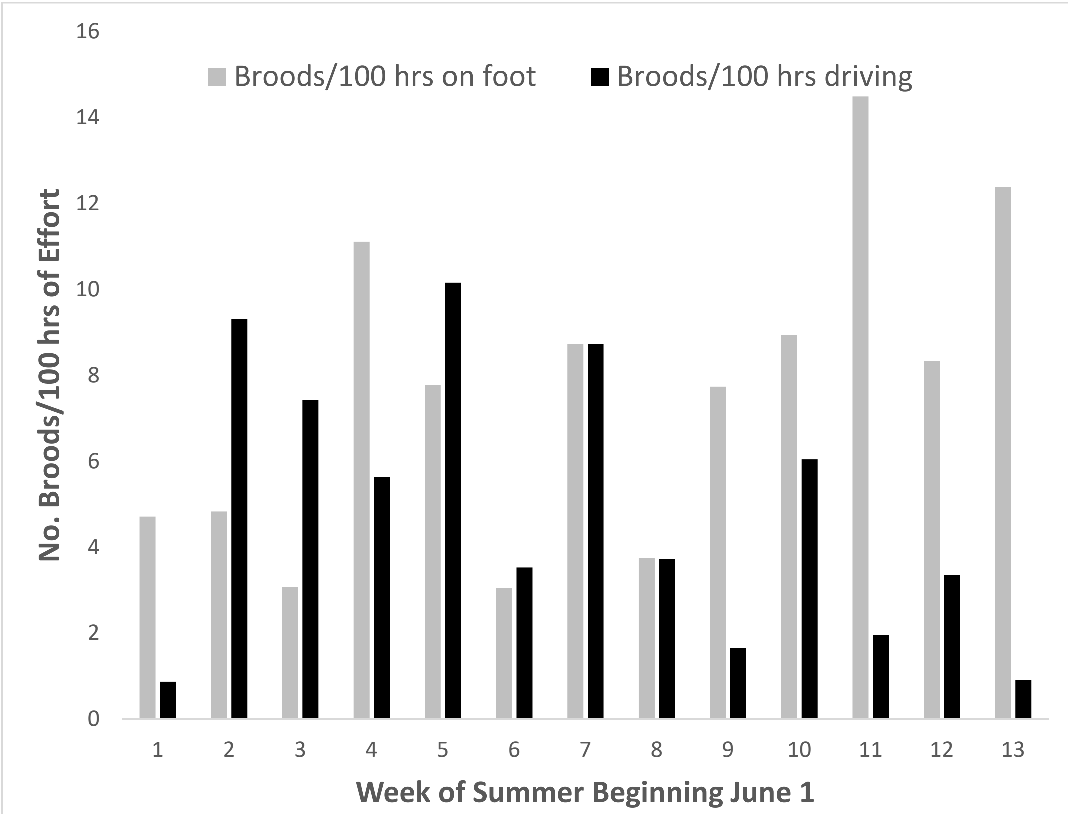

Figure 3. Ruffed grouse broods/100 person-hrs afield each week while either on foot or while driving in Minnesota during June, July, and August 2024. This index is adjusted for effort so that comparisons can be made among years in which time spent afield varies.