WATERFOWL PRODUCTION IN THE CHIPPEWA NATIONAL FOREST: A HISTORICAL PERSPECTIVE

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SUMMARY OF FINDINGS

We repeated a historical waterfowl production survey on the Chippewa National Forest in 2019. The survey had previously been conducted from 1937-1972. The methodology was straightforward and repeatable; we plan to conduct the survey for 4 additional years to compare waterfowl production between historical and modern time-periods. In 2019, total waterfowl abundance was similar to the historical average. However, overall waterfowl productivity and production per brood appeared to have decreased. In addition, results from 2019 indicate a long-term shift in species composition of waterfowl breeding in this region. Findings from this study will be used to identify research needs and management solutions for sustaining or increasing forest-breeding waterfowl populations in Minnesota.

INTRODUCTION

The principle goal of Minnesota's Long Range Duck Recovery Plan is to restore breeding waterfowl populations to their historical levels (Minnesota Department of Natural Resources, [MNDNR] 2006). Implicit in this goal is a thorough understanding of statewide populations and an associated historical perspective. However, the majority of Minnesota's forested region is not surveyed regularly for breeding waterfowl (Cordts 2018), despite its importance to commonly harvested species including ring-necked ducks (*Aythya collaris*), wood ducks (*Aix sponsa*), mallards (*Anas platyrhynchos*) and, to a lesser extent, blue-winged teal (*Spatula discors*; Pfannmuller et al. 2017, Soulliere et al. 2007, Zicus et al. 2013). Data on the status of forest-breeding waterfowl in Minnesota are required to achieve goals in the Duck Plan.

Historically, waterfowl hunting heritage and harvest were strong in the forested portion of Minnesota (Kirby et al. 1976, Stoudt 1938). However, more recent estimates indicate a reduction in harvest from the forest (MNDNR 2001). This is likely related to fewer waterfowl hunters, though concern over declining production from forested wetlands has also been a principle issue raised by researchers and wildlife managers (Zicus 2003; *but see* Lawrence 2003). With locally reared ducks contributing as much as 70% of the overall harvest in Great Lakes States (T. Arnold *unpublished data*), duck hunting opportunity in Minnesota's forests relies on an understanding of local population trajectories.

The primary goal of this study is to give context to modern waterfowl populations in the forests of north-central Minnesota by repeating a historical waterfowl production survey. Over 80 years ago, Jerome Stoudt of the United States Forest Service (USFS) established a survey of waterfowl production in the Chippewa National Forest (CNF; Stoudt 1938). The survey was conducted from 1937-1972, providing managers with trends in waterfowl abundance and productivity. By repeating the survey from 2019-2023, we hope to provide wildlife managers

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with important insights into changes, if any, in breeding productivity and species composition of waterfowl in the CNF over the last century. Here, we report on the survey methods and preliminary results from 2019.

OBJECTIVES

1. Our primary objective is to repeat the CNF waterfowl production survey (hereafter, 'historical survey') from 2019-2023 to determine changes in relative abundance, productivity, and species composition of waterfowl from historical to modern time-periods.

METHODS

The following methods have been summarized from original methodological documents pertaining to the historical survey. These original files have been digitized and archived along with annual data summaries and raw data. We indicate where methods have been modified or where we made assumptions about unknown methodologies during the first year of sampling, 2019.

Chippewa National Forest Waterfowl Production Survey

The historical survey was conducted on 10 lakes and flowages in the CNF (Figure 1). Each year, the survey was initiated in early-mid July, after most waterfowl broods had hatched, but before the earliest broods had started to fly. Survey dates ranged from 5-26 July, but were most often 8-13 July. Anecdotal reports of broods and pre-survey scouting were utilized to determine when to conduct the survey.

Each study lake was sampled on one morning or evening visit, usually not after 0900 hours or before 1700 hours. Note, in 2019, we surveyed all lakes in the morning hours. Surveys were not conducted when there were high winds or heavy rain. Ideal conditions for sampling were calm, cloudy days. Six of the study lakes cover the entirety of the given lake's shoreline, while the remainder include only portions of the shoreline (Figure 2). Details regarding survey nuances at each site are beyond the scope of this report and are summarized elsewhere (e.g., lake access points, anticipated vegetative conditions). Generally, the survey was conducted in a similar manner between sites, as described below.

Two observers conducted the survey from a canoe. The canoe was positioned along the shoreline and slowly paddled around the perimeter of the lake. Shoreline context varied greatly, including forested, wetland shrubs (e.g., willow [*Salix* spp.]), sedge mats (*Carex* spp.), aquatic emergent vegetation (e.g., bulrush [*Scirpus* spp.], wild rice [*Zizania* spp.]), un-vegetated (e.g., rocks, sand) and developed (e.g., cabins, docks). Each situation required a slightly different canoe position and speed to detect waterfowl broods. In addition, a third person walking along the shoreline, approximately 50 m ahead of the canoe, was used in locations where broods could escape unnoticed. This method was usually used on hard-bottomed areas with extensive bulrushes. Outboard motors were occasionally used on the canoe for travelling to and from study sites or for surveying sections of barren shoreline where broods could be observed from >100 m.

All waterfowl (ducks, geese, and swans) encountered along designated survey routes were counted and recorded. Note, during the historical survey, no Canada geese (*Branta canadensis*) or trumpeter swans (*Cygnus buccinator*) were observed. However, based on the descriptions of the survey, we believe that these species would have been counted similarly to ducks had they been breeding in these areas during the survey (e.g., the historical survey was consistently referred to as a 'waterfowl' survey). Nearly twenty species of waterfowl are potential breeding species in the CNF (Table 1). Historically, only 6 of these were common enough to summarize on an individual basis: American wigeon (*Mareca americana*), blue-

winged teal, common goldeneye (*Bucephala clangula*), mallard, ring-necked duck, and wood duck.

Each observation was categorized by species, age (adult or brood), sex (male or female; adults only) and total count. Broods were further classified by their developmental stage, from fully downy ducklings (class I) to those approaching flight stage (class III; Bellrose and Kortright 1976, Gollop and Marshall 1954). For each brood, surveyors indicated whether the adult hen was present and if they felt the entire brood was accurately counted or not (i.e., if several brood members appeared to have escaped into cover prior to being counted). Surveyors closely observed the behavior of adult hens in order to identify likely broods that were concealed and unavailable to count. Maternal hens will feign injury or lead potential predators away from their broods, often flying short distances or otherwise creating a distraction. These behaviors were used to indicate a concealed brood by recording the hen as a maternal hen.

Incomplete broods and maternal hens were expanded to represent unobserved ducklings by assigning species- and year-specific brood averages for complete broods. Note, in 2019, we used averages from all complete broods for a given species to identify these unobserved ducklings. Historically, the averages were both species- and lake-specific. For example, the average of complete mallard broods for Round Lake in 1953 was applied to each mallard maternal hen or incomplete brood for Round Lake.

Data Summary

We made basic graphical summaries comparing waterfowl counts from the historical survey to 2019. There were adequate historical data to compare: 1) total waterfowl abundance, 2) abundance of adults and juveniles, 3) juvenile-adult ratio, 4) total number of broods, 5) lake-specific waterfowl counts and production, 5) species composition, 6) species-specific abundance, and 7) species-specific production and age of young. Additional data summary and analysis will be included after further sampling, 2020-2023.

RESULTS AND DISCUSSION

In July 2019, we assessed the efficacy of repeating the methodology from the historical survey. We attempted to follow all protocols as documented in the Methods, above. In general, we felt that the survey was repeatable and that it was worthwhile to continue sampling through 2023.

All lakes were surveyed for waterfowl during 8-22 July 2019. We conducted a second survey of one lake (Bowstring) on 2 August 2019 due to updated information we found regarding the sampling route used in historical surveys. Amongst the 10 lakes, approximately 70 miles of shoreline were surveyed for waterfowl. A total of 2,035 waterfowl were observed, which is similar to the historical average count of 1,996 (Figure 3). Past counts fluctuated widely and indicated a long-term decline in total abundance of waterfowl, particularly production of young, from 1937-1972 (Figure 3; Figure 4). The number of juveniles counted in 2019 was similar to those counted in 1960s-1970s, but less than those counted in the 1930s-1940s. However, the number of adults was the third highest counted in the nearly 40 years of surveys. Combining these data points generated a juvenile-adult ratio near the lowest of the historical data (Figure 5). Most individual lakes had total counts that were similar to or above their historical averages, with the exception of Bowstring Lake (Figure 6).

In 2019, we counted more individual waterfowl broods than the historical average (238 versus 200). However, we counted fewer young per brood. Historical averages for complete broods usually ranged from 6-8 ducklings per brood for commonly observed duck species. In 2019, brood averages ranged from 4-6 for these species, including 5.6 for the most common species, mallard (Figure 7). It does not appear that this potential decline in brood-level productivity can

be explained by shifts in age-classes of broods over time; the proportion of mallard broods in 3 standard age-classes was generally similar between 2019 and historical data (Figure 8).

Species composition and abundance of individual species shifted between the historical time-period and samples from 2019 (Figure 9; Figure 10). The total number and percent contribution of ring-necked ducks and wood ducks was far greater in 2019 than 1937-1972. There were fewer blue-winged teal and American wigeon than what was historically counted, though a decline in these species was apparent in the historical data (as well as the aforementioned increase in wood ducks). Common goldeneyes appear to have changed little in abundance. Mallards were consistently the most common species, including in 2019. However, when compared to historical counts, they represented a smaller percentage of all waterfowl. Finally, 'other' waterfowl composed a greater portion of all waterfowl in 2019 versus historical counts. 'Other' was primarily composed of hooded mergansers (*Lophodytes cucullatus*) and Canada geese in 2019, the latter being a species that was never observed during 1937-1972.

With further sampling, 2020-2023, the results of this study will provide state, federal, and tribal managers with new historical context regarding waterfowl populations in the CNF and potentially other forested regions of Minnesota. We plan to use the results of this study, in conjunction with previously identified research needs (e.g., Zicus 2003), to propose research projects aimed at determining management solutions for sustaining or increasing forest waterfowl populations in Minnesota.

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LITERATURE CITED

Bellrose, F. C., & Kortright, F. H. 1976. Ducks, geese & swans of North America. Stackpole Books.

Cordts, S.D. 2018. 2018 Waterfowl Breeding Population Survey, Minnesota. Status of Wildlife Populations, 2018. Minnesota Department of Natural Resources.

Gollop, J. B., & Marshall, W. H. 1954. Guide for aging duck broods in the field. US Department of the Interior, Bureau of Sport Fisheries and Wildlife.

Kirby, R. E., Riechmann, J. H., & Shough, M. E. 1976. A preliminary report on Minnesota's innovative 1973 waterfowl season. Wildlife Society Bulletin, 55-63.

Lawrence, J.S. 2003. Waterfowl populations in Minnesota's forested region – breeding populations, banding data, and harvest. *In* Forest Wetlands and Waterfowl Workshop Meeting Synthesis and Summary of Information Needs.

Minnesota Department of Natural Resources. 2006. Long Range Duck Recovery Plan. https://files.dnr.state.mn.us/recreation/hunting/waterfowl/duckplan_042106.pdf

Minnesota Department of Natural Resources. 2001. Restoring Minnesota's Wetland and

Waterfowl Hunting Heritage. http://files.dnr.state.mn.us/recreation/hunting/waterfowl/fall_duck_use_plan.pdf

Pfannmuller, L., G. Niemi, J. Green, B. Sample, N. Walton, E. Zlonis, T. Brown, A. Bracey, G. Host, J. Reed, K. Rewinkel, and N. Will. 2017. The First Minnesota Breeding Bird Atlas (2009-2013).

Soulliere, G. J., B. A. Potter, J. M. Coluccy, R. C. Gatti, C. L. Roy, D. R. Luukkonen, P. W. Brown, and M. W. Eicholz. 2007. Upper Mississippi River and Great Lakes Region Joint Venture Waterfowl Habitat Conservation Strategy. U.S. Fish and Wildlife Service, Fort Snelling, Minnesota, USA.

Stoudt, J. H. 1938. The number of waterfowl and the kill on the Chippewa National Forest, 1937. The Journal of Wildlife Management, 2(3), 82-93.

Zicus, M.C.. 2003. Developing a forest wetland and waterfowl initiative and defining research needs. Minnesota Department of Natural Resources unpublished report.

Zicus, M. C., Rave, D. P., Fieberg, J. R., Giudice, J. H., & Wright, R. G. 2013. Distribution and abundance of Minnesota-breeding Ring-necked Ducks Aythya collaris. Wildfowl, 58(58), 31-45.

Table 1. List of potential waterfowl species seen during the summer in the Chippewa National Forest. The American Ornithologist's Union acronym is listed for each species. Some species are rare during this season.

Species	**AOU abbreviation**
Canada goose (*Branta canadensis*)	CANG
Trumpeter swan (*Cygnus buccinator*)	TRUS
Wood duck (*Aix sponsa*)	WODU
Blue-winged teal (*Spatula discors*)	BWTE
Northern shoveler (*Spatula clypeata*)	NOSH
Gadwall (*Mareca strepera*)	GADW
American wigeon (*Mareca americana*)	AMWI
Mallard (*Anas platyrhynchos*)	MALL
Northern pintail (*Anas acuta*)	NOPI
Green-winged teal (*Anas crecca*)	AGWT
Canvasback (*Aythya valisineria*)	CANV
Redhead (*Aythya americana*)	REDH
Ring-necked duck (*Aythya collaris*)	RNDU
Lesser scaup (*Aythya affinis*)	LESC
Bufflehead (*Bucephala albeola*)	BUFF
Common goldeneye (*Bucephala clangula*)	COGO
Hooded merganser (*Lophodytes cucullatus*)	HOME
Common merganser (*Mergus merganser*)	COME
Red-breasted merganser (*Mergus serrator*)	RBME

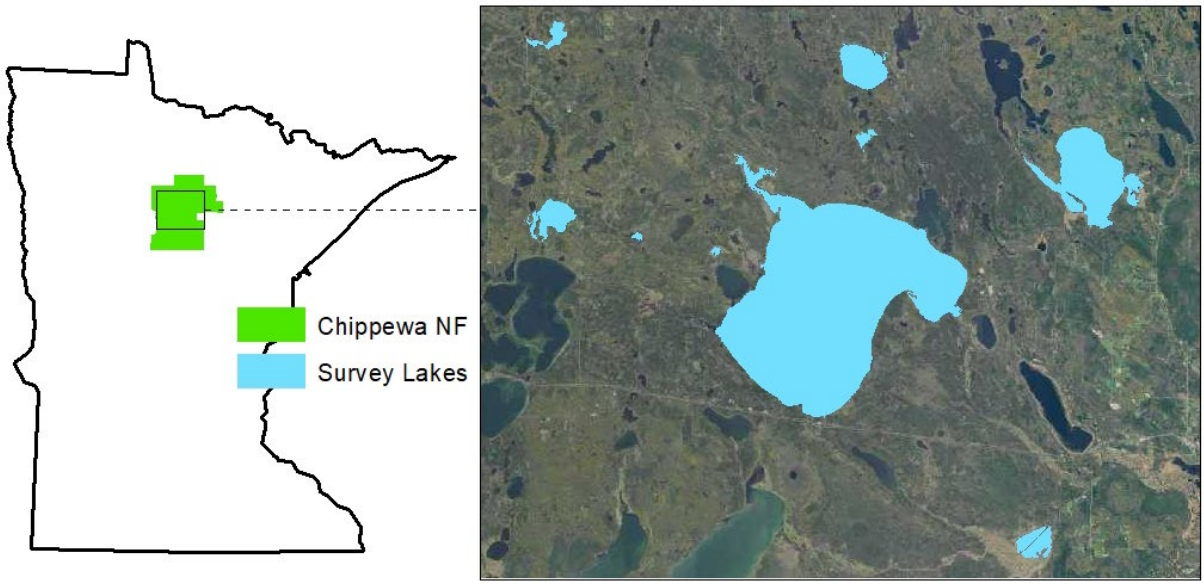

Figure 1. Chippewa National Forest and associated lakes surveyed for waterfowl broods. In the historical survey, 10 lakes and flowages were sampled from 1937-1972 and again in 2019 in Minnesota.

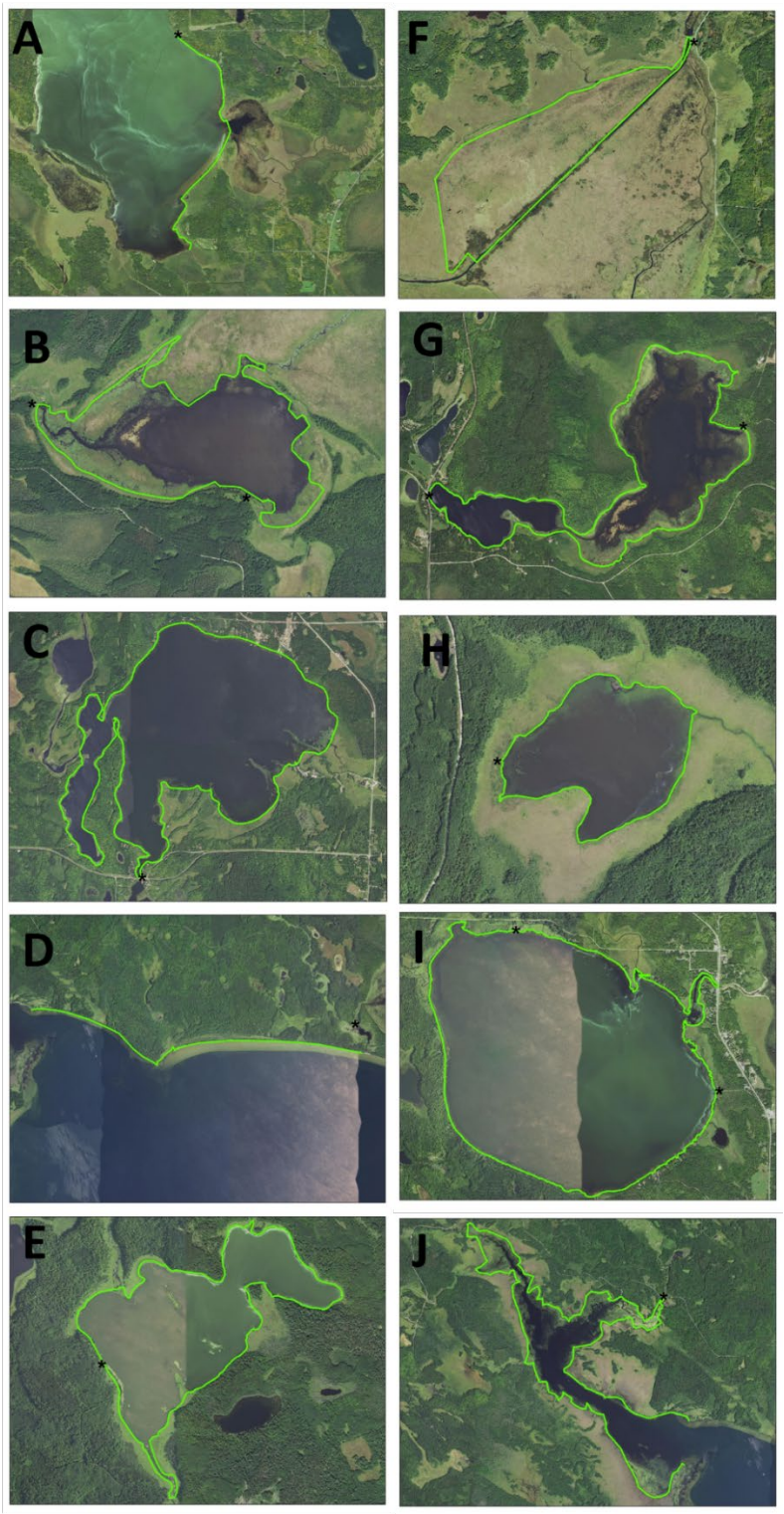

Figure 2. Individual maps of lakes and flowages surveyed for waterfowl broods 1937-1972 and 2019 in Minnesota. The green line indicates the shoreline sampled. A, Bowstring; B, Burns; C, Kitchi; D, Lake Winnibigoshish; E, Lower Pigeon; F, Mud; G, Rabideau; H, Raven; I, Round; J, Third River. Access sites are indicated by an asterisk. Note, the scale is not the same between maps.

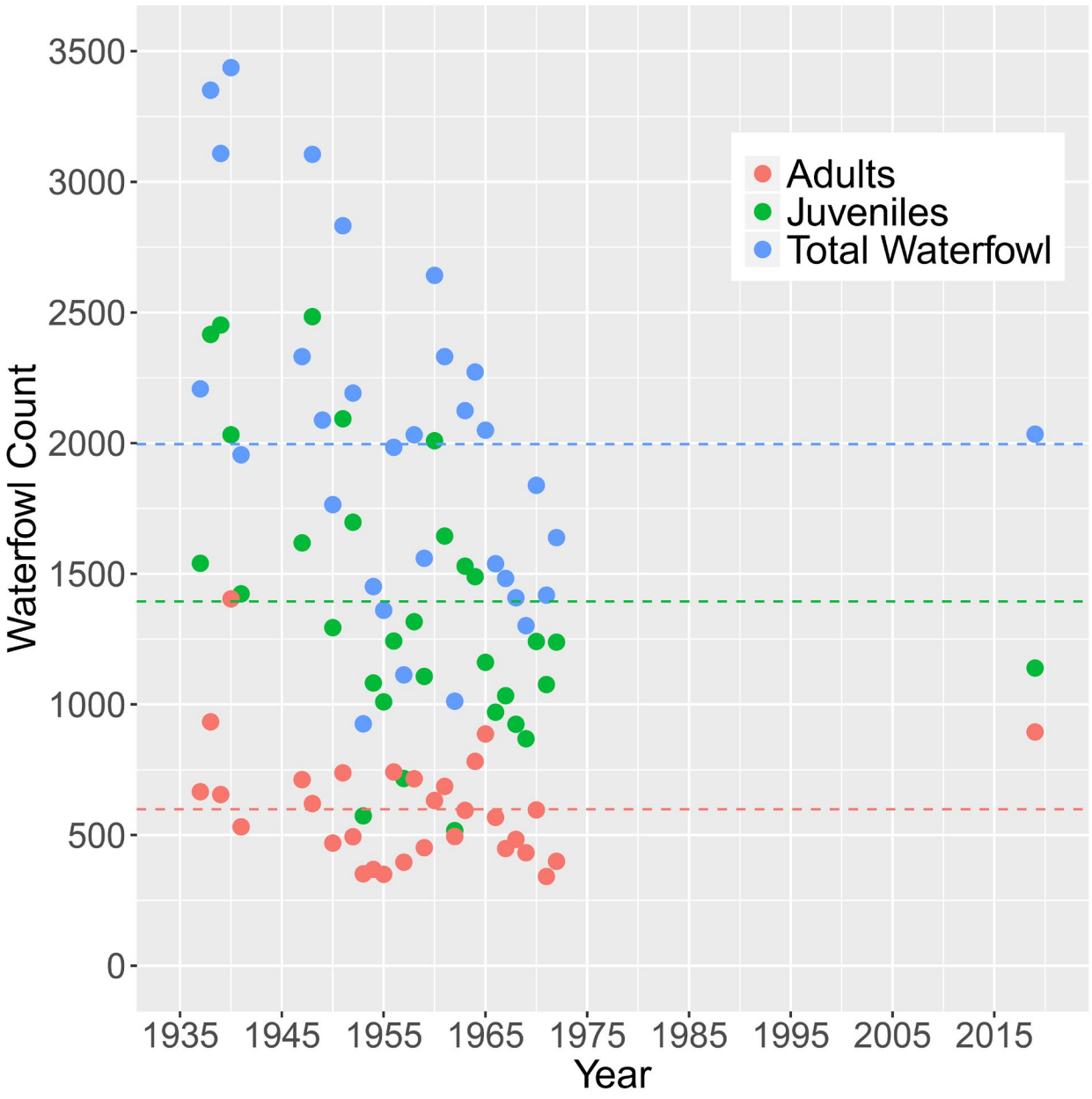

Figure 3. Total number of waterfowl observed on 10 lakes and flowages in the Chippewa National Forest, Minnesota,1937-1972 and 2019. The total count is split into adults and juveniles. Historical averages (1937-1972) for each total are indicated by a dashed line. The survey was not conducted 1942-1946 due to World War II.

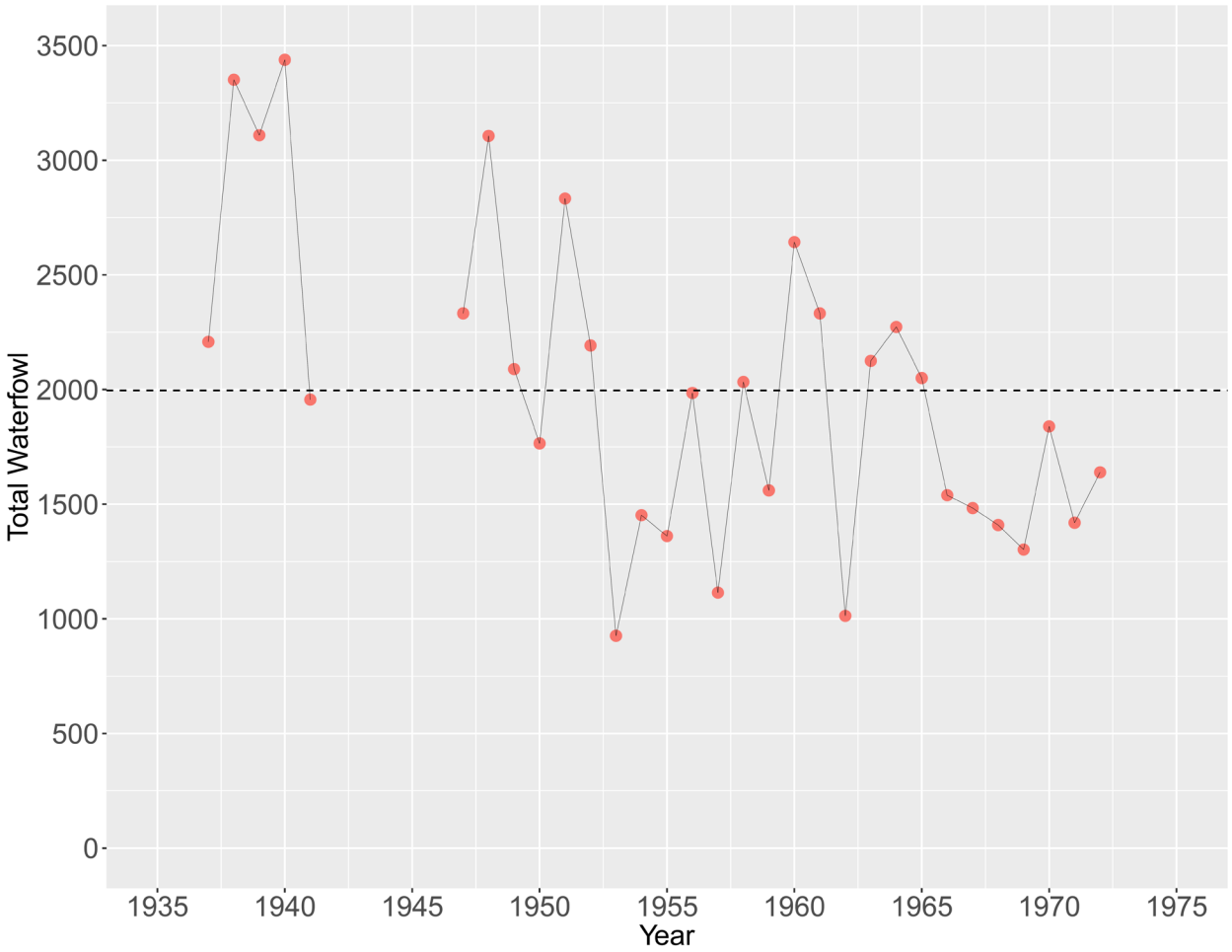

Figure 4. Total number of waterfowl observed on 10 lakes and flowages in the Chippewa National Forest, Minnesota, 1937-1972. Dashed line represents the average total count for these years. The survey was not conducted 1942-1946 due to World War II.

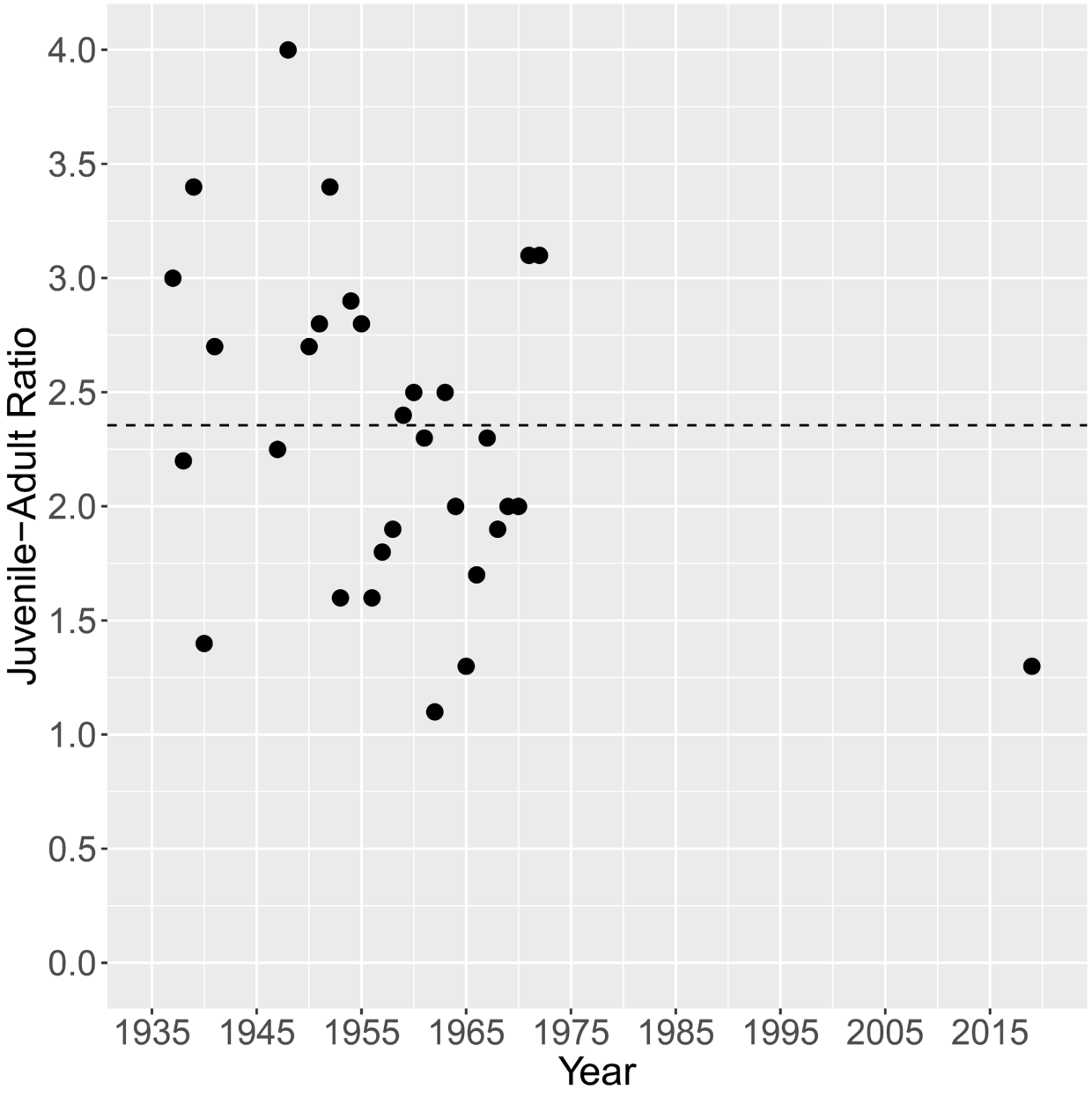

Figure 5. Juvenile to adult ratio of waterfowl observed on 10 lakes in the Chippewa National Forest, Minnesota,1937-1972 and 2019. The historical average ratio (1937-1972) is indicated by a dashed line.

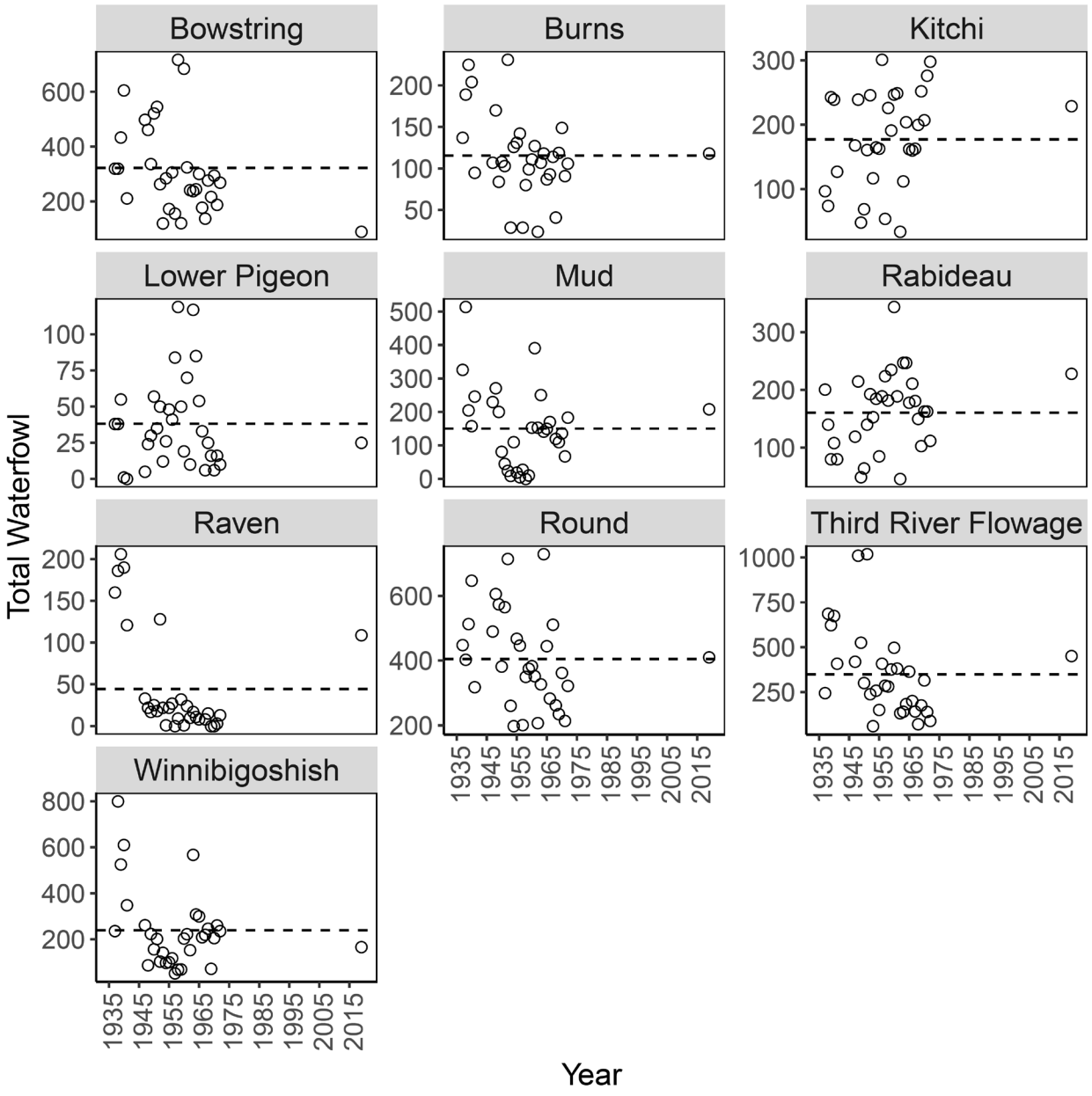

Figure 6. Number of waterfowl observed on 10 lakes and flowages in the Chippewa National Forest, Minnesota,1937-1972 and 2019. The shoreline of each lake was surveyed for waterfowl broods in July of each year. The shoreline sampled on each lake is indicated in Figure 2. The dashed lines represent the historical average (1937-1972) waterfowl count on the respective lake.

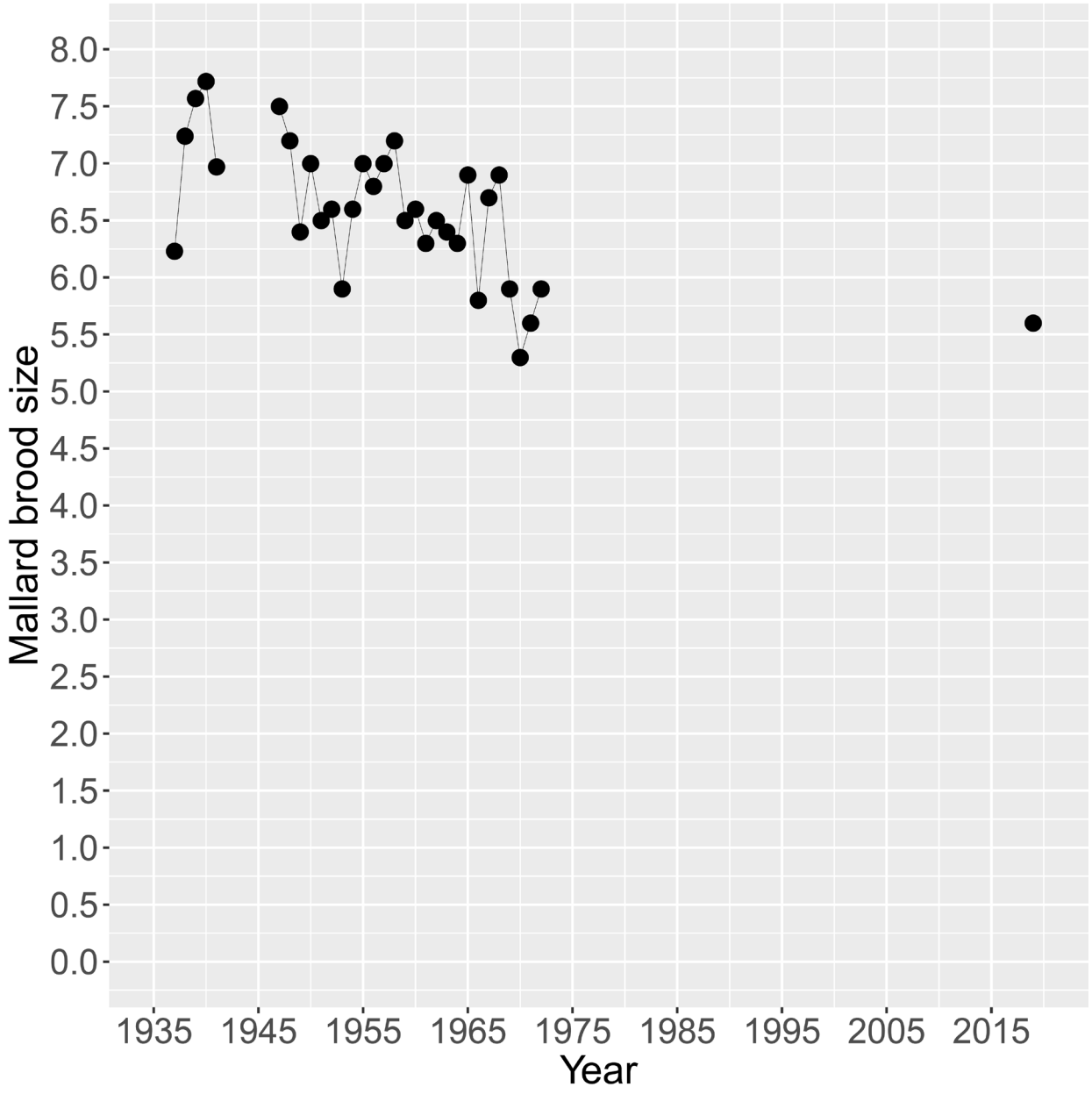

Figure 7. Average number of Mallard ducklings per brood observed on 10 lakes in the Chippewa National Forest, Minnesota,1937-1972 and 2019. Only broods where the observer could accurately make a complete count of ducklings are included in the average. Hens are not included in the brood number.

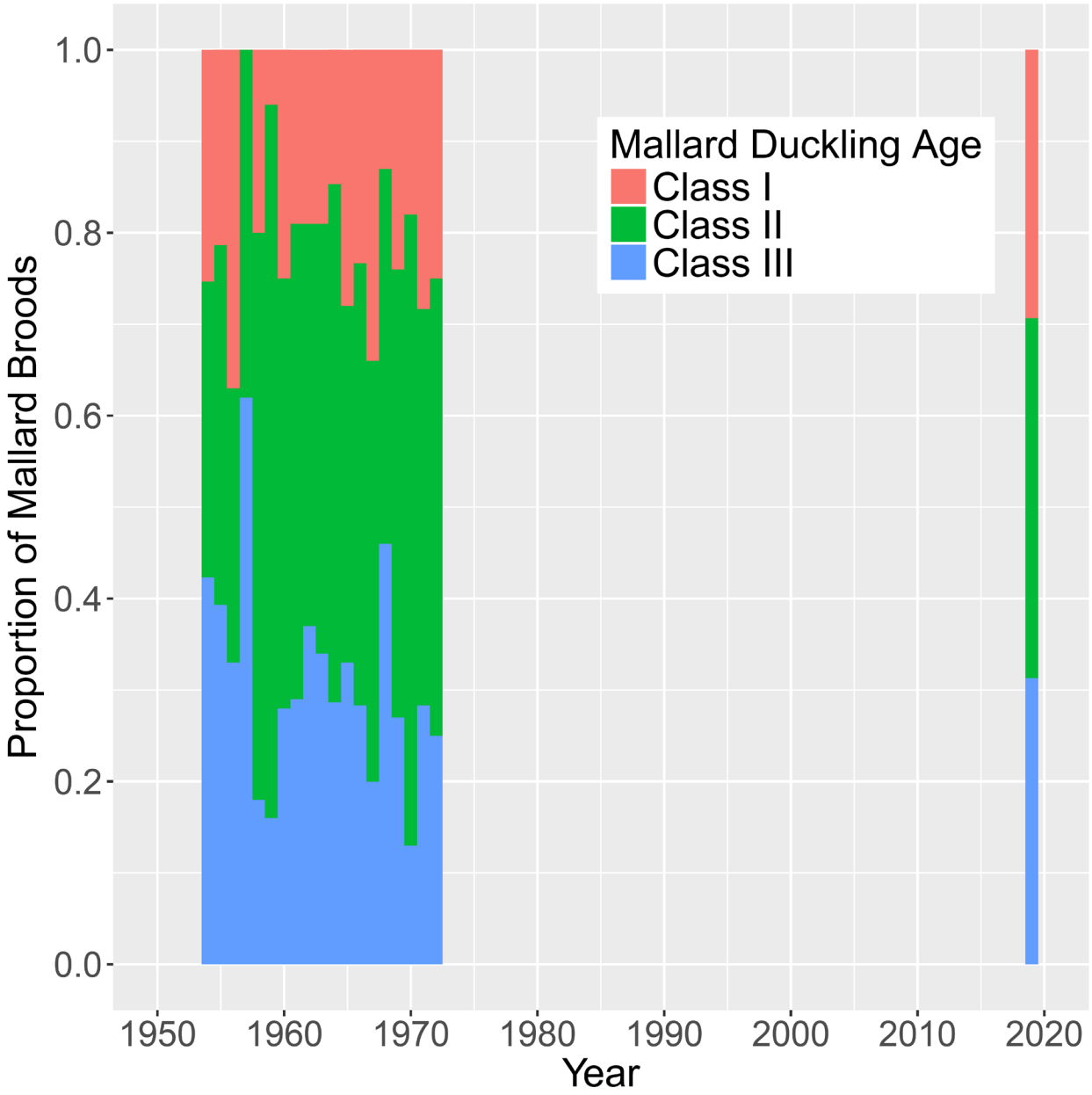

Figure 8. Mallard brood age classes observed on 10 lakes in the Chippewa National Forest, Minnesota,1937-1972 and 2019. The proportion of broods in each age class is indicated for each year. Class I ducklings are completely down-covered. Class II ducklings have started to develop adult feathers but still have some down. Class III ducklings have little if any down, though are still flightless.

Figure 9. Composition of waterfowl species observed on 10 lakes in the Chippewa National Forest, Minnesota,1937-1972 and 2019. The percent contribution of the 6 most common species observed historically (1937-1972) is given for each year. All other species are grouped into the 'Other' category. In early years, 'Other' included redhead, ruddy duck, hooded merganser, lesser scaup, northern pintail, green-winged teal and American black duck. In 2019, 'Other' consisted of hooded merganser, Canada goose and trumpeter swan.

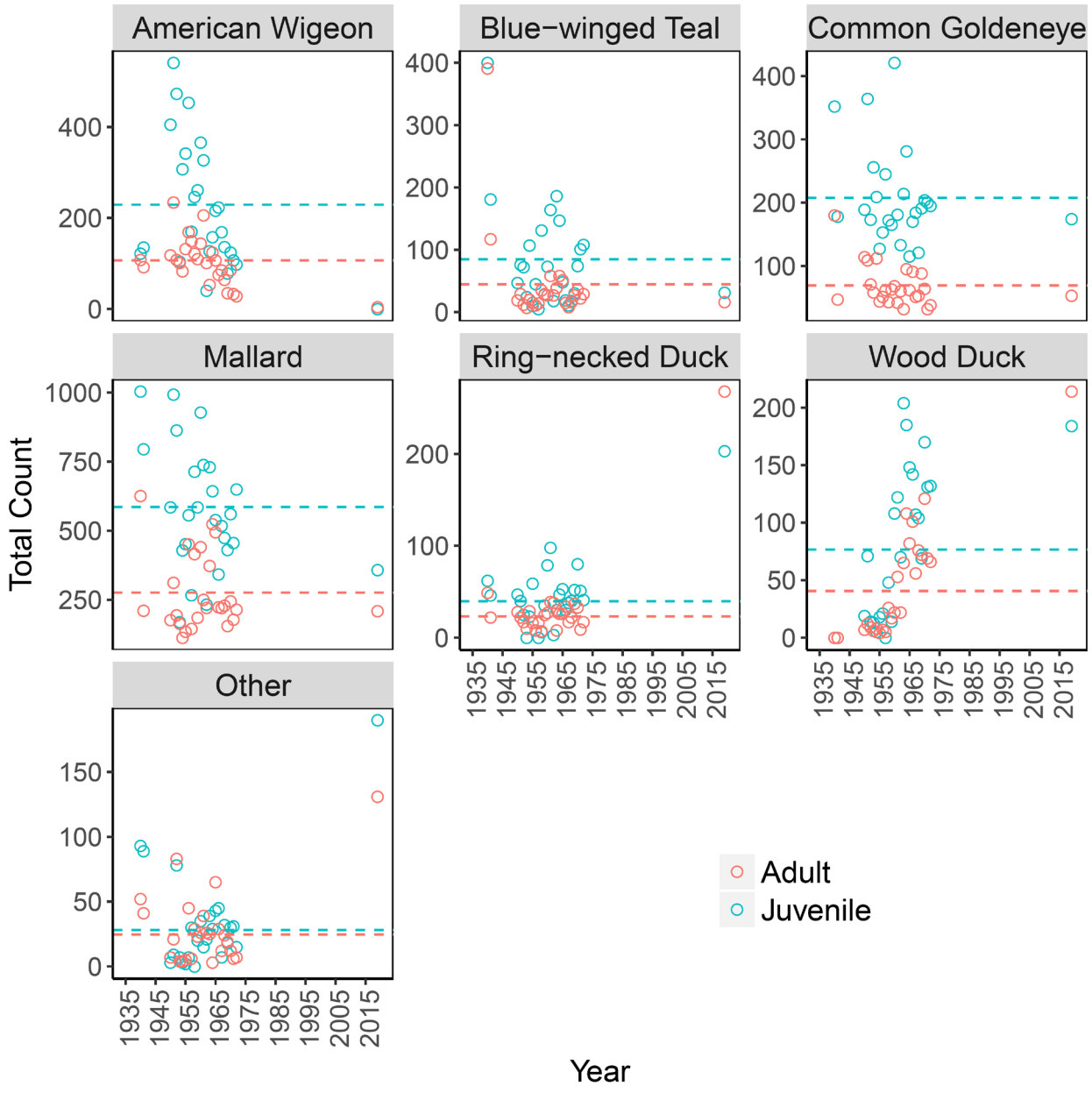

Figure 10. Number of waterfowl observed by species on 10 lakes in the Chippewa National Forest, Minnesota,1937-1972 and 2019. The 6 most common species in historical counts (1937-1972) are included. For each species, the number of adults and juveniles are indicated. The dashed blue line represents the historical average number of juveniles observed for the given species. The dashed red line represents the historical average number of adults observed for the given species.