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DUCK PRODUCTION: THE WISCONSIN PICTURE

The outlook for ducks in North America is a bleak picture: continued habitat degradation and loss, severe and prolonged drought in the duck factory of southern Canada, mallard populations that are 24% below the 31-year average (1955-86), and total duck populations that are 12% below average. Regressions of mallard and blue-winged teal breeding pair counts for North America during the past 14 years show a good fit to declining populations.

It is easy to hear this bad news from the continental perspective and assume that the same goes for Wisconsin ducks. But is it true? Wisconsin has been counting breeding ducks in a standard survey for 14 years (1973-86). This survey indicates a declining blue-winged teal population in southern Wisconsin, but no trend in northern Wisconsin. For mallards, total counts in the state have fluctuated over the 14-year period, but do not fit a regression over time in any of the 3 state regions.

There are many reasons why the situation in Wisconsin could be different, either better or worse. In comparison to the prairie states and provinces, we have: lower duck densities, higher predator densities, different predator communities, more predator habitat, probably more alternate prey for nest predators, different land use, more precipitation, and fewer but larger and more stable wetlands. How do these factors fit together, and what do they mean for Wisconsin duck populations? The only sure conclusion is that the situation here could be different. We should not extrapolate from studies in the prairies.

Measuring Nest Success

Research on duck populations has often focused on measuring nest success. You first have to look at how nest success is calculated to understand these research findings. Original duck studies calculated nest success simply as the number of hatched nests divided by the number of total nests, excluding nests destroyed by the observer or abandoned. This is referred to as the "Traditional Method." It is known to be biased high, because you cannot find all nests, and you tend to miss more nests that were preyed upon than hatched nests. Most recent studies use a method known as the "Mayfield Method," which eliminates this bias and has been shown to be more accurate. The Mayfield Method is based on daily nest survival after the nest is found.

The U. S. Fish and Wildlife Service published a mallard model in 1979, based on previous studies from

across North America. When nest success is allowed to drive this model and all other variables are held constant at average values, a Mayfield nest success of 17% achieves a stable mallard population. That is, when Mayfield nest success is 17%, recruitment balances mortality. Using the Traditional Method in calculating nest success, about 35% nest success is needed rather than 17%.

When the mallard model is applied to Wisconsin, the higher mortality rates found here require a Mayfield nest success of 20% to balance out to a stable population. Average values are assumed for most variables except mortality in these calculations.

Past Work

Estimates of duck nest success from the Midwest and the prairies during the late 1960s to mid 1980s reinforce the grim continental duck situation indicated by breeding pair counts. Nest success in 7 of these 8 studies was inadequate to offset annual mortality (Fig. 1).

In Wisconsin, the earliest studies with reasonable sample sizes used the Traditional Method, and nest success was near or above the population maintenance level on all 3 study areas (Fig. 2). However, results of 5 more recent studies (1976-82), which used the Mayfield Method, were mostly in the zone of inadequate nest success.

New Findings

These findings were discouraging, in view of the state's active nest cover management program. A 3-year study was initiated in 1983 to look more closely at nest cover. Although switchgrass was the focus of this study, I came upon some unexpected findings about overall

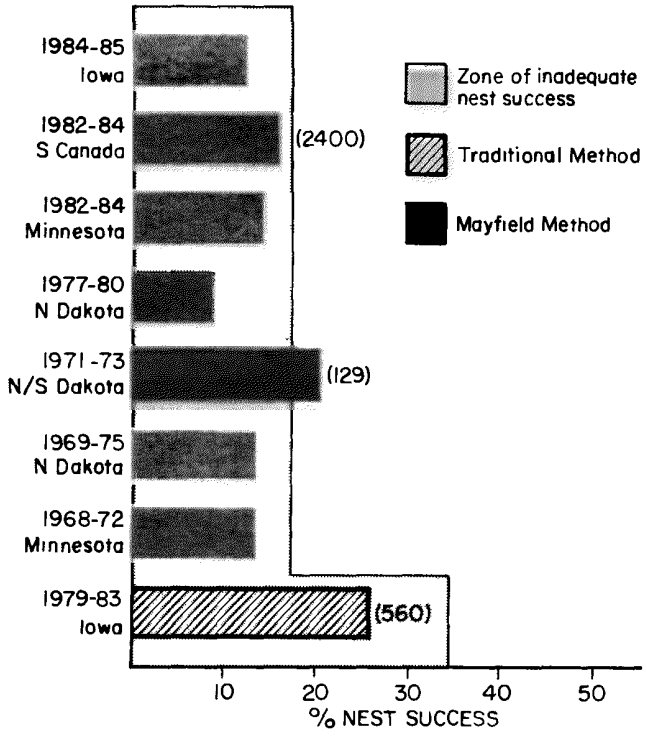

Figure 1. Nest success for ducks from 8 prairie study areas, 1968-85; sample size in ( ). Nest success is generally inadequate to balance mortality.

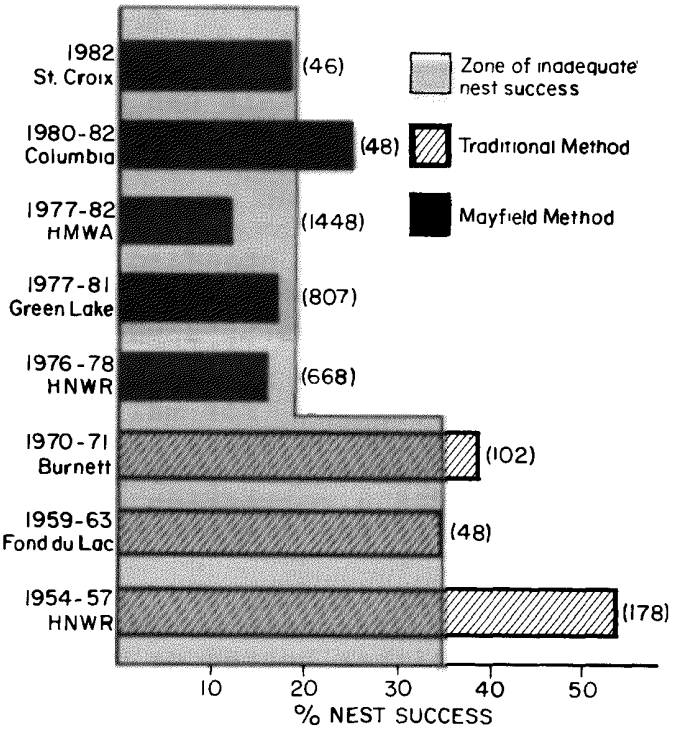

Figure 2. Nest success for ducks from study areas in 5 Wisconsin counties, Horicon Marsh Wildlife Area, and Horicon National Wildlife Refuge, 1954-82.

nest success. The study areas covered 1,700 acres on 16 properties, and spanned 3 regions: Baldwin, Madison, and Horicon. Fields were searched for nests 2-3 times each year with vehicles and cable-chains, and nests were checked for fate after the projected hatch date. All data came from managed nest cover, about equally split between switchgrass and cool season grass or forb fields on each property.

When data from all years were pooled by region and then averaged, Mayfield nest success was a surprising 32% (N=628 nests). This is above the population maintenance level and predicts an average increase in the population on these properties of 13% each year. The 95% confidence interval ranges entirely above the 20% maintenance level.

Nest success was good all 3 years of study (29%, 32%, 36%). Keep in mind the broad geographic spread of the study. We know that nest success on single study areas is highly variable between years. We also know that nest success in a given year is not synchronous in different study areas. The geographic spread of the data yielded average values for the many study areas in each year, yielding less variability between years. Recent Wisconsin studies from single areas have not shown this stability of 3 good nest success years in a row.

When I looked at individual species, I found differences ($p < 0.05$) in nest success between mallard and blue-winged teal, which together made up over 95% of the sample of nests. Nest success was 35% (N=150) for mallards vs. 27% (N=456) for blue-winged teal. Differences between species appeared in most of the individual region-year data subsets also. The 35% mallard nest success predicts an average increase in the population on these properties of 16% per year.

There were also regional differences. The Baldwin and Madison regions each had higher ($p < 0.01$) nest success (44% and 34%, respectively) than the Horicon region (19%). Regional differences appeared in all 3 years. All 4 properties in the Baldwin region were over 20% nest success. Six of 8 properties in the Madison region were above 20% nest success. In the Horicon region, 2 of 3 properties, including Horicon National Wildlife Refuge, were below 20% nest success.

Nest Success and Property Size

As I reviewed the data, I noticed that higher nest success was coming from smaller properties. A regression of nest success on total property size showed an inverse curvilinear relation ($p < 0.01$): lower nest success on larger properties (Fig. 3).

There are several theories that could explain this. Past studies have shown an inverse relationship between duck population densities and nest success, and large properties generally have higher

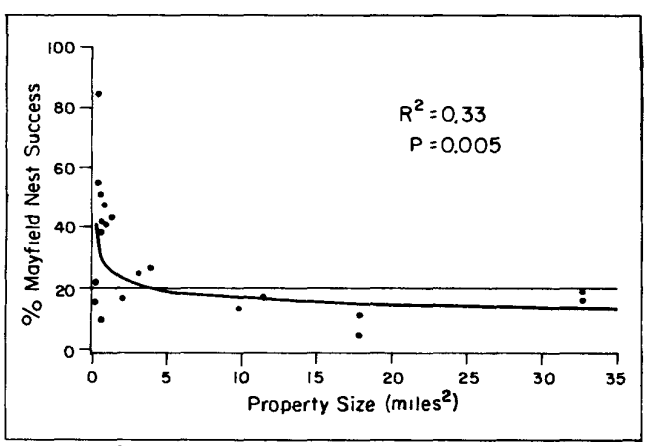

Figure 3. Relationship between duck nest success and property size. Nest success is highest on small properties.

duck densities. Also, larger properties may have higher predator densities for various habitat or population control reasons, and more predators may mean lower nest success.

This relationship between nest success and property size definitely needs refinement and further research. The importance of habitat type and pattern will be analyzed next. However, temporal differences are not involved; the low nest success I found on large properties agrees with findings from earlier studies on these areas.

Wrapping It Up

What do all the studies and numbers mean? First, local studies are important to find out what is happening in Wisconsin. We cannot always depend on national or regional studies for management guidance.

Second, it appears that Wisconsin mallards are faring better than those in the Midwest or prairies recently. Nest success for blue-winged teal also appeared good on a mix of Wisconsin public lands being managed for ducks. However, brood survival needs to be evaluated in Wisconsin to clarify the production picture.

Third, there are dangers in using only a few study areas and years. The selection of representative study areas is critical and may influence the results obtained. Most recent Wisconsin studies took place on large properties, but they may not represent the range of public properties, or Wisconsin in general.

We should remember that the most important areas to total Wisconsin duck production are private lands, areas for which we have little nest success data. For example, nest success found on public lands does not explain declining blue-winged teal in southern Wisconsin, suggesting that teal production on private lands is inadequate. Private lands have lower densities of wetlands, ducks, and perhaps predators than public lands, but different nest cover options. Nest success estimates for private lands are needed to understand the total Wisconsin duck production picture.

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Written by Ron Gatti, Bureau of Research. Ron works in the Wildlife Section in Madison and conducts research on farmland wildlife. Address: DNR, 3911 Fish Hatchery Road, Fitchburg, WI 53711. Telephone: (608)275-3211.

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Edited by Betty Les

Bureau of Research
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707

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