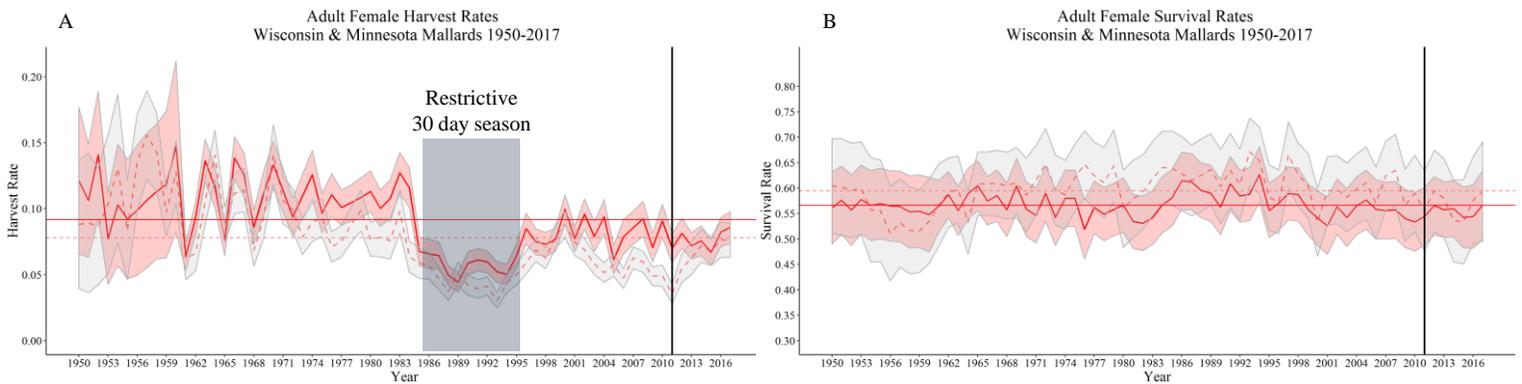




# Long-term trends in harvest and survival rates of hen mallards across Wisconsin and Minnesota

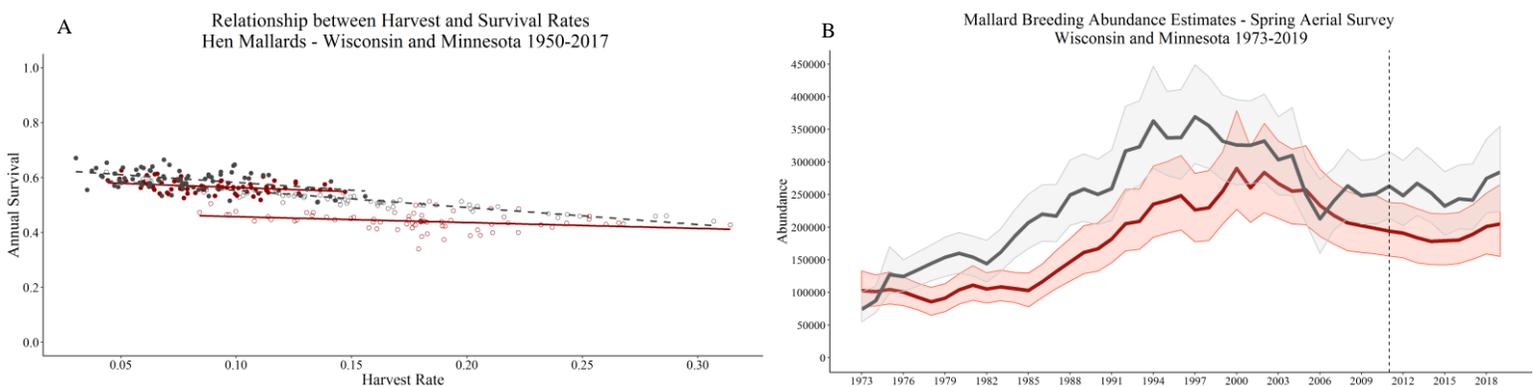
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- Waterfowl vital rates, such as annual survival probability and recruitment (successfully bringing new individuals to the fall flight) are frequently monitored and evaluated to understand their influence on population change. Leg banding programs allow for the estimation of annual survival and harvest rates and have been conducted in Wisconsin and Minnesota since 1950.
- In 2011, Minnesota DNR shifted from a 1 to a 2 hen mallard daily bag limit provided by federal frameworks. What affect has this had on resulting survival probabilities and breeding population abundance?
- Here, we summarize long-term trends in adult hen mallard harvest (Fig. 1A), survival (Fig. 1B), the relationship between them (Fig. 2A) and spring breeding abundance estimates (Fig. 2B) from Wisconsin and Minnesota.



**Fig. 1** (Above) – Harvest (A) and survival (B) rates of Wisconsin (solid red) and Minnesota (dashed red) adult hen mallards with 95% confidence intervals. Black vertical line denotes a Minnesota regulatory change from a 1 to 2 hen daily bag limit. Horizontal lines represent long-term vital rate means. Note that the restrictive 30 day season also coincided with severe drought across North America.

**Fig. 2** (Below) – A: Correlation scatter plot between annual harvest and survival rates of Wisconsin (red) and Minnesota (gray) hen mallards. Solid circles represent adults. Open circles represent juveniles. B: Mallard breeding abundance estimates for Wisconsin (red) and Minnesota (gray).



- Despite an increase in Minnesota adult hen mallard harvest rates following the 2011 regulation change, corresponding survival rates and breeding population abundances have remained stable (Figs. 1B, 2B). This stability is partially explained because of a weak relationship between harvest rate and survival rate (Fig. 2A).
- Instead, the current body of waterfowl research indicates that annual population change in most waterfowl species are influenced more by environmental variation (such as changing habitat availability and climatic patterns) that affect overall recruitment.
- In short, data presented here do not suggest an affect of increased hen mallard harvest on hen survival, and a daily 2-hen mallard bag limit should be considered sustainable.