INTEGRATED WATERBIRD *Management & Monitoring*

A continental landscape where non-breeding waterbirds have the right habitat, in the right place, at the right time.

PUBLICATION SUMMARY

Mixed Flock. Henry McLin

Integrated wetland management for waterfowl and shorebirds at Mattamuskeet National Wildlife Refuge, North Carolina: U.S. Geological Survey Open-File Report 2017–1052, 43 p., https://doi.org/10.3133/ofr20171052

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THE PROBLEM

At Mattamuskeet National Wildlife Refuge (NWR) in coastal North Carolina, more than 20,000 ha have been set aside to benefit migratory birds. The refuge provides a mix of open water, marsh, forest and fields, with Lake Mattamuskeet comprising nearly 80% of the refuge area. The lake is surrounded by 14 freshwater impoundments that are managed annually to provide high quality foraging and resting habitat for waterfowl during the nonbreeding period, and shorebirds during spring and fall migration. However, migrating and overwintering waterfowl benefit from units dominated by annual vegetation following growing season drawdowns (moist-soil) and periodic vegetation manipulations, while migrating shorebirds benefit from marshes with shallow water and mudflat habitat timed to spring and fall migration windows. These competing objectives, along with limited financial resources, staff and seasonal availability of water resources, make it a challenge to annually manage the complex of wetlands in ways that provide the right habitat at the right time for both focal guilds.

THE IWMM APPROACH

We used decision analysis to help staff annually decide how to manage the refuge's 14 impoundments given their seasonal and often competing use by waterbirds. Within the decision framework, three different management objectives were defined: shorebird use-days for both fall and spring migrations, and waterfowl use-days during the nonbreeding season (fall and winter). In addition, management alternatives were defined as collections of management actions, or portfolios that represent a combination of management actions (Figure 1), that could be implemented across the impoundments. The approach evaluated portfolios relative to expected waterbird use, and identified those that optimized use by waterfowl and shorebirds with respect to budget and other management constraints. Going forward, ongoing IWMM monitoring data will be used to test predictions and update the analyses used.

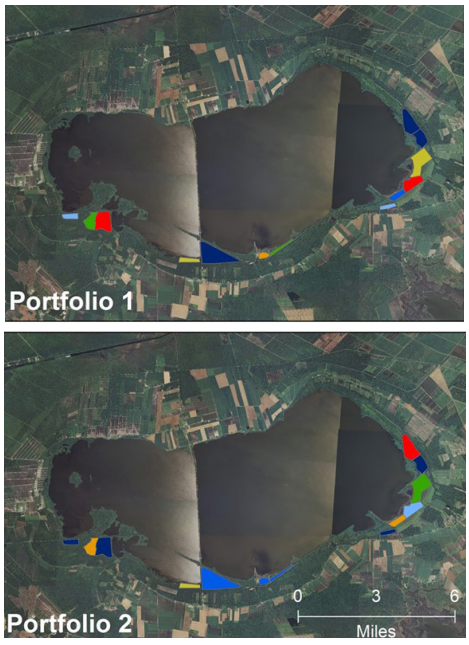

Figure 1. Examples of decision support model outputs (two shown, but many others possible): Displayed as color-coded management action portfolios for 14 freshwater impoundments on Mattamuskeet NWR. Each colored area represents a specific combination of hydroperiod and / or vegetation manipulation.

METHODOLOGY

For each impoundment, specific combinations of vegetation and hydroperiod manipulations were defined as potential management actions, with a total of 16 combined management actions possible. With 14 impoundments and 16 management actions, the number of possible management portfolios was very large. Therefore, we used a genetic

algorithm to evaluate possible management action portfolios and identify the preferred option (i.e., the combination of management actions that maximized objectives). Expert elicitation procedures were used to build predictive models of expected waterfowl and shorebird use-days, the criteria used to evaluate the benefits of each management action portfolio. Weights were assigned to waterfowl and shorebird use-day objectives to capture their differential importance in the refuge decision-making process. Nonbreeding waterfowl were most heavily weighted to reflect the refuge's primary purpose, and fall shorebirds were given higher weights than spring shorebirds to meet demand for a general lack of suitable fall shorebird habitat in this region. Five scenarios were developed with a variety of objective weights and budget constraints to help identify the optimal portfolio. This enabled refuge staff to explore the sensitivity of their management decisions to the importance of their management objectives and budget constraints.


Northern Pintail. Mike Dunn

RESULTS/FINDINGS

The decision analysis identified a preferred portfolio that provided nearly the best possible predicted bird-use days for nonbreeding waterfowl and good outcomes for fall and spring migrating shorebirds at a reasonable expense (Table 1). At a budget less than $40,000, the preferred portfolio resulted in more than 376,000 fall shorebird-use days, more than 182,000 spring shorebird-use days, and nearly 10 million non-breeding waterfowl use-days. It also considered tradeoffs among the three management objectives and aligned with the greater weights given to bird-use days for non-breeding waterfowl and fall shorebirds. Depending on the objective weights defined and the budget specified, the preferred portfolio will differ. However, results for Mattamuskeet NWR indicated that the majority of actions remained unchanged even when the budget was substantially increased, suggesting that spending more money may not substantially affect management planning for most impoundments at this location.

Combined Hydroperiod / Vegetation Manipulation	Number of Impoundments Treated	Number of Hectares Treated
Early summer drawdown to below ditch top / Disk	11	818.4
Late summer drawdonw to below ditch top / Disk	2	42.7
Early summer drawdown to ditch top / No Action	1	183.3
Fall Shorebird use-days	376,323	
Spring Shorebird use-days	182,925	
Non-breeding waterfowl use-days	9,890,124	
Budget	$39,830	

Table 1. Attributes of the optimal management actions portfolio identified for Mattamuskeet NWR, given a budget of $40,000 and objective weights for fall shorebirds (0.3), spring shorebirds (0.2), and non-breeding waterfowl (0.5).

FOR MORE INFORMATION

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