Collaborative Research on Secretive Marsh Birds in the Midwest Region: Linking Monitoring and Wetland Management

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INTRODUCTION AND CONTEXT

Wetland management for wildlife occurs across the Midwest region. Although not typically targeted to secretive marsh birds (rails, bitterns, and grebes), these efforts can create or modify wetlands in ways likely to impact this bird group. Three primary marsh management activities in the Midwest include impoundment management for waterfowl (i.e., dabbling ducks), wetland restoration under programs such as the Wetlands Reserve Program (WRP), and efforts to control aggressive invasive plants often found in large monoculture stands (e.g., *Phragmites*). Management actions yield wetlands that can differ greatly in area, spatial distribution, and fine-scale structure. For example, moist-soil management of impoundments usually results in

emergent wetlands with high production of seed-producing annual plants; WRP restoration often creates unmanaged marshes in agriculturally dominated landscapes; and control of invasive wetland plants can increase the structural heterogeneity of emergent marshes by restoring native plant communities. Wildlife managers concerned with marsh bird conservation have expressed the following information needs: 1) what effects do marsh management actions have on secretive marsh birds, and 2) could these actions be modified to yield greater benefits for marsh birds?

A Midwest Marsh Bird Working Group, formed in 2012, established an explicit goal and objectives for regional marsh bird conservation (Soulliere et al. 2012). These scientists suggested use of the recently established secretive marsh bird survey (Conway 2011) as a means to address research questions while providing a regional measure of population status and trends. Thus, a regional framework for collaborative marsh bird research compatible with this larger-scale monitoring effort was needed to maximize survey value for conservation planning. In February 2013 a research subcommittee of the Marsh Bird Working Group was formed and tasked with developing research objectives regarding the effects of wetland management on marsh birds. Explicit research objectives were necessary to generate testable hypotheses and to determine if and how breeding-season marsh bird surveys required adjustment to yield more beneficial information.

Implementation of marsh management actions varies across the Midwest, which is relevant to our goal of cross-regional coordination. Control of invasive wetland plants, for instance, is a primary concern in the northern part of the Midwest region, whereas moist-soil management for waterfowl food production is more common in the southern part of the region. There are several national programs encouraging wetland restoration (e.g., WRP, Conservation Reserve Enhancement Program - CREP, Partners for Fish and Wildlife), but they operate at local scales in terms of planning and implementation. Goals for managed impoundments vary regionally as well, with northern units generally focused on hemi-marsh management for breeding wetland birds and southern units on moist-soil management for migrant waterfowl.

Wetlands are dynamic ecosystems, and restoration / management actions often result in short-term or cyclical changes to vegetation, making evaluation of these activities as part of a longer-term monitoring program attractive. Following restoration of a wetland, early successional plant communities often result in high bird use, giving way to lower use following encroachment by woody plants or

dense stands of emergent herbaceous vegetation and reduction of open water. Water levels in managed wetlands can be manipulated to reset successional stages among wetland plant communities, achieving amounts and configurations of emergent vegetation to meet the needs of target wildlife species. However, water-level management schemes vary, ranging from annual drawdowns to establish mudflat and annual-plant cover to stabilized water levels with infrequent dewatering resulting in floating vegetation mats dominated by invasive species.

Control of aggressive or exotic vegetation through herbicide and other management actions can also set plant communities back from persistent, later-successional states to earlier-successional stages. However, these communities often revert back to invasive species monocultures if they are not part of a long-term control program. Impacts of these various management components on marsh bird populations remain unclear, but the geographic breadth of our working group provides an opportunity to distinguish bird-habitat relationships during different life history stages (breeding vs. migration) and across multiple spatial scales.

Research questions

We propose three broad research questions related to wetland management and marsh bird occurrence and abundance (by species) that may be determined through a well-coordinated monitoring effort:

1. Does management of impoundments for waterfowl influence marsh bird use relative to un-impounded wetlands, and what conditions maximize use by both bird groups?
2. How does marsh bird use of restored wetlands compare to naturally-occurring wetlands, and what aspects of restored wetlands maximize use by marsh birds?
3. Does control of invasive wetland plants increase marsh bird use relative to uncontrolled sites, and what techniques or resulting conditions maximize wetland use by marsh birds?

STUDY DESIGN AND CONSIDERATIONS

There are at least three key requirements that a collaborative marsh bird research and monitoring framework must meet. First, population and habitat data need to be collected in a manner compatible with current broad-scale, status and trends monitoring. Second, methods must be standardized enough to allow for synthesis across research projects. And third, methods must be flexible enough to accommodate different questions and wetland systems important to conservation partners.

We think these needs can be met by:
- A powerful sampling design allowing for hierarchal stratification of primary and secondary sampling units (e.g., Johnson et al. 2009).

- Continuing to standardize collection of marsh bird detections (e.g., Conway 2011; survey protocol, detection-probability estimation, etc.).
- Adopting standardized approaches for collecting habitat data.
  - o The U.S. Environmental Protection Agency's (EPA's) tiered system for wetland assessment (Level 1—Landscape, Level 2—Rapid site assessment, Level 3—Intensive site assessment) is adaptable to projects with different priorities in terms of how "fine-grained" they are to assess habitat and use of different resources for data collection (U.S. EPA 2011).
  - o EPA's National Wetland Condition Assessment (NWCA) protocol incorporates these tiers and is a robust method for collecting plant-community and other habitat data. Adopting the NWCA approach would facilitate use of EPA data for modeling efforts—they sampled 1,179 wetland points nationwide in 2011 and are scheduled to repeat that sampling with an ongoing effort.
  - o While rigorously collected bird habitat data are valuable, the reliance of many monitoring programs on volunteers must be factored into sampling decisions.
- Incorporating "natural treatments" into ongoing use of a spatially stratified sampling framework via Primary and Secondary Sampling Units (PSUs and SSUs).
  - o SSUs of unlike status (e.g., restored vs. natural) can be compared within the same PSU or across PSUs at larger spatial scales.
  - o For questions at a larger spatial scale, it *might* be possible to pair PSUs (e.g., one dominated by intensive moist soil management vs. one dominated by unmanaged emergent marshes).
  - o More complex questions could be addressed by incorporating additional strata into this hierarchical design (e.g., SSUs comprising natural marshes with and without invasive plants and with young and old restorations nested within the same PSU).

Additional considerations

The research subcommittee identified four additional concerns important to developing an effective research and monitoring scheme, including landscape position, sample size, coordination, and funding. First, the spatial arrangement of sampling points must be informed by knowledge of the potential for bird use based on landscape attributes. Otherwise, effects attributed to site-scale phenomena could be confounded by landscape-level factors. Regarding appropriate sample sizes, power analyses of existing occupancy data may be used to determine levels of replication needed to answer specific questions. Third, partner coordination is needed to ensure independent projects are successful and complementary at regional and or sub-regional scales. Establishment of a data sharing program will allow development of research questions at longer temporal or larger spatial scales. Finally, sources available to fund research

must be explored, and appropriate time frames must be developed for presenting outcomes to financial and management partners.

In the short-term, collaborative research and monitoring will help identify where marsh bird species occur during the breeding period and how conservation actions (e.g. restoration, wetland management, invasive species control) are associated with marsh bird use of these wetlands. However, local occurrence and abundance does not necessarily reflect habitat quality defined in terms of reproduction and survival (Van Horne 1983). Ultimately, we hope proposed coordinated efforts lead to identifying local and landscape conditions favorable for higher survival and reproduction, providing information crucial to refine habitat restoration and management actions that maximize our influence on marsh bird populations.

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Appendix: Sample research project

Expectations for how marsh bird occupancy will respond to wetland management likely differ across the region and among investigators. The following is an example of how specific research hypotheses could be addressed within the framework described above (from W. Glisson, R. Brady, A. Paulios, and D. Larkin).

Researchers in southeastern Wisconsin conducted initial sampling of secretive marsh bird use of restored wetlands (WRP sites). Based on preliminary data analysis and a literature review, the following hypotheses were developed:
- Occupancy by secretive marsh birds will be lower in restored wetlands than in natural wetlands.
- Occupancy in restored wetlands will differ by site age, with younger restorations having higher occupancy and older restorations—which are typically not actively managed—having lower occupancy due to increasingly monotypic, invasive-dominated vegetation.
- In older restorations, management actions that reduce invasive-plant dominance will be associated with higher marsh bird occupancy.

To address the hypotheses within a regional collaboration, researchers recommended:
- Develop a sampling design aimed at comparing occupancy across natural and restored wetlands and between "young" and "old" restorations. This could take the form of identifying multiple PSUs across the region for use as replicates, each PSU containing SSUs located in natural marshes, young restored marshes, and older restored marshes.
- Collect occupancy data over multiple seasons at each sampling point. Preliminary data suggested annual variation in marsh bird occupancy is high, indicating that long-term research of four or more years may be required.
- Collect detailed landscape and habitat data using EPA assessment protocols.
- Synthesize and analyze data to assess the extent to which wetland restoration and management efforts are providing habitat that attracts and supports secretive marsh birds.
- Engage wetland managers early in the process. It is important for us to have a clear understanding of their management goals and information needs so that we can develop realistic recommendations.