A Background and Discussion Paper on a National Marshbird Monitoring Strategy for Canada

Submitted to:
The Inland Waterbird Chapter of NABCI Canada's Waterbird Technical Committee

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PREAMBLE

The North American Bird Conservation Initiative's (NABCI) vision is to protect, restore and enhance North America's bird populations and habitats. One of NABCI's main functions is to optimize effectiveness and efficiency of existing and new conservation programs. It does this in part by enhancing coordination among stakeholders and by promoting conservation programs that engage regional partners in pursuing ecologically based landscape conservation.

NABCI aims to achieve its vision without reducing autonomy of participating individuals, organizations, agencies and programs currently engaged in bird conservation. In Canada, there are four major bird initiatives: North American Waterfowl Management Plan, Partners in Flight – Canada, Canadian Shorebird Conservation Plan and the North American Waterbird Conservation Plan (NAWCP). For each of these bird initiatives, extensive planning is required to set goals and objectives for conserving and enhancing species' populations and their habitats. The NAWCP is probably the least developed initiative of these four, because it was the latest to get underway and because of the broad spectrum and diversity of species involved and unavailability of information about population and habitat status of several waterbird species. Within the waterbird group, marshbird species are perhaps the least understood and least documented in terms of their population status and critical habitat requirements. This is due largely to the highly cryptic and secretive nature of certain genera, especially the rallids and bitterns. While there are several efforts continentally to gather information about population status and trends of marshbirds through various monitoring and intensive study initiatives, most of these have been local in scale and most have occurred in the United States. Additionally, sampling design and survey protocol of these efforts have been quite variable, resulting in reduced comparability of data across regions.

To begin addressing these issues, a Marshbird Monitoring Workshop was held in Laurel, MD in 1998, to address strategies for monitoring populations of marshbird species, namely rails, bitterns, moorhens, gallinules, snipe and coots). It was agreed that inconspicuous marshbirds are difficult to detect and inhabit areas that are often not readily accessible. For this reason, it was also agreed that such species are poorly surveyed by existing extensive bird survey initiatives such as the Breeding Bird Survey. Participants reviewed current monitoring and research efforts related to population assessments of marshbirds, initiated work to standardize protocols for marshbird monitoring, and identified information gaps and needs necessary for developing protocols and sampling schemes for monitoring at local, regional and national scales.

Some information needs identified by the participants were to understand potential biases associated with call-playback techniques and how to design a statistically sound spatial sampling regime for monitoring marshbirds. Other recognized needs were to evaluate existing wetland databases, how to accommodate temporal change in habitat, which habitat parameters to monitor, timing and duration of surveys, how indices are linked to real population size, and spatial differences in breeding phenology. Quality control of

data and nature of monitoring participants (i.e., salaried vs. volunteer) were less important issues considered.

A Steering Committee, comprised of Canadian and U.S. agency and organization representatives, was constituted to guide development of a Marshbird Monitoring Program for North America. Since 1998, the Steering Committee *per se* has been inactive, but the United States Geological Survey's Biological Resources Division has and continues to fund work (primarily in the U.S.) to inventory and evaluate existing protocol, which has already led to a recent proposal for a standardized North American MarshBird Monitoring Protocol.

Herein, we provide a brief review of past and current marshbird monitoring initiatives and describe a standardized protocol recently recommended by a team of U.S. researchers for monitoring populations of marshbirds in North America. Lastly, we provide a list of key questions for the Chapter to address in its deliberation of how Canada can effectively develop and deliver a national marshbird monitoring strategy.

INTRODUCTION

Two of the primary objectives of the North American Bird Conservation Initiative (NABCI) are to set population goals for migratory bird species as a means for guiding habitat-based conservation initiatives, and to prioritize management and recovery actions. In doing so for any given species, this implies that there exists a certain level of knowledge and confidence about current population status and trends. Often when data are lacking for a given species, such approximations are derived from projections of local or regional based densities and trends among habitat types most utilized by that species (e.g., boreal forest studies for boreal breeding species). While such exercises are useful, data derived from extensive population monitoring initiatives (e.g., aerial waterfowl surveys, Breeding Bird Survey (BBS)) have been deemed most useful for providing such estimates.

Unfortunately, few extensive monitoring initiatives exist for marshbirds and, therefore, few approach the scale required for generating species-specific population estimates and/or trends at either continent-wide or regional (e.g., Bird Conservation Regions – BCRs; Waterbird Conservation Planning Regions – WCPRs) scales. Sample sizes for estimated BBS population trends of many marshbird species are extremely low because the BBS does not adequately sample emergent wetlands (Bystrak 1981, Robbins et al. 1986, Gibbs and Melvin 1993). Other information derived from local and regional based marshbird monitoring initiatives (e.g., state and provincial monitoring programs, Great Lakes region Marsh Monitoring Program) suggests that continental and/or regional populations of certain species (e.g., Black Tern – eastern North America; Pied-billed

Grebe – continent-wide; American and Least Bittern – continent wide) have been declining (Tate 1986, Eddleman et al. 1988, Conway et al. 1994). Despite perceived population declines, effective monitoring programs that adequately estimate population size or national trends of marshbirds are lacking. Consequently, in Canada there is a growing recognized need for developing an improved and standardized national marshbird monitoring scheme to document population trends across Canada.

In 1998, this lack of appropriate monitoring programs resulted in a binational meeting of leading experts in the field of marshbird monitoring who began to complete the following: 1) a review of current marshbird monitoring and research efforts related to population assessment, focusing on rallids, bitterns, and non-colonial marsh nesting grebes (i.e., Pied-billed, Horned, Red-necked and Least Grebes); 2) development of standardized protocols for monitoring these species; 3) development of sampling schemes for monitoring marshbirds at national, regional and local scales, and; 4) enhanced communications among biologists and managers interested in marshbird monitoring issues. To achieve these ends, participants worked in discussion groups and generated questions to address three fundamental issues (field protocols, statistical design and sampling regimes, and implementation) that would result in an improved, robust, and standardized scheme for monitoring marshbirds at national, regional and local spatial scales. Detailed proceedings of this workshop are summarized in Ribic et al. (1999).

Although representatives from Environment Canada's Canadian Wildlife Service (CWS) and from Bird Studies Canada (BSC) participated in this workshop, most of the

participants were from various U.S. state and federal agencies. Consequently, most of the work following this workshop, addressing the three fundamental issues, has been done in the U.S., primarily through funding from the United States Geological Survey's Biological Resources Division (USGS – BRD). Past, current and proposed projects supported by USGS – BRD related to addressing some of these questions are listed on the U.S. Department of Agriculture's Current Research Information System (CRIS) internet web site. One project that has begun to directly address questions generated at the marshbird monitoring workshop is a five-year study aimed to develop and field test survey methods for a continental breeding marshbird monitoring program. A report that summarizes work to develop a recommended survey protocol for monitoring marshbirds at an extensive scale was completed in 2001 (Conway and Gibbs 2001). A document recommending standardized North American marshbird monitoring protocols to be used by wildlife refuge personnel in the U.S. was later released in December 2002 (Conway 2002), which aimed to engage refuge personnel to collect pilot data for evaluating recommended marshbird monitoring protocol. Field work to test this proposed monitoring protocol began in 2002, will continue through 2005, and a final report for this study will be completed and distributed to planners and cooperators in 2005.

In Canada, the most extensive effort to monitor breeding marshbirds occurs in the Great Lakes basin. This effort is achieved through Bird Studies Canada's Marsh Monitoring Program (MMP), which is delivered in partnership with Environment Canada's Canadian Wildlife Service – Ontario Region, and the United States Environmental Protection Agency's Great Lakes National Program Office. MMP representatives from both BSC

and CWS participated in the 1998 MarshBird Monitoring Workshop and BSC maintains correspondence with U.S. representatives who are conducting the previously described protocol evaluations.

In August 2001, a planning meeting for the North American Waterbird Conservation Plan's (NAWCP) marshbird sub-component was held in Denver, Colorado, to establish objectives, attempt to set population and habitat goals, and to establish continental marshbird monitoring priorities. The driving force behind the marshbird monitoring discussions was Conway's current protocol evaluation supported through USGS – BRD. Recommendations put forth in Conway and Gibbs (2001) are being incorporated into the marshbird sub-component of NAWCP.

Certain elements of Conway and Gibbs' (2001) recommended breeding marshbird monitoring protocol are being considered for incorporation into the Great Lakes Marsh Monitoring Program to improve ability to estimate detection probability and vocalization probability of marshbirds monitored almost entirely through aural detection. In 2003, standard MMP survey protocol will be evaluated against a revised protocol scheme that will allow estimations of detection probabilities for focal species of marshbirds. Rather, the MMP point-count protocol will be evaluated against more intensive area-search methods. These evaluations will be conducted by BSC at coastal wetland marshes situated on the north shore of Lake Ontario and along St. Lawrence River in eastern Ontario and Quebec, in cooperation with CWS – Quebec Region and CWS – Ontario Region.

In Canada, the Inland Waterbird Chapter of the Waterbird Technical Committee has completed Canada's Waterbird Conservation Plan (Milko et al. 2003). Although attempts were made to identify general population status and trends for many marshbird species, the Chapter has recognized that there is insufficient data for many of these species, especially at a national scale. During discussions of the Chapter's recent planning meetings held in 2001 and 2002, members agreed that a national monitoring strategy for Canada is desired and would improve knowledge about marshbird population status and trends in Canada. Second, the Chapter recognized that any effort to develop such a program in Canada should be tied closely to analogous efforts underway in the United States, and should consider incorporating protocols recommended by U.S. researchers who are engaged in protocol evaluation studies. Third, the Chapter agreed that further discussions are required before moving forward to develop such a program, and that key issues should be identified and questions generated and addressed as to how such an initiative could unfold for Canada. The present document was prepared, as directed by the Inland Waterbird Technical Chapter, to begin progress on the latter by providing a review of marshbird monitoring information available to date, to identify key issues that require consideration by the Chapter, and to generate questions that should be answered before and/or during any effort to advance a national marshbird monitoring scheme for Canada.

PAST AND PRESENT MARSHBIRD MONITORING REGIMES

In North America, there have been many efforts to survey and monitor secretive marshbirds. Most of these have been relatively local in scale, have been quite temporally

limited in nature, and have been done to address specific life-history research questions (Walkinshaw 1937, Walkinshaw 1940, Weller 1961, Horak 1970, Tomlinson and Todd 1973, Griese et al. 1980, Kaufmann 1983, Zimmerman 1984, Zembal and Massey 1987, Kaufmann 1989, Bogner and Baldassare 2003a). Others have been designed to evaluate survey protocol and sampling regimes appropriate for gaining long-term population trend information for various marshbird species (Glahn 1974, Bart et al. 1984, Johnson and Dinsmore 1986, Manci and Rusch 1988, Swift et al. 1988, Conway et al. 1993, Gibbs et al. 1993, Legare et al. 1999, Bogner and Baldassare 2003b).

More recently however, recognizing that there are incongruencies in survey and sampling regimes used to survey marshbirds, wetland bird specialists in Canada and the United States have begun to coordinate their efforts to improve and standardize these techniques and even to develop a North American continental marshbird monitoring strategy (Ribic et al. 1999). In fact, new survey protocols for monitoring marshbirds in North America have already been proposed (Conway and Gibbs 2001), and are being evaluated in the field during the next three years to evaluate their effectiveness in providing improved count estimates for various marshbirds. Other aspects of marshbird monitoring protocol have been evaluated recently in field studies such as sampling efficiency of morning versus evening surveys (Krzys et al. 2002), power to detect trends in abundance using call-response surveys (Gibbs and Melvin 1997), and effectiveness of call-response surveys for detecting Least Bitterns. Thus, marshbird specialists are beginning to provide much needed answers to important questions posed by those working to develop and coordinate efforts to monitor marshbirds across North America.

STANDARDS THAT HAVE BEEN PROPOSED FOR MONITORING MARSHBIRDS IN NORTH AMERICA

Eddleman et al. (1988) recognized the need to estimate efficiency of marshbird censuses in detecting true presence and abundance of individuals in sampled marshes. If our goal in monitoring marshbirds is to reliably estimate population trends, a survey design that maximizes statistical power to detect temporal changes and that minimizes temporal variance in probability of detecting individuals is better than one that maximizes total count.

Most marshbird surveys use primarily aural detection because many marshbirds remain hidden in emergent vegetation, making them difficult to observe visually during surveys. Thus, marshbird surveys commonly employ use of recorded broadcasts of focal species to elicit call responses of individuals (Glahn 1974, Johnson and Dinsmore 1986, Manci and Rusch 1988, Swift et al. 1988, Gibbs and Melvin 1993). However, Conway and Gibbs (2001) suggested potential drawbacks of this survey method (e.g., calls of one species could potentially suppress vocalization of others, or birds may habituate to broadcast calls after repeated exposure (Smith 1974)), and described key assumptions made by surveys employing use of call playback recordings. These authors solicited data collected through numerous marshbird surveys across North America and evaluated the extent to which call broadcast surveys increased detection probability and influenced temporal and spatial variation in detection probability compared to passive surveys.

Detection probability, p, is the probability that an individual occurring within an area of interest is detected by the observer during the survey period. For aural surveys, p is the product of the probability that an individual bird within the sample area vocalizes during the survey period (p_v), and the probability that the observer hears and records that bird vocalize during the survey period (p_o). p_v is likely more variable than p_o because marshbirds vocalize sporadically, yet calls are relatively loud and distinct when they do vocalize (Conway and Gibbs 2001). These authors compared pooled data from passive survey periods with call broadcast periods for 15 different marshbird surveys and found that call broadcasting increased the mean number of birds detected per survey point for most rails, Least Bittern, Common Moorhen and Marsh Wren. However, they also found that temporal and spatial variation in the number of birds detected during broadcast survey periods was higher than during passive survey periods.

Consequently, Conway (2002) has drafted an improved protocol to aid those who monitor marshbirds across North America. His recommendations include a protocol that will allow estimation of detection probability, and that will attempt to reduce variation resulting from among-species seasonal differences in peak detection probability, and from spatial and other temporal-related variation in detection probability. The following outlines Conway's (2002) recommended protocol for monitoring marshbirds in North America, modified by us.

Location of Surveys

Permanent survey points should be placed in marshes in an area-based fashion so as to encompass all possible regimes of marsh habitat composition as it changes in the wetland basin through time. This would eliminate the need to relocate, add or remove survey stations and would eliminate bias associated with selecting survey stations that sample the most suitable habitat (highest bird density) in the first year -- a bias that can lead to artificial apparent decline in focal species. A minimum of 400 m should occur between survey stations to reduce chances of double-counting (200 m can be used in small habitats but increases likelihood of double-counting). Stations should be placed at either the interface of upland and wetland edge and/or the interface of open water and emergent cover edge. Each survey station should be identified uniquely and its location plotted using a GPS unit or at least using a high quality topographic map.

Timing of Surveys

Each of three annual surveys be done during a ten-day period and occur at least seven days apart (e.g., 20-30 May, 8-17 June, 25 June – 4 July). According to Conway (2002), surveys should be done during the morning beginning one half hour before sunrise. Seasonal timing of the three surveys should be appropriate for the breeding phenology of that region. Morning versus evening surveys and the number of required surveys (one, two, or three) are potentially contentious issues if the program has a large volunteer participant base.

Survey Methods

Recommended survey methods include a passive listening period followed by a call broadcast period wherein the observer records all species detected (focal and non-focal) during both the passive and broadcast period. For example, the survey would be structured as follows:

- 5 minutes of listening
- for each of *n* primary species, 30 seconds of broadcast calling periods consisting of alternating 5 seconds of calls and 5 seconds of silence

All species calls included in call broadcasting should be local breeders and the order of calls should start with the least intrusive species first (yet to be determined for each region). Calls for each species should be the primary advertising call. Further details of the recommended methodology are described in Conway and Gibbs (2001) and include provisions for allowing detailed estimation of vocalization probability for each species included on the call broadcast recording.

Habitat Measurements

In any given wetlands, patterns of distribution and population trends of marshbirds can often be explained by local changes in wetland habitat. Natural water level fluctuations and habitat alterations (e.g., dredging, burning, diking) can result in major changes in marsh vegetation. Thus, it is important that surveyors attempt to quantify proportions of major habitat types associated with survey stations. Ideally, this will be qualified on an annual basis, as recommended in BSC's protocol. Observers should visually estimate proportion of each major habitat type within a 100 m radius semi-circle around each

survey point; current aerial photographs should be used to refine such estimations where possible. To control for variation in annual growth of emergent plants, observers should quantify habitat at their stations during the month of June each year.

Personnel and Training

Observers should be provided with sufficient survey training information and should be examined for their ability to identify vocalizations of marshbird species. Additionally, observers should be evaluated for their distance-sampling abilities and ability to identify all major marsh plant taxa and marsh habitat types in their region.

Data Collection, Analysis, Summary and Reporting

Field data should be manually entered onto standard field data forms and all data forms should be reviewed by the surveyor for mistakes and completeness. Data should be submitted to a central data repository and entered into an electronic relational database as soon as possible after collection. In addition to hard copies, two copies of electronic data should be stored in separate locations. Annual summary reports should be completed each year, and after each season survey data should be tabulated and summaries should include mean number of individuals detected per survey station during both passive and call broadcast periods for each species. After several years, survey data can be used to estimate annual population indices and population trends of marshbirds using route-regression analyses.

Estimates of changes in marshbird populations should be analyzed regionally by BCR and, nationally, and internationally. Comparisons among regions can be made once a standardized survey protocol has been adopted and regions have adequate temporal data to estimate trends. For more detailed information describing the protocol that has been proposed by researchers working in the United States, refer to Conway and Gibbs (2001) and visit the following internet web site:

www.cris.csrees.usda.gov/cgi-bin/starfinder/brdassist.txt

A MARSHBIRD MONITORING PROGRAM FOR CANADA

Conway's (2002) recommended protocol for monitoring marshbirds in North America is valuable in that it was based on comparison of results from several different monitoring initiatives. However, clearly there are components of these recommendations that raise questions as to their applicability and appropriateness for monitoring marshbirds in Canada, especially if surveyors constitute a range of participant types (e.g., volunteers vs. resource personnel). For example, morning surveys may not be practical or desirable for gaining good spatial and temporal coverage of marshbird data if surveyors are volunteers. Volunteer participants are more likely to conduct a marshbird monitoring survey during evening hours, as this period least often conflicts with most work schedules. In addition to the above, results of several studies have shown that evening surveys are as good, or better at recording occurrence and abundance of obligate marshbirds than morning surveys (McCracken 1994, Krzys 2002, Priestly 2003).

There are several components of Conway's recommended protocol that may benefit by modifying or replacing with protocols from other proven marshbird surveys, such as the Great Lakes Marsh Monitoring Program. A thoughtful approach by the Inland Waterbird Chapter to develop standards for marshbird monitoring in Canada will help develop the most rigorous national monitoring program possible for marshbirds in Canada.

QUESTIONS AND TOPICS FOR DISCUSSION

The above review provides information about past and current activities related to developing robust, standardized and useful approaches for gaining knowledge about population status and change in marshbirds that are very difficult to monitor using more traditional and conventional population survey techniques. In working to develop an effective marshbird monitoring strategy for Canada, several key questions and topics for discussion may arise. The following questions/topics are meant to aid the Inland Waterbird Chapter's discussions toward developing a national marshbird monitoring strategy for Canada, but by no means are intended to comprise a complete list of all possible issues and questions:

1. *What are the primary objectives, goals and priorities associated with our desire to establish a national marshbird monitoring strategy for Canada?*
2. *Are our intentions only to define and monitor populations, i.e., population-based trends, or do they also include cause and effect assessment and recovery/restoration?*

3. *How can government and non-government constituencies work to develop a national marshbird monitoring strategy for Canada? Should it be separate for Canada?*
4. *Should such a monitoring scheme include only trained professional participants, only trained volunteers, or both?*
5. *How can such an initiative be adequately funded such that monitoring effort is adequate and representative across regions?*
6. *Which regions of Canada should be included in such a strategy: all of Canada, only temperate and prairie regions…? Should there be special efforts for remote areas such as the boreal or arctic?*
7. *Should Canada follow as closely as possible the draft monitoring protocol that has been recommended recently by U.S. researchers, and how can Canada and the U.S. work together and at the same pace to develop necessary protocol?*
8. *Who will house, manage, analyze, summarize and report on such data? Will this be partitioned into regions, should there be a central repository for all of Canada's data, or both?*
9. *Should stakeholders be simultaneously working to establish a standard system for inventorying all available marsh habitats in Canada in order to ensure a representative sample design? What will be the sampling scheme, and how can a rigorous sampling scheme be designed and maintained and be maintained with adequate sampling effort?*
10. *How can Canada access necessary funding through NAWCP to support development, delivery and maintenance of such a long-term initiative?*

11. *How do we ensure that such a strategy can endure in order to maintain a long-term marshbird monitoring scheme for Canada?*
12. *Should we incorporate a pilot period to evaluate various survey protocols and sampling regimes before deciding to adopt certain methods and initiate a long-term monitoring program? Should we participate in pilot studies currently underway in the U.S. by testing the same recommended methodologies, or should we experiment with others? What are the regional differences in selection of focal species that are targeted for call broadcast?*
13. *How do we arrive at the most objective, yet realistic means for spatially sampling marsh habitat? Can we randomize? Can we reduce site selection bias associated with selecting the "best" habitat at any point in time (i.e., can we employ an area-based sampling scheme)?*
14. *How do we reduce temporal and spatial variance associated with variability in species breeding range, habitat preferences, and breeding phenology? Should we be considering incorporation of double-sampling techniques to produce observer correction coefficients?*
15. *Do we restrict the program solely to freshwater marshes, or do we include saltwater marshes?*

There are potentially several other questions that could be raised to assist Canada's efforts to move toward developing a marshbird monitoring strategy. We encourage anyone to provide additional questions to add to this tentative list, and to provide insight into answering these and any other questions that arise.

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