

IMPLEMENTING THE STANDARDIZED NORTH AMERICAN MARSH BIRD MONITORING PROGRAM IN SOUTHERN ONTARIO

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Introduction and Background

Bird Studies Canada (BSC) has delivered the Great Lakes Marsh Monitoring Program (GLMMP) annually since 1995. The GLMMP tracks populations of wetland bird species as indicators of wetland health following the Standardized North American Marsh Bird Monitoring Program field protocol throughout the southern portion of the Great Lakes basin (Conway 2011). The GLMMP has enormous potential to inform the conservation and management of marsh birds, from evaluating the population status of targeted species, to prioritizing sites for future securement. For instance, the GLMMP produces the most reliable population trends for marsh birds in the Great Lakes region (Tozer 2013, Tozer 2016). GLMMP marsh bird data are also used to assess the health of Great Lakes coastal wetlands for the triennial State of the Great Lakes reports, which are required under the Canada-US Great Lakes Water Quality Agreement (Tozer et al. 2017). The program is a rare example of a highly successful sustainable Citizen Science program that has been very effective at achieving its wetland bird monitoring goals.

During most of the GLMMP's history, survey locations were selected by volunteers. This approach has been enormously successful, yielding marsh bird information from ~800 points annually with extremely low cost because volunteers are able to select survey sites near their homes. However, the non-random selection (hereafter "existing sampling framework") potentially limits inferences made using the GLMMP dataset, and thus may limit the GLMMP's ability to contribute to conservation and management of wetland species. The non-random selection also precludes the GLMMP from contributing data to the Standardized North American Marsh Bird Monitoring Program, which has strict sampling guidelines for selecting randomized spatially-balanced survey points (Johnson et al. 2009).

To increase the value of the GLMMP for conservation and management, BSC has integrated the experimental design recommendations of the Standardized North American Marsh Bird Monitoring Program into the GLMMP's overall design. BSC has developed and selected 60 new survey routes throughout the Ontario portion of Bird Conservation Region 13 (BCR 13) following the experimental design recommendations of Johnson et al. (2009) (hereafter "new sampling framework"). We have focused on southern Ontario for this initiative, in part, because the Standardized North American Marsh Bird Monitoring Program is already being implemented in most of the rest of the Great Lakes basin by other organizations.

The GLMMP will, however, continue to sample marsh birds as it always has since 1995 throughout much of the entire Great Lakes basin. This will maintain the power and flexibility of selecting sample points outside of the new sampling framework for evaluating priorities of interest at scales that may not be covered adequately by the new sampling framework. For instance, for evaluating the status of specific Great Lakes Areas of Concern (e.g., Macecek and Grabas 2011), or for evaluating other targeted areas or regions (e.g., Cartwright et al. 2013). It will also maintain the program's outstanding ability to engage the public, particularly large

segments of non-hunters, in hands-on wetland conservation, a valuable contribution to the new 2012 North American Waterfowl Management Plan (NAWMP) human dimensions goal.

During the development of the new sampling scheme in southern Ontario, we engaged members of the Ontario Eastern Habitat Joint Venture (OEHJV) and other GLMMP partners to identify marsh bird conservation and management questions of interest to be built into the new experimental design. As a result, the new sampling framework is stratified based on inland and Great Lakes coastal wetlands, and wetlands within and outside Great Lakes Areas of Concern. The framework also includes wetlands managed under NAWMP and unmanaged wetlands. These strata will yield data to answer questions of management interest within southern Ontario, while also contributing to the continent-wide monitoring program for marsh birds.

At the outset of the project, many of the sample points within the new sampling framework in southern Ontario had been ground-truthed and landowner permission had been obtained in most locations where needed. We had also completed one season of field surveys at the new sample points in the spring and early summer of 2016. The objectives of the project were to complete remaining tasks associated with implementing the Standardized North American Marsh Bird Monitoring Program in southern Ontario. These tasks were:

- 1) seek landowner permission to access remaining sample points that have not yet been ground-truthed;
- 2) trouble-shoot and finalize permanent scannable bird and habitat field forms;
- 3) complete permanent maps of each survey route to be used during future annual sampling; and
- 4) trouble-shoot and finalize data pathway from scannable field forms to permanent data archive within BSC's Nature Counts database, part of the Avian Knowledge Network.

Other tasks completed during the project included data preparation and preliminary analyses suitable for submission to peer-reviewed journals on topics of conservation and management interest.

Methods

The study took place throughout the Ontario portion of BCR 13, and closely followed the experimental design and field protocol recommendations of the Standardized North American Marsh Bird Monitoring Program (Johnson et al. 2009, Conway 2011). The experimental design consisted of a two-stage cluster design using Generalized Random Tesselated Stratified selection of sampling units at each stage to achieve a random but spatially balanced and efficiently-accessed set of permanent sampling points. We elected to use 10 x 10 km squares based on the military grid reference system and Universal Transverse Mercator coordinate system as primary sampling units in the first stage of the two-stage design due to advantages in overlap with Ontario Breeding Bird Atlas squares, and due to the system being recommended by the North American Bird Conservation Initiative to implement all North American bird monitoring program experimental designs to facilitate broad-scale analysis across different datasets (US-North American Bird Conservation Initiative Monitoring Subcommittee 2013).

The primary sampling units were apportioned according to actual aerial extent of mapped emergent wetlands among the following strata: inland and Great Lakes coastal wetlands, and

wetlands within and outside Great Lakes International Joint Commission Areas of Concern. The primary sampling units also included squares with wetlands managed under NAWMP and squares with only unmanaged wetlands. We chose 60 primary sampling units based on a balance between available funding for completing ongoing annual field surveys at the sampling points and achieving acceptable statistical power within the Ontario portion of BCR 13 based on plots reported in Stiedl et al. (2013), i.e., 60 primary sampling units were expected to achieve sufficient power to detect at least a 3% annual change in numbers of individuals of most species of interest. We then selected 190 secondary sampling units or sample points within the above primary sampling units, again following the guidance provided in Johnson et al. (2009). See Figure 1 for an illustration.

Anticipated Future Outcomes

The project is anticipated to produce numerous products that will be of use to the marsh bird conservation community. The raw data will be available to project partners and private users upon approval by the project coordinator for various uses via an online data request system within BSC's permanent online Nature Counts database, part of the Avian Knowledge Network. The project will also lead to peer-reviewed papers on topics such as comparing and contrasting expected benefits for marsh birds of wetlands managed under NAWMP compared to unmanaged wetlands; estimating total population size of various migratory webless game bird species at relevant scales within the Ontario portion of BCR 13; and identifying key sites/areas that support the highest densities of wetland-dependent bird species, particularly elusive webless migratory game bird species, within BCR 13 ON, and whether these key sites/areas are captured within OEHJV priority habitat areas.

Management Implications

There are at least two major ways that the ongoing work from this project will benefit conservation and management of wetland birds in southern Ontario. One, OEHJV partners, such as Ducks Unlimited Canada, will have robust quantification of the expected benefits for marsh birds of wetlands managed under NAWMP compared to unmanaged wetlands. Southern Ontario is one of the most intensively used landscapes by humans on the continent, and as such, the area contains numerous priority areas identified for land acquisition and enhancement by Joint Venture partners (Ontario Eastern Habitat Joint Venture 2007). Data from the project that robustly quantifies the benefits of NAWMP wetlands for marsh bird species will provide Joint Venture partners with much needed fuel to justify the cost of enhanced management within existing acquisitions (e.g., more frequent draw downs), or the cost of acquiring new wetland properties.

Two, as with many areas on the continent, there is scant information available on total population size of nearly all species of wetland birds within southern Ontario. However, population sizes along with population trends are key characteristics used by agencies to assign legal conservation status in Ontario and Canada. An example of this is Least Bittern (*Ixobrychus exilis*), which is designated as threatened under Ontario and Canada species at risk legislation (COSEWIC 2009, Ontario Ministry of Natural Resources and Forestry 2015). The designation is based on steep population declines from breeding bird atlas and GLMMP trend data in combination with what is thought to be a small population size. The population size estimate, however, is based on expert estimates rather than on quantitative field data, so there is no way of

knowing the precision and accuracy of the estimate. It is thought by some that there may be many more individuals of this species in southern Ontario than currently thought, which could have major implications for the legal status and the management of the species. Data from the project that robustly quantifies population sizes of this and other wetland bird species of conservation concern will be immediately useful to agencies responsible for assigning legal status of wetland birds in southern Ontario and Canada, which in turn will have immediate implications for the conservation and management of these species.

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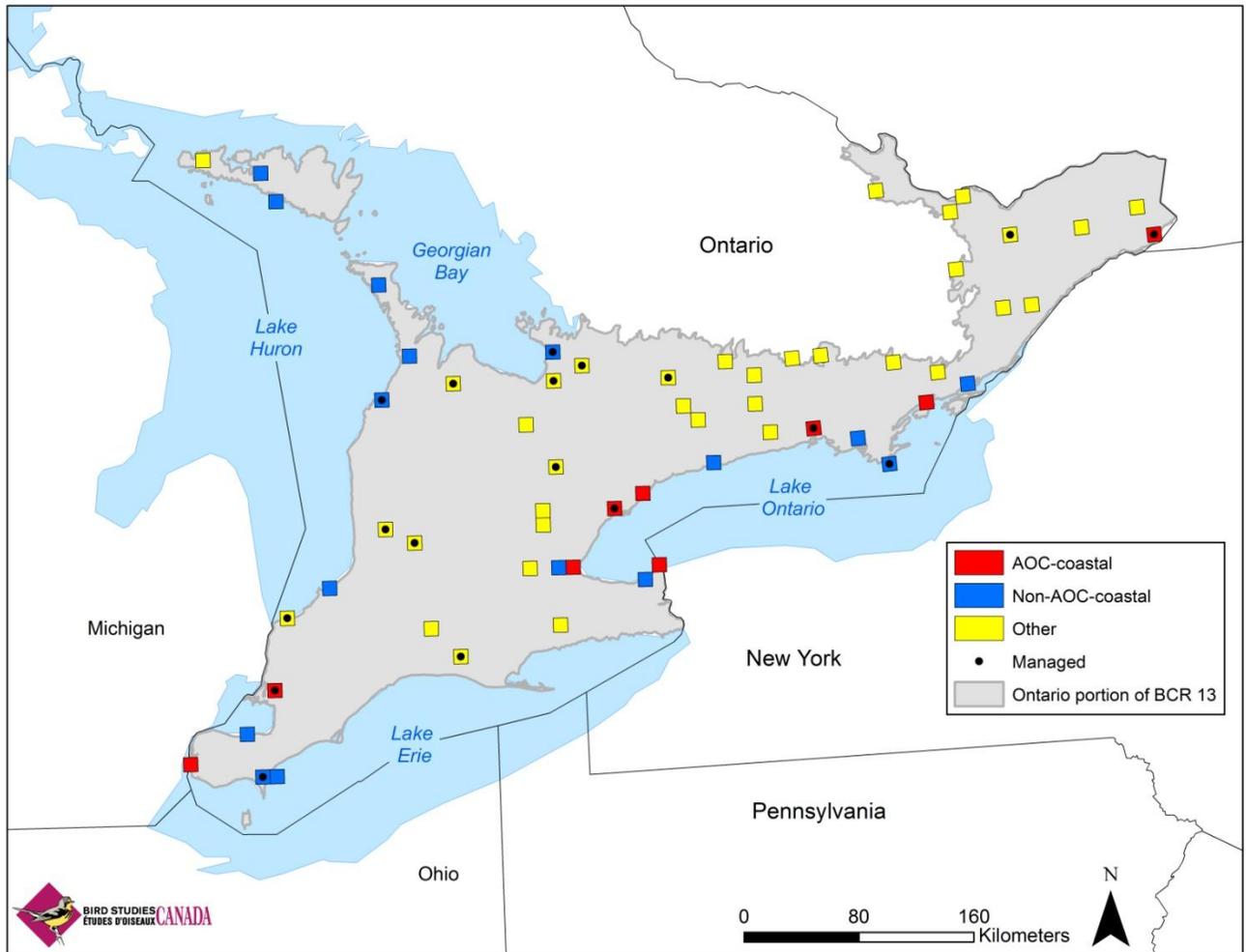


Figure 1. New GLMMP sampling framework within the Ontario portion of Bird Conservation Region 13 (BCR 13), set up following the experimental design recommendations of the Standardized North American Marsh Bird Monitoring Program, provided in detail by Johnson et al. (2009). Shown are sixty 10 x 10 km primary sampling units apportioned according to the actual aerial extent of mapped wetlands across three strata: overlapping a Great Lakes Area of Concern and containing Great Lakes coastal wetlands (AOC-coastal), not overlapping a Great Lakes Area of Concern and containing Great Lakes coastal wetlands (Non-AOC-coastal), and not meeting either of the above criteria (Other). Also shown is whether each primary sampling unit contains at least one wetland managed under the North American Waterfowl Management Plan (Managed). Not shown are 190 sampling points or secondary sampling units randomly placed within the primary sampling units.