EXPANDING THE MICHIGAN MARSH BIRD SURVEY TO FACILITATE CONSERVATION AT MULTIPLE SCALES

FINAL REPORT

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Introduction and Objectives

Many wetland-dependent bird species appear to have declined over the last several decades and the need to implement conservation actions to reverse this trend has been recognized at continental (Kushlan et al. 2002), regional (Soulliere et al. 2007), and state levels (Eagle et al. 2005). Biologists have also understood that the North American Breeding Bird Survey does not adequately survey marsh bird species (Bart et al. 2004, Rich et al. 2004), which led to the development of standardized survey techniques (Ribic et al. 1999, Conway 2011) and a sample design (Johnson et al. 2009) for a national marsh bird survey. A national secretive marsh bird monitoring program has been piloted in several states in recent years, including Michigan.

Implementation of a national secretive marsh bird monitoring program was the top priority identified for several hunted marsh bird species by the Association of Fish and Wildlife Agencies' Migratory Shore and Upland Game Bird Support Task Force (Case and McCool 2009, D.J. Case and Associates 2010). Soulliere et al. (2007) made implementation of the national secretive marsh bird monitoring program its top waterbird monitoring priority for the Upper Mississippi River and Great Lakes Region Joint Venture (hereafter Joint Venture), because the survey would provide critical information on marsh bird distribution, abundance, and trends. Data collected from Michigan's marsh bird survey will also provide opportunities for analyses to better understand habitat needs and ensure sustainability of harvest regulations. A fully functioning survey will also facilitate the use of Strategic Habitat Conservation (SHC), an iterative process of biological planning, conservation design, implementation, and evaluation (National Ecological Assessment Team 2006), to guide marsh bird conservation. Having a robust marsh bird survey is vital to the evaluation portion of SHC to inform regulatory decision-making and conservation planning, implementation, and assessment.

Several states have implemented marsh bird surveys using the national marsh bird monitoring protocol (Conway 2011) and sample design (Johnson et al. 2009), of which four are located in the Mississippi Flyway (Wisconsin, Michigan, Ohio, and Kentucky). In 2010, the Michigan Bird Conservation Initiative (MiBCI) began a pilot marsh bird survey, with the Michigan Natural Features Inventory (MNFI) coordinating the effort. The initial pilot survey in Michigan consisted of 15 primary sample units (PSUs). The MNFI proposed to use Webless Migratory Game Bird Program funding to expand the program by approximately 30 PSUs. We intended to use the increased survey effort to improve our ability to track marsh bird populations over time at the State level, as well as provide more meaningful data for regional- (e.g., upper Midwest, Joint Venture, Mississippi Flyway) and national-scale monitoring. An expanded Michigan Marsh Bird Survey would provide improved data on seven species of migratory game birds: King Rail (*Rallus elegans*; MI endangered), Virginia Rail (*Rallus limicola*), Sora (*Porzana carolina*), Common Gallinule (*Gallinula galeata*; MI threatened), American Coot (*Fulica americana*), Sandhill Crane (*Grus canadensis*), and Wilson's Snipe (*Gallinago delicata*). In addition to these game species, we are collecting data on 10 other bird species of conservation concern. Two of these species, Yellow Rail (*Coturnicops noveboracensis*; MI threatened) and Black Tern (*Chlidonias niger*; MI special concern), are Joint Venture focal species along with King Rail. The eight remaining species are considered species of greatest conservation need under Michigan's Wildlife Action Plan (Eagle et al. 2005): Pied-billed Grebe (*Podilymbus podiceps*), American Bittern (*Botaurus lentiginosus*; MI special concern), Least Bittern (*Ixobrychus exilis*; MI threatened), Forster's Tern (*Sterna forsteri*; MI threatened), Sedge Wren

(*Cistothorus platensis*), Marsh Wren (*Cistothorus palustris*; MI special concern), Le Conte's Sparrow (*Ammodramus leconteii*), and Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*; MI special concern). Although data are lacking for the above species, information is needed by state and federal agencies making regulatory decisions about game species, as well as a variety of agencies and organizations interested in tracking trends in relative abundance and distribution, learning more about habitat needs, and planning, implementing, and evaluating conservation actions.

We implemented a 3.5-year plan to expand the Michigan Marsh Bird Survey to a full-scale program, which consisted of two objectives: (1) expand the Michigan survey from the pilot stage to a fully functional survey; and (2) make data available to partners for conservation and regulatory purposes via the national marsh bird database and other suitable portals (e.g., Midwest Avian Data Center). We took a phased approach to expanding the program over the 3.5-year project. In the first 1.5 years (late 2011 through 2012), we conducted the GIS analysis and began field ground truthing to develop new primary and secondary sample units and continued surveys at pilot sites. During the 2013 field season, we surveyed new PSUs, completed ground truthing on remaining expansion sites, and began recruiting new volunteers. In the final year of the project (2014), we focused on recruiting additional volunteers and conducting surveys on all PSUs.

Methods

Initiation of this project coincided with an evaluation of the pilot National Secretive Marsh Bird Monitoring Program, which included a national workshop held in December 2011 and culminated in a set of recommendations for future monitoring (Seamans et al. 2013). Improving our understanding of the effects of habitat management on marsh birds was identified as a priority issue for the Midwest (Seamans et al. 2013). Therefore, we designed the expanded Michigan survey to address this priority through sample stratification allowing us evaluate the effects of waterfowl management on marsh birds. Our goal was to stratify our 30 new PSUs into 15 impounded and 15 unimpounded PSUs (Figure 1). This design would facilitate comparisons of marsh bird use between wetlands managed for waterfowl and sites lacking water level control. Furthermore, long-term data collection at managed wetlands would provide opportunities for evaluating marsh bird response to water level manipulations over time.

We worked with Joint Venture science staff to develop the sample frame for Michigan's expanded survey and select potential primary and secondary sample units. We used the National Wetlands Inventory (NWI) to identify the sampling universe of emergent wetlands in Michigan. Hydrologic modifiers in NWI wetland classifications and expert knowledge were used to identify impounded study sites. We used the same grid of 40-km^2 hexagonal cells (White 2007) to form the boundaries of PSUs as was used in developing Michigan's pilot survey. Our goal was to expand the Michigan Marsh Bird survey to approximately 45 PSUs, so the sample frame incorporated an oversample of PSUs to account for sites unsuitable for survey (e.g., inaccessible, lacking potential marsh bird habitat). We implemented a spatially balanced procedure to randomly select a sample frame of 60 PSUs containing 30 impounded and 30 nearby unimpounded PSUs. Secondary sample units (SSUs, or point count stations) were developed using a random point generator in ArcMap 10.0 and a minimum separation distance of 400 m. We conducted an initial in-office GIS evaluation of all 60 potential PSUs and associated SSUs using 2009/2010 aerial imagery. Eight PSUs were removed based on the in-office evaluation because of inaccessibility and/or lack of potential habitat. On-site ground truthing of secondary sample units was conducted on 49 PSUs, resulting in 19 PSUs being removed because of wetland conditions or access limitations and 30 PSUs becoming new active survey routes. Our final set of 30 new PSUs consisted of 14 impounded and 16 unimpounded routes. Ground truthing was not completed on three PSUs because of spring flooding, but these sites will be revisited at a future date.
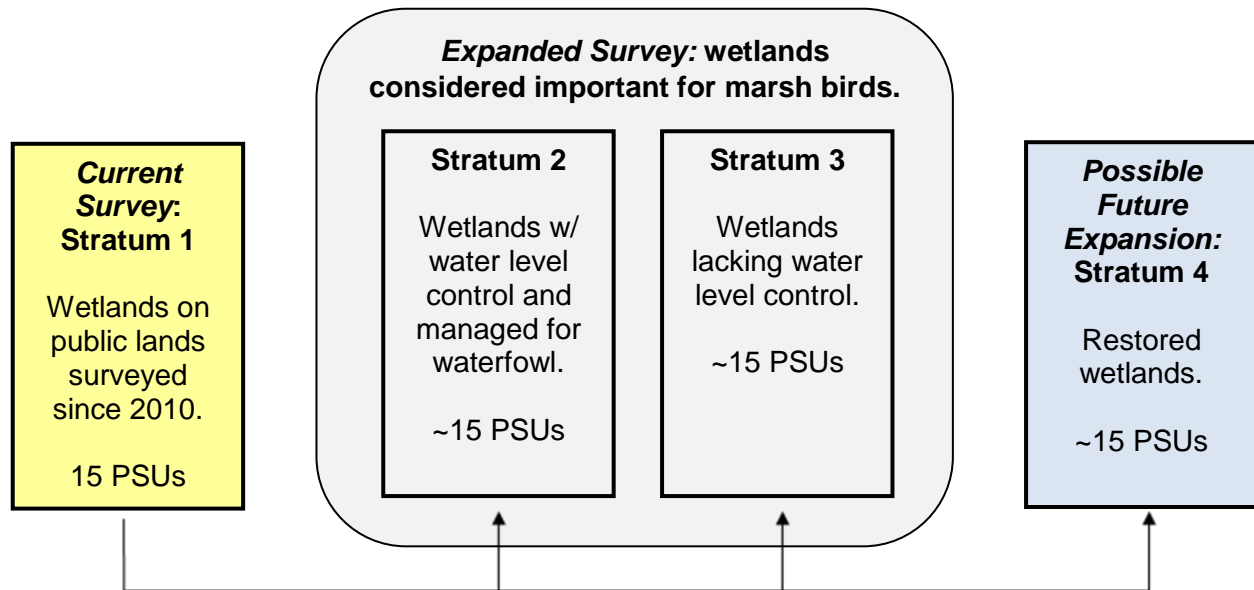
Figure 1. Sample design for an expanded Michigan Marsh Bird Survey consisting of the current pilot survey stratum (yellow box), additional survey strata using current funding (gray boxes), and a possible restored wetland stratum for future expansion (blue box). The approximate number of primary sample units (PSUs) to be surveyed is listed for each stratum.

Marsh bird data were collected using the standardized point-count method described by Conway (2011) and adapted for Michigan (Michigan Bird Conservation Initiative 2010). Primary target species were Pied-billed Grebe, American Bittern, Least Bittern, King Rail, Virginia Rail, Sora, Common Gallinule, and American Coot. In addition to the primary species, Michigan Marsh Bird Survey participants recorded occurrences of the following secondary species: Yellow Rail, Sandhill Crane (*Grus canadensis*), Wilson's Snipe (*Gallinago delicata*), Black Tern, Forster's Tern, Sedge Wren, Marsh Wren, Le Conte's Sparrow, Swamp Sparrow (*Melospiza georgiana*), and Yellow-headed Blackbird. Participants conducted three visits to each point during May 1 to June 30, with surveys in northern Michigan beginning approximately two weeks later than southern Michigan. Point counts consisted of a five-minute passive listening period followed by an audio broadcast period of secretive marsh bird calls (one-min broadcast series per species). Calls of five species were broadcasted during Michigan surveys resulting in a 10-min point count. In southern Michigan, calls of five species were played in this order: Least Bittern, Sora, Virginia Rail, King Rail, and American Bittern. In northern Michigan, calls of Least Bittern, Yellow Rail, Sora, Virginia Rail, and American Bittern were broadcasted. We recorded all marsh birds seen or heard during each point count. Surveyors estimated distances from count stations to birds using ocular/aural estimation and/or a laser rangefinder; distances to primary target species (i.e., grebes, bitterns, rails, coots, gallinules) were estimated to the nearest five meters, whereas observations of secondary species were placed in one of three distance categories (≤50 m, >50-100 m, and >100 m).

Results and Discussion

With funding from the Webless Migratory Bird Program, we were able to increase the number of PSUs and SSUs surveyed annually by over 3.5 times compared to the survey effort completed under the pilot program (2010 – 2011; Table 1). We met our goal of developing 30 new PSUs by the end of the project to bring Michigan's total to 45 PSUs (Figure 2). Participants surveyed 93% of the PSUs in 2013 and 89% in 2014. We recruited several new volunteers in 2014, the final season with funding provided by the Webless Migratory Bird Program, bringing our total to 25. Two paid MNFI staff and 25 volunteers surveyed 40 of the 45 PSUs in 2014.

Table 1. Number of primary sample units (PSUs) and survey points surveyed by year since the inception of the Michigan Marsh Bird Survey.

Year	Number of PSUs	Number of Survey Points			
		Period 1	Period 2	Period 3	Season
2010	11	35	48	53	58
2011	11	54	62	48	62
2012	28	87	118	143	150
2013	42	142	211	214	223
2014	40	156	185	154	213
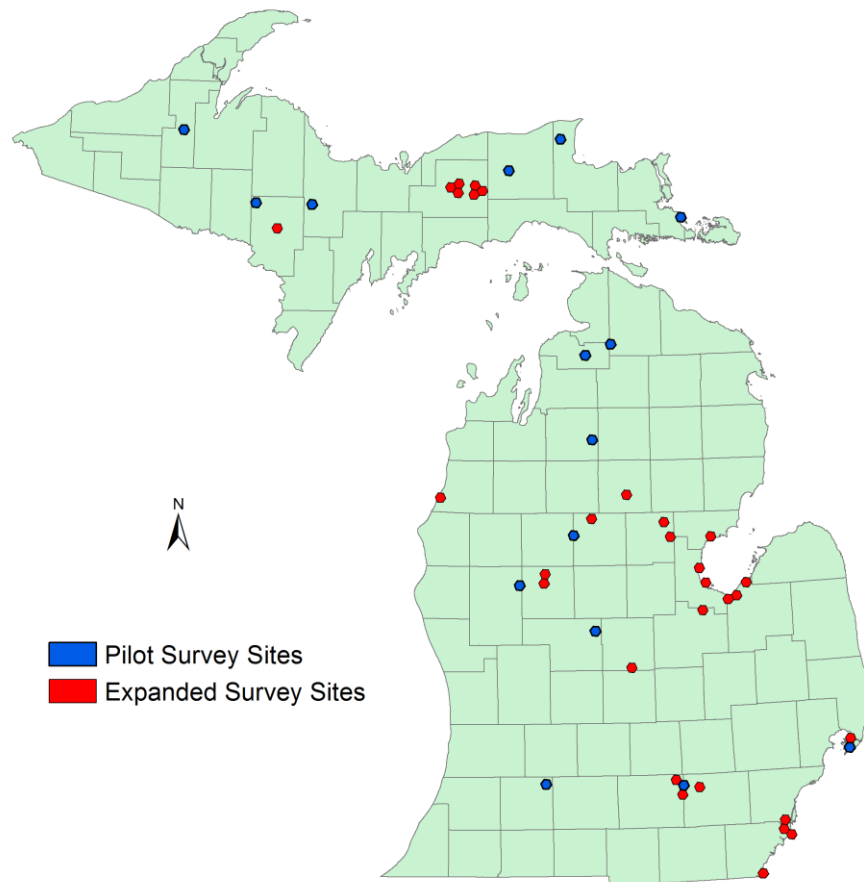
Figure 2. Map of primary sample units surveyed for the Michigan Marsh Bird Survey. Blue shaded units were developed for the pilot survey (2010-2011) and red shaded sample units were developed for the expanded program (2012-2014).

All 18 primary and secondary target species were detected during at least one year of the Michigan Marsh Bird Survey. With the increased survey effort made possible by this project, the number of target species detected per year has increased from 11 species in 2010 to 17 species in 2014. Swamp Sparrow was the species most commonly detected during surveys, being recorded at about half of the survey points annually (Table 2). In all but one year, Sandhill Crane was the second most common species observed and was annually recorded at 27 – 48% of the survey points. American Bittern was the most commonly detected primary target species and was documented at 18 – 37% of the points annually. Most target species were detected in low numbers and at small proportions of the survey points. We observed Pied-billed Grebe, Marsh Wren, and Sedge Wren on 10 – 23% of the points annually. Sora, Virginia Rail, and Wilson's Snipe were annually detected on 5 – 15% of the survey points. All of the other target species were usually recorded at less than 10% of the survey points (Table 2). The design of this survey does not appear effective in locating the extremely rare King Rail or more nocturnal Yellow Rail; modifications to the survey design/methodology would be needed to better survey these species.

During the period of this project, management of marsh bird data collected in the U.S. has changed. Marsh bird data were previously maintained within the National Marsh Bird Database, which was managed by the U.S. Geological Survey and U.S. Fish and Wildlife Service (USFWS). This database was recently migrated to the Avian Knowledge Network (AKN), so data collected under the Michigan Marsh Bird Survey will now be housed within this system. Michigan data collected during 2010-2012 were moved to the AKN via the database migration and we are currently working with USFWS and Point Blue representatives to get data from 2013-2014 uploaded into the new system. Beginning in 2015, data from the Michigan Marsh Bird Survey will be input directly into the Midwest Avian Data Center, a node of the AKN. We are working with the USFWS, Point Blue, and the Midwest Marsh Bird Working Group to ensure that marsh bird data collected in the Midwest are entered into and managed within the Midwest Avian Data Center in a consistent manner.

We worked closely with national, regional, and state partners to coordinate the Michigan Marsh Bird Survey with ongoing efforts within the region and nation. The coordinator of the Michigan Marsh Bird Survey has served as Chair of the Midwest Marsh Bird Working Group since 2012 and continued as a member of the Joint Venture Waterbird Subcommittee. We had numerous communications with other partners in the region and members of the Midwest Marsh Bird Working Group throughout the project period. We helped facilitate meetings of the working group during the 2012 and 2014 Midwest Bird Conservation and Monitoring Workshops and participated in several conference call meetings. The working group has made significant progress toward coordinated marsh bird monitoring and research in the region. We worked with other working group members to identify objectives for a regional marsh bird monitoring program, develop research objectives for the region, and write two joint venture technical reports summarizing our efforts (Soulliere et al. 2012, Larkin et al. 2013). Data collected in Michigan have already been incorporated into analyses of marsh bird habitat use (Monfils et al. 2012, 2014) and will be used along with other data from the Midwest to inform the ongoing revision of the Joint Venture's Waterbird Habitat Conservation Strategy. We will continue collaborating with regional partners to further marsh bird monitoring, research, and conservation in the Midwest.

Table 2. Number of individuals detected by year and survey period and proportion of points having detections for primary and secondary target species observed during the Michigan Marsh Bird Survey, 2010 – 2014.

Year and Survey Period	American Bittern	American Coot	Common Gallinule	King Rail	Least Bittern	Pied-billed Grebe	Sora	Virginia Rail	Wilson's Snipe	Yellow Rail	Black Tern	Forster's Tern	Le Conte's Sparrow	Marsh Wren	Sandhill Crane	Sedge Wren	Swamp Sparrow	Yellow-headed Blackbird
	\<-- Primary Target Species -->										\<-- Secondary Target Species -->							
2010 Period 1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	27	16	31	0
Period 2	18	0	0	0	0	19	4	8	3	0	8	2	0	24	21	12	44	0
Period 3	12	0	0	0	0	5	0	2	3	0	5	3	0	39	9	12	35	0
Total	30	0	0	0	0	24	5	11	7	0	13	5	0	63	57	40	110	0
Proportion	0.21	0.00	0.00	0.00	0.00	0.21	0.07	0.10	0.07	0.00	0.07	0.05	0.00	0.12	0.40	0.16	0.47	0.00
2011 Period 1	16	2	2	0	0	12	2	8	4	0	0	1	0	7	33	8	43	0
Period 2	19	0	5	0	1	15	1	5	0	0	1	2	0	21	41	12	45	2
Period 3	14	1	2	0	1	16	1	5	0	0	2	0	0	27	21	13	39	0
Total	49	3	9	0	2	43	4	18	4	0	3	3	0	55	95	33	127	2
Proportion	0.18	0.03	0.03	0.00	0.02	0.23	0.06	0.13	0.06	0.00	0.05	0.03	0.00	0.21	0.48	0.10	0.52	0.02
2012 Period 1	32	21	8	0	1	22	11	15	5	0	1	5	2	28	45	17	122	0
Period 2	18	0	3	0	1	5	8	7	6	0	4	1	1	36	26	20	107	0
Period 3	11	1	2	0	2	22	0	13	14	0	5	4	4	26	59	39	151	0
Total	61	22	13	0	4	49	19	35	25	0	10	10	7	90	130	76	380	0
Proportion	0.21	0.04	0.04	0.00	0.03	0.10	0.09	0.12	0.11	0.00	0.01	0.03	0.03	0.12	0.35	0.23	0.61	0.00
2013 Period 1	41	55	0	0	1	36	35	13	23	0	3	18	0	98	55	29	188	0
Period 2	73	24	7	0	6	30	23	20	19	1	4	7	0	121	117	84	301	9
Period 3	38	8	6	0	6	40	9	13	17	0	16	8	0	146	106	84	338	8
Total	152	87	13	0	13	106	67	46	59	1	23	33	0	365	278	201	827	17
Proportion	0.25	0.02	0.02	0.00	0.03	0.13	0.12	0.07	0.13	<0.01	0.02	0.01	0.00	0.14	0.27	0.18	0.49	0.02
2014 Period 1	77	38	5	3	15	23	24	11	14	1	5	25	0	44	55	30	203	0
Period 2	74	24	3	1	11	36	23	19	8	0	7	16	0	48	79	38	170	1
Period 3	32	13	5	1	15	42	3	12	1	0	1	8	0	58	38	39	112	1
Total	183	75	13	5	41	101	50	42	23	1	13	49	0	150	172	107	485	2
Proportion	0.37	0.07	0.03	0.02	0.11	0.16	0.15	0.13	0.10	<0.01	0.04	0.08	0.00	0.12	0.35	0.15	0.50	0.00

Future Work

With funding from the Webless Migratory Bird Program, we were able to successfully expand the Michigan Marsh Bird Survey into a fully functional program. However, there are still refinements that we plan to implement over time. Because conservationists in the Midwest are interested in understanding marsh bird response to wetland restoration (Soulliere et al. 2012), we hope to develop a restored wetland stratum in the future (Figure 1). We are working with partners of the Midwest Marsh Bird Working Group to coordinate the creation of restored wetland strata for marsh bird surveys in the upper Midwest and identify potential funding sources for strata development.

When developing Michigan's pilot marsh bird survey, we included PSUs with marginal wetland conditions because the habitat preferences for many marsh bird species are not well known. However, there are several PSUs on which surveyors have never detected a primary target species. With several years of negative data and the associated difficulty of recruiting volunteers to survey these locations, we need to evaluate if surveys should be discontinued on these routes in favor of other PSUs that have not been surveyed.

Having multiple years of data collected in Michigan and other Midwestern states, we need to begin developing state- and/or regional-scale products that help facilitate marsh bird conservation. This issue was a major focus of discussions at a recent Midwest Marsh Bird Working Group meeting held in August 2014. Developing marsh bird population estimates and predicted distributions were ranked as "high" priority regional products during the working group meeting. Working group members, including the Michigan representative, are providing input to USFWS and Point Blue staff to incorporate population estimates and other analyses into the structure of the Midwest Avian Data Center. In addition, we plan to develop a report template that briefly summarizes data from the Michigan Marsh Bird Survey on an annual basis using outputs from the Midwest Avian Data Center. This report would be used as a regular communication tool with volunteers and other partners and a means to advertise the value of the program.

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