Calumet Marsh Bird Monitoring Report: Illinois 2019

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Executive Summary

Eight bird monitors conducted 279 surveys at 93 points at 12 wetland sites, including four Illinois Nature Preserves during 1 May through 15 June 2019. Surveyors detected eleven of seventeen focal marsh bird species. We recorded 707 detections of focal marsh bird species, with Marsh Wren (239 detections) and Sora (177) being the most frequently detected species. Marsh bird occupancy was consistently the highest at Big Marsh, Burnham and Eggers and showed increasing trends at seven of eleven wetland sites, despite high water levels in 2019.

Introduction

The Calumet region, which makes up the southern shore of Lake Michigan, has historically been dominated by wetland habitats (including marshes, swales, and lakes), which were home to dense populations of breeding marsh birds and waterbirds. A lengthy history of industrialization and urbanization has highly altered the hydrology of Calumet wetlands, resulting in threats to the long-term sustainability of Calumet wetlands, in particular marshes, because of their dependence on natural and dynamic water conditions. Invasive species such as common reed (*Phragmites australius*) and narrowleaf cattail (*Typha angustifolia*) further degrade marsh conditions as reflected by documented declines marsh-dependent bird species throughout the Great Lakes region (Tozer 2016, Tozer and Mackenzie, 2019). The need for increased scientific information that forms the basis for wetland restoration and long-term management has been widely identified as critical in the conservation community. Marsh birds serve as a primary indicator of wetland quality and their charismatic nature and highly visible nature promote great public interest that serves to raise the profile of this large collaboration.

The objectives of the Calumet Marsh Bird Survey are to provide important feedback to landowners on marsh bird populations in response to habitat restoration and to use marsh bird density to inform future management actions. As a result of the collaborative marsh bird monitoring work in the Calumet region, our goal is to increase suitable marsh habitat and therefore positively influence marsh bird population trends, especially for species of concern in the states of Illinois and Indiana. In addition to quantifying marsh bird populations at Calumet wetlands, we aim to collect a variety of habitat data including water level, percent cover of emergent vegetation and open water, and aerial imagery. The results of these data collection will inform a larger project investigating habitat associations of marsh birds in the state of Indiana.

Methods

Sites. During 1 May-15 June 2019, we conducted marsh bird surveys at 13 survey routes at 12 wetland sites: Big Marsh, Burnham Prairie, Eggers Grove, Gensburg-Markham Prairie, Hegewisch Marsh, Indian Ridge Marsh, Marian Byrnes Park (formerly called Van Vlissingen Prairie), Orland Grassland, Powderhorn & 136th St. Marsh, Whitford Pond and Wolf Lake Management Units 5 & 9. Sand Ridge Nature Center was not completely surveyed in 2019.

Bird Monitoring. Marsh bird surveys were conducted by volunteer and contracted surveyors using the widely recognized "Standardized North American Marsh Bird Monitoring Protocol" (Conway 2011), developed by the U.S. Fish and Wildlife Survey as a continent-wide, standardized protocol for measuring breeding marsh bird densities.



Swamp Sparrow. Photo: Georgia Wilson.

The seven primary focal species for the study are 1) hemi-marsh dependent birds that are judged to be good indicators of restoration successes and 2) regularly occurring in the region and in the core of their breeding ranges (Table 1). Some secondary focal species are less reliable indicators of hemimarsh, due to either being range peripheral, generalists not requiring hemi-marsh, or extirpated colonial nesting species (Table 1). These species may or may not respond to future hemimarsh restoration. Three of these species are colonial or semicolonial nesters not suited for territory mapping, and dependent upon stochastic processes out of our control (e.g. the presence of suitable rookery trees), as much as they are marsh habitat management. Black Tern, Little Blue Heron, Snowy Egret, Yellowcrowned Night-Heron, and Yellowheaded Blackbird are breeding range peripheral though are included in the survey to monitor potential range shifts.

Following the Standardized North American Marsh Bird Monitoring Protocol (Conway 2011), surveyors conducted three point counts at each assigned point three times each season (first during May 1-14, then again May 15-31, and finally June 1-15). The number of points varied from two to thirteen depending on the size of the site



Figure 1. Marsh bird wetland sites, survey points and water gauges visited in 2019 including A) Lake Calumet sites, B) wetlands southwest of the Lake Calumet region: Gensburg-Markham Prairie and Orland Grassland.

and the amount of marsh habitat therein. Points were distributed at a spacing of one point per 200m grid cell, at an accessible location within the marsh. Each point was visited for 10 minutes in sequence starting 30 minutes prior to sunrise and finishing at the latest three hours post-sunrise. At each point, a pre-recorded playback including vocalizations of each of five of the seven primary focal species will be broadcast, with a five minute period of silent listening before the recording. All visual and audio detections of primary and secondary species were recorded.

American Bittern (Botaurus lentiginosus)*	American Coot (Fulica americana)
Common Gallinule (Gallinula chloropus)	Black Tern (Chlidonias niger)
Least Bittern (Ixobrychus exilis)	Black-crowned Night-Heron (<i>Nycticorax</i> <i>nycticorax</i>)
King Rail (<i>Rallus elegans</i>)*	Blue-winged Teal (Anas discors)
Pied-billed Grebe (Podilymbus podiceps)	Little Blue Heron (<i>Egretta caerulea</i>)
Sora (Porzana carolina)	Marsh Wren (Cistothorus palustris)
Virginia Rail (<i>Rallus limicola</i>)	Snowy Egret (<i>Egretta thula</i>)
	Swamp Sparrow (Melospiza georgiana)
	Yellow-crowned Night-Heron (<i>Nyctanassa</i> vioacea)
	Yellow-headed Blackbird (Xanthocephalus xanthocephalus)

Table 1. Focal marsh bird species.

*American Bittern and King Rail were primary focal species not included in the audio broadcast.

Water level monitoring. Staff gauges were installed in 2018 at the following Illinois wetlands: Big Marsh, Eggers Grove, Hegewisch Marsh, Indian Ridge Marsh, and Wolf Lake. Volunteer bird monitors recorded water levels at staff gauges during regular bird monitoring visits during 1 May through 15 June. We determined the mean water level value between 1 May-15 June in 2018 and 2019.

Analysis. We estimated occupancy and detection probability parameters for focal species with the unmarked package in R 3.4.3 (Fiske and Chandler 2011). We estimated species-specific occupancy using the likelihood-based method (MacKenzie et al. 2002). We developed separate models for each species based on stacking data from repeated survey visits within years; thus, our "effective sites" were derived from 2 or 3 survey visits at each survey point annually. We treated year as a site-specific covariate in all models.

Under this occupancy model parameterization, the area within 200 m of the survey point (i.e., only detections within 200 m were retained; < 3% of detections omitted) is considered closed to changes in occupancy across all surveys and within years (MacKenzie et al. 2002). Thus, if a given species is detected at a survey point (i.e. site), that point is assumed to be closed to changes in species occupancy for the duration of the breeding season. Therefore, our occupancy response variable can be considered "use" (sensu MacKenzie 2005, MacKenzie et al. 2006) because birds may be temporarily, but not permanently, absent from a given survey point at random times. In this context, our estimate of occupancy describes the proportion of survey points ever occupied, rather than the survey points that are permanently occupied (Kéry and Schaub 2012).



Sora. Photo: Claudio Contreras Koob.

We were interested in accounting for two processes known to influence detection probability of marsh birds during surveys (Conway 2011, Tozer 2016, Wiest et al. 2016): time of day (24 hr) and time of year (ordinal date). Both continuous explanatory variables were standardized to have a mean of zero and standard deviation (SD) of one. We assessed linear and quadratic terms (based on standardized values) for both variables, and used Akaike's Information Criterion (AIC) to compare among models, which included a null (intercept-only) model. The model with the lowest AIC was retained as the top-ranked occupancy model for each focal species.

Results

Bird monitoring. In 2019, eight bird monitors conducted 279 surveys at 93 points (Figure 1) during three two-week sampling periods from 1 May through 15 June 2019. Data for Sand Ridge were not available in 2019 and are not included in this summary. We detected six of seven primary focal species (American Bittern, Common Gallinule, Least Bittern, Pied-billed Grebe, Sora and Virginia Rail), and five of eleven secondary focal species (American Coot, Black-crowned Night-Heron, Bluewinged Teal, Marsh Wren and Swamp Sparrow). We recorded 707 detections of focal marsh bird species during surveys, with Marsh Wren (239 detections) and Sora (177) being the most frequently detected species (Figure 2).

The wetland sites with the highest marsh bird species richness in 2019 were Burnham Prairie (10 species), Hegewisch Marsh (10), and Big Marsh (9) and the sites with the lowest species richness was Marian Byrnes (5). Marsh Wren, Sora and Virginia Rail were detected at all wetland sites surveyed. American Coot, Common Gallinule and American Bittern were detected at the fewest sites (4; Figure 3).

Marsh bird occupancy. All but five marsh bird species were included in the species-specific occupancy analysis. King Rail, Little Blue Heron, Snowy Egret, Yellow-crowned Night-Heron, and Yellow-headed Blackbird were excluded due to low detections.

We averaged species-specific occupancy estimates at each site to estimate 'average marsh bird occupancy' annually (Figure 3). Big Marsh, Burnham and Eggers consistently had the highest occupancy (Gensburg-Markham was excluded from this comparison since it only had one survey point, which biased results). Average marsh bird occupancy has increased over time at most wetlands with three years of data, aside from Eggers and Indian Ridge, which were relatively stable.

Water level monitoring. Volunteer water level monitoring was not consistent across all sites during 2018-19. In addition, water gauges at Big Marsh and Indian Ridge Marsh had to be moved between years due to complete inundation of the original sites. However, we had enough samples to compare water levels between years at the following sites: Eggers Grove, Marian Byrnes and Wolf Lake. Mean water gauge measurements showed an increase in water level at Wolf Lake and Eggers Groves in 2019 and stable water levels at Marian Byrnes between years (Figure 5).





Pied-billed Grebe. Photo: Steve Cronin.

Figure 2. Combined frequency of detections per species at all Illinois Calumet wetland sites in 2019.

Wetland Site	Marsh Wren	Sora	Virginia Rail	Blue-winged Teal	Pied-billed Grebe	Swamp Sparrow	Black-crowned Night-Heron	Least Bittern	American Coot	Common Gallinule	American Bittern	Species Richness
Burnham Prairie*	X	¥	- 5	\$	2		7	7	-	ب		10
Hegewisch Marsh	X	¥	-	\$	2			Ţ	-	ب		10
Big Marsh	X	¥	-5	\$				The second secon		ک		9
Eggers Grove	X	4	-	\$	2				-			8
Whitford Pond	X	¥	- 5		2				-			7
Orland Grassland*	X	¥	-	\$	2							7
Gensburg- Markham	X	~	-	3	2							
Prairie*						_	•					6
Indian Ridge	X	S					h			<u></u>		6
Powderhorn* & 136th St Marsh	X	¥	-		2			7				6
Wolf Lake Units 5 & 9	X	¥	-53	\$	2			7				6
Marian Byrnes	X	¥	-	\$	2							5

*Figure 3. Marsh bird species detected during 2019 marsh bird surveys and marsh bird species richness. Bird icons indicate that the species was detected. *Indicates Illinois Nature Preserves.*

Conclusions

Marsh bird monitoring results increasing occupancy of marsh birds in 2019 at most Illinois Calumet wetlands compared to previous years, and this could be related to restoration activities at Big Marsh, Burnham, Hegewisch, Marian Byrnes, and Powderhorn. However there was an increase in marsh bird occupancy at sites not undergoing restoration such as Whitford and Wolf Lake Units 5 & 9, which may indicate an increase in habitat availability with high water levels at these sites.

A future analysis will investigate how marsh bird species are associated with changes in water level as well as habitat variables, such as interspersion of emergent vegetation and open water and percent cover of invasive species. We recommend continued monitoring at Calumet area wetlands in Illinois in order to inform ongoing restoration efforts in this region and to better understand population trends for multiple species of conservation concern, as well as potential range shifts due to climate change. Audubon will continue to lead marsh bird monitoring in 2020 and plans to build sustainability of monitoring into the future.



Figure 4. Marsh bird occupancy at wetland sites for 2017-2019 Illinois Calumet marsh bird surveys. Not shown is Orland Grassland.



Figure 5. Mean water level recorded at staff gauges at Illinois Calumet marshes during 1 May-15 June 2018 and 2019.

References

- Fiske, I., and R. Chandler (2011). unmarked: An R package for fitting hierarchical models of wildlife occurrence and abundance. Journal of Statistical Software 43:1–23.
- MacKenzie, D. I. (2005). What are the issues with presence–absence data for wildlife managers? The Journal of Wildlife Management 69:849–860.
- MacKenzie, D. I., and L. L. Bailey (2004). Assessing the fit of siteoccupancy models. Journal of Agricultural, Biological, and Environmental Statistics 9:300–318.
- MacKenzie, D. I., J. D. Nichols, G. B. Lachman, S. Droege, J. A. Royle, and C. A. Langtimm (2002). Estimating site occupancy rates when detection probabilities are less than one. Ecology 83:2248–2255.
- Mackenzie, D. I., J. D. Nichols, J. A. Royle, K. H. Pollock, L. L. Bailey, and J. E. Hines (2006). Occupancy Modeling and Estimation. Academic Press, San Diego, CA, USA.
- Kery, M., and M. Schaub (2012). Bayesian Population Analysis Using WinBUGS: A Hierarchical Perspective. Academic Press, New York, NY, USA.
- Conway, C. J. (2011). Standardized North American marsh bird monitoring protocol. Waterbirds 34:319–346.
- Tozer, D. C. (2016). Marsh bird occupancy dynamics, trends, and conservation in the southern Great Lakes basin: 1996 to 2013. Journal of Great Lakes Research 42:136–145.
- Tozer, D. C., & Mackenzie, S. A. (2019). Control of Invasive Phragmites Increases Marsh Birds but not Frogs. Canadian Wildlife Biology & Management 8(2): 66-82.
- Wiest, W. A., M. D. Correll, B. J. Olsen, C. S. Elphick, T. P. Hodgman, D. R. Curson, and W. G. Shriver (2016). Population estimates for tidal marsh birds of high conservation concern in the northeastern USA from a design-based survey. The Condor: Ornithological Applications 118:274–288