

Calumet Marsh Bird Monitoring Report: Illinois 2020

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Audubon GREAT LAKES

Contents

Executive Summary	2
Introduction	2
Methods	2
Sites	2
Bird monitoring	2
Water level monitoring	4
Habitat and management data collection	4
Analysis	4
Results	5
Bird monitoring	5
Marsh bird occupancy	5
Water level monitoring	5
Habitat and management data collection	5
Conclusion	5
References	8

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Executive Summary

Five bird monitors conducted 191 surveys at 64 points at 8 wetland sites, including three Illinois Nature Preserves during 1 May through 15 June 2020. Surveyors detected thirteen of seventeen focal marsh bird species. We recorded 500 detections of focal marsh bird species, with Marsh Wren (228 detections) and Virginia Rail (58) being the most frequently detected species. Marsh bird occupancy was highest at Big Marsh, Burnham and Hegewisch in 2020. Average marsh bird occupancy decreased at Eggers in 2020 compared to past years and this may be related to lack of sufficient emergent vegetation observed during spring 2020.

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 australis*) 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 occupancy 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 2020, we conducted marsh bird surveys at eight wetland sites: Big Marsh, Burnham Prairie, Eggers Grove, Gensburg-Markham Prairie, Hegewisch Marsh, Indian Ridge Marsh, Marian Byrnes Park (formerly called Van Vliissingen Prairie), and Powderhorn & 136th St. Marsh. Orland Grassland, Whitford Pond, Wolf Lake Management Units 5 & 9, and Sand Ridge Nature Center were not surveyed in 2020.

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.



Snowy Egret. Photo: Denise Hackert, Audubon Photography Awards.

The seven primary focal species for the study are marsh-dependent species that breed in the Calumet area and tend to be “secretive” and thus not well sampled by other survey methods (Conway, 2011; Table 1). Secondary species are not as secretive, but we included them as important indicators of hemimarsh habitat (Table 1). Some secondary species may or may not respond to future hemi-marsh restoration. Three of these species are colonial or semi-colonial 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, Yellow-crowned Night-Heron, and Yellow-headed 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 (May 1-14, May 15-31, and June 1-15). The number of points varied from one to thirteen depending on the size of the site and the amount of marsh habitat therein. Points were distributed at a spacing of one point per 200-m 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.

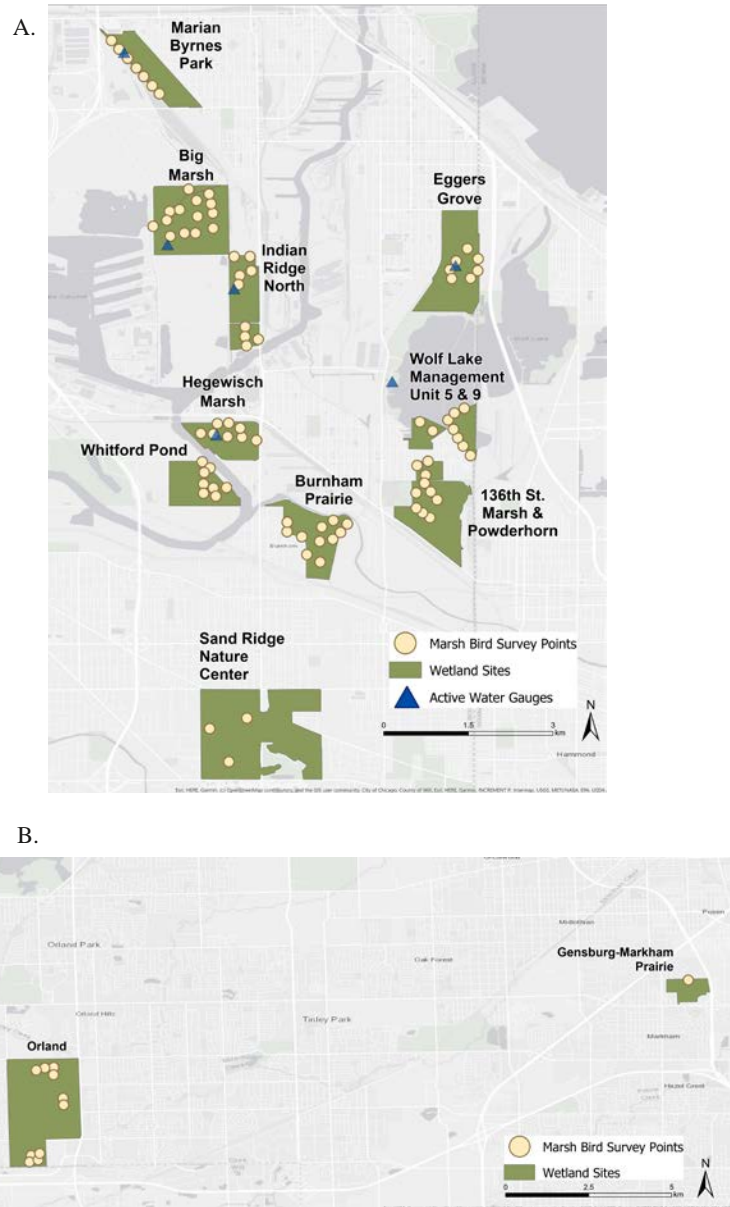


Figure 1. Marsh bird wetland sites, survey points and water gauges visited in 2020 including A) Lake Calumet sites (Wolf Lake, Whitford Pond and Sand Ridge were not visited in 2020), B) wetlands southwest of the Lake Calumet region: Gensburg-Markham Prairie. Orland Prairie was not visited in 2020.

Table 1. Focal marsh bird species.

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

*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 2018-2020.

Habitat and management data collection. In 2020, habitat data were collected at all sites where marsh bird monitoring data were collected that year. We used a modified habitat sampling protocol adapted from the Birds Canada Marsh Monitoring Protocol (Birds Canada 2009) and collected data on habitat characteristics at each marsh bird sampling point, such as percent open water, percent emergent vegetation and dominant species present. We also contacted land managers in late 2020 to complete a survey to submit management data for the past five years, so it can be correlated with marsh bird occupancy.

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).



King Rail. Photo: Robert Grundy, Audubon Photography Awards.

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 2020, five bird monitors conducted 191 surveys at 64 points (Figure 1) during three two-week sampling periods from 1 May through 15 June 2020. We detected all seven primary focal species (American Bittern, Common Gallinule, Least Bittern, King Rail, Pied-billed Grebe, Sora and Virginia Rail), and six of eleven secondary focal species (American Coot, Black-crowned Night-Heron, Blue-winged Teal, Marsh Wren, Snowy Egret, and Swamp Sparrow). We recorded 500 detections of focal marsh bird species during surveys, with Marsh Wren (228 detections) and Virginia Rail (58) being the most frequently detected species (Figure 2).

The wetland sites with the highest marsh bird species richness in 2020 were Burnham Prairie (10 species), Hegewisch Marsh (9), 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. King Rail and Snowy Egret were only detected at Burnham Prairie (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 Hegewisch had the highest occupancy in 2020 (Gensburg-Markham was excluded from this comparison since it only had one survey point, which biased results). Average marsh bird occupancy has increased or has been relatively stable at most wetlands. However, Eggers and Big Marsh showed a drop in average marsh bird occupancy in 2020 compared to previous years.

Water level monitoring. Water gauge data were compiled for the following sites across three years: Big Marsh, Eggers Grove, Indian Ridge Marsh and Marian Byrnes. Wolf Lake was also included though it was not surveyed in 2020. Mean water gauge measurements showed an increase in water level at Big Marsh and a decrease in water level at Eggers Groves in 2020 and relatively stable water levels at Indian Ridge Marsh and Marian Byrnes between years (Figure 4). Although water levels across Calumet and the Great Lakes region have been high in the past few years, water levels decreased at Eggers due to the installment of a new water control structure.































































Habitat and management data collection. Habitat and management data collection has not yet been completely analyzed and will be available in 2021. On the ground observations during habitat data collection indicated that high water levels at Big Marsh and management activity resulted in lower emergent cover compared to 2019, though this has not been quantified. In addition, emergent cover also appeared relatively low at Eggers due to invasive control activities.

Conclusions

Marsh bird monitoring results showed variable trends in occupancy of marsh birds in 2020 at Illinois Calumet wetlands compared to previous years. There was a decrease in average marsh bird occupancy at Big Marsh and Eggers and this may be a result of a lack of emergent cover in 2020. The conditions at these sites are likely related to changes in water levels and invasive removal which decreased the availability of emergent cover. Although marsh birds may be negatively impacted by invasive control, these are temporary conditions and management activities take time to yield a beneficial impact on breeding marsh birds. It is important to continue to collect data in future years particularly to measure how the enhanced water level management at Eggers and regrowth of emergent cover will impact marsh bird occupancy.

A future analysis will investigate how marsh bird species are associated with changes in water level as well as habitat variables, such as interspersed 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 2021 and plans to build sustainability of monitoring into the future.

Table 2. Marsh bird species detected during 2020 marsh bird surveys and marsh bird species richness. Includes species detected by monitors both within and outside the survey period. Bird icons indicate that the species was observed. *Indicates sites that are Illinois Nature Preserves.

Wetland Site	Marsh Wren	Sora	Virginia Rail	Pied-billed Grebe	Swamp Sparrow	Blue-winged Teal	Black-crowned Night-Heron	Common Gallinule	American Coot	Least Bittern	American Bittern	King Rail	Snowy Egret	Species Richness
Burnham Prairie*														10
Big Marsh														9
Indian Ridge Marsh														9
Eggers Grove														8
Hegewisch Marsh														8
Powderhorn Lake*														7
Gensberg-Markham Prairie*														6
Marian Byrnes														5

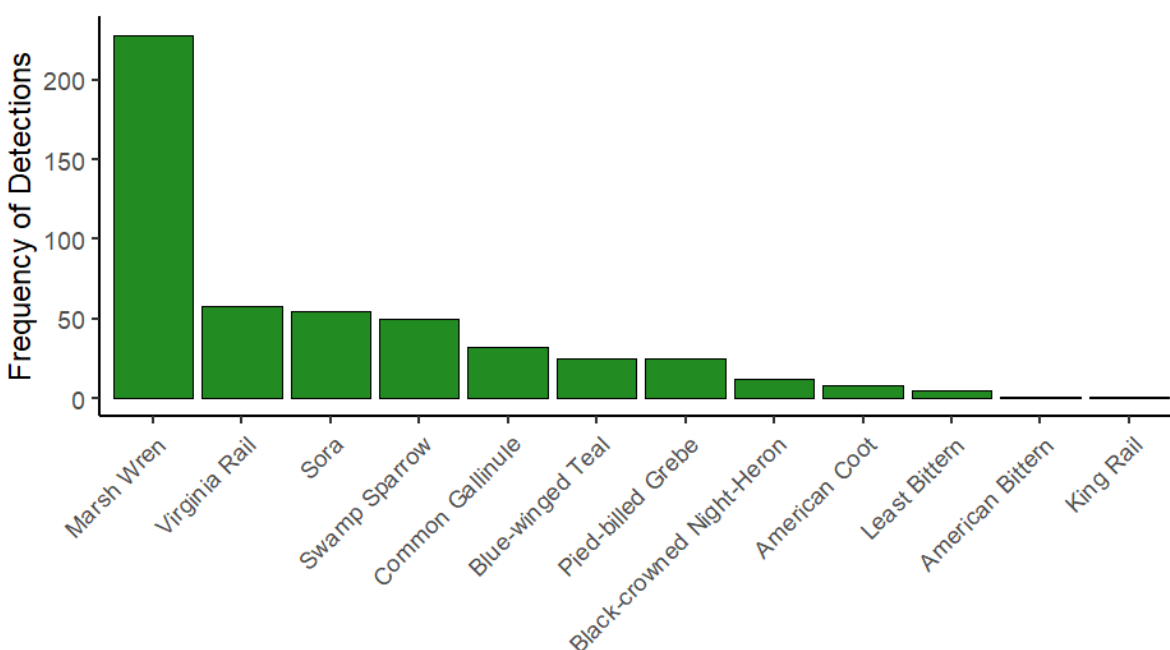


Figure 2. Combined frequency of detections per species during marsh bird surveys at all Illinois Calumet wetland sites in 2020.

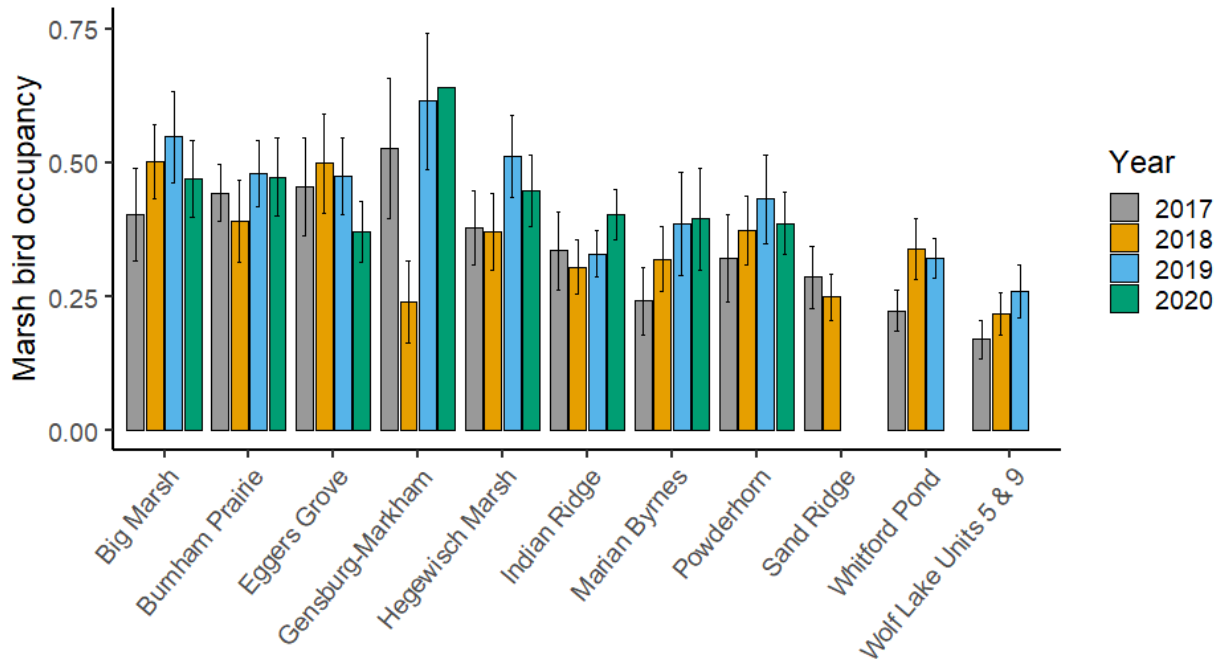


Figure 3. Average marsh bird occupancy at wetland sites for 2017-2020 Illinois Calumet marsh bird surveys. Not shown: Orland Grassland.

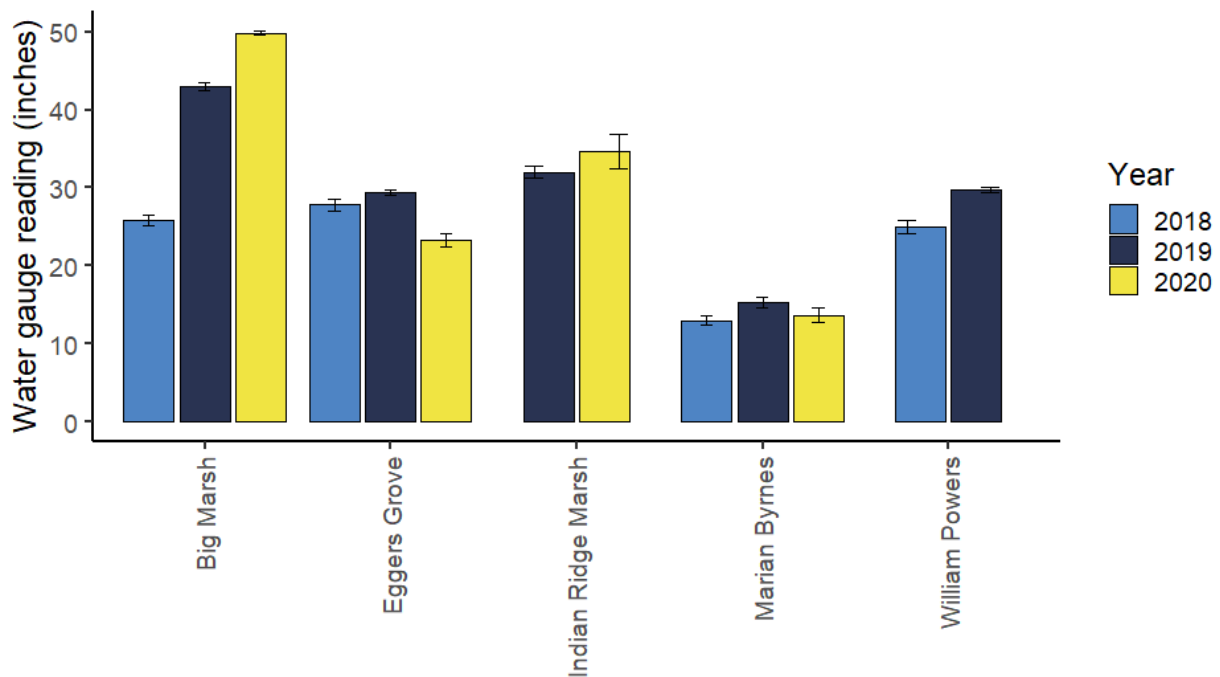


Figure 4. Mean water level recorded at staff gauges at Illinois Calumet marshes during 1 May-15 June 2018-2020, for gauges with at least two complete years of data. Surveys were not completed at William Powers in 2020.

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