Calumet Marsh Bird Monitoring Report: Illinois 2021

Prepared by: Stephanie Beilke

January 19, 2022

Audubon | GREAT LAKES

Photo: Jocelyn Anderson/Audubon Photography Awards

Contents

Marsh bird surveys were conducted under permits granted by the Chicago Park District, Forest Preserves of Cook County, Northeastern University and the Illinois Nature Preserves Commission

We thank the following individuals who contributed to the findings in this report: Jack Connell, Aqsa Junagadhwala, Lila Fried, Vera Leopold, Walter Marcisz, Libby Keyes, Travis Kuntzelman, Michael McNamee, Emily Pfieffer, Paul Senner, and Edward Warden.

Executive Summary

Ten bird monitors conducted 301 surveys at 101 points at 13 wetland sites, including three Illinois Nature Preserves during 1 May through 15 June 2021. Surveyors detected twelve of seventeen focal marsh bird species. We recorded 608 detections of focal marsh bird species, with Marsh Wren (248 detections) and Swamp Sparrow (138) being the most frequently detected species. Marsh bird occupancy was highest at Big Marsh and Hegewisch in 2021. Average marsh bird occupancy decreased at Burnham Prairie, Eggers, Indian Ridge, and Marian Byrnes in 2021 compared to 2020 and this could have been related to drought conditions observed during spring 2021.

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 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 Illinois and Indiana.

Methods

Sites. During 1 May-15 June 2021, we conducted marsh bird surveys at thirteen wetland sites: Big Marsh, Burnham Prairie, Deadstick Pond, Eggers Grove, Gensburg-Markham Prairie, Hegewisch Marsh, Indian Ridge Marsh, Marian Byrnes Park (formerly called Van Vlissingen Prairie), Orland Grassland, and Powderhorn & 136th St. Marsh, Whitford Pond, and Wolf Lake Management Units 5 & 9. Deadstick Pond was added as a new survey site in 2021.

King Rail. Photo: Robert Gundy. Audubon Photography Awards.

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.

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.

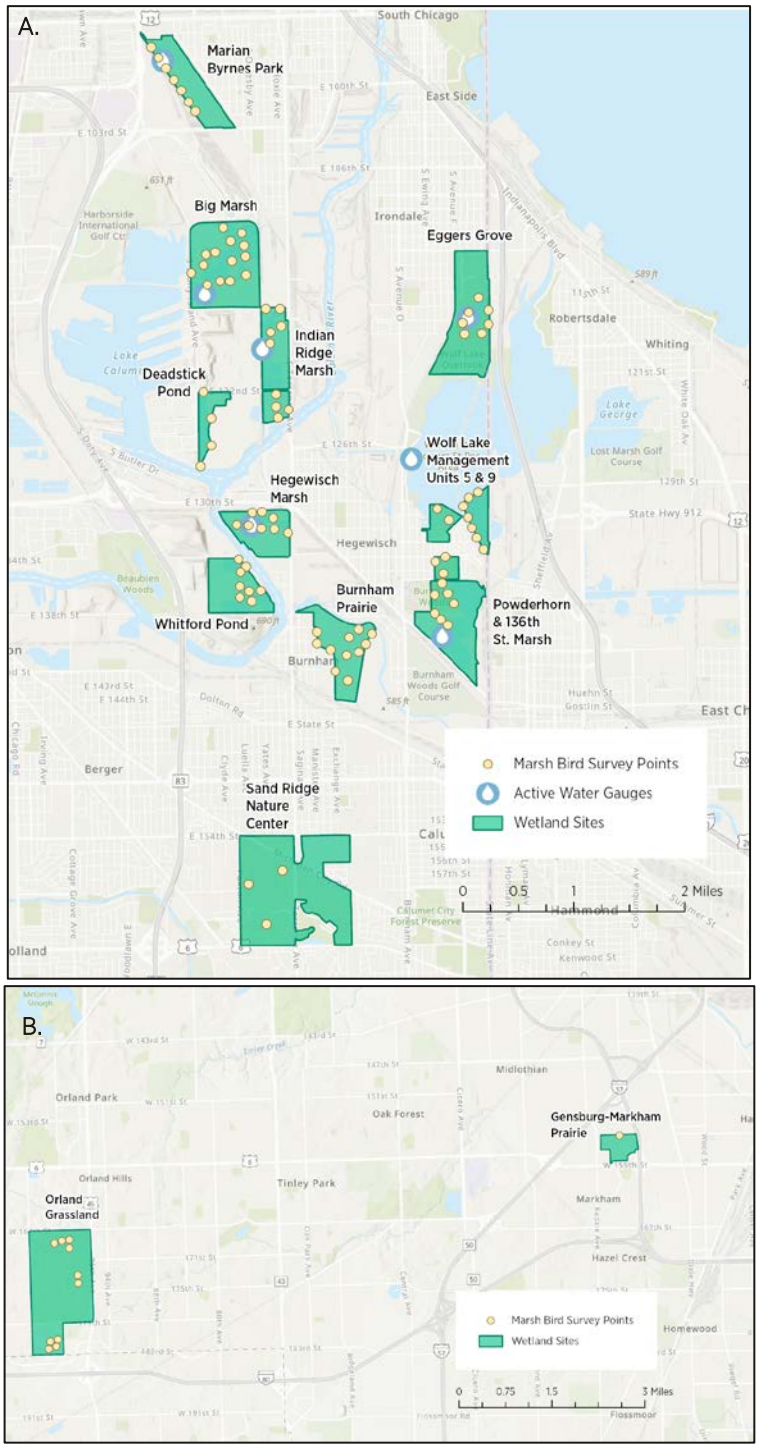


Figure 1. Marsh bird wetland sites, survey points and water gauges visited in 2021 including A) Lake Calumet sites B) wetlands southwest of the Lake Calumet region: Gensburg-Markham Prairie and Orland Grassland

Table 1. Focal marsh bird species.

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

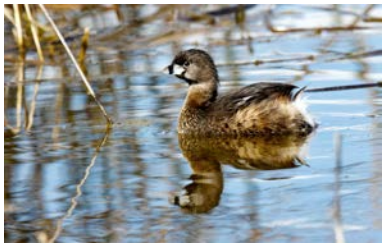
**American Bittern and King Rail were primary focal species not included in the audio broadcast.*

Water level monitoring. Staff gauges were installed in 2018 at the following Illinois wetlands: Big Marsh, Eggers Grove, Hegewisch Marsh, Marian Byrnes, Indian Ridge Marsh, and Wolf Lake/William Powers. 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 2018-2021.

Habitat and management data collection. In 2021, 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 2021 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).



Pied-billed Grebe. Photo: Donald Dvorak, 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 2021, ten bird monitors conducted 301 surveys at 101 points (Figure 1A-B) during three two-week sampling periods from 1 May through 15 June 2021. We detected all seven primary focal species (American Bittern, Common Gallinule, Least Bittern, King Rail, Pied-billed Grebe, Sora and Virginia Rail), and five of eleven secondary focal species (American Coot, Black-crowned Night-Heron, Blue-winged Teal, Marsh Wren, and Swamp Sparrow). We recorded 608 detections of focal marsh bird species during surveys, with Marsh Wren (248 detections) and Swamp Sparrow (138) being the most frequently detected species (Figure 2).

The wetland sites with the highest marsh bird species richness in 2020 were Big Marsh (10 species), Hegewisch Marsh (8), Powderhorn Lake (8), and Orland Grassland (8). The site with the lowest species richness was Marian Byrnes (3). Marsh Wren, Sora and Virginia Rail were detected at the most wetland sites surveyed. King Rail and American Bittern were detected at the fewest sites with King Rail detections at Big Marsh and Orland and American Bittern only detected at Powderhorn.

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 and Hegewisch had high occupancy in 2021 relative to other sites (Gensburg-Markham was excluded from this comparison since it only had one survey point, which biased results). Average marsh bird occupancy has been relatively stable at most wetlands. However, several sites (Burnham Prairie, Eggers, Indian Ridge, Marian Byrnes) showed significantly lower occupancy in 2021 in comparison to 2020.

Water level monitoring. Water gauge data were compiled for the following sites across four years: Big Marsh, Eggers Grove, Indian Ridge Marsh, Marian Byrnes, and Wolf Lake. Wolf Lake was included though bird surveys were not completed in 2020. Mean water gauge measurements showed a decrease in water level at Big Marsh and relatively stable water levels at Eggers, Indian Ridge Marsh, Marian Byrnes, and Wolf Lake between years (Figure 4). Although much of the Midwest experienced drought conditions during spring 2021, this wasn't necessarily reflected in mean water level data for the 2021 marsh bird season.

Habitat and management data collection. Habitat and management data collection has not yet been completely analyzed but will be added to the Calumet Marsh Bird Data Hub in early 2022. On the ground observations during habitat data collection indicated that vegetation regrowth during late June altered the amount of habitat present at Indian Ridge Marsh-North and the southern end of Big Marsh near the cinder block look-out. We expect these changes to enhance marsh bird use in 2022 at both sites. Emergent cover along the western edge of Eggers continues due to invasive control though most rails were found using the emergent patches of phragmites in the southeast corner.

Conclusions

Marsh bird monitoring results generally showed a decrease in occupancy of marsh birds in 2021 at Illinois Calumet wetlands compared to previous years. Marsh bird monitors and managers alike noticed a decline in water availability due to drought conditions in the spring of 2021 though this wasn't necessarily reflected in the mean water level data since the averaged values were relatively stable at most sites across years. A combination of low water levels and an absence of emergent vegetation at the southern section of the main pool at Big Marsh may both have contributed to the lower occupancy of marsh birds at this site in 2021. Although the vegetation at the south section of Big Marsh grew back in at the end of the season, it was mostly a mud flat during May and early June. The mud however, provided key habitat for migratory shorebirds during spring 2021. The benefit that mud flats provide for migratory shorebirds in Calumet

demonstrates a conservation opportunity, but also highlights potential trade-offs that may exist when managing the same wetland for multiple bird species groups.

The future direction of Audubon Great Lakes marsh bird monitoring will be to better integrate site-level marsh bird and habitat monitoring results with individual conversations with land managers. In early 2022, with the official update to the web-based Marsh Bird Monitoring Hub, we will be reaching out to managers to schedule these conversations. We're looking forward to discussions that will help the Audubon Great Lakes team better assist managers with planning restoration actions that can have a positive impact on bird populations. In addition, we see this as an excellent opportunity for a mutual learning experience where both Audubon Great Lakes and our partners can work together toward conservation solutions for birds and people.

*Table 2. Marsh bird species detected during 2021 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	Swamp Sparrow	Blue-winged Teal	Black-crowned Night-Heron	Least Bittern	Pied-billed Grebe	American Coot	Common Gallinule	King Rail	American Bittern	Species Richness
Big Marsh	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		10
Hegewisch Marsh	✓	✓	✓	✓	✓			✓	✓	✓			8
*Powderhorn Lake & 136th St Marsh**	✓	✓	✓	✓	✓		✓		✓			✓	8
*Orland Grassland**	✓	✓	✓	✓	✓		✓	✓			✓		8
*Burnham Prairie**	✓		✓	✓	✓	✓	✓	✓					7
Eggers Grove	✓	✓		✓	✓	✓		✓					6
Wolf Lake Pools 5 & 9	✓	✓	✓	✓	✓	✓							6
Whitford Pond	✓	✓	✓	✓	✓								5
Deadstick Pond	✓	✓	✓	✓									4
Indian Ridge Marsh	✓	✓			✓	✓							4
Sand Ridge Nature Center	✓	✓	✓	✓									4
*Gensburg-Markham Prairie**	✓	✓	✓					✓					4
Marian Byrnes Prairie	✓	✓	✓										3

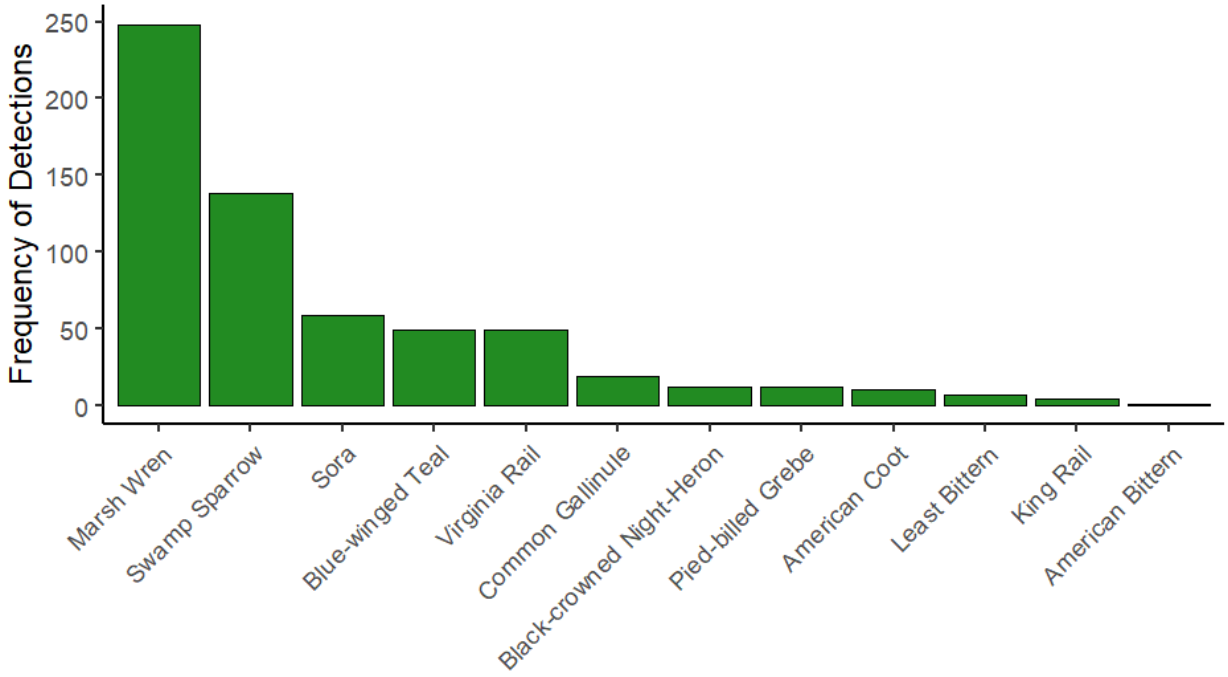


Figure 2. Combined frequency of detections per species during marsh bird surveys at all Illinois Calumet wetland sites in 2021.

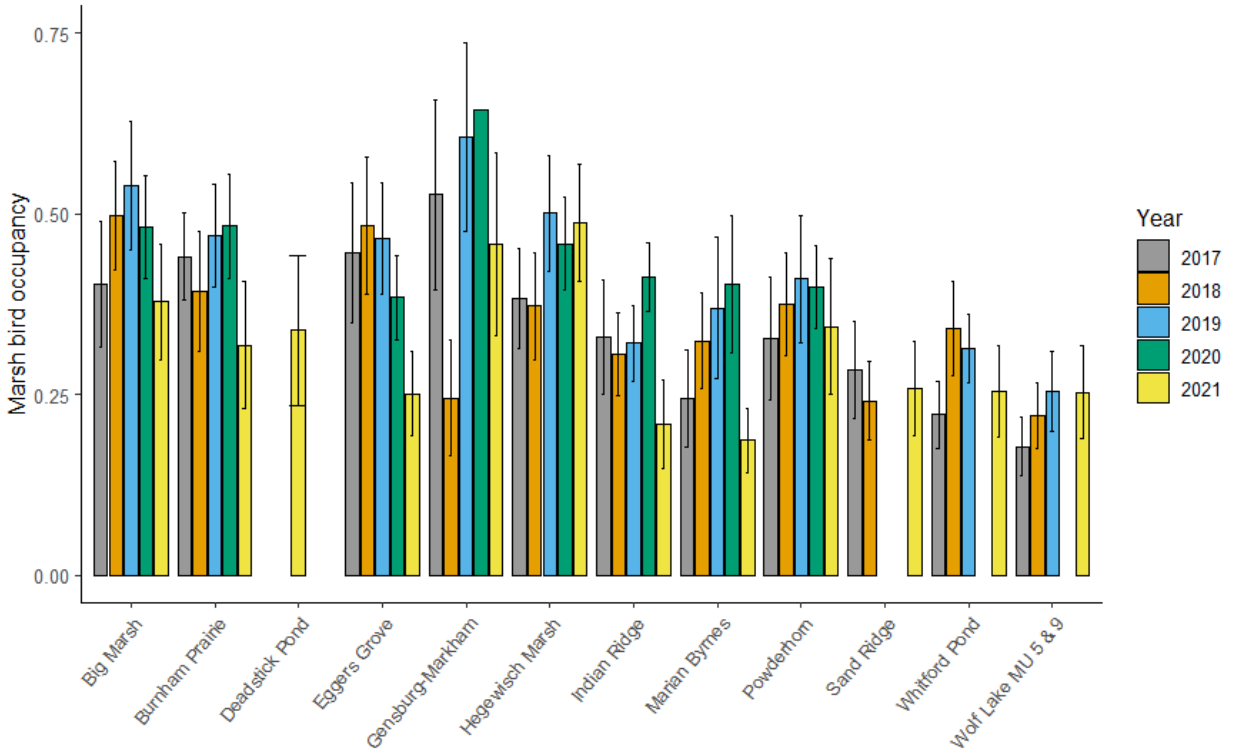


Figure 3. Average marsh bird occupancy at wetland sites for 2017-2021 Illinois Calumet marsh bird surveys. Not shown: Orland Grassland.

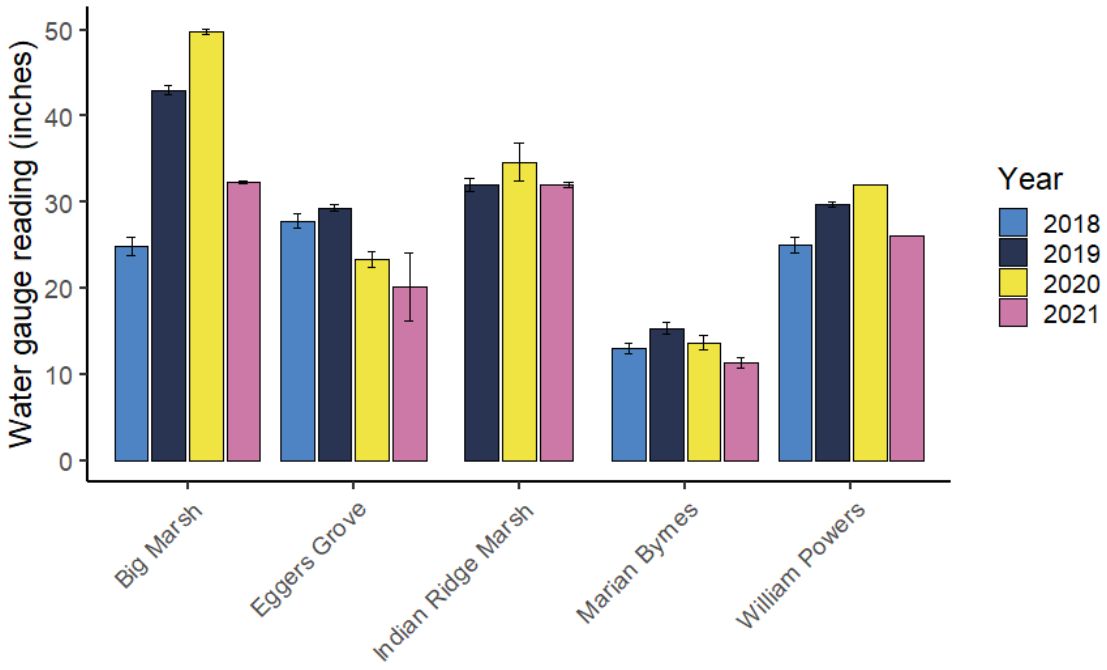


Figure 4. Mean water level recorded at staff gauges at Illinois Calumet marshes during 1 May-15 June 2018-2021, for gauges with at least three years of data.

References

Bird Studies Canada. (2009). Marsh Monitoring Program participant's handbook for surveying marsh birds. Bird Studies Canada in Cooperation with Environment Canada and the U.S. Environmental Protection Agency, Port Rowan, Ontario, Canada.

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