



**ILLINOIS NATURAL
HISTORY SURVEY**
PRAIRIE RESEARCH INSTITUTE

UNIVERSITY OF ILLINOIS
Prairie Research Institute
Brian D. Anderson, Executive Director

Illinois Natural History Survey
Geoffrey A. Levin, Director
Forbes Natural History Building
1816 South Oak Street
Champaign, IL 61820
(217) 333-6830

Wetland Management Strategies that Maximize Marsh Bird Use in the Midwest

Annual Report

Period: 1 July 2014 – 30 June 2015

Prepared by:

Heath M. Hagy¹,
& Douglas R. McClain

¹Director, Forbes Biological Station
Frank C. Bellrose Waterfowl Research Center
P.O. Box 590, Havana, IL 62644
Phone: (309) 543-3950
Email: hhagy@illinois.edu

INHS Technical Report 2015 (29)

Prepared for:

United States Fish and Wildlife Service
Contract Number: F14AP00485

Issue Date: 28 September 2015

Unrestricted – Release immediately

Introduction

Marsh birds are an understudied guild of wetland-associated species that can be valuable indicators of wetland health and condition (Conway 2011). As wetlands have declined in Illinois, likely so have marsh birds (Bolenbaugh et al. 2011), but until recently, lack of standardized monitoring protocols made assessing population size and wetland occupancy difficult (Conway et al. 1994, Eddleman et al. 1988). Until recently, the Breeding Bird Survey (BBS) data served as the sole large-scale source of information on marsh bird abundance, distribution, and population trends despite the known biases for this group of relatively inconspicuous birds (Sauer et al. 2004, Conway 2011). However, recent work by the USFWS and other partners has resulted in a framework for coordinated survey design, sampling methods, and data collection and sharing for marsh bird monitoring. Despite existence of this framework and support from a large number of entities, a nationwide program similar to the BBS for marsh birds may not be feasible or financially sustainable. Therefore, there is currently a need for regional-scale, multi-objective projects that adopt approved marsh bird monitoring protocols and methods and produce estimates that can be scaled up and inform a national monitoring effort.

Wetland management in the Midwest for wildlife is often used to increase energetic carrying capacity for waterfowl, primarily dabbling ducks (Soulliere et al. 2007a). Other conservation initiatives encourage multi-species design and management, but often waterfowl are a primary focal group (King et al. 2006, Soulliere et al. 2007b, DeStevens & Gramling 2012). It is widely assumed that waterfowl management activities benefit other birds, but few studies have quantified those benefits or evaluated tradeoffs among management strategies for multiple species (O'Neal et al. 2008, Gray et al. 2013). A key assumption of several conservation planning documents is that waterbird (e.g., shorebird, secretive marsh bird) habitat and population objectives can be accomplished by fulfilling waterfowl habitat objectives (e.g., shorebirds [Upper Mississippi Valley / Great Lakes Shorebird Conservation Plan; de Szalay et al. 2000, Potter et al. 2007], waterbirds [Illinois Wetlands Campaign; Schultheis and Eichholz 2013]). However, few researchers have examined the relationship between wetlands managed for waterfowl and the provision of habitat for other migratory birds, especially in the breeding season. In fact, the Wetlands Campaign of the IDNR identifies the “contribution of moist-soil management to wildlife objectives” as an important information gap which requires additional research.

Moreover, intrinsic vegetation characteristics may be less important than wetland surroundings (DeLuca et al. 2004) and size (Brown and Dinsmore 1986) in site occupancy of marsh birds. However, wetland characteristics, such as emergent vegetation type and height, can influence occupancy rates of wetland complexes, but associations with intrinsic and extrinsic factors are highly variable in the Midwest, perhaps because habitat is limited (Bolenbaugh et al. 2011). Thus, wetlands managed for other species (e.g., dabbling ducks) may provide benefits to marsh birds collectively or a subset of species (e.g., rails). Ancillary observations indicate that wetland drawdowns during the summer for emergent vegetation production attract several secretive marsh bird species (Heath Hagy, INHS, personal observation); however, data on densities, timing of occupancy, and associated management practices (e.g., drawdown timing, vegetation species composition, etc.) are unknown.

We determined marsh bird use across a wide range of wetland types (e.g., emergent, non-vegetated, riparian), hydrologic regimes (e.g., temporary, seasonal, semi-permanent), management practices (e.g., active, passive, unmanaged), and past disturbance regimes (e.g., natural and restored through Wetlands Reserve Program, impounded and unimpounded) in Illinois during late spring and early summer 2015. Our objectives were to 1) compare marsh bird use of wetland impoundments managed for waterfowl

across a continuum of management intensities and strategies to predict how impoundment management actions can increase use by both groups, 2) compare marsh bird use of restored and natural wetlands, and 3) determine characteristics of wetlands and the surrounding landscape that influence marsh bird use of restored wetlands. Additionally, we surveyed marsh birds using the standard protocol timing and methodology on wetlands concurrently surveyed within the Illinois Critical Trends Assessment Program for comparison of methodologies.

Methods

We devised three distinct sample populations for marsh bird surveys: 1) random wetlands, 2) focal wetlands (managed or restored), and 3) CTAP wetlands. For random wetlands, we stratified Illinois by natural division and allocated survey effort in proportion to wetland density within natural divisions. We consolidated National Wetland Inventory (NWI) polygons into 6 classes (Freshwater Pond, Lake, Freshwater Emergent [herbaceous only], Freshwater Scrub-Shrub/Forested, Riverine, and Other) and used total wetland area to determine the number of sample plots in each natural division with Neyman allocation (160 plots as maximum sampling effort). We then used the Reversed Randomized Quadrant-Recursive Raster tool in ArcMap to assign plot locations within wetland area inside each natural division, which created a more spatially-balanced sample population than simple random allocation. We established 1-km² plots as sample units and used aerial photos to determine if wetlands within each plot likely contained emergent aquatic vegetation. If wetlands likely contained suitable habitat conditions for marsh birds, they were retained and entered into a sample population. We subsequently chose approximately 20 random wetlands from this population for sampling. A sample population of focal wetlands was built by communicating with private landowners, state and federal agency personnel, and Illinois Natural History Survey staff until approximately 50 wetlands managed for waterfowl were identified. We randomly choose approximately 20 of these wetlands for sampling. Similar to random plots, we obtained the 2015 CTAP wetland sampling schedule and used field notes and aerial photographs to determine a sample population where marsh bird habitat was present. Due to a limited sample size, we sampled all CTAP wetlands where there was evidence of emergent aquatic vegetation.

Prior to marsh bird surveys, observers visited each wetland and established 1–5 fixed sample points that were readily accessible and within or adjacent to emergent aquatic vegetation. Sample points were marked with GPS coordinates. Points were spaced at least 400m apart and the number of points per wetland was determined by size and configuration given the spacing constraints. We restricted the maximum number of survey points to allow observers to survey multiple wetlands in a single sampling period. Wetlands less than 0.5 ha in size were not sampled (Conway 2011). All points within each wetland were considered a survey “route” and all surveys were conducted between ½ hour before sunrise and 2 hours after sunrise (Bolenbaugh et al. 2011). We used a 5-min passive survey followed by a 1-min alternating series of calls and silence of least bittern (*Ixobrychus exilis*), yellow rail (*Coturnicops noveboracensis*), black rail (*Laterallus jamaicensis*), king rail (*Rallus elegans*), Virginia rail (*Rallus limicola*), sora (*Porzana carolina*), common gallinule (*Gallinula galeata*), American bittern (*Botaurus lentiginosus*), American coot (*Fulica americana*), and pied-billed grebe (*Podilymbus podiceps*). Calls were broadcast using Western Rivers Pursuit (Maestro Game Calls, LLC., Dallas, Texas, U.S.A.) and Primos Turbo Dogg (Primos Hunting, Flora, Mississippi, U.S.A.) electronic game calls. Game calls were pointed toward emergent vegetation at each point, while repeated surveys at each

survey point were conducted in the same cardinal direction. Calls were broadcast at a volume of 80-90dB. Observers estimated distance and direction of each individual by species and recorded covariates possibly important for estimating detection probability (e.g., ambient noise level, wind speed, cloud cover, precipitation, etc.). In subsequent years when more data are available, we will estimate density and abundance using distance methods (Buckland et al. 2001, Johnson et al. 2009). Subsequently, we report means and variances from raw count data compared between wetland types and survey periods.

Following surveys, investigators surveyed wetland vegetation and condition using a modified version of the Environmental Protection Agency's National Wetland Condition Assessment rapid assessment method (USA-RAM; Gray et al. 2012). The USA-RAM procedure used potential stressors as indicators of wetland condition, yet inclusive of metrics indicative of wetland quality for marsh birds under a wide variety of modified conditions (e.g., management of hydrology, presence of water control structures, drawdown timing, etc.). Methods were approved by the University of Illinois Institutional Animal Care Use Committee (#15029) and permissions and permits were acquired from all federal (USFWS), state (IDNR), and private sites (TNC) where they were required.

Timeline

July 2014 – March 2015	Prepare for first field season; Obtain permits and permissions to conduct surveys; work with USFWS and other conservation partners to finalize survey design; ground-truth study sites; select sampling units; hire and train field personnel
April – June 2015	Conduct marsh bird surveys and collect vegetation and wetland condition data
July – September 2015	Perform QA/QC on data, analyze data, summarize results, compile reports, and present findings; share data with project collaborators and deposit within the AKN;

Results

We surveyed 21 random sites, 15 focal sites, and 10 CTAP sites during 25 April through 16 June 2015. Additionally, we conducted marsh bird surveys on 6 Wetland Reserve Easements in conjunction with a separate project, but those data are not yet available for dissemination (Fig. 1). We visited each site 3 times, once during each survey period at the appropriate latitude. Our study sites overlapped two latitudinal zones across Illinois (Conway 2011).

We detected 59.3% of individuals during our first survey period, followed by 28.3% during our second survey period and 12.4% during our third survey period. American coot, king rail, and sora detections declined with survey period whereas common gallinule, least bittern, and pied-billed grebe increased with survey period. American bittern, Virginia rail, and yellow rail detections were relatively uncommon and showed no pattern in relation to survey period. American coot (56.3%), sora (24.0%), and pied-billed grebe (10.0%) were the most common species and accounted for >90% of detections (Table 1). The number of individuals detected per survey location decreased by approximately 0.2 detections/day, although the relationship was nonlinear and most detections occurred during late April and early May, regardless of latitude (Figure 2). Species richness followed a similar trend declining approximately 0.04 species/survey location/day, although the trend was nonlinear and richness increased during the last survey period (Figure 4).

Total marsh bird detections were greatest on focal sites (15.5 ± 4.6 detections/survey/site), followed by random (2.6 ± 0.6 detections/survey/site) and CTAP sites (0.4 ± 0.2 detections/survey/site). Sites where wetland management practices were evident (8.8 ± 2.8 detections/survey/site) had more detections than those without management practices present (3.5 ± 0.9 detections/survey/site). Similarly, restored wetlands (7.9 ± 1.9 detections/survey/site) had more detections than natural wetlands (2.3 ± 1.9 detections/survey/site).

In future years when more data are available, we will model marsh bird detections by various wetland management actions and generate density estimates using a detection function. We will also compare marsh bird detections from our survey with detections from the CTAP program and Wetland Reserve Easements, pending data availability.

Literature Cited

- Bolenbaugh, J.R., D.G., Krementz, and S.E. Lehnen. 2011. Secretive marsh bird species co-occurrences and habitat associations across the Midwest, USA. *Journal of Fish and Wildlife Management* 2:49–60.
- Brown, M., and J.J. Dinsmore. 1986. Implications of marsh size and isolation for marsh bird management. *Journal of Wildlife Management* 50:392–397.
- Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers, and L. Thomas. 2001. *Introduction to Distance Sampling*. Oxford University Press, Oxford, UK.
- Conway, C.J. 2011. Standardized North American marsh bird monitoring protocol. *Waterbirds* 34:319–346.
- Conway, C.J., W. R. Eddleman, and S.H. Anderson. Nesting success and survival of Virginia rails and soras. *Wilson Bulletin* 106:466-473.
- DeLuca, W.V., C.E. Studds, L.L. Rockwood, and P.P. Marra. Influence of land use on the integrity of marsh bird communities of Chesapeake Bay, USA. *Wetlands* 24:837–847.
- DeStevens, D., and J.M. Gramling. 2012. Diverse characteristics of wetlands restored under the Wetlands Reserve Program in the Southeastern United States. *Wetlands* 32:593–604.
- Gray, M. J., H. A. Hagy, J. A. Nyman, and J. D. Stafford. 2014. Management of wetlands for wildlife. *In* C. A. Davis and J. T. Anderson, editors. *Wetland Techniques*, Volume 3, Springer, Secaucus, New Jersey, USA.
- Johnson, D.H., J.P. Gibbs, M. Herzog, S. Lor, N.D. Niemuth, C.A. Ribic, M. Seamans, T.L. Shaffer, W.G. Shriver, S.V. Stehman, and W.L. Thompson. 2009. A sampling design framework for monitoring secretive marshbirds. *Waterbirds* 32:203–215.
- King, S.L., D.J. Twedt, and R.R. Wilson. 2006. The role of the wetland reserve program in conservation efforts in the Mississippi River Valley. *Wildlife Society Bulletin* 34:914–920.
- Koch, K.E., T. Will, G.J. Soulliere, B. Bartush, R. Mordecai and R. Brady. 2010. Framework for the Midwest Coordinated Bird Monitoring Partnership: 2010-2012. USFWS, Fort Snelling, MN, USA. 16 pages
- O’Neal, B.J., E.J. Heske, and J.D. Stafford. 2008. Waterbird response to wetlands restored through the Conservation Reserve Enhancement Program. *Journal of Wildlife Management* 72:654–664.
- Potter, B. A., R. J. Gates, G. J. Soulliere, R. P. Russell, D. A. Granfors, and D. N. Ewert. 2007. Upper Mississippi River and Great Lakes Region Joint Venture Shorebird Habitat Conservation Strategy. U. S. Fish and Wildlife Service, Fort Snelling, Minnesota, USA.

- Sauer, J. R., Niven, D. K., and W. A. Link. 2004. Statistical analyses make the Christmas bird count relevant for conservation. *American Birds* 58:21–25.
- Schultheis, R. D., and M. W. Eichholz. 2013. A multi-scale wetland conservation plan for Illinois. Prepared for Illinois Department of Natural Resources, Springfield, Illinois, USA.
- Soulliere, G. J., B. A. Potter, J. M. Coluccy, R. C. Gatti., C. L. Roy, D. R. Luukkonen, P. W. Brown, and M. W. Eichholz. 2007a. Upper Mississippi River and Great Lakes Region Joint Venture waterfowl habitat conservation strategy. U.S. Fish and Wildlife Service, Fort Snelling, Minnesota, USA.
- Soulliere, G. J., B. A. Potter, D. J. Holm, D. A. Granfors, M. J. Monfils, S. J. Lewis, and W. E. Thogmartin. 2007b. Upper Mississippi River and Great Lakes Region Joint Venture waterbird habitat conservation strategy. U.S. Fish and Wildlife Service, Fort Snelling, MN, USA. 68pp.
- Soulliere G.J., B.M. Kahler, M.J. Monfils, K.E. Koch, R. Brady, and T. Cooper. 2012. Coordinated conservation and monitoring of secretive marsh birds in the Midwest –2012 workshop review and recommendations. Upper Mississippi River and Great Lakes Region Joint Venture Technical Report No. 2012-2, Bloomington MN, USA. <online>
<http://wiatri.net/projects/birdroutes/Xtras/Marshbird/MidwestMarshbirdWorkshop2012.pdf>.
- Stevens, D.L., and A.R. Olsen. 2004. Spatially balanced sampling of natural resources. *Journal of the American Statistical Association* 99:262–278.
- de Szalay, F., D. Helmers, D. Humburg, S. J. Lewis, B. Pardo, and M. Sheildcastle. 2000. Upper Mississippi Valley/Great Lakes Regional Shorebird Conservation Plan: Version 1.0. U.S. Shorebird Conservation Plan.

Table 1. Number of marsh bird detections by species during three survey periods in spring 2015.

Species	Survey Round			Total
	1	2	3	
American bittern	11	2	6	19
American coot	311	162	23	496
Black rail	0	0	0	0
Common gallinule	0	8	18	26
King Rail	3	0	0	3
Least bittern	2	7	9	18
Pied-billed grebe	23	28	37	88
Sora	165	34	12	211
Virginia Rail	7	7	4	18
Yellow Rail	0	1	0	1
Total	522	249	109	880

Figure 1. Locations of marsh bird surveys conducted during spring 2015 at random sites, focal sites, Critical Trends Assessment Program Sites (CTAP), and National Resource Conservation Program Wetland Reserve Easements (WRP).

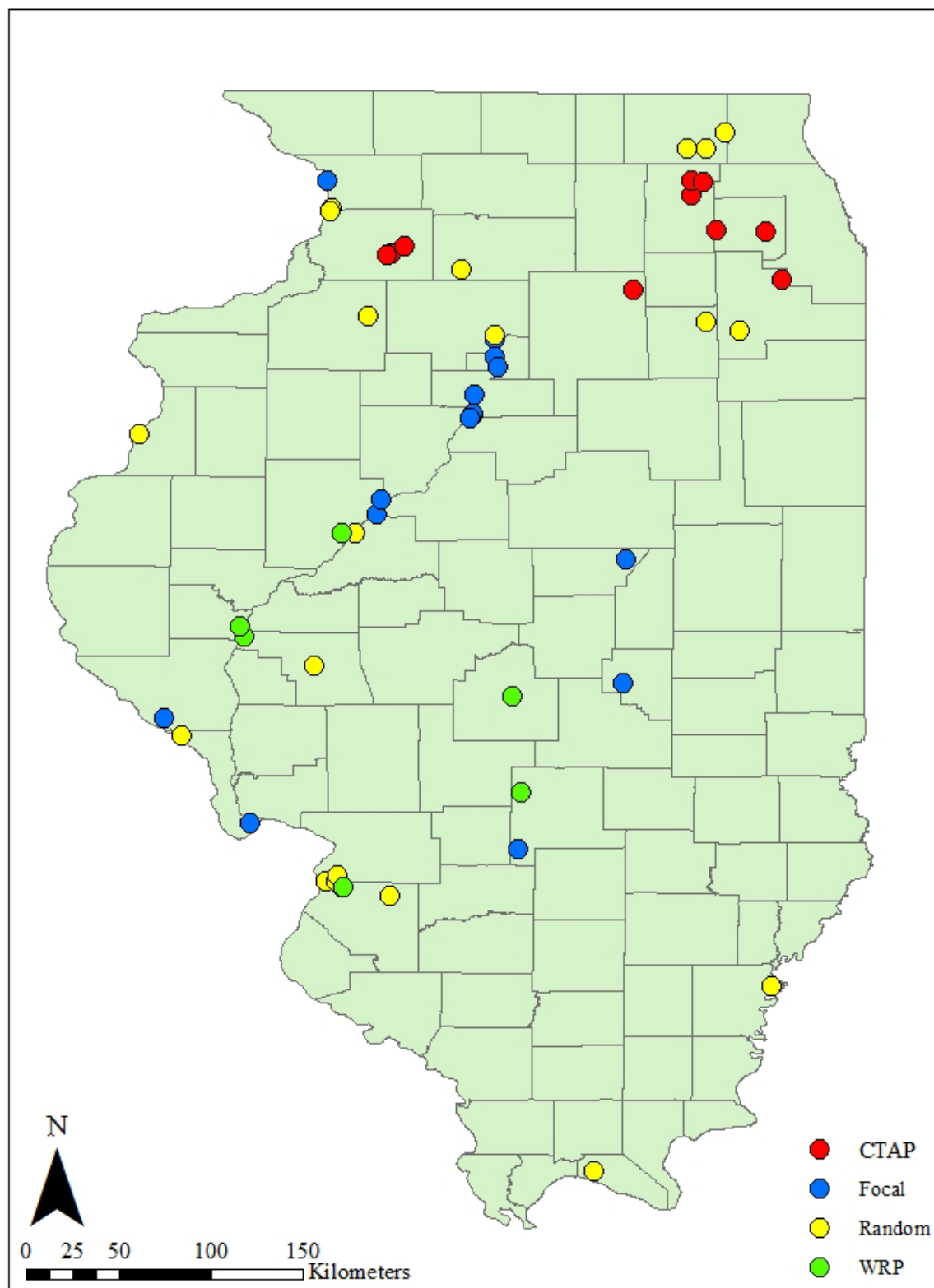


Figure 2. Number of marsh bird detections, corrected for survey effort, in relation to survey date in Illinois during spring 2015.

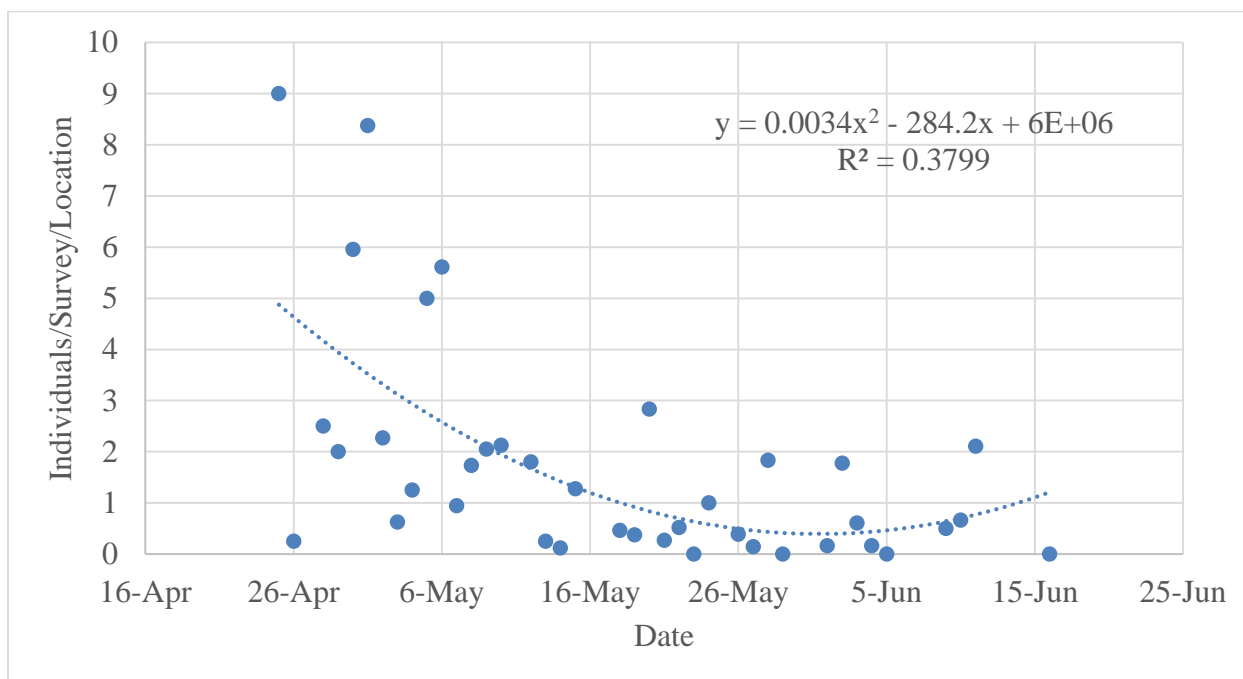


Figure 3. Number of marsh bird detections, corrected for survey effort and excluding the most common species, American coot (*Fulica americana*), in relation to survey date in Illinois during spring 2015.

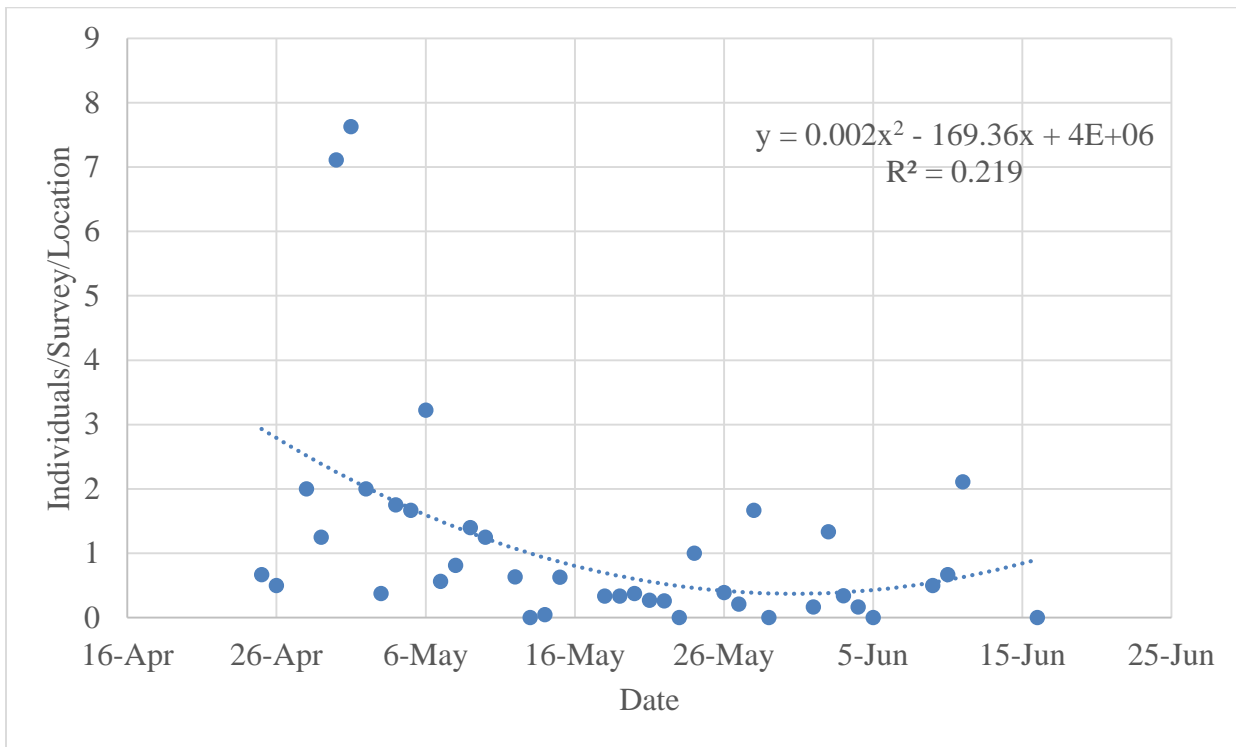
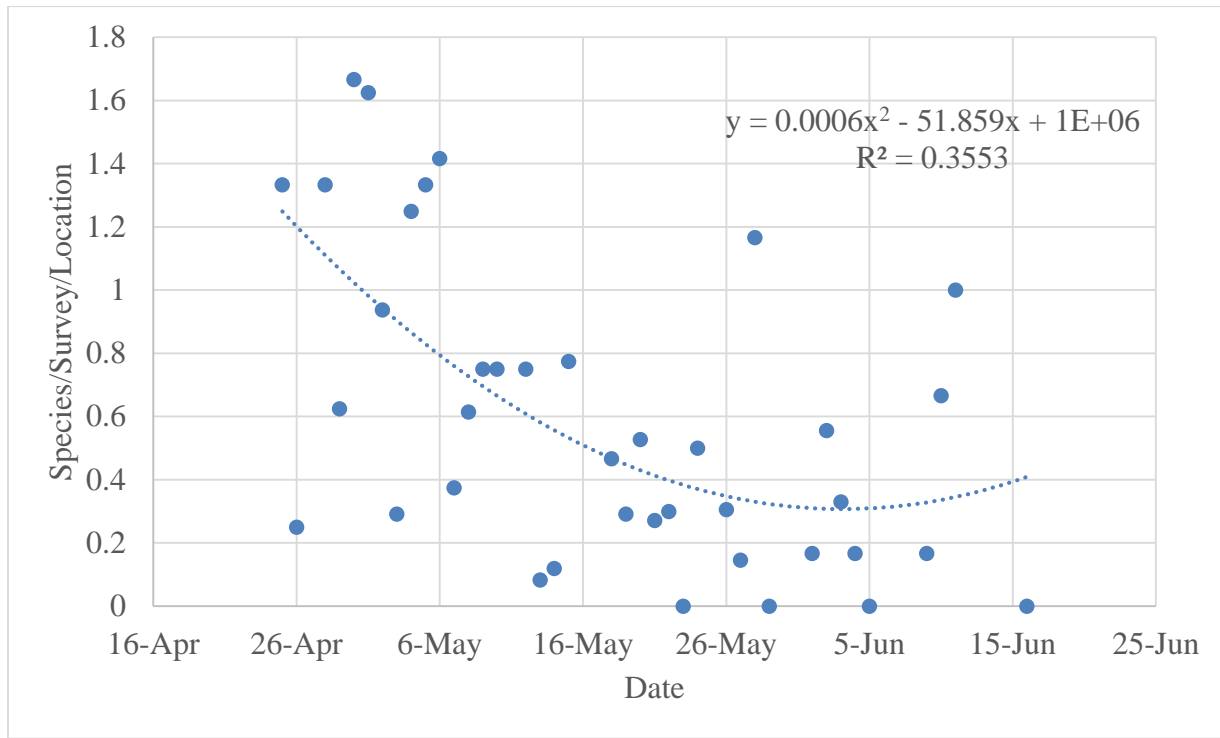


Figure 4. Number of marsh bird species detections, corrected for survey effort, in relation to survey date in Illinois during spring 2015.



Submitted by:

A handwritten signature in cursive script that reads "Heath M. Hagy". The signature is written in dark ink and is positioned below the "Submitted by:" text.

Heath M. Hagy, Ph.D., AWB
Director, Forbes Biological Station
Illinois Natural History Survey

Date: 28 September 2015