Winous Point Marsh Conservancy

2015 Research and Activities Report

February 2015

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On the cover: Shorebird researchers and long-time Winous Point partners Tom Bartlett (left) and Tom Kashmer (right) hold the 10,000th shorebird that they have banded in their careers. Shorebird banding began in 2006 and since that time they have banded over 10,000 shorebirds of 28 different species. Their banded shorebirds have been re-sighted on several Caribbean islands, Brazil, and the southern end of Chile. Their banding dataset represents one of the largest and most extensive shorebird datasets ever compiled and has been used by graduate students and researchers on several projects here at Winous Point.

Winous Point Marsh Conservancy

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Executive Summary

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In the late 1940's and early 1950's Winous Point Marsh Conservancy began (originally Winous Point Research Committee) as a graduate student sponsorship agreement to facilitate research projects on Ohio's coastal marshes. The program grew over the next few decades as an increasing list of research needs were identified and as the program expanded to include other conservation projects beyond research. In 1999 the WPMC was incorporated to handle this growing research program and, in part, to facilitate conservation protection by easement of part of Winous Point marshlands. This past year (2015) was no exception to previous growth as we added a fifth employee to the program, an additional third summer internship, several new research projects of our own interest and in cooperation with old and new partners, and continued to investigate additional easement protection and marsh restoration projects.

We were excited this year to bring Mike Picciuto (University of Toledo) on board. Mike had assisted some of our bird banding programs in the past and when we were in need of assistance with winter duck banding we hired him. He quickly proved himself and now through a variety of grants we employ Mike full-time. He is primarily in charge of field operations for all of our waterfowl banding and marking projects, our marshbird (rails) banding and survey projects, and our submerged aquatic vegetation sampling project. We also brought a new coordinator on this year to manage the ongoing regional Cooperative Weed Management Area (CWMA), now in its seventh year. Oliver Cornet (Ohio State University) works with all of the partners of the CWMA to deliver invasive species control and management on parcels of land stretching from Mentor Marsh (Cleveland) to Toledo. Both Mike and Oliver were assisted this year by our three seasonal interns Dave Cornet (OSU), Luke Costilow (WVU), and Sam Burns (WVU) who rotated amongst research projects and Winous Point's ongoing maintenance and marsh management projects.

The need for additional employees at Winous Point was largely driven by recent expansion in the research program that has occurred thanks, in part, to the hard work of Brendan Shirkey. New or recent projects that filled our schedule this year include a cooperative mallard research project with Long Point Waterfowl (Page 6), regional submerged aquatic vegetation sampling and abundance estimates in partnership with the Illinois Natural History Survey, Forbes Biological Station–Bellrose Waterfowl Research Center (Page 26), several marshbird research projects funded and conducted with a variety of partners and sources (Pages 34 and 38), and two

cooperative projects with the Ohio Division of Wildlife analyzing statewide waterfowl band recovery data (Pages 14 and 18) and using remote satellite sensing to map and ID wetland plant communities in northwest Ohio (Page 31).

In addition to the research presented in this report Winous Point Marsh Conservancy continues to be involved conservation projects and programs both on our property and regionally. We worked diligently in 2015 toward protecting the remainder of the WPMC landholdings under permanent wetland easement, with over 2000 acres nearly protected. Winous Point continues to seek funding and support for coastal wetland restoration projects and was awarded a $950,000 Sustain Our Great Lakes coastal wetland restoration grant this past year. The staff is active in regional working groups and partnerships that align with the goals guiding the WPMC including the Upper Mississippi/Great Lakes Joint Venture, Long Point Waterfowl, the Great Lakes Partners Forum, and several regional conservation education programs.

Lastly, take another look at the cover photo and the note inside the front cover. Last August our long-time partners and volunteers Tom Bartlett and Tom Kashmer banded their 10,000th shorebird in northwest Ohio, including many at Winous Point this past summer. What a tremendous accomplishment and dataset for future researchers here and elsewhere! See Page 46 for more information on this project.

The Winous Point Marsh Conservancy has been able to continually grow, evolve, and develop because of the generous support and dedication we receive from our trustees, donors, partners, and neighbors. We genuinely value the support that our partners and contributors bring Winous Point and look forward to many challenges and accomplishments next year and beyond.

Regards,

John Simpson

Influenza A virus surveillance in wild, free-ranging waterfowl at Winous Point Marsh, Port Clinton, OH: 1986-2014

Investigators: Andrew S. Bowman, Richard D. Slemons, and Jacqueline M. Nolting, Animal Influenza Ecology and Epidemiology Research Program, Department of Veterinary Preventive Medicine, The Ohio State University

Collaborators: USDA National Research Initiative, The Ohio State University, Ohio Division of Wildlife, Winous Point Marsh Conservancy, other private landowners.

Schedule: 1986 - Present

Summary: For more than twenty years Winous Point Marsh Conservancy (WPMC), the Ohio Department of Wildlife, and the Department of Veterinary Preventive Medicine at The Ohio State University have participated in a proactive, collaborative influenza A virus surveillance program in wild, free-ranging ducks. The objectives of this ongoing effort are to: 1) better define the natural history of influenza A virus in wild birds (how the genetic and antigenic diversity of these viruses are maintained in the duck population over time); 2) assess the threat these viruses present to wild birds and domestic birds; 3) and since 2003, contribute to the national effort to detect the introduction of the Asian lineage of high pathogenic H5N1 avian virus into North America via wild birds. Fortunately, no one has detected the movement of the Asian high pathogenic H5N1 influenza virus into the Western Hemisphere by wild birds or by humans, exotic birds or animal products. Over the years our collaborative project has provided valuable insight into the natural history of influenza A viruses in waterfowl and demonstrated that the threat presented to the poultry industry by these low pathogenic viruses can simply be addressed by the widely accepted, standard biosecurity measures currently being used by the U.S. poultry industry. Lastly, our, and other investigators have not shown influenza A virus infections to have a significant negative impact on waterfowl populations; however, more work is needed in this area.

Publications:

1. Nolting JM, Fries AC, Gates RJ, Bowman AS, Slemons RD. "Influenza A viruses from over-wintering and spring-migrating waterfowl in the Lake Erie Basin, United States." Avian Diseases. (In Press).

Table 1 provides the number of samples collected at WPMC by year since 1986 and the number of type A influenza viruses recovered from these samples.

Table 1. Type A Influenza samples collected and tested at Winous Point Marsh, Port Clinton, OH since 1986.

Year	# Collected	# Flu Positive	% Positive
1986	191	18	9.42
1987	196	3	1.53
1988	104	4	3.85
1989	0	0	0
1990	0	0	0
1993	54	0	0
1998	0	0	0
1999	58	4	6.9
2000	22	3	13.64
2001	56	12	21.43
2002	96	7	7.29
2003	39	4	10.26
2004	106	5	4.72
2005	222	18	8.11
2006	346	21	6.07
2007	458	11	2.4
2008	549	36	6.56
2009	652	48	7.36
2010	657	57	8.68
2011	356	20	5.62
2012	712	39	5.48
2013	1192	185	15.52
2014	925	50	5.41
2015	1039	84	8.07
Total	**8030**	**629**	**7.83**

Winous Point supports this project through shorebird and waterfowl sample collections, assistance with trapping waterfowl and shorebirds, and housing interns and staff as needed.

Habitat selection and survival of mallards in the Lake St. Clair and Sandusky Bay region during autumn and winter

Investigators: Matthew Palumbo Ph.D. student, Long Point Waterfowl, Western University; Dr. Scott A. Petrie, Western University; Dr. Chris G. Guglielmo, Western University; Dr. Michael Schummer, Long Point Waterfowl Scientist; John Simpson and Brendan Shirkey, Winous Point Marsh Conservancy, Port Clinton, OH

Schedule: 2014 - 2017

Summary: The Lake St. Clair region of southern Ontario and the wetlands of western Lake Erie provide important staging habitat for millions of waterfowl from the Atlantic and Mississippi Flyways. Unfortunately, this region has experienced significant habitat loss from converting wetlands to agriculture. The habitat that remains is threatened by additional conversion in addition to stress from invasive species, industrial development, and population growth. Additionally, these wetlands may continue to experience increased use by waterfowl as a result of warmer winters and consequently more and more birds using the region as a wintering destination rather than a migration stop-over.

Despite the threats to the waterfowl habitat and the potential for increased future use, little is known about how waterfowl use the remaining habitat and the impacts on their survival during autumn and winter. This project will estimate waterfowl use of different habitat types (e.g. flooded agriculture, dry agriculture, open water, emergent marsh) and how this use is influenced by land management practices. The project will also examine how daytime and nighttime habitat use varies within mallards and how that behavior affects their associated fall and winter survival.

2015 Project Update: In Year 2 of this mallard project, approximately 40 adult hen mallards (*Anas platyrhynchos*) were equipped with satellite transmitters (Northstar Telemetry) on Lake St. Clair, ON and 22 adult hen mallards were equipped with transmitters at Winous Point, OH during summer banding efforts (Figure 1). Each of these transmitters will provide up to eight daily GPS locations on a duck and will download data via cellular towers. In addition, each point is tagged with date, time, and a host of other information that can be utilized for habitat selection analyses.

Figure 1. Female mallard equipped with a solar-powered GPS transmitter.

Winous staff deployed 22 satellite transmitters during July and August of 2015. Of those 22, four were predated prior to duck season, one transmitter failed, one duck left the study area, and two were censored as they appeared unhealthy, leaving 14 active transmitters at the beginning of fall waterfowl hunting season. We were able to get our first glimpse into survival rates of mallards in the northwest Ohio region as eight of the 14 birds were harvested by hunters (two in local public marshes, 5 in local private hunting clubs, and one in southern Ohio). Furthermore, we received an initial look at migratory departure dates of local mallards as six of the seven actively transmitting ducks all left the Sandusky Bay Region at the first significant ice (Dec. 20 - 22) and did not return to the region when milder temperatures returned. Interestingly, a number of our transmitter ducks migrated east to the Akron/Canton area in addition to several that took a more traditional route south to areas surrounding Columbus, OH and one duck that went as far as southern Kentucky (Figure 2).

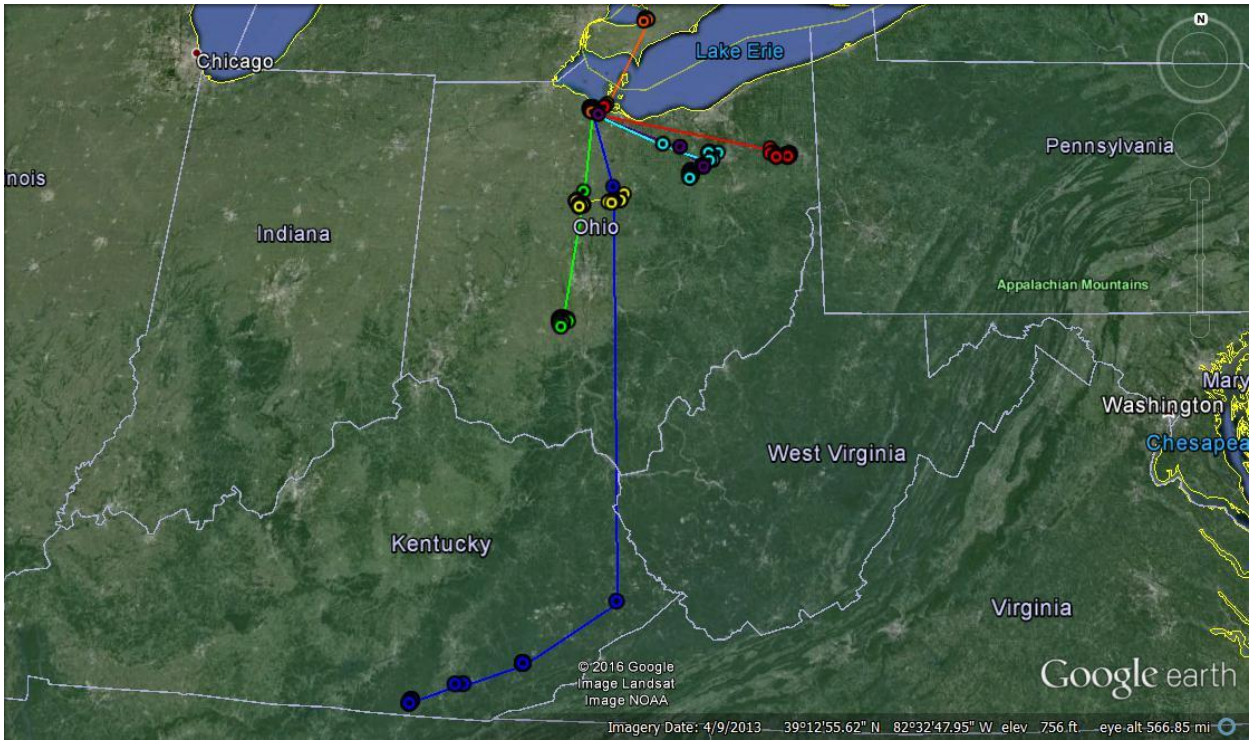

Figure 2. Migratory paths for six marked mallards from Winous Point and one marked mallard from Lake St. Clair in late December, 2015 and early January, 2016.

We obtained 3,318 GPS locations from these 14 birds providing some of the first quantifiable data on mallard habitat use and survival in the Sandusky Bay region during autumn and winter. Currently, we have only just begun to summarize the GPS location data for the Ohio birds by assigning each point to a habitat class (emergent marsh, flooded agriculture, dry agriculture, open water, or residential; Figure 3). Duck use during duck season was highest in the emergent marsh class (58%), followed by flooded agriculture (28%), open water (13%), and residential ponds (1%).

Figure 3. Satellite-marked duck locations in relation to habitat type for 14 marked hen mallards in the Muddy Creek Bay region during the 60 days of fall waterfowl hunting season, 2015.

Perhaps one of the more interesting summary statistics is the drastic disparity in daytime vs. nighttime patterns of duck use (Table 1). Emergent marsh, flooded agriculture, and open water (Muddy Creek and Sandusky Bays) received nearly 100% of the duck use, with other categories only accounting for 16 total data points. Within emergent marsh, daytime and nighttime use was nearly evenly split, meaning ducks appear equally likely to use emergent marshes during the daytime or nighttime. Flooded agriculture and open water rest areas were highly skewed; ducks showed a clear avoidance of flooded agriculture in the daytime (only 0.04% of the total locations) and preferred the open water rest areas during the day (81% of the locations in that habitat type).

Table 1. Percentage of total locations by time period (nighttime vs. daytime) for each habitat type for satellite-marked female mallards in Muddy Creek Bay, OH, Fall 2015.

	Nocturnal		Diurnal	
Habitat Type	**# Data Points**	**Percentage**	**# Data Points**	**Percentage**
Emergent Marsh	909	0.47	1019	0.53
Flooded Agriculture	889	0.96	38	0.04
Open Water	87	0.19	360	0.81
Residential	7	0.44	9	0.56
Dry Agriculture	0	0	0	0

The marked ducks all displayed very different habitat use strategies during the fall hunting season. Two ducks used exclusively emergent marsh habitat day and night, another five used emergent marshes primarily during the day and flooded agriculture at night, and the remaining seven used some combination of open water and emergent marsh and flooded agriculture primarily at night. Ultimately, a more rigorous analysis of habitat selection and its interaction with survival of mallards in the Great Lakes region will help influence harvest and habitat management decisions for that region.

Winous Point is a key partner is this project through fundraising, deploying satellite transmitters, and completing harvest surveys, and taking morphometric measurements of mallards.

Control of Invasive Plant Species in Northwest Ohio

Investigators: John W. Simpson, Winous Point Marsh Conservancy; Jeff Finn, U.S. Fish and Wildlife Service; Tara Baranowski, The Nature Conservancy; Oliver Cornet, Lake Erie Cooperative Weed Management Association; Mike Libben, Ottawa Soil and Water Conservation District; and Mark Witt, Ohio Division of Wildlife.

Schedule: Initiated in 2009, long-term

Summary: Aquatic invasive plants threaten the ecological integrity of wetlands across North America. Here in the Western Lake Erie basin invasive plants are especially prevalent and add an extra stressor to the already degraded coastal wetlands. Invasive plants damage coastal wetlands by excluding native vegetation, reducing plant species diversity, and eliminating animal food resources. In addition, invasive plants typically reduce recreational opportunity and limit wetland functions related to water quality and flood storage.

In northwest Ohio the most widespread and damaging invasive plant is *Phragmites australis*, a large perennial rhizomatous grass, or reed. It is widespread in the United States and grows in wetlands usually inhabiting the marsh-upland interface. It is capable of vigorous vegetative reproduction and often forms dense, virtually monospecific stands.

In addition to phragmites, coastal wetlands in western Lake Erie are threatened by flowering rush (*Butomus umbellatus*), a newcomer under close watch, and purple loosestrife (*Lythrum salicaria*), an established species thought to be under control. Several other non-native invasive plant species such as narrow-leaf cattail (*Typha angustifolia*) and reed canary grass (*Phalaris arundinacea*) are prevalent in this region but are not considered as damaging.

In 2009 a cooperative effort including the Winous Point Marsh Conservancy, U.S. Fish and Wildlife Service, The Nature Conservancy, and the Ottawa Soil and Water Conservation District joined forces to create the Lake Erie Cooperative Weed Management Area (CWMA). The program quickly grew, and today the CWMA has a full time staff, consisting of a program coordinator, interns, and steering committee. Due to the popularity of the program it has now expanded its campaign to include combating other top invasives in the area as well as transitioning the program over to a landowner-led initiative (i.e., the CWMA will now start informing landowners through on-site visits and providing literature on how to identify and eradicate invasive plants themselves). While the CWMA will continue to offer the late-summer spraying campaign, the program's new goal is to provide landowners all the information and tools they need to effectively manage invasive plants themselves. The CWMA has been extremely successful and its commitment to the eradication of invasive species through spraying

programs, prescribed burning, and landowner outreach initiatives has been welcome initiative in northwest Ohio (Table 1).

Table 1. On-the-ground Phragmites management accomplishments under the CWMA cooperative program since 2009.

Year	Aerial Application Acres	Ground Application Acres	Prescribed Burn Acres	Mechanical Treatment Acres (Smash/Mow)
2009	550	0	0	0
2010	625	175	0	0
2011	1120	325	0	0
2012	1100	429	318	306
2013	1140	292	113	32
2014	700	50	87	0
2015	1188	80	0	0
Totals:	**6423**	**1351**	**518**	**338**

Beginning in 2011 experimental sampling plots were established within various treatment stands to monitor the effectiveness of various treatment combinations by a) controlling the coverage and density of live phragmites stems, and b) reestablishing a diverse wetland plant community. In total 78 vegetation plots were monitored across 11 different ownerships.

Each treatment type showed a significant reduction in percent cover of live phragmites between 2011 and 2013 (Figure 1).

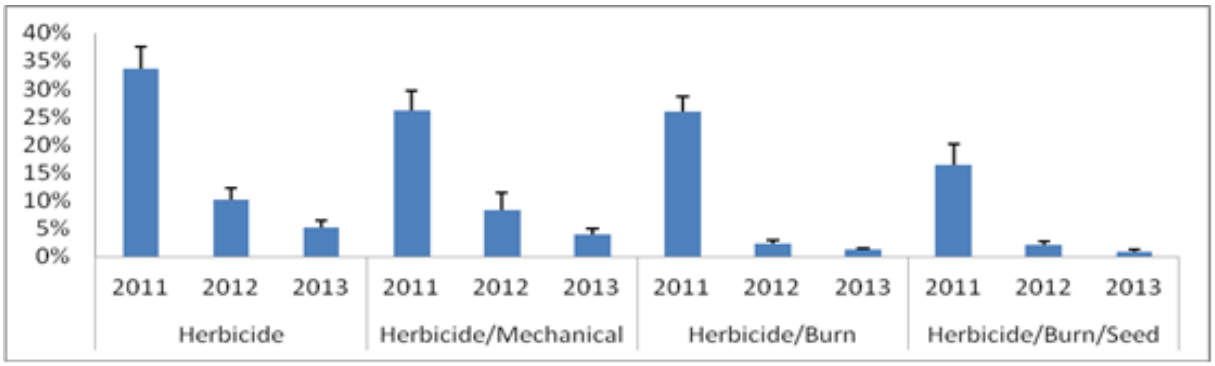

Figure 1. Percent cover of live phragmites within treatment quadrants by year and by treatment type.

Each treatment type increased species richness by at least 36% over the three-year study. The treatment types incorporating prescribed fire averaged at least a two-fold increase in the number

of species observed at each plot (Table 2). The Herbicide/Burn treatment showed a significantly greater increase in species richness than Herbicide only (Figure 2).

Table 2. Change in Species Richness between 2011 and 2013 by treatment type.

Treatment Type	2011 Species Richness (*avg*)	2013 Species Richness (*avg*)	% Increase (*avg*)	t	df	p
Herbicide	2.25	3.08	36%	-3.08	11	0.01
Herbicide/Mechanical	2.07	3.07	48%	-2.56	14	0.02
Herbicide/Burn	1.86	4.97	167%	-8.74	35	<0.01
Herbicide/Burn/Seed	2.2	4.87	121%	-3.45	14	<0.01
Overall	2.03	4.29	111%	-8.76	77	<0.01

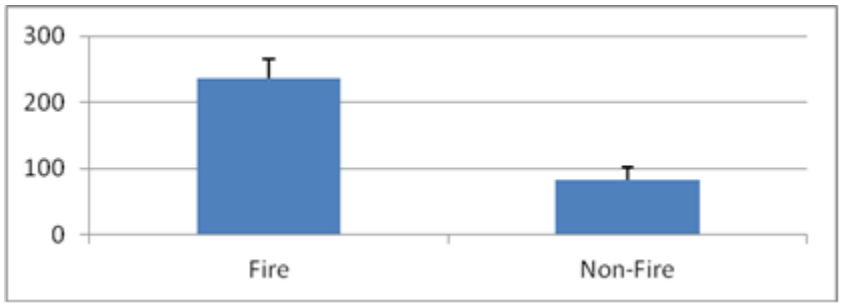

Figure 2. Percent increase in number of species (+/- SE) on plots with "fire" and "non-fire" treatments after 3 years of treatment.

Winous Point supports this project as a steering committee member, by acquiring and holding grant funding, by providing research locations, and by hiring and housing project staff. Currently, funding is provided by a US EPA Great Lakes Restoration Initiative grant. In the past, funding has been from many sources, including the Ohio Division of Wildlife, Sustain Our Great Lakes, the US Fish and Wildlife Service, Healing Our Waters Coalition, and private donations from individuals, program participants, and corporations.

Winous Point and Ohio Division of Wildlife Cooperative Waterfowl Banding

Investigators: Brendan Shirkey and John Simpson, Winous Point Marsh Conservancy; Michael Ervin and Dave Sherman, Ohio Division of Wildlife; and Bob Gates, The Ohio State University

Collaborators: Pat Devers, Black Duck Joint Venture; Tom Kashmer, Sandusky County Park District; Mark Shieldcastle, Black Swamp Bird Observatory

Schedule: Long-term

Introduction: Since 2011 Winous Point has been heavily involved in the Ohio Division of Wildlife's (ODOW) summer banding program targeting wood ducks and mallards as well as the winter banding program targeting black ducks (*Anas rubripes*). Recently we have developed a more formal cooperative agreement with the ODOW with established goals of having Winous Point band 50 black ducks, 400 mallards (*Anas platyrhynchos*), and 150 adult male wood ducks (*Aix sponsa*) annually, helping the ODOW meet their banding quotas for the US Fish and Wildlife Service and Mississippi Flyway Waterfowl Administrative Council.

Waterfowl band recovery data plays a key role in determining flyway level harvest regulations and population demographics for many waterfowl species. In addition to the scientific benefits, waterfowl banding offers a tremendous hands-on opportunity to get kids and adults excited about ducks, duck hunting, and Ohio's wetland resources (Figure 1).

Figure 1. Audrey Rohrer assisting with waterfowl banding, February, 2015.

Summary: Banding efforts in 2015 involving Winous Point staff resulted in the capture and banding of seven different duck species totalling over 1000 banded individuals (Table 1).

Table 1. Total number of banded individuals during the winter banding program (January - March, 2015) and summer banding program (July – August, 2015).

Species	Winter totals	Summer Totals
Black Duck	6	3
Mallard	86	496
Canvasback	35	0
Wood Duck	0	232
Redhead	126	0
Ringneck	32	0
Scaup	13	0
Seasonal Total	**298**	**731**

This program builds on waterfowl banding that has been occurring at Winous as part of various programs and projects since 2010 and is approaching 3000 total banded ducks (Table 2).

Table 2. Total number of waterfowl banded at Winous Point since 2010, by species.

Year	Black Duck	Mallard	Redhead	Gadwall	Wood Duck	Pintail	Widgeon	Canvasback	Scaup	Ring Neck	Shoveler
2010	41	3	0	0	0	0	0	0	0	0	0
2011	42	186	0	0	39	0	0	0	0	0	0
2012	125	49	0	0	143	0	0	0	0	0	0
2013	51	237	123	0	140	0	0	1	10	0	9
2014	23	181	7	341	164	7	6	5	5	2	1
2015	9	582	126	0	232	0	0	35	13	32	0
Totals	**291**	**1238**	**256**	**341**	**718**	**7**	**6**	**41**	**28**	**34**	**10**

Band recovery data is used to inform population management estimates for habitat and harvest goals and to calculate important waterfowl vital rates (e.g. survival and harvest rates). In addition, band recovery data can provide visual representation of harvest derivation and migratory routes. Waterfowl banded at Winous Point are recovered throughout the Atlantic and Mississippi flyways, with gadwall (*Anas strepera*) concentrating on the eastern seaboard, redheads (*Aythya americana*) along the Atlantic and gulf coastlines, wood ducks being recovered throughout the southeast, and mallards regionally important to harvest within the Great Lakes states (Figures 2 and 3).

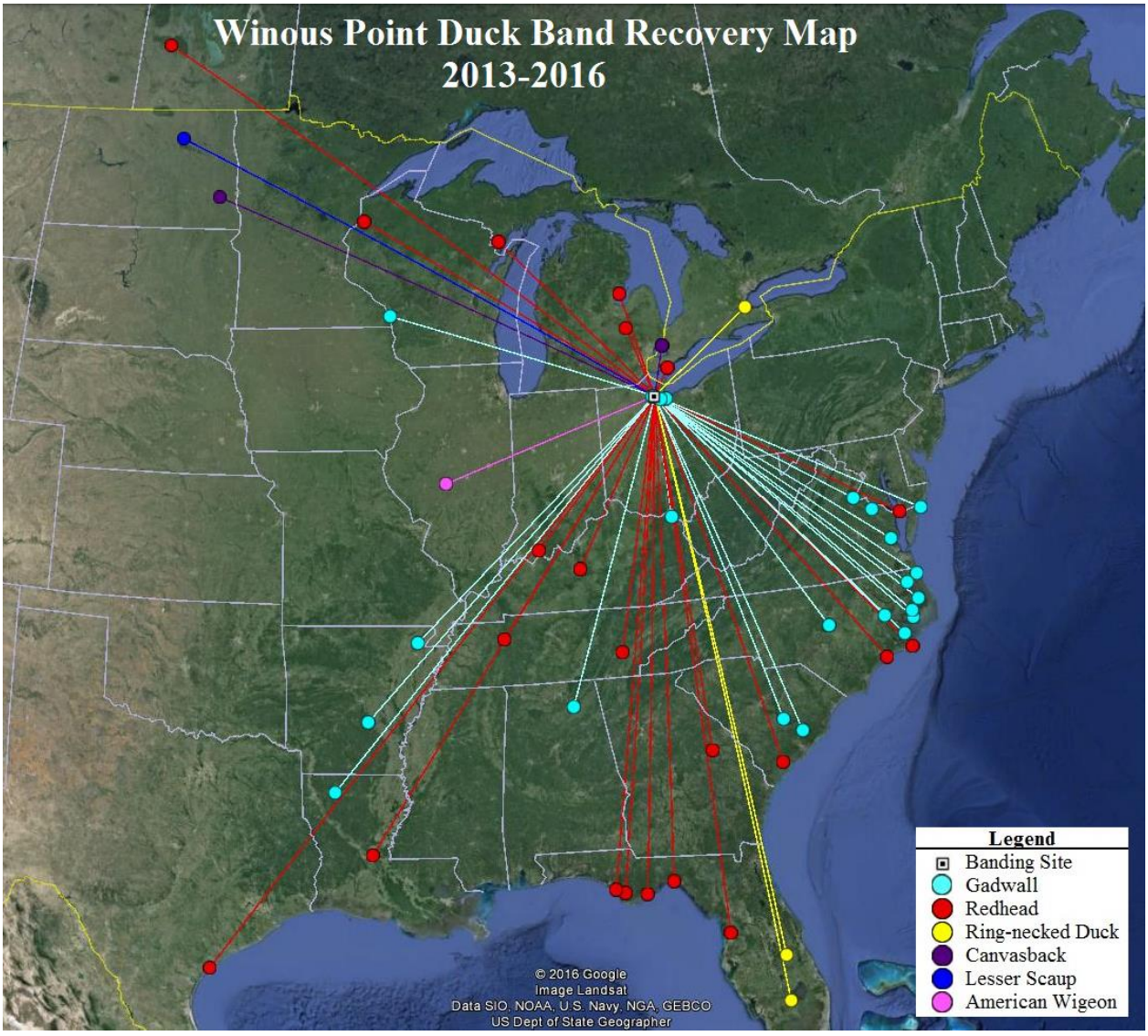

Figure 2. Band recovery locations for gadwall, redhead, ring-necked duck, canvasback, lesser scaup, and American widgeon banded at Winous Point from 2013 – 2015.

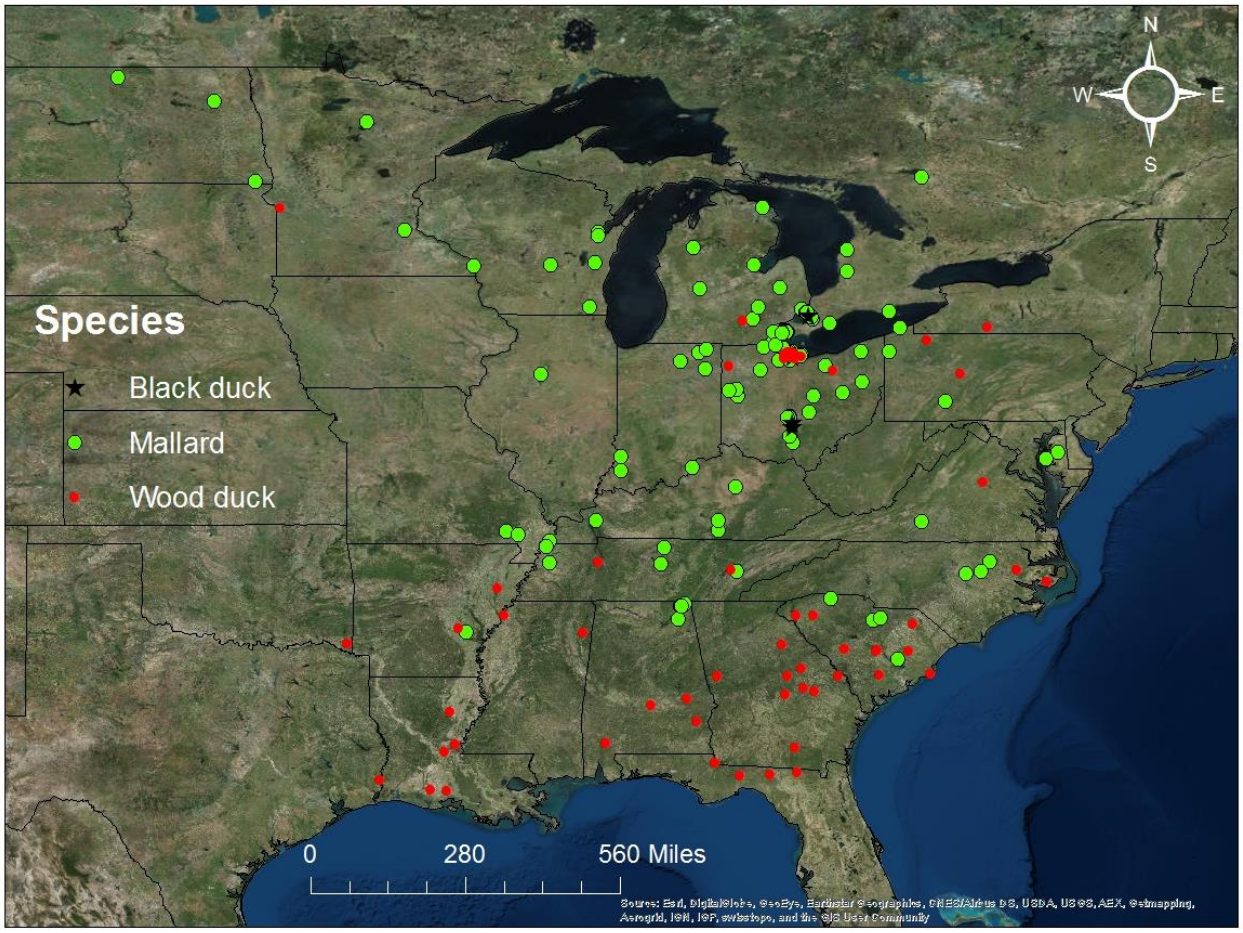

Figure 3. Band recovery locations for mallards and wood ducks banded at Winous Point from 2012 – 2015.

Winous Point supports this project through a cooperative agreement with the Ohio Division of Wildlife whereby WPMC supplies field staff, time, and materials to band waterfowl and analyze data. In addition to ODOW, project funding is also sourced from the Black Duck Joint Venture and Ohio State University.

Survival and Harvest Rate Analyses of Ohio Hatched Wood Ducks

Investigators: Brendan Shirkey, Research Coordinator Winous Point Marsh Conservancy; Robert J. Gates, Associate Professor, The Ohio State University; and Michael Ervin, Ohio Division of Wildlife

Introduction: The Ohio Department of Natural Resources, Division of Wildlife, has banded wood ducks (*Aix sponsa*) over several decades to satisfy banding quotas established by the U.S. Fish and Wildlife Service and Mississippi Flyway. These data are used for continental, national, and regional scale analyses of population and demographic trends. Banding and recovery data have not been used to develop state-specific estimates or analyses of population sizes of demographic vital rates. Recent banding efforts in Ohio were presumed to be sufficient to estimate abundance and population vital rates with reasonable power and confidence intervals assuming certain effect sizes. This project was initiated to apply current band recovery analysis methodologies to data collected exclusively in Ohio. We estimated annual (~1990 - present) vital rates of wood ducks as a basis for evaluating harvest regulation changes, annual trend assessment, and comparisons among geographic regions (e.g. waterfowl hunting zones) or banded age cohorts (hatch-year [HY] versus after hatch-year [AHY]).

Methods: Band recovery data was obtained from the software *Gamebirds* (USGS 2014). We mapped wood duck band recoveries after filtering the data to include only direct and indirect recoveries of hunter-harvested wood ducks that were banded in Ohio during pre-season banding periods (Jul - Aug.). Recovery records obtained from *Gamebirds* included geographic coordinates for locations where bands were recovered. These coordinates were imported into ArcGIS along with other information associated with each band recovery, including banding location, sex, and age of harvested birds. We used the kernel density tool in the spatial analyst extension of ArcGIS to map densities of direct and indirect recoveries of wood ducks banded during 1990 - 2013. Separate kernel density maps were created for male and female wood ducks to examine potential differences in harvest distributions between sex classes.

Survival and harvest rate estimates were based on only wood ducks banded in Ohio during July-August 1990 - 2013. Wood duck bandings and recoveries were organized by year and location (north vs. south zones) of banding, year of recovery, and age (HY vs. AHY) and sex of banded bird. Annual harvest totals for wood ducks in Ohio were obtained from the Mississippi Flyway Council Databook. We estimated harvest rates of Ohio-banded wood ducks by multiplying annual harvest estimates by proportions of wood ducks that were both banded and harvested in Ohio. Without this step, the harvest estimate would be biased high by wood ducks that were produced out of state and later harvested in Ohio. Harvest rate was estimated from band recovery data by dividing direct recovery rates by band reporting rates. Because harvest rate is in effect the ratio of direct recovery rate to band reporting rate, both of which have an associated

variance estimate, we then calculated the harvest rate variance using an approximation of the delta method.

We created encounter histories for wood ducks in *Microsoft Excel* and imported the encounter histories into *Microsoft Notepad+* to generate an input file to program *Mark*. We designated 24 encounter occasions (1990 - 2013). Eight cohorts of wood ducks were designated *a priori* (north zone adult females, north zone hatch year females, north zone adult males, north zone hatch year males, south zone adult females, south zone hatch year females, south zone adult males, and south zone hatch year males (hereafter N AHY F, N HY F, N AHY M, N HY M, S AHY F, S HY F, S AHY M, and S HY M, respectively). We conducted all survival (S) and recovery rate (F, i.e., probability of being harvested, retrieved, and reported) analyses in program *Mark* using a list of *a priori* Brownie dead recovery models. We estimated harvest rates by dividing direct recovery rates by band reporting rates of wood ducks (0.73 during 1996 - 2003). We could not find published estimates of band reporting rates before 1996 for wood ducks

Results: Harvest distribution of wood ducks was concentrated in Ohio with the highest densities of reported bands occurring in the northwest and southeast regions of the state (Figure 1). Band recoveries were reported throughout the Atlantic and Mississippi Flyways with band recovery densities concentrated in the Carolinas, Georgia, Alabama, Mississippi, and Louisiana. Few wood ducks were recovered from the Central and Pacific Flyways. No substantial changes were observed in harvest distribution of wood ducks in the 5 - 6 year increments examined. There were no apparent differences in harvest distribution between males and females, although band recoveries of males were more widespread in the southeastern United States (Figure 1).

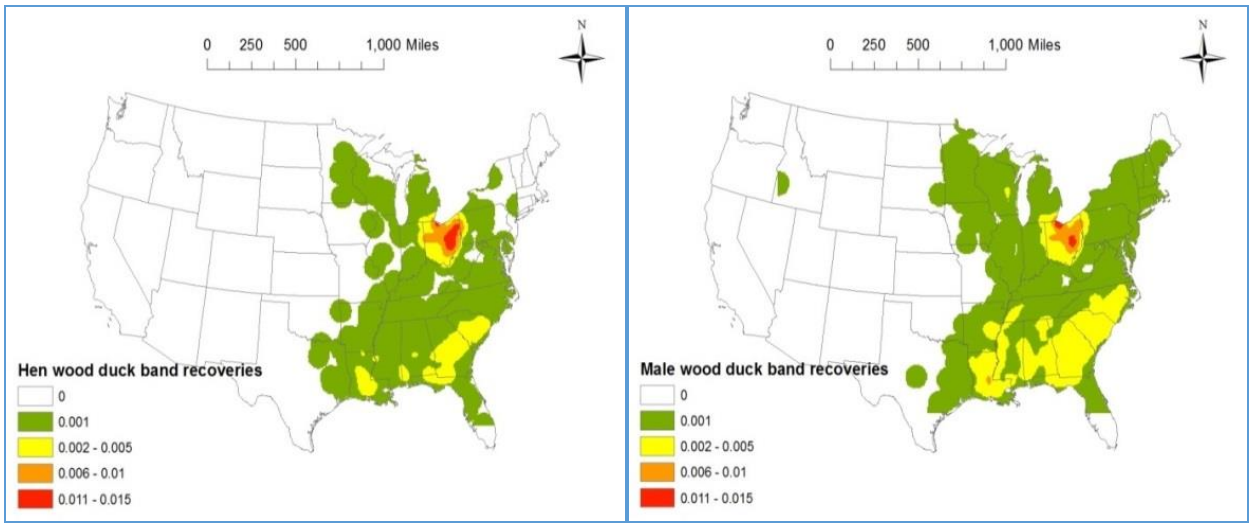

Figure 1. Kernel density estimates of direct and indirect band recoveries/km^2 for female and male wood ducks banded in Ohio during July-August 1990 - 2013.

A total of 38,743 banded wood ducks and 4,148 wood duck recoveries were used to create encounter histories for survival analyses in program *Mark*. We tested a candidate model set with 14 different models that were hypothesized to explain wood duck survival (S) and recovery rates (F). The top-ranked model for wood ducks allowed survival to vary over time and by sex and age, however survival was constrained so that there was a main effect on survival rates across cohorts (AHY females, HY females, AHY males, & HY males) over time (Figure 2). Wood duck survival varied largely by sex, age, and time with little effect of north/south waterfowl hunting zone.

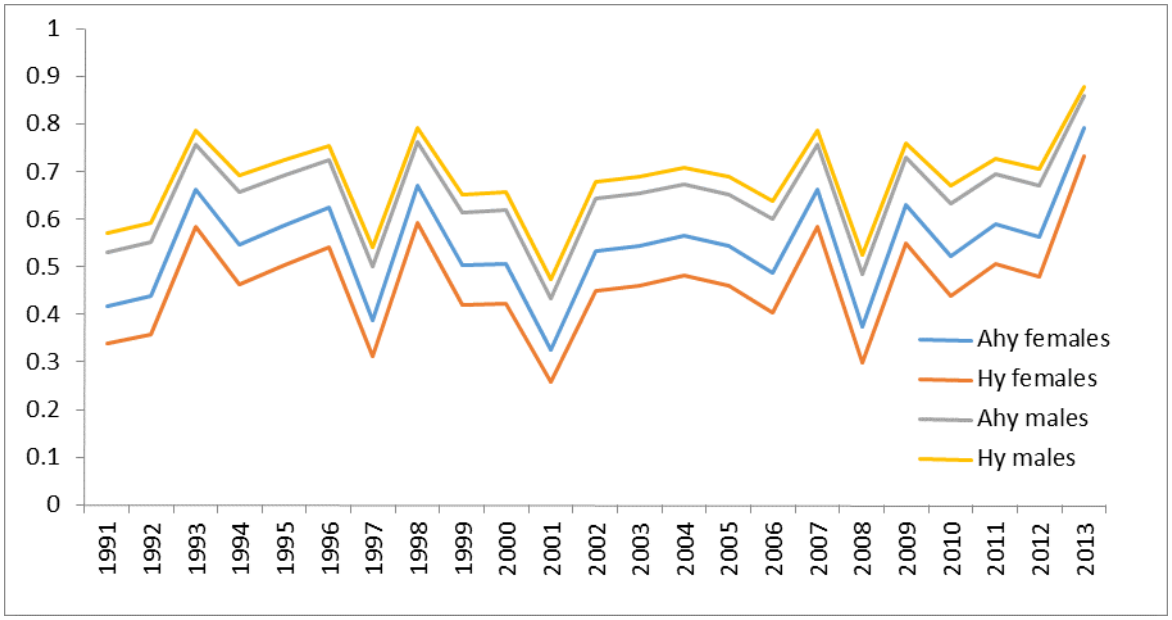

Figure 2. Annual survival rate estimates for wood ducks banded in Ohio during 1991-2013. Estimates were based on the highest-ranked model (S (age and sex + time), R (time)).

Wood duck harvest rates increased at the rate of 0.14% per year during 1996 - 2013 and ranged from 0.044 in 1996 to 0.097 in 2012 (Figure 3). There was no evidence that survival rate declined after the daily bag limit for wood ducks was raised from two to three in 2008. Wood duck survival rate estimates with sex and age classes combined averaged 0.64 under the three bird daily bag limit compared to 0.60 with the two bird daily bag limit.

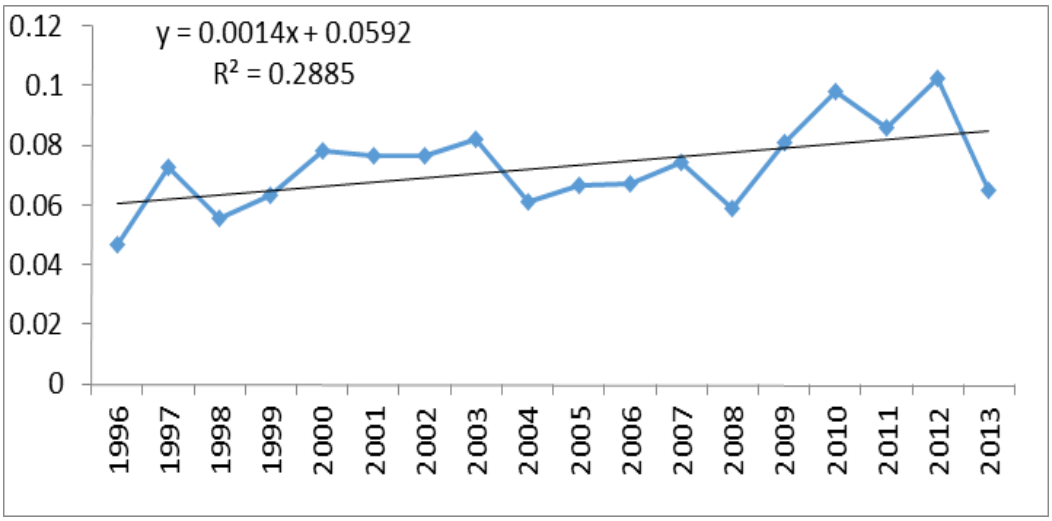

Figure 3. Annual harvest rates of wood ducks banded in Ohio during July-August 1996 - 2013. Harvest rate was calculated by dividing direct recovery rates by band reporting rates.

Discussion: Band recoveries from wood ducks in Ohio during June-August 1991 - 2013 were sufficient to provide information on harvest distribution, survival rates, and harvest rates that can be applied to management of these waterfowl species. There were trends over time and differences among cohorts that are relevant to managing populations of wood ducks, with the caveat that further analyses and statistical tests are needed to substantiate the apparent patterns in our results.

Geographic distributions of band recoveries indicated that wood ducks that breed and are produced in Ohio are largely harvested in-state. This finding suggests that population and habitat management actions directed toward these species in Ohio can provide direct benefits to waterfowl hunters within the state. Survival rates of wood ducks varied annually with no strong indication of change in the long-term trend (1991 - 2013), although survival rates appeared to increase through 2013 after a low point in 2008. Male wood ducks had substantially higher survival rates than female wood ducks. Predictably, AHY female wood ducks appeared to have higher survival rates than HY females, however survival rates were similar between AHY and HY males. We found no evidence that survival rate was negatively affected by increasing the daily bag limit for wood ducks from two to three birds.

Results obtained from this project provide waterfowl managers in Ohio with useful information on harvest distribution, annual survival, harvest rates, and population sizes of Canada geese and wood ducks to better inform population management. The project demonstrated that data collected from bandings of wood ducks in Ohio can be productively analyzed to make inferences about the effect of changes in waterfowl harvest regulations and to monitor demographic changes in populations over time and space (e.g. north versus south hunting zones). This project developed the analytical framework for such analyses and it would be a simple process to update

the analyses as new banding and recovery data become available. Similar analyses of banding data for mallards should also be undertaken. More in-depth analyses and statistical testing of the estimates, temporal trends, and geographic differences described in this report are also needed. We intend to pursue these analyses as we prepare one or more manuscripts for publication in peer-reviewed journals.

Winous Point undertook this project in cooperation with The Ohio State University, Terrestrial Wildlife Ecology Lab in partnership with the Ohio Division of Wildlife.

Responses of Colonial Wading Bird Populations within the Lake Erie Marsh Focus Area to Cormorant Control and Wetland Management

Investigators: Christopher Tonra, Ohio State University; and Laura Kerns, Ohio Division of Wildlife

Schedule: 2015 - 2016

Objectives:

1) Quantify the effect of foraging distance/food delivery rate on chick development
2) Quantify the effects of colony distance-to-shore on black-crowned night-heron (*Nycticorax nycticorax*) post-fledging survival
3) Identify important foraging areas and prey
4) Analyze long term population trends, spatial distribution of species, and cormorant removal data to assess effectiveness of cormorant control on conserving nesting habitat for herons and egrets

Overview: On July 1, 2015 we initiated a pilot study to 1) determine the feasibility of deploying VHF nanotags on juvenile black-crowned night-herons, 2) assess our ability to capture adults, and 3) begin identifying important areas for the population. This study is designed to utilize an existing radio-tower array to track bird movements along the coast of western Lake Erie (Figure 1).

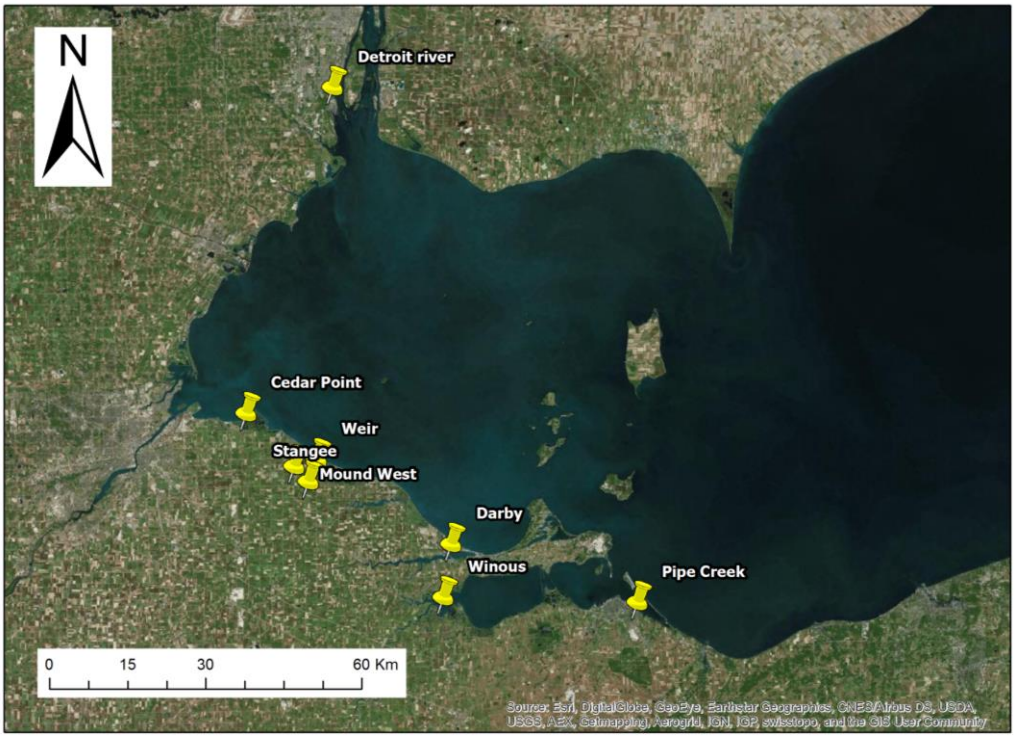

Figure 1. Map of eight existing VHF radio-tag datalogging towers in western Lake Erie.

We deployed 15 tags on nestlings on West Sister Island (hereafter WSI). Eight of these individuals were eventually detected on the mainland, most showing some use of the Ottawa NWR and surrounding state lands. Of the remaining transmitters, one fell off in the nest due to faulty harness attachment, one bird was found dead below the nest, and one signal was picked up still on the island after the end of September, suggesting mortality. Three juveniles were found alive on WSI on 6 Aug, but have not been observed off the island. One individual has not been found since deployment. Using a bungee-net, we were able to capture five adults (Figure 2). These adults appeared to be post or non-breeders, as towers did not detect them heading to WSI and they were detected at or around the marinas throughout the day and night over the next couple of weeks. After Aug 15th however these individuals began to disperse more and their habitat use became more widespread.

Figure 2. Adult black-crowned night heron fitted with nanotag tracking device, 2015.

In all cases where individuals were observed post-deployment there were no outward signs of ill effects of the transmitter or harness on condition or behavior. Many of these birds continue in the study area and are currently being hand-tracked and picked up by the telemetry array. The combined use of the array and hand-tracking has thus far been effective in acquiring locations of individuals and with increased effort this approach will likely be an effective method for measuring survival and habitat use. Data extraction from the telemetry array continues.

Based on the success of the pilot field season, we plan to expand the project next spring to deploy more coded tags. We also would like to explore the possibilities of deploying satellite

telemetry units on adults to estimate migratory connectivity of the western Lake Erie population. Finally, we will begin preliminary analysis of available home range data and determine feasibility of capturing adults at a wider variety of study sites (i.e. Ottawa NWR and state lands).

Winous Point supports this project by supplying technician housing, tower placement, and other logistical support.

Energetic Carrying Capacity of Submerged Aquatic Vegetation in Semi-permanent Marshes for Dabbling Ducks in the Upper Mississippi River and Great Lakes Region Joint Venture

Principal Investigators: John Simpson and Brendan Shirkey, Winous Point Marsh Conservancy; Heath M. Hagy and Sarah Vanderhorst, Illinois Natural History Survey, Forbes Biological Station – Bellrose Waterfowl Research Center

Schedule: 2015 – 2017

Summary: Wetlands within the Upper Mississippi River and Great Lakes Region Joint Venture (hereafter, Joint Venture) have been intensively impacted by anthropogenic influences. Many wetland areas have been lost altogether and those large wetland complexes that remain are thus increasingly important to regional waterfowl. Understanding the distribution and availability of waterfowl food resources, especially the carrying capacity of those food resources, is important for waterfowl conservation planning and resource management on a regional and even continental scale.

The lower Great Lakes coastal marshes are valuable resources to migratory and wintering waterfowl and are among the most biologically significant wetlands within the Joint Venture. These marshes have long been recognized for their importance in providing habitat for a wide variety of flora and fauna, and in particular for migratory birds. As an example, the coastal wetlands of northwest Ohio alone support an estimated 500,000 itinerant waterfowl during fall migration (ODOW, unpublished). These marshes are also subject to a variety of anthropogenic stressors, including dredging, nutrient/pollutant loading, and altered hydrological regimes, all of which have led to significant losses and degradation in aquatic plant communities. Today, a majority of the region's coastal marshes and wetlands have been drained or replaced by shoreline development. Furthermore, a large proportion of remaining coastal marshes are now impounded and actively managed, in some cases for submerged aquatic vegetation (SAV), but no information is available about the density or nutritional value of SAV communities within either managed or unmanaged marshes.

Consequently, information is needed on the density and forage value of SAV and other aquatic plants in semi-permanent marshes throughout the Joint Venture before carrying capacity models can be updated and wetland restoration practices can be fully understood relative to their value for dabbling ducks and other SAV-dependent species.

Study Area: We propose to sample wetland sites within the lower portion of the Joint Venture annually. Over the three years in which sampling will occur, 5 of the 10 sampling sites will remain constant to account for temporal variation in abundance and distribution. The remaining 5

sites will be rotated each year to improve the spatial distribution of the samples. Each rotation is designed to focus on a spatially unique region, Northern Ohio being the focus of 2015, rotating to Eastern Michigan for 2016, and then to the IRV/Mississippi River in 2017 (Table 1). Data on SAV availability during spring will be assembled from recently completed waterfowl research projects where data was collected from across the Joint Venture, including Illinois and Wisconsin, and from other published literature.

Table 1. Planned project sampling sites in 2015, 2016, and 2017.

2015	2016	2017
Winous Point	Winous Point	Winous Point
Bay View Private Wetlands	Bay View Private Wetlands	Bay View Private Wetlands
Big Island WA (Ohio Inland)	Big Island WA (Ohio Inland)	Big Island WA (Ohio Inland)
Cedar Point/Little Darby NWR	Cedar Point/Little Darby NWR	Cedar Point/Little Darby NWR
East Harbor State Park, OH	East Harbor State Park, OH	East Harbor State Park, OH
Mosquito Creek WA (Ohio Inland)	Pte. Moullie, MI	Pte. Moullie, MI
Pickeral Creek WA	Harsens Island	IRV or Mississippi River Site
Ottawa Shooting Club	Saginaw Bay #1	Swan Lake Club, IL
Ottawa National Wildlife Refuge	Saginaw Bay #2	Pool 13 (Fulton, IL)
Magee Marsh WA	Shiawassee NWR, MI	Pool 19 (Keokuk, IA)

Methods: To assess energetic carrying capacity, we will build a database during the summer of each year of SAV samples where semi-permanent marsh habitat and fall waterfowl concentrations exist. Sample sites will be selected using anecdotal observations of waterfowl professionals, historic records, National Wetland Inventory data, and other available data. At each of the ten sites we will collect samples at 10 points for a total of 100 samples annually. We will use a multi-stage sampling design where ~33% of sites within our sampling frame are selected annually and 10 points are randomly sampled within each site for SAV and other seeds, tubers, and aquatic invertebrates that may be present (Figure 1). We will sample deep-water areas (>45 cm) with a modified Gerking box sampler (Figure 2) and convert measures to biomass and energy density (kg[dry]/ha, duck energy days [DED]/ha) to reflect foods "available" for waterfowl consumption. In cooperation with an ongoing Illinois Natural History Survey study, we will develop a visual rapid assessment method similar to Naylor et al. (2005) and document species richness, diversity, density, and quality at each sample location during autumn to determine if rapid visual assessment can serve as an index of foraging habitat quality in shallow- and deep-water marshes.

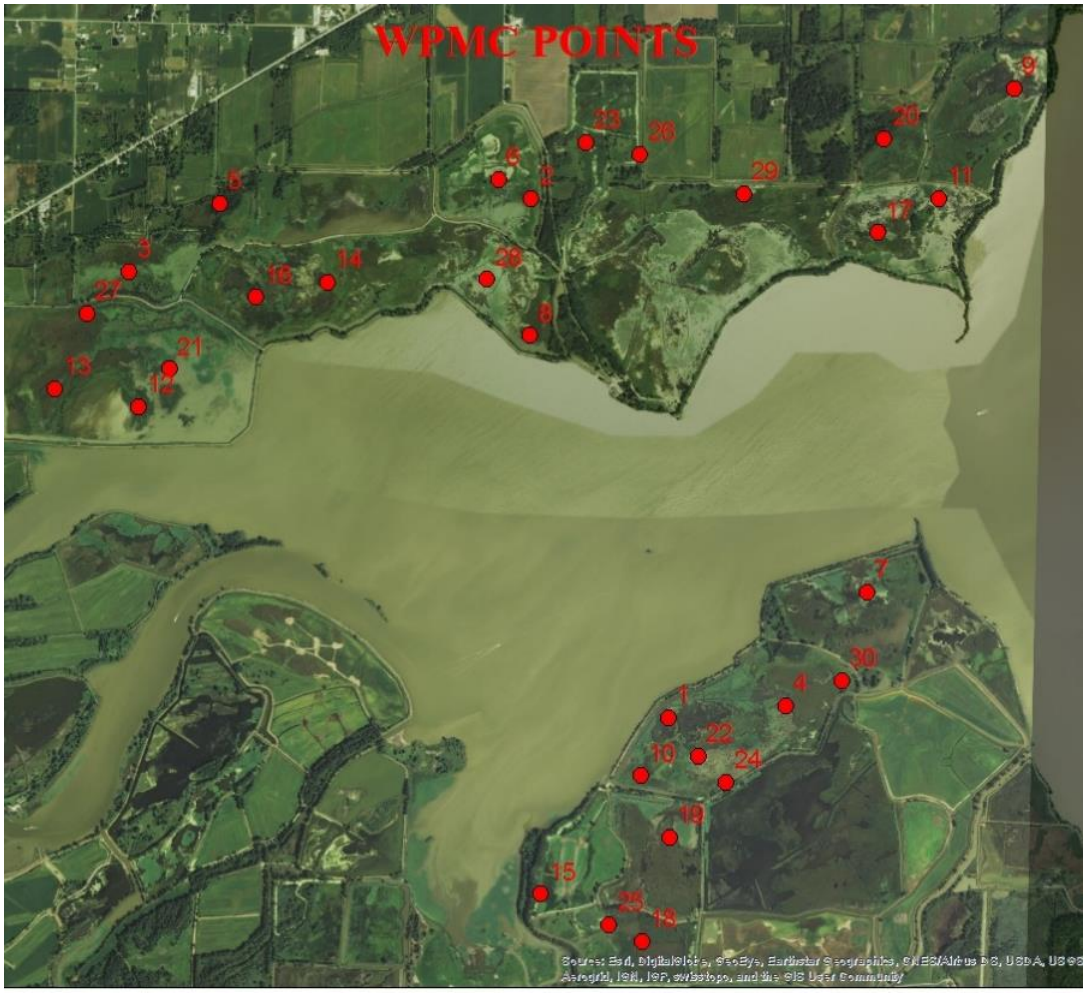

Figure 1. Example sample site map with 30 randomly generated points, ten of which were objectively selected for SAV sampling.

Preliminary Results: After 2015 sample collection and processing was completed, 21 different species spaning 10 different genera of submerged aquatic vegetation were identified in the 100 samples. Coontail (*Ceratophylum demersum*) represented the highest total biomass as it comprised 47.7% the total SAV biomass sampled from all locations. The next most abundant SAV species (total biomass sampled) were Canada waterweed (*Elodea canadensis*) at 16.51%, eurasian watermilfoil (*Myriophyllum demersum*) at 14.61%, and brittle naiad (*Najas minor*) at 8.39% (Table 2). Coontail was also the most widespread of the 21 species within the study area given that it was present in 51 of the 100 samples. This frequency is more than double that of all other encountered SAV species with the exception of leafy pondweed (*Potamogeton foliosus*), which was present in 28 samples but in much smaller amounts.

Figure 2. Graduate student Sarah Vanderhorst prepares to use a "Gerking Box" sampler to collect an SAV sample from a coastal wetland.

Table 2. Five most prevalent species, by total biomass, occurring in 2015 SAV sampling. Table includes species, total dry mass sampled, percent of total biomass, number of sample sites where located, and mean biomass per site located.

Species	Dry Mass (g)	Percent	Sample Size	Mean (g)
Coontail	129.2877	47.70%	51	2.5351
Canada Waterweed	44.7515	16.51%	19	2.3553
Eurasian Watermilfoil	39.5914	14.61%	21	1.8853
Brittle Naiad	22.7404	8.39%	15	1.5160
Spiny Naiad	9.7791	3.61%	5	1.9558

Coontail was also the most abundant species in terms of average biomass per sample site, with 2.5351 g/sample, though four species were all nearly identical in terms of biomass per site, though encountered less frequently (Figure 3).

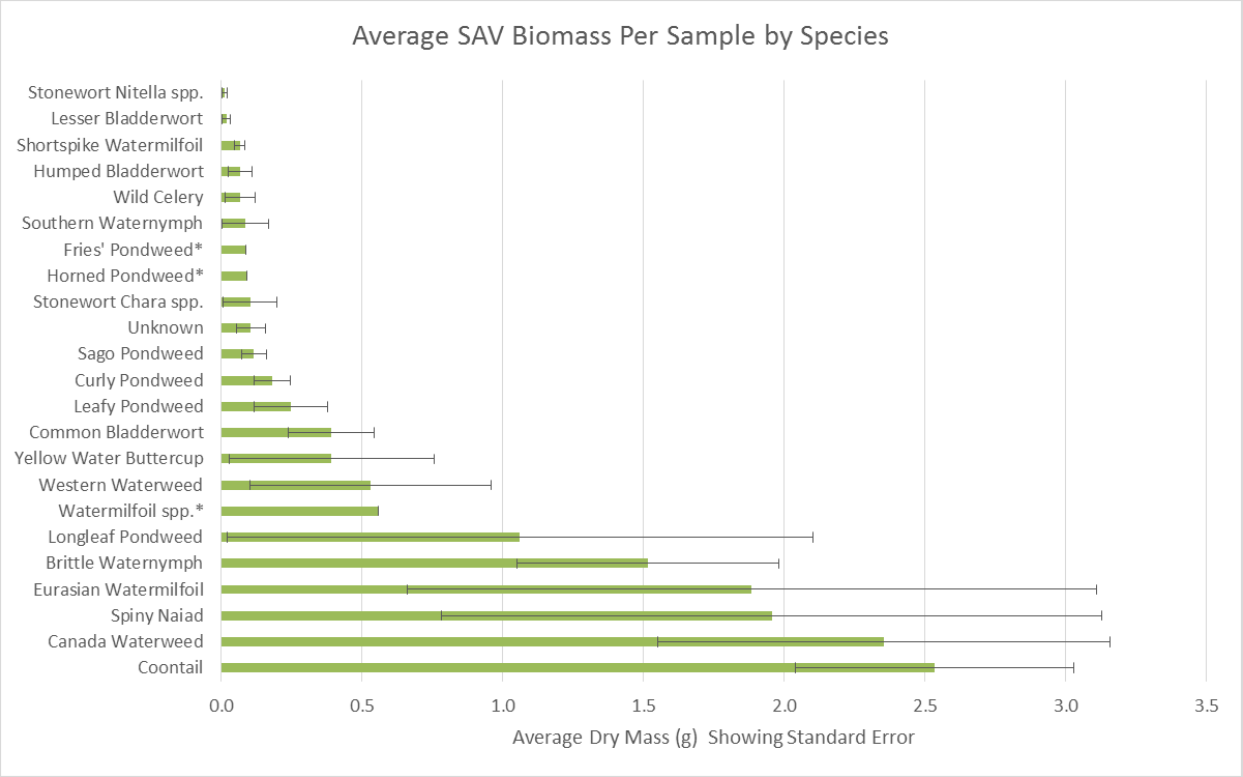

Figure 3. Histogram of average dry mass in samples for all SAV species encountered.

Winous Point has undertaken this project in cooperation with the Illinois Natural History survey which is conducting a related study designed to inform habitat objectives developed by the Upper Mississippi Great Lakes Joint Venture. Funding for this project comes from the Upper Mississippi Great Lakes Joint Venture.

Using Satellite Imagery to Map Wetland Vegetation Communities in Northwest Ohio

Investigators: Brendan Shirkey, John Simpson, and Mike Picciuto, Winous Point Marsh Conservancy; Michael Ervin and Dave Sherman, Ohio Division of Wildlife

Schedule: 2015; replicated every 5 years

Summary: The National Wetlands Inventory, which was completed in Ohio in 2009, provides the spatial distribution of wetlands within the state as well as determining the type of wetland (e.g., emergent marsh, forested wetland). However, no indication of wetland quality is currently available for the focus areas (i.e., Sandusky Bay and southwest Lake Erie marshes). This project will assist in determining wetland quality through vegetation identification. Satellite imagery of wetlands will be analyzed using remote sensing software and ground-truthed to determine what vegetation types are within wetlands inside the focus areas.

Once the vegetation is determined, it can be classified as desired, undesired, invasive, etc. thereby giving an indication of wetland quality. In addition, identification of vegetation will enable managers to create quantifiable management objectives (e.g., increase desired vegetation by 40%). Biological information such as marshbird surveys and aerial waterfowl surveys will then be integrated into the vegetation data so that relationships between wildlife can be identified and used to construct management goals.

Benefits/Expected Results: This project will be used to 1) provide vegetation maps to area managers which will allow them to use data to make management decisions, 2) assist area managers in monitoring the success or failure of different management strategies, 3) allow the integration of biological data (e.g., marshbird surveys, waterfowl surveys) into the vegetation maps to determine optimal habitat composition for various species, and 4) monitor invasive species and assist in determining success/failure of invasive species management.

Methods: We contracted Landinfo Worldwide Mapping, LLC who utilized satellite cameras to provide a high-quality (2-m/8-band) satellite imagery of the Lake Erie marsh region in northwest Ohio. Cloud cover prevented image acquisition in July and August and the image was delivered in September, 2015 (Figure 1).

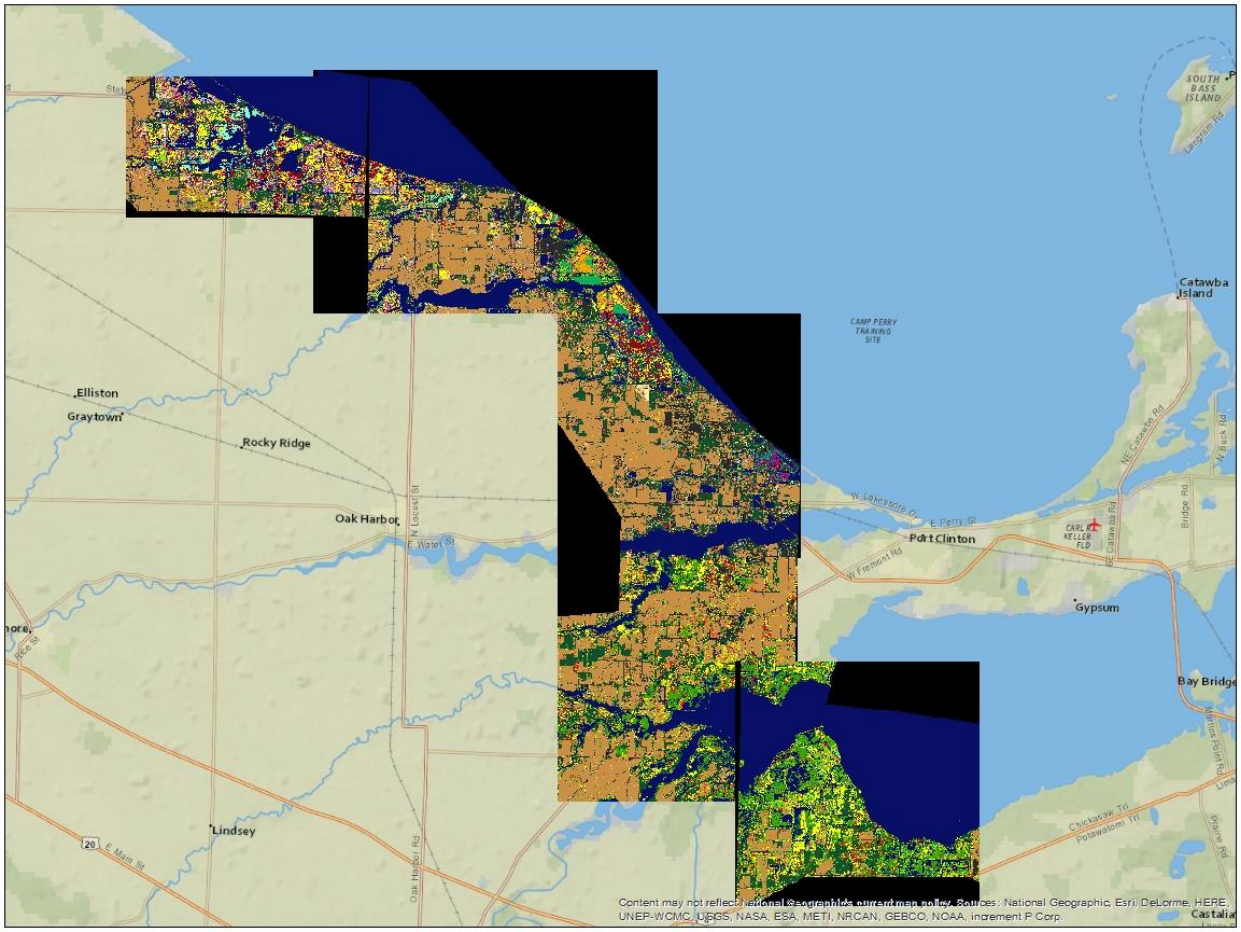

Figure 1. Composite image taken September, 2015 from Cedar Point National Wildlife Refuge to Pickerel Creek Wildlife Area, OH in northwest Ohio.

Ground-truthed data, in the form of GPS coordinates of known vegetation types, was needed to train ERDAS Imagine software to recognize patterns of desired surface features within the satellite image. In July, August, and September, 2015 GPS coordinates were recorded at 842 locations where the dominant vegetation or surface feature was known. Ideally, GPS points were recorded from within a stand of target vegetation at a position no less than 10 ft. from any edge due to the normal ±10 ft. of error associated with the GPSmap 60CSx handheld GPS device used. Desired stands had an estimated target species area coverage of 75% or greater.

Ground-truthed GPS coordinates were converted into a shape file using ArcGIS, which could then be imported into ERDAS Imagine and overlaid on the satellite imagery. Points that fell within one of our images were then used to sample groups of pixels to generate a spectral signature for all target species and/or features. The Grow tool ERDAS Imagine was used to create each Area of Interest shape containing a target vegetation or feature. The Grow tool searches the pixels around a point to determine if they are similar enough to the original pixels color values to be included in the shape being grown. The tolerance of the Grow tool can be

adjusted on a case by case basis by increasing or decreasing the Euclidean distance setting depending on how different your target feature is from the surroundings. After completing each sample shape, the Signature Editor tool is used to designate sample shapes as known vegetation types. Once all signatures are collected for all class features present in the image, the software then uses the spectral signature to infer the presence of a target species or feature elsewhere in the same image by use of a supervised classification. The supervised classification processes the satellite image by assigning every pixel to a feature class that has the best pattern match as defined by your signature. The result is a new image where each color shown is associated with a specific vegetation or landcover type (Figure 2).

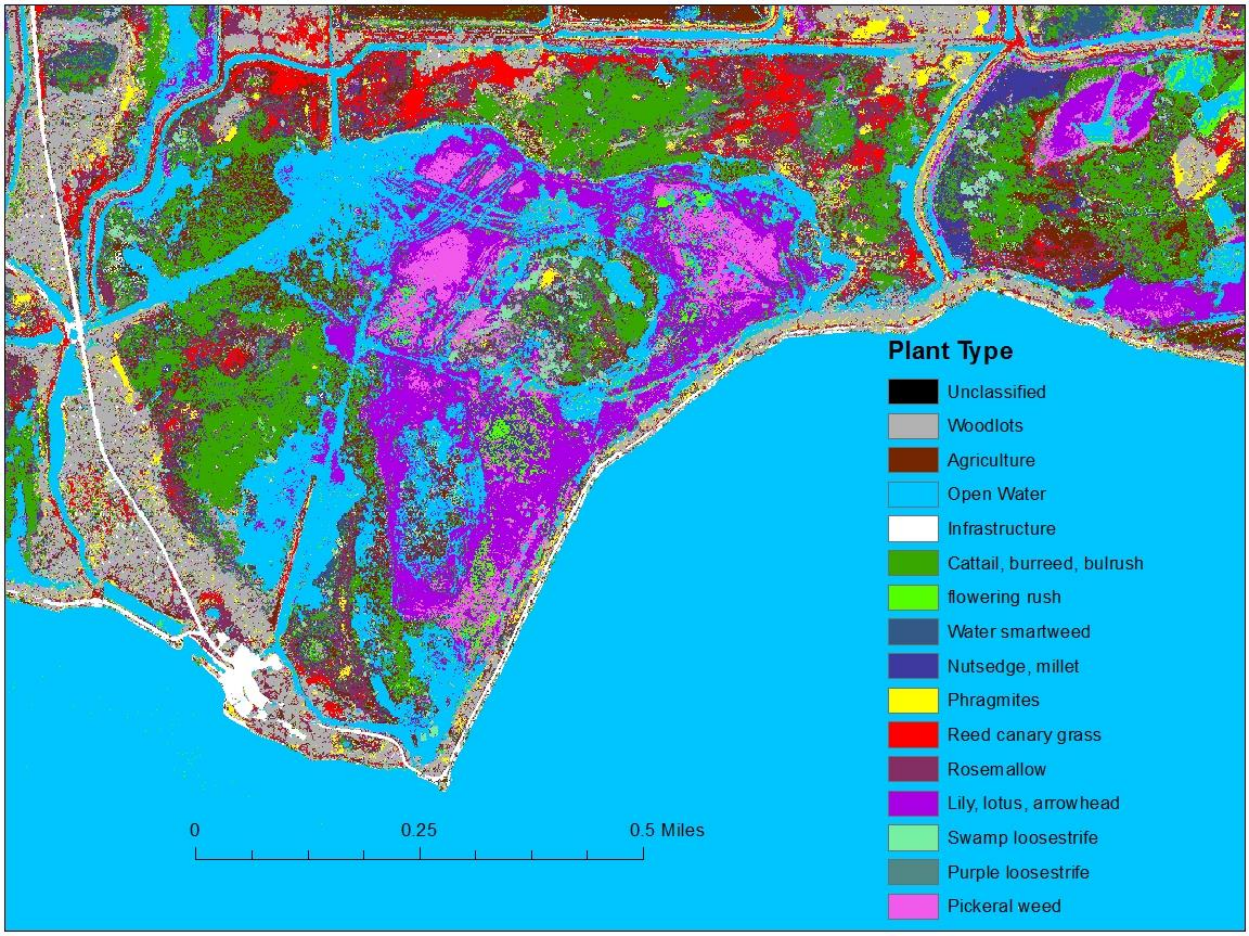

Figure 2. Example ERDAS Imagine classification scheme for the 360-acre North Marsh, Winous Point, OH, 2015.

Winous Point completed this work as part of a cooperative agreement with the Ohio Division of Wildlife.

Population Monitoring, Ecology, and Habitat Relationships of Sora and Virginia Rails in Northwestern Ohio

Investigators: Bob Gates and Chris Tonra, Ohio State University; Laura Kerns, Ohio Division of Wildlife; and Brendan Shirkey and John Simpson, Winous Point Marsh Conservancy

Collaborators: Tom Kashmer, Sandusky County Park District; Mark Shieldcastle, Black Swamp Bird Observatory; Dr. David Krementz and Auriel Van der Laar Fournier, University of Arkansas

Schedule: 2016 - 2019

Project Overview: The Ohio Department of Natural Resources Division of Wildlife is responsible for conserving wildlife populations for enjoyment by hunting and non-hunting public users. Interest in secretive marsh birds including rails, bitterns, coots, and gallinules has increased in recent years, culminating in the implementation of the spring secretive marsh bird survey. Very little information is available regarding population trends of these bird species, but in general most information suggests that marshbirds species in general are in population decline. Rails (sora [*Porzana carolina*] and Virginia rails [*Rallus limicola*] in particular) are of special interest because of their status as game birds in Ohio. Rail bag limits are 25 per day and harvest is assumed to have little impact on rail populations because hunting pressure is thought to be minimal. However, due to their secretive nature, very little is known about rail abundance or population vital rates in Ohio. Although general habitat requirements are reasonably well understood for most rails, the relationships between abundance and demographic parameters are also not well known, particularly associations at the microhabitat level.

The Ohio Division of Wildlife has participated in the secretive marsh bird monitoring program developed by Conway (2011). The marshbird survey program was implemented to improve estimates of relative abundance with use of call-playback surveys. This survey implements a standardized protocol for monitoring rails and can be used to estimate population trends of various rail species if key assumptions are met. Distance sampling is a method that could be used to generate abundance estimates from secretive marsh bird survey. However, distance sampling is hindered by violating the fundamental assumption of 100% detection of individuals at survey points. We anticipate that a correction factor could be developed to determine the proportion of rails that do not respond to call-back surveys, thus allowing for more statistically rigorous estimates of sora and Virginia rail abundance. This correction factor could be applied to secretive marsh bird survey data to estimate population densities of sora and Virginia rails in Ohio and elsewhere. Since detection probabilities may differ among habitat types, corrected estimates of true density (as opposed to relative density) could help clarify understanding of habitat associations for these species.

Figure 1. Virginia rail captured in walk-in trap at Winous Point; Spring, 2015.

Assessment of rail habitat use is often limited by a lack of monitoring and robust datasets that contain rail detections across multiple habitat types. Occupancy modeling is one method that can be used to relate presence of marsh birds to various habitat and detection probability covariates. We propose to use an experimental trail camera survey design to examine rail occupancy rates among various habitat types and/or management regimes (e.g. deep water marsh, moist soil units, and sedge meadow). Selection of habitat covariates and the design of occupancy surveys will be guided by findings from preceding studies of distribution, abundance, and habitat relationships across the unglaciated region of Ohio.

Effective management of any wildlife species is aided by the ability of wildlife managers to estimate abundance and track changes in abundance over time. Due to their secretive nature, no current estimates of rail abundance exist for the state of Ohio, nor do measures of population parameters that might indicate the health of Ohio's rail populations such as nest success or survival rates. We plan to equip both sora and Virginia rails with VHF radio-transmitters after spring migration to estimate breeding season survival rates, nesting success, and fall departure dates. Furthermore, we plan to evaluate habitat conditions at nest sites to determine the effects of various habitat covariates (e.g. water depth, vegetation type, vegetation density) on nest success.

Objectives:

1) Determine distribution, occupancy, and relative abundance of sora and Virginia Rails using the National Marsh-bird Monitoring Protocol and an automated call-playback /trail camera system.

2) Identify local landscape, habitat, and microhabitat factors associated with occupancy rates and seasonal home range and movement patterns of radio-marked sora and Virginia rails

3) Assess and compare the efficacy of survey protocols (National Protocol and automated system) with regard to meeting fundamental assumptions of distance sampling and occupancy modeling and recommend improvements to statewide marsh-bird survey design, methodology, and analyses.

4) Estimate demographic vital rates including breeding and post-breeding season survival, nesting success, and phenology of life history events including migration arrival and departure, nesting, and post-nesting.

5) Evaluate or model viability and resilience of sora and Virginia rail populations to sustain harvest levels under the current regulatory framework using data collected by the Harvest Information Program and results from this study.

Benefits/Expected Results: This project will provide empirical data on distribution, abundance, and local population densities of two harvestable species, for which there is currently only sparse information. Knowledge of population demography, life history phenology, and population-habitat relationships will inform harvest management and address potential concerns by constituents and stakeholders over the sustainability of current and projected future harvest levels in Ohio. Knowledge and understanding of seasonal movements, home range, and habitat use patterns will inform habitat management recommendations for these two species.

Approach/Planned Activities: Call playback (National Protocol and automated system) surveys will be conducted during spring and early summer. Sora and Virginia rails will be captured, banded, and radio-marked (n = 50 - 75 for each species) and tracked using standard VHF telemetry to locate nests, estimate survival and cause-specific mortality rates (Figure 2). Radio-tracking throughout spring and summer will provide information on microhabitat and habitat associations, seasonal movements and home ranges in relation to local landscape features, and nesting and migration phenology. Radio-marked birds also will be used to determine seasonal changes in call response and detectability rates of sora and Virginia rails.

Figure 2. Wood duck (Aix sponsa) visits a marshbird trap location at Winous Point, 2015. Note the captured sora within the trap (far right lower corner of trap).

Estimates of population density will be applied to estimates of statewide distribution and abundance of sora and Virginia rails based on Kahler (2013) and the second Ohio Breeding Bird Atlas. Statewide distribution and abundance of sora and Virginia rails will be considered in the context of distribution and levels of hunter effort and harvest rates in Ohio. Estimates of nesting success or overall breeding productivity and breeding/post-breeding season survival rates will be used to model potential effects of current and projected levels of hunter harvest rates on population growth or viability of sora and Virginia rail populations in Ohio.

Winous Point is a lead investigator on the project, assisting with the proposal development and research implementation. This project is funded by the Ohio Division of Wildlife through the Terrestrial Wildlife Ecology Lab at Ohio State University.

Evaluation of King Rail Trapping Techniques in Midwestern United States

Investigators: Brendan T. Shirkey, John Simpson, and Michael Picciuto, Winous Point Marsh Conservancy

Collaborators: Bob Gates, The Ohio State University; Tom Kashmer, Sandusky County Park District; Mark Shieldcastle, Black Swamp Bird Observatory; Dave Sherman, Ohio Division of Wildlife; Dr. David Krementz and Auriel Van der Laar Fournier, University of Arkansas

Schedule: 2016 - 2020

Introduction: Contrary to the more resident populations of king rails in the gulf coast region (U.S.A), the more northerly, migratory population of king rails (*Rallus elegans*) that breed in the upper Midwest are quite rare and/or widely dispersed. Due to their limited detectability and secretive nature very little is known about these birds. The little evidence that has been collected suggests that these birds have experienced significant population decline in the past 50 years, and consequently they have been identified as endangered and species of conservation interest by multiple state and federal agencies (ODNR 2015 and UMRGLJV 2007). Assumed population declines are unsurprising given that these birds are a wetland dependent species and wetland habitat has experienced some of the most substantial loss and severe degradation of any habitat type in the country.

Local king rail populations are undoubtedly low in the Midwest although some uncertainty exists about just how low due to the difficulty associated with detecting king rails even when present. A combination of anecdotal evidence and graduate research at the Winous Point Marsh Conservancy may help to highlight this problem. In 1973 graduate research was conducted exploring king rail habitat utilization. Over two years Andrews (1973) captured 34 king rails with basic trapping techniques. In the past five years, the Winous Point Marsh Conservancy has participated in the statewide secretive marsh bird survey and over that five-year period only one king rail has been recorded either indicating a severe reduction in king rail abundance on the property from 1973 to the present day or a limitation of the secretive marsh bird survey in detecting king rails when present.

We developed a pilot king rail research project in the spring of 2014 at Winous Point to further evaluate the presence or absence of king rails on the property using call-back audio systems similar to those used during secretive marsh bird surveys, trail cameras, walk-in traps, and a bungee propelled “whoosh” net. The objectives of this project were two-fold: 1) to compare trapping efficiency of two different trapping techniques for king rails in the Midwest (i.e., walk-in traps vs. bungee propelled net [hereafter referred to as a whoosh net]) and 2) determine

presence or absence of king rails on the property using trail cameras thus providing additional data that might be used to better inform our secretive marshbird surveys

Methods: We established five king rail trapping locations at Winous Point in April of 2014 and another thirteen in April of 2015 within habitat we hypothesized was suitable rail habitat (e.g., dense emergent vegetation with shallow or no standing water). We placed a rail trap, live trap baited with marshmallows (to discourage raccoons from trying to enter the rail trap), trail camera, and an automated rail-call broadcaster at each site. Rail calls were broadcast from sunset to sunrise because we hypothesized most king rail activity occurred during twilight hours. We used trail cameras to monitor 3 of our 5 king rail trapping locations during our spring 2014 field season and we monitored all king rail trapping locations (5 - 7 on any given night) with trail cameras during the 2015 field season (Figure 1). In addition, we tracked the number of trap nights, dates and times of all king rails captured on camera and in traps, and man-hours needed to deploy trapping equipment and check traps in order to track capture rates and capture efficiency.

Figure 1. Two individual king rails are captured on trail camera inside a walk-in trap at Winous Point.

Furthermore, we used trail camera data to develop a coarse minimum count of individual king rails observed on our property in the spring of 2014 and 2015 and we displayed that data by week illustrating the arrival dates of king rails in northwest Ohio. Trail camera data was censored so that multiple pictures occurring during the same night or during consecutive nights were treated as a single individual unless multiple individuals were present in the same picture (which

happened twice), and photos from different trapping locations were treated as different individuals. We were comfortable making this assumption based on the distance between traps and the observed home range size of previous satellite marked birds (Brendan Shirkey, unpublished data).

The whoosh net is a relatively new technique for capturing wildlife that pulls a net over top of birds that are standing on the ground using large elastic bands (i.e., bungee cords; Bird Ecology and Conservation: A Handbook of Techniques). The whoosh net used for our research consisted of a 6 m by 6 m twine net with 2.5 cm spacing, two 1.5 m high metal stands used to elevate the net, and two 10 m long bungee cords of 1.75 cm's in diameter. We utilized a remote release system so that the net could be released by an individual up to 100 m away. We established whoosh net call stations by placing an automated calling system within suspected rail habitat with a trail camera to monitor rail activity. Once trail camera data indicated that a rail was frequently visiting for consecutive days the site field staff would set up the whoosh net and attempt to manually release the net and capture the bird on subsequent evenings and mornings. Finally, we tracked the number of whoosh net trapping attempts, the man-hours needed, and successful captures to track capture rates and efficiency for comparison with walk-in trapping techniques.

Figure 2. A king rail visits a whoosh-net call station at dawn; Winous Point, 2015.

Results: We captured two king rails during the spring 2014 field season and six king rails during the spring 2015 field season at six different locations at Winous Point (Table 1).

Table 1. Summary of trapping dates, locations, and results for eight King Rails captured and banded at Winous Point, 2014 and 2015.

Date	Location	Trap Type	Satellite Transmitter
May 7, 2015	North Boalt's	Walk-in	Yes
May 11, 2014	Weaver's	Walk-in	No
May 12, 2015	Elm Island	Walk-in	Yes
May 15, 2015	Weaver's	Walk-in	Yes
May 24, 2014	Weaver's	Walk-in	Yes
June 4, 2015	East Metzger's	Whoosh net	No
June 8, 2015	East Metzger's	Walk-in	No
June 18, 2015	Hickory Island	Whoosh net	No

All eight king rails were banded with a federal leg band and four of the birds were equipped with a 9.5 satellite transmitter (Microwave Telemetry) to collect data for future analyses regarding migratory pathways, migratory arrival and departure dates, potential habitat bottlenecks encountered during migration, and winter and summer habitat selection (Figure 3).

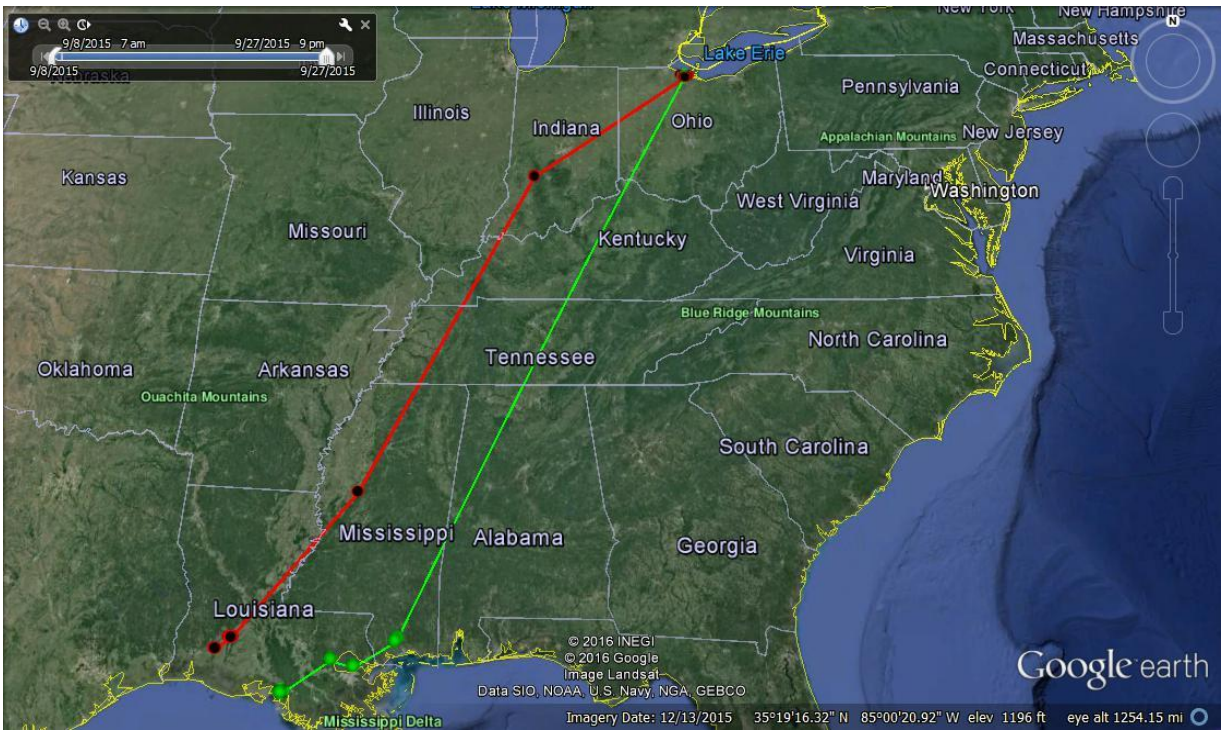

Figure 3. Migratory pathways of two satellite-marked King Rails from Winous Point to Louisiana, both in late September. Red line is a 2014 bird, 2015 in green.

We generated a coarse minimum estimated count of 13 individual king rails on trail camera over the course of the two-year study compared to zero detections over that same time period when conducting the standardized secretive marsh bird surveys (Figure 4). We did not have any within season or across season recaptures of banded bird during our trapping efforts.

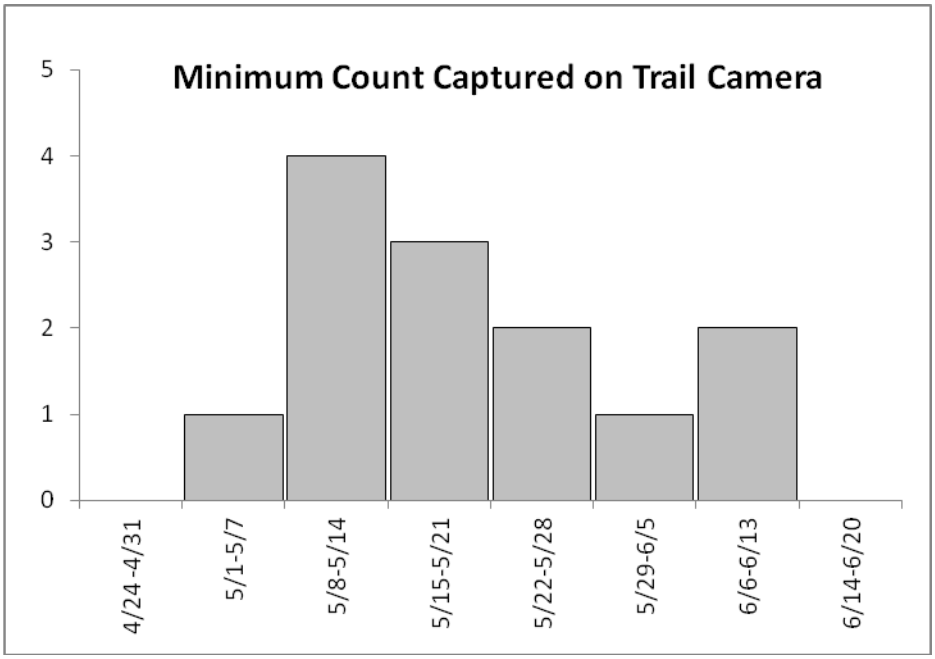

Figure 4. Minimum estimated count of individual King Rails detected by trail camera, per week, at Winous Point in 2014 and 2015 combined.

Of the eight king rails captured, six were captured using walk-in traps and two were captured using the whoosh net, which we believe are the first documented successful captures of king rails using this technique. Although sample size is limited for the whoosh net technique this did prove to be the more effective method for capture (0.28 rails/trap night vs. 0.019 rail/trap night for walk-in traps). Walk-in traps were still less efficient per man-hour than the whoosh net (0.024 rails/man-hour vs. 0.051 rails/man-hour), but these values were far more comparable because both trapping techniques required daily checks of the site (Table 2).

Table 2. Caparison of man-hours of effort for walk-in and whoosh net rail trapping at Winous Point in 2014 and 2015.

	Walk-in Traps			Whoosh net		
year	man-hours	captures	trap nights	man-hours	captures	trap nights
2014	100	2	90	na	na	na
2015	142	4	225	39	2	7

Discussion: This research documents both the presence of a state endangered wetland-dependent species at the Winous Point Marsh Conservancy and a novel capture technique for this species. The results of this work are also contrast with the secretive marshbird monitoring protocol that was developed with the long-term objective of monitoring secretive marshbird populations, as king rail detections the protocol did not detect any king rails at Winous Point despite our ability to trap and photograph multiple individuals during the same time period. We hypothesize that the secretive marshbird survey, although effective for more commonly detected species, is limited by a lack of data for rare species and could be improved upon with some of our techniques. For example, trail cameras could be used to model occupancy of king rails not just at Winous Point but statewide and then occupancy could be linked to various habitat covariates thus improving habitat abundance estimates for king rails. We hope our continued effort to trap and equip king rails with satellite transmitters will provide valuable new data on timing of migration, habitat selection and linkages to important wintering areas for king rails.

Winous Point is a lead investigator on this project, seeking grant funding from a variety of sources, including the Webless Migratory Bird Fund, Ohio Division of Wildlife, and the Upper Mississippi/Great Lakes Joint Venture to fund transmitters and technicians needed for the project.

Additional Research Supported by WPMC in 2015

In addition to the projects detailed above, Winous Point annually supports a variety of projects in partnership with partners who initiate the project and utilize Winous Point as a study area or for logistical support. While these projects are not directly initiated by WPMC, they are nonetheless important to conservation in northwest Ohio and help WPMC attain program objectives.

- The Ohio Sea Grant, The Nature Conservancy, and Ohio State University utilized Winous Point in 2015 as one of several field sites to sample fish communities on either side of water control structures within diked coastal wetlands. This research provides important knowledge about fish passage through water control structures and how coastal diking could potentially be improved for fish communities.

- Central Michigan University utilized Winous Point and surrounding private wetlands as one of many field sites across the Great Lakes as a study area for standardized amphibian surveys for the Great Lakes Costal Wetland Monitoring project. This coordinated survey effort provides important monitoring data for these understudied species and about the health of coastal wetlands in general.

- Researchers from University of Akron used Winous Point as one of several study sites along the coast of western Lake Erie to survey for bat species and to track bats utilizing transmitters and automated tracking tower systems. Winous Point also supported the project by providing storage and logistical support for tower systems and other equipment.

- For the fifth consecutive year USDA Ohio Wildlife Services conducted trapping efforts as part of an integrated approach to managing meso-predator populations, mainly raccoons (*Procyon lotor*), in northwest Ohio. The focus of the project is on increasing the nesting success and enhancing the survival rate of the state-listed Threatened Blanding's (*Emydoidea blandingii*) and spotted (*Clemmys guttata*) turtles. WPMC acts as a study area and logistic hub for housing and storage for this Great Lakes Restoration Initiative funded project.

- Winous Point and the Black Swamp Bird Observatory work together each year to support their respective research and conservation programs. BSBO is directly or indirectly involved with many of the bird banding projects conducted annually at Winous Point. Winous Point supplies housing for BSBO seasonal banding staff and conducts three private lands birding tours each year in support of BSBO programs.

- Sandusky County Park District (SCPD) and Green Creek Wildlife Society continue to work cooperatively with the WPMC to achieve mutually beneficial program goals. The SCPD is an essential partner in our waterfowl banding operations and WPMC youth education programs. WPMC assists the SCPD by providing a research site for shorebirds, Christmas bird count, and shorebird conservation tours. As mentioned in the introduction, Table 1 provides a full breakdown of the yearly shorebird bandings.

Table 1. Yearly shorebird bandings by species, 2006 – 2015. Banding sites include WPMC, ONWR, McClure's Marsh, Decoy Club Park, and East Harbor State Park.

Species	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	Total
Least Sandpiper	90	279	381	461	304	454	467	557	82	25	3100
Semipalmated Sandpiper	2	267	309	423	402	475	515	538	73	40	3044
Pectoral Sandpiper	2	84	69	346	12	134	127	112	19	1	906
Killdeer	27	90	126	177	97	118	114	115	1	4	869
Dunlin	77	0	358	258	43	6	100	5	0	0	847
Short-billed Dowitcher	0	55	62	22	75	134	128	106	75	142	799
Lesser Yellowlegs	4	124	71	138	27	107	84	45	17	5	622
Semipalmated Plover	3	3	79	58	90	39	39	52	1	6	370
Wilson's Snipe	1	9	95	11	3	4	12	3	6	1	145
Stilt Sandpiper	1	0	7	3	15	14	33	24	1	1	99
Spotted Sandpiper	0	2	21	16	18	9	13	16	3	0	98
Solitary Sandpiper	11	4	11	31	1	6	13	13	0	0	90
White-rumped Sandpiper	1	0	4	4	21	1	2	3	0	0	36
Greater Yellowlegs	1	2	9	8	3	0	1	1	1	0	26
Red-necked Phalarope	0	0	6	0	2	15	2	0	0	0	25
Western Sandpiper	0	0	1	1	2	2	4	2	0	0	12
Long-billed Dowitcher	0	2	0	0	0	1	4	0	2	0	9
Red Knot	0	0	0	0	4	0	0	0	0	1	5
Baird's Sandpiper	0	0	1	0	0	4	0	0	0	0	5
Wilson's Phalarope	0	1	1	2	0	0	1	0	0	0	5
American Golden Plover	0	0	1	1	1	0	1	0	0	0	4
Buff-breasted Sandpiper	0	0	0	0	1	3	0	0	0	0	4
Black-bellied Plover	0	0	0	1	2	0	0	0	0	0	3
Marbled Godwit	0	0	0	0	0	1	1	1	0	0	3
Sanderling	0	0	0	0	0	2	0	0	0	0	2
Upland Sandpiper	0	0	0	0	1	0	0	0	0	0	1
Hudsonian Godwit	0	0	0	0	1	0	0	0	0	0	1
Ruddy Turnstone	0	0	0	1	0	0	0	0	0	0	1
Totals	**220**	**922**	**1612**	**1962**	**1125**	**1529**	**1661**	**1593**	**281**	**226**	**11131**

2015 WPMC Activities and Presentations

February	Ohio Fish and Wildlife Management Association Conference, Columbus, OH
February	Upper Mississippi Great Lakes Joint Venture science meetings, Wichita, KS
February	Presented "Marshbird Research" at Port Clinton Middle School
March	Hosted and presented Lake Erie Marsh Owners Annual Winter Meeting
April	Presented at Ohio Decoy Collectors and Carver Association Show, Cleveland, OH
March	Hosted "Avian Influenza in Ohio" meeting
March	Supported the Ottawa County Pheasants Forever Banquet
April	Hosted Ohio Decoy Collectors and Carver Association Annual Meeting
April	Hosted USFWS Private Lands Program retreat
May	Hosted WPMC Annual Meeting
May	Black Swamp Bird Observatory birdwatching tours (3)
May	Hosted and presented at the Great Lakes Partners Forum
June	Hosted Ohio Division of Wildlife Banding training session
June	Presented sessions at the "Land Stewardship Workshop", Oak Harbor, OH
July	Cleveland Museum of Natural History field day
July	Attended and presented at SUNY-Oswego Wetland and Waterfowl Partnership Meeting, Oswego, NY
July/August	Sandusky County Park District shorebird tours (4)
September	Ohio State University Wildlife Management Class for 25 students
September	Attended Moist-soil Wetland Management Training Workshop, Puxico, MO
October	Presented at Ottawa National Wildlife Refuge "Youth Waterfowlers of Tomorrow"
November	Long Point Waterfowl Planning Meeting, Port Rowan, ON