MIGRATIONAL MOVEMENTS AND HABITAT USAGE BY MIGRANT PASSERINES IN THE GREAT LAKES REGION: OTTAWA NATIONAL WILDLIFE REFUGE, OHIO

PROGRESS REPORT-2020
BSBO-21-1

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INTRODUCTION

In 2020, Black Swamp Bird Observatory continued a long term passerine migration study on the Ottawa National Wildlife Refuge complex in the southern Lake Erie region. Specific goals of the project are to monitor the population status of Neotropical migrants in the Great Lakes region and to better understand the relationship between en-route habitat and their breeding and winter ecology in order to inform conservation decisions that protect these species throughout the entire life cycle. Lake Erie represents a barrier to most passerine migrants. Passerines' reluctance to navigate open water results in major concentrations along the southwestern shore of Lake Erie, unparalleled in the Midwest. With continuing habitat loss along both the Lake Erie coast and inland, this study will assist in monitoring the effects of habitat isolation and degradation on use by these species. There are only four small segments of beach ridge habitat remaining west of Port Clinton along Ohio's Lake Erie shoreline. The intensive bird use of these ridges in contrast to the adjacent condominium complexes and marinas demonstrates the importance of this habitat component in the Lake Erie marsh system. A wide range of migration corridor and stopover habitat occurs throughout the region (Ewert et al. 2006), but these sites do not contain bird concentrations as high as the beach ridges. The fall season appears to paint a different picture with habitat farther from the lake receiving much greater use. A complex of study sites are necessary to fully examine habitat use, migrational timing, and energetic condition of birds.

The importance of understanding avian migration and stopover habitat needs has greatly increased over the past two decades as tropical deforestation and temperate forest fragmentation have expanded and songbird populations have declined. Little information is known about the "problems" migrants contend with along their migratory routes (Morse 1980), not to mention the transition between spring migration and the breeding period. Recent studies have indicated upwards of 80% of annual mortality occurs during migration for many landbirds (Sillett and Holmes 2002). To offset the energetic costs of migration, birds deposit substantial lipid reserves which may reach 50% body weight among long distance intercontinental migrants (Berthold 1975). As lipid stores are depleted during migration, birds are capable of replenishing reserves in a few days at rates approaching 10% body weight per day (e.g. Barlein 1985; Biebach *et al.* 1986; Moore & Kerlinger 1987). These lipid deposits are obviously critical for a successful migration, and they may also provide a selective advantage to the migrant with energy reserves remaining (see Sinclair 1983; Ojanen 1984; Krapu *et al.* 1985; Krementz & Ankney 1987). Adequate stopover habitat may play an important role in delivering

migrating passerines to their breeding grounds with sufficient energy reserves to successfully nest.

In addition to the biological stressors confronting migratory birds, the changing landscape presents increasing risks of human-induced mortality and individual and population stressors. Only in the past year or two has there been a movement to recognize the air column as a vital habitat for birds. Much of their life cycle is spent in this habitat component. A variety of communication towers for radio, television, and cell phones dot the regional landscape. Huge kills have been documented at the battery of guy-wired towers south of Maumee Bay by farmers surveying field preparedness during spring migration. One such incident involved a bushel basket of male Rose-breasted Grosbeaks brought to the state wildlife office in Oak Harbor for identification by the farmer. This was a single night event under one tower and represented a large easy to see species, suggesting that many more cryptic, small birds went undetected. As the 21st century unfolds, a new threat has emerged in the form of increasing interest in wind power as an alternative power source. The cumulative negative effect on the avian resource in a highly important stopover area such as the western basin is of great concern to the future maintenance of avian populations through the eastern United States.

To this end, this project is an important part of a massive study being conducted along the western basin of Lake Erie. Multiple methodologies are being brought together to quantify their effectiveness of representing migration and risk to individuals, to identify nocturnal movements and their volume in this highly important stopover habitat, and to quantify ascent and descent trajectories of birds arriving and leaving the region. A study of this size - involving multiple radar units, comprehensive banding operations, and region-wide point counts - has not been conducted in the region to date.

There is no substitute for long-term monitoring to address many pressing questions regarding the health of the environment in general and of birds specifically. Annual, site, species, and weather variation results in large uncontrollable parameters that cloud short-term studies. There are few long-term (greater than 20 years) programs for resource managers to utilize to inform decision making processes. These long-term datasets, such as that of the Navarre banding station, offer the greatest value in the interpretation of long-term ecological change.

Due to the Covid-19 global pandemic, field operations at the Navarre study site were cancelled for spring and only point counts were conducted during the fall migration. Social distancing protocols of the state of Ohio and personnel safety dictated that the immense need of volunteers to collect field data could not be accomplished in 2020. After complete cessation of field activity in the spring, staff decisions with increased knowledge of the virus permitted a controlled operation to collect fall point count data under the standard protocol. This annual report covers those findings and a comparison to the long-term point count dataset for the site.

STUDY AREAS

Black Swamp Bird Observatory (BSBO) banding sites are centered along the western basin of Lake Erie in Ohio. The primary site is located at the Navarre Unit of Ottawa National Wildlife Refuge on the largest remaining beach ridge along the western basin of Lake Erie and that holds the most

complete native beach ridge vegetative complex. Habitat at the site is dominated by Carolinian forest with multiple bands of wetland associations. Hackberry and Kentucky Coffeetree along with Eastern Cottonwood and White Ash make up the majority of overstory. The understory is primarily several species of Dogwood, Buttonbush, and Bush Honeysuckle. Herbaceous layers include a wide variety of herbs, sedges, and grasses. There is a diverse wildflower component but considerable damage from invasive Garlic Mustard and overgrazing by White-tailed Deer are stressors to this layer.

METHODS AND MATERIALS

During the fall migration season of 2020, migrating and resident passerines were sampled on the Navarre Unit of the Ottawa National Wildlife Refuge in the Great Lakes region through point counts. Following the Midwest Migration Network protocols for landbird migration surveys point count efforts covered a minimum of 75% of the migration period for the study site. Every attempt was made to equalize any un-sampled parts of the migration period at the beginning and ending time frame (Shieldcastle 2018). The migration period covers both short distance and long distance (Neotropical) migrants. Fall migration field work was conducted mid-August to the end of October.

Point counts were spaced evenly throughout the banding station defined by the area covered by nets. Points are located a minimum of 100 meters apart to reduce the potential of double counting individuals. This assumption may not always be fulfilled as the migration period is characteristic of the definition of an open population as individuals may be actively migrating all day long. The Navarre route follows the primary direction of bird movement.

Point counts were conducted during fall migration in 2020 to provide a continuum to the long-term study dataset. Counts were conducted for five minutes in which all birds seen or heard were recorded. Counts were run near sunrise each morning when permitted by weather. Point counts were canceled during extremely high wind or precipitation events.

RESULTS

FALL

Fall migration starts in July for many species and some breeding Neotropical migrants (e.g., Yellow Warbler) have left the study area by mid-August. Weather conditions appear less important and food availability appears to be a key factor in migration timing. Additional factors include the inexperience of young birds and the molt status of individuals.

Navarre Banding Station, Ottawa County, Ohio (413-0830)

The Navarre main station fall point counts were conducted on 80 days during 2020. A total of 15,059 individuals of 122 species were recorded (Table 1). The most abundant species observed were Red-

winged Blackbird (2,476), European Starling (1,178), Common Grackle (994), American Robin (932), Canada Goose (650), Tree Swallow (510), Northern Cardinal (490), Gray Catbird (486), Cedar Waxwing (475), and White-throated Sparrow (409).

The purpose of completing the fall points in 2020 is to provide a bridge between the long-term dataset and future banding operations following the Covid-19 lockdown. As a result this report investigates point counts conducted in 2020 to the long-term point count dataset. Future analysis will go into additional depth in banding and point count data comparisons.

While total individual counts were below average, speciation was higher than in 2019 and many species' numbers were above their long-term averages. Red-winged Blackbird numbers in 2020 could solely explain why total numbers were below average and could mask an above average fall migration. Several species' above average numbers can be attributed to a short-tem population increase in the region. These include Trumpeter Swan, Sandhill Crane, Bald Eagle, White-breasted Nuthatch, and Black-capped Chickadee. Hairy Woodpecker and Red-bellied Woodpecker both showed above average counts that could be related to the Emerald Ash Borer infestation of the past several years. A widely reported northern finch invasion was reflected in a large increase in Pine Siskin numbers and the irruptive related Red-breasted Nuthatch. A large increase was noted in the swallow family, the reason being unclear. Red-eyed Vireo which had extremely high banding numbers at banding stations in the general region showed well above average numbers during the migration. Several species beyond the blackbird family had well below average numbers. These included White-throated Sparrow, Magnolia Warbler, Common Yellowthroat, and Gray-cheeked Thrush. Two species were recorded on Navarre point counts for the first time in 2020. These were Black-necked Stilt and Blue Grosbeak. The grosbeak has been banded at the station but this was the first known report for the stilt in Navarre.

RETURNS AND RECOVERIES

A long term study of this type has an added benefit of developing return rates and survival rates over time. One assumption that has not been verified is that passerines often return to the same breeding grounds to nest. There is substantial evidence for this but more research is needed to confirm the rate of this phenomenon. There is less evidence available regarding site fidelity to migration stopover sites. With no banding operations in 2020 due to the Covid-19 pandemic recoveries were reduced. Encounters of study site birds are shown in Table 2. Continued analysis in this area will hopefully shed some light on turnover rate and site fidelity in some species.

DISCUSSION

Black Swamp Bird Observatory has conducted bird migration monitoring research in the Lake Erie Marsh Region for more than 40 years. Annual variation in migrational monitoring numbers makes statements concerning populations very risky, even with long-term datasets. Does the variability represent true population fluctuation, is it an artifact of sample design, variation of weather patterns, or some combination of these and untold factors? Understanding these vital questions will provide

considerable value to bird conservation initiatives both today and into the future. It is through long-term studies such as this that these answers may be sorted out and some sense of landbird populations be made. To implement and accomplish life cycle conservation many hard questions will need to be addressed. Climate change is on the front burner of many conservation efforts today. Only through long-term comparisons will real change and avian response be documented. Will there be breeding and wintering range changes; will there be vegetative response to climate change; will migration timing be altered in response to food sources; or will there be biological cost? Long-term studies will allow for a more in depth analysis of weather patterns and bird activities in migration to tease apart annual variability and trend changes. For these reasons, Black Swamp Bird Observatory made every effort to conduct point counts in the fall to provide data continuity.

Long-term data do not support a major change in migrational timing of the core of any population. However, there may be evidence of an increase in early individuals of some species in the spring. This may be an indicator of a larger portion of a species "short-stopping" in southward migration or an increased survival of those that are always an exception to the norm. Fall migration is much more drawn out with heavy age effects on observations. Even with 20 years of data, annual variation still clouds conclusions about migrational changes. However, core timing can be established for both spring and fall for most landbird species covered by this study.

Black Swamp Bird Observatory operates multiple banding stations to acquire a clearer picture of migration along Lake Erie and its environs. Many questions pertaining to stopover habitat values and use can be addressed by multiple sites that can't be by any one site alone. Not all species utilize the stopover habitat that makes up the marsh region the same. Several species such as Yellow-rumped "Myrtle" Warbler and White-crowned Sparrow appear common everywhere but are much more common away from the lake shore. Magnolia Warbler concentrates heavily on the beach ridges and occurs at a much lower frequency a half mile or more from the lake. Station comparisons have identified that a much wider range of habitats are of importance and in need of protection to accomplish conservation goals in the region. Lake effect on migrating landbirds is demonstrated through the multiple banding sites. Lake Erie is a major water barrier to landbirds. Reluctance to cross the lake results in large concentrations seen at birding "hotspots" such as Magee Marsh Wildlife Area and Ottawa National Wildlife Refuge. Banding data from the Navarre station indicate spring averages of 8,000 birds banded, and 5,500 in fall when up to four times as many birds should exist in the population. This spring-dominated figure is a direct result of lake effect and how birds use the habitat. Spring and fall comparisons of sites show differential use and species composition which provides valuable information to habitat priorities in land acquisition and management. Lake effect may also be a player when reviewing the data for distance from the lake. Spring indicates concentrations are largely adjacent to the lake on the beach ridges, i.e. birds pushing against the barrier. Fall paints another story. Much lower bird concentrations are seen along the lake shore in fall but a vast increase is noted inland during fall migration. This may represent the descending range of those crossing the lake. The species composition also differs with distance from the lake. Warblers and thrushes dominate along the shore, while sparrows are most abundant inland. Studying age ratios during migration gives insight to reproductive success and habitat use variation. Few of these species can be adequately studied on their breeding or wintering grounds, so as a result, migration becomes a window

of opportunity to look at population based parameters for conservation. These age ratios can be compared between sites, between years, and between seasons to better understand population status, habitat needs, and conservation priorities.

Comparing spring and fall migration is an important part of life cycle conservation. It is not just breeding, wintering, and migration but includes the interaction of these events. Considerably different drivers are of importance between the two migrational seasons. Spring migration is driven northward by the urge to breed. These hormonal factors contribute to individuals pressing against unfavorable environmental conditions that can have serious survival ramifications. Fall migration appears to be more laid back as birds build body condition from the stresses of breeding or are facing their first migrational experience. Fall tends to be slower with longer stopover. Many species demonstrate differential migration routes between the two migrational periods. Three distinct patterns are apparent in the northward migration from Central America. There is the Caribbean route, trans-Gulf route, and the westward passage around the Gulf of Mexico. All three groups join in the Great Lakes. Several species show a more direct route up the Mississippi River in their core movement north to the Northwest Territories of Canada and Alaska Others are moving through the Lake Erie region to the boreal forest of eastern Canada and the northern United States. The Great Lakes also create a funneling effect during fall migration as birds from the prairies to eastern Canada make contact with the lakes' north shores. Some cross the continent diagonally from the northwest into the Great Lakes and southward to the Appalachians and Atlantic seaboard. Others come from eastern Canada and continue towards Texas and southward. Another important aspect of avian life cycle conservation is the understanding of connectivity among habitats utilized across the year. Coordination of multiple banding stations provides opportunities to link wintering grounds, migrational pathways, and breeding areas for a species or population. As these linkages are better understood a better ability to manage species will be reached. Many larger well-studied species such as waterfowl are recognized to have many independent populations of a given species; each of these has different stressors, threats, and habitat needs. The importance of population differences is totally unknown among landbird species and hinders strong and sound conservation efforts.

The results of this project suggest the need to establish a standardized sampling protocol across the Great Lakes region. The collection of similar data has the advantage that it allows comparisons across different study sites throughout the landscape. This study has developed a multi-method approach that can be reproduced anywhere in the upper Midwest. A combination of banding, point count surveys, and a daily species list permits the strengthening of weaknesses of each and builds on their individual strengths. It also allows for the use of other, less skill intensive methods such as counts to be done along a broader front and still be comparable to more detailed banding operations. This protocol will accommodate new methods such as radar and acoustics as they become available.

This study is the building block for such a network being instituted for the Great Lakes region by the Midwest Migration Network and U.S. Fish and Wildlife Service at this time. This network's goal is to bring multiple field researchers together to collaborate on big picture questions for the region. Similar field methods allow for site comparisons, habitat comparisons, body condition, migrational timing, and decision support for wind turbine placement among regional questions. This network, supported

by a central database (the Midwest Avian Data Center) will assist researchers, sample design, and analysis effectiveness. Data from this study will be submitted to the Data Center.

Birds far from breeding or wintering areas are seldom encountered in multiple years at the same stopover location. Little is known about how strong migrational route fidelity is in passerines. Before 2011, this study had only two individual birds not known to breed close to the marsh region that were recaptured at this site in two different migrational seasons, out of 350,000 birds banded. This highlights the importance of the seven returns of Blackpoll Warblers during fall 2011 and additional birds annually since. This species that breeds from Alaska across the subarctic front and winter in South America, was a long way from terminus locations. To have this many encounters homing to a single stopover location indicates an extreme importance of the region to this species' life cycle conservation. This total included a bird first banded in 2006, an individual that has logged a minimum of 50,000 miles in migration and endured at least five crossings of the Atlantic Ocean to South America, each consisting of 80 hours of non-stop flight. In addition to the apparent Blackpoll connection to Lake Erie a first Magnolia Warbler was captured for the second time at Navarre in in 2019. Repeated use of stopover habitat in the marsh region supports the continental importance of the region to migratory birds.

One of the biggest emerging threats to migratory birds in the past decade is the proliferation of wind power in the upper Midwest. Only in the past few years has the importance of the air column as a habitat to birds been recognized. Much of their life cycle is spent in this habitat. With the Lake Erie marsh region being possibly the most important stopover habitat in eastern North America, identifying habitat needs and use of migrants is of utmost priority for informed decision making of regulatory agencies. Risk to migratory birds needs to be identified. This includes documentation of ascent and descent rates and angles of migrants into the stopover habitat, elevation and volume of migrants, feeding flight activity, movement in relationship to lake shore, and movement over the open lake. Project personnel have been instrumental in bringing partners together to begin answering these questions. U.S. Geological Survey and Bowling Green University have provided radar units to document nocturnal movements, Ohio State University has a graduate student conducting point counts in the region, and BSBO provides the systematic banding program. Our shared objectives are to answer bird movement questions and to evaluate the effectiveness of banding and point counts to represent migration.

Long-term studies of this nature offer opportunities to annually address research questions but to also consider those that only long-term datasets can access. Personnel are presently working on manuscripts addressing the use of DNA analysis to document a first species record for Ohio, the use of migrational banding stations to address population trends in species of concern, migrational timing and effects of climate change, and use of age ratios in addressing population health. Future analyses will include development of migrational species accounts for the region. Additional manuscripts with partners working with radar technology will be developed as those projects mature.

ENVIRONMENTAL EDUCATION

A secondary goal of this study is to educate the general public on avian migration, research, habitat management, and ecosystems. During 2020, no public education programming could be accomplished.

MANAGEMENT RECOMMENDATIONS

Adequate stopover habitat is a necessity if migrating birds are to successfully reach breeding and wintering home ranges each year. While the Lake Erie marsh region may contain extremely important breeding habitats for some species, it is of much greater importance in meeting migration stopover needs. The combination of quality marshland, scrub-shrub upland and swamps, and wooded beach ridges provide food, water, and shelter for migrants. Intensively managed wetlands form the base for this habitat complex in the Lake Erie Marsh Region. The invertebrate populations required by the massive bird movement are born from these wetlands and shelters in the scrub and on beach ridges. This scrub-shrub and beach ridge habitat provides shelter from weather and protection from predators as well as the birds' food source. Rough-leaved Dogwood dominates the shrub habitat providing vast surface area for invertebrates as well as fall migrating birds. Any management scheme at this latitude needs to recognize the overriding importance of the region as stopover habitat for migrants. With the exception of the Gulf coast, no other region of eastern North America can demonstrate concentrations of avian migrants like Lake Erie's coast.

Management of these habitats needs to ensure protection of the remaining beach ridges and to provide both healthy wetlands and adequate shrub habitat. The mature forests of the Great Black Swamp once held many breeding species, but this habitat should not be a management priority. While migrational needs can be addressed in concentrated habitat units, to meet acreage requirements to influence breeding volume is presently beyond management resources. Wetland and moist soil habitats need to be managed to ensure water inundation during critical spring months to provide the substrate required for abundant invertebrate production. A well planned rotation of management units must be incorporated for summer and fall management plans to accommodate the habitat needs of the different migrant species, including deep water marshes, shallow water marshes, and moist soil areas. Shrub and grassland habitat management should consider migration as well as breeding needs. Management scenarios should also include food and cover during migration as well as protection during breeding season. Dike systems should be designed to incorporate scrub borders to provide travel lanes for migrants to mimic the limited beach ridges and to augment passerine breeding in shrub management units. Research has not been conducted to determine to what extent dike nesting success may influence overall regional avian production. This needs to be assessed to fully examine this habitat use. In theory, dikes should be looked to as additional habitat for breeders spilling over from more productive shrub habitat blocks. Scrub-shrub habitats need to be maintained to provide adequate surface area for invertebrates, cover for migrants and breeders, and to encourage fruit production for fall migration. This will require periodic rejuvenation of units on a rotational basis.

This study will provide components for an informed decision matrix for regulatory agencies in wind power placement in the Great Lakes region. Black Swamp Bird Observatory will use results from data analysis of

this project to formulate comments and positions on regulatory decisions on governmental policy.

Wise management of wetlands, shrub, grasslands, and riparian woodlands will not only benefit passerines on a year-round basis, but will also enhance the lives of other avian groups, mammals, reptiles, amphibians, and native plant associations.

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Table 1. Point count observations for 2020 and long-term averages.

Species	# Days 2020	# Observed 2020	Average # Observed 1994-2020	Species	# Days 2020	# Observed 2020	Average # Observed 1994-2020
Herring Gull	21	53	103	White-throated Sparrow	37	409	733
Ring-billed Gull	50	187	293	Slate-colored Junco	6	6	7
Bonaparte's Gull	6	85	136	Song Sparrow	43	117	36
Caspian Tern	6	7	9	Swamp Sparrow	3	3	5
Double-cr. Cormorant	24	341	318	Fox Sparrow	2	5	3
Mallard	37	282	341	Eastern Towhee	3	3	9
American Black Duck	6	13	13	Northern Cardinal	78	490	415
Gadwall	22	83	45	Rose-breasted Grosbeak	15	36	17
American Wigeon	4	6	100	Blue Grosbeak	1	1	<1
Green-winged Teal	1	2	7	Purple Martin	32	354	123
Blue-winged Teal	4	9	16	Barn Swallow	29	190	50
Northern Pintail	2	9	38	Tree Swallow	46	510	202
Wood Duck	41	129	82	Bank Swallow	15	176	110
Canada Goose	68	650	1313	No. Rough-wing Swallow	3	7	7
Trumpeter Swan	13	26	7	Cedar Waxwing	68	475	429
Tundra Swan	1	2	<1	Red-eyed Vireo	24	47	18
Great Blue Heron	33	51	54	Philadelphia Vireo	2	2	1
Great Egret	15	24	9	Warbling Vireo	33	80	22
Green Heron	7	8	2	Blue-headed Vireo	4	5	1
Sandhill Crane	6	14	3	Black-and white Warbler	2	2	2
King Rail	1	2	<1	Prothonotary Warbler	2	4	<1
Virginia Rail	2	2	<1	Nashville Warbler	4	4	2
Black-necked Stilt	1	1	<1	Tennessee Warbler	9	15	7
American Woodcock	3	3	<1	Northern Parula	2	3	<1
Killdeer	9	10	16	Yellow Warbler	10	22	1
Mourning Dove	12	16	33	Black-thr. Blue Warbler	14	18	3
Cooper's Hawk	1	1	1	Myrtle Warbler	27	151	148
Red-tailed Hawk	6	9	2	Magnolia Warbler	7	9	25
Bald Eagle	42	76	26	Chestnut-sided Warbler	4	5	2
Merlin	1	1	<1	Bay-breasted Warbler	8	12	5
American Kestrel	1	1	<1	Blackpoll Warbler	40	158	134
Osprey	1	1	<1	Blackburnian Warbler	1	1	1
Eastern Screech Owl	6	7	1	Black-thr. Green Warbler	6	6	3
Great Horned Owl	3	4	<1	Western Palm Warbler	2	4	1
Yellow-billed Cuckoo	4	4	3	Ovenbird	5	6	8
Belted Kingfisher	3	4	2	Mourning Warbler	1	1	<1
Hairy Woodpecker	18	18	4	Common Yellowthroat	6	9	25
Downy Woodpecker	68	153	135	Wilson Warbler	2	2	<1
Yellow-bellied Sapsucker	7	8	7	Canada Warbler	2	2	1
Red-headed Woodpecker	3	4	2	American Redstart	13	19	13
Red-bellied Woodpecker	50	71	9	Gray Catbird	60	486	297
Yellow-shafted Flicker	59	162	88	Brown Thrasher	6	7	13
Common Nighthawk	1	1	<1	Carolina Wren	62	132	115
Chimney Swift	39	143	137	House Wren	50	138	34
Ruby-th. Hummingbird	24	43	6	Winter Wren	14	22	23
Eastern Kingbird	23	35	20	Marsh Wren	1	1	<1
Great Cr. Flycatcher	4	4	1	Brown Creeper	7	8	6
Eastern Phoebe	11	11	8	White-br. Nuthatch	41	82	18
Olive-sided Flycatcher	1	1	<1	Red-br. Nuthatch	45	101	33
Eastern Wood Pewee	11	11	15	Black-capped Chickadee	40	71	19

Species	# Days 2020	# Observed 2020	Average # Observed 1994-2020	Species	# Days 2020	# Observed 2020	Average # Observed 1994-2020
Yellow-bellied Flycatcher	2	2	<1	Golden-crowned Kinglet	26	127	111
Least Flycatcher	3	3	<1	Ruby-crowned Kinglet	26	71	65
Blue Jay	63	193	235	Blue-gray Gnatcatcher	3	3	<1
American Crow	1	2	3	Veery	10	15	6
European Starling	78	1175	2827	Gray-cheeked Thrush	15	42	91
Brown-headed Cowbird	25	87	91	Swainson's Thrush	41	295	282
Red-winged Blackbird	74	2476	15919	Hermit Thrush	19	57	20
Baltimore Oriole	28	167	65	American Robin	72	932	517
Rusty Blackbird	21	278	290	Eastern Bluebird	1	2	<1
Common Grackle	71	994	1284	Unknown Duck	17	197	26
Purple Finch	16	35	60	Unknown Swallow	7	15	2
House Finch	23	49	20	Unknown Warbler	41	255	358
American Goldfinch	26	62	93	Unknown Thrush	3	3	<1
Pine Siskin	28	295	50	Unknown Blackbird	1	4	<1

Table 2. Foreign recoveries of study banded birds since last progress report.

Species	Band Number	Band Date	Band Location*	Recovery Date	Recovery Location
Red-winged Blackbird	1412-26836	04-18-19	Navarre	03-21-20	Ohio 413-0830
Common Yellowthroat	2780-41175	08-24-18	Navarre	05-11-19	Navarre

*Banding coordinates for study sites: Navarre 413-0830, BSBO 413-0831.