

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

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INTRODUCTION

In 2012, Black Swamp Bird Observatory continued a long term passerine migration study on the Ottawa National Wildlife Refuge complex and various other sites 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 signifies 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. 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 occur 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; Krentz &

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 of 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 21<sup>st</sup> 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 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 the Navarre banding station, offer the greatest value in the interpretation of long-term ecological change.

## STUDY AREAS

Black Swamp Bird Observatory (BSBO) banding sites are centered along the western basin of Lake Erie in Ohio with additional coverage along the central basin of Lake Erie east of Cleveland. The primary site is located at the Navarre Unit of Ottawa National Wildlife Refuge and is located on the largest remaining beach ridge along the western basin of Lake Erie which holds the most complete native beach ridge vegetative complex. Netting was also conducted on an active beach ridge outside the lakefront dike in Navarre during fall migration. This location allows the opportunity to study avian use of a beach ridge from its formation into maturity. 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.

Additional sites operated by BSBO include the Shaker Lakes site near Cleveland, Petersburg site in southeastern Michigan, and Creek Bend site in Sandusky County, Ohio. Shaker Lakes is approximately five miles from Lake Erie and lies on a major riparian corridor to the lake. Habitats include a brook, marsh, scrub-shrub, and the border of a woods. The Petersburg site in southern Michigan is shrub habitat that is located past the lake effect zone for bird migration. This site provides a comparison of a habitat away from the lake proper and potentially gives some indications to how quickly migrants spread out across the landscape. The Creek Bend site is located approximately 15 miles due south of Lake Erie and is also past the perceived lake effect zone. This site provides a comparison to Navarre for lake effect and spring and fall comparisons for different species groups. Habitat is dominated by dogwood, old field, and a riparian corridor. The variety of habitat types and distances from the lake surveyed allows us to document variation in migrational timing, habitat selection, and movement.

## METHODS AND MATERIALS

In 2012, migrating and resident passerines were sampled on the Navarre Unit of the Ottawa National Wildlife Refuge and three other sites in the Great Lakes region: Creek Bend, Shaker Lakes, and Petersburg (Figure 1). Sites operated near Cleveland and Lindsey, Ohio, and Monroe, Michigan provide comparisons to the refuge site that is located at a major passerine migration staging area. Banding and 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. The migration period covers both short distance and long distance (Neotropical) migrants. Spring migration operation in 2012 began mid-April and continued through early-June. Fall migration banding was July 1 to early November.

Placement of mist nets is designed to represent the habitat at the site and to bisect primary bird movement direction and corridors. Mist nets are considered a random method of capture with the premise being they are undetectable by foraging and traveling birds. This is a broad assumption with many caveats that must be considered in analysis of data. In reality not all birds have equal chance of capture. Bird size affects the chances of being captured and held in the net, species behavior can be a factor across species, height of activity is a factor, and weather effects can occur on any given day.

Mist netting was conducted from one-half hour before sunrise to at least 11:00 AM on each day of operation, weather permitting. Birds were captured utilizing 2.6 x 12 meter mist nets of 30mm mesh size. All birds were removed from the net, with the band and net recorded if previously banded, and placed in a mesh holding bag until processing. During processing, each bird was banded with a standard U.S. Fish & Wildlife Service leg band, measured by closed wing chord, body mass recorded, visually inspected for subcutaneous fat deposits using a 6-point ordinal scale (Helms & Drury 1960), and time stamped to net round. Birds were sexed and aged by the use of plumage characteristics (Pyle

1997) and guidelines of the Bird Banding Manual and Woods Manual (Woods 1969). Weather data were compiled from hourly readings of Toledo Edison's Davis Besse Nuclear Power Station.

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 both spring and fall migration to complement mist-netting operations and document species such as larger birds that are not typically captured by mist-nets. Counts were conducted for five minutes in which all birds seen or heard were recorded. Counts were run after net set up each morning permitted by weather and avian abundance. Point counts were canceled on extremely high wind or high bird activity days.

A daily list of species was compiled to document presence/absence for each site. This method complements the banding and point counts by acknowledging all species seen on a given day. This assists in rare species documentation and provides more complete information on arrival and departure dates for all species, particularly those that are unlikely to be banded in numbers reflecting their true abundance.

## RESULTS

### SPRING

Spring migration was monitored, weather permitting, daily in the Navarre Unit and when personnel were available at the Shaker Lakes, Creek Bend, and Petersburg sites in 2012. Spring 2012 was recorded as one of the warmest on record for Northwest Ohio. From March through May weather was dotted with record temperatures (Figure 2). This pattern appeared to affect migration timing for short-distance migrants, but not long-distance Neotropical migrants. Low pressure cells had a tendency to track from the southern plains into the Great Lakes rather than continue across the country. This had a dampening effect on volume that is usually seen with this pattern. Good diversity, but below average volume, was recorded at the Navarre station. Preliminary data analysis suggest the warm weather appears to have shortened stopover duration as well.

Through our research, we have found large numbers of Neotropical and short-distance migrants arrive in three “waves”. These waves are generated by weather patterns and migrational drivers of each individual species. Day length is the primary driver initiating migration in birds. This results in definable and predictable timing of migration annually. Weather patterns at the time of movement affects the fine-scale details of the movement. For the Lake Erie Marsh Region a low pressure cell centered in the Arkansas/Oklahoma region spins warm fronts that pick up warm tropical winds and pushes migrants up the Mississippi and Ohio River drainages. This front is depicted by a jump in temperature, southwest winds and stormy weather leading to major movements of passerines. These

patterns generally occur approximately every 7 days. Each “wave” of migrants is dominated by certain species and sex classes of birds with a large number of associated species. Males tend to precede a week to ten days ahead of females in most all species in migration. For the Lake Erie Marsh Region, the first wave occurs around 24 April and is dominated by male White-throated Sparrow, Hermit Thrush, male Yellow-rumped Warbler, and male Ruby-crowned Kinglet. In 2012, this wave did not appear to have a major first pulse and had only a moderate second pulse, peaking 01-04 May. Reports along the Mississippi River in 2012 indicate weather patterns may have resulted in the first pulse traveling predominantly up that corridor into Wisconsin and Minnesota. The second wave occurs 07-13 May and is represented by the greatest species diversity of the spring. It is dominated by female White-throated Sparrow, Swainson’s Thrush, female Yellow-rumped Warbler, female Ruby-crowned Kinglet, and male Magnolia Warbler. A second pulse of this wave comes five to seven days later, and usually has the largest volume and contains the same dominant species. This second wave was fair to below average and occurred 08-12 May with a stronger second pulse on 19-20 May. The third wave normally comes around Memorial Day weekend and is dominated by female Magnolia Warbler, American Redstart, Mourning Warbler, vireos, and flycatchers. In 2012, the third wave appeared 25-27 May with little movement in a second pulse 03 June.

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

In spring 2012, the Navarre banding station was operated on 49 days for 7,167.8 net hours. Including hummingbirds, 6,475 new birds were banded and a total of 7,636 birds handled (Table 1). The capture rate was 106.5 birds/100 net hours. This compares to the long-term average (1992-2010) of 122.7 birds/100 net hours (-13% from average). The long-term average shows no change over time of the capture rate at Navarre. One hundred and one species were banded in Navarre during spring 2012 (Table 2). The most unusual species and subspecies included Cooper’s Hawk, Red-headed Woodpecker, Olive-sided Flycatcher, Gambel’s White-crowned Sparrow, Cerulean Warbler, Louisiana Waterthrush, Eastern Whip-poor-will, Pine Warbler, Clay-colored Sparrow, and Northern Rough-winged Swallow. The ten most abundant species banded were Magnolia Warbler (576), Gray Catbird (440), White-throated Sparrow (355), Yellow-rumped Warbler (336), Yellow Warbler (308), Red-winged Blackbird (303), Swainson’s Thrush (300), Trail’s (Alder/Willow) Flycatcher (239), Common Yellowthroat (228), and American Redstart (222).

Point counts were initiated in 1995 as a part of the data collection at the Navarre site. These counts provide the best data for larger birds not sampled by mist nets. Point counts were conducted on 46 days during spring 2012. One hundred and thirty-six species and 27,081 individuals were recorded (Table 3). Canada Goose, Northern Cardinal, Red-winged Blackbird, Common Grackle, Tree Swallow, Song Sparrow, and American Robin were observed each count day. The most abundant species recorded was Red-winged Blackbird (6,321) followed by Blue Jay (4,583), Canada Goose (1,550), Tree Swallow (1,227), and Common Grackle (1,004).

#### Creek Bend Banding Station, Sandusky County, Ohio (412-0832)

This site permits comparison to the Lake Erie coastal sites as a riverine travel lane. 2012 was the 5<sup>th</sup>

year of data collection at this site. Banding operations were conducted on 8 days with 76 new birds banded in 155 net hours (49 birds/100 net hours) (Table 4). Twenty-three species (Table 5) were banded with the five most abundant species being Traill's Flycatcher (10), Indigo Bunting (8), American Goldfinch (7), Common Yellowthroat (7), and Gray Catbird (7).

#### Petersburg Banding Station, Monroe County, Michigan (415-0833)

This site is located west of Lake Erie and north of Toledo and permits comparison to the Lake Erie sites as birds migrate around the lake and disperse through the landscape. 2012 was the 18<sup>th</sup> year of banding at this site. Banding operations were conducted on 10 days with 146 new birds banded in 1,553.8 net hours (13.3 birds/100 net hours) (Table 6). Thirty-four species (Table 7) were banded with the five most abundant species banded being American Robin (25), Gray Catbird (23), Common grackle (15), Swainson's Thrush (15), and Magnolia Warbler (8).

Point counts were conducted on 10 days during spring 2012. Twenty-six species with 277 individuals were recorded (Table 8). American Robin, and Gray Catbird were observed each count day. The most abundant species recorded was American Robin (43) followed by Northern Cardinal (40), Gray Catbird (38), American Crow (27), and Field Sparrow (19).

#### Shaker Lakes Banding Station, Cuyahoga County, Ohio (412-0813)

This site is located east of Cleveland at the Nature Center of Shaker Lakes and 2012 was the 11th year of the banding operation. This site permits comparison to western Lake Erie sites as birds migrate along Lake Erie and disperse through the landscape. Banding operations were conducted Mondays, Wednesdays, and Fridays and was conducted on eleven days, with 124 new birds banded in 390.5 net hours (31.8 birds/100 net hours). A total of 173 birds were handled (44.3 birds/100 net hours) during spring migration (Table 9). Thirty-four species (Table 10) were banded with the six most abundant species banded being American Robin (21), Gray Catbird (18), Song Sparrow (10), Traill's Flycatcher (6), Magnolia Warbler (6), and Swainson's Thrush (6).

Point counts were conducted on 11 days during spring 2012. Forty-four species with 462 individuals were recorded (Table 11). The most abundant species recorded was American Robin (69) followed by Song Sparrow (39), American Goldfinch (27), Gray Catbird (26), and Warbling Vireo (24).

#### 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. Average fall temperatures were near normal with below average temperature in most of September and slightly elevated temperatures in October (Figure 3). Fall bird migration is dominated by different stimuli than in spring. Weather conditions appear less important and food availability appears to be a key factor. Additional factors include young inexperienced birds and molt status of individuals.

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

The Navarre main station was operated 62 days for 7,675.2 net hours. Five thousand and twenty-seven birds were banded with a total of 6,421 birds handled including recaptures (Table 12). This was the 20th fall season in which an extensive netting effort had been conducted on a daily basis. The capture rate for 2012 was 83.7 birds/100 net hours (+8% from 2011). A total of 88 species were banded during fall 2012 (Table 13). The ten most abundant species banded were Myrtle Warbler (1,176), Blackpoll Warbler (750), Swainson's Thrush (519), White-throated Sparrow (286), Hermit Thrush (236), Gray Catbird (221), Gray-cheeked Thrush (212), Golden-crowned Kinglet (174), Magnolia Warbler (120), and Tennessee Warbler (90).

Fall point counts were conducted on 50 days during 2012. A total of 20,935 individuals of 94 species were recorded (Table 14). The Red-winged Blackbird was observed on all count days. The most abundant species were Red-winged Blackbird (13,680), Canada Goose (1,289), Common Grackle (1,253), European Starling (502), and White-throated Sparrow (334).

For the 20th year, additional nets were run on an active beach ridge just outside the lake front dike near the main study site. This ridge has one band of 50-60 feet tall Cottonwoods about 30 feet wide and 75 yards long. The ridge presents an opportunity to document avian use as the habitat matures. This ridge has seen considerable loss of sand the past five years with a major narrowing of the vegetated portion resulting in reduced habitat with higher levels of Lake Erie. In 2012, four and one half nets were run on 58 days for 1,408 net hours (Table 15). The capture rate for fall 2012 was 146.1 birds/100 net hours. One thousand seven hundred and sixty-three birds of 64 species were banded on the beach ridge (Table 16). The top ten species banded were Myrtle Warbler (482), Blackpoll Warbler (419), Gray Catbird (104), Golden-crowned Kinglet (74), Red-breasted Nuthatch (72), Ruby-crowned Kinglet (51), Tennessee Warbler (50), Red-winged Blackbird (48), Swainson's Thrush (45), White-throated Sparrow (36), and Common Yellowthroat (36).

### Creek Bend Banding Station, Sandusky County, Ohio (412-0832)

Banding operations were conducted on 41 days with 2,609 new birds banded in 2,195.5 net hours (118.8 birds/100 net hours) (Table 17). Sixty-eight species (Table 18) were banded with the ten most abundant species being American Goldfinch (795), White-throated Sparrow (213), Song Sparrow (208), Indigo Bunting (173), Nashville Warbler (88), Myrtle Warbler (87), Ruby-crowned Kinglet (87), Swamp Sparrow (86), Lincoln Sparrow (85), and Pine Siskin (82). The large volume of American Goldfinches banded at this site was a direct result of a 5 acre patch of forbs and third year sunflowers next to the banding station. This food plot was part of the County Park District land management plan for the year. Changes to this management rotation will affect species captured and will need to be documented on an annual basis to interpret banding results over time.

### Shaker Lakes banding Station, Cuyahoga County, Ohio (412-0813)

Banding operations were carried out on Mondays, Wednesdays, and Fridays and were conducted on

20 days with 541 new birds banded in 600 net hours (90.2 birds/100 net hours). A total of 628 birds were handled (104.7 birds/100 net hours) during fall migration (Table 19). Fifty-nine species (Table 20) were banded with the ten most abundant species being Myrtle Warbler (76), White-throated Sparrow (49), Swainson's Thrush (47), American Goldfinch (40), Magnolia Warbler (29), Gray Catbird (28), Song Sparrow (21), Ruby-crowned Kinglet (18), American Redstart (14), Black-throated Blue Warbler (13), and Golden-crowned Kinglet (13).

Point counts were conducted on 20 days during fall 2012. Thirty-seven species and 819 individuals were recorded (Table 21). The most abundant species recorded was Chimney Swift (356) followed by Song Sparrow (90), American Goldfinch (49), Cedar Waxwing (37), and American Robin (33).

### SUMMARY BANDINGS

Total combined bandings for passerine migration 2012 for the Black Swamp Bird Observatory is in Table 22. Totals without parentheses are for the National Wildlife Refuge complex. The ten most abundant species banded on Ottawa NWR complex were Myrtle Warbler (1,996), Blackpoll Warbler (1,295), Swainson's Thrush (804), Gray Catbird (765), Magnolia Warbler (734), White-throated Sparrow (678), Hermit Thrush (363), Red-winged Blackbird (360), Common Yellowthroat (356), and Tennessee Warbler (347). Inclusive totals of all sites were topped by Myrtle Warbler (2,159), Blackpoll Warbler (1,329), White-throated Sparrow (946), Swainson's Thrush (885), Gray Catbird (882), American Goldfinch (879), Magnolia Warbler (818), Common Yellowthroat (435), Hermit Thrush (388), and Tennessee Warbler (382). A combined total of 118 species of 16,761 individuals (79.3 birds/100 net hrs) were banded. Totals for each study site and for each season are shown in Table 23. Species with greater than 50 individuals sampled had fall age ratios generally lower than the long-term average (Table 24).

### RETURNS AND RECOVERIES

A long term study of this type has an added benefit to develop 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. During 2012, 331 birds of 23 species were captured as returning birds at the Navarre sites (Table 25). This total includes 70 Yellow Warblers with the oldest being banded in 2006, 83 Gray Catbirds with the oldest from 2004, 21 Common Yellowthroats (oldest from 2006), 37 Red-winged Blackbird (oldest from 2003), 28 Northern Cardinals (oldest from 2003), and 12 Baltimore Orioles (oldest from 2008). The long term study at Navarre has resulted in state longevity records for the Yellow Warbler, Prothonotary Warbler, Warbling Vireo, Eastern Wood Pewee, Brown Creeper, Northern Waterthrush, Ovenbird, Great-crested Flycatcher, Cedar Waxwing, and Hermit Thrush. The Yellow Warbler record surpasses the species record as reported by the Bird Banding Laboratory. Continued analysis in this area will hopefully shed some light on turnover rate and site fidelity in some species. An additional 30 birds of 10 species were return captures at Shaker Lakes in 2012 (Table 26). A Song Sparrow and Blue Jay were captured that were first banded in 2007. Creek Bend had 71 individuals of 10 species return from previous year bandings (Table 27). A White-throated



Sparrow banded at Navarre in spring of 2004 was recaptured in November. Petersburg had 21 returns of 4 species (Table 28). Several foreign captures were made of study birds and are reported in Table 29 as well as two foreign banded bird that were captured during the 2012 study year.

### ENERGETIC CONDITION

The relationship between energetic condition during migration and breeding success is not well known in passerines. There are many factors that could affect the amount of fat a bird may carry at any given time. We are collecting data on several factors that may affect lipid deposition, but it will be several years before those trends may be tied to productivity. For 2012, 33 species (Table 30) had adequate sample sizes in both 2011 and 2012 to look at the changes in average fat deposits during spring migration. There was considerable variability in species when comparing 2011 and 2012. Twenty-six species indicated higher fat deposits in 2012 and 7 in 2011.

For passerines it is extremely difficult to acquire an adequate sample of breeding pairs to assess annual production on the breeding grounds. Considerable work has been conducted on larger species, especially waterfowl, on the relationship of spring body condition and reproductive success that breeding season. One method of assessing annual production in passerines is to compare fall age ratios (e.g. production) to spring migration body condition where an adequate sample may be acquired. Of 12 species with adequate sample sizes of spring fat and fall age ratios, three appeared to show a similar trend in fat between 2011 and 2012 and the percent change in age ratios for these species between the two years. This relationship will be monitored for potential usefulness in assessing species productivity.

In 2012, fall fat composition was higher in 2011 in 12 species with 5 species higher in 2012 ( $p < .05$ ) (Table 31).

### DISCUSSION

Black Swamp Bird Observatory has conducted bird migration monitoring research in the Lake Erie Marsh Region for more than 30 years. Annual variation in migrational monitoring numbers makes statements concerning populations very risky, even with long-term datasets. This past spring resulted in one of the lowest banding totals recorded at the Navarre station. This followed a record number of birds banded the spring 2011 and an extremely low total in 2010. Determining what contributes to this great variability and how can it be quantified is a challenge. Does the variability represent true population fluctuation, is it an artifact of sample design, vagrancy 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 indepth analysis of weather patterns and bird activities in migration to tease apart annual variability and trend changes.

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 affects on observations. Even with 20 years of data, annual variation still clouds inference of migrational changes. 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 of 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 fall at 5,500 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, 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 at the more inland sites such as Creek Bend during fall migration. This may represent the descending range of those crossing the lake. The species composition also differs with distance from lake. Warblers and thrushes dominate along the shore; while sparrows are most abundant inland. Studying age ratios during migration gives an 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, 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. 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 northern United States. The Great Lakes also create a funneling affect 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 utilize across the year. A coordination of multiple banding stations provides opportunity 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 having 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, count surveys, and 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 considered for the Great Lakes region by the 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 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 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 an additional two in fall 2012. A species that breeds from Alaska across the subarctic front and wintering 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. 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 year 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 need 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, while BSBO provides the systematic banding program. 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 2012, project personnel entertained 105 groups at Navarre and the Black Swamp Bird Observatory Nature Center educating 3,600 individuals on migration and banding. In addition, six presentations were made to 190 people on avian ecology and migration. As a part of International Migratory Bird Day events, banding demonstrations were presented on the Magee Marsh State Wildlife Area for some 3,000 people. In addition, an estimated 40,000 individuals were educated through face to face interaction and print and video media about the importance of the western basin of Lake Erie as a stopover habitat for migrating landbirds during the Biggest Week in American Birding Festival in early May.

### 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 their 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 over-riding 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 migrant 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 other avian groups, mammals, reptiles, amphibians, and native plant associations.

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Table 1. Daily banding totals for Navarre, spring 2012.

Date	Net Hour	Banded	Banded/ 100 net hr	Returns	Recaptures	Total birds*	Total bird/ 100 net hr
413	51.75	27	52.17	7	0	34	65.70
414	RAIN						
415	134.17	96	71.55	2	1	100	74.53
416	63.25	35	55.34	3	3	41	64.82
417	134.17	22	16.40	3	5	30	22.36
418	130.41	20	15.34	6	3	30	23.00
419	149.50	46	30.77	4	2	54	36.12
420	145.59	65	44.65	2	0	67	46.02
421	111.17	14	12.59	0	3	17	15.29
422	85.93	39	45.39	3	5	48	55.86
423	97.94	37	37.78	0	8	46	46.97
424	115.58	28	24.23	4	8	40	34.61
425	138.00	37	26.81	1	12	50	36.23
426	132.25	36	27.22	1	8	49	37.05
427	143.75	24	16.70	2	19	46	32.00
428	107.41	27	25.14	1	9	37	34.45
429	122.59	33	26.92	5	11	50	40.79
430	145.59	137	94.10	1	6	145	99.60
501	172.50	289	167.54	4	9	303	175.65
502	174.34	227	130.21	5	12	244	139.96
503	164.83	387	234.79	15	2	404	245.10
504	172.50	247	143.19	11	14	273	158.26
505	167.90	116	69.09	6	13	135	80.41
506	164.83	141	85.54	13	24	178	107.99
507	Rain						
508	180.17	276	153.19	16	24	316	175.39
509	182.08	184	101.05	8	35	227	124.67
510	143.75	107	74.44	3	26	136	94.61
511	151.34	121	79.95	11	42	174	114.97
512	172.50	380	220.29	4	22	406	235.36
513	172.50	199	115.36	9	31	239	138.55
514	184.00	159	86.41	10	36	206	111.96
515	176.41	228	129.24	7	34	271	153.62
516	185.84	183	98.47	11	22	216	116.23
517	166.75	88	52.77	7	42	137	82.16
518	130.41	67	51.38	4	19	90	69.01
519	178.25	360	201.96	7	29	396	222.16
520	180.09	459	254.87	2	25	486	369.87
521	164.84	241	146.20	10	31	282	171.08
522	153.41	94	61.27	4	39	137	89.30
523	159.08	111	69.78	6	32	149	93.66
524	159.08	163	102.46	4	32	200	125.72
525	172.50	301	174.49	6	18	325	188.41
526	115.00	67	58.26	4	21	92	80.00
527	166.75	196	117.54	4	20	223	133.73
528	138.00	108	78.26	6	14	128	92.75
529	Rain						
530	161.00	54	33.54	6	29	89	55.28
531	139.84	41	29.32	3	10	54	38.62
601	109.25	19	17.39	1	10	30	27.46
602	161.00	59	36.65	5	32	96	59.63
603	138.00	80	57.97	8	22	110	79.71
TOTAL	7167.79	6475	90.33	265	874	7636	106.53

\* Total birds include Brown-headed Cowbirds and European Starlings released unbanded.

Table 2. Spring banding totals, Navarre, 2012.

Species	Banded	Species	Banded	Species	Banded
Sharp-shinned Hawk	7	Field Sparrow	2	Bay-breasted Warbler	57
Cooper Hawk	1	Slate-colored Junco	4	Blackpoll Warbler	126
Yellow-billed Cuckoo	1	Song Sparrow	38	Blackburnian Warbler	35
Black-billed Cuckoo	1	Lincoln Sparrow	85	Black-th.-Green Warbler	48
Hairy Woodpecker	2	Swamp Sparrow	105	Pine Warbler	2
Downy Woodpecker	10	Fox Sparrow	1	Western Palm Warbler	104
Yellow-bellied Sapsucker	2	Northern Cardinal	33	Ovenbird	137
Red-headed Woodpecker	1	Rose-breasted Grosbeak	6	Northern Waterthrush	76
Red-bellied Woodpecker	1	Indigo Bunting	103	Louisiana Waterthrush	2
Yellow-shafted Flicker	1	Scarlet Tanager	3	Connecticut Warbler	5
Whip-poor-will	2	Barn Swallow	5	Mourning Warbler	95
Ruby-th. Hummingbird	25	Tree Swallow	7	Common Yellowthroat	228
Eastern Kingbird	3	N. Rough-winged Swallow	1	Yellow-breasted Chat	2
Great-crested Flycatcher	12	Cedar Waxwing	5	Hooded Warbler	12
Eastern Phoebe	1	Red-eyed Vireo	153	Wilson's Warbler	124
Olive-sided Flycatcher	1	Philadelphia Vireo	37	Canada Warbler	117
Eastern Wood Pewee	20	Warbling Vireo	24	American Redstart	222
Yellow-bellied Flycatcher	99	Blue-headed Vireo	15	Gray Catbird	440
Acadian Flycatcher	8	White-eyed Vireo	4	Brown Thrasher	7
Trail's Flycatcher	239	Black and White Warbler	52	Carolina Wren	1
Least Flycatcher	50	Prothonotary Warbler	15	House Wren	68
Blue Jay	18	Blue-winged Warbler	7	Winter Wren	1
Brown-headed Cowbird	1	Golden-winged Warbler	1	Brown Creeper	2
Red-winged Blackbird	303	Nashville Warbler	211	Black-capped Chickadee	7
Baltimore Oriole	58	Orange-crowned Warbler	6	Golden-crowned Kinglet	2
Rusty Blackbird	3	Tennessee Warbler	207	Ruby-crowned Kinglet	77
Common Grackle	50	Northern Parula	28	Blue-gray Gnatcatcher	11
American Goldfinch	12	Cape May Warbler	9	Wood Thrush	30
White-crowned Sparrow	34	Yellow Warbler	308	Veery	84
Gambel's Wh.-cr. Sparrow	1	Black-th.-Blue Warbler	35	Gray-cheeked Thrush	42
White-throated Sparrow	355	Myrtle Warbler	336	Swainson's Thrush	300
American Tree Sparrow	1	Magnolia Warbler	576	Hermit Thrush	101
Chipping Sparrow	3	Cerulean Warbler	3	American Robin	36
Clay-colored Sparrow	1	Chestnut-sided Warbler	143		



Table 3. Number of days observed and totals of species seen on point counts, Navarre spring 2012.

Species	# days	#Observed	Species	# days	#Observed	Species	# days	#Observed
Pied-billed Grebe	41	210	Eastern Phoebe	1	1	Black & White Warbler	17	40
Herring Gull	31	76	Olive-sided Flycatcher	2	2	Prothonotary Warbler	24	49
Ring-billed Gull	33	164	E. Wood Pewee	15	40	Blue-winged Warbler	4	8
Bonaparte's Gull	4	6	Yellow-bel. Flycatcher	5	6	Nashville Warbler	15	58
Caspian Tern	7	8	Acadian Flycatcher	2	3	Orange-crowned Warbler	2	2
Dou.-cr. Cormorant	16	118	Alder Flycatcher	8	16	Tennessee Warbler	24	192
Mallard	11	19	Willow Flycatcher	20	69	Northern Parula	12	18
Wood Duck	29	133	Trail's Flycatcher	1	2	Cape May Warbler	6	12
Redhead	1	1	Least Flycatcher	12	28	Yellow Warbler	34	947
Lesser Scaup	1	2	Blue Jay	47	4,595	Black-th.-Blue Warbler	10	13
Bufflehead	1	2	E. Starling	47	430	Myrtle Warbler	25	259
Canada Goose	48	1,583	Bobolink	8	31	Magnolia Warbler	24	112
Trumpeter Swan	11	40	Brown-headed Cowbird	47	427	Cerulean Warbler	6	7
Least Bittern	11	18	Red-winged Blackbird	48	6,461	Chestnut-sided Warbler	26	59
Gr.-blue Heron	42	151	Eastern Meadowlark	1	1	Bay-breasted Warbler	8	19
Great Egret	22	46	Orchard Oriole	2	2	Blackpoll Warbler	24	119
Green Heron	7	9	Baltimore Oriole	34	528	Blackburnian Warbler	11	18
Black-cr. N. Heron	4	6	Rusty Blackbird	13	68	Black-th.-Green Warbler	19	44
Sandhill Crane	4	10	Common Grackle	48	1,033	Pine Warbler	1	1
Sora	24	63	Purple Finch	3	10	W. Palm Warbler	11	26
Common Moorhen	3	3	Am. Goldfinch	40	368	Ovenbird	18	32
Am. Coot	19	43	White-cr. sparrow	6	26	No. Waterthrush	21	47
Greater Yellowlegs	1	1	White-th. Sparrow	29	956	Connecticut Warbler	4	4
Lesser Yellowlegs	3	8	American Tree Sparrow	1	1	Mourning Warbler	16	28
Solitary Sandpiper	3	3	Slate-colored Junco	6	17	Com. Yellowthroat	34	212
Killdeer	4	4	Song Sparrow	48	480	Yellow-breasted Chat	5	5
Mourning Dove	24	40	Lincoln Sparrow	11	14	Hooded Warbler	5	5
Turkey Vulture	2	6	Swamp Sparrow	28	54	Wilson's Warbler	22	39
Sharp-sh.. Hawk	5	5	Eastern Towhee	3	5	Canada Warbler	13	19
Cooper's Hawk	1	1	No. Cardinal	48	634	American Redstart	27	110
Red-tailed Hawk	8	8	Rose-br. Grosbeak	13	31	Gray Catbird	36	791
Bald Eagle	9	11	Indigo Bunting	25	94	Brown Thrasher	33	58
Peregrine Falcon	1	1	Scarlet Tanager	12	16	Carolina Wren	42	82
American Kestrel	1	1	Purple Martin	16	28	House Wren	41	235
Yellow-billed Cuckoo	11	38	Cliff Swallow	2	2	Marsh Wren	22	34
Black-billed Cuckoo	10	31	Barn Swallow	26	87	Black-capped Chickadee	14	19
Belted Kingfisher	2	2	Tree Swallow	48	1,285	Ruby-crowned Kinglet	24	99
Hairy Woodpecker	2	2	Bank Swallow	10	27	Blue-gray Gnatcatcher	14	52
Downy Woodpecker	34	94	Rough-winged Swallow	12	22	Wood Thrush	9	18
Red-h. Woodpecker	3	4	Cedar Waxwing	25	857	Veery	17	36
Red-b. Woodpecker	31	73	Red-eyed Vireo	28	234	Gray-cheeked Thrush	8	13
Yellow-shafted Flicker	16	26	Philadelphia Vireo	8	14	Swainson's Thrush	27	121
Whip-poor-will	1	1	Warbling Vireo	31	101	Hermit Thrush	5	15
Chimney Swift	8	22	Yellow-throated Vireo	4	4	American Robin	48	313
Ruby-th. Humming.	5	5	Blue-headed Vireo	4	6	Eastern Bluebird	1	1
Eastern Kingbird	30	78	White-eyed Vireo	3	3	Unk. warbler	30	367
Great-cr. Flycatcher	13	28						

Table 4. Daily banding totals for Creek Bend, spring 2012.

Date	Net Hour	Banded	Banded/ 100 net hr	Returns	Recaptures	Total birds	Total bird/ 100 net hr
425	5.0	2	40.0	1	0	3	60.0
430	15.0	14	93.3	3	2	19	126.7
517	15.0	9	60.0	0	0	9	60.0
523	15.0	3	20.0	0	0	3	20.0
525	27.5	17	61.8	10	1	28	101.8
526	30.0	14	46.7	8	3	25	83.3
528	22.5	12	53.3	4	2	18	80.0
608	25.0	5	20.0	0	0	5	20.0
<b>TOTAL</b>	<b>155.0</b>	<b>76</b>	<b>49.0</b>	<b>26</b>	<b>8</b>	<b>110</b>	<b>71.0</b>

Table 5. Daily banding totals Creek Bend, spring, 2012

Species	Banded	Species	Banded	Species	Banded
Downy Woodpecker	1	Indigo Bunting	8	Gray Catbird	7
Trail's Flycatcher	10	Tree Swallow	5	Brown Thrasher	2
Common Grackle	1	Red-eyed Vireo	1	House Wren	1
American Goldfinch	7	Yellow Warbler	5	Blue-gray Gnatcatcher	1
White-throated Sparrow	3	Magnolia Warbler	1	Swainson's Thrush	1
Field Sparrow	3	Western Palm Warbler	1	Hermit Thrush	2
Song Sparrow	3	Common Yellowthroat	7	Eastern Bluebird	3
Lincoln Sparrow	1	Wilson's Warbler	2		

Table 6. Daily banding totals for Petersburg, spring 2012.

Date	Net Hour	Banded	Banded/ 100 net hr	Returns	Recaptures	Total birds	Total bird/ 100 net hr
502	153.6	10	6.51	4	0	14	9.11
503	118.6	10	8.43	1	0	11	9.27
508	156.8	20	12.76	1	4	25	15.94
511	171.8	17	9.90	0	4	11	6.40
515	166.6	11	6.60	2	7	20	12.00
517	191.6	24	12.53	3	5	32	16.70
519	136.6	20	14.64	2	5	27	19.77
520	138.2	12	8.68	0	6	18	13.02
522	170.0	13	7.65	4	6	23	13.53
523	150.0	9	6.00	3	3	15	10.00
<b>TOTAL</b>	<b>1553.8</b>	<b>146</b>	<b>9.40</b>	<b>20</b>	<b>40</b>	<b>206</b>	<b>13.26</b>

Table 7. Daily banding totals Petersburg, spring, 2012.

Species	Banded	Species	Banded	Species	Banded
American Woodcock	2	Rose-breasted Grosbeak	2	American Redstart	5
Downy Woodpecker	4	Indigo Bunting	1	Gray Catbird	23
Least Flycatcher	2	Nashville Warbler	2	Brown Thrasher	1
Brown-headed Cowbird	2	Yellow Warbler	2	Tufted Titmouse	1
Red-winged Blackbird	1	Magnolia Warbler	8	Ruby-crowned Kinglet	1
Common Grackle	15	Ovenbird	3	Wood Thrush	1
White-throated Sparrow	2	Northern Waterthrush	4	Veery	2
Chipping Sparrow	3	Mourning Warbler	2	Gray-cheeked Thrush	4
Field Sparrow	3	Common Yellowthroat	1	Swainson's Thrush	15
Song Sparrow	1	Hooded Warbler	1	Hermit Thrush	1
Lincoln Sparrow	1	Wilson Warbler	1	American Robin	25
Northern Cardinal	4				

Table 8. Point count days conducted and species totals, spring season, Petersburg, 2012.

Species	# days	# birds	Species	# days	# birds	Species	# days	# bird
Ring-billed Gull	1	1	European Starling	1	1	Black-th.-blue Warbler	1	1
Mallard	1	1	Baltimore Oriole	6	7	Common Yellowthroat	2	2
Canada Goose	5	12	Common Grackle	9	13	Gray Catbird	10	38
Ring-necked Pheasant	4	5	Am. Goldfinch	1	1	Brown Thrasher	3	6
Mourning Dove	1	1	White-th. Sparrow	3	3	Tufted Titmouse	6	15
Red-bel. Woodpecker	4	5	Chipping Sparrow	1	2	Black-cap Chickadee	6	11
Great-cr. Flycatcher	6	11	Field Sparrow	9	19	American Robin	10	43
Blue Jay	3	3	Song Sparrow	1	1	Eastern Bluebird	1	1
Am. Crow	8	27	No. Cardinal	9	40			

Table 9. Daily banding totals for Shaker Lakes, spring 2012.

Date	Net Hour	Banded	Banded/ 100 net hr	Returns	Recaptures	Total birds	Total bird/ 100 net hr
514	36.0	11	30.56	6	0	17	47.22
516	36.0	23	63.89	2	2	27	75.00
518	35.5	17	47.89	2	1	20	56.34
521	38.0	16	42.11	3	4	23	60.53
523	38.0	10	26.32	2	2	14	36.84
525	35.0	11	31.43	3	2	16	45.71
528	33.5	12	35.82	2	0	14	41.79
530	33.5	3	8.96	0	6	9	26.87
604	35.0	9	25.71	2	4	15	42.86
606	36.0	7	19.44	0	4	11	30.56
608	34.0	5	14.71	0	2	7	20.59
TOTAL	390.5	124	31.75	22	27	173	44.30

Table 10. Daily banding totals Shaker Lakes, spring 2012.

Species	Banded	Species	Banded	Species	Banded
Black-billed Cuckoo	1	Lincoln Sparrow	1	Common Yellowthroat	2
Hairy Woodpecker	1	Northern Cardinal	5	Wilson's Warbler	2
Downy Woodpecker	1	Red-eyed Vireo	2	Canada Warbler	4
Eastern Phoebe	1	Philadelphia Vireo	1	American Redstart	5
Eastern Wood Pewee	1	Warbling Vireo	1	Gray Catbird	18
Yellow-bellied Flycatcher	2	Yellow Warbler	1	House Wren	2
Traill's Flycatcher	6	Magnolia Warbler	6	White-br. Nuthatch	1
Brown-headed Cowbird	2	Blackpoll Warbler	1	Tufted Titmouse	1
House Finch	2	Ovenbird	1	Gray-cheeked Thrush	3
American Goldfinch	5	Northern Waterthrush	3	Swainson's Thrush	6
White-throated Sparrow	1	Mourning Warbler	4	American Robin	21
Song Sparrow	10				

Table 11. Point count days conducted and species totals, spring season, Shaker Lakes, 2012.

Species	# days	# birds	Species	# days	# birds	Species	# days	# birds
Herring Gull	2	2	Eastern Wood Pewee	6	7	N. Rough-wing Swal.	1	1
Mallard	2	9	Acadian Flycatcher	3	3	Cedar Waxwing	2	2
Wood Duck	5	11	Blue Jay	3	3	Red-eyed Vireo	10	19
Canada Goose	4	12	American Crow	2	2	Warbling Vireo	10	24
Great Blue Heron	6	8	European Starling	5	11	Yellow Warbler	8	11
Mourning Dove	4	7	Brown-head. Cowbird	3	3	Magnolia Warbler	1	1
Rock Pigeon	6	17	Red-wing . Blackbird	3	4	Common Yellowthroat	2	2
Cooper's Hawk	1	1	Baltimore Oriole	9	18	Gray Catbird	11	26
Red-tailed Hawk	1	1	Common Grackle	5	6	House Wren	1	1
Belted Kingfisher	2	2	House Finch	1	1	White-br. Nuthatch	3	6
Red -bell Woodpecker	7	10	American Goldfinch	9	27	Tufted Titmouse	10	19
Yell-shaft Flicker	2	3	Song Sparrow	11	39	Black-cap. Chickadee	4	7
Chimney Swift	8	21	No. Cardinal	9	14	American Robin	11	69
Ru.-th. Hummingbird	2	2	Rose-br. Grosbeak	1	1	Unk. Flycatcher	2	2
Gr-cr Flycatcher	9	12	Scarlet Tanager	1	1	Unk. Woodpecker	1	1
Eastern Phoebe	7	12						

Table 12. Daily banding totals for Navarre, fall 2012.

Date	Net Hour	Banded	Banded/100 net hr	Returns	Recaptures	Total birds*	Total bird/ 100 net hr
716	103.50	74	71.50	7	8	89	85.99
725	92.00	16	17.39	0	3	19	20.65
806	82.42	22	26.69	1	4	27	32.76
822	138.00	32	23.19	3	2	37	26.81
823	134.17	24	17.89	0	1	25	18.63
824	120.75	16	13.25	1	5	22	18.22
825	115.00	11	9.57	1	3	15	13.04
826	109.25	10	9.15	1	0	11	10.07
827	RAIN						
828	115.00	30	26.09	1	7	38	33.04
829	124.60	32	25.68	0	2	34	27.29
830	128.42	18	14.02	0	5	23	17.91
831	126.50	24	18.97	0	4	28	22.13
901	141.83	43	30.32	1	12	56	39.48
902	118.83	40	33.66	0	3	43	36.19
903	115.00	33	28.70	0	4	37	32.17
904	122.60	29	23.65	0	1	30	24.47
905	132.25	32	24.20	0	6	38	28.73
906	130.41	42	32.21	0	6	48	36.81
907	141.83	46	32.43	0	8	54	38.07
908	97.75	27	27.62	0	5	32	32.74
909	120.75	84	69.57	0	11	95	78.68
910	128.41	46	35.82	0	7	53	41.27
911	120.75	57	47.21	0	2	59	48.86
912	122.59	55	44.87	0	12	67	54.65
913	139.92	63	45.03	1	9	73	52.17
914	80.50	29	36.03	0	7	36	44.72
915	118.80	69	58.08	0	7	76	63.97
916	118.80	57	47.98	1	9	67	56.40
917	143.75	79	54.96	1	12	92	64.00
918	116.92	45	38.49	1	14	60	51.32
919	126.50	118	93.28	0	14	132	104.35
920	121.90	85	69.73	2	25	112	91.88
921	115.00	109	94.78	1	29	139	120.87
922	138.00	77	55.80	0	34	111	80.44
923	130.40	90	69.02	0	30	121	92.79
924	138.00	76	55.07	0	24	100	72.46
925	157.16	76	48.36	0	54	130	82.72
926	138.00	67	48.55	0	21	88	63.77
927	118.83	92	77.42	0	38	130	109.40
928	143.75	127	88.35	1	26	154	107.13
929	147.58	142	96.22	0	31	173	117.23
930	118.83	74	62.27	0	34	108	90.89
1001	138.00	75	54.35	0	33	109	78.99
1002	RAIN						
1003	126.50	66	52.17	0	24	90	71.15
1004	115.00	82	71.30	0	18	101	67.83
1005	149.50	263	175.92	0	27	290	193.98
1006	164.83	289	175.33	0	37	326	197.78
1007	136.08	222	163.14	0	44	266	195.47
1008	136.08	161	118.31	0	59	220	161.67
1009	132.25	117	88.47	0	58	175	132.33
1010	130.41	118	90.48	0	56	174	133.43
1011	126.50	159	125.69	0	51	210	166.01
1012	103.50	101	97.59	1	41	143	138.16
1013	126.50	174	137.55	0	60	234	184.98
1014	111.17	40	35.98	0	32	72	64.77
1015	105.12	139	132.23	0	76	215	204.53
1016	138.00	178	128.99	0	41	219	158.70
1017	138.00	110	79.71	0	52	162	117.39
1019	113.10	112	99.03	0	57	169	149.43
1020	92.00	90	97.83	0	38	128	139.13
1021	111.17	179	161.02	0	23	202	181.70
1106	86.25	34	39.42	0	0	34	39.42
TOTAL	7,675.21	5,027	65.50	25	1,366	6,421	83.66

\* Total birds include Brown-headed Cowbirds and European Starlings released unbanded.

Table 13. Fall banding totals, Navarre 2012.

<b>Species</b>	<b>Banded</b>	<b>Species</b>	<b>Banded</b>	<b>Species</b>	<b>Banded</b>
American Woodcock	1	Eastern Towhee	2	Pine Warbler	2
Eastern Screech Owl	2	Northern Cardinal	35	Western Palm Warbler	6
Downy Woodpecker	18	Rose-breasted Grosbeak	16	Ovenbird	78
Yellow-bellied Sapsucker	7	Indigo Bunting	4	Northern Waterthrush	28
Red-bellied Woodpecker	2	Scarlet Tanager	4	Connecticut Warbler	10
Yellow-shafted Flicker	7	Cedar Waxwing	3	Mourning Warbler	6
Ruby-th. Hummingbird	5	Red-eyed Vireo	60	Common Yellowthroat	71
Eastern Phoebe	12	Philadelphia Vireo	6	Wilson's Warbler	11
Eastern. Wood Pewee	8	Warbling Vireo	1	Canada Warbler	8
Yellow-bellied Flycatcher	11	Yellow-throated Vireo	1	American Redstart	60
Acadian Flycatcher	1	Blue-headed Vireo	6	Gray Catbird	221
Traill's Flycatcher	2	White-eyed Vireo	1	Brown Thrasher	2
Least Flycatcher	4	Black and White Warbler	22	Carolina Wren	7
Blue Jay	2	Prothonotary Warbler	8	House Wren	15
Red-winged Blackbird	11	Golden-winged Warbler	2	Winter Wren	28
Baltimore Oriole	4	Nashville Warbler	19	Marsh Wren	4
Rusty Blackbird	6	Orange-crowned Warbler	6	Brown Creeper	60
Common Grackle	70	Tennessee Warbler	90	White-breasted Nuthatch	2
Purple Finch	27	Northern Parula	5	Red-breasted Nuthatch	19
House Finch	2	Cape May Warbler	16	Tufted Titmouse	1
American Goldfinch	19	Yellow Warbler	30	Black-capped Chickadee	10
White-crowned Sparrow	7	Black-th.-Blue Warbler	48	Golden-crowned Kinglet	174
White-throated Sparrow	286	Myrtle Warbler	1,176	Ruby-crowned Kinglet	64
Chipping Sparrow	1	Magnolia Warbler	120	Wood Thrush	6
Field Sparrow	1	Chestnut-sided Warbler	16	Veery	18
Slate-colored Junco	20	Bay-breasted Warbler	23	Gray-cheeked Thrush	212
Song Sparrow	38	Blackpoll Warbler	750	Swainson's Thrush	519
Lincoln Sparrow	4	Blackburnian Warbler	5	Hermit Thrush	236
Swamp Sparrow	26	Black-th.-Green Warbler	13	American Robin	43
Fox Sparrow	15				

Table 14. Number of days observed and totals of species seen on point counts, Navarre fall 2012.

Species	# days	#Observed	Species	# days	#Observed	Species	# days	#Observed
Herring Gull	6	7	Chimney Swift	21	95	Warbling Vireo	9	13
Ring-billed Gull	17	63	Eastern Phoebe	7	8	Blue-headed Vireo	3	3
Bonaparte's Gull	6	16	Eastern Wood Pewee	2	3	Nashville Warbler	2	2
D-c. Cormorant	4	8	Horned Lark	1	1	Tennessee Warbler	1	1
Mallard	13	186	Blue Jay	49	241	Black-th-Blue Warbler	1	1
American Black Duck	2	9	American Crow	1	1	Myrtle Warbler	21	246
Gadwall	2	33	European Starling	46	569	Magnolia Warbler	11	19
American Wigeon	4	49	Brown-headed Cowbird	8	10	Chestnut-sided Warbler	1	1
Northern Shoveler	1	1	Red-winged Blackbird	51	13,704	Blackpoll Warbler	21	72
Northern Pintail	3	27	Baltimore Oriole	10	29	Blk.-th-green Warbler	2	2
Blue-winged Teal	2	13	Rusty Blackbird	8	58	Ovenbird	5	5
Green-winged Teal	1	2	Common Grackle	28	1,254	No. Waterthrush	2	2
Wood Duck	10	28	Purple Finch	6	14	Common Yellowthroat	8	10
Canada Goose	49	1,375	House Finch	1	5	American Redstart	4	5
Trumpeter Swan	2	4	American Goldfinch	19	78	Gray Catbird	38	233
Great- blue Heron	36	65	Pine Siskin	10	118	Brown Thrasher	6	9
Great Egret	4	6	Chipping Sparrow	1	1	Carolina Wren	35	81
Sora	5	6	White-cr. Sparrow	1	1	House Wren	4	4
American Woodcock	3	3	White-th. Sparrow	21	337	Winter Wren	10	11
Wilson's Snipe	2	2	Slate-colored Junco	2	3	Brown Creeper	4	4
Pectoral Sandpiper	1	4	Song Sparrow	8	12	White-br. Nuthatch	9	20
Lesser Yellowlegs	1	1	Swamp Sparrow	3	8	Red-br. Nuthatch	30	70
Killdeer	2	2	Fox Sparrow	3	8	Black.-cap. Chickadee	18	27
Mourning Dove	7	12	Eastern Towhee	2	4	Golden-cr. Kinglet	13	60
Turkey Vulture	2	3	Northern Cardinal	50	301	Ruby-cr. Kinglet	9	15
Cooper's Hawk	1	1	Rose-br. Grosbeak	8	10	Gray-cheeked Thrush	24	70
Red-tailed Hawk	2	2	Purple Martin	2	4	Swainson's Thrush	35	185
Bald Eagle	13	19	Barn Swallow	3	4	Hermit Thrush	3	8
Eastern Screech Owl	1	1	Tree Swallow	13	50	American Robin	35	223
Hairy Woodpecker	4	5	Bank Swallow	6	37	Eastern Bluebird	1	2
Downy Woodpecker	40	96	N. Rough-wing. Swal.	1	2	Unk. Finch	4	14
Yellow-bel. Sapsucker	2	2	Cedar Waxwing	36	269	Unk. Flycatcher	1	1
Red-bell. Woodpecker	1	2	Red-eyed Vireo	12	17	Unk. Warbler	39	161
Yellow-sh. Flicker	25	43						



Table 15. Daily banding totals for Navarre Beach, fall 2012.

Date	Net Hour	Banded	Banded/100 nh	Returns	Recaptures	Total birds*	Totalbird/100nh
822	26.25	15	57.14	0	0	15	57.14
823	27.00	20	74.08	1	3	24	88.89
824	24.00	4	16.67	1	3	8	33.33
825	24.00	2	8.33	0	1	3	12.50
826	22.12	4	18.08	0	1	5	22.60
827	WIND						
828	26.25	4	15.24	0	1	5	19.05
829	24.37	4	16.41	0	2	6	24.62
830	25.52	12	47.02	0	1	13	50.94
831	24.75	24	96.97	0	4	33	133.33
901	27.75	5	18.02	0	1	6	21.62
902	24.00	5	20.83	0	1	6	25.00
903	23.25	2	8.60	0	1	3	12.90
904	24.00	6	25.00	0	4	10	41.67
905	26.25	8	30.48	0	1	9	34.29
906	25.52	18	70.53	0	0	18	70.53
907	27.00	18	66.67	1	1	20	74.07
908	19.50	2	10.26	0	0	2	10.26
909	24.75	11	44.44	1	3	17	68.69
910	25.12	9	35.83	1	1	11	43.79
911	24.37	7	28.72	0	0	7	28.72
912	24.00	4	16.67	0	4	8	33.33
913	27.37	20	73.07	0	2	22	80.38
914	16.88	2	11.85	0	1	3	17.77
915	23.63	4	16.93	0	1	5	21.16
916	23.63	22	93.10	0	7	29	122.73
917	29.25	44	150.43	0	3	47	160.68
918	21.00	10	47.62	1	2	13	61.91
919	25.12	44	175.16	0	3	47	187.10
920	24.75	32	129.29	0	4	36	145.46
921	23.25	76	326.88	0	4	80	344.09
922	24.62	95	385.87	0	13	108	438.67
923	27.00	38	140.74	1	9	48	177.78
924	26.24	58	221.04	0	10	68	259.15
925	27.00	74	274.07	0	11	85	314.82
926	28.13	43	152.86	0	10	53	188.41
927	2.40	1	41.67	0	1	2	83.33
928	28.88	14	48.48	0	1	15	51.94
929	30.00	37	123.33	0	5	42	140.00
930	15.38	2	13.00	0	2	4	26.01
1001	24.00	19	79.17	0	9	28	116.67
1002	RAIN						
1003	26.25	20	76.19	0	5	25	95.24
1004	23.63	26	110.03	0	9	35	148.12
1005	29.63	75	253.122	0	5	80	270.00
1006	28.13	127	451.48	0	7	134	476.36
1007	27.00	140	518.52	0	10	150	555.56
1008	28.13	124	440.81	0	13	137	487.03
1009	27.00	30	111.11	0	10	40	148.15
1010	27.00	35	129.63	0	15	50	185.19
1011	25.88	29	112.06	1	8	38	146.83
1012	21.00	21	100.00	0	2	23	109.52
1013	24.75	47	189.90	0	8	55	222.22
1014	21.00	15	71.43	0	13	28	133.33
1015	23.25	17	73.12	0	2	19	81.72
1016	23.85	95	398.32	0	8	103	431.87
1017	25.52	59	231.19	0	16	75	293.89
1019	18.37	19	103.43	0	7	26	141.54
1020	18.00	26	144.44	0	8	34	188.89
1021	21.38	39	182.41	0	2	41	191.77
TOTAL	1,408.07	1,763	125.61	8	279	2,057	146.09

\* Total birds include Brown-headed Cowbirds and European Starlings released unbanded.

Table 16. Fall banding totals, Navarre Beach 2012.

Species	Banded	Species	Banded	Species	Banded
Mourning Dove	1	Red-eyed Vireo	8	Connecticut Warbler	1
Hairy Woodpecker	1	Philadelphia Vireo	3	Mourning Warbler	1
Downy Woodpecker	7	Warbling Vireo	3	Common Yellowthroat	36
Yellow-bellied Sapsucker	1	Blue-headed Vireo	4	Wilson's Warbler	3
Ruby-th. Hummingbird	2	Black and White Warbler	8	American Redstart	9
Eastern Phoebe	9	Prothonotary Warbler	1	Gray Catbird	104
Eastern Wood Pewee	9	Nashville Warbler	15	Carolina Wren	3
Yellow-bellied Flycatcher	2	Tennessee Warbler	50	House Wren	10
Trail's Flycatcher	1	Northern Parula	3	Winter Wren	12
Red-winged Blackbird	48	Cape May Warbler	22	Marsh Wren	1
Baltimore Oriole	1	Black-th. Blue Warbler	8	Brown Creeper	11
Purple Finch	2	Myrtle Warbler	482	White-breasted Nuthatch	1
American Goldfinch	1	Magnolia Warbler	33	Red-breasted Nuthatch	72
Savannah Sparrow	1	Chestnut-sided Warbler	6	Black-capped Chickadee	3
White-crowned Sparrow	1	Bay-breasted Warbler	9	Golden-crowned Kinglet	74
White-throated Sparrow	36	Blackpoll Warbler	419	Ruby-crowned Kinglet	51
Slate-colored Junco	8	Blackburnian Warbler	2	Veery	2
Song Sparrow	19	Black-th.-Green Warbler	1	Gray-cheeked Thrush	22
Lincoln Sparrow	2	Western Palm Warbler	2	Swainson's Thrush	45
Swamp Sparrow	16	Ovenbird	15	Hermit Thrush	29
Northern Cardinal	3	Northern Waterthrush	5	American Robin	1
Indigo Bunting	2				

Table 17 . Daily banding totals for Creek Bend County Park, fall 2012.

Date	Net Hour	Banded	Banded/ 100 net hr	Returns	Recaptures	Total birds	Total bird/ 100 net hr
902	46.0	27	58.70	0	0	27	58.70
909	57.5	96	166.96	2	2	100	173.91
910	67.5	46	68.15	1	0	47	69.63
912	72.5	59	81.38	4	2	65	89.66
913	58.0	62	106.90	3	3	68	117.24
915	72.5	20	27.59	1	2	23	31.72
916	58.0	40	68.97	0	1	41	70.69
917	58.0	42	72.41	0	1	43	74.14
919	72.5	70	96.55	4	7	81	111.72
920	7.0	10	142.86	0	0	10	142.86
921	72.5	81	111.72	1	2	84	115.86
923	72.5	88	121.38	6	4	98	135.17
924	29.0	15	51.72	0	0	15	51.72
925	10.5	12	114.29	0	0	12	114.29
929	101.5	234	230.54	1	0	235	231.53
930	43.5	33	75.86	0	0	33	75.86
1001	58.0	77	132.76	1	0	78	134.48
1003	72.5	94	129.66	2	7	103	142.07
1005	32.0	35	109.38	4	3	42	131.25
1006	40.5	113	279.01	0	0	113	279.01
1008	72.5	142	195.86	3	2	147	202.76
1009	43.5	27	62.07	0	0	27	62.07
1011	55.0	61	110.91	1	14	76	138.18
1012	72.5	122	168.28	3	7	132	182.07
1013	58.0	51	87.93	1	4	56	96.55
1016	58.0	108	186.21	2	8	118	203.45
1017	58.0	86	148.28	1	17	104	179.31
1019	43.5	85	195.40	0	6	91	209.20
1021	72.5	67	92.41	3	6	76	104.83
1022	72.5	166	228.97	0	1	167	230.35
1023	58.0	95	163.79	1	9	105	181.03
1024	54.0	26	48.15	0	5	31	57.41
1026	8.00	11	137.50	0	0	11	137.50
1101	54.0	82	151.85	1	4	87	161.11
1102	54.0	45	83.33	0	0	45	83.33
1103	58.0	86	148.28	0	0	86	148.28
1105	46.0	33	71.74	1	2	36	78.26
1106	34.5	4	11.59	0	0	4	11.59
1109	46.0	32	69.56	0	4	36	78.26
1110	46.0	20	43.48	0	3	23	50.00
1111	29.0	6	20.69	0	0	6	20.69
<b>TOTAL</b>	<b>2,195.5</b>	<b>2,609</b>	<b>118.83</b>	<b>47</b>	<b>126</b>	<b>2,782</b>	<b>126.71</b>

Table 18. Fall banding totals for Creek Bend County Park, fall 2012.

Species	Banded	Species	Banded	Species	Banded
Hairy Woodpecker	1	Fox Sparrow	11	Connecticut Warbler	2
Downy Woodpecker	6	Eastern Towhee	1	Mourning Warbler	4
Yellow-bellied Sapsucker	2	Northern Cardinal	14	Common Yellowthroat	63
Eastern Phoebe	3	Rose-breasted Grosbeak	10	Wilson's Warbler	6
Yellow-bellied Flycatcher	5	Indigo Bunting	173	American Redstart	11
Traill's Flycatcher	4	Red-eyed Vireo	2	Northern Mockingbird	1
Red-winged Blackbird	1	Philadelphia Vireo	1	Gray Catbird	41
Purple Finch	4	Blue-headed Vireo	1	Brown Thrasher	1
House Finch	26	Black and White Warbler	3	Carolina Wren	1
American Goldfinch	795	Blue-winged Warbler	1	House Wren	29
Pine Siskin	82	Nashville Warbler	88	Winter Wren	5
Vesper Sparrow	1	Orange-crowned Warbler	6	Brown Creeper	3
Savannah Sparrow	8	Tennessee Warbler	34	Tufted Titmouse	4
LeConte's Sparrow	1	Cape May Warbler	1	Black-capped Chickadee	2
White-crowned Sparrow	40	Black-th. Blue Warbler	3	Golden-crowned Kinglet	42
White-throated Sparrow	213	Myrtle Warbler	87	Ruby-crowned Kinglet	87
American Tree Sparrow	52	Magnolia Warbler	40	Wood Thrush	1
Chipping Sparrow	14	Chestnut-sided Warbler	2	Veery	1
Field Sparrow	58	Blackpoll Warbler	28	Gray-cheeked Thrush	7
Slate-colored Junco	41	Black-th. Green Warbler	3	Swainson's Thrush	12
Song Sparrow	208	Western Palm Warbler	12	Hermit Thrush	13
Lincoln's Sparrow	85	Ovenbird	13	American Robin	1
Swamp Sparrow	86	Northern Waterthrush	2		

Table 19. Daily banding totals for Shaker Lakes, fall 2012.

Date	Net hour	Banded	Banded/ 100 net hr	Returns	Recaptures	Total birds	Total bird/ 100 net hr
820	34.0	18	52.94	0	1	19	55.88
822	32.0	16	50.00	0	0	16	50.00
824	31.5	29	92.06	0	4	33	104.76
827	30.0	12	40.00	1	0	13	43.33
829	32.0	25	78.13	0	7	32	100.00
831	32.0	11	34.38	0	1	12	37.50
903	34.5	42	121.74	1	2	45	130.44
905	28.5	13	45.61	0	4	17	59.65
907	30.0	18	60.00	1	1	20	66.67
910	30.0	18	60.00	0	2	20	66.67
917	30.5	20	65.57	0	7	27	88.53
921	35.5	35	98.59	0	4	39	109.86
924	28.5	39	136.84	0	4	43	150.88
1001	28.0	31	110.71	1	5	37	132.14
1003	27.5	15	54.55	0	2	17	61.82
1005	27.0	36	133.33	0	1	37	137.04
1008	26.5	39	147.17	1	8	48	181.13
1012	26.5	55	207.55	1	2	58	218.87
1015	24.5	33	134.69	1	12	46	187.76
1019	31.0	36	116.13	1	12	49	158.07
<b>Total</b>	<b>600.0</b>	<b>541</b>	<b>90.17</b>	<b>8</b>	<b>79</b>	<b>628</b>	<b>104.67</b>

Table 20. Daily banding totals Shaker Lakes, fall 2012.

<b>Species</b>	<b>Banded</b>	<b>Species</b>	<b>Banded</b>	<b>Species</b>	<b>Banded</b>
Hairy Woodpecker	1	Red-eyed Vireo	5	Hooded Warbler	1
Downy Woodpecker	3	Warbling Vireo	1	Wilson's Warbler	10
Eastern Phoebe	3	Blue-headed Vireo	1	Canada Warbler	3
Eastern Wood-Pewee	4	Black and White Warbler	6	American Redstart	14
Yellow-bellied Flycatcher	3	Blue-winged Warbler	1	Gray Catbird	28
Traill's Flycatcher	2	Nashville Warbler	12	House Wren	5
Least Flycatcher	5	Tennessee Warbler	1	Winter Wren	5
Blue Jay	5	Yellow Warbler	1	Brown Creeper	2
Purple Finch	2	Black-thr. Blue Warbler	13	White-breasted Nuthatch	2
House Finch	4	Myrtle Warbler	76	Red-breasted Nuthatch	2
American Goldfinch	40	Magnolia Warbler	29	Tufted Titmouse	11
White-crowned Sparrow	2	Chestnut-sided Warbler	2	Black-capped Chickadee	10
White-throated Sparrow	49	Bay-breasted Warbler	2	Golden-crowned Kinglet	13
Slate-colored Junco	1	Blackpoll Warbler	5	Ruby-crowned Kinglet	18
Song Sparrow	21	Black-th. Green Warbler	2	Wood Thrush	2
Lincoln Sparrow	1	Ovenbird	7	Veery	4
Swamp Sparrow	3	Northern Waterthrush	12	Gray-cheeked Thrush	5
Fox Sparrow	2	Connecticut Warbler	1	Swainson's Thrush	47
Northern Cardinal	9	Mourning Warbler	2	Hermit Thrush	9
Cedar Waxwing	5	Common Yellowthroat	6		

Table 21. Point count days conducted and species totals, fall season, Shaker Lakes, 2012.

<b>Species</b>	<b># days</b>	<b># birds</b>	<b>Species</b>	<b># days</b>	<b># birds</b>	<b>Species</b>	<b># days</b>	<b># birds</b>
Mallard	9	21	European Starling	1	2	Winter Wren	2	2
Wood Duck	1	1	American Goldfinch	13	49	White-br. Nuthatch	16	23
Canada Goose	4	17	White-crowned Sparrow	2	4	Tufted Titmouse	4	6
Great Blue Heron	11	12	White-throated Sparrow	5	16	Black-capped Chickadee	6	7
Mourning Dove	4	6	Song Sparrow	20	90	Golden-crowned Kinglet	3	5
Rock Pigeon	1	9	Swamp Sparrow	4	6	Swainson's Thrush	4	5
Belted Kingfisher	6	6	Northern Cardinal	10	17	Hermit Thrush	1	1
Downy Woodpecker	5	8	Cedar Waxwing	3	37	American Robin	9	33
Red-bellied Woodpecker	6	9	Red-eyed Vireo	2	2	Unk. Woodpecker	2	2
Yellow-shafted Flicker	1	1	Warbling Vireo	1	1	Unk. Flycatcher	2	2
Chimney Swift	11	356	Myrtle Warbler	5	12	Unk. Sparrow	2	2
Ruby-th. Hummingbird	4	5	Common Yellowthroat	3	3	Unk. Warbler	2	4
Eastern Phoebe	1	1	Hooded Warbler	2	2	Unk. Kinglet	1	5
E. Wood-Pewee	7	8	Gray Catbird	7	13	Unk. Thrush	3	5
Blue Jay	3	3						

Table 22. Total bandings Black Swamp Bird Observatory, passerine migration , 2012.

Species	Banded	Species	Banded	Species	Banded
American Woodcock	1 (3)	Am. Tree Sparrow	1 (53)	Bay-breasted Warbler	89 (91)
Mourning Dove	1	Chipping Sparrow	4 (21)	<b>(2)</b> Blackpoll Warbler	1295(1329)
Sharp-shinned Hawk	7	Clay-colored Sparrow	1	Blackburnian Warbler	42
Cooper's Hawk	1	Field Sparrow	3 (67)	Blk.-th. Grn. Warbler	62 (67)
Eastern Screech Owl	2	Slate-colored Junco	32 (74)	Pine Warbler	3
Yellow-billed Cuckoo	1	Song Sparrow	95 (338)	West. Palm Warbler	111 (124)
Black-billed Cuckoo	1 (2)	Lincoln Sparrow	90 (179)	Ovenbird	231 (255)
Hairy Woodpecker	3 (6)	Swamp Sparrow	146 (235)	Northern Waterthrush	109 (130)
Downy Woodpecker	35 (50)	Fox Sparrow	16 (29)	Louisiana Waterthr.	2
Yellow-bell. Sapsucker	10 (12)	Eastern Towhee	2 (3)	Connecticut Warbler	16 (19)
Red-headed Woodpecker	1	Northern Cardinal	71 (103)	Mourning Warbler	102 (114)
Red-bellied Woodpecker	3	Rose-breasted Grosbeak	22 (34)	<b>(8)</b> C. Yellowthroat	356 (435)
Yellow-shafted Flicker	8	Indigo Bunting	109 (291)	Yellow-breasted Chat	2
Whip-poor-will	2	Scarlet Tanager	7	Hooded Warbler	12 (14)
Ruby-th. Hummingbird	35	Barn Swallow	3	Wilson's Warbler	145 (166)
Eastern Kingbird	3	Tree Swallow	7 (12)	Canada Warbler	125 (132)
Great-crested Flycatcher	12	No. Rough-wing. Swallow	1	American Redstart	291 (326)
Eastern Phoebe	22 (29)	Cedar Waxwing	8 (13)	No. Mockingbird	0 (1)
Olive-sided Flycatcher	1	Red-eyed Vireo	221 (231)	<b>(5)</b> Gray Catbird	765 (882)
Eastern Wood-Pewee	37 (42)	Philadelphia Vireo	46 (48)	Brown Thrasher	10 (14)
Yellow-bell. Flycatcher	112 (122)	Warbling Vireo	28 (30)	Carolina Wren	12 (13)
Acadian Flycatcher	9	Yellow-throated Vireo	1	House Wren	92 (129)
Traill's Flycatcher	243 (265)	Blue-headed Vireo	25 (27)	Winter Wren	41 (51)
Least Flycatcher	54 (61)	White-eyed Vireo	5	Marsh Wren	5
Blue Jay	20 (25)	Black and White Warbler	82 (91)	Brown Creeper	73 (78)
Brown-headed Cowbird	1 (5)	Prothonotary Warbler	24	White-br Nuthatch	3 (6)
Red-winged Blackbird	360 (362)	Blue-winged Warbler	7 (9)	Red-br. Nuthatch	91 (93)
Baltimore Oriole	63	Golden-winged Warbler	3	Tufted Titmouse	1 (18)
Rusty Blackbird	9	Nashville Warbler	245 (347)	Black-cap. Chickadee	20 (32)
Common Grackle	120 (136)	Orange-crowned Warbler	12 (18)	Golden-cr. Kinglet	250 (305)
Purple Finch	29 (35)	<b>(10)</b> Tennessee Warbler	347 (382)	Ruby-cr Kinglet	192 (298)
House Finch	2 (34)	Northern Parula	36	Blue-gray Gnatcatch.	11 (12)
<b>(6)</b> American Goldfinch	32 (879)	Cape May Warbler	47 (48)	Wood Thrush	36 (40)
Pine Siskin	0 (82)	Yellow Warbler	332 (341)	Veery	103 (110)
Vesper Sparrow	0 (1)	Black-th. Blue Warbler	91 (107)	Gray-cheek Thrush	276 (295)
Savannah Sparrow	1 (9)	<b>(1)</b> Myrtle Warbler	1996(2159)	<b>(4)</b> Swainson Thrush	804 (885)
LeConte's Sparrow	0 (1)	<b>(7)</b> Magnolia Warbler	734 (818)	<b>(9)</b> Hermit Thrush	363 (388)
White-cr. Sparrow	42 (84)	Cerulean Warbler	3	American Robin	80 (127)
Gambel's W-c Sparrow	1	Chestnut-sided Warbler	165 (169)	Eastern Bluebird	0 (3)
<b>(3)</b> White-th. Sparrow	678(946)				

**( ) numbers in bold are top ten banded species**



Table 23. Banding effort totals by area and by season, 2012.

<b>Area</b>	<b>Sample Days</b>	<b>Net Hours</b>	<b>Birds Banded</b>	<b>Birds/ 100 Net Hr</b>	<b>Total Captured</b>	<b>Total/ 100 Net Hr</b>
Navarre	110	16,251.1	13,265	81.63	16,114	99.16
Petersburg	10	1,553.8	146	9.40	206	13.26
Shaker Lakes	31	990.5	665	67.14	801	80.87
Creek Bend	49	2,350.5	2,685	114.23	2,892	123.04
<b>Season</b>	<b>Sample Days</b>	<b>Net Hours</b>	<b>Birds Banded</b>	<b>Birds/ 100 Net Hr</b>	<b>Total Captured</b>	<b>Total/ 100 Net Hr</b>
All Stations						
Spring	52	9,267.1	6,821	73.60	8,125	87.68
Fall	75	11,878.8	9,940	83.68	11,888	128.28
<b>TOTAL</b>	<b>127</b>	<b>21,145.9</b>	<b>16,761</b>	<b>79.26</b>	<b>20,013</b>	<b>94.64</b>
ONWR Stations						
Spring	49	7,167.8	6,475	90.33	7,636	106.53
Fall	61	9,083.3	6,790	74.75	8,478	93.34
<b>TOTAL</b>	<b>110</b>	<b>16,251.1</b>	<b>13,265</b>	<b>81.63</b>	<b>16,114</b>	<b>99.16</b>

Table 24. Fall age ratios of selected species, Navarre 2012.

Species	2012		2011		Percent Change	91-11Ave. HY/AHY	2012 % Change from avg.
	Sample	HY/AHY	Sample	HY/AHY			
Baltimore Oriole	5	1.50	30	2.00	-25	5.61	-73
<b>Wh-th Sparrow*</b>	<b>322</b>	<b>1.22</b>	<b>254</b>	<b>2.18</b>	<b>-44</b>	<b>3.88</b>	<b>-69</b>
Song Sparrow	57	0.97	41	1.05	-8	2.27	-57
Cedar Waxwing	3	-	5	0.67	-	1.87	-
<b>Red-eyed Vireo</b>	<b>68</b>	<b>5.80</b>	<b>85</b>	<b>4.67</b>	<b>+24</b>	<b>6.73</b>	<b>-14</b>
Warbling Vireo	4	3.00	16	15.00	-80	10.72	-72
Bl. and Wh. Warbler	30	0.76	30	2.00	-62	1.98	-72
Nashville Warbler	34	2.09	87	2.11	-1	2.71	-23
<b>Tennessee Warbler</b>	<b>140</b>	<b>4.19</b>	<b>126</b>	<b>4.48</b>	<b>-6</b>	<b>6.79</b>	<b>-38</b>
Cape May Warbler	38	0.73	99	1.02	-28	1.19	-39
Bl-thr. Blue Warb.	56	2.11	33	3.71	-43	3.57	-41
<b>Myrtle Warbler</b>	<b>1,658</b>	<b>2.38</b>	<b>481</b>	<b>2.49</b>	<b>-4</b>	<b>2.15</b>	<b>+11</b>
<b>Magnolia Warbler</b>	<b>153</b>	<b>3.25</b>	<b>203</b>	<b>2.69</b>	<b>+21</b>	<b>3.47</b>	<b>-6</b>
<b>Blackpoll Warbler</b>	<b>1,169</b>	<b>1.47</b>	<b>1156</b>	<b>1.60</b>	<b>-8</b>	<b>2.12</b>	<b>-31</b>
<b>Ovenbird</b>	<b>93</b>	<b>4.47</b>	<b>76</b>	<b>4.85</b>	<b>-8</b>	<b>7.03</b>	<b>-36</b>
No. Waterthrush	33	2.00	30	3.29	-39	4.15	-52
<b>Com. Yellowthroat</b>	<b>107</b>	<b>7.23</b>	<b>116</b>	<b>4.80</b>	<b>+51</b>	<b>6.92</b>	<b>+4</b>
American Redstart	69	1.65	38	2.17	-24	2.45	-33
<b>Gray Catbird</b>	<b>325</b>	<b>9.16</b>	<b>316</b>	<b>7.78</b>	<b>+18</b>	<b>8.58</b>	<b>+7</b>
House Wren	24	3.00	21	6.00	-50	6.33	-53
<b>Gray-cheek Thrush</b>	<b>234</b>	<b>1.82</b>	<b>344</b>	<b>1.44</b>	<b>+26</b>	<b>2.01</b>	<b>-9</b>
<b>Swainson's Thrush</b>	<b>564</b>	<b>1.40</b>	<b>495</b>	<b>1.38</b>	<b>+1</b>	<b>1.52</b>	<b>-8</b>
<b>Hermit Thrush</b>	<b>265</b>	<b>2.19</b>	<b>179</b>	<b>5.88</b>	<b>-63</b>	<b>5.42</b>	<b>-60</b>
American Robin	44	2.38	37	3.11	-23	3.31	-28

\*Species in bold have samples sizes for both 2011 and 2012 over 50.

Table 25. Banding year of returning birds captured at Navarre study site, 2012.

<b>Species</b>	<b>2011</b>	<b>2010</b>	<b>2009</b>	<b>2008</b>	<b>2007</b>	<b>2006</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>	<b>Total</b>
Downy Woodpecker	7	2		1						10
Red-bellied Woodpecker	1									1
Eastern Kingbird	1									1
Blue Jay		1	1							2
Red-winged Blackbird	13	11	5	5	2				1	37
Baltimore Oriole	7		3	2						12
Common Grackle	1									1
Song Sparrow	3	2	2							7
Northern Cardinal	19	4	1	3					1	28
Indigo Bunting				1						1
Tree Swallow			1							1
Red-eyed Vireo	1									1
Warbling Vireo	2	1								3
Prothonotary Warbler	6	2		1						9
Yellow Warbler	28	20	13	8		2				70
Blackpoll Warbler	2									2
Com. Yellowthroat	9	6	2	1	1	2				21
Gray Catbird	51	15	7	6	2		1	1		83
Brown Thrasher	5	1		1						7
Carolina Wren	4									4
House Wren	1	2								3
Black-cap. Chickadee	2	2	1	1						6
American Robin	11	5	2	3						21
<b>Total</b>	<b>174</b>	<b>76</b>	<b>38</b>	<b>33</b>	<b>5</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>331</b>

Table 26. Banding year of returning birds captured at Shaker Lakes study site, 2012.

<b>Species</b>	<b>2011</b>	<b>2010</b>	<b>2009</b>	<b>2008</b>	<b>2007</b>	<b>Total</b>
Downy Woodpecker			1			1
Eastern Wood Pewee	1					1
Blue Jay					1	1
American Goldfinch	2		1			3
Song Sparrow	2	4	3		1	10
Northern Cardinal		1	2			3
Gray Catbird		1	1			2
Tufted Titmouse	1					1
Black-capped Chickadee	1		1			2
American Robin	5	1				6
<b>Total</b>	<b>12</b>	<b>7</b>	<b>9</b>	<b>0</b>	<b>2</b>	<b>30</b>

Table 27. Banding year of returning birds captured at Creek Bend study site, 2012.

<b>Species</b>	<b>2011</b>	<b>2010</b>	<b>2009</b>	<b>2008</b>	<b>2004</b>	<b>Total</b>
Downy Woodpecker				1		1
American Goldfinch	12	10	5			27
White-throated Sparrow					1	1
Field Sparrow		2	2			4
Song Sparrow	2	6	4	2		14
Indigo Bunting	2	2	1			5
Common Yellowthroat	10					10
Gray Catbird	2	3	2			7
Northern Mockingbird			1			1
Black-capped Chickadee			1			1
<b>Total</b>	<b>28</b>	<b>23</b>	<b>16</b>	<b>3</b>	<b>1</b>	<b>71</b>

Table 28. Banding year of returning birds captured at Petersburg study site, 2012.

<b>Species</b>	<b>2011</b>	<b>2010</b>	<b>2009</b>	<b>2008</b>	<b>2007</b>	<b>Total</b>
Northern Cardinal	1	1	2			4
Gray Catbird	1	1	1			3
Black-capped Chickadee	3			1	1	5
American Robin	2	1	4	2		9
<b>Total</b>	<b>7</b>	<b>3</b>	<b>7</b>	<b>3</b>	<b>1</b>	<b>21</b>

Table 29. Foreign recoveries of study banded birds since last progress report.

<b>Species</b>	<b>Band Number</b>	<b>Band Date</b>	<b>Band Location*</b>	<b>Recovery Date</b>	<b>Recovery Location</b>
Red-winged Blackbird	1751-65279	04-28-2003	Ottawa NWR	06-02-2012	Navarre
Common Grackle	1603-49667	10-14-2011	Navarre	04-99-2012	Ohio 413-0830
Common Grackle	1603-67360	06-26-2012	Navarre	07-08-2012	Ohio 413-0825
American Goldfinch	2600-30826	10-01-2010	Creek Bend	08-10-2012	Ohio 413-0830
White-throated Sparrow	1871-83142	04-19-2004	Navarre	11-05-2012	Creek Bend
Lincoln's Sparrow	2540-45561	12-05-2008	Texas 2825-09655	09-23-2012	Creek Bend
Myrtle Warbler	2500-43690	10-07-2011	Shaker Lakes	10-16-2011	Pennsylvania 400-0791
Myrtle Warbler	2700-08129	10-17-2012	Navarre	12-08-2012	North Carolina 360-0791
Swainson's Thrush	2291-11648	09-15-2008	Ontario 4234-08025	05-12-2012	Navarre

\*Banding coordinates for study sites: Navarre 413-0830, Shaker Lakes 412-0813, Ottawa NWR 413-0831, Creek Bend 412-0832, Petersburg 415-0833.

Table 30. Spring fat composition comparisons of selected species for 2011 and 2012, Navarre (Two sample T-Test, alpha = .05).

Sign. Higher 2011	Non-sign. Higher 2011	Sign. Higher 2012	Non- sign. Higher 2012
Red eyed Vireo	Cape May Warbler	Yellow-bellied Flycatcher	White-throated Sparrow
Veery	House Wren	Traill's Flycatcher	Swamp Sparrow
Swainson's Thrush	Bl.-gr. Gnatcatcher	Least Flycatcher	Indigo Bunting
	Gray-ch. Thrush	Lincoln Sparrow	Tennessee Warbler
		Black & White Warbler	Yellow Warbler
		Nashville Warbler	Golden-cr. Kinglet
		Myrtle Warbler	Ruby-cr. Kinglet
		Magnolia Warbler	Hermit Thrush
		Chestnut-sided Warbler	
		Bay-breasted Warbler	
		Blackpoll Warbler	
		Western Palm Warbler	
		Ovenbird	
		Northern Waterthrush	
		Mourning Warbler	
		Common Yellowthroat	
		Wilson's Warbler	
		Canada Warbler	

Table 31. Fall fat composition comparisons of selected species for 2011 and 2012, Navarre (Two sample T-Test, alpha = .05).

Sign. Higher 2011	Non-sign. Higher 2011	Sign. Higher 2012	Non- sign. Higher 2012
Myrtle Warbler	Swamp Sparrow	Blackpoll Warbler	Wh.-throated Sparrow
Gray Catbird	Red-eyed Vireo	Golden-cr. Kinglet	Hermit Thrush
Gray-ch. Thrush	Black & White Warbler	Ruby-cr. Kinglet	
Swainson's Thrush	Cape May Warbler		
	Magnolia Warbler		
	Ovenbird		
	Common Yellowthroat		
	American Redstart		
	House Wren		

Figure 1. Migration field sites, 1989- 2011.

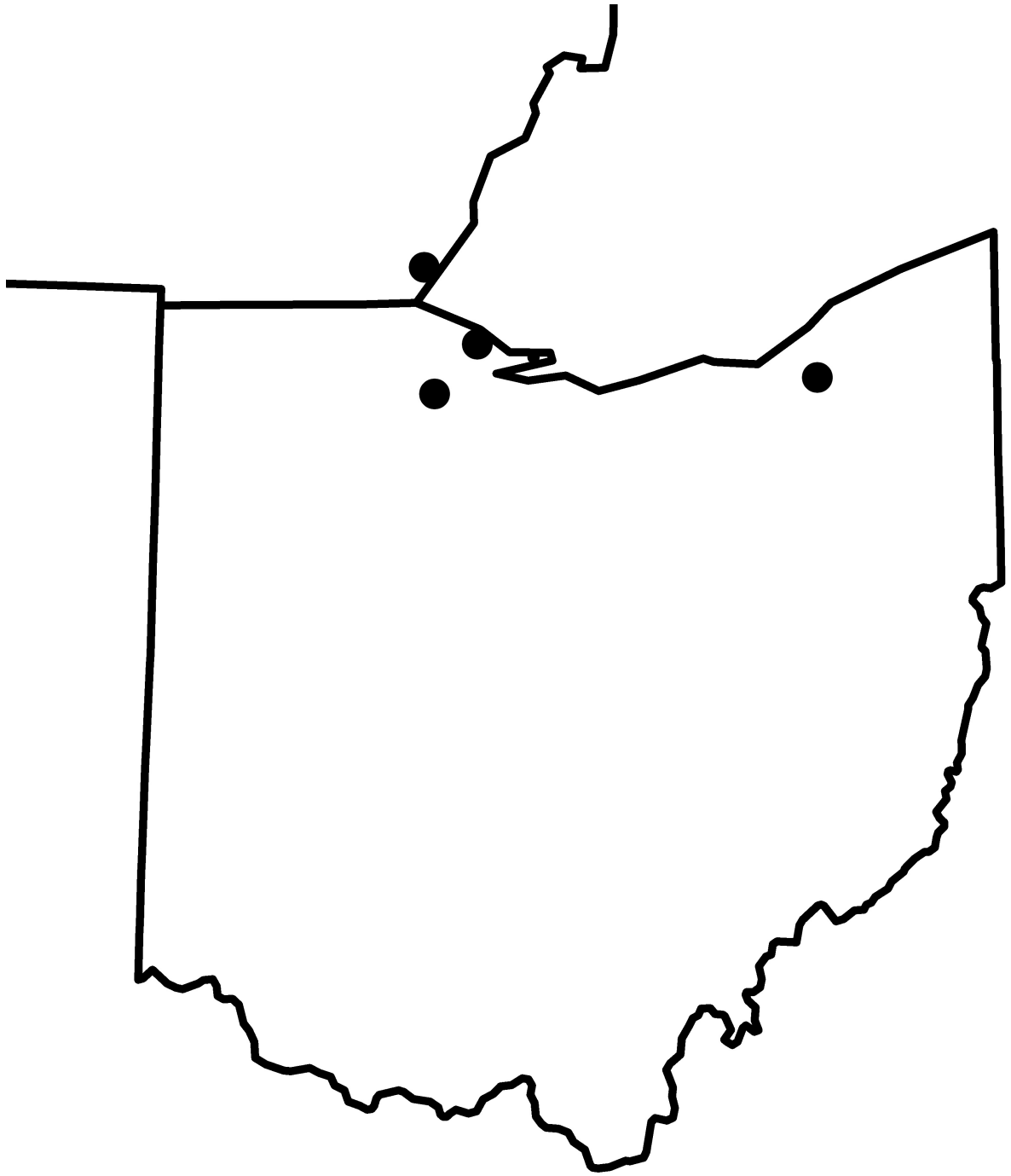




Figure 2. Spring temperature patterns, long-term average and 2012 (9 AM, 100 meters).

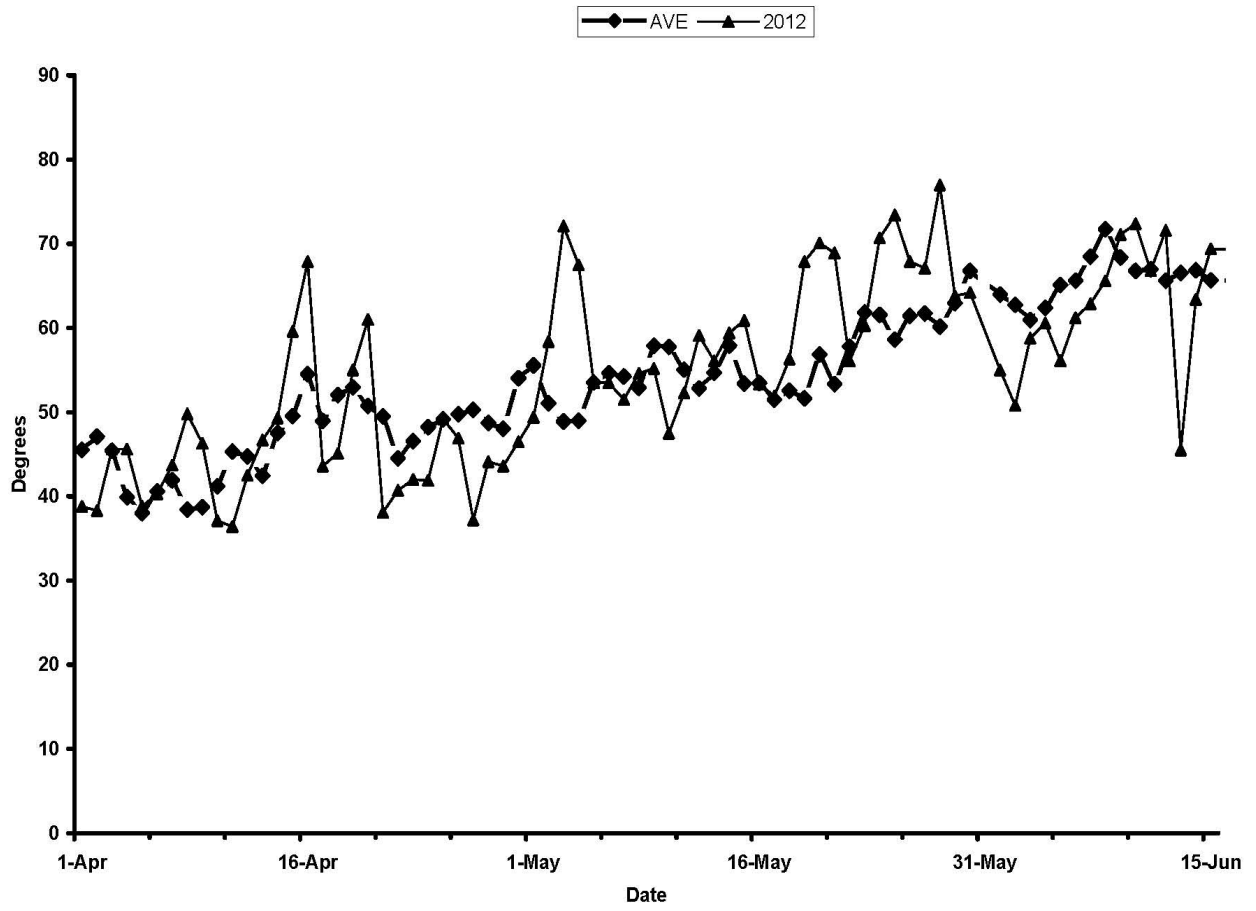


Figure 3. Fall temperature patterns, long-term average and 2011 (9 AM, 100 meters).

