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

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## INTRODUCTION

In 2013, 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. The fall appears to paint a different picture with habitat further from the lake indicating 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 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; 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 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 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 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 2013, 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 2013 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 data analysis. 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 2013. Spring 2013 was relatively normal for weather patterns in Northwest Ohio.(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 across the country. Good diversity and average volume, was recorded at the Navarre station.

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 2013, this wave had a moderate first pulse on 25 April but had a good second pulse, peaking 30 April -04 May. 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 excellent and occurred 09-16 May with a second pulse on 19-24 May with transitioned into the third wave birds. The third wave normally comes around Memorial Day weekend and is dominated by female Magnolia Warbler, American Redstart, Mourning Warbler, vireos, and flycatchers. In 2013, the third wave appeared as part of the last pulse of the second wave and continued 28-30 May with little movement in June.

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

In spring 2013, the Navarre banding station was operated on 48 days for 7,352.6 net hours. Including hummingbirds, 8,919 new birds were banded and a total of 10,426 birds handled (Table 1). The capture rate was 141.8 birds/100 net hours. This compares to the long-term average (1992-2012) of 121.1 birds/100 net hours (+17% from average). The long-term average shows no change over time of the capture rate at Navarre. One hundred and six species were banded in Navarre during spring 2013 (Table 2). The most unusual species and subspecies included Cooper's Hawk, Olive-sided Flycatcher, Gambel's White-crowned Sparrow, Cerulean Warbler, Louisiana Waterthrush, Pine Warbler, Henslow's Sparrow, House Finch, Kentucky Warbler, Prairie Warbler, Yellow Palm Warbler, and Summer Tanager. The ten most abundant species banded were Yellow-rumped Warbler (844), Magnolia Warbler (725), Traill's (Alder/Willow) Flycatcher (593), White-throated Sparrow (587), Gray Catbird (512),Yellow Warbler (428), Common Yellowthroat (375), American Redstart (293), Nashville Warbler (266), and Western Palm Warbler (233).

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 43 days during spring 2013. One hundred and fourty-five species and 25,261 individuals were recorded (Table 3). Canada Goose, Northern Cardinal, Red-winged Blackbird, Common Grackle, Tree Swallow, European Starling, Brown-headed Cowbird, and American Robin were observed each count day. The most abundant species recorded was Blue Jay (5,807) followed by, Red-winged Blackbird (3,510), Canada Goose (2,296), Tree Swallow (1,221), and Yellow Warbler (1,194).

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

This site permits comparison to the Lake Erie coastal sites as a riverine travel lane. 2013 was the 6$^{th}$ year of data collection at this site. Banding operations were conducted on 7 days with 119 new birds banded in 377.5 net hours (49.3 birds/100 net hours) (Table 4). Thirty-four species (Table 5) were banded with the five most abundant species being White-throated Sparrow (14), House Wren (14),

Gray Catbird (13), Field Sparrow (7), and Song Sparrow (7). Station surprises included Yellow-bellied Flycatcher and Blackpoll Warbler.

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. 2013 was the 19th year of banding at this site. Banding operations were conducted on 2 days with 54 new birds banded in 291 net hours (21.7 birds/100 net hours) (Table 6). Fifteen species (Table 7) were banded with the three most abundant species banded being Slate-colored Junco (11), Northern Cardinal (10), and American Robin (8).

Point counts were conducted on 2 days during spring 2013. Ten species with 67 individuals were recorded (Table 8). The most abundant species recorded was American Robin (22) followed by Northern Cardinal (15), American Crow ( 7), Black-capped Chickadee (6), and Canada Goose (5).

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

This site is located east of Cleveland at the Nature Center of Shaker Lakes and 2013 was the 12th 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 eighteen days, with 242 new birds banded in 627.5 net hours (38.9 birds/100 net hours). A total of 324 birds were handled (52.1 birds/100 net hours) during spring migration (Table 9). Fifty-two species (Table 10) were banded with the eight most abundant species banded being Gray Catbird (29), Magnolia Warbler (17), American Redstart (14), American Robin (11), Wilson Warbler (9), Canada Warbler (9), Ruby-crowned Kinglet (9), and Northern Waterthrush (8). A Louisiana Waterthrush was a pleasant surprise for the site.

Point counts were conducted on 18 days during spring 2013. Fifty-four species with 617 individuals were recorded (Table 11). The most abundant species recorded was American Robin (73) followed by American Goldfinch (53), Canada Goose (52), Rock Pigeon (52), Song Sparrow (45), Gray Catbird (39), and Warbling Vireo (26).

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 60 days for 7,157.9 net hours. Three thousand three hundred and seventy-six birds were banded with a total of 4,114 birds handled including recaptures (Table 12). This was the 21st fall season in which an extensive netting effort had been conducted on a daily basis. The capture rate for 2013 was 47.2 birds/100 net hours (-44% from 2012). A total of 77 species were banded during fall 2013 (Table 13). On 01 October the federal government shutdown resulting in work being suspended under all federal scientific use permits. This meant, for sixteen days the Navarre station was inactive during the height of the migration period. More in depth analysis of possible affects on the dataset are underway. Until those studies are completed, any comparison to last year or the long-term should be done with caution. Age ratios are expected to be impacted along with speciation and abundance parameters. The ten most abundant species banded were Blackpoll Warbler (711), Swainson's Thrush (375), Gray Catbird (230), Tennessee Warbler (204), Gray-cheeked Thrush (195), Golden-crowned Kinglet (143), Cape May Warbler (111), White-throated Sparrow (102), Magnolia Warbler (95), and Hermit Thrush (82). Several surprises were captured during the fall season. A Brewster's Warbler and Golden-winged Warbler were captured along with the stations first Western Wood Pewee and Audubon's Warbler.

Fall point counts were conducted on 55 days during 2013. A total of 8,749 individuals of 96 species were recorded (Table 14). The Northern Cardinal was observed on all count days. The most abundant species were Red-winged Blackbird (2,489), Canada Goose (1,414), European Starling (486), Northern Cardinal (392), and White-throated Sparrow (367).

For the 21st 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 65 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 six years with a major narrowing of the vegetated portion resulting in reduced habitat with higher levels of Lake Erie. In 2013, five nets were run on 55 days for 1,439 net hours (Table 15). The capture rate for fall 2013 was 35.0 birds/100 net hours. Capture rate was surely affected by the loss of the first half of October. Unusual captures included Yellow-breasted Chat and White-eyed Vireo. Five hundred and three birds of 47 species were banded on the beach ridge (Table 16). The top ten species banded were Blackpoll Warbler (126), Gray Catbird (44), Golden-crowned Kinglet (43), Swainson's Thrush (32), Tennessee Warbler (28), Ruby-crowned Kinglet (25), Cape May Warbler (15), White-throated Sparrow (14), Common Yellowthroat (14), and Gray-cheeked Thrush (13).

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

Banding operations were conducted on 34 days with 3,274 new birds banded in 1,747.3 net hours (187.4 birds/100 net hours) (Table 17). A total of 3,752 birds were handled for a 214.8 birds/100 net hours at the station. Seventy species (Table 18) were banded with the ten most abundant species being American Goldfinch (1,494), Indigo Bunting (288), Song Sparrow (244), White-throated Sparrow (144), Myrtle Warbler (117), Swamp Sparrow (99), Common Yellowthroat (77), Field Sparrow (70), Ruby-crowned Kinglet (66), and Slate-colored Junco (62). Considering the habitat of this site the capture of Scarlet Tanager and Marsh Wren was unexpected. Additional captures of Northern Shrike

and Blue-winged Warbler added surprises to the station. The large volume of American Goldfinches banded at this site was a direct result of a 5 acre patch of forbs and fourth 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.

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

Banding operations were conducted on 19 days with 258 new birds banded in 2,571.6 net hours (10.0 birds/100 net hours) (Table 19). A total of 302 birds were handled for a 11.7 birds/100 net hours. Forty-one species (Table 20) were banded with the ten most abundant species banded being Ruby-crowned Kinglet (21), Swainson Thrush (19), Ovenbird (18), Magnolia Warbler (16), Hermit Thrush (16), Golden-crowned Kinglet (15), White-throated Sparrow (12), Black-throated-Blue Warbler (10), American Redstart (10), Nashville Warbler (9), and American Robin (9). A Yellow-throated Vireo was an unusual capture for this station.

Point counts were conducted on 19 days during fall 2013. Twenty-one species with 260 individuals were recorded (Table 21). The most abundant species recorded was American Robin (72) followed by Blue Jay (48), American Crow (39), American Goldfinch (21), and Northern Cardinal (20).

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

Banding operations were carried out on Mondays, Wednesdays, and Fridays and were conducted on 27 days with 776 new birds banded in 1,159.5 net hours (66.9 birds/100 net hours). A total of 877 birds were handled (75.6 birds/100 net hours) during fall migration (Table 22). Sixty-two species (Table 23) were banded with the ten most abundant species being Myrtle Warbler (145), American Goldfinch (103), White-throated Sparrow (50), Magnolia Warbler (43), Swainson's Thrush (42), Nashville Warbler (32), Golden-crowned Kinglet (32), Ruby-crowned Kinglet (31), Tennessee Warbler (27), and Gray Catbird (27). Belted Kingfisher and Connecticut Warbler added to the diversity captured at this site.

Point counts were conducted on 27 days during fall 2013. Fifty-three species and 1,317 individuals were recorded (Table 24). The most abundant species recorded was Chimney Swift (268) followed by American Goldfinch (156), Canada Goose (91), Myrtle Warbler (80), and Cedar Waxwing (55). A large number of unidentified blackbirds (252) were also recorded.

SUMMARY BANDINGS

Total combined bandings for passerine migration 2013 for the Black Swamp Bird Observatory is in Table 25. Totals without parentheses are for the National Wildlife Refuge complex. The ten most abundant species banded on Ottawa NWR complex were Myrtle Warbler (910), Blackpoll Warbler (897), Magnolia Warbler (837), Gray Catbird (786), White-throated Sparrow (703), Swainson's Thrush (630), Traill's Flycatcher (597), Yellow Warbler (503), Common Yellowthroat (457), and American Redstart (363). Inclusive totals of all sites were topped by American Goldfinch (1,619),

Myrtle Warbler (1,182), Magnolia Warbler (932), White-throated Sparrow (919), Blackpoll Warbler (916), Gray Catbird (889), Swainson's Thrush (696), Traill's Flycatcher (609), Common Yellowthroat (550), and Yellow Warbler (507). A combined total of 118 species of 17,521 individuals (77.1 birds/100 net hrs) were banded. Totals for each study site and for each season are shown in Table 26. Species with greater than 50 individuals sampled had fall age ratios generally lower than the long-term average (Table 27). However, this could be affected by the shutdown of the Navarre station as previously stated.

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 2013, 336 birds of 23 species were captured as returning birds at the Navarre sites (Table 28). This total includes 80 Yellow Warblers with the oldest being banded in 2006, 93 Gray Catbirds with the oldest from 2004, 19 Common Yellowthroats (oldest from 2006), 29 Red-winged Blackbird (oldest from 2006), 30 Northern Cardinals (oldest from 2007), 27 American Robin (oldest from 2007), and 15 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 43 birds of 11 species were return captures at Shaker Lakes in 2013 (Table 29). Creek Bend had 95 individuals of 13 species return from previous year bandings (Table 30). A Song Sparrow and two Indigo Buntings were all captured at Creek Band and originally banded at Navarre in previous years. Petersburg had 8 returns of 3 species (Table 31). Several foreign captures were made of study birds and are reported in Table 32 as well as two foreign banded bird that were captured during the 2013 study year. A Yellow Warbler banded in the spring of 2012 on Pelee Island, Ontario was captured in Navarre during the spring migration. The biggest surprise of the spring came in the form of a Wilson's Warbler captured in the spring at Navarre that was wearing a band from Mexico. It was banded the previous fall at a major operation in the southern part of that country.

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 2013, 35 species (Table 33) had adequate sample sizes in both 2012 and 2013 to look at the changes in average fat deposits during spring migration. There was considerable variability in species when comparing 2012 and 2013. Twenty-two species indicated higher fat deposits in 2013 and 13 in 2012.

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, eight appeared to show a similar trend in fat between 2012 and 2013 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 2013, fall fat composition was higher in 2012 in 13 species with 5 species higher in 2013 ($p<.05$) (Table 34).

## 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 an above average capture rate which followed the low year of 2012 which followed a record number of birds banded the spring 2011 and an extremely low total in 2010. This cycle that is amerging is interesting and needs to be investigated further. 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 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 utilized 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 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 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 2013, project personnel entertained 50 groups at Navarre and the Black Swamp Bird Observatory Nature Center educating 1,100 individuals on migration and banding. In addition, eight presentations were made to 600 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 1,000 people. In addition, an estimated 50,000 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 2013.

| Date | Net Hour | Banded | Banded/ 100 net hr | Returns | Recaptures | Total birds* | Total bird/ 100 net hr |
|---|---|---|---|---|---|---|---|
| 415 | 103.50 | 111 | 107.25 | 11 | 0 | 122 | 117.87 |
| 416 | 166.75 | 300 | 179.91 | 7 | 11 | 318 | 190.71 |
| 417 | 184.00 | 84 | 45.65 | 5 | 31 | 126 | 68.48 |
| 418 | 132.75 | 87 | 65.54 | 1 | 18 | 106 | 79.85 |
| 419 | RAIN | | | | | | |
| 420 | 92.00 | 116 | 126.09 | 1 | 8 | 125 | 135.87 |
| 421 | 128.42 | 68 | 52.95 | 1 | 22 | 91 | 80.86 |
| 422 | 134.17 | 44 | 32.79 | 1 | 30 | 77 | 57.39 |
| 423 | 141.83 | 57 | 40.19 | 6 | 21 | 84 | 59.23 |
| 424 | RAIN | | | | | | |
| 425 | 143.75 | 169 | 117.57 | 2 | 27 | 198 | 137.74 |
| 426 | 155.75 | 81 | 52.01 | 0 | 24 | 105 | 67.42 |
| 427 | 138.00 | 50 | 36.23 | 2 | 13 | 66 | 47.83 |
| 428 | 69.00 | 33 | 47.83 | 1 | 12 | 46 | 66.67 |
| 429 | 139.92 | 57 | 40.74 | 1 | 16 | 74 | 52.89 |
| 430 | 143.75 | 143 | 99.48 | 4 | 3 | 150 | 104.35 |
| 501 | 164.68 | 228 | 138.45 | 8 | 8 | 244 | 148.17 |
| 502 | 166.75 | 200 | 119.94 | 12 | 10 | 222 | 133.13 |
| 503 | 176.41 | 313 | 177.43 | 7 | 10 | 331 | 187.63 |
| 504 | 172.50 | 168 | 97.39 | 8 | 11 | 187 | 108.41 |
| 505 | 143.41 | 56 | 36.50 | 8 | 22 | 86 | 56.06 |
| 506 | 132.25 | 46 | 34.78 | 3 | 10 | 59 | 44.61 |
| 507 | 143.75 | 52 | 36.17 | 4 | 13 | 69 | 48.00 |
| 508 | 149.50 | 27 | 18.06 | 9 | 24 | 60 | 40.13 |
| 509 | 159.08 | 146 | 91.78 | 9 | 17 | 172 | 108.12 |
| 510 | 168.59 | 499 | 295.98 | 6 | 9 | 515 | 305.48 |
| 511 | 191.59 | 456 | 238.01 | 10 | 59 | 525 | 274.02 |
| 512 | 161.00 | 271 | 168.32 | 6 | 77 | 354 | 219.88 |
| 513 | 164.68 | 200 | 121.45 | 10 | 89 | 299 | 181.56 |
| 514 | 184.00 | 646 | 351.09 | 10 | 51 | 707 | 384.24 |
| 515 | 185.92 | 577 | 310.35 | 7 | 32 | 616 | 331.33 |
| 516 | 161.00 | 296 | 183.85 | 9 | 47 | 352 | 218.63 |
| 517 | 149.50 | 104 | 69.57 | 5 | 31 | 143 | 95.65 |
| 518 | 161.00 | 132 | 81.99 | 10 | 56 | 198 | 122.98 |
| 519 | 159.08 | 212 | 133.27 | 8 | 21 | 241 | 151.50 |
| 520 | 187.68 | 671 | 357.52 | 8 | 14 | 693 | 369.25 |
| 521 | 166.75 | 274 | 164.32 | 3 | 28 | 305 | 182.91 |
| 522 | 187.68 | 291 | 155.05 | 3 | 31 | 326 | 173.70 |
| 523 | 159.08 | 177 | 111.27 | 7 | 31 | 215 | 135.15 |
| 524 | 172.50 | 189 | 109.57 | 3 | 49 | 241 | 139.71 |
| 525 | 155.25 | 95 | 61.19 | 7 | 41 | 143 | 92.11 |
| 526 | 134.17 | 75 | 55.90 | 6 | 32 | 113 | 84.22 |
| 527 | 143.75 | 60 | 41.74 | 5 | 28 | 93 | 64.70 |
| 528 | 187.68 | 495 | 263.75 | 2 | 37 | 534 | 284.53 |
| 529 | 172.50 | 282 | 163.48 | 5 | 21 | 308 | 178.55 |
| 530 | 159.08 | 120 | 75.43 | 4 | 15 | 139 | 87.38 |
| 531 | 147.58 | 51 | 34.56 | 8 | 24 | 83 | 56.24 |
| 601 | 90.08 | 25 | 27.75 | 4 | 14 | 43 | 47.74 |
| 602 | 149.50 | 49 | 32.78 | 1 | 12 | 62 | 41.47 |
| 603 | 161.00 | 36 | 22.36 | 7 | 17 | 60 | 37.27 |
| TOTAL | 7352.56 | 8919 | 121.30 | 265 | 1227 | 10426 | 141.80 |

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

Table 2. Spring banding totals, Navarre, 2013.

| Species | Banded | Species | Banded | Species | Banded |
|---|---|---|---|---|---|
| American Woodcock | 1 | Lincoln Sparrow | 97 | Pine Warbler | 7 |
| Mourning Dove | 1 | Swamp Sparrow | 90 | Western Palm Warbler | 233 |
| Sharp-shinned Hawk | 8 | Fox Sparrow | 13 | Yellow Palm Warbler | 1 |
| Cooper Hawk | 1 | Eastern Towhee | 10 | Prairie Warbler | 1 |
| American Kestrel | 1 | Northern Cardinal | 72 | Ovenbird | 153 |
| Yellow-billed Cuckoo | 5 | Rose-breasted Grosbeak | 11 | Northern Waterthrush | 78 |
| Black-billed Cuckoo | 4 | Indigo Bunting | 68 | Louisiana Waterthrush | 1 |
| Hairy Woodpecker | 1 | Scarlet Tanager | 5 | Kentucky Warbler | 1 |
| Downy Woodpecker | 6 | Summer Tanager | 1 | Connecticut Warbler | 10 |
| Yellow-bellied Sapsucker | 2 | Tree Swallow | 17 | Mourning Warbler | 109 |
| Red-bellied Woodpecker | 5 | Cedar Waxwing | 11 | Common Yellowthroat | 375 |
| Yellow-shafted Flicker | 8 | Red-eyed Vireo | 131 | Yellow-breasted Chat | 2 |
| Ruby-th. Hummingbird | 45 | Philadelphia Vireo | 18 | Hooded Warbler | 14 |
| Eastern Kingbird | 4 | Warbling Vireo | 40 | Wilson's Warbler | 226 |
| Great-crested Flycatcher | 33 | Yellow-throated Vireo | 2 | Canada Warbler | 131 |
| Eastern Phoebe | 5 | Blue-headed Vireo | 53 | American Redstart | 293 |
| Olive-sided Flycatcher | 1 | White-eyed Vireo | 11 | Gray Catbird | 512 |
| Eastern Wood Pewee | 43 | Black and White Warbler | 127 | Brown Thrasher | 14 |
| Yellow-bellied Flycatcher | 127 | Prothonotary Warbler | 11 | Carolina Wren | 3 |
| Acadian Flycatcher | 27 | Blue-winged Warbler | 25 | House Wren | 106 |
| Traill's Flycatcher | 593 | Golden-winged Warbler | 5 | Winter Wren | 16 |
| Least Flycatcher | 68 | Nashville Warbler | 266 | Marsh Wren | 2 |
| Blue Jay | 34 | Orange-crowned Warbler | 19 | Brown Creeper | 30 |
| Red-winged Blackbird | 139 | Tennessee Warbler | 127 | Red-breasted Nuthatch | 16 |
| Orchard Priole | 2 | Northern Parula | 33 | Black-capped Chickadee | 3 |
| Baltimore Oriole | 36 | Cape May Warbler | 35 | Golden-crowned Kinglet | 57 |
| Common Grackle | 18 | Yellow Warbler | 428 | Ruby-crowned Kinglet | 216 |
| House Finch | 1 | Black-th.-Blue Warbler | 53 | Blue-gray Gnatcatcher | 77 |
| American Goldfinch | 13 | Myrtle Warbler | 844 | Wood Thrush | 30 |
| Henslow's Sparrow | 1 | Magnolia Warbler | 725 | Veery | 90 |
| White-crowned Sparrow | 66 | Cerulean Warbler | 1 | Gray-cheeked Thrush | 23 |
| Gambel's Wh.-cr. Sparrow | 3 | Chestnut-sided Warbler | 164 | Swainson's Thrush | 223 |
| White-throated Sparrow | 587 | Bay-breasted Warbler | 32 | Hermit Thrush | 171 |
| Field Sparrow | 5 | Blackpoll Warbler | 60 | American Robin | 30 |
| Slate-colored Junco | 3 | Blackburnian Warbler | 42 | | |
| Song Sparrow | 34 | Black-th.-Green Warbler | 87 | | |

Table 3. Number of days observed and totals of species seen on point counts, Navarre spring 2013.

| Species | # days | #Observed | Species | # days | #Observed | Species | # days | #Observed |
|---|---|---|---|---|---|---|---|---|
| Pied-billed Grebe | 22 | 60 | Yellow-bel. Flycatcher | 6 | 10 | Tennessee Warbler | 18 | 74 |
| Herring Gull | 11 | 24 | Acadian Flycatcher | 7 | 11 | Northern Parula | 13 | 36 |
| Ring-billed Gull | 25 | 84 | Alder Flycatcher | 8 | 15 | Cape May Warbler | 7 | 18 |
| Bonaparte's Gull | 3 | 3 | Willow Flycatcher | 17 | 125 | Yellow Warbler | 37 | 1194 |
| Caspian Tern | 6 | 8 | Traill's Flycatcher | 3 | 21 | Black-th.-Blue Warbler | 9 | 21 |
| Dou.-cr. Cormorant | 22 | 131 | Least Flycatcher | 15 | 28 | Myrtle Warbler | 24 | 302 |
| Common Merganser | 1 | 7 | Blue Jay | 41 | 5807 | Magnolia Warbler | 19 | 109 |
| Hooded Merganser | 1 | 1 | American Crow | 1 | 1 | Cerulean Warbler | 1 | 1 |
| Mallard | 14 | 26 | E. Starling | 43 | 719 | Chestnut-sided Warbler | 24 | 61 |
| Gadwall | 6 | 113 | Bobolink | 4 | 11 | Bay-breasted Warbler | 4 | 4 |
| American Wigeon | 2 | 8 | Brown-headed Cowbird | 43 | 418 | Blackpoll Warbler | 14 | 52 |
| Blue-winged Teal | 2 | 12 | Red-winged Blackbird | 43 | 3510 | Blackburnian Warbler | 9 | 29 |
| Wood Duck | 19 | 82 | Orchard Oriole | 2 | 2 | Black-th.-Green Warbler | 20 | 59 |
| Lesser Scaup | 3 | 26 | Baltimore Oriole | 31 | 469 | Pine Warbler | 3 | 3 |
| Canada Goose | 43 | 2296 | Rusty Blackbird | 6 | 22 | W. Palm Warbler | 13 | 52 |
| Mute Swan | 1 | 3 | Common Grackle | 43 | 715 | Ovenbird | 15 | 53 |
| Trumpeter Swan | 11 | 28 | Purple Finch | 11 | 35 | No. Waterthrush | 15 | 49 |
| Least Bittern | 1 | 2 | House Finch | 2 | 3 | Connecticut Warbler | 4 | 6 |
| Gr.-blue Heron | 42 | 212 | Am. Goldfinch | 34 | 214 | Mourning Warbler | 12 | 30 |
| Great Egret | 24 | 42 | Pine Siskin | 3 | 6 | Com. Yellowthroat | 33 | 237 |
| Snowy Egret | 1 | 1 | Clay-colored Sparrow | 1 | 1 | Yellow-breasted Chat | 1 | 1 |
| Black-cr. N. Heron | 2 | 2 | White-cr. sparrow | 10 | 47 | Wilson's Warbler | 17 | 56 |
| Sandhill Crane | 28 | 108 | White-th. Sparrow | 29 | 595 | Canada Warbler | 11 | 20 |
| Sora | 8 | 11 | Song Sparrow | 42 | 266 | American Redstart | 21 | 103 |
| Virginia Rail | 7 | 12 | Lincoln Sparrow | 5 | 8 | American Pipit | 1 | 20 |
| Am. Coot | 2 | 3 | Swamp Sparrow | 18 | 41 | Gray Catbird | 31 | 646 |
| Lesser Yellowlegs | 3 | 3 | Fox Sparrow | 1 | 5 | Brown Thrasher | 28 | 80 |
| Solitary Sandpiper | 2 | 2 | Eastern Towhee | 16 | 31 | Carolina Wren | 40 | 90 |
| Killdeer | 1 | 1 | No. Cardinal | 43 | 803 | House Wren | 36 | 277 |
| Mourning Dove | 29 | 90 | Rose-br. Grosbeak | 16 | 53 | Winter Wren | 1 | 2 |
| Rock Dove | 1 | 1 | Indigo Bunting | 19 | 78 | Marsh Wren | 18 | 20 |
| Sharp-sh.. Hawk | 1 | 2 | Scarlet Tanager | 12 | 18 | Brown Creeper | 3 | 7 |
| Cooper's Hawk | 1 | 1 | Purple Martin | 11 | 21 | Red-breasted Nuthatch | 3 | 3 |
| Northern Harrier | 2 | 2 | Barn Swallow | 19 | 37 | Tufted Titmouse | 1 | 1 |
| Bald Eagle | 7 | 10 | Tree Swallow | 43 | 1221 | Black-capped Chickadee | 17 | 47 |
| Great Horned Owl | 31 | 34 | Bank Swallow | 10 | 51 | Golden-crowned Kinglet | 5 | 22 |
| Yellow-billed Cuckoo | 9 | 48 | Rough-winged Swallow | 3 | 6 | Ruby-crowned Kinglet | 24 | 150 |
| Black-billed Cuckoo | 9 | 29 | Cedar Waxwing | 18 | 618 | Blue-gray Gnatcatcher | 26 | 134 |
| Hairy Woodpecker | 1 | 1 | Red-eyed Vireo | 20 | 150 | Wood Thrush | 9 | 15 |
| Downy Woodpecker | 25 | 55 | Philadelphia Vireo | 7 | 8 | Veery | 11 | 17 |
| Yellow-bellied Sapsu. | 2 | 3 | Warbling Vireo | 29 | 101 | Gray-cheeked Thrush | 2 | 3 |
| Red-b. Woodpecker | 16 | 27 | Yellow-throated Vireo | 2 | 3 | Swainson's Thrush | 16 | 64 |
| Yellow-shafted Flicker | 16 | 34 | Blue-headed Vireo | 12 | 27 | Hermit Thrush | 9 | 27 |
| Common Nighthawk | 1 | 1 | White-eyed Vireo | 2 | 2 | American Robin | 43 | 362 |
| Chimney Swift | 20 | 49 | Black & White Warbler | 21 | 78 | Eastern Bluebird | 2 | 2 |
| Ruby-th. Humming. | 5 | 5 | Prothonotary Warblar | 27 | 50 | Unk. Flycatcher | 3 | 21 |
| Eastern Kingbird | 27 | 80 | Worm-eating Warbler | 1 | 1 | Unk. warbler | 20 | 264 |
| Great-cr. Flycatcher | 14 | 29 | Blue-winged Warbler | 5 | 7 | | | |
| Eastern Phoebe | 3 | 3 | Golden-winged Warbler | 4 | 5 | | | |
| E. Wood Pewee | 7 | 17 | Nashville Warbler | 18 | 111 | | | |

Table 4. Daily banding totals for Creek Bend, spring 2013.

| Date | Net Hour | Banded | Banded/ 100 net hr | Returns | Recaptures | Total birds | Total bird/ 100 net hr |
|---|---|---|---|---|---|---|---|
| 421 | 40.00 | 8 | 20.00 | 1 | 0 | 9 | 22.50 |
| 423 | 62.50 | 19 | 30.40 | 4 | 2 | 25 | 40.00 |
| 427 | 50.00 | 19 | 38.00 | 7 | 5 | 31 | 62.00 |
| 428 | 50.00 | 5 | 10.00 | 0 | 1 | 6 | 12.00 |
| 507 | 56.25 | 19 | 33.78 | 8 | 6 | 33 | 58.67 |
| 522 | 56.25 | 37 | 65.78 | 11 | 8 | 56 | 99.56 |
| 603 | 62.50 | 12 | 19.20 | 7 | 7 | 26 | 41.60 |
| TOTAL | 377.50 | 119 | 31.52 | 38 | 29 | 186 | 49.27 |

Table 5. Daily banding totals Creek Bend, spring, 2013.

| Species | Banded | Species | Banded | Species | Banded |
|---|---|---|---|---|---|
| Eastern Phoebe | 2 | Eastern Towhee | 2 | Wilson's Warbler | 1 |
| Yellow-bellied Flycat. | 1 | Northern Cardinal | 3 | American Redstart | 1 |
| Traill's Flycatcher | 6 | Indigo Bunting | 4 | Gray Catbird | 13 |
| Baltimore Oriole | 2 | Cedar Waxwing | 1 | Brown Thrasher | 1 |
| American Goldfinch | 4 | Tennessee Warbler | 1 | House Wren | 14 |
| White-th. Sparrow | 14 | Yellow Warbler | 1 | Black-capped Chickadee | 1 |
| Chipping Sparrow | 1 | Myrtle Warbler | 2 | Ruby-crowned Kinglet | 3 |
| Field Sparrow | 7 | Magnolia Warbler | 2 | Blue-gray Gnatcatcher | 2 |
| Slate-colored Junco | 2 | Blackpoll Warbler | 1 | Wood Thrush | 1 |
| Song Sparrow | 7 | Mourning Warbler | 3 | Swainson's Thrush | 1 |
| Lincoln Sparrow | 1 | Common Yellowthroat | 5 | American Robin | 5 |
| Swamp Sparrow | 4 | | | | |

Table 6. Daily banding totals for Petersburg, spring 2013.

| Date | Net Hour | Banded | Banded/ 100 net hr | Returns | Recaptures | Total birds | Total bird/ 100 net hr |
|---|---|---|---|---|---|---|---|
| 414 | 121.00 | 24 | 19.83 | 1 | 0 | 25 | 20.66 |
| 427 | 170.00 | 30 | 17.65 | 4 | 4 | 38 | 22.35 |
| TOTAL | 291.00 | 54 | 18.56 | 5 | 4 | 63 | 21.65 |

Table 7. Daily banding totals Petersburg, spring, 2013.

| Species | Banded | Species | Banded | Species | Banded |
|---|---|---|---|---|---|
| Brown-headed Cowbird | 2 | Chipping Sparrow | 2 | Tufted Titmouse | 2 |
| Red-winged Blackbird | 1 | Field Sparrow | 3 | Black-capped Chickadee | 3 |
| Rusty Blackbird | 1 | Slate-colored Junco | 11 | Ruby-crowned Kinglet | 1 |
| Common Grackle | 5 | Eastern Towhee | 1 | Hermit Thrush | 3 |
| White-throated Sparrow | 1 | Northern Cardinal | 10 | American Robin | 8 |

Table 8. Point count days conducted and species totals, spring season, Petersburg, 2013.

| Species | # days | # birds | Species | # days | # birds | Species | # days | # bird |
|---|---|---|---|---|---|---|---|---|
| Canada Goose | 1 | 5 | Red-winged Blackbird | 1 | 1 | Black-cap Chickadee | 2 | 6 |
| Ring-necked Pheasant | 1 | 2 | Am. Crow | 2 | 7 | American Robin | 2 | 22 |
| Mourning Dove | 1 | 2 | Field Sparrow | 2 | 3 | | | |
| Eastern Phoebe | 1 | 2 | No. Cardinal | 2 | 15 | | | |

Table 9. Daily banding totals for Shaker Lakes, spring 2013.

| Date | Net Hour | Banded | Banded/ 100 net hr | Returns | Recaptures | Total birds | Total bird/ 100 net hr |
|---|---|---|---|---|---|---|---|
| 422 | 31.50 | 23 | 73.02 | 5 | 0 | 28 | 88.89 |
| 426 | 33.00 | 13 | 39.39 | 1 | 2 | 16 | 48.49 |
| 429 | 34.50 | 5 | 14.49 | 7 | 3 | 15 | 43.48 |
| 501 | 33.00 | 5 | 15.15 | 1 | 3 | 9 | 27.27 |
| 506 | 32.50 | 8 | 24.62 | 1 | 1 | 10 | 30.77 |
| 508 | 34.50 | 3 | 8.70 | 3 | 2 | 8 | 23.19 |
| 510 | 29.00 | 4 | 13.79 | 1 | 0 | 5 | 17.24 |
| 513 | 36.00 | 21 | 58.33 | 2 | 3 | 26 | 72.22 |
| 515 | 43.00 | 46 | 106.98 | 0 | 3 | 49 | 133.95 |
| 517 | 35.50 | 24 | 67.61 | 2 | 0 | 26 | 73.24 |
| 520 | 36.00 | 24 | 66.67 | 1 | 4 | 29 | 80.56 |
| 522 | 35.50 | 8 | 22.54 | 2 | 3 | 13 | 36.62 |
| 524 | 34.00 | 11 | 32.35 | 0 | 8 | 19 | 55.88 |
| 527 | 34.50 | 11 | 31.88 | 2 | 5 | 18 | 52.17 |
| 529 | 38.00 | 13 | 34.21 | 1 | 2 | 16 | 42.11 |
| 531 | 36.00 | 7 | 19.44 | 0 | 4 | 11 | 30.56 |
| 603 | 29.50 | 8 | 27.12 | 1 | 5 | 14 | 47.46 |
| 605 | 36.50 | 8 | 21.92 | 0 | 4 | 12 | 32.88 |
| TOTAL | 622.50 | 242 | 38.88 | 30 | 52 | 324 | 52.05 |

Table 10. Daily banding totals Shaker Lakes, spring 2013.

| Species | Banded | Species | Banded | Species | Banded |
|---|---|---|---|---|---|
| Downy Woodpecker | 1 | Warbling Vireo | 2 | American Redstart | 14 |
| Eastern Kingbird | 1 | Black & White Warbler | 2 | Gray Catbird | 29 |
| Eastern Phoebe | 7 | Blue-winged Warbler | 2 | Carolina Wren | 2 |
| Yellow-bellied Flycatcher | 4 | Nashville Warbler | 6 | House Wren | 4 |
| Traill's Flycatcher | 4 | Yellow Warbler | 3 | White-br. Nuthatch | 1 |
| Least Flycatcher | 3 | Black-th. Blue Warbler | 3 | Tufted Titmouse | 1 |
| Brown-headed Cowbird | 2 | Magnolia Warbler | 17 | Black-capped Chickadee | 4 |
| Baltimore Oriole | 2 | Myrtle Warbler | 3 | Golden-cr. Kinglet | 1 |
| American Goldfinch | 5 | Blackpoll Warbler | 1 | Ruby-cr. Kinglet | 9 |
| White-throated Sparrow | 7 | Black-th Green Warbler | 2 | Blue-gray Gnatcatcher | 1 |
| Chipping Sparrow | 3 | Western Palm Warbler | 6 | Wood Thrush | 2 |
| Field Sparrow | 1 | Ovenbird | 1 | Veery | 3 |
| Song Sparrow | 5 | Northern Waterthrush | 8 | Gray-cheeked Thrush | 1 |
| Swamp Sparrow | 3 | Louisiana Waterthrush | 1 | Swainson's Thrush | 5 |
| Northern Cardinal | 4 | Mourning Warbler | 2 | Hermit Thrush | 2 |
| Indigo Bunting | 1 | Common Yellowthroat | 7 | American Robin | 11 |
| Cedar Waxwing | 7 | Wilson's Warbler | 9 | | |
| Red-eyed Vireo | 3 | Canada Warbler | 9 | | |

Table 11. Point count days conducted and species totals, spring season, Shaker Lakes, 2013.

| Species | # days | # birds | Species | # days | # birds | Species | # days | # birds |
|---|---|---|---|---|---|---|---|---|
| Herring Gull | 3 | 3 | Blue Jay | 4 | 8 | Yellow Warbler | 1 | 1 |
| Double-cr. Cormorant | 1 | 1 | American Crow | 2 | 2 | Myrtle Warbler | 2 | 2 |
| Mallard | 7 | 14 | European Starling | 4 | 8 | Magnolia Warbler | 1 | 2 |
| Wood Duck | 4 | 7 | Brown-head. Cowbird | 7 | 9 | Chestnut-sided Warb. | 1 | 1 |
| Canada Goose | 9 | 52 | Red-wing . Blackbird | 11 | 12 | Northern Waterthrush | 2 | 2 |
| Great Blue Heron | 8 | 9 | Baltimore Oriole | 5 | 7 | American Redstart | 6 | 8 |
| Mourning Dove | 5 | 6 | Common Grackle | 1 | 1 | Gray Catbird | 14 | 39 |
| Rock Pigeon | 7 | 52 | American Goldfinch | 14 | 53 | Carolina Wren | 10 | 13 |
| Belted Kingfisher | 2 | 3 | White-th. Sparrow | 3 | 3 | House Wren | 3 | 3 |
| Downy Woodpecker | 6 | 7 | American tree Sparrow | 1 | 1 | White-br. Nuthatch | 7 | 10 |
| Red -bell Woodpecker | 11 | 17 | Chipping Sparrow | 2 | 3 | Tufted Titmouse | 1 | 2 |
| Yell-shaft Flicker | 1 | 1 | Song Sparrow | 17 | 45 | Black-cap. Chickadee | 11 | 15 |
| Common Nighthawk | 1 | 2 | No. Cardinal | 14 | 21 | Ruby-crowned Kinglet | 3 | 4 |
| Chimney Swift | 6 | 11 | Rose-br. Grosbeak | 1 | 1 | Blue-gray Gnatcatcher | 1 | 1 |
| Ru.-th. Hummingbird | 1 | 1 | N. Rough-wing Swal. | 1 | 2 | Swainson Thrush | 1 | 1 |
| Gr-cr Flycatcher | 9 | 12 | Red-eyed Vireo | 10 | 15 | American Robin | 18 | 73 |
| Eastern Phoebe | 4 | 8 | Warbling Vireo | 14 | 26 | Unk. Gull | 3 | 4 |
| Eastern Wood Pewee | 4 | 4 | Nashville Warbler | 1 | 1 | Unk. Warbler | 1 | 2 |
| Acadian Flycatcher | 1 | 1 | Tennessee Warbler | 1 | 1 | | | |

Table 12. Daily banding totals for Navarre, fall 2013.

| Date | Net Hour | Banded | Banded/100 net hr | Returns | Recaptures | Total birds* | Total bird/ 100 net hr |
|---|---|---|---|---|---|---|---|
| 706 | 107.40 | 67 | 62.38 | 5 | 16 | 88 | 81.94 |
| 713 | 92.00 | 34 | 36.96 | 3 | 6 | 43 | 46.74 |
| 724 | 99.60 | 47 | 47.19 | 2 | 5 | 54 | 54.22 |
| 801 | 103.50 | 70 | 67.63 | 1 | 21 | 92 | 88.89 |
| 818 | 107.40 | 21 | 19.55 | 2 | 5 | 28 | 26.07 |
| 819 | 120.75 | 10 | 8.28 | 0 | 6 | 16 | 13.25 |
| 820 | 120.75 | 8 | 6.63 | 0 | 6 | 14 | 11.59 |
| 821 | 115.00 | 13 | 11.30 | 1 | 3 | 17 | 14.78 |
| 822 | 107.40 | 5 | 4.66 | 2 | 2 | 9 | 8.38 |
| 823 | 126.50 | 25 | 19.76 | 0 | 3 | 28 | 22.13 |
| 824 | 103.50 | 9 | 8.70 | 0 | 4 | 13 | 12.56 |
| 825 | 109.25 | 11 | 10.07 | 0 | 2 | 13 | 11.90 |
| 826 | 103.50 | 11 | 10.63 | 0 | 1 | 12 | 11.59 |
| 827 | 57.50 | 2 | 3.48 | 0 | 0 | 2 | 3.48 |
| 828 | 107.40 | 10 | 9.31 | 1 | 3 | 14 | 13.04 |
| 829 | 105.40 | 28 | 26.57 | 0 | 6 | 34 | 32.26 |
| 830 | 136.08 | 15 | 11.02 | 0 | 4 | 19 | 13.96 |
| 831 | 103.50 | 15 | 14.49 | 0 | 3 | 18 | 17.39 |
| 901 | 111.17 | 20 | 17.99 | 0 | 2 | 22 | 19.79 |
| 902 | 118.68 | 8 | 6.74 | 0 | 4 | 12 | 10.11 |
| 903 | 126.50 | 12 | 9.49 | 0 | 1 | 13 | 10.28 |
| 904 | 120.75 | 39 | 32.30 | 0 | 4 | 43 | 35.61 |
| 905 | 134.17 | 32 | 23.85 | 0 | 6 | 38 | 28.32 |
| 906 | 115.00 | 39 | 33.91 | 0 | 7 | 46 | 40.00 |
| 907 | 115.00 | 46 | 40.00 | 0 | 5 | 51 | 44.35 |
| 908 | 107.41 | 35 | 32.59 | 0 | 5 | 40 | 37.24 |
| 909 | 126.50 | 24 | 18.97 | 0 | 10 | 34 | 26.88 |
| 910 | 111.17 | 61 | 54.87 | 0 | 4 | 66 | 59.37 |
| 911 | 130.41 | 81 | 62.11 | 0 | 7 | 88 | 67.48 |
| 912 | 138.00 | 144 | 104.35 | 0 | 6 | 150 | 108.70 |
| 913 | 145.59 | 231 | 158.67 | 0 | 21 | 252 | 173.09 |
| 914 | 122.59 | 141 | 115.02 | 0 | 27 | 169 | 137.86 |
| 915 | 138.00 | 148 | 107.25 | 0 | 31 | 179 | 129.71 |
| 916 | 126.50 | 59 | 46.64 | 0 | 14 | 73 | 57.71 |
| 917 | 138.00 | 78 | 56.52 | 0 | 20 | 98 | 71.01 |
| 918 | 128.42 | 75 | 58.40 | 0 | 26 | 101 | 78.65 |
| 919 | 134.09 | 32 | 23.87 | 1 | 17 | 50 | 37.29 |
| 920 | 134.09 | 52 | 38.78 | 0 | 15 | 67 | 49.97 |
| 921 | 197.42 | 314 | 159.05 | 0 | 20 | 334 | 169.18 |
| 922 | 153.41 | 115 | 74.96 | 0 | 37 | 152 | 99.08 |
| 923 | 132.25 | 55 | 41.59 | 0 | 27 | 83 | 62.76 |
| 924 | 132.25 | 48 | 36.30 | 1 | 28 | 77 | 58.22 |
| 925 | 138.00 | 47 | 34.06 | 1 | 18 | 66 | 47.83 |
| 926 | 133.59 | 36 | 29.37 | 0 | 14 | 50 | 40.79 |
| 927 | 132.25 | 45 | 34.03 | 0 | 14 | 59 | 44.61 |
| 928 | 126.50 | 43 | 33.99 | 0 | 18 | 61 | 48.22 |
| 929 | 132.25 | 99 | 74.86 | 0 | 23 | 122 | 92.25 |
| 930 | 161.00 | 266 | 165.22 | 0 | 23 | 289 | 179.50 |
| 1001 | CLOSED | Thru | 1016 | | | | |
| 1002 | Government | Shutdown | | | | | |
| 1003 | | | | | | | |
| 1017 | 118.83 | 100 | 84.15 | 0 | 10 | 110 | 92.57 |
| 1018 | 126.50 | 41 | 32.41 | 0 | 18 | 59 | 46.64 |
| 1019 | 49.68 | 14 | 28.18 | 0 | 7 | 21 | 42.27 |
| 1020 | 116.84 | 50 | 42.79 | 0 | 17 | 67 | 57.34 |
| 1021 | 111.09 | 24 | 21.60 | 0 | 31 | 55 | 49.51 |
| 1022 | 120.75 | 42 | 34.78 | 0 | 19 | 61 | 50.52 |
| 1023 | 141.68 | 132 | 93.17 | 0 | 24 | 156 | 110.11 |
| 1024 | 88.09 | 44 | 49.95 | 0 | 8 | 52 | 59.03 |
| 1025 | 99.59 | 22 | 22.09 | 0 | 5 | 27 | 27.11 |
| 1026 | 112.93 | 12 | 10.63 | 0 | 3 | 15 | 13.28 |
| 1027 | 115.00 | 42 | 36.52 | 0 | 20 | 62 | 53.91 |
| 1030 | 80.50 | 27 | 33.54 | 0 | 3 | 30 | 37.27 |
| TOTAL | 7157.87 | 3376 | 47.16 | 20 | 715 | 4114 | 57.48 |

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

Table 13. Fall banding totals, Navarre 2013.

| Species | Banded | Species | Banded | Species | Banded |
|---|---|---|---|---|---|
| Black-billed Cuckoo | 1 | Indigo Bunting | 4 | Northern Waterthrush | 52 |
| Hairy Woodpecker | 1 | Scarlet Tanager | 2 | Connecticut Warbler | 5 |
| Downy Woodpecker | 18 | Red-eyed Vireo | 46 | Mourning Warbler | 7 |
| Yellow-bellied Sapsucker | 3 | Philadelphia Vireo | 4 | Common Yellowthroat | 68 |
| Yellow-shafted Flicker | 3 | Warbling Vireo | 8 | Wilson's Warbler | 15 |
| Ruby-th. Hummingbird | 19 | Blue-headed Vireo | 1 | Canada Warbler | 11 |
| Great-cr. Flycatcher | 2 | Black and White Warbler | 32 | American Redstart | 64 |
| Eastern Phoebe | 5 | Prothonotary Warbler | 7 | Gray Catbird | 230 |
| Eastern. Wood Pewee | 12 | Brewster's Warbler | 1 | Brown Thrasher | 2 |
| Western Wood Pewee | 1 | Golden-winged Warbler | 1 | Carolina Wren | 12 |
| Yellow-bellied Flycatcher | 36 | Nashville Warbler | 29 | House Wren | 25 |
| Traill's Flycatcher | 4 | Tennessee Warbler | 204 | Winter Wren | 26 |
| Least Flycatcher | 2 | Northern Parula | 1 | Marsh Wren | 1 |
| Blue Jay | 2 | Cape May Warbler | 111 | Brown Creeper | 31 |
| Red-winged Blackbird | 7 | Yellow Warbler | 75 | White-breasted Nuthatch | 2 |
| Baltimore Oriole | 2 | Black-th.-Blue Warbler | 35 | Red-breasted Nuthatch | 3 |
| Rusty Blackbird | 3 | Myrtle Warbler | 65 | Black-capped Chickadee | 7 |
| Common Grackle | 29 | Audubon's Warbler | 1 | Golden-crowned Kinglet | 143 |
| White-throated Sparrow | 102 | Magnolia Warbler | 95 | Ruby-crowned Kinglet | 77 |
| Field Sparrow | 1 | Chestnut-sided Warbler | 29 | Wood Thrush | 3 |
| Slate-colored Junco | 8 | Bay-breasted Warbler | 20 | Veery | 16 |
| Song Sparrow | 37 | Blackpoll Warbler | 711 | Gray-cheeked Thrush | 195 |
| Lincoln Sparrow | 3 | Blackburnian Warbler | 6 | Swainson's Thrush | 375 |
| Swamp Sparrow | 11 | Black-th.-Green Warbler | 4 | Hermit Thrush | 82 |
| Fox Sparrow | 9 | Western Palm Warbler | 1 | American Robin | 19 |
| Northern Cardinal | 27 | Ovenbird | 64 | | |

Table 14. Number of days observed and totals of species seen on point counts, Navarre fall 2013.

| Species | # days | #Observed | Species | # days | #Observed | Species | # days | #Observed |
|---|---|---|---|---|---|---|---|---|
| Common Loon | 1 | 1 | Chimney Swift | 16 | 50 | Black & White Warbler | 1 | 1 |
| Herring Gull | 13 | 24 | Ruby-th. Hummingbird | 1 | 1 | Nashville Warbler | 1 | 1 |
| Ring-billed Gull | 17 | 96 | Eastern Kingbird | 1 | 2 | Tennessee Warbler | 7 | 14 |
| Bonaparte's Gull | 3 | 9 | Eastern Phoebe | 1 | 1 | Cape May Warbler | 4 | 6 |
| Caspian Tern | 14 | 23 | Eastern Wood Pewee | 2 | 2 | Myrtle Warbler | 12 | 45 |
| Common Tern | 1 | 2 | Yellow-bellied Flycat. | 1 | 2 | Magnolia Warbler | 10 | 17 |
| D-c. Cormorant | 2 | 26 | Blue Jay | 54 | 224 | Chestnut-sided Warbler | 3 | 3 |
| Mallard | 22 | 112 | American Crow | 2 | 2 | Bay-breasted Warbler | 2 | 2 |
| American Black Duck | 2 | 2 | European Starling | 48 | 486 | Blackpoll Warbler | 25 | 170 |
| Gadwall | 3 | 65 | Brown-headed Cowbird | 2 | 2 | Blk.-th-green Warbler | 1 | 1 |
| American Wigeon | 1 | 22 | Red-winged Blackbird | 46 | 2489 | Ovenbird | 13 | 14 |
| Northern Shoveler | 1 | 1 | Baltimore Oriole | 17 | 43 | Common Yellowthroat | 8 | 9 |
| Northern Pintail | 4 | 58 | Rusty Blackbird | 11 | 190 | Wilson Warbler | 3 | 3 |
| Blue-winged Teal | 1 | 1 | Common Grackle | 37 | 253 | American Redstart | 2 | 7 |
| Wood Duck | 6 | 8 | Purple Finch | 5 | 14 | Gray Catbird | 45 | 272 |
| Canada Goose | 47 | 1414 | House Finch | 1 | 5 | Brown Thrasher | 10 | 12 |
| Tundra Swan | 1 | 5 | American Goldfinch | 17 | 52 | Carolina Wren | 40 | 108 |
| Trumpeter Swan | 1 | 2 | White-th. Sparrow | 20 | 367 | House Wren | 4 | 4 |
| Great- blue Heron | 41 | 96 | Slate-colored Junco | 1 | 4 | Winter Wren | 12 | 32 |
| Great Egret | 5 | 7 | Song Sparrow | 13 | 23 | Brown Creeper | 2 | 4 |
| Black-cr. Night-Heron | 5 | 5 | Swamp Sparrow | 2 | 2 | White-br. Nuthatch | 7 | 9 |
| Sora | 5 | 6 | Fox Sparrow | 1 | 2 | Red-br. Nuthatch | 4 | 7 |
| Dunlin | 1 | 15 | Eastern Towhee | 4 | 5 | Black.-cap. Chickadee | 7 | 8 |
| Killdeer | 5 | 6 | Northern Cardinal | 55 | 392 | Golden-cr. Kinglet | 18 | 104 |
| Mourning Dove | 7 | 10 | Rose-br. Grosbeak | 2 | 3 | Ruby-cr. Kinglet | 15 | 53 |
| Red-tailed Hawk | 1 | 1 | Scarlet Tanager | 1 | 1 | Verry | 1 | 1 |
| Bald Eagle | 1 | 1 | Purple Martin | 5 | 14 | Gray-cheeked Thrush | 21 | 53 |
| Yellow-billed Cuckoo | 1 | 1 | Barn Swallow | 7 | 52 | Swainson's Thrush | 29 | 221 |
| Hairy Woodpecker | 5 | 5 | Tree Swallow | 13 | 38 | Hermit Thrush | 4 | 16 |
| Downy Woodpecker | 37 | 80 | Bank Swallow | 10 | 67 | American Robin | 38 | 241 |
| Yellow-bel. Sapsucker | 2 | 3 | Cedar Waxwing | 30 | 186 | Unk. Warbler | 32 | 196 |
| Red-bell. Woodpecker | 7 | 8 | Red-eyed Vireo | 7 | 9 | | | |
| Yellow-sh. Flicker | 10 | 13 | Warbling Vireo | 3 | 3 | | | |

Table 15. Daily banding totals for Navarre Beach, fall 2013.

| Date | Net Hour | Banded | Banded/100 nh | Returns | Recaptures | Total birds* | Totalbird/100nh |
|---|---|---|---|---|---|---|---|
| 818 | 21.65 | 3 | 13.86 | 1 | 0 | 4 | 18.48 |
| 819 | 25.40 | 9 | 35.43 | 0 | 2 | 11 | 43.31 |
| 820 | 25.00 | 6 | 24.00 | 0 | 2 | 8 | 32.00 |
| 821 | 25.00 | 10 | 40.00 | 0 | 0 | 10 | 40.00 |
| 822 | 23.75 | 1 | 4.21 | 1 | 1 | 3 | 12.63 |
| 823 | 21.00 | 2 | 9.52 | 0 | 1 | 3 | 14.29 |
| 824 | 23.75 | 2 | 8.42 | 0 | 2 | 4 | 16.84 |
| 825 | 25.00 | 1 | 4.00 | 0 | 2 | 3 | 12.00 |
| 826 | 24.17 | 2 | 8.28 | 0 | 0 | 2 | 8.28 |
| 827 | 12.50 | 1 | 8.00 | 0 | 0 | 1 | 8.00 |
| 828 | 23.50 | 5 | 21.28 | 0 | 0 | 5 | 21.28 |
| 829 | 24.17 | 4 | 16.55 | 0 | 0 | 4 | 16.55 |
| 830 | 30.00 | 7 | 23.33 | 0 | 0 | 7 | 23.33 |
| 831 | 24.17 | 2 | 8.28 | 1 | 0 | 3 | 12.41 |
| 901 | 24.58 | 1 | 4.07 | 1 | 0 | 2 | 8.14 |
| 902 | 25.80 | 1 | 3.88 | 0 | 1 | 2 | 7.75 |
| 903 | 25.75 | 3 | 11.65 | 0 | 1 | 4 | 15.53 |
| 904 | 25.75 | 9 | 34.95 | 0 | 3 | 12 | 46.60 |
| 905 | 20.64 | 1 | 4.85 | 1 | 0 | 2 | 9.69 |
| 906 | 26.25 | 3 | 11.43 | 1 | 0 | 4 | 15.24 |
| 907 | 26.25 | 3 | 11.43 | 0 | 3 | 6 | 22.86 |
| 908 | 19.33 | 0 | 0.00 | 0 | 0 | 0 | 0.00 |
| 909 | 28.75 | 4 | 13.91 | 1 | 2 | 7 | 24.35 |
| 910 | 25.80 | 12 | 46.51 | 0 | 5 | 17 | 65.89 |
| 911 | 30.00 | 10 | 33.33 | 0 | 5 | 15 | 50.00 |
| 912 | 27.50 | 45 | 163.64 | 0 | 4 | 49 | 178.18 |
| 913 | 32.50 | 6 | 18.46 | 0 | 0 | 6 | 18.46 |
| 914 | 27.92 | 11 | 39.40 | 0 | 0 | 11 | 39.40 |
| 915 | 31.25 | 42 | 134.40 | 0 | 4 | 46 | 147.20 |
| 916 | 29.15 | 5 | 17.15 | 1 | 3 | 10 | 34.31 |
| 917 | 30.80 | 6 | 19.48 | 1 | 0 | 7 | 22.73 |
| 918 | 30.42 | 9 | 29.59 | 0 | 1 | 10 | 32.87 |
| 919 | 29.15 | 3 | 10.30 | 0 | 2 | 5 | 17.15 |
| 920 | 28.75 | 3 | 10.44 | 0 | 0 | 3 | 10.44 |
| 921 | 33.75 | 28 | 82.96 | 1 | 2 | 31 | 91.85 |
| 922 | 34.15 | 16 | 46.85 | 0 | 3 | 19 | 55.64 |
| 923 | 29.58 | 4 | 13.52 | 0 | 3 | 25 | 84.52 |
| 924 | 30.00 | 3 | 10.00 | 0 | 5 | 8 | 26.67 |
| 925 | 31.25 | 2 | 6.40 | 1 | 1 | 4 | 12.80 |
| 926 | 27.92 | 1 | 3.58 | 0 | 1 | 2 | 7.16 |
| 927 | 29.15 | 3 | 10.29 | 0 | 0 | 3 | 10.29 |
| 928 | 29.55 | 5 | 16.92 | 0 | 2 | 7 | 23.69 |
| 929 | 27.92 | 20 | 71.63 | 0 | 0 | 20 | 71.63 |
| 930 | 33.35 | 72 | 215.89 | 1 | 1 | 74 | 221.89 |
| 1001 | CLOSED | | | | | | |
| 1002 | | | | | | | |
| 1003 | | | | | | | |
| 1017 | 28.35 | 13 | 45.86 | 0 | 4 | 17 | 59.97 |
| 1018 | 29.15 | 11 | 37.74 | 0 | 4 | 15 | 51.46 |
| 1019 | 11.65 | 6 | 51.50 | 0 | 2 | 8 | 68.67 |
| 1020 | 25.00 | 11 | 44.00 | 2 | 0 | 13 | 52.00 |
| 1021 | 25.00 | 13 | 52.00 | 0 | 0 | 13 | 52.00 |
| 1022 | 26.25 | 9 | 34.29 | 0 | 3 | 12 | 45.71 |
| 1023 | 28.75 | 28 | 97.39 | 0 | 1 | 29 | 100.87 |
| 1024 | 19.15 | 4 | 20.89 | 0 | 4 | 8 | 41.78 |
| 1025 | 21.65 | 8 | 36.95 | 0 | 1 | 9 | 41.57 |
| 1026 | 17.50 | 8 | 45.71 | 0 | 4 | 12 | 68.57 |
| 1027 | 24.55 | 6 | 24.44 | 0 | 0 | 6 | 24.44 |
| TOTAL | 1439.02 | 503 | 34.95 | 14 | 85 | 621 | 43.15 |

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

Table 16. Fall banding totals, Navarre Beach 2013.

| Species | Banded | Species | Banded | Species | Banded |
|---|---|---|---|---|---|
| Downy Woodpecker | 6 | Black and White Warbler | 2 | Yellow-breasted Chat | 1 |
| Yellow-bellied Sapsucker | 1 | Nashville Warbler | 4 | Wilson's Warbler | 7 |
| Ruby-th. Hummingbird | 4 | Orange-crowned Warbler | 2 | American Redstart | 6 |
| Eastern Wood Pewee | 5 | Tennessee Warbler | 28 | Gray Catbird | 44 |
| Yellow-bellied Flycatcher | 1 | Cape May Warbler | 15 | Brown Thrasher | 1 |
| Least Flycatcher | 1 | Black-th. Blue Warbler | 4 | Carolina Wren | 9 |
| Red-winged Blackbird | 3 | Myrtle Warbler | 1 | House Wren | 7 |
| White-throated Sparrow | 14 | Magnolia Warbler | 7 | Winter Wren | 9 |
| Song Sparrow | 7 | Chestnut-sided Warbler | 3 | Brown Creeper | 11 |
| Lincoln Sparrow | 1 | Bay-breasted Warbler | 6 | Golden-crowned Kinglet | 43 |
| Swamp Sparrow | 2 | Blackpoll Warbler | 126 | Ruby-crowned Kinglet | 25 |
| Fox Sparrow | 1 | Black-th.-Green Warbler | 3 | Veery | 1 |
| Northern Cardinal | 2 | Ovenbird | 5 | Gray-cheeked Thrush | 13 |
| Red-eyed Vireo | 6 | Northern Waterthrush | 7 | Swainson's Thrush | 32 |
| Warbling Vireo | 2 | Mourning Warbler | 1 | Hermit Thrush | 10 |
| White-eyed Vireo | 1 | Common Yellowthroat | 14 | | |

Table 17 . Daily banding totals for Creek Bend County Park, fall 2013.

| Date | Net Hour | Banded | Banded/ 100 net hr | Returns | Recaptures | Total birds | Total bird/ 100 net hr |
|---|---|---|---|---|---|---|---|
| 903 | 62.50 | 69 | 110.40 | 4 | 1 | 74 | 118.40 |
| 905 | 37.50 | 30 | 80.00 | 4 | 3 | 37 | 98.68 |
| 907 | 50.00 | 46 | 92.00 | 4 | 6 | 56 | 112.00 |
| 910 | 50.00 | 43 | 86.00 | 3 | 3 | 49 | 98.00 |
| 913 | 50.00 | 66 | 132.00 | 0 | 5 | 71 | 142.00 |
| 914 | 62.50 | 81 | 129.60 | 0 | 2 | 83 | 132.80 |
| 917 | 50.00 | 49 | 98.00 | 1 | 8 | 58 | 116.00 |
| 920 | 31.25 | 17 | 54.40 | 0 | 4 | 21 | 67.20 |
| 922 | 62.50 | 102 | 163.20 | 3 | 9 | 114 | 182.40 |
| 923 | 38.00 | 52 | 136.84 | 3 | 0 | 55 | 144.74 |
| 924 | 38.00 | 65 | 171.05 | 1 | 3 | 69 | 181.58 |
| 927 | 62.50 | 88 | 140.80 | 1 | 5 | 94 | 150.40 |
| 928 | 50.00 | 67 | 134.00 | 3 | 0 | 70 | 140.00 |
| 930 | 62.50 | 127 | 203.20 | 4 | 0 | 131 | 209.60 |
| 1001 | 38.00 | 69 | 181.58 | 1 | 0 | 70 | 184.21 |
| 1003 | 54.00 | 118 | 218.52 | 1 | 0 | 119 | 220.37 |
| 1008 | 47.50 | 176 | 370.53 | 0 | 0 | 176 | 370.53 |
| 1009 | 47.50 | 96 | 202.11 | 0 | 0 | 96 | 202.11 |
| 1010 | 46.00 | 90 | 195.65 | 3 | 1 | 94 | 204.35 |
| 1011 | 50.00 | 85 | 170.00 | 3 | 0 | 88 | 176.00 |
| 1013 | 75.00 | 197 | 262.67 | 2 | 0 | 199 | 265.33 |
| 1016 | 62.50 | 167 | 267.20 | 3 | 26 | 196 | 313.60 |
| 1017 | 50.00 | 88 | 176.00 | 5 | 13 | 106 | 212.00 |
| 1018 | 50.00 | 96 | 192.00 | 4 | 31 | 131 | 262.00 |
| 1020 | 106.25 | 120 | 112.94 | 0 | 50 | 170 | 160.00 |
| 1022 | 62.50 | 101 | 161.60 | 2 | 61 | 164 | 262.40 |
| 1023 | 38.25 | 120 | 313.73 | 2 | 38 | 160 | 418.30 |
| 1025 | 30.00 | 79 | 263.33 | 0 | 33 | 112 | 373.33 |
| 1027 | 38.00 | 28 | 73.68 | 0 | 12 | 40 | 105.26 |
| 1028 | 38.00 | 117 | 307.90 | 0 | 21 | 138 | 363.16 |
| 1029 | 56.25 | 179 | 318.22 | 0 | 27 | 206 | 366.22 |
| 1030 | 62.50 | 210 | 336.00 | 0 | 25 | 235 | 376.00 |
| 1104 | 68.75 | 109 | 158.55 | 0 | 13 | 122 | 177.46 |
| 1105 | 19.00 | 127 | 688.42 | 0 | 21 | 148 | 778.95 |
| TOTAL | 1747.25 | 3274 | 187.38 | 57 | 421 | 3752 | 214.74 |

Table 18.Fall banding totals for Creek Bend County Park, fall 2013.

| Species | Banded | Species | Banded | Species | Banded |
|---|---|---|---|---|---|
| American Woodcock | 1 | Northern Cardinal | 7 | Western Palm Warbler | 17 |
| Downy Woodpecker | 1 | Rose-breasted Grosbeak | 1 | Ovenbird | 6 |
| Red-bellied Woodpecker | 1 | Indigo Bunting | 288 | Northern Waterthrush | 1 |
| Eastern Phoebe | 1 | Scarlet Tanager | 1 | Mourning Warbler | 4 |
| Eastern Wood Pewee | 2 | Cedar Waxwing | 1 | Common Yellowthroat | 77 |
| Yellow-bellied Flycatcher | 9 | Northern Shrike | 1 | Yellow-breasted Chat | 2 |
| Traill's Flycatcher | 1 | Red-eyed Vireo | 13 | Wilson's Warbler | 11 |
| Least Flycatcher | 1 | Philadelphia Vireo | 2 | Canada Warbler | 1 |
| Blue Jay | 1 | Warbling Vireo | 3 | American Redstart | 10 |
| Red-winged Blackbird | 9 | Blue-headed Vireo | 1 | Gray Catbird | 34 |
| House Finch | 11 | Black and White Warbler | 3 | Brown Thrasher | 1 |
| American Goldfinch | 1494 | Blue-winged Warbler | 1 | Carolina Wren | 2 |
| Savannah Sparrow | 3 | Nashville Warbler | 60 | House Wren | 12 |
| White-crowned Sparrow | 14 | Orange-crowned Warbler | 2 | Winter Wren | 9 |
| White-throated Sparrow | 144 | Tennessee Warbler | 38 | Marsh Wren | 1 |
| American Tree Sparrow | 56 | Cape May Warbler | 4 | Brown Creeper | 3 |
| Chipping Sparrow | 36 | Black-th. Blue Warbler | 3 | Tufted Titmouse | 2 |
| Field Sparrow | 70 | Myrtle Warbler | 117 | Black-capped Chickadee | 2 |
| Slate-colored Junco | 62 | Magnolia Warbler | 43 | Golden-crowned Kinglet | 50 |
| Song Sparrow | 244 | Chestnut-sided Warbler | 2 | Ruby-crowned Kinglet | 66 |
| Lincoln's Sparrow | 55 | Bay-breasted Warbler | 4 | Gray-cheeked Thrush | 1 |
| Swamp Sparrow | 99 | Blackpoll Warbler | 17 | Swainson's Thrush | 18 |
| Fox Sparrow | 6 | Black-th. Green Warbler | 1 | Hermit Thrush | 8 |
| Eastern Towhee | 2 | | | | |

Table 19. Daily banding totals for Petersburg, fall 2013.

| Date | Net hour | Banded | Banded/ 100 net hr | Returns | Recaptures | Total birds | Total bird/ 100 net hr |
|---|---|---|---|---|---|---|---|
| 826 | 100.00 | 32 | 32.00 | 2 | 1 | 35 | 35.00 |
| 830 | 130.00 | 14 | 10.77 | 1 | 1 | 16 | 12.31 |
| 905 | 170.00 | 13 | 7.65 | 0 | 1 | 14 | 8.24 |
| 906 | 103.40 | 11 | 10.64 | 0 | 1 | 12 | 11.61 |
| 918 | 145.00 | 9 | 6.21 | 0 | 2 | 11 | 7.59 |
| 922 | 170.00 | 13 | 7.65 | 0 | 4 | 17 | 10.00 |
| 923 | 131.60 | 16 | 12.16 | 0 | 1 | 17 | 12.92 |
| 924 | 170.00 | 16 | 9.41 | 0 | 5 | 21 | 12.35 |
| 926 | 85.00 | 10 | 11.76 | 0 | 2 | 12 | 14.12 |
| 927 | 125.00 | 3 | 2.40 | 0 | 2 | 5 | 4.00 |
| 928 | 126.60 | 8 | 6.32 | 0 | 2 | 10 | 7.90 |
| 930 | 125.00 | 10 | 8.00 | 0 | 2 | 12 | 9.60 |
| 1001 | 130.00 | 8 | 6.15 | 0 | 0 | 8 | 6.15 |
| 1002 | 161.60 | 17 | 10.52 | 0 | 3 | 20 | 12.38 |
| 1008 | 158.40 | 20 | 12.63 | 0 | 3 | 23 | 14.52 |
| 1009 | 161.60 | 10 | 6.19 | 0 | 2 | 12 | 7.43 |
| 1010 | 133.40 | 16 | 11.99 | 0 | 2 | 18 | 13.49 |
| 1011 | 146.60 | 20 | 13.64 | 0 | 3 | 23 | 15.69 |
| 1028 | 98.40 | 12 | 12.20 | 0 | 4 | 16 | 16.26 |
| Total | 2571.60 | 258 | 10.03 | 3 | 41 | 302 | 11.74 |

Table 20. Daily banding totals Petersburg, fall 2013.

| Species | Banded | Species | Banded | Species | Banded |
|---|---|---|---|---|---|
| Sharp-shinned Hawk | 1 | Orange-crowned Warbler | 2 | Gray Catbird | 8 |
| Hairy Woodpecker | 1 | Tennessee Warbler | 7 | Carolina Wren | 1 |
| Downy Woodpecker | 1 | Cape May Warbler | 2 | House Wren | 1 |
| Yellow-bellied Flycatcher | 1 | Black-thr. Blue Warbler | 10 | Winter Wren | 6 |
| Traill's Flycatcher | 1 | Magnolia Warbler | 16 | White-breasted Nuthatch | 1 |
| Blue Jay | 3 | Chestnut-sided Warbler | 6 | Black-capped Chickadee | 7 |
| White-throated Sparrow | 12 | Bay-breasted Warbler | 2 | Golden-crowned Kinglet | 15 |
| Lincoln's Sparrow | 1 | Blackpoll Warbler | 5 | Ruby-crowned Kinglet | 21 |
| Northern Cardinal | 8 | Black-th. Green Warbler | 2 | Wood Thrush | 2 |
| Philadelphia Vireo | 2 | Ovenbird | 18 | Gray-cheeked Thrush | 7 |
| Yellow-throated Vireo | 1 | Mourning Warbler | 2 | Swainson's Thrush | 19 |
| Blue-headed Vireo | 2 | Common Yellowthroat | 2 | Hermit Thrush | 16 |
| Black and White Warbler | 8 | Canada Warbler | 1 | American Robin | 9 |
| Nashville Warbler | 9 | American Redstart | 10 | | |

Table 21. Point count days conducted and species totals, fall season, Petersburg, 2013.

| Species | # days | # birds | Species | # days | # birds | Species | # days | # birds |
|---|---|---|---|---|---|---|---|---|
| Sharp-shinned Hawk | 1 | 1 | Red-winged Blackbird | 1 | 1 | Gray Catbird | 9 | 16 |
| Wild Turkey | 1 | 1 | American Goldfinch | 11 | 21 | Red-br. Nuthatch | 1 | 1 |
| Downy Woodpecker | 2 | 2 | White-throated Sparrow | 1 | 1 | Tufted Titmouse | 3 | 3 |
| Yellow-shafted Flicker | 1 | 1 | Northern Cardinal | 10 | 20 | Black-capped Chickadee | 7 | 11 |
| Blue Jay | 17 | 48 | Barn Swallow | 1 | 2 | Golden-crowned Kinglet | 2 | 6 |
| American Crow | 14 | 39 | Cedar Waxwing | 1 | 7 | Ruby-crowned Kinglet | 1 | 1 |
| European Starling | 2 | 5 | Black-th. Green Warbler | 1 | 1 | American Robin | 17 | 72 |

Table 22. Daily banding totals for Shaker Lakes, fall 2013.

| Date | Net hour | Banded | Banded/ 100 net hr | Returns | Recaptures | Total birds | Total bird/ 100 net hr |
|---|---|---|---|---|---|---|---|
| 821 | 32.50 | 12 | 36.92 | 1 | 0 | 13 | 40.00 |
| 823 | 32.00 | 12 | 37.50 | 0 | 0 | 12 | 37.50 |
| 826 | 35.50 | 1 | 2.82 | 2 | 3 | 6 | 16.90 |
| 828 | 32.00 | 7 | 21.88 | 0 | 2 | 9 | 28.13 |
| 830 | 32.00 | 9 | 28.13 | 0 | 1 | 10 | 31.25 |
| 902 | 32.00 | 17 | 53.13 | 0 | 2 | 19 | 59.38 |
| 904 | 31.00 | 6 | 19.36 | 1 | 2 | 9 | 29.03 |
| 906 | 29.00 | 17 | 58.62 | 2 | 3 | 22 | 75.86 |
| 909 | 32.50 | 16 | 49.23 | 0 | 3 | 19 | 58.46 |
| 911 | 31.50 | 35 | 111.11 | 0 | 2 | 37 | 117.46 |
| 913 | 29.50 | 26 | 88.14 | 2 | 3 | 31 | 105.09 |
| 916 | 28.00 | 25 | 89.29 | 1 | 1 | 27 | 96.43 |
| 918 | 28.50 | 14 | 49.12 | 0 | 5 | 19 | 66.67 |
| 920 | 29.50 | 8 | 27.12 | 1 | 5 | 14 | 47.46 |
| 923 | 33.50 | 38 | 113.43 | 0 | 2 | 40 | 119.40 |
| 925 | 30.50 | 10 | 32.79 | 0 | 1 | 11 | 36.07 |
| 927 | 29.50 | 10 | 33.90 | 0 | 2 | 12 | 40.68 |
| 930 | 30.50 | 10 | 32.79 | 0 | 2 | 12 | 39.34 |
| 1002 | 27.00 | 39 | 144.44 | 2 | 2 | 43 | 159.26 |
| 1007 | 24.00 | 72 | 300.00 | 0 | 4 | 76 | 316.67 |
| 1009 | 32.00 | 51 | 159.38 | 0 | 2 | 53 | 165.63 |
| 1011 | 27.00 | 50 | 185.19 | 0 | 5 | 55 | 203.70 |
| 1014 | 45.00 | 110 | 244.44 | 0 | 7 | 117 | 260.00 |
| 1018 | 32.50 | 30 | 92.31 | 0 | 10 | 40 | 123.08 |
| 1021 | 30.00 | 24 | 80.00 | 0 | 9 | 33 | 110.00 |
| 1030 | 31.00 | 45 | 145.16 | 0 | 5 | 50 | 161.29 |
| 1104 | 32.00 | 82 | 256.25 | 1 | 5 | 88 | 275.00 |
| Total | 1159.51 | 776 | 66.92 | 13 | 88 | 877 | 75.64 |

Table 23. Daily banding totals Shaker Lakes, fall 2013.

| Species | Banded | Species | Banded | Species | Banded |
|---|---|---|---|---|---|
| Mourning Dove | 1 | Fox Sparrow | 1 | Common Yellowthroat | 4 |
| Belted Kingfisher | 1 | Northern Cardinal | 8 | Wilson's Warbler | 14 |
| Hairy Woodpecker | 2 | Rose-breasted Grosbeak | 2 | Canada Warbler | 3 |
| Downy Woodpecker | 11 | Red-eyed Vireo | 1 | American Redstart | 24 |
| Red-bellied Woodpecker | 2 | Blue-headed Vireo | 1 | Gray Catbird | 27 |
| Yellow-shafted Flicker | 1 | Black and White Warbler | 6 | Carolina Wren | 1 |
| Eastern Phoebe | 9 | Nashville Warbler | 32 | House Wren | 8 |
| Yellow-bellied Flycatcher | 4 | Orange-crowned Warbler | 4 | Winter Wren | 9 |
| Traill's Flycatcher | 1 | Tennessee Warbler | 27 | Brown Creeper | 2 |
| Least Flycatcher | 1 | Cape May Warbler | 1 | White-breasted Nuthatch | 4 |
| Blue Jay | 5 | Black-thr. Blue Warbler | 5 | Tufted Titmouse | 9 |
| Common Grackle | 7 | Myrtle Warbler | 145 | Black-capped Chickadee | 4 |
| House Finch | 13 | Magnolia Warbler | 43 | Golden-crowned Kinglet | 32 |
| American Goldfinch | 103 | Chestnut-sided Warbler | 2 | Ruby-crowned Kinglet | 31 |
| American Tree Sparrow | 2 | Bay-breasted Warbler | 1 | Wood Thrush | 3 |
| Chipping Sparrow | 1 | Blackburnian Warbler | 1 | Verry | 1 |
| White-crowned Sparrow | 3 | Black-th. Green Warbler | 2 | Gray-cheeked Thrush | 15 |
| White-throated Sparrow | 50 | Ovenbird | 2 | Swainson's Thrush | 42 |
| Slate-colored Junco | 13 | Northern Waterthrush | 8 | Hermit Thrush | 14 |
| Song Sparrow | 10 | Connecticut Warbler | 1 | American Robin | 3 |
| Swamp Sparrow | 2 | Mourning Warbler | 1 | | |

Table 24. Point count days conducted and species totals, fall season, Shaker Lakes, 2013.

| Species | # days | # birds | Species | # days | # birds | Species | # days | # birds |
|---|---|---|---|---|---|---|---|---|
| Herring Gull | 1 | 1 | Eastern Phoebe | 3 | 3 | Tennessee Warbler | 1 | 1 |
| Double-cr. Cormorant | 1 | 1 | Olive-sided Flycatcher | 1 | 1 | Myrtle Warbler | 6 | 80 |
| Mallard | 13 | 54 | Blue Jay | 8 | 15 | American Redstart | 1 | 1 |
| Wood Duck | 3 | 19 | Common Grackle | 3 | 7 | Gray Catbird | 17 | 32 |
| Canada Goose | 7 | 91 | American Goldfinch | 23 | 156 | White-br. Nuthatch | 10 | 14 |
| Great Blue Heron | 5 | 5 | White-crowned Sparrow | 1 | 2 | Tufted Titmouse | 1 | 1 |
| Mourning Dove | 9 | 20 | White-throated Sparrow | 6 | 17 | Black-capped Chickadee | 6 | 7 |
| Rock Pigeon | 8 | 35 | American Tree Sparrow | 1 | 2 | Golden-crowned Kinglet | 2 | 5 |
| Cooper's Hawk | 3 | 3 | Slate-colored Junco | 3 | 7 | Ruby-crowned Kinglet | 2 | 2 |
| Red-shouldered Hawk | 1 | 2 | Song Sparrow | 15 | 30 | Wood Thrush | 1 | 1 |
| Osprey | 1 | 1 | Swamp Sparrow | 1 | 1 | Swainson's Thrush | 3 | 4 |
| Belted Kingfisher | 8 | 9 | Northern Cardinal | 9 | 15 | American Robin | 10 | 33 |
| Hairy Woodpecker | 1 | 1 | Rose-breasted Grosbeak | 1 | 2 | Unk. Woodpecker | 1 | 3 |
| Downy Woodpecker | 10 | 13 | Barn Swallow | 1 | 1 | Unk. Warbler | 2 | 5 |
| Red-bellied Woodpecker | 16 | 18 | Cedar Waxwing | 2 | 55 | Unk. Kinglet | 2 | 3 |
| Yellow-shafted Flicker | 3 | 3 | Red-eyed Vireo | 1 | 1 | Unk. Thrush | 2 | 2 |
| Chimney Swift | 15 | 268 | Warbling Vireo | 2 | 2 | Unk. Blackbird | 4 | 252 |
| Ruby-th. Hummingbird | 4 | 7 | Nashville Warbler | 1 | 1 | | | |

Table 25. Total bandings Black Swamp Bird Observatory, passerine migration , 2013.

| Species | Banded | Species | Banded | Species | Banded |
|---|---|---|---|---|---|
| American Woodcock | 1 (2) | Field Sparrow | 6 (87) | Blackburnian Warbler | 48 (49) |
| Mourning Dove | 1 (2) | Slate-colored Junco | 11 (99) | Blk.-th. Grn. Warbler | 94 (99) |
| Sharp-shinned Hawk | 8 | Song Sparrow | 78 (344) | Pine Warbler | 7 |
| Cooper's Hawk | 1 | Lincoln Sparrow | 101 (157) | West. Palm Warbler | 234 (257) |
| American Kestel | 1 | Swamp Sparrow | 103 (211) | Yellow Palm Warbler | 1 |
| Yellow-billed Cuckoo | 5 | Fox Sparrow | 23 (30) | Prairie Warbler | 1 |
| Black-billed Cuckoo | 5 | Eastern Towhee | 10 (15) | Ovenbird | 222 (231) |
| Belted Kingfisher | 0 (1) | Northern Cardinal | 101 (133) | Northern Waterthrush | 137 (154) |
| Hairy Woodpecker | 2 | Rose-breasted Grosbeak | 11 (14) | Louisiana Waterthr. | 1 (2) |
| Downy Woodpecker | 30 (43) | Indigo Bunting | 72 (365) | Kentucky Warbler | 1 |
| Yellow-bell. Sapsucker | 6 | Scarlet Tanager | 7 (8) | Connecticut Warbler | 15 (16) |
| Red-bellied Woodpecker | 5 (8) | Summer Tanager | 1 | Mourning Warbler | 117 (127) |
| Yellow-shafted Flicker | 11 (12) | Tree Swallow | 17 (22) | **(9)**C. Yellowthroat | 457 (550) |
| Ruby-th. Hummingbird | 68 | Cedar Waxwing | 11 (20) | Yellow-breasted Chat | 3 (5) |
| Eastern Kingbird | 4 (5) | Northern Shrike | 0 (1) | Hooded Warbler | 14 |
| Great-crested Flycatcher | 35 | Red-eyed Vireo | 183 (199) | Wilson's Warbler | 242 (277) |
| Eastern Phoebe | 10 (29) | Philadelphia Vireo | 22 (24) | Canada Warbler | 142 (155) |
| Olive-sided Flycatcher | 1 | Warbling Vireo | 50 (55) | American Redstart | 363 (412) |
| Eastern Wood-Pewee | 60 (62) | Yellow-throated Vireo | 2 | **(6)**Gray Catbird | 786 (889) |
| Western Wood Pewee | 1 | Blue-headed Vireo | 54 (56) | Brown Thrasher | 17 (19) |
| Yellow-bell. Flycatcher | 164 (182) | White-eyed Vireo | 12 | Carolina Wren | 24 (29) |
| Acadian Flycatcher | 27 | Black and White Warbler | 161 (172) | House Wren | 138 (176) |
| **(8)** Traill's Flycatcher | 597 (609) | Prothonotary Warbler | 18 | Winter Wren | 51 (69) |
| Least Flycatcher | 71 (76) | Blue-winged Warbler | 25 (28) | Marsh Wren | 3 (4) |
| Blue Jay | 36 (42) | Brewster's Warbler | 1 | Brown Creeper | 72 (77) |
| Brown-headed Cowbird | 0 (4) | Golden-winged Warbler | 6 | White-br Nuthatch | 2 (7) |
| Red-winged Blackbird | 149 (159) | Nashville Warbler | 299 (397) | Red-br. Nuthatch | 19 |
| Orchard Oriole | 2 | Orange-crowned Warbler | 21 (27) | Tufted Titmouse | 0 (14) |
| Baltimore Oriole | 38 (42) | Tennessee Warbler | 359 (425) | Black-cap. Chickadee | 10 (24) |
| Rusty Blackbird | 3 (4) | Northern Parula | 34 | Golden-cr. Kinglet | 243 (326) |
| Common Grackle | 51 (63) | Cape May Warbler | 161 (165) | Ruby-cr Kinglet | 318 (428) |
| House Finch | 1 (25) | **(10)** Yellow Warbler | 503 (507) | Blue-gray Gnatcatch. | 77 (80) |
| **(1)** American Goldfinch | 13 (1619) | Black-th. Blue Warbler | 92 (103) | Wood Thrush | 33 (39) |
| Henslow's Sparrow | 1 | **(2)**Myrtle Warbler | 910 (1182) | Veery | 107 (111) |
| Savannah Sparrow | 0 (3) | Audubon's Warbler | 1 | Gray-cheek Thrush | 231 (248) |
| White-cr. Sparrow | 66 (83) | **(3)**Magnolia Warbler | 827 (932) | **(7)**Swainson Thrush | 630 (696) |
| Gambel's W-c Sparrow | 3 | Cerulean Warbler | 1 | Hermit Thrush | 263 (290) |
| **(4)**White-th. Sparrow | 703 (919) | Chestnut-sided Warbler | 196 (200) | American Robin | 49 (76) |
| Am. Tree Sparrow | 0 (58) | Bay-breasted Warbler | 58 (63) | | |
| Chipping Sparrow | 0 (43) | **(5)**Blackpoll Warbler | 897 (916) | | |

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

Table 26. Banding effort totals by area and by season, 2013.

| Area | Sample Days | Net Hours | Birds Banded | Birds/ 100 Net Hr | Total Captured | Total/ 100 Net Hr |
|---|---|---|---|---|---|---|
| Navarre | 108 | 15,949.5 | 12,798 | 80.2 | 15,161 | 95.1 |
| Petersburg | 21 | 2,862.6 | 312 | 10.9 | 365 | 12.8 |
| Shaker Lakes | 45 | 1,782.0 | 1,018 | 57.1 | 1,201 | 67.4 |
| Creek Bend | 41 | 2,124.8 | 3,393 | 159.7 | 3,938 | 185.3 |
| **Season** | **Sample Days** | **Net Hours** | **Birds Banded** | **Birds/ 100 Net Hr** | **Total Captured** | **Total/ 100 Net Hr** |
| All Stations | | | | | | |
| Spring | 50 | 8,643.6 | 9,334 | 108.0 | 10,999 | 127.3 |
| Fall | 75 | 14,075.3 | 8,187 | 58.2 | 8,866 | 63.0 |
| TOTAL | 125 | 22,718.9 | 17,521 | 77.1 | 19,865 | 87.4 |
| ONWR Stations | | | | | | |
| Spring | 48 | 7,352.6 | 8,919 | 121.3 | 10,426 | 141.8 |
| Fall | 60 | 8,596.9 | 3,879 | 45.1 | 4,735 | 55.1 |
| TOTAL | 108 | 15,949.5 | 12,798 | 80.2 | 15,161 | 95.1 |

Table 27. Fall age ratios of selected species, Navarre 2013.

| Species | 2013 | | 2012 | | Percent Change | 91-12Ave. HY/AHY | 2013 %Change from avg. |
|---|---|---|---|---|---|---|---|
| | Sample | HY/AHY | Sample | HY/AHY | | | |
| Baltimore Oriole | 2 | - | 5 | 1.50 | - | 5.38 | - |
| **Wh-th Sparrow*** | **116** | **2.63** | **322** | **1.22** | **+116** | **3.76** | **-30** |
| Song Sparrow | 44 | 0.76 | 57 | 0.97 | -22 | 2.21 | -66 |
| Cedar Waxwing | 0 | - | 3 | - | - | 1.86 | - |
| **Red-eyed Vireo** | **52** | **2.71** | **68** | **5.80** | **-53** | **6.69** | **-59** |
| Warbling Vireo | 10 | 1.00 | 4 | 3.00 | -67 | 10.34 | -90 |
| Bl. and Wh. Warbler | 34 | 1.43 | 30 | 0.76 | +88 | 1.92 | -26 |
| Nashville Warbler | 33 | 1.36 | 34 | 2.09 | -35 | 2.68 | -49 |
| **Tennessee Warbler** | **232** | **5.11** | **140** | **4.19** | **+22** | **6.67** | **-33** |
| Cape May Warbler | 126 | 1.25 | 38 | 0.73 | +71 | 1.16 | +8 |
| Bl-thr. Blue Warb. | 39 | 4.57 | 56 | 2.11 | +117 | 3.51 | +30 |
| **Myrtle Warbler** | **66** | **1.54** | **1,658** | **2.38** | **-35** | **2.14** | **-28** |
| **Magnolia Warbler** | **102** | **1.17** | **153** | **3.25** | **-64** | **3.46** | **-66** |
| **Blackpoll Warbler** | **837** | **1.97** | **1,169** | **1.47** | **+34** | **2.09** | **-6** |
| **Ovenbird** | **69** | **6.67** | **93** | **4.47** | **+49** | **6.91** | **-3** |
| No. Waterthrush | 59 | 8.83 | 33 | 2.00 | +342 | 4.06 | +117 |
| **Com. Yellowthroat** | **82** | **15.40** | **107** | **7.23** | **+113** | **6.94** | **+122** |
| **American Redstart** | **70** | **2.18** | **69** | **1.65** | **+32** | **2.45** | **-11** |
| **Gray Catbird** | **274** | **6.41** | **325** | **9.16** | **-30** | **8.61** | **-26** |
| House Wren | 32 | 1.67 | 24 | 3.00 | -44 | 6.17 | -73 |
| **Gray-cheek Thrush** | **208** | **1.63** | **234** | **1.82** | **-10** | **2.00** | **-18** |
| **Swainson's Thrush** | **407** | **1.58** | **564** | **1.40** | **+13** | **1.51** | **+5** |
| **Hermit Thrush** | **92** | **4.75** | **265** | **2.19** | **+117** | **5.27** | **-10** |
| American Robin | 19 | 2.80 | 44 | 2.38 | +18 | 3.27 | -14 |

*Species in bold have samples sizes for both 2012 and 2013 over 50.

Table 28. Banding year of returning birds captured at Navarre study site, 2013.

| Species | 2012 | 2011 | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 | 2004 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Hairy Woodpecker | 1 | | | | | | | | | 1 |
| Downy Woodpecker | 1 | 2 | | | | | | | | 3 |
| Red-bellied Woodpecker | 1 | | | | | | | | | 1 |
| Eastern Kingbird | | 1 | | | | | | | | 1 |
| Blue Jay | | 1 | 1 | 1 | | | | | | 3 |
| Red-winged Blackbird | 15 | 4 | 3 | 5 | 1 | 1 | 1 | | | 30 |
| Baltimore Oriole | 6 | 5 | | 3 | 1 | | | | | 15 |
| Common Grackle | 4 | | 1 | | | | | | | 5 |
| Song Sparrow | 2 | 1 | | 1 | | | | | | 4 |
| Swamp Sparrow | 1 | | | | | | | | | 1 |
| Northern Cardinal | 8 | 14 | 5 | | 2 | 1 | | | | 30 |
| Indigo Bunting | 1 | | | | | | | | | 1 |
| Red-eyed Vireo | 1 | | | | | | | | | 1 |
| Warbling Vireo | 3 | 2 | | | | | | | | 5 |
| Prothonotary Warbler | | 2 | | | | | | | | 2 |
| Yellow Warbler | 36 | 17 | 10 | 5 | 9 | 1 | 2 | | | 80 |
| Com. Yellowthroat | 6 | 3 | 3 | 3 | 2 | 1 | 1 | | | 19 |
| Gray Catbird | 46 | 24 | 9 | 3 | 6 | 3 | | 1 | 1 | 93 |
| Brown Thrasher | | | 1 | | | | | | | 1 |
| Carolina Wren | 2 | 5 | | | | | | | | 7 |
| House Wren | 2 | | | | | | | | | 2 |
| Black-cap. Chickadee | 2 | 2 | | 1 | | | | | | 5 |
| American Robin | 7 | 11 | 6 | | 2 | 1 | | | | 27 |
| Total | 145 | 94 | 39 | 22 | 23 | 8 | 4 | 1 | 1 | 337 |

Table 29. Banding year of returning birds captured at Shaker Lakes study site, 2013.

| Species | 2012 | 2011 | 2010 | 2009 | 2008 | Total |
|---|---|---|---|---|---|---|
| Downy Woodpecker | 2 | | | 2 | | 4 |
| Blue Jay | | 1 | | | | 1 |
| American Goldfinch | | 1 | | | | 1 |
| Song Sparrow | 6 | 2 | 3 | 1 | | 12 |
| Northern Cardinal | 1 | 1 | | 1 | | 3 |
| Red-eyed Vireo | 1 | | | 1 | | 2 |
| Gray Catbird | 5 | 2 | 2 | 1 | | 10 |
| White-breasted Nuthatch | 1 | | | | | 1 |
| Tufted Titmouse | 4 | 1 | | | | 5 |
| Black-capped Chickadee | | 1 | | | | 1 |
| American Robin | 3 | | | | | 3 |
| Total | 23 | 9 | 5 | 6 | | 43 |

Table 30. Banding year of returning birds captured at Creek Bend study site, 2013.

| Species | 2012 | 2011 | 2010 | 2009 | 2008 | Total |
|---|---|---|---|---|---|---|
| Downy Woodpecker | | | 2 | | | 2 |
| Baltimore Oriole | | | 1 | 1 | | 2 |
| American Goldfinch | 14 | 12 | 3 | 3 | | 32 |
| Chipping Sparrow | | | 1 | | | 1 |
| Field Sparrow | 3 | 1 | 1 | | | 5 |
| Song Sparrow | 16 | 1 | 4 | 3 | 1 | 25 |
| Northern Cardinal | 1 | | | | | 1 |
| Indigo Bunting | 9 | 1 | 4 | 1 | | 15 |
| Yellow Warbler | 1 | | | 1 | | 2 |
| Common Yellowthroat | 2 | 3 | | | | 5 |
| Gray Catbird | 3 | | | | | 3 |
| House Wren | 1 | | | | | 1 |
| Black-capped Chickadee | | | | 1 | | 1 |
| Total | 50 | 18 | 16 | 10 | 1 | 95 |

Table 31. Banding year of returning birds captured at Petersburg study site, 2013.

| Species | 2012 | 2011 | 2010 | 2009 | 2008 | 2007 | Total |
|---|---|---|---|---|---|---|---|
| Northern Cardinal | 1 | 2 | | | | | 3 |
| Black-capped Chickadee | | 1 | | | | 1 | 2 |
| American Robin | 2 | | | | 1 | | 3 |
| Total | | | | | | | |

Table 32. Foreign recoveries of study banded birds since last progress report.

| Species | Band Number | Band Date | Band Location* | Recovery Date | Recovery Location |
|---|---|---|---|---|---|
| Red-winged Blackbird | 1951-46251 | 04-22-2006 | Navarre | 05-09-2013 | Ohio 413-0830 |
| Common Grackle | 1603-49583 | 06-26-2010 | Navarre | 05-29-2013 | Ohio 411-0825 |
| American Goldfinch | 2460-28825 | 09-19-2012 | Creek Bend | 05-05-2013 | Ohio 412-0830 |
| American Goldfinch | 2460-30990 | 10-06-2009 | Creek Bend | 03-23-2013 | BSBO |
| American Goldfinch | 2460-30993 | 10-06-2009 | Creek Bend | 08-07-2013 | Ontario 433-0795 |
| American Tree Sparrow | 2460-28847 | 09-21-2012 | Creek Bend | 02-05-2013 | BSBO |
| Song Sparrow | 2571-67576 | 05-27-2012 | Navarre | 10-16-2013 | Creek Bend |
| Indigo Bunting | 0890-70620 | 05-25-2012 | Navarre | 09-24-2013 | Creek Bend |
| Indigo Bunting | 2171-48678 | 05-23-2001 | Navarre | 09-28-2013 | Creek Bend |
| Prothonatary Warbler | 2700-04946 | 07-16-2012 | Navarre | 05-19-2013 | Ottawa NWR |
| Prothonatary Warbler | 2700-04947 | 07-16-2012 | Navarre | 05-17-2013 | Ottawa NWR |
| Yellow Warbler | 2610-85628 | 05-09-2012 | Ontario 4146-08238 | 04-30-2013 | Navarre |
| Wilson's Warbler | 008954 | 10-10-2012 | Mexico 1759-09430 | 05-24-2013 | Navarre |
| Gray Catbird | 1951-46958 | 09-20-2008 | BSBO | 09-01-2013 | Navarre |
| Gray Catbird | 2531-75135 | 05-06-2011 | Navarre | 07-25-2013 | Michigan 433-0841 |
| Gray Catbird | 2561-69282 | 05-09-2012 | Navarre | 06-04-2013 | Ohio 413-0831 |
| Gray Catbird | 2641-44440 | 05-18-2013 | Navarre | 05-25-2013 | Pennsylvania 420-0800 |
| House Wren | 2690-06668 | 04-27-2013 | Creek Bend | 07-15-2013 | Illinois 402-0882 |
| House Wren | 2710-16282 | 05-17-2013 | Navarre | 11-04-2013 | Florida 302-0871 |
| Black-cap. Chickadee | 2700-04930 | 06-02-2012 | Navarre | 01-16-2013 | BSBO |
| Wood Thrush | 2641-44064 | 05-13-2013 | Navarre | 05-15-2013 | Michigan 432-0832 |
| American Robin | 1292-25996 | 10-19-2012 | Navarre | 05-13-2013 | Ohio 413-0830 |

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

Table 33. Spring fat composition comparisons of selected species for 2012 and 2013, Navarre (Two sample T-Test, alpha = .05).

| Sign. Higher 2012 | Non-sign. Higher 2012 | Sign. Higher 2013 | Non- sign. Higher 2013 |
|---|---|---|---|
| White-throated Sparrow | Traill's Flycatcher | Red eyed Vireo | Yellow-bellied Flycatcher |
| Swamp Sparrow | Indigo Bunting | Swainson's Thrush | Least Flycatcher |
| Black & White Warbler | Nashville Warbler | | Lincoln Sparrow |
| Ruby-cr. Kinglet | Magnolia Warbler | | Tennessee Warbler |
| | Northern Waterthrush | | Cape May Warbler |
| | Wilson's Warbler | | Yellow Warbler |
| | Canada Warbler | | Myrtle Warbler |
| | Gray Catbird | | Chestnut-sided Warbler |
| | Golden-cr. Kinglet | | Bay-breasted Warbler |
| | | | Blackpoll Warbler |
| | | | Western Palm Warbler |
| | | | Ovenbird |
| | | | Mourning Warbler |
| | | | Common Yellowthroat |
| | | | American Redstart |
| | | | House Wren |
| | | | Bl.-gr. Gnatcatcher |
| | | | Veery |
| | | | Gray-ch. Thrush |
| | | | Hermit Thrush |

Table 34. Fall fat composition comparisons of selected species for 2012 and 2013, Navarre (Two sample T-Test, alpha = .05).

| Sign. Higher 2012 | Non-sign. Higher 2012 | Sign. Higher 2013 | Non- sign. Higher 2013 |
|---|---|---|---|
| Wh.-throated Sparrow | Swamp Sparrow | | Cape May Warbler |
| Blackpoll Warbler | Red-eyed Vireo | | Magnolia Warbler |
| Golden-cr. Kinglet | Black & White Warbler | | Ovenbird |
| Gray-ch. Thrush | Myrtle Warbler | | Common Yellowthroat |
| Swainson's Thrush | Gray Catbird | | American Redstart |
| | House Wren | | |
| | Ruby-cr. Kinglet | | |
| | Hermit Thrush | | |

Figure 1. Migration field sites, 1989- 2013.

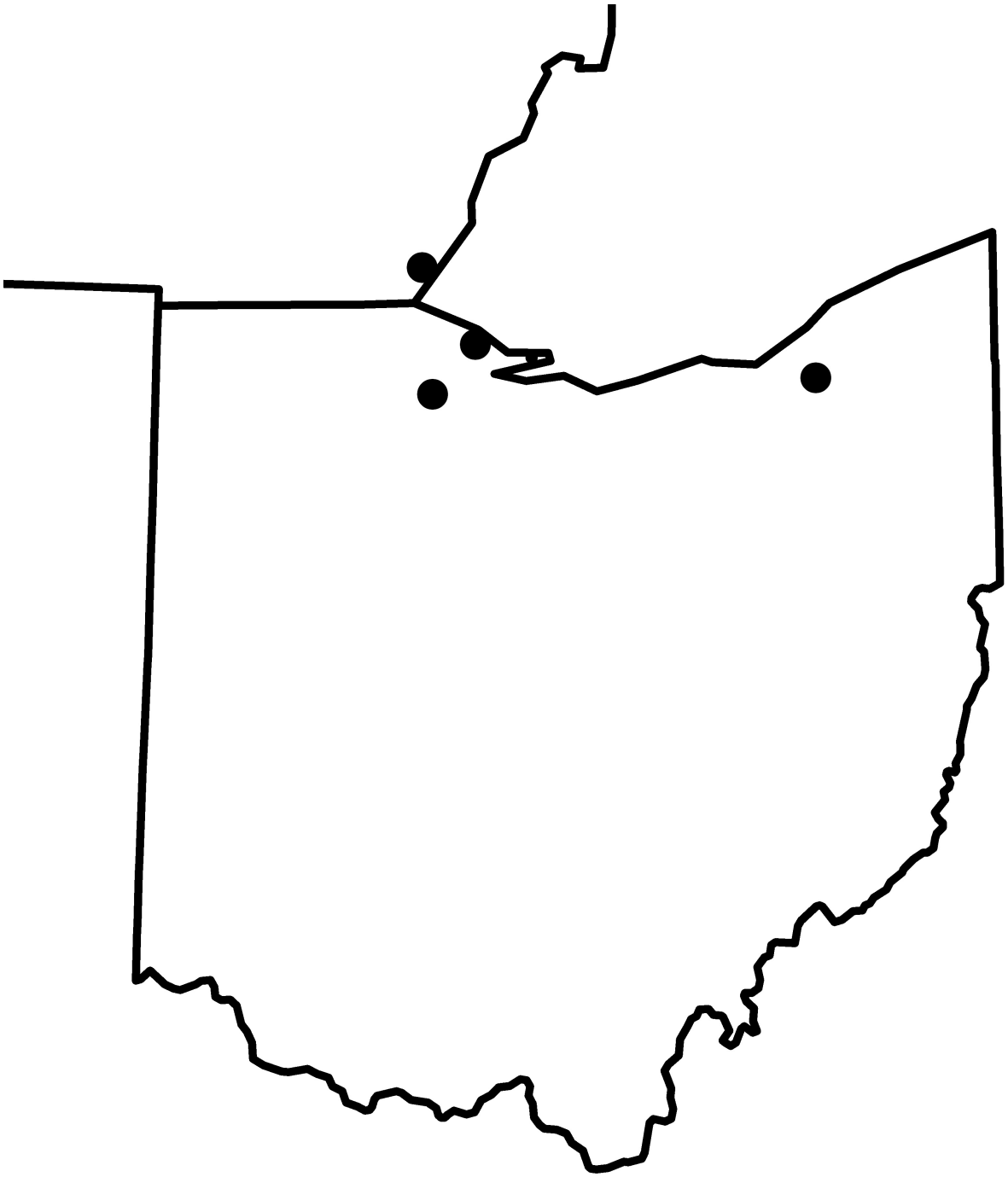

Figure 2. Spring temperature patterns, long-term average and 2013 (9 AM, 100 meters)**.**

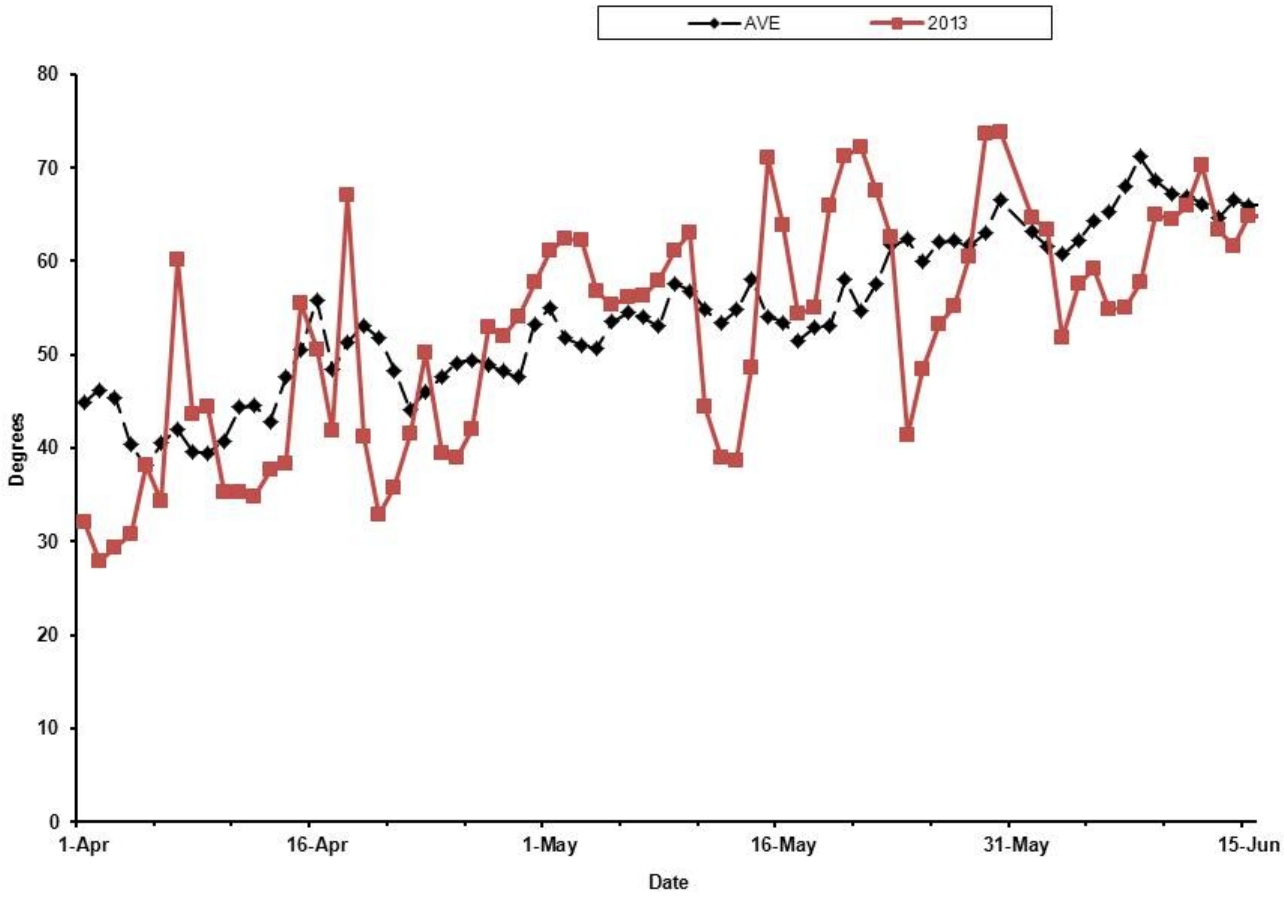

Figure 3. Fall temperature patterns, long-term average and 2013 (9 AM, 100 meters)**.**