

**A SUMMARY OF MIGRATORY NONGAME BIRD BANDING AT FARM
ISLAND AND OAHE DOWNSTREAM STATE RECREATION AREAS,
SOUTH DAKOTA, FROM 1992 - 2016**



Male Magnolia Warbler

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INTRODUCTION

Farm Island and Oahe Downstream State Recreation State Recreation Areas (SRA) are located along the Missouri River in central South Dakota. The upper Missouri River has been altered by a series of mainstem dams, four located in South Dakota, which converted a riverine environment to a series of reservoirs. Oahe Dam, closed in 1958 and operational by 1963, was built just north of Oahe Downstream SRA. The reservoir above Oahe Dam is named Lake Oahe. The reservoir below Oahe Dam is Lake Sharpe, created by the closure of Big Bend Dam at Chamberlain in 1963. These impoundments created drastically altered habitats and disrupted ecological processes. In addition to direct flooding and loss of riparian habitats, remaining cottonwood forests are experiencing succession to Russian olive, eastern red cedar, or cattails. Riparian forests in the area are also declining because of the reduced capacity of the cottonwoods to regenerate due to loss of natural spring flooding in this intensively-managed system of reservoirs.

PROJECT OBJECTIVES

South Dakota Game, Fish and Parks (SDGFP) started this banding project in 1992 to document bird use of a representative site (Farm Island Nature Area) containing remnant riparian cottonwood forest habitats along the Missouri River in central South Dakota during spring and fall migrations. These habitats have continued to decline in the more than 50 years since Lake Sharpe was created.

Secondary objectives of this banding effort are:

- raise awareness among state park visitors about the use of bird banding as a safe, humane monitoring tool;
- document bird species longevity and site fidelity through recaptures;
- document presence of rare species using these sites;
- evaluate banding data for long-term trends in species presence;
- report significant findings for publication in scientific venues;
- assist other researchers by providing data or samples; and
- determine importance of these sites as migratory and breeding areas to individual birds through recaptures.

BIRD BANDING CONSIDERATIONS

Bird banding is a valuable tool to monitor bird populations, document the importance of particular sites or habitats to birds, and conduct a variety of scientific studies. Although any capture and handling of a wild animal presents a risk of injury or death, properly conducted bird banding is a very safe practice. Resources available to banders include training courses, interactions with other banders through list-servs and mentoring, assistance from the U.S. Geological Survey's Bird Banding Lab (USGS-BBL), established protocols for banding operations, and the "Bander's Code of Ethics," accessible at <https://www.usgs.gov/centers/pwrc/science/ethics-and-responsibilities-bird-banders?qt->

[science_center_objects=0#qt-science_center_objects](https://www.usgs.gov/centers/pwrc/science/bird-banding-laboratory?qt-science_center_objects=0#qt-science_center_objects). Bird banders in the U.S. must strictly comply with permits issued by the U.S. Fish and Wildlife Service's Migratory Bird Office and the USGS-BBL. The USGS-BBL is also the entity that provides information to banders and members of the public who report banded or marked birds (https://www.usgs.gov/centers/pwrc/science/bird-banding-laboratory?qt-science_center_objects=0#qt-science_center_objects)

Our banding activities are permitted under USGS-BBL Federal Bird Banding Permit #21966, issued to the State of South Dakota – Nongame, Pierre, South Dakota.

The Farm Island banding site is placed along and adjacent to a popular hiking and biking trail within a nature area that has extensive public use. Although banders are always in the general vicinity of the mist nets, visitors may come upon nets without knowing their function. For this reason, signs are placed such that visitors encounter the signs before seeing the first mist net along the Farm Island Nature Area Trail (Figures 1 and 2). An additional sign placed farther down the trail marks the end of the banding area.



Figure 1. Sign combination placed near the beginning of the Farm Island Nature Area banding area.



Figure 2. Relative location of informational signs at Farm Island Nature Area banding location. The first net encountered by visitors is visible on the left edge of the path.

PUBLIC AND SCIENTIFIC INTERACTIONS

Because our banding sites are located on public land, we often interact with the public, particularly at Farm Island. No restrictions are placed on public access to the sites, but we attempt to interact with all trail users to make them aware of the presence of mist nets, particularly if they are accompanied by children or dogs. This is also an opportunity for us to explain the purpose for the banding operation and associated oversight, address any questions or concerns, and invite interested visitors to view the bird banding process. We have also hosted organized groups of students or others interested in this topic (Figure 3).



Figure 3. Bird banding demonstration by Eileen Dowd Stukel and Nathan Baker at Farm Island banding site.

We have assisted researchers when possible by providing specific data or by collecting particular samples upon request. All research activities we have cooperated on have been consistent with our federal bird banding permit.

PREVIOUS BIRD BANDING AT FARM ISLAND

Doug Backlund, SDGFP wildlife biologist (retired), compiled a list of species previously banded at Farm Island prior to the beginning of our effort (Table 1). Banders from the 1960s to the 1980s included Nelda Holden, Gladyce and Charles Rogge, and other members of the South Dakota Ornithologists' Union (SDOU).

Table 1. Early Banding Records for Farm Island from “South Dakota Bird Notes.”

| Species | 1962 (Holden 1962)¹ | 1964 (Holden 1964)² | 1965 (Holden 1966)³ | 1990 (Rogge 1990)⁴ |
|--------------------------|---|---|---|--|
| American Goldfinch | 0 | 1 | 3 | 11 |
| American Redstart | 10 | 48 | 52 | 115 |
| Baltimore Oriole | 2 | 5 | 4 | 2 |
| Bell's Vireo | 0 | 3 | 11 | 18 |
| Black-and-white Warbler | 1 | 4 | 17 | 21 |
| Black-billed Cuckoo | 1 | 0 | 0 | 0 |
| Black-capped Chickadee | 0 | 0 | 17 | 41 |
| Black-headed Grosbeak | 7 | 0 | 35 | 42 |
| Blackpoll Warbler | 0 | 1 | 9 | 9 |
| Blue Jay | 0 | 1 | 4 | 5 |
| Blue-headed Vireo | 0 | 0 | 0 | 2 |
| Brown Thrasher | 1 | 9 | 16 | 15 |
| Bullock's Oriole | 0 | 1 | 0 | 0 |
| Cedar Waxwing | 1 | 0 | 0 | 2 |
| Chipping Sparrow | 0 | 0 | 7 | 25 |
| Clay-colored Sparrow | 0 | 0 | 15 | 40 |
| Common Yellowthroat | 0 | 1 | 5 | 26 |
| Connecticut Warbler | 0 | 0 | 1 | 0 |
| Dark-eyed Junco | 0 | 0 | 6 | 6 |
| Downy Woodpecker | 0 | 1 | 1 | 1 |
| Eastern Bluebird | 0 | 0 | 0 | 1 |
| Eastern Kingbird | 0 | 0 | 0 | 2 |
| Eastern Wood-Pewee | 0 | 0 | 2 | 0 |
| Field Sparrow | 0 | 0 | 2 | 4 |
| Gray Catbird | 2 | 23 | 42 | 80 |
| Gray-cheeked Thrush | 0 | 1 | 1 | 43 |
| Great Crested Flycatcher | 0 | 1 | 4 | 8 |
| Hairy Woodpecker | 0 | 0 | 2 | 7 |
| Harris's Sparrow | 0 | 0 | 4 | 5 |

| | | | | |
|------------------------|--------------------------|----|----|-----|
| House Wren | 1 | 4 | 0 | 38 |
| Indigo Bunting | 0 | 0 | 8 | 7 |
| Lazuli Bunting | 0 | 2 | 6 | 5 |
| Least Flycatcher | 0 | 9 | 34 | 91 |
| Lincoln's Sparrow | 0 | 0 | 12 | 44 |
| MacGillivray's Warbler | 1 | 0 | 0 | 1 |
| Magnolia Warbler | 0 | 1 | 2 | 1 |
| Mourning Warbler | 0 | 0 | 2 | 2 |
| Myrtle Warbler | 0 | 0 | 26 | 8 |
| Nashville Warbler | 0 | 0 | 0 | 1 |
| Northern Cardinal | 0 | 1 | 3 | 6 |
| Northern Waterthrush | 0 | 0 | 18 | 20 |
| Orange-crowned Warbler | 0 | 0 | 47 | 48 |
| Orchard Oriole | 0 | 0 | 22 | 18 |
| Ovenbird | 1 | 6 | 13 | 15 |
| Philadelphia Vireo | 0 | 0 | 1 | 0 |
| Red-eyed Vireo | 8 | 14 | 6 | 16 |
| Rose-breasted Grosbeak | 0 | 1 | 1 | 1 |
| Ruby-crowned Kinglet | 0 | 0 | 4 | 23 |
| Savannah Sparrow | 0 | 0 | 1 | 0 |
| Scarlet Tanager | 2 | 1 | 2 | 5 |
| Song Sparrow | 0 | 0 | 2 | 2 |
| Spotted Towhee | 1 | 6 | 32 | 63 |
| Swainson's Thrush | 1 | 15 | 51 | 132 |
| Tennessee Warbler | 0 | 0 | 2 | 0 |
| Traill's Flycatcher | 4 (Alder Flycatchers) | 1 | 16 | 30 |
| Veery | 0 | 0 | 1 | 0 |
| Vesper Sparrow | 0 | 0 | 4 | 0 |
| Warbling Vireo | 0 | 5 | 6 | 10 |
| Western Flycatcher | 0 | 5 | 2 | 0 |

| | | | | |
|-------------------------|-----------|------------|-------------------|--------------------|
| Western Wood-Pewee | 0 | 2 | 0 | 0 |
| White-breasted Nuthatch | 0 | 0 | 0 | 4 |
| White-crowned Sparrow | 0 | 0 | 5 | 6 |
| White-throated Sparrow | 0 | 0 | 28 | 12 |
| Wilson's Warbler | 0 | 1 | 5 | 7 |
| Winter Wren | 0 | 0 | 1 | 2 |
| Wood Thrush | 0 | 2 | 4 | 7 |
| Worm-eating Warbler | 0 | 0 | 1 | 1 |
| Yellow Warbler | 3 | 23 | 36 | 74 |
| Yellow-billed Cuckoo | 0 | 0 | 0 | 1 |
| Yellow-breasted Chat | 5 | 32 | 26 | 28 |
| Yellow-shafted Flicker | 0 | 2 | 6 (+1 intergrade) | 6 (+3 intergrades) |
| Total | 44 | 191 | 463 | 804 |

¹Three nets, one or two days in May.

²Twenty nets on May 16, 17, and 18. These data may include some of the birds reported in Gladys Rogge's 1990 report.

³Banding results with unknown number of nets on May 8-9, May 22-23, Sept. 4-5, and Sept. 25-26, 1965. These data may include some of the birds reported in Gladys Rogge's 1990 report.

⁴Banding from 1964-1987, 66 days effort, net hours not reported. Most of the banding was done in the 1960's and 1970 and some in the 1980's. This table does not include all of the species banded by the Rogges.

STUDY AREA

Both banding sites are located near Pierre and Fort Pierre, South Dakota (Figure 4). Farm Island is located approximately 3 miles east of Pierre in Hughes County. The banding area begins near the entrance to the hiking trail within Farm Island Nature Area (Figure 5). The USGS-BBL 10-minute block is 442-1001. Farm Island has been affected by both Oahe Dam and Big Bend dams. Impacts include high releases during the winter, often related to ice jams, which have flooded portions of the island and contributed to bank erosion.

Oahe Downstream is located near Oahe Dam in Stanley County, on the western shore of Lake Sharpe. The banding site is called Fisherman's Point, also known locally as Diver's Point. The USGS-BBL 10-minute block is 442-1002. Habitat at this site includes a remnant cottonwood forest with fewer long-term flooding issues than at Farm Island (Figure 6).

Rogers (1966) sampled four vegetation stands on Farm Island in 1966, using 5 1/10-acre circular quadrats. Rogers also sampled one plot on LaFramboise Island (Figure 4). Rogers' Stands C and D on Farm Island are closest to the banding location. Stand C had 94 eastern cottonwoods (*Populus deltoides*) per acre, 12 green ash (*Fraxinus pennsylvanica*) per acre, and 4 boxelder (*Acer negundo*) per acre, with green ash seedlings and saplings

described as “very abundant.” Stand D had 30 eastern cottonwoods per acre, 142 eastern red cedar (*Juniperus virginiana*), and 4 green ash per acre, with reproduction by junipers and green ash seedlings and saplings called “fairly abundant.”

Ode (2004) surveyed the wildlife habitats of LaFramboise Island, a forested island in the Missouri River near Pierre and Fort Pierre. LaFramboise shares many characteristics with Farm Island, although LaFramboise is more directly influenced by the nearby mouth of the Bad River. Ode replicated Rogers’ cottonwood data collection on LaFramboise Island and found 75 cottonwoods per acre in 2003, compared to 138 per acre by Rogers (Ode 2004). Average cottonwood diameter at breast height increased from 11.2” in 1966 to 17.4” in 2003. Ode (2004) reported that cottonwood decline on LaFramboise Island has occurred at a loss of about 2 cottonwoods per acre per year, while junipers, in particular, have drastically increased. This trend toward mature cottonwood forests with fewer, larger trees per acre is occurring at many sites along the Missouri River. Historical spring flooding that facilitated cottonwood regeneration has been replaced by managed water levels along Missouri River reservoirs, with a change in species composition that more closely resembles upland habitats (Rogers 1966).

Both sites were seriously impacted by flooding from record-level releases from Missouri River dams in 2011. Farm Island Nature Area, in particular, was subjected to months of flooding during the summer and early fall of 2011 (Figure 7), resulting in additional loss of much of the lower habitat structure and sand deposition in areas well away from the shorelines. Banding at Farm Island was relocated to a temporary site during the spring of 2012 due to trail reconstruction within the Nature Area. The temporary site’s habitat was more open and manicured than the traditional, long-term banding site within the Farm Island Nature Area.

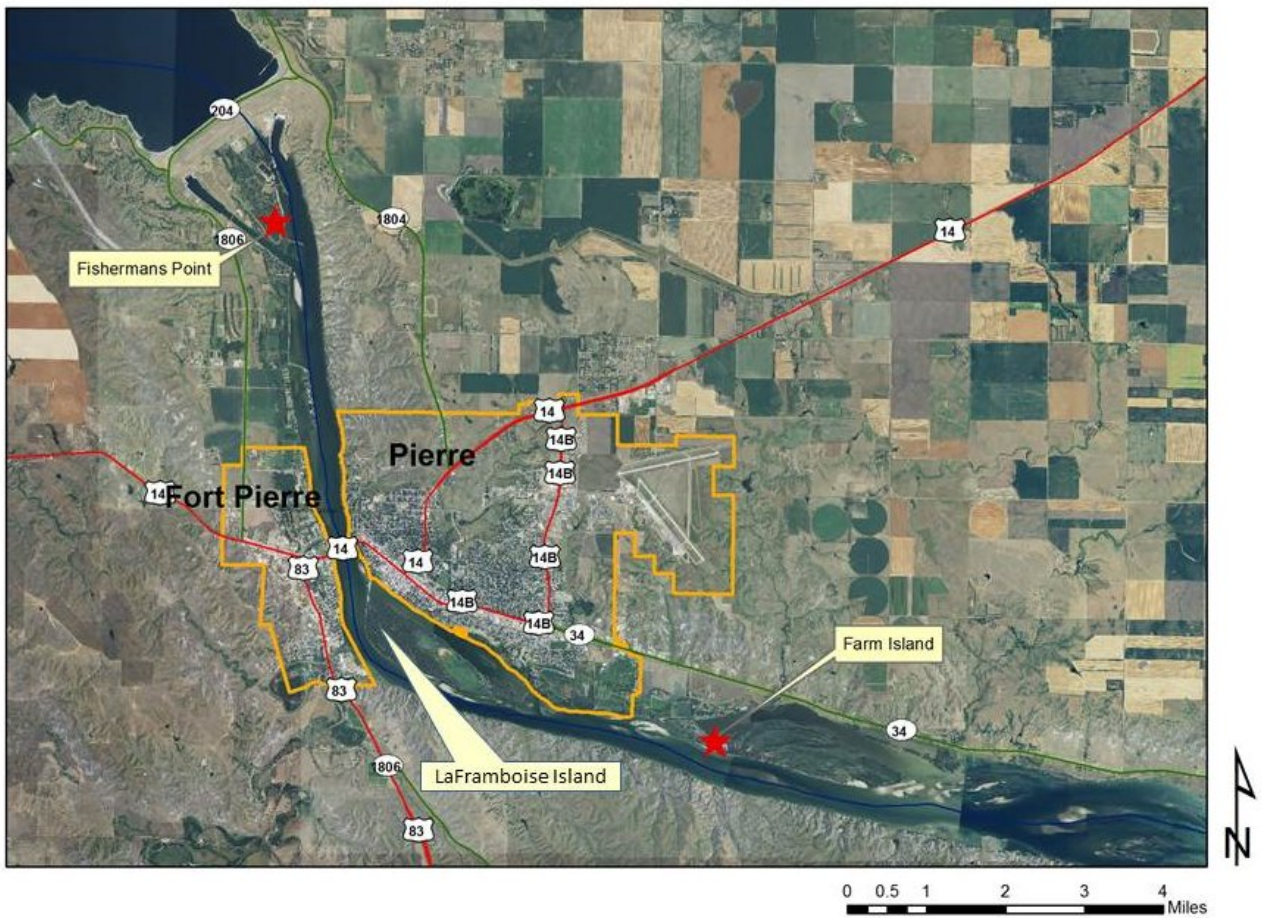


Figure 4. Locations of banding sites at Oahe Downstream State Recreation Area (Fisherman's Point) and Farm Island State Recreation Area, South Dakota.



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Figure 5. A portion of the Farm Island banding area viewed toward the entrance to the Nature Area.



Figure 6. A portion of the Fisherman's Point banding area.



Figure 7. View from entrance to Farm Island banding site during 2011 flood.

METHODS

Timing

Bird banding is typically done during mild weather conditions and not conducted during extreme temperatures or when it is very windy or raining hard. Occasionally, bird banding sites may experience an unexpected “fallout” of migratory birds that may overwhelm the ability of banders to handle, band, and measure birds in a timely way. In these cases, changes are made in the normal operation of the site. These changes include seeking additional experienced help, closing nets early, setting up fewer nets, taking fewer measurements, or releasing birds without banding them. Bird safety is the highest priority of any banding operation. Specific concerns with a banding operation are evaluated by the federal entities that legally permit bird banding. Some states require banders to obtain a state permit. A separate state banding permit is presently not required in South Dakota.

We have banded each spring and fall at the Farm Island SRA since 1992. In the spring of 2004 we opened a second banding station at Fisherman’s Point, located within the Oahe Downstream SRA. The exception to spring and fall banding was 2011, when banding was possible only during the early spring, after which deliberate, record-setting releases through Missouri River dams forced the closure of these and other recreational sites along the Missouri River due to flooding and subsequent infrastructure repairs.

Our banding period ranges from late April to early June in the spring and from late August to mid-October in the fall. Spring banding is concentrated in May and fall banding in September. A typical banding day is from approximately 8 am to 12 noon, using up to ten 30-mm mesh, 12x2.6 m, 4-shelf mist nets, supplemented with some use of 60-mm mesh nets (Figure 8). Nets are attended continuously and birds removed as quickly as possible (Figure 9). All materials are removed at the end of the day's banding and set up again for the next banding session. Dedicated banding vans are used at each site for transporting banding equipment and processing birds. Our banding operation is passive, without the use of lures or baits.



Figure 8. Black-capped Chickadee in 30-mm mesh mist net.



Figure 9. Silka Kempema extracts a bird from a mist net. Two additional netted birds are visible in this image.

Data collected

A daily banding effort date sheet is completed for each site. Banders record estimated time each net is operated and beginning and ending weather conditions. A net hour is one net operational for one hour. Minimum data collected for newly-banded birds are species (species identification required prior to banding), sex if able to be determined and how sex was determined, and age and how age was determined.

Sex may be determined by different plumages for males and females or observation of a cloacal protuberance in males or a brood patch, primarily in females. Prior to mating, a male bird stores sperm in his cloaca, causing it to swell. A brood patch is a featherless area on a bird's breast or abdomen fed by blood vessels to help produce warmth for incubation. Some male birds may also develop a brood patch during the breeding season. Sex cannot be determined for many of the birds we handle, and these are recorded as unknown sex.

Age categories are HY (hatch year) and AHY (after hatch year) during the fall, and SY (second year) and ASY (after second year) during the spring. Some species can be aged to ATY (after third year) or older. If time allows, we also collect data on length of unflattened wing chord (Figure 10), tail length, weight, and extent of fat deposition on the furculum

(area near wishbone) and abdomen based on a scale of 0 to 5, with 5 as the maximum score (Figure 11; Helms and Drury 1960).



Figure 10. Measuring unflattened wing chord of a Swainson's Thrush.



Figure 11. Examining a Northern Cardinal for fat score. The furculum (white arrow) has a small amount of fat.

When banding flycatchers in the genus *Empidonax*, we examine feather characteristics and record additional wing and bill measurements to help confirm species identifications. We have also collected data on culmen (upper ridge of bird's beak) and tarsus (leg segment between lower leg and toes) lengths, but we have generally discontinued taking those measurements in recent years except when handling species that are unusual for our area.

For a recaptured bird, we record band number, species, sex and how determined, age and how determined, weight, and fat score. Comments may be noted about unusual characteristics, previous injuries, or deformities on newly-banded or recaptured birds. Unusual species for our area are typically photographed.

We attempt to age birds during both spring and fall. Spring birds are aged as SY (second year) or ASY (after second year) by examining feather replacement patterns known for that species using a variety of tools (Pyle 1997, McGill Bird Observatory website, Ralph and Sakai 2007). Banding summaries posted on our website (<https://gfp.sd.gov/bird-banding/>) often include illustrations of aging techniques. Fall aging is completed with these tools plus the use of "skulling."

Skulling is a technique used with passerines (perching birds or songbirds) to describe the extent of skull pneumaticization (Pyle 1997). Among bird skeletal adaptations for flight are hollow or "pneumatized" bones filled with air spaces instead of bone marrow. When a young passerine fledges, the skull over the brain is a single layer of bone. As the bird matures during its first year of life, a second layer of bone develops under the first, with the two layers separated by air spaces and small columns of bone. This development process is called skull pneumaticization. Close examination of a bird's skull in the fall in combination with known timeframes associated with the pneumaticization process for that species allow banders to age many fall birds as HY (hatch year) or AHY (after hatch year). Not all species or individuals can be skulled, and banders are always encouraged to use as many characteristics and tools as possible to correctly identify an individual's species, age, and sex.

Data entry

We use software provided by the USGS-BBL to enter and submit data. Current software is Bandit 4.0, which includes standard fields, with the option to customize data entry with additional user fields. Current data categories are Settings, Band Inventory, Locations, Bands, Recaptures, Banding Mortality, and Reference. Banders are strongly encouraged to submit banding data at regular intervals or following the conclusion of a particular banding season to facilitate prompt responses of the USGS-BBL to band recoveries. Data are submitted to the USGS-BBL and quality control conducted by that entity. Follow up to banders may include questions about particular records or an indication that certain changes were made to the data.

Data analysis

We exported banding records from 1992-2016 at both banding sites from the Bandit 4.0 software into Microsoft Excel 2010 to create all summary graphs and tables. Summary statistics were calculated using the Data Analysis Descriptive Statistics tool in Excel.

Dr. Jeff Palmer, Dakota State University, maintains a seasonal reporting database and website that is also available on the SDOU website (<http://sdou.org/Birds/Reporting.aspx>). In an attempt to see migratory timing patterns among the 20 most commonly banded species at our sites, Dr. Palmer ran an analysis of seasonal reports for 2003-2017 for Missouri River-adjacent counties from the North Dakota border through southcentral South Dakota. Counties included in the analysis were Corson, Campbell, Walworth, Dewey, Potter, Sully, Hughes, Stanley, Hand, Lyman, Buffalo, Brule, Gregory, and Charles Mix. This analysis yielded early and late median dates for each species for spring and fall.

RESULTS AND DISCUSSION

Newly-captured birds

Banding Efforts by Location

Number of net hours per year and birds captured per net hour for the Farm Island banding site are presented in Table 2. Net hours were not recorded consistently until 1999.

Limited banding was conducted in 1992 as we acquired equipment and learned proper net placement and handling techniques. Excluding 1992, the number of birds banded per year at Farm Island from 1993 to 2016 has ranged from a low of 85 in 1993 to a high of 1,235 in 2015. The number of species banded at this site ranged from a low of 20 in 1993 and 1994 to a high of 88, also in 2015. Excluding 2011, when flooding prevented fall banding and curtailed spring banding, net hours ranged from a low of 1,081.33 in 2010, to a high of 1,809.27 in 2015. Birds captured per net hour at Farm Island from 1999-2016 ranged from a low of 0.36 in 2000 to a high of 0.70 in 2012.

Table 2. Farm Island, South Dakota, effort and results summary from 1992-2016.

| Year | Number of Birds | Number of Species | Net Hours | Birds/net hour |
|-------------------|------------------------|--------------------------|------------------|-----------------------|
| 1992 | 3 | 3 | | |
| 1993 | 85 | 20 | | |
| 1994 | 116 | 20 | | |
| 1995 | 159 | 25 | | |
| 1996 | 484 | 43 | | |
| 1997 | 316 | 45 | | |
| 1998 | 532 | 61 | | |
| 1999 | 696 | 76 | 1,156.46 | 0.60 |
| 2000 | 401 | 45 | 1,099.19 | 0.36 |
| 2001 | 602 | 48 | 1,608.92 | 0.37 |
| 2002 | 752 | 62 | 1,350.42 | 0.56 |
| 2003 | 509 | 52 | 1,286.00 | 0.40 |
| 2004 | 854 | 53 | 1,321.97 | 0.65 |
| 2005 | 764 | 59 | 1,549.15 | 0.49 |
| 2006 | 675 | 63 | 1,345.53 | 0.50 |
| 2007 | 831 | 65 | 1,564.90 | 0.53 |
| 2008 | 801 | 65 | 1,515.25 | 0.53 |
| 2009 | 587 | 54 | 1,152.81 | 0.51 |
| 2010 | 411 | 55 | 1,081.33 | 0.38 |
| 2011 ¹ | 296 | 39 | 432.38 | 0.68 |
| 2012 | 879 | 76 | 1,256.52 | 0.70 |
| 2013 | 675 | 57 | 1,250.34 | 0.54 |
| 2014 | 1031 | 75 | 1,627.02 | 0.63 |
| 2015 | 1,235 | 88 | 1,809.27 | 0.68 |
| 2016 | 888 | 78 | 1,555.06 | 0.57 |

¹Banding conducted only during portion of spring of 2011 and no banding during fall of 2011 because of planned water releases from Missouri River dams in South Dakota.

Fisherman's Point banding effort is presented in Table 3. Excluding 2011, when fall banding was precluded by flooding and spring banding was ended earlier than usual, the number of birds banded per year ranged from a low of 228 in 2010 to a high of 943 in 2015, with a secondary peak of 928 birds during 2004, the first year this site was operated. The number of species banded ranged from a low of 32 in 2006 to a high of 74 in 2004. Excluding 2011, net hours ranged from a low of 443 in 2009 to a high of 1,329 in 2015. Birds captured per net hour at this site ranged from a low of 0.36 in 2005 to a high of 1.14 in 2004.

Table 3. Fisherman’s Point, South Dakota, effort and results summary from 2004-2016.

| Year | Number of Birds | Number of Species | Net Hours | Birds/net hour |
|-------------------|------------------------|--------------------------|------------------|-----------------------|
| 2004 | 928 | 74 | 817.37 | 1.14 |
| 2005 | 443 | 46 | 1,217.7 | 0.36 |
| 2006 | 329 | 32 | 783.52 | 0.42 |
| 2007 | 585 | 55 | 901.72 | 0.65 |
| 2008 | 605 | 52 | 913.25 | 0.66 |
| 2009 | 276 | 45 | 442.95 | 0.62 |
| 2010 | 228 | 33 | 463.69 | 0.49 |
| 2011 ¹ | 193 | 34 | 236.50 | 0.82 |
| 2012 | 525 | 61 | 1,147.31 | 0.46 |
| 2013 | 357 | 46 | 714.52 | 0.50 |
| 2014 | 718 | 70 | 1,113.00 | 0.65 |
| 2015 | 943 | 73 | 1,328.57 | 0.71 |
| 2016 | 522 | 52 | 1,012.61 | 0.52 |

¹Banding conducted only during portion of spring of 2011 and no banding during fall of 2011 because of planned water releases from Missouri River dams in South Dakota.

Banding Efforts by Season

Banding efforts for the two sites combined during spring (Table 4) and fall (Table 5) are displayed. A total of 10,637 birds were banded during spring seasons from 1992-2016 at both sites combined (Table 4). When 1992 is excluded because of the limited effort, the number of birds captured during spring banding ranged from a low of 24 in 1994 to a high of 1,423 in 2004. Number of species banded during the spring seasons ranged from 15 in 1994 to 60 in 2014 and 2015, with data from 1992 excluded.

Spring net hours for years when these figures were estimated ranged from a low of 421.64 in 2010 to a high of 1,461.46 in 2015 (Table 4). Birds banded per net hour during spring banding ranged from a low of 0.31 in 2010 to a high of 1.18 in 2004. If bird totals from years when spring net hours were not estimated are removed (1992-1998), the bird total is 9,705, which results in an average of 0.59 birds/net hour during spring banding.

A total of 10,590 birds were banded during fall seasons from 1993-2016 at both sites combined (Table 5). The number of birds banded during the fall at both sites combined ranged from 14 in 1993 to 1,081 in 2012. Excluding 2011 data, the number of species banded ranged from 6 in 1994 to 94 in 2012. Fall net hours for years when these figures were estimated ranged from a low of 350.77 in 1999 to a high of 1,676.38 in 2015. Birds per net hour during fall banding ranged from 0.28 in 2001 to 0.88 in 2012. If bird totals from years when fall net hours were not estimated are removed (1993-1998), the total is 9,827 birds, which translates to an average of 0.53 birds/net hour during fall banding.

Table 4. Spring banding summary for Farm Island and Fisherman’s Point banding sites, South Dakota, combined from 1992-2016.

| Year | Number of Birds | Number of Species | Net Hours | Birds/net hour |
|-------------------|------------------------|--------------------------|------------------|-----------------------|
| 1992 | 3 | 3 | | |
| 1993 | 71 | 17 | | |
| 1994 | 24 | 15 | | |
| 1995 | 114 | 25 | | |
| 1996 | 295 | 33 | | |
| 1997 | 235 | 39 | | |
| 1998 | 190 | 36 | | |
| 1999 | 507 | 51 | 805.69 | 0.63 |
| 2000 | 231 | 35 | 607.20 | 0.38 |
| 2001 | 356 | 37 | 731.77 | 0.49 |
| 2002 | 474 | 44 | 638.80 | 0.74 |
| 2003 | 305 | 38 | 583.25 | 0.52 |
| 2004 ¹ | 1,423 | 58 | 1,208.85 | 1.18 |
| 2005 | 492 | 37 | 1,145.00 | 0.43 |
| 2006 | 386 | 38 | 952.79 | 0.41 |
| 2007 | 443 | 48 | 913.54 | 0.48 |
| 2008 | 701 | 47 | 905.32 | 0.77 |
| 2009 | 436 | 44 | 821.00 | 0.53 |
| 2010 | 132 | 28 | 421.64 | 0.31 |
| 2011 ² | 489 | 52 | 668.88 | 0.73 |
| 2012 | 323 | 56 | 1,172.23 | 0.28 |
| 2013 | 636 | 58 | 1,013.88 | 0.63 |
| 2014 | 885 | 60 | 1,254.73 | 0.71 |
| 2015 | 853 | 60 | 1,461.46 | 0.58 |
| 2016 | 633 | 58 | 1,215.73 | 0.52 |
| Total | 10,637 | | 16,521.76 | |

¹First year of banding at Fisherman’s Point

²Spring banding season shortened due to Missouri River flooding

Table 5. Fall banding summary for Farm Island and Fisherman’s Point banding sites, South Dakota, combined from 1993-2016.

| Year | Number of Birds | Number of Species | Net Hours | Birds/net hour |
|-------------------|------------------------|--------------------------|------------------|-----------------------|
| 1993 | 14 | 10 | | |
| 1994 | 92 | 6 | | |
| 1995 | 45 | 7 | | |
| 1996 | 189 | 27 | | |
| 1997 | 81 | 22 | | |
| 1998 | 342 | 48 | | |
| 1999 | 189 | 26 | 350.77 | 0.54 |
| 2000 | 170 | 25 | 491.99 | 0.35 |
| 2001 | 246 | 33 | 877.15 | 0.28 |
| 2002 | 278 | 34 | 711.62 | 0.39 |
| 2003 | 204 | 36 | 702.75 | 0.29 |
| 2004 ¹ | 356 | 41 | 930.49 | 0.38 |
| 2005 | 715 | 58 | 1,621.85 | 0.44 |
| 2006 | 618 | 57 | 1,176.26 | 0.53 |
| 2007 | 973 | 60 | 1,553.08 | 0.63 |
| 2008 | 705 | 58 | 1,523.18 | 0.46 |
| 2009 | 423 | 51 | 774.76 | 0.55 |
| 2010 | 507 | 53 | 1,123.38 | 0.45 |
| 2011 ² | 0 | 0 | 0 | 0.00 |
| 2012 | 1,081 | 94 | 1,231.60 | 0.88 |
| 2013 | 396 | 39 | 950.98 | 0.42 |
| 2014 | 864 | 61 | 1,485.29 | 0.58 |
| 2015 | 1,325 | 89 | 1,676.38 | 0.79 |
| 2016 | 777 | 72 | 1,351.94 | 0.57 |
| Total | 10,590 | | 18,533.47 | |

¹First year of banding at Fisherman’s Point

²Flooding from late spring through summer and related damage prevented fall banding at both sites.

Total Number of Birds Banded

We banded 21,226 birds of 126 species or hybrids at both sites combined from 1992-2016 (Appendix A). Breakdown by site was 14,574 birds banded at Farm Island from 1992-2016 and 6,652 at Fisherman’s Point from 2004-2016.

Most Commonly-banded Species

The ten most commonly-banded species by season for both sites combined from 1992-2016 are listed in Table 6. Five species are listed for both spring and fall; Yellow Warbler, Swainson’s Thrush, Common Yellowthroat, Myrtle Warbler, and Orange-crowned Warbler. The Yellow Warbler and Common Yellowthroat nest in central South Dakota. Swainson’s Thrushes nest in the Black Hills in western South Dakota. The Audubon form of the Yellow-rumped Warbler nests in the Black Hills and less commonly elsewhere in western South Dakota. The myrtle form of the Yellow-rumped Warbler does not nest in South Dakota.

Five species were listed on the spring list only; Least Flycatcher, “Traill’s” Flycatcher, House Wren, Tennessee Warbler, and Blackpoll Warbler (Table 6). A Traill’s Flycatcher may be either a Willow or Alder flycatcher, because these species cannot be reliably separated in hand. Of the top 10 species listed for spring only, the House Wren, Least Flycatcher, and Willow Flycatcher nest in central South Dakota.

Five species were among the most commonly-banded in fall only; Ruby-crowned Kinglet, Wilson’s Warbler, Gray Catbird, White-throated Sparrow, and Lincoln’s Sparrow (Table 6). Of these species, only the Gray Catbird nests in central South Dakota, although the Ruby-crowned Kinglet nests in the Black Hills in extreme western South Dakota.

With seasons combined, the twenty most commonly-banded species by site are listed in Table 7. Ten of these species, plus the Willow Flycatcher, nest in central South Dakota. This does not mean all banded birds of these species were local nesters or their progeny. More detailed information for each of these species is included in Appendices C-V.

A number of species showed spring peaks during 2004, including American Redstart; Orange-crowned, Yellow, Wilson’s, Tennessee, and Blackpoll warblers; Common Yellowthroat; Least Flycatcher; Gray Catbird; Spotted Towhee; and White-throated and Lincoln’s sparrows (Appendices C-V). To check whether the spring of 2004 had an unusually high number of migrants in other parts of the state, we checked reports for the month of May in the SDOU seasonal reporting system database (SDOU 2018) for each of these species for all South Dakota counties and counties along the Missouri River only. None of the species showed surprisingly high numbers in either of these searches, indicating that this was likely a local phenomenon. The spring 2004 peaks may have resulted from weather conditions that caused migrants to stall at our banding sites or arrive in greater numbers than expected due to unfavorable migration conditions or weather-caused delays at stopover sites south of ours.

Our seasonal results do not necessarily indicate which species are most common in the areas around our sites. We do not conduct separate bird surveys in the vicinities of the banding areas. Not all species present are equally vulnerable to capture by mist nets, and resource availability likely further affects vulnerability to capture. For instance, during spring mist-netting, we often observe warblers and kinglets gleaning insects from tree buds relatively high in the canopy. These individuals are unlikely to be mist-netted during those high-canopy foraging bouts.

An analysis of sightings reported to the SDOU Seasonal Reporting system from 2003-2017 yielded early and late spring and fall median dates for the 20 species we most commonly banded at our sites (SDOU 2018; Tables 8 and 9). These data are also depicted in Figures 12 and 13. In Table 8 and Figure 12, species that potentially breed at the sites lack the late spring median date, because a sighting of a breeding species during late spring could be of a migrant or a breeder. The same is true in Table 9 and Figure 13, where species that potentially breed at the sites lack the early fall median date, because a sighting of a breeding species during early fall could be either an individual that was migrating or one that nested or was produced at the site. Similarly, sightings for the Yellow-rumped Warbler

extended into the winter, resulting in a lack of median dates for early spring and late fall (Tables 8 and 9; Figures 12 and 13).

Table 6. Ten most commonly-banded species by season for Farm Island and Fisherman’s Point banding sites, South Dakota, combined from 1992-2016.

| SPRING | | | FALL | | |
|------------------------|-------|-----------------------|------------------------|-------|-----------------------|
| Species | Total | % of all birds banded | Species | Total | % of all birds banded |
| Yellow Warbler | 1,515 | 14.24 | Orange-crowned Warbler | 3,336 | 31.50 |
| Swainson’s Thrush | 1,115 | 10.48 | Myrtle Warbler | 934 | 8.82 |
| Least Flycatcher | 1,045 | 9.83 | Ruby-crowned Kinglet | 709 | 6.69 |
| Common Yellowthroat | 805 | 7.57 | Swainson’s Thrush | 509 | 4.81 |
| Traill’s Flycatcher | 672 | 6.32 | Common Yellowthroat | 461 | 4.35 |
| Myrtle Warbler | 657 | 6.18 | Wilson’s Warbler | 420 | 3.97 |
| Orange-crowned Warbler | 610 | 5.74 | Gray Catbird | 385 | 3.64 |
| House Wren | 335 | 3.15 | White-throated Sparrow | 367 | 3.47 |
| Tennessee Warbler | 322 | 3.03 | Lincoln’s Sparrow | 335 | 3.16 |
| Blackpoll Warbler | 265 | 2.49 | Yellow Warbler | 280 | 2.64 |

Table 7. Twenty most commonly-banded species for Farm Island and Fisherman’s Point banding sites, South Dakota, from 1992-2016.

| Species | Nests in central SD | Neotropical Migrant | NUMBER BANDED | | |
|------------------------|---------------------|---------------------|---------------|-------------------|-------|
| | | | Farm Island | Fisherman’s Point | Total |
| Orange-crowned Warbler | | X (Mexico) | 2,450 | 1,496 | 3,946 |
| Yellow Warbler | X | X | 1,199 | 596 | 1,795 |
| Swainson’s Thrush | | X | 1,085 | 539 | 1,624 |
| Myrtle Warbler | | X | 997 | 594 | 1,591 |
| Common Yellowthroat | X | X | 1,088 | 178 | 1,266 |
| Least Flycatcher | X | X | 837 | 251 | 1,088 |
| Ruby-crowned Kinglet | | X (Mexico) | 414 | 389 | 803 |
| Traill’s Flycatcher | X (Willow) | X (Willow) | 572 | 191 | 763 |
| Gray Catbird | X | X | 402 | 217 | 619 |
| House Wren | X | X (Mexico) | 263 | 206 | 469 |
| Wilson’s Warbler | | X | 262 | 200 | 462 |
| White-throated Sparrow | | | 357 | 104 | 461 |
| Lincoln’s Sparrow | | X (Mexico) | 369 | 81 | 450 |
| Spotted Towhee | X | X (Mexico) | 272 | 104 | 376 |
| Tennessee Warbler | | X | 159 | 185 | 344 |
| Clay-colored Sparrow | X | X (Mexico) | 233 | 104 | 337 |
| American Redstart | X | X | 287 | 44 | 331 |
| Blackpoll Warbler | | X | 201 | 70 | 271 |
| Warbling Vireo | X | X | 174 | 88 | 262 |
| Song Sparrow | X | | 240 | 21 | 261 |

Table 8. Early and late spring median dates for 20 most commonly-banded species at Farm Island and Fisherman's Point banding sites, South Dakota, from 2003-2017, derived from SDOU reporting system.

| Species | Early Spring | Late Spring | No. of Years Reported | Sightings |
|------------------------------------|--------------|-------------|-----------------------|-----------|
| Orange-crowned Warbler | 18-Apr | 19-May | 15 | 315 |
| Yellow Warbler ¹ | 02-May | | 15 | 372 |
| Swainson's Thrush | 01-May | 01-Jun | 15 | 238 |
| Yellow-rumped Warbler ² | | 21-May | 15 | 426 |
| Common Yellowthroat ¹ | 02-May | | 15 | 275 |
| Least Flycatcher ¹ | 03-May | | 15 | 227 |
| Ruby-crowned Kinglet | 08-Apr | 16-May | 15 | 183 |
| Willow Flycatcher ¹ | 18-May | | 13 | 57 |
| Alder Flycatcher | 26-May | 31-May | 8 | 18 |
| Gray Catbird ¹ | 06-May | | 14 | 201 |
| House Wren ¹ | 24-Apr | | 15 | 322 |
| Wilson's Warbler | 09-May | 21-May | 15 | 63 |
| White-throated Sparrow | 15-Apr | 17-May | 15 | 203 |
| Lincoln's Sparrow | 20-Apr | 18-May | 15 | 225 |
| Spotted Towhee ¹ | 16-Apr | | 15 | 357 |
| Tennessee Warbler | 08-May | 28-May | 15 | 173 |
| Clay-colored Sparrow ¹ | 30-Apr | | 15 | 216 |
| American Redstart ¹ | 08-May | | 15 | 186 |
| Blackpoll Warbler | 07-May | 27-May | 15 | 210 |
| Warbling Vireo ¹ | 09-May | | 15 | 217 |
| Song Sparrow ¹ | 11-Mar | | 15 | 455 |

¹nests in central SD

²early dates extend into winter

Table 9. Early and late fall median dates for 20 most commonly-banded species at Farm Island and Fisherman's Point banding sites, South Dakota, from 2003-2017, derived from SDOU reporting system.

| Species | Early Fall | Late Fall | No. of Years Reported | No. of Sightings |
|-----------------------------------|------------|-----------|-----------------------|------------------|
| Orange-crowned Warbler | 28-Aug | 19-Oct | 15 | 387 |
| Yellow Warbler ¹ | | 25-Sep | 15 | 382 |
| Swainson's Thrush | 28-Aug | 30-Sep | 15 | 168 |
| Yellow-rumped Warbler | 06-Sep | | 15 | 417 |
| Common Yellowthroat ¹ | | 06-Oct | 15 | 232 |
| Least Flycatcher ¹ | | 15-Sep | 15 | 98 |
| Ruby-crowned Kinglet | 07-Sep | 01-Nov | 15 | 287 |
| Willow Flycatcher ¹ | | 23-Aug | 12 | 48 |
| Alder Flycatcher | 22-Jul | 06-Aug | 1 | 1 |
| Gray Catbird ¹ | | 06-Oct | 15 | 379 |
| House Wren ¹ | | 04-Oct | 15 | 337 |
| Wilson's Warbler | 23-Aug | 04-Oct | 15 | 269 |
| White-throated Sparrow | 12-Sep | 04-Nov | 15 | 295 |
| Lincoln's Sparrow | 02-Sep | 16-Oct | 15 | 254 |
| Spotted Towhee ^{1, 2, 3} | | | | |
| Tennessee Warbler | 29-Aug | 22-Sep | 14 | 54 |
| Clay-colored Sparrow ¹ | | 12-Oct | 14 | 201 |
| American Redstart ¹ | | 15-Sep | 15 | 211 |
| Blackpoll Warbler | 02-Sep | 10-Sep | 7 | 23 |
| Warbling Vireo ¹ | | 16-Sep | 15 | 235 |
| Song Sparrow ^{1, 3} | | | | |

¹ nests in central SD

² late dates extend into winter

³ no values; species is a breeder and also has records extending into winter

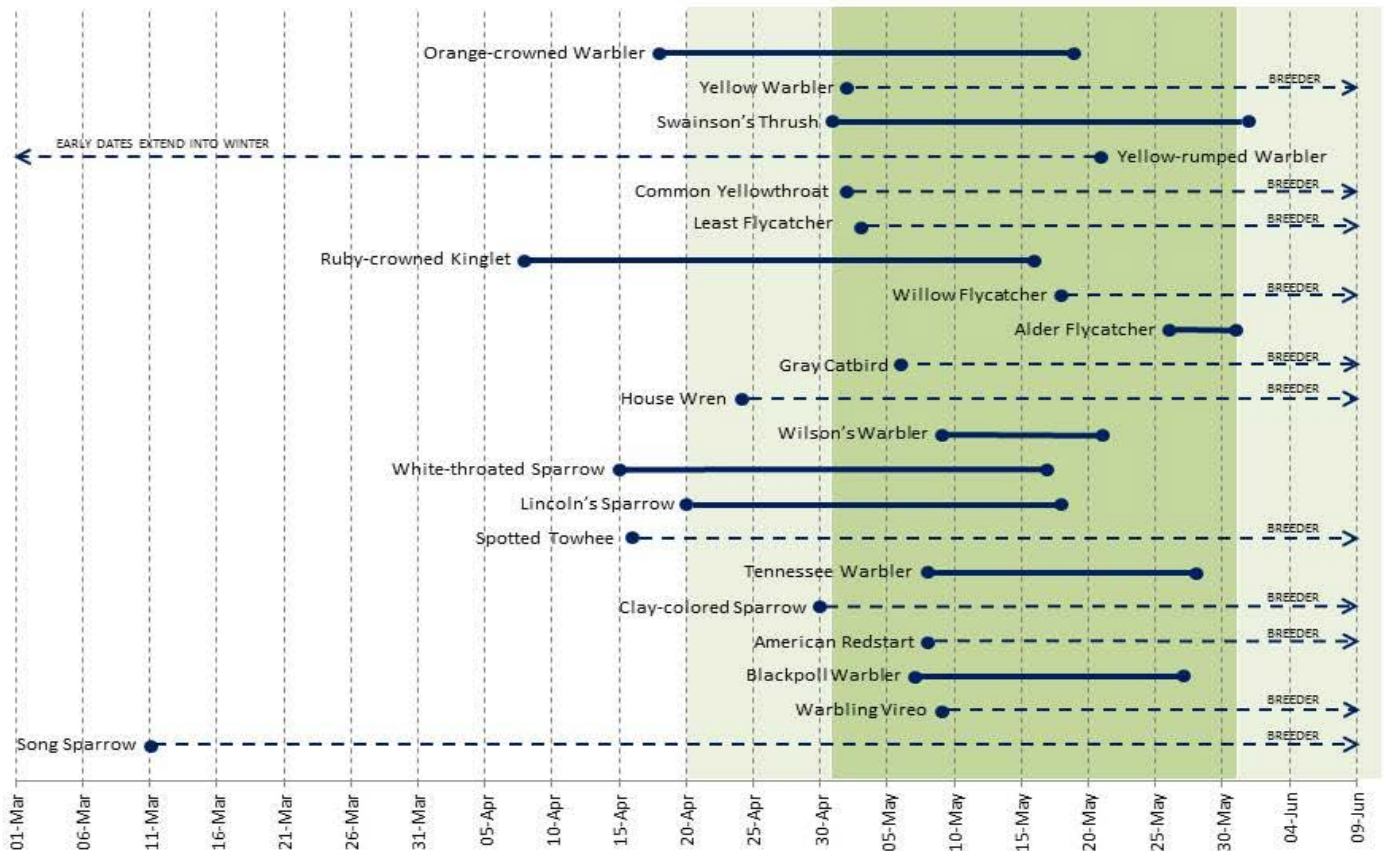


Figure 12. Early and late spring median dates for 20 most commonly-banded species at Farm Island and Fisherman's Point banding sites, South Dakota, from 2003-2017, derived from SDOU reporting system. Shaded area represents time period when spring banding occurs.

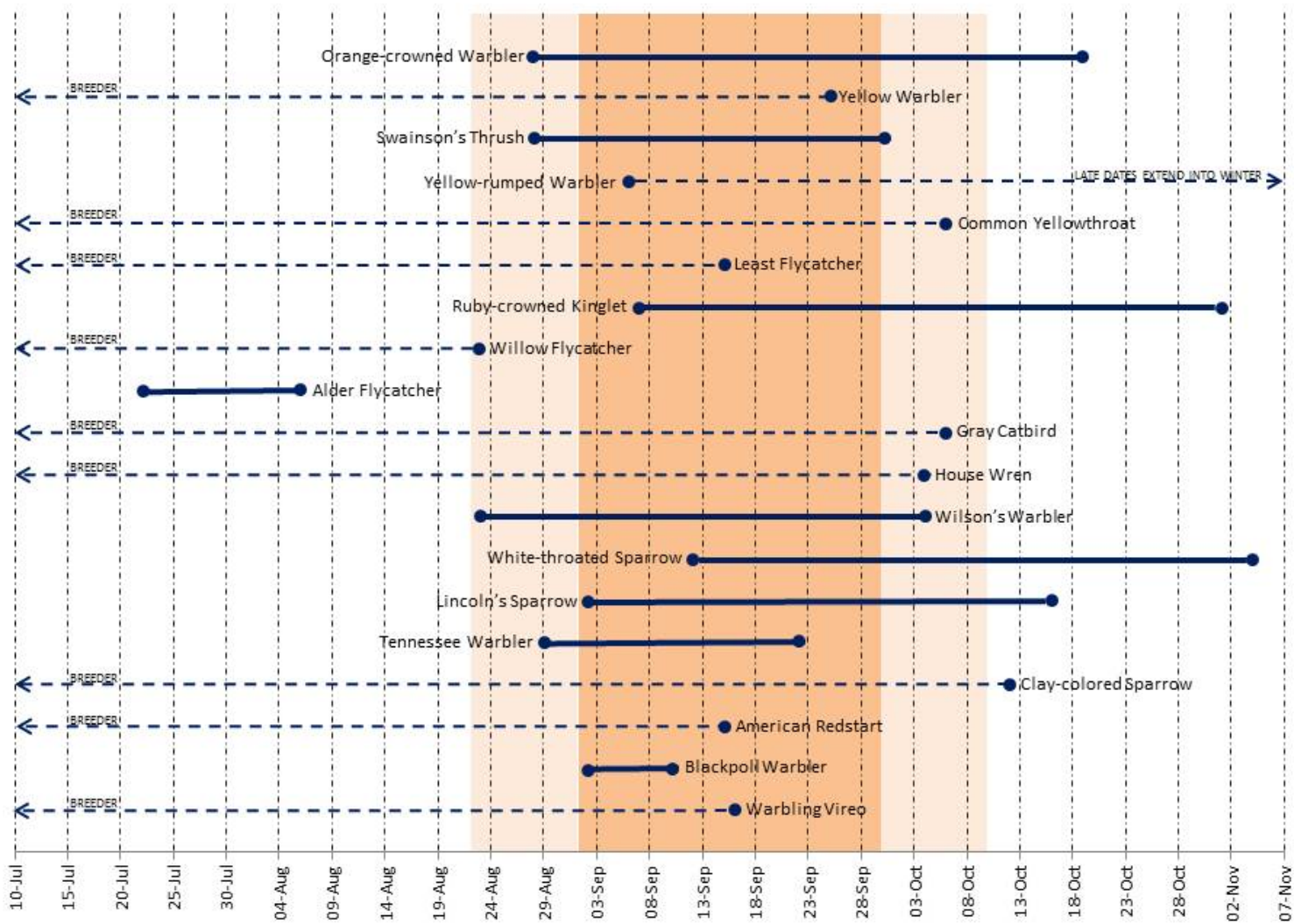


Figure 13. Early and late fall median dates for 20 most commonly-banded species at Farm Island and Fisherman's Point banding sites, South Dakota, from 2003-2017, derived from SDOU reporting system. Shaded area represents time period when fall banding occurs.

Species rarely captured at banding sites

Table 10 lists species that have been netted at our sites three times or less. Some species listed are rare in the state or in central South Dakota. Others typically occupy different habitats than those found at the banding sites.

Table 10. Species banded 1-3 times at Farm Island or Fisherman's Point banding sites, South Dakota, from 1992-2016.

| Species | Number banded | Comments |
|-------------------------------|---------------|---|
| Northern Parula | 3 | uncommon migrant in SD |
| Barn Swallow | 3 | netted at temporary Farm Island site in spring 2012 |
| American Kestrel | 3 | nests in the area, but typically occupies more open habitats |
| Blue Grosbeak | 2 | not a common inhabitant of these sites |
| House Finch | 2 | one netted at temporary Farm Island site in spring 2012 |
| Northern Rough-winged Swallow | 2 | typically occupies more open habitats than found at the banding sites |
| Belted Kingfisher | 2 | breeds in the area, but typically closely associated with aquatic areas |
| Connecticut Warbler | 2 | rare migrant in SD |
| LeConte's Sparrow | 2 | uncommon migrant in SD |
| Savannah Sparrow | 2 | more typically found in grassland habitats |
| Townsend's Warbler | 2 | rare migrant in SD |
| Blackburnian Warbler | 2 | rare migrant in SD |
| Red-shafted Flicker | 2 | more common in western SD |
| Winter Wren | 2 | typically a wintering species |
| Yellow-bellied Sapsucker | 2 | uncommon migrant in central SD |
| Flicker Intergrade | 2 | central SD is a known area of hybridization between Red-shafted and Yellow-shafted flickers |
| Sora | 2 | captured near a small wetland along Farm Island trail |
| Blue-winged Warbler | 1 | rare migrant in SD |
| Carolina Wren | 1 | rare migrant in central SD |
| Hooded Warbler | 1 | rare migrant in SD |

| | | |
|--------------------------------|---|--|
| Plumbeous Vireo | 1 | uncommon migrant outside the Black Hills |
| Red-headed Woodpecker | 1 | breeds in the area, but typically found in more open habitats |
| Worm-eating Warbler | 1 | rare migrant in SD |
| Wood Thrush | 1 | rare migrant in central SD |
| Yellow-billed Cuckoo | 1 | rare breeder in the area; uncommon migrant |
| Eastern Wood-Pewee | 1 | netted less than expected, unless it has been confused with other flycatchers |
| Audubon's Warbler | 1 | nests in the Black Hills and occurs less commonly elsewhere in the state |
| Tree Swallow | 1 | netted at temporary Farm Island site in spring 2012 |
| Western Kingbird | 1 | netted at temporary Farm Island site in spring 2012 |
| Western Meadowlark | 1 | netted at temporary Farm Island site in spring 2012 |
| Eastern Phoebe | 1 | uncommon migrant in SD |
| Cooper's Hawk | 1 | nests in the area at low densities |
| Western Tanager | 1 | uncommon migrant in central SD |
| Indigo x Lazuli Bunting hybrid | 1 | central SD is a known area of hybridization |
| Grosbeak hybrid | 1 | central SD is a known area of hybridization between Rose-breasted and Black-headed grosbeaks |
| Scarlet Tanager | 1 | rare breeder and uncommon migrant in SD |
| Townsend's Solitaire | 1 | permanent resident of Black Hills; typically a wintering species in central SD |
| Yellow-throated Warbler | 1 | rare migrant in SD |
| Lark Sparrow | 1 | netted at temporary Farm Island site in spring 2012 |

Full Life-cycle Bird Conservation

Those interested in bird conservation have increasingly recognized that migratory birds have year-round needs in breeding, migratory, and wintering areas. Our banding areas provide habitat for certain permanent residents, but the majority of birds we band use the areas for nesting or as migratory stopover sites. Of the twenty most commonly-netted species at our banding sites (Table 7), the majority are considered neotropical migratory species, which breed in Canada or the U.S. but winter in Mexico, Central or South America, or the Caribbean. These results demonstrate that Farm Island and Fisherman's Point are

helping to provide critical nesting and stop-over habitat to help fulfill a portion of the full life-cycle needs of these species.

Measurement Summaries

All measurement data are entered in the banding software and submitted to the USGS-BBL. We analyzed wing chord, tail length, and weight for the 20 most commonly banded species at our sites (Appendix B). Average, minimum, and maximum values are included, with standard deviations, for each measurement category for each of these species. If the species could be identified to sex, the same analyses are presented for males and females. Age categories were also analyzed for these measurements, comparing hatch year/second year birds to after hatch year/after second year birds. Average values by species and by sex, if applicable, are included in species profiles (Appendices C-V).

Traill's Flycatcher Identification

Bird banders may not band a bird they are unable to identify to species. One exception is "Traill's" Flycatcher, which can be either of two species, a Willow or Alder flycatcher, both of which occur in central South Dakota. The Willow Flycatcher breeds in central South Dakota. The Alder Flycatcher migrates through the area, and small numbers breed in the Black Hills. These species are most easily identified by their voices. Although very similar in size and appearance, these two species vary slightly in certain wing measurements (Pyle 1997).

Based on guidance provided in literature (Hussell 1990) and reference material (Pyle (1997) and consultation with other bird banders, we have collected additional wing measurement data on Traill's Flycatchers in recent years to attempt to categorize them to species. In addition to our standard measurements of wing chord, tail length, fat scores, and weight, we have recorded the following measurements for Traill's Flycatchers beginning with the spring of 2015:

- bill length of exposed culmen (length of bill not covered by feathers);
- bill length from anterior end (toward the tip) of nostrils (nares) to tip of bill;
- bill width at anterior end of nares;
- bill depth at anterior end of nares;
- length of the longest primary feather minus length of the 6th primary;
- difference in length between the 10th and 5th primaries; and
- whether the difference between the length of the 10th and 5th primaries is positive or negative.

Using data from 75 Traill's Flycatchers banded from 2015 through 2017, we categorized them as follows: 11 Willow Flycatchers, 47 Alder Flycatchers, and 17 that could not be categorized as either species. Figure 14 depicts this analysis in a scatter diagram plotting bill length from the nares to the tip as the y-axis. The x-axis plots values from the following formula, named Formula 1 on Figure 14: (longest primary minus 6th primary) minus (5th primary minus 10th primary). For this analysis, we included banding data from 2017.

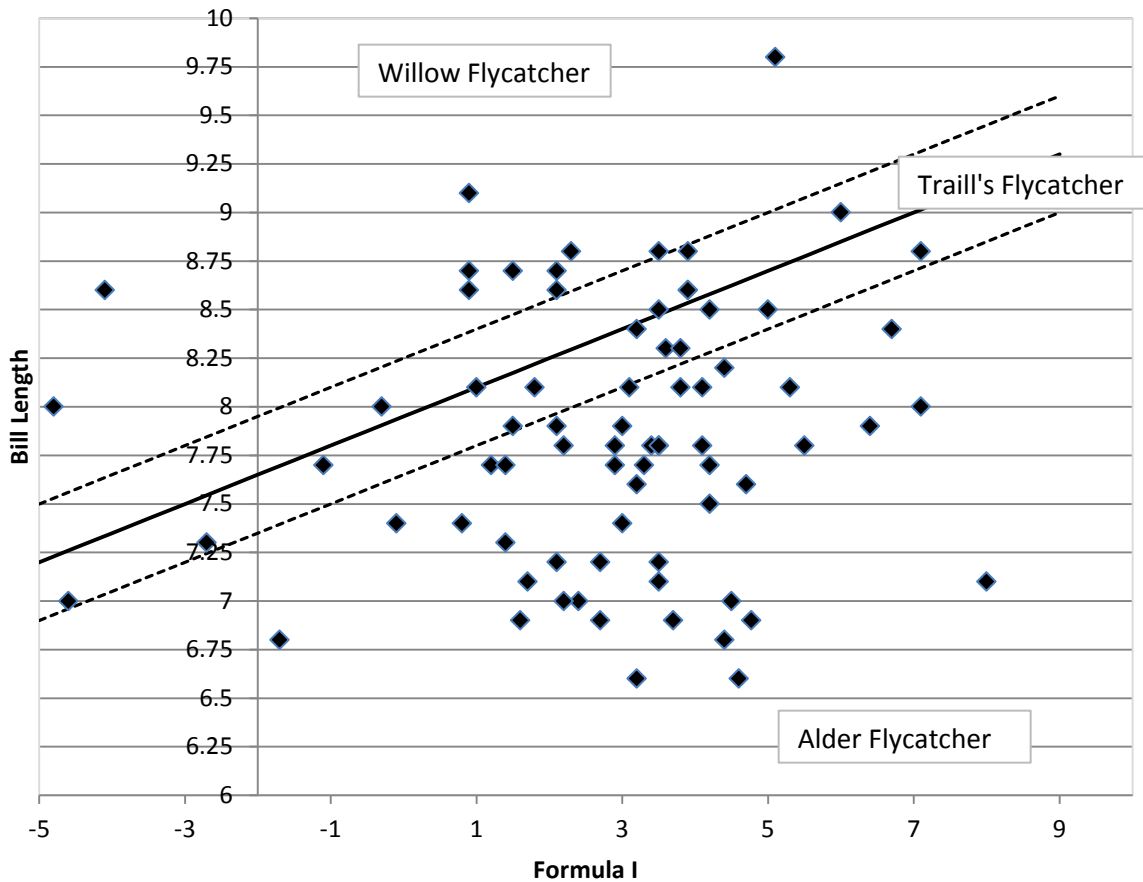


Figure 14. Scatter diagram of bill length and wing formula equation to separate Willow and Alder flycatchers, using data from Farm Island and Fisherman’s Point banding sites, South Dakota, from 2015 through 2017.

Recaptured birds

Long-term banding at a consistent location provides the opportunity to recapture individuals at various time intervals since banding, which has important habitat management implications. For species that migrate through our area without nesting, recaptures during the same season the bird was banded indicate that migrants are using our sites for resting and refueling during their spring and/or fall migration. Such evidence justifies protection of existing habitats that have demonstrated benefits to migratory birds. Recaptures during subsequent years prove site fidelity, whether for nesting or year-round residence. Such recaptures also strongly justify protection of habitats that are providing nesting and wintering habitats for species in those categories.

A local recapture is defined by the USGS-BBL as the capture of a previously banded bird at the same site where originally banded. A foreign recapture is of a previously-banded bird recaptured at a different location.

Table 11 illustrates 1,191 “unique” recaptures for 58 species at either of our sites from 1992 – 2016. A unique recapture is the capture of an individual banded bird during a specific banding season. If that individual was recaptured again in the same season, the additional

recaptures were not counted in this analysis. Table 11 includes a description of the species' status in central South Dakota, whether a potential breeder, migrant or wintering resident or year-round resident. We cannot conclude that all individuals of species identified as potential breeders nested in our area. Recaptured individuals for the potential breeder category are likely a combination of central South Dakota nesters and additional birds migrating through to nest elsewhere.

Table 11 demonstrates that we did not recapture an exclusively migratory species except during the same season the birds were banded. The Orange-crowned Warbler was the most commonly recaptured migratory species, with 85 unique recaptures. Recaptures during the remaining 8 time intervals were of species that either nest or live year-round in the vicinity of our banding sites. The most commonly recaptured breeding species were Common Yellowthroat (172), Yellow Warbler (119), and House Wren (106). Common Yellowthroats winter primarily throughout Mexico, south to Panama and northern South America, and in Bermuda, the Bahamas, Greater Antilles and Cayman Islands (Guzy and Ritchison 1999). The Yellow Warbler winters from northern Mexico south to portions of Brazil and Peru (Lowther et al. 1999). House Wrens winter in the southern U.S. and in much of Mexico (Johnson 1998). Among permanent residents occupying our sites, the Black-capped Chickadee was the most commonly recaptured species (160).

A subset of local recaptures is the "same season" category. It is well known that suitable and sufficient stopover habitats are critical for species that migrate between breeding and wintering areas (Moore et al. 1995). Moore and Kerlinger (1987) reviewed literature and described basic principles of bird migratory movements. North American breeders can increase their survivorship by migrating to the temperate neotropics, but this advantage must be balanced against the rigors of migration. Much of the energy needed for migration is gained prior to the journey, and selection of favorable migration routes can facilitate rapid replenishment of reserves during migration.

Minimum stopover duration, defined as time between first and last capture, is frequently mentioned by banders and bird migration researchers. Schaub et al. (2001) questioned the accuracy of this estimate based on banding at a stopover site in Switzerland. They challenged the assumption that minimum stopover duration represents total stopover duration by applying capture-recapture data and results of modeling probabilities of immigration and emigration. They concluded that small passerine stopover durations have generally been underestimated.

Table 12 subdivides the same season recaptures for species that are exclusively migratory in central South Dakota to depict the number of days between original banding and recapture. If the results of Schaub et al. (2001) are applicable, timeframes between capture and recapture likely underestimate the actual amount of time spent at these migration stopover sites in central South Dakota.

Table 11. Local recapture categorization for Farm Island and Fisherman’s Point banding sites, South Dakota, from 1992 – 2016.

| Species and Status* | same season | Recapture time since banded | | | | | | | | TOTAL |
|------------------------------|-------------|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | next season - 1yr | 1-2yr | 2-3yr | 3-4yr | 4-5yr | 5-6yr | 6-7yr | 7-8yr | |
| American Goldfinch (Y) | 1 | 1 | | | | | | | | 2 |
| American Redstart (B) | 7 | 1 | | | | | | | | 8 |
| American Robin (Y) | 10 | 3 | 3 | 3 | | | | | | 19 |
| Baltimore Oriole (B) | 4 | 2 | 1 | 2 | | | | | | 9 |
| Black-and-white Warbler (M) | 5 | | | | | | | | | 5 |
| Black-capped Chickadee (Y) | 58 | 61 | 22 | 10 | 5 | 4 | | | | 160 |
| Brown-headed Cowbird (B) | 6 | 5 | 2 | | | | | | | 13 |
| Black-headed Grosbeak (B) | 1 | 7 | 4 | 3 | 1 | 4 | | 1 | | 21 |
| Blue-headed Vireo (M) | 1 | | | | | | | | | 1 |
| Blackpoll Warbler (M) | 4 | | | | | | | | | 4 |
| Brown Thrasher (B) | 9 | 12 | 1 | | 4 | 2 | | | | 28 |
| Clay-colored Sparrow (B) | 3 | | | | | | | | | 3 |
| Chipping Sparrow (B) | 1 | | | | | | | | | 1 |
| Common Yellowthroat (B) | 62 | 48 | 29 | 14 | 8 | 3 | 5 | 2 | 1 | 172 |
| Downy Woodpecker (Y) | 6 | 4 | 2 | | 1 | | | | | 13 |
| Field Sparrow (B) | 10 | | | | | | | | | 10 |
| Great Crested Flycatcher (B) | | | | | 1 | | | | | 1 |
| Gray-cheeked Thrush (M) | 1 | | | | | | | | | 1 |
| Gray Catbird (B) | 10 | 8 | | 1 | 1 | | | | | 20 |
| Harris's Sparrow (M) | 9 | | | | | | | | | 9 |
| Hairy Woodpecker (Y) | 1 | 5 | 2 | 1 | | | | | | 9 |
| House Wren (B) | 53 | 39 | 8 | 5 | 1 | | | | | 106 |
| Indigo Bunting (B) | 1 | | | 1 | | | | | | 2 |
| Least Flycatcher (B) | 11 | | | | | | | | | 11 |
| Lincoln's Sparrow (M) | 26 | | | | | | | | | 26 |
| Magnolia Warbler (M) | 1 | | | | | | | | | 1 |
| Marsh Wren (B) | 3 | | | | | | | | | 3 |
| Mourning Warbler (M) | 1 | | | | | | | | | 1 |
| Myrtle Warbler (M) | 12 | | | | | | | | | 12 |
| Nashville Warbler (M) | 1 | | | | | | | | | 1 |
| Northern Cardinal (Y) | 4 | 4 | | 2 | 2 | | | | | 12 |
| Northern Waterthrush (M) | 4 | | | | | | | | | 4 |

| | | | | | | | | | | | |
|---------------------------------|------------|------------|-----------|-----------|-----------|-----------|----------|----------|----------|--|-------------|
| Orange-crowned Warbler (M) | 85 | | | | | | | | | | 85 |
| Orchard Oriole (B) | 1 | 1 | 1 | | | | | | | | 3 |
| Ovenbird (B) | 8 | | 1 | | | | | | | | 9 |
| Philadelphia Vireo (M) | 1 | | | | | | | | | | 1 |
| Rose-breasted Grosbeak (B) | | 1 | | | | | | | | | 1 |
| Red-breasted Nuthatch (M) | 1 | | | | | | | | | | 1 |
| Red-bellied Woodpecker (Y) | | | 1 | | | | | | | | 1 |
| Ruby-crowned Kinglet (M) | 13 | | | | | | | | | | 13 |
| Red-eyed Vireo (B) | 4 | 1 | | | | | | | | | 5 |
| Red-winged Blackbird (B) | 2 | 1 | 1 | | | | | | | | 4 |
| Slate-colored Junco (M) | 7 | | | | | | | | | | 7 |
| Song Sparrow (B) | 31 | 10 | 1 | | | | 1 | | | | 43 |
| Spotted Towhee (B) | 31 | 14 | 4 | 2 | 2 | | | | | | 53 |
| Sharp-shinned Hawk (M) | 1 | | | | | | | | | | 1 |
| Summer Tanager (M) | 1 | | | | | | | | | | 1 |
| Swamp Sparrow (M) | 2 | | | | | | | | | | 2 |
| Swainson's Thrush (M) | 41 | | | | | | | | | | 41 |
| Tennessee Warbler (M) | 1 | | | | | | | | | | 1 |
| Trail's Flycatcher (B - Willow) | 6 | | | | | | | | | | 6 |
| Warbling Vireo (B) | 8 | 9 | 1 | 1 | 1 | | | | | | 20 |
| White-breasted Nuthatch (Y) | 11 | 11 | 2 | 2 | 1 | | | | | | 27 |
| Wilson's Warbler (M) | 16 | | | | | | | | | | 16 |
| White-throated Sparrow (M) | 34 | | | | | | | | | | 34 |
| Yellow-breasted Chat (B) | 1 | | | | | | | | | | 1 |
| Yellow Warbler (B) | 59 | 36 | 9 | 5 | 6 | 1 | 3 | | | | 119 |
| Yellow-shafted Flicker (Y) | 3 | 2 | 1 | | | | | | | | 6 |
| TOTAL | 694 | 286 | 96 | 53 | 35 | 14 | 9 | 3 | 1 | | 1191 |

*Status in central SD
 B Potential breeder
 M Migrant or winter resident
 Y Year-round resident

Table 12. Time between banding and recapture for local recaptures of migratory species during the same season for Farm Island and Fisherman’s Point banding sites, South Dakota, 1992-2016.

| Species | Recapture time since banded | | | Total recaps. |
|-------------------------|-----------------------------|-----------|-------------|---------------|
| | 1-5 days | 6-10 days | 11+ days | |
| Black-and-white Warbler | 5 | | | 5 |
| Blue-headed Vireo | 1 | | | 1 |
| Blackpoll Warbler | 2 | 1 | 1 (13 days) | 4 |
| Gray-cheeked Thrush | 1 | | | 1 |
| Harris’s Sparrow | 8 | | 1 (11) | 9 |
| Lincoln’s Sparrow | 17 | 8 | 1 (12) | 26 |
| Magnolia Warbler | 1 | | | 1 |
| Mourning Warbler | 1 | | | 1 |
| Myrtle Warbler | 10 | 2 | 1 (14) | 13 |
| Nashville Warbler | 1 | | | 1 |
| Orange-crowned Warbler | 78 | 7 | | 85 |
| Philadelphia Vireo | 1 | | | 1 |
| Red-breasted Nuthatch | 1 | | | 1 |
| Ruby-crowned Kinglet | 11 | 2 | | 13 |
| Swamp Sparrow | 1 | | 1 (22) | 2 |
| Swainson’s Thrush | 36 | 4 | 1 (16) | 41 |
| Tennessee Warbler | 1 | | | 1 |
| Wilson’s Warbler | 14 | 1 | 1 (17) | 16 |
| White-throated Sparrow | 29 | 4 | 1 (14) | 34 |
| TOTAL | 219 | 29 | 8 | 256 |

Significant local recaptures:

Table 13 lists individual birds that we have banded and recaptured at least 5 years after banding. All species represented in the table nest in central South Dakota. All individuals listed in Table 13 were originally banded as at least after hatch year age. None of these records is a longevity record for these species, based on information maintained by the USGS-BBL. However, these findings clearly demonstrate strong site fidelity of permanent residents, such as the Black-capped Chickadee and of species returning to these sites to breed annually, including the Black-headed Grosbeak, Brown Thrasher, Common Yellowthroat, Song Sparrow, and Yellow Warbler.

Table 13. Birds recaptured at least 5 years after original banding date at Farm Island or Fisherman's Point banding sites, South Dakota, from 1992-2016.

| Species and sex ¹ | Band number | Location | Date and age when banded | Last recaptured | Minimum age ^{2,3} | Interim recaptures |
|------------------------------|-------------|-------------------|----------------------------------|-----------------|----------------------------|---|
| Black-capped Chickadee (U) | 2070-12717 | Farm Island | 9/16/1998 after hatch year (AHY) | 5/6/2003 | 6 years | spring 2001 fall 2002 |
| Black-capped Chickadee (U) | 2460-73276 | Fisherman's Point | 9/18/2009 AHY | 9/29/2014 | 6 years 4 months | spring 2010 spring 2011 fall 2013 |
| Black-capped Chickadee (U) | 2540-27682 | Fisherman's Point | 9/17/2010 AHY | 5/21/2015 | 5 years | fall 2012 spring 2013 |
| Black-headed Grosbeak (M) | 0981-97719 | Farm Island | 5/17/2002 AHY | 5/15/2007 | 6 years | spring 2004 |
| Black-headed Grosbeak (M) | 0981-97726 | Farm Island | 5/22/2002 AHY | 5/21/2007 | 6 years | spring 2003 |
| Black-headed Grosbeak (M) | 8071-78011 | Farm Island | 5/14/1996 AHY | 05/17/2001 | 5 years | |
| Black-headed Grosbeak (F) | 8071-78093 | Farm Island | 5/22/2001 AHY | 5/23/2006 | 6 years | spring 2004 |
| Black-headed Grosbeak (F) | 8101-63043 | Fisherman's Point | 5/26/2004 AHY | 5/23/2011 | 7 years | |
| Brown Thrasher (U) | 1453-72036 | Fisherman's Point | 5/10/2007 AHY | 9/10/2012 | 6 years 4 months | spring 2008 fall 2008 |
| Brown Thrasher (U) | 1453-72050 | Farm Island | 5/29/2009 AHY | 5/7/2014 | 6 years | spring 2013 |
| Common Yellowthroat (M) | 2070-12431 | Farm Island | 9/17/1997 AHY | 5/22/2003 | 7 years | |
| Common Yellowthroat (M) | 2070-12976 | Farm Island | 9/17/2009 AHY | 5/23/2014 | 5 years | fall 2010 spring 2011 spring 2013 |
| Common Yellowthroat (M) | 2190-36693 | Farm Island | 9/7/2001 AHY | 5/15/2007 | 7 years | spring 2002 spring 2003 spring 2006 |
| Common Yellowthroat (M) | 2270-39582 | Farm Island | 9/4/2003 AHY | 5/28/2009 | 7 years | spring 2004 spring 2005 |
| Common Yellowthroat (M) | 2270-39584 | Farm Island | 9/4/2003 AHY | 9/29/2009 | 7 years 4 months | fall 2007 spring 2008 spring 2009 |
| Common Yellowthroat (F) | 2370-23986 | Farm Island | 9/6/2006 AHY | 5/30/2013 | 8 years | |
| Common Yellowthroat (M) | 2460-73421 | Farm Island | 9/12/2006 AHY | 5/14/2014 | 9 years | spring 2013 |
| Song Sparrow (U) | 1641-76350 | Farm Island | 5/9/2003 AHY | 5/12/2009 | 7 years | |
| Yellow Warbler (F) | 2340-65653 | Farm Island | 5/27/2004 AHY | 5/27/2009 | 6 years | |
| Yellow Warbler (F) | 2370-23156 | Fisherman's Point | 5/20/2004 AHY | 05/20/2010 | 7 years | |
| Yellow Warbler (F) | 2370-23297 | Fisherman's Point | 5/25/2004 AHY | 05/19/2010 | 7 years | |
| Yellow Warbler (M) | 2500-50126 | Farm Island | 5/21/2008 AHY | 5/28/2014 | 7 years | spring 2009 |

¹F = female; M = male; U = unknown sex

²Longevity records for North American species, as reported to the USGS-BBL, can be viewed at this site: https://www.pwrc.usgs.gov/BBI/longevity/longevity_main.cfm

³Minimum age is estimated by assuming a hatch date of June for all species, making June of a bird's first year month 00 for this calculation.

Significant foreign recaptures

Our foreign recaptures are described below.

- A female Yellow Warbler banded as an ASY (after-second-year) age at Farm Island on May 24, 2016 was found dead in Montana on May 29, 2016. The cause of death code was: Caught due to striking: stationary object other than wires or towers. This bird travelled approximately 300 miles between the two sites.
- A female Common Yellowthroat banded as an AHY (after-hatch-year) age at Farm Island on September 11, 2013 was found dead in Grand Island, Nebraska on June 3, 2017. This individual also died from striking a stationary object other than wires or towers.
- A Blue Jay banded at Farm Island on October 9, 2013 was found dead in a trap line in Duck Mountain Provincial Forest in Manitoba, Canada on December 3, 2015. Bird banding and subsequent recaptures or encounters have shown that although some Blue Jays remain in an area year-round, others may migrate either north or south, even after breeding in an area.
- We netted and released a banded Alder Flycatcher on May 23, 2007 that was originally banded at Mugaha Creek in British Columbia, Canada on August 19, 2004.
- We banded a Blackpoll Warbler at Farm Island on May 25, 2005. The bird was recaptured that fall (September 15) and released at the Allegheny Front Bird Observatory in West Virginia. This species uses different migratory pathways during the spring and fall, a pattern our data supports.
- We banded a Swainson's Thrush at Farm Island on May 8, 2001. The bird was found dead two years later, on May 20, 2003, in Calgary, Alberta, Canada.

CONCLUSIONS

SDGFP Wildlife Diversity staff, other agency staff, and supervised volunteers have banded birds at Farm Island and Oahe Downstream state recreation areas since 1992 and 2004, respectively. We have mist-netted and banded birds as weather and other work commitments have allowed during each spring and fall, with the exception of portions of 2011, when flooding prevented access to the sites. During the reporting period of 1992 – 2016, we banded 21,226 birds of 126 species or hybrids at both sites combined.

We have had nearly 1,200 unique recaptures at our banding sites. These recaptures include documentation of stopovers during a migration season, continued use of the sites by permanent residents, and breeding site fidelity by species that nest in the areas but migrate south for the winter. These results demonstrate the importance of the banding sites in meeting full-cycle conservation needs of bird species. If these two sites are any

indication, available and suitable habitats throughout the state are meeting critical habitat needs for birds, and loss of such habitats has major impacts to birds and other wildlife.

Although we lack quantitative data from earlier banding efforts for comparison, our long-term commitment to this effort has allowed us to observe a shift in bird species composition, particularly at Farm Island, from forest-associated species to those considered generalists in habitat needs. This trend is consistent with the change in habitat conditions following the conversion of the Missouri River to a series of managed reservoirs 50-60 years ago. In addition to submersion of Missouri River forests following dam closures, remaining riparian forests dominated by eastern cottonwoods no longer experience the dynamic flooding and substrate movement and deposition needed to sustain and replace them.

Our banding is conducted at public sites. The Farm Island banding operation, in particular, is viewed annually by hundreds of Farm Island Nature Area users. This interface presents an excellent opportunity for the public to view wildlife biology, monitoring, and science in action. This experience includes observations of the use of standard methodology under the oversight of a cooperating federal entity (USGS-BBL) and safe handling and release of banded birds at a time when members of the public have increasingly less direct contact with nature. The link between our banding project and management of these two Parks Division sites demonstrates a longstanding, successful cooperative effort between divisions of our agency.

Our long-term banding operation has allowed us to help mentor banders seeking additional experience in handling and identifying birds. We have participated opportunistically in several research projects. We have collected substantial measurement data that contribute knowledge about the species we have handled.

There are fewer long-term monitoring wildlife efforts today than in the past, meaning less opportunity to gain the scientific, monitoring, and interpretive values of projects like the Farm Island and Fisherman's Point banding operations.

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Images in this report were taken by Farm Island and Fisherman's Point banders. Range maps were used with permission of the Cornell Lab of Ornithology (<https://www.allaboutbirds.org/>), using maps provided to them by the Birds of North America project (<https://birdsna.org/Species-Account/bna/species/rebnut/introduction>).

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ADDITIONAL RESOURCES

Books

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Bird Banding at Farm Island and Fisherman's Point (SDGFP): <https://gfp.sd.gov/bird-banding/>

South Dakota Breeding Bird Atlas2 (SDGFP): <https://gfp.sd.gov/breeding-bird-atlas/>

South Dakota Ornithologists' Union (SDOU): <http://sdou.org/>

Seasonal Bird Reporting (SDOU): <http://sdou.org/Birds/Reporting.aspx>

All About Birds (Cornell Lab of Ornithology): <https://www.allaboutbirds.org/>

North American Breeding Bird Survey (USGS): <https://www.pwrc.usgs.gov/bbs/>

eBird: <https://ebird.org/home>

Regional Birding Trail Guides

- Great Lakes (central SD): <https://gfp.sd.gov/userdocs/great-lakes-birding-trail.pdf>
- Glacial Lakes and Prairies (northeastern SD): <https://gfp.sd.gov/userdocs/glacial-lakes-birding.pdf>
- Black Hills, Badlands and Lakes (western SD): <https://gfp.sd.gov/userdocs/BHBadlands-birding-trail.pdf>
- Southeast SD: <https://gfp.sd.gov/userdocs/southeast-birding-trail.pdf>

Appendix A. Number of birds banded by species at Farm Island and Fisherman's Point, South Dakota, from 1992-2016 in order of total banded.

| Species | NUMBER BANDED | | |
|--|---------------|-------------------|-------|
| | Farm Island | Fisherman's Point | Total |
| Orange-crowned Warbler | 2,450 | 1,496 | 3,946 |
| Yellow Warbler | 1,199 | 596 | 1,795 |
| Swainson's Thrush | 1,085 | 539 | 1,624 |
| Myrtle Warbler (Yellow-rumped Warbler) | 997 | 594 | 1,591 |
| Common Yellowthroat | 1,088 | 178 | 1,266 |
| Least Flycatcher | 837 | 251 | 1,088 |
| Ruby-crowned Kinglet | 414 | 389 | 803 |
| Trail's Flycatcher ¹ | 572 | 191 | 763 |
| Gray Catbird | 402 | 217 | 619 |
| House Wren | 263 | 206 | 469 |
| Wilson's Warbler | 262 | 200 | 462 |
| White-throated Sparrow | 357 | 104 | 461 |
| Lincoln's Sparrow | 369 | 81 | 450 |
| Spotted Towhee | 272 | 104 | 376 |
| Tennessee Warbler | 159 | 185 | 344 |
| Clay-colored Sparrow | 233 | 104 | 337 |
| American Redstart | 287 | 44 | 331 |
| Blackpoll Warbler | 201 | 70 | 271 |
| Warbling Vireo | 174 | 88 | 262 |
| Song Sparrow | 240 | 21 | 261 |
| Black-capped Chickadee | 208 | 49 | 257 |
| Brown Thrasher | 170 | 72 | 242 |
| Ovenbird | 98 | 81 | 179 |
| Slate-colored Junco | 141 | 30 | 171 |
| White-crowned Sparrow | 154 | 9 | 163 |
| Red-eyed Vireo | 107 | 52 | 159 |
| Northern Waterthrush | 108 | 27 | 135 |
| American Robin | 88 | 46 | 134 |
| Black-and-white Warbler | 72 | 51 | 123 |
| Harris's Sparrow | 117 | 3 | 120 |
| Field Sparrow | 104 | 9 | 113 |
| Swamp Sparrow | 89 | 22 | 111 |
| Nashville Sparrow | 63 | 45 | 108 |
| Chipping Sparrow | 67 | 39 | 106 |
| Black-headed Grosbeak | 67 | 35 | 102 |
| Yellow-breasted Chat | 70 | 20 | 90 |
| American Goldfinch | 59 | 26 | 85 |
| Mourning Warbler | 45 | 36 | 81 |
| Baltimore Oriole | 31 | 42 | 73 |
| Yellow-shafted Flicker | 59 | 11 | 70 |
| Gray-cheeked Thrush | 64 | 5 | 69 |
| Magnolia Warbler | 40 | 26 | 66 |
| White-breasted Nuthatch | 43 | 19 | 62 |

| | | | |
|------------------------------|----|----|----|
| Northern Cardinal | 51 | 9 | 60 |
| Downy Woodpecker | 39 | 16 | 55 |
| Indigo Bunting | 37 | 16 | 53 |
| Cedar Waxwing | 46 | 4 | 50 |
| Orchard Oriole | 9 | 41 | 50 |
| Common Grackle | 45 | 1 | 46 |
| Red-winged Blackbird | 44 | 1 | 45 |
| Brown-headed Cowbird | 28 | 10 | 38 |
| Red-breasted Nuthatch | 22 | 9 | 31 |
| Bell's Vireo | 23 | 7 | 30 |
| Blue Jay | 20 | 6 | 26 |
| Rose-breasted Grosbeak | 18 | 6 | 24 |
| Brown Creeper | 16 | 6 | 22 |
| Western Palm Warbler | 15 | 7 | 22 |
| Hairy Woodpecker | 11 | 8 | 19 |
| MacGillivray's Warbler | 12 | 6 | 18 |
| Chestnut-sided Warbler | 13 | 3 | 16 |
| Golden-crowned Kinglet | 10 | 6 | 16 |
| American Tree Sparrow | 15 | 0 | 15 |
| Lazuli Bunting | 6 | 8 | 14 |
| Sharp-shinned Hawk | 13 | 1 | 14 |
| Great Crested Flycatcher | 7 | 6 | 13 |
| Marsh Wren | 13 | 0 | 13 |
| Blue-headed Vireo | 5 | 6 | 11 |
| Fox Sparrow | 10 | 1 | 11 |
| Veery | 6 | 5 | 11 |
| Eastern Kingbird | 6 | 4 | 10 |
| Philadelphia Vireo | 8 | 2 | 10 |
| Red-bellied Woodpecker | 5 | 4 | 9 |
| Unidentified Dark-eyed Junco | 0 | 9 | 9 |
| Black-throated Blue Warbler | 6 | 1 | 7 |
| Pine Siskin | 1 | 6 | 7 |
| American Kestrel | 4 | 0 | 6 |
| Black-throated Green Warbler | 4 | 1 | 5 |
| Hermit Thrush | 5 | 0 | 5 |
| Yellow-bellied Flycatcher | 4 | 1 | 5 |
| Bay-breasted Warbler | 4 | 1 | 4 |
| Canada Warbler | 3 | 0 | 4 |
| Eastern Bluebird | 3 | 1 | 4 |
| Flicker intergrade | 2 | 2 | 4 |
| Golden-winged Warbler | 3 | 1 | 4 |
| Oregon Junco | 4 | 0 | 4 |
| Red-headed Woodpecker | 4 | 0 | 4 |
| Solitary Sandpiper | 4 | 0 | 4 |
| Summer Tanager | 2 | 2 | 4 |
| Barn Swallow | 3 | 0 | 3 |
| Blue-winged Warbler | 2 | 2 | 3 |
| Northern Parula | 2 | 1 | 2 |
| Belted Kingfisher | 1 | 0 | 2 |

| | | | |
|---|---------------|--------------|---------------|
| Blackburnian Warbler | 1 | 1 | 2 |
| Blue Grosbeak | 0 | 1 | 2 |
| Connecticut Warbler | 2 | 2 | 2 |
| House Finch | 2 | 0 | 2 |
| LeConte's Sparrow | 2 | 0 | 2 |
| Northern Rough-winged Swallow | 2 | 0 | 2 |
| Red-shafted Flicker | 2 | 0 | 2 |
| Savannah Sparrow | 2 | 0 | 2 |
| Sora | 1 | 0 | 2 |
| Townsend's Warbler | 1 | 1 | 2 |
| Winter Wren | 2 | 1 | 2 |
| Yellow-billed Cuckoo | 2 | 0 | 2 |
| Yellow-bellied Sapsucker | 1 | 0 | 1 |
| Audubon's Warbler (Yellow-rumped Warbler) | 1 | 0 | 1 |
| Carolina Wren | 1 | 0 | 1 |
| Cooper's Hawk | 1 | 0 | 1 |
| Eastern Phoebe | 1 | 0 | 1 |
| Eastern Wood-Pewee | 1 | 0 | 1 |
| Hooded Warbler | 1 | 0 | 1 |
| Hybrid passerine (Audubon x Myrtle Warbler) | 0 | 1 | 1 |
| Indigo x Lazuli Bunting hybrid | 0 | 1 | 1 |
| Lark Sparrow | 1 | 0 | 1 |
| Plumbeous Vireo | 1 | 0 | 1 |
| Scarlet Tanager | 0 | 1 | 1 |
| Solitary Vireo | 1 | 0 | 1 |
| Townsend's Solitaire | 0 | 1 | 1 |
| Tree Swallow | 1 | 0 | 1 |
| Vesper Swallow | 1 | 0 | 1 |
| Western Kingbird | 1 | 0 | 1 |
| Western Meadowlark | 1 | 0 | 1 |
| Western Tanager | 1 | 0 | 1 |
| Worm-eating Warbler | 0 | 1 | 1 |
| Wood Thrush | 0 | 1 | 1 |
| Yellow-throated Warbler | 1 | 0 | 1 |
| TOTAL | 14,574 | 6,652 | 21,226 |

¹Willow or Alder Flycatcher

Appendix B. Summaries of selected measurements for the twenty most commonly banded species from 1992-2016 at Farm Island and Fisherman's Point banding sites in central South Dakota.

| Orange-crowned Warbler (All) | N | Avg | Min | Max | STD |
|-------------------------------------|-------|------|------|------|------|
| Wing Chord (mm) | 3,368 | 59.6 | 47.5 | 69.0 | 2.9 |
| Tail (mm) | 2,500 | 35.7 | 36.0 | 69.0 | 22.7 |
| Weight (g) | 3,336 | 9.2 | 6.0 | 14.0 | 1.2 |

| Male | | | | | | Female | | | | |
|-------------------------------|-------|------|------|------|------|---------------|------|------|------|------|
| Orange-crowned Warbler | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 1,808 | 60.9 | 48.0 | 69.0 | 2.6 | 1,560 | 58.2 | 47.5 | 68.5 | 2.7 |
| Tail (mm) | 1,421 | 38.3 | 36.0 | 63.0 | 23.5 | 1,079 | 32.5 | 37.0 | 69.0 | 21.9 |
| Weight (g) | 1,786 | 9.4 | 6.2 | 12.5 | 1.1 | 1,549 | 9.0 | 6.0 | 14.0 | 1.2 |

| (HY) Hatch year/(SY) Second year | | | | | | (AHY) After hatch year/(ASY) After second year | | | | |
|---|-------|------|------|------|------|---|------|------|------|------|
| Orange-crowned Warbler | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 1,294 | 59.5 | 47.5 | 68.0 | 2.4 | 1,065 | 59.5 | 48.0 | 68.5 | 3.8 |
| Tail (mm) | 1,093 | 41.6 | 36.0 | 69.0 | 21.7 | 793 | 35.6 | 37.0 | 63.0 | 21.2 |
| Weight (g) | 1,286 | 9.1 | 6.4 | 14.0 | 0.9 | 1,058 | 9.4 | 6.2 | 14.0 | 1.4 |

| Yellow Warbler (All) | N | Avg | Min | Max | STD |
|-----------------------------|-------|------|------|------|------|
| Wing Chord (mm) | 1,708 | 60.5 | 46.0 | 70.0 | 3.6 |
| Tail (mm) | 1,261 | 31.7 | 35.0 | 61.0 | 19.6 |
| Weight (g) | 1,693 | 10.2 | 6.9 | 16.0 | 1.7 |

| Male | | | | | | Female | | | | |
|-----------------------|-----|------|------|------|------|---------------|-------|------|------|------|
| Yellow Warbler | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 899 | 61.8 | 46.0 | 68.0 | 3.0 | 781 | 59.0 | 46.0 | 70.0 | 3.7 |
| Tail (mm) | 673 | 33.0 | 35.0 | 58.0 | 19.4 | 573 | 31.02 | 36.0 | 61.0 | 19.3 |
| Weight (g) | 887 | 10.5 | 7.3 | 14.9 | 1.6 | 779 | 9.9 | 6.9 | 16.0 | 1.6 |

| HY/SY | | | | | | AHY/ASY | | | | |
|-----------------------|-----|------|------|------|-----|----------------|------|------|------|------|
| Yellow Warbler | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 161 | 59.8 | 54.0 | 68.0 | 2.5 | 522 | 60.6 | 46.0 | 70.0 | 3.8 |
| Tail (mm) | 156 | 41.7 | 37.0 | 51.0 | 7.6 | 341 | 29.7 | 35.0 | 61.0 | 20.6 |
| Weight (g) | 160 | 9.6 | 7.4 | 12.4 | 1.2 | 341 | 10.3 | 6.9 | 16.0 | 1.7 |

| Swainson's Thrush (All) | N | Avg | Min | Max | STD |
|--------------------------------|-------|------|------|-------|-----|
| Wing Chord (mm) | 1,173 | 97.4 | 65.0 | 107.0 | 3.5 |
| Tail (mm) | 1,173 | 67.5 | 52.0 | 94.0 | 4.3 |
| Weight (g) | 1,173 | 32.6 | 20.2 | 43.8 | 3.3 |

| | HY/SY | | | | | AHY/ASY | | | | |
|--------------------------|-------|------|------|-------|-----|---------|------|------|-------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Swainson's Thrush | | | | | | | | | | |
| Wing Chord (mm) | 196 | 96.2 | 72.0 | 105.0 | 3.6 | 906 | 97.8 | 65.0 | 107.0 | 3.4 |
| Tail (mm) | 196 | 67.3 | 57.0 | 91.0 | 4.3 | 906 | 67.5 | 52.0 | 94.0 | 4.3 |
| Weight (g) | 196 | 30.7 | 20.2 | 42.8 | 3.3 | 906 | 33.1 | 24.6 | 43.8 | 3.1 |

| Myrtle Warbler (All) | N | Avg | Min | Max | STD |
|-----------------------------|-------|------|------|------|-----|
| Wing Chord (mm) | 1,117 | 71.3 | 56.0 | 81.0 | 2.9 |
| Tail (mm) | 1,117 | 55.1 | 38.0 | 68.0 | 3.2 |
| Weight (g) | 1,117 | 12.6 | 8.0 | 17.4 | 1.2 |

| | Male | | | | | Female | | | | |
|-----------------------|------|------|------|------|-----|--------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Myrtle Warbler | | | | | | | | | | |
| Wing Cord (mm) | 425 | 73.2 | 56.0 | 81.0 | 2.5 | 583 | 69.9 | 58.0 | 79.0 | 2.5 |
| Tail (mm) | 425 | 56.4 | 38.0 | 66.0 | 3.0 | 583 | 54.3 | 40.0 | 68.0 | 3.0 |
| Weight (g) | 425 | 13.0 | 8.0 | 17.1 | 1.2 | 583 | 12.5 | 9.2 | 17.4 | 1.2 |

| | HY/SY | | | | | AHY/ASY | | | | |
|-----------------------|-------|------|------|------|-----|---------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Myrtle Warbler | | | | | | | | | | |
| Wing Chord (mm) | 384 | 71.4 | 58.0 | 78.0 | 3.0 | 587 | 71.2 | 56.0 | 81.0 | 2.9 |
| Tail (mm) | 384 | 55.5 | 42.0 | 65.0 | 2.9 | 547 | 55.1 | 38.0 | 68.0 | 3.3 |
| Weight (g) | 384 | 12.3 | 8.0 | 15.7 | 1.1 | 547 | 13.0 | 9.1 | 17.4 | 1.2 |

| Common Yellowthroat (All) | N | Avg | Min | Max | STD |
|----------------------------------|-----|------|------|------|-----|
| Wing Chord (mm) | 889 | 53.5 | 44.0 | 65.6 | 2.5 |
| Tail (mm) | 889 | 49.1 | 26.0 | 60.0 | 3.4 |
| Weight (g) | 889 | 10.2 | 6.4 | 14.2 | 0.8 |

| | Male | | | | | Female | | | | |
|----------------------------|------|------|------|------|-----|--------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Common Yellowthroat | | | | | | | | | | |
| Wing Chord (mm) | 599 | 54.5 | 47.0 | 65.6 | 2.2 | 357 | 52.1 | 44.0 | 62.0 | 2.0 |
| Tail (mm) | 599 | 50.0 | 39.0 | 60.0 | 3.2 | 357 | 48.1 | 32.0 | 57.0 | 3.0 |
| Weight (g) | 599 | 10.4 | 7.9 | 13.9 | 0.7 | 357 | 9.8 | 6.4 | 14.2 | 0.8 |

| | HY/SY | | | | | AHY/ASY | | | | |
|----------------------------|-------|------|------|------|-----|---------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Common Yellowthroat | | | | | | | | | | |
| Wing Chord (mm) | 258 | 52.9 | 44.0 | 61.0 | 2.2 | 661 | 53.9 | 47.0 | 65.6 | 2.5 |
| Tail (mm) | 258 | 48.5 | 40.0 | 56.0 | 3.0 | 661 | 49.5 | 32.0 | 60.0 | 3.3 |
| Weight (g) | 258 | 10.1 | 7.5 | 14.2 | 0.8 | 661 | 10.2 | 6.4 | 13.8 | 0.8 |

| Least Flycatcher (All) | N | Avg | Min | Max | STD |
|-------------------------------|-------|------|------|------|-----|
| Wing Chord (mm) | 1,086 | 63.0 | 49.0 | 69.0 | 2.7 |
| Tail (mm) | 768 | 54.0 | 46.0 | 68.0 | 3.0 |
| Weight (g) | 1,078 | 11.3 | 6.3 | 15.8 | 1.1 |

| Least Flycatcher | HY/SY | | | | | AHY/ASY | | | | |
|-------------------------|--------------|------|------|------|-----|----------------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 80 | 62.4 | 57.0 | 68.0 | 2.8 | 993 | 63.0 | 49.0 | 69.0 | 2.7 |
| Tail (mm) | 77 | 53.9 | 49.0 | 65.0 | 3.0 | 684 | 54.0 | 46.0 | 68.0 | 3.0 |
| Weight (g) | 80 | 10.9 | 6.7 | 14.1 | 1.3 | 987 | 11.3 | 6.3 | 15.8 | 1.1 |

| Ruby-crowned Kinglet (All) | N | Avg | Min | Max | STD |
|-----------------------------------|-----|------|------|------|-----|
| Wing Chord (mm) | 651 | 56.9 | 51.0 | 64.0 | 2.1 |
| Tail (mm) | 460 | 41.8 | 14.0 | 49.0 | 2.7 |
| Weight (g) | 649 | 6.4 | 4.0 | 10.7 | 0.7 |

| Ruby-crowned Kinglet | Male | | | | | Female | | | | |
|-----------------------------|-------------|------|------|------|-----|---------------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 237 | 58.6 | 53.0 | 64.0 | 1.7 | 397 | 55.9 | 51.0 | 62.0 | 1.5 |
| Tail (mm) | 158 | 43.1 | 37.0 | 49.0 | 2.3 | 289 | 41.2 | 33.0 | 49.0 | 2.2 |
| Weight (g) | 235 | 6.6 | 5.0 | 9.5 | 0.6 | 397 | 6.3 | 4.0 | 10.7 | 0.7 |

| Ruby-crowned Kinglet | HY/SY | | | | | AHY/ASY | | | | |
|-----------------------------|--------------|------|------|------|-----|----------------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 126 | 56.2 | 51.0 | 59.0 | 1.5 | 275 | 57.0 | 52.0 | 63.0 | 2.2 |
| Tail (mm) | 106 | 42.0 | 37.0 | 49.0 | 2.2 | 230 | 42.0 | 33.0 | 49.0 | 2.5 |
| Weight (g) | 124 | 6.3 | 4.7 | 8.5 | 0.6 | 276 | 6.5 | 4.0 | 10.7 | 0.9 |

| Traill's Flycatcher (All) | N | Avg | Min | Max | STD |
|----------------------------------|-----|------|------|------|-----|
| Wing Chord (mm) | 763 | 71.7 | 58.0 | 79.0 | 3.2 |
| Tail (mm) | 509 | 57.7 | 45.0 | 74.0 | 3.5 |
| Weight (g) | 750 | 14.3 | 10.0 | 19.2 | 1.5 |

| Traill's Flycatcher | HY/SY | | | | | AHY/ASY | | | | |
|----------------------------|--------------|------|------|------|-----|----------------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 56 | 69.9 | 63.0 | 77.0 | 2.8 | 692 | 72.0 | 58.0 | 79.0 | 3.1 |
| Tail (mm) | 49 | 57.0 | 50.0 | 67.0 | 3.7 | 447 | 57.9 | 45.0 | 74.0 | 3.5 |
| Weight (g) | 56 | 13.2 | 10.9 | 16.2 | 1.2 | 681 | 14.4 | 10.0 | 19.2 | 1.5 |

| Gray Catbird (All) | N | Avg | Min | Max | STD |
|---------------------------|-----|------|------|-------|-----|
| Wing Chord (mm) | 589 | 88.7 | 75.0 | 102.0 | 3.1 |
| Tail (mm) | 431 | 91.8 | 40.0 | 114.0 | 5.8 |
| Weight (g) | 581 | 38.1 | 30.7 | 63.1 | 3.3 |

| Gray Catbird | HY/SY | | | | | AHY/ASY | | | | |
|---------------------|--------------|------|------|-------|-----|----------------|------|------|-------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 175 | 87.8 | 80.0 | 98.0 | 2.9 | 300 | 89.3 | 75.0 | 102.0 | 3.1 |
| Tail (mm) | 147 | 91.1 | 71.0 | 104.0 | 5.1 | 194 | 92.6 | 40.0 | 114.0 | 6.6 |
| Weight (g) | 173 | 37.8 | 30.8 | 45.6 | 2.9 | 298 | 38.3 | 30.1 | 63.1 | 3.6 |

| House Wren (All) | N | Avg | Min | Max | STD |
|-------------------------|-----|------|------|------|-----|
| Wing Chord (mm) | 458 | 50.6 | 39.0 | 64.0 | 2.0 |
| Tail (mm) | 355 | 41.9 | 31.0 | 55.0 | 2.7 |
| Weight (g) | 441 | 10.7 | 8.0 | 17.4 | 0.9 |

| House Wren | HY/SY | | | | | AHY/ASY | | | | |
|-------------------|--------------|------|------|------|-----|----------------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 81 | 50.4 | 46.0 | 55.0 | 1.5 | 330 | 50.7 | 39.0 | 64.0 | 2.1 |
| Tail (mm) | 69 | 42.6 | 38.0 | 50.0 | 2.4 | 252 | 42.0 | 35.0 | 89.0 | 3.9 |
| Weight (g) | 79 | 10.6 | 8.7 | 12.5 | 0.8 | 317 | 10.7 | 8.0 | 17.4 | 0.9 |

| Wilson's Warbler (All) | N | Avg | Min | Max | STD |
|-------------------------------|-----|------|------|------|-----|
| Wing Chord (mm) | 452 | 55.9 | 49.5 | 68.5 | 2.0 |
| Tail (mm) | 280 | 49.4 | 38.0 | 56.0 | 2.4 |
| Weight (g) | 446 | 8.0 | 6.0 | 11.4 | 0.7 |

| Wilson's Warbler | Male | | | | | Female | | | | |
|-------------------------|-------------|------|------|------|-----|---------------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 299 | 56.6 | 49.5 | 68.5 | 1.9 | 145 | 54.6 | 52.0 | 61.0 | 1.4 |
| Tail (mm) | 186 | 49.7 | 38.0 | 55.0 | 2.4 | 93 | 48.8 | 41.0 | 56.0 | 2.3 |
| Weight (g) | 296 | 8.1 | 6.0 | 11.4 | 0.7 | 143 | 7.7 | 6.5 | 10.4 | 0.6 |

| Wilson's Warbler | HY/SY | | | | | AHY/ASY | | | | |
|-------------------------|--------------|------|------|------|-----|----------------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 232 | 55.6 | 50.0 | 61.0 | 1.9 | 138 | 56.4 | 49.5 | 68.5 | 2.2 |
| Tail (mm) | 143 | 49.6 | 38.0 | 56.0 | 2.4 | 97 | 49.5 | 45.0 | 55.0 | 2.3 |
| Weight (g) | 228 | 7.9 | 6.5 | 10.0 | 0.6 | 137 | 8.1 | 6.3 | 11.4 | 0.8 |

| White-throated Sparrow (All) | N | Avg | Min | Max | STD |
|-------------------------------------|-----|------|------|------|-----|
| Wing Chord (mm) | 432 | 71.5 | 64.0 | 89.0 | 2.9 |
| Tail (mm) | 345 | 71.7 | 59.0 | 82.0 | 3.5 |
| Weight (g) | 432 | 25.2 | 14.1 | 34.9 | 2.4 |

HY/SY

AHY/ASY

| White-throated Sparrow | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
|-------------------------------|-----|------|------|------|-----|-----|------|------|------|-----|
| Wing Chord (mm) | 137 | 71.5 | 64.0 | 77.5 | 2.8 | 151 | 70.9 | 65.0 | 79.0 | 3.0 |
| Tail (mm) | 116 | 72.0 | 60.0 | 82.0 | 3.4 | 123 | 70.6 | 59.0 | 82.0 | 3.4 |
| Weight (g) | 137 | 24.5 | 19.9 | 30.7 | 2.2 | 145 | 26.1 | 14.1 | 34.9 | 2.8 |

| Lincoln's Sparrow (All) | N | Avg | Min | Max | STD |
|--------------------------------|-----|------|------|------|-----|
| Wing Chord (mm) | 401 | 60.8 | 51.0 | 69.0 | 2.5 |
| Tail (mm) | 357 | 56.6 | 43.0 | 69.0 | 3.6 |
| Weight (g) | 396 | 16.5 | 10.9 | 22.2 | 1.6 |

HY/SY

AHY/ASY

| Lincoln's Sparrow | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
|--------------------------|-----|------|------|------|-----|-----|------|------|------|-----|
| Wing Chord (mm) | 145 | 60.6 | 55.0 | 67.0 | 2.2 | 161 | 60.7 | 51.0 | 69.0 | 2.7 |
| Tail (mm) | 136 | 56.8 | 43.0 | 69.0 | 3.6 | 140 | 55.8 | 45.0 | 65.0 | 3.7 |
| Weight (g) | 148 | 16.2 | 10.9 | 22.2 | 1.3 | 160 | 17.0 | 13.6 | 21.3 | 1.6 |

| Spotted Towhee (All) | N | Avg | Min | Max | STD |
|-----------------------------|-----|------|------|-------|-----|
| Wing Chord (mm) | 365 | 83.5 | 72.0 | 96.0 | 3.2 |
| Tail (mm) | 301 | 95.0 | 45.0 | 112.0 | 5.8 |
| Weight (g) | 359 | 38.4 | 28.5 | 46.5 | 3.0 |

Male

Female

| Spotted Towhee | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
|-----------------------|-----|------|------|-------|-----|-----|------|------|-------|-----|
| Wing Chord (mm) | 182 | 85.3 | 79.0 | 96.0 | 2.5 | 149 | 81.4 | 72.0 | 88.0 | 2.4 |
| Tail (mm) | 156 | 96.8 | 45.0 | 112.0 | 6.1 | 125 | 93.1 | 85.0 | 110.0 | 3.9 |
| Weight (g) | 178 | 39.2 | 28.5 | 46.5 | 3.0 | 147 | 37.3 | 31.6 | 43.3 | 2.7 |

HY/SY

AHY/ASY

| Spotted Towhee | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
|-----------------------|-----|------|------|-------|-----|-----|------|------|-------|-----|
| Wing Chord (mm) | 169 | 83.3 | 75.0 | 96.0 | 3.1 | 167 | 83.7 | 72.0 | 92.0 | 3.2 |
| Tail (mm) | 150 | 95.2 | 85.0 | 110.0 | 4.5 | 129 | 94.7 | 45.0 | 112.0 | 7.1 |
| Weight (g) | 168 | 38.2 | 28.5 | 46.5 | 3.1 | 162 | 38.7 | 31.6 | 45.0 | 2.9 |

| Tennessee Warbler (All) | N | Avg | Min | Max | STD |
|--------------------------------|-----|------|------|------|-----|
| Wing Chord (mm) | 340 | 62.5 | 51.0 | 70.0 | 2.4 |
| Tail (mm) | 130 | 41.4 | 35.0 | 58.0 | 3.2 |
| Weight (g) | 335 | 11.3 | 7.7 | 15.1 | 1.5 |

| Male | | | | | | Female | | | | |
|--------------------------|-----|------|------|------|-----|---------------|------|------|------|-----|
| Tennessee Warbler | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 170 | 63.7 | 58.0 | 70.0 | 2.0 | 145 | 61.3 | 51.0 | 67.0 | 2.2 |
| Tail (mm) | 66 | 42.3 | 37.0 | 58.0 | 3.0 | 46 | 40.0 | 35.0 | 55.0 | 3.3 |
| Weight (g) | 165 | 11.5 | 8.6 | 14.8 | 1.5 | 146 | 11.1 | 7.7 | 15.1 | 1.4 |

| HY/SY | | | | | | AHY/ASY | | | | |
|--------------------------|----|------|------|------|-----|----------------|------|------|------|-----|
| Tennessee Warbler | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 17 | 61.9 | 57.0 | 68.0 | 2.9 | 317 | 62.6 | 51.0 | 70.0 | 2.4 |
| Tail (mm) | 17 | 40.8 | 36.0 | 45.0 | 2.6 | 108 | 41.6 | 35.0 | 58.0 | 3.2 |
| Weight (g) | 17 | 10.3 | 8.1 | 12.9 | 1.4 | 311 | 11.4 | 7.7 | 15.1 | 1.5 |

| Clay-colored Sparrow (All) | N | Avg | Min | Max | STD |
|-----------------------------------|-----|------|------|------|-----|
| Wing Chord (mm) | 283 | 59.7 | 52.0 | 70.0 | 2.7 |
| Tail (mm) | 266 | 58.5 | 33.0 | 69.0 | 3.3 |
| Weight (g) | 279 | 11.3 | 9.1 | 13.8 | 0.9 |

| HY/SY | | | | | | AHY/ASY | | | | |
|-----------------------------|-----|------|------|------|-----|----------------|------|------|------|-----|
| Clay-colored Sparrow | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 120 | 59.1 | 54.0 | 70.0 | 2.4 | 135 | 59.8 | 52.0 | 70.0 | 2.8 |
| Tail (mm) | 119 | 58.4 | 33.0 | 65.0 | 3.5 | 120 | 58.4 | 47.0 | 69.0 | 3.2 |
| Weight (g) | 119 | 11.2 | 9.1 | 13.8 | 0.8 | 133 | 11.4 | 9.7 | 13.7 | 0.9 |

| American Redstart (All) | N | Avg | Min | Max | STD |
|--------------------------------|-----|------|------|------|-----|
| Wing Chord (mm) | 320 | 60.9 | 52.0 | 67.0 | 2.3 |
| Tail (mm) | 252 | 55.2 | 46.0 | 67.0 | 2.7 |
| Weight (g) | 318 | 8.7 | 5.9 | 14.9 | 1.0 |

| Male | | | | | | Female | | | | |
|--------------------------|-----|------|------|------|-----|---------------|------|------|------|-----|
| American Redstart | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 158 | 62.3 | 52.0 | 67.0 | 1.9 | 159 | 59.6 | 56.0 | 66.0 | 1.8 |
| Tail (mm) | 124 | 56.1 | 46.0 | 67.0 | 2.8 | 126 | 54.3 | 47.0 | 60.0 | 2.4 |
| Weight (g) | 158 | 8.9 | 7.0 | 13.0 | 0.9 | 157 | 8.5 | 5.9 | 14.9 | 1.0 |

| American Redstart | HY/SY | | | | | AHY/ASY | | | | |
|--------------------------|--------------|------|------|------|-----|----------------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 70 | 60.7 | 52.0 | 67.0 | 2.4 | 243 | 61.1 | 56.0 | 67.0 | 2.2 |
| Tail (mm) | 60 | 55.4 | 47.0 | 62.0 | 2.5 | 185 | 55.1 | 46.0 | 67.0 | 2.8 |
| Weight (g) | 71 | 8.5 | 7.0 | 10.2 | 0.7 | 240 | 8.8 | 5.9 | 14.9 | 1.0 |

| Blackpoll Warbler (All) | N | Avg | Min | Max | STD |
|--------------------------------|-----|------|------|------|-----|
| Wing Chord (mm) | 269 | 73.3 | 62.0 | 86.0 | 2.8 |
| Tail (mm) | 171 | 49.3 | 42.0 | 59.0 | 2.4 |
| Weight (g) | 269 | 14.4 | 10.1 | 19.6 | 1.9 |

| Blackpoll Warbler | Male | | | | | Female | | | | |
|--------------------------|-------------|------|------|------|-----|---------------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 142 | 74.9 | 65.0 | 81.0 | 2.2 | 122 | 71.5 | 62.0 | 86.0 | 2.3 |
| Tail (mm) | 95 | 50.2 | 45.0 | 59.0 | 2.1 | 72 | 48.0 | 42.0 | 54.0 | 2.2 |
| Weight (g) | 143 | 15.0 | 10.9 | 19.6 | 1.9 | 121 | 13.7 | 10.1 | 19.0 | 1.6 |

| Blackpoll Warbler | HY/SY | | | | | AHY/ASY | | | | |
|--------------------------|--------------|------|------|------|-----|----------------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 8 | 73.8 | 69.0 | 86.0 | 5.5 | 260 | 73.3 | 62.0 | 81.0 | 2.7 |
| Tail (mm) | 7 | 49.7 | 46.0 | 54.0 | 2.6 | 163 | 49.3 | 42.0 | 59.0 | 2.4 |
| Weight (g) | 8 | 13.3 | 11.8 | 15.8 | 1.5 | 260 | 14.4 | 10.1 | 19.6 | 1.9 |

| Warbling Vireo (All) | N | Avg | Min | Max | STD |
|-----------------------------|-----|------|------|------|-----|
| Wing Chord (mm) | 253 | 69.5 | 52.0 | 80.0 | 3.6 |
| Tail (mm) | 190 | 51.2 | 42.0 | 66.0 | 3.5 |
| Weight (g) | 254 | 14.7 | 8.8 | 19.6 | 1.9 |

| Warbling Vireo | HY/SY | | | | | AHY/ASY | | | | |
|-----------------------|--------------|------|------|------|-----|----------------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 73 | 69.1 | 55.0 | 80.0 | 3.3 | 162 | 69.6 | 52.0 | 79.0 | 3.8 |
| Tail (mm) | 68 | 51.3 | 45.0 | 61.0 | 3.3 | 107 | 51.1 | 42.0 | 66.0 | 3.6 |
| Weight (g) | 72 | 14.2 | 10.7 | 18.8 | 1.6 | 164 | 15.0 | 8.8 | 19.6 | 2.1 |

| Song Sparrow (All) | N | Avg | Min | Max | STD |
|---------------------------|-----|------|------|------|-----|
| Wing Chord (mm) | 235 | 65.1 | 57.0 | 76.0 | 2.9 |
| Tail (mm) | 212 | 65.7 | 38.0 | 76.0 | 5.2 |
| Weight (g) | 227 | 20.8 | 17.2 | 24.8 | 1.5 |

| Song Sparrow | HY/SY | | | | | AHY/ASY | | | | |
|---------------------|--------------|------|------|------|-----|----------------|------|------|------|-----|
| | N | Avg | Min | Max | STD | N | Avg | Min | Max | STD |
| Wing Chord (mm) | 100 | 64.8 | 57.0 | 75.0 | 3.0 | 85 | 65.4 | 60.0 | 76.0 | 3.0 |
| Tail (mm) | 94 | 65.4 | 43.0 | 74.0 | 5.2 | 76 | 66.2 | 58.0 | 76.0 | 4.5 |
| Weight (g) | 98 | 20.6 | 17.2 | 24.1 | 1.6 | 82 | 21.0 | 18.0 | 24.8 | 1.4 |

Appendix C. Orange-crowned Warbler (*Oreothlypis celata*) profile.

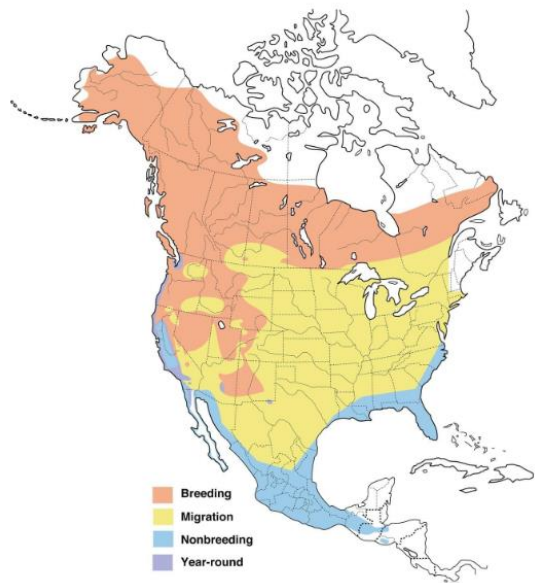
At 18.6% (3,946), this migratory species has been the most commonly-banded at our sites by a large margin. It has also been the most commonly-banded species in the fall, at 31.5% (3,336). Analysis of sightings reported to the SDOU database showed the late spring median date in Missouri River counties considered was May 19, approximately 2/3 of the way through our typical spring banding period (Table 8). This was the most commonly recaptured species during the same season the individual birds were banded (85).

| Orange-Crowned Warbler Measurements (sample sizes in parentheses)* | | | |
|---|--------------------------|---------------------|-----------------------|
| | average all birds | male average | female average |
| wing chord (mm) | 59.6 (3,368) | 60.9 (1,808) | 58.2 (1,560) |
| tail (mm) | 35.7 (2,500) | 38.3 (1,421) | 32.5 (1,079) |
| weight (g) | 9.2 (3,336) | 9.4 (1,786) | 9.0 (1,549) |

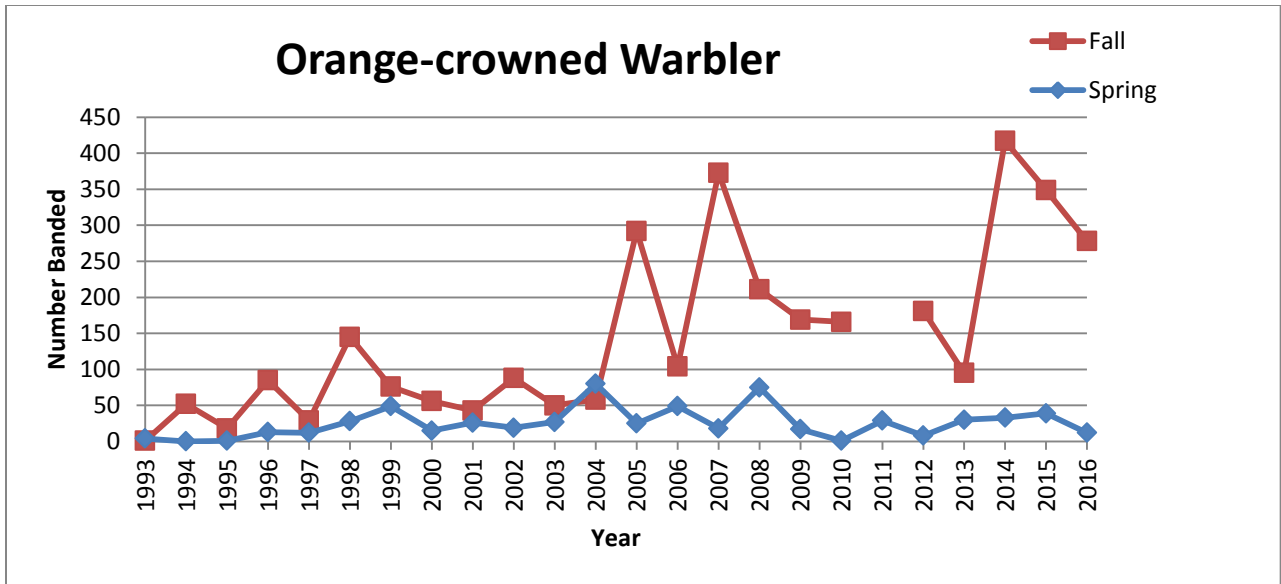
*See Appendix B for more detailed analysis. Male and female totals may not equal all birds total if sex was undetermined for some birds.



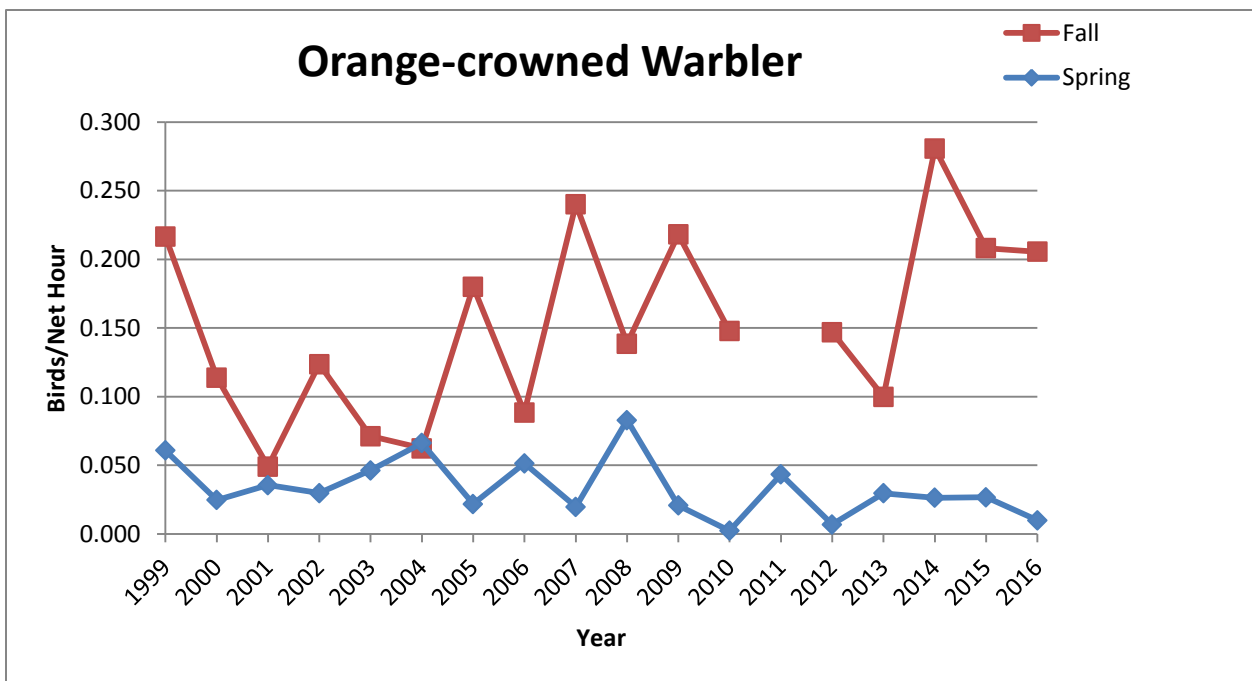
Male with head feathers parted to show orange crown



Orange-crowned Warbler



Number of Orange-crowned Warblers banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1993-2016.



Number of Orange-crowned Warblers banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix D. Yellow Warbler (*Setophaga petechia*) Profile.

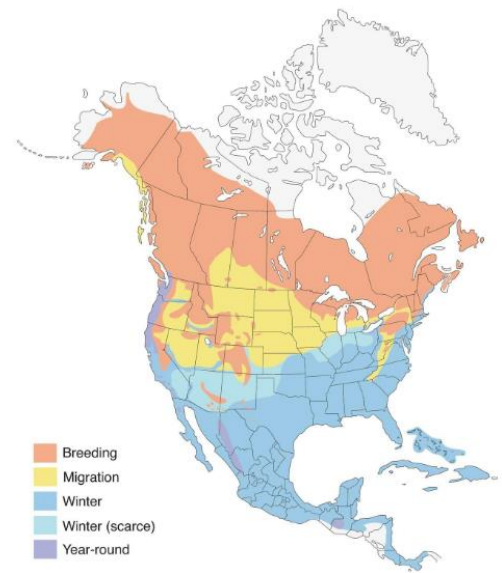
This species migrates through and nests in central South Dakota. Yellow Warbler captures made up 8.46% (1,795) of birds banded at our sites. This was the most commonly banded species in the spring at 14.24% (1,515). Analysis of SDOU sightings indicated that we should have relatively good representation of this species in the fall (Table 9). We had 119 unique recaptures of Yellow Warblers, with nearly 80% during the same or next season following the season the individual was banded. Three individuals were recaptured at a minimum age of 7 years; 2 females at Fisherman's Point and 1 male at Farm Island.

| Yellow Warbler Measurements (sample sizes in parentheses)* | | | |
|---|--------------------------|---------------------|-----------------------|
| | average all birds | male average | female average |
| wing chord (mm) | 60.5 (1,708) | 61.8 (899) | 59.0 (781) |
| tail (mm) | 31.7 (1,261) | 33.0 (673) | 31.0 (573) |
| weight (g) | 10.2 (1,693) | 10.5 (887) | 9.9 (779) |

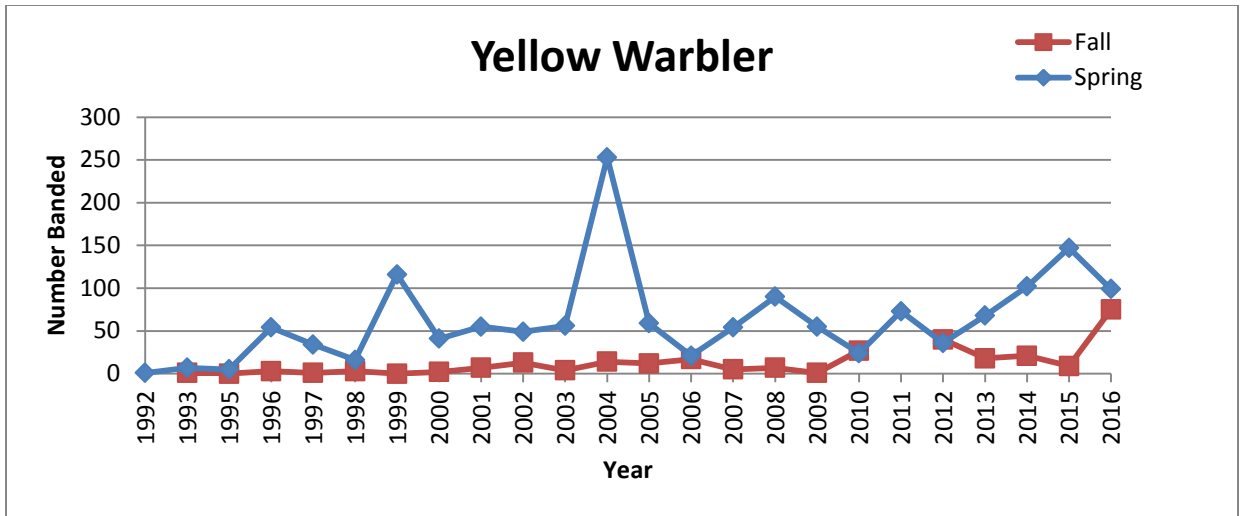
*See Appendix B for more detailed analysis. Male and female totals may not equal all birds total if sex was undetermined.



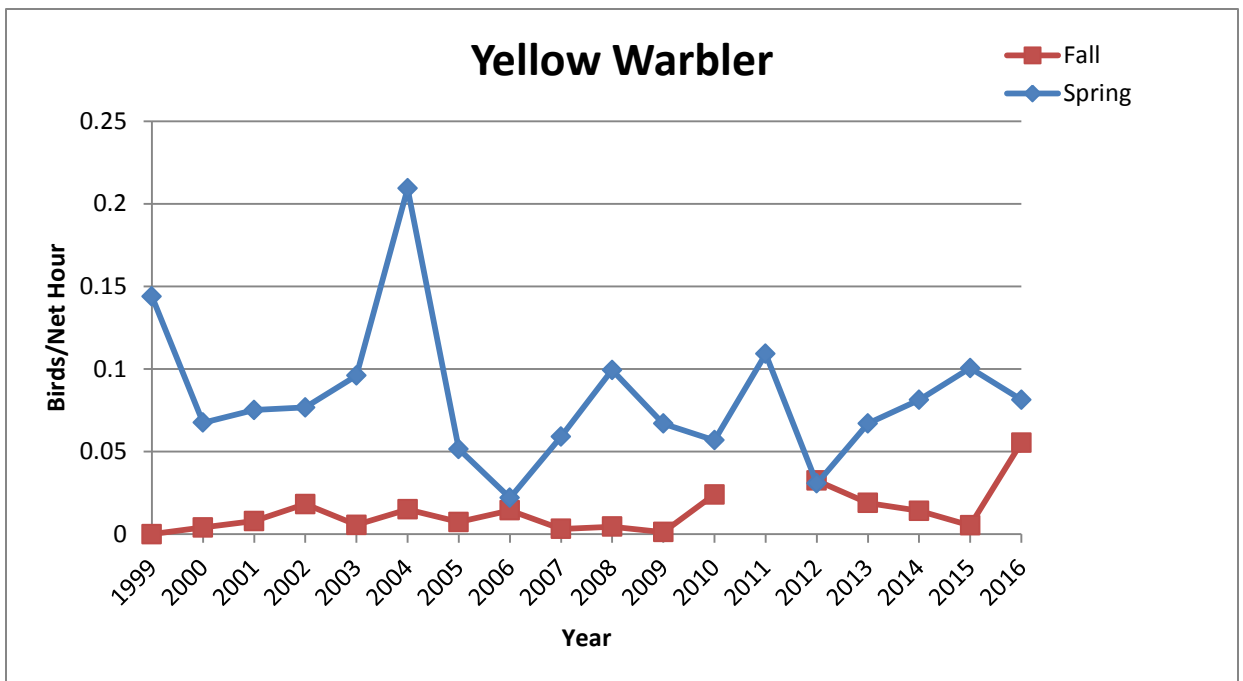
Male Yellow Warbler



Female Yellow Warblers



Number of Yellow Warblers banded by season and year at Farm Island and Fisherman's Point banding sites combined from 1992-2016.



Number of Yellow Warblers banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix E. Swainson's Thrush (*Catharus ustulatus*) Profile.

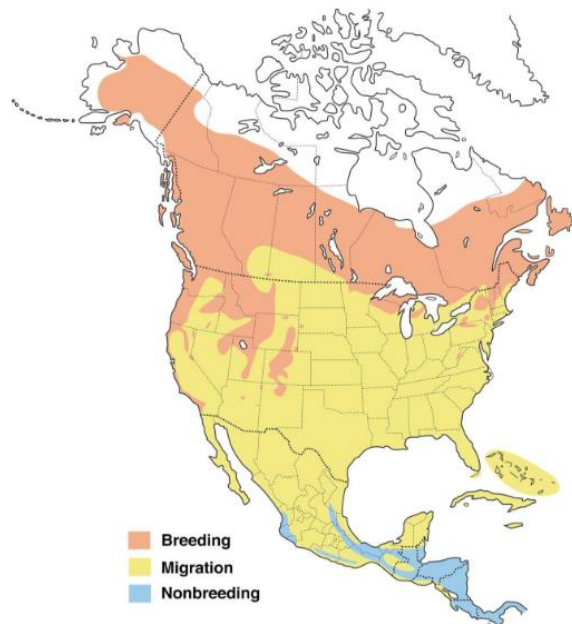
Swainson's Thrushes breed in the Black Hills of South Dakota and migrate through the central portion of the state. This species comprised 7.65% (1,624) of all birds banded and was the second most commonly banded in the spring (10.48%; 1,115). This is the fourth most common species banded at each site. Analysis of SDOU sightings indicates that our banding periods overlap the time this species is expected to migrate during both spring and fall (Tables 8 and 9). We have had 41 unique recaptures of this species, all during the same season the individuals were banded. More than twice as many Swainson's Thrushes were banded at Farm Island (1,085) compared to Fisherman's Point (539).

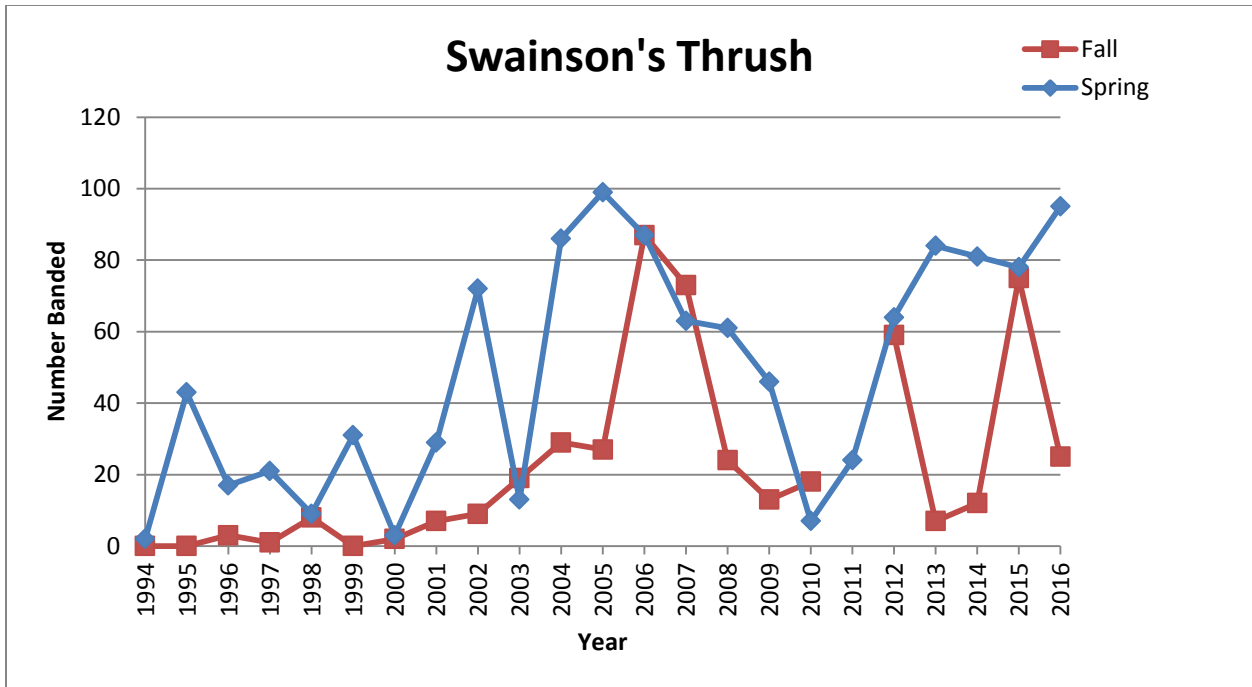
| Swainson's Thrush Measurements (sample sizes in parentheses)* | |
|--|--------------------------|
| | average all birds |
| wing chord (mm) | 97.4 (1,173) |
| tail (mm) | 67.5 (1,173) |
| weight (g) | 32.6 (1,173) |

*See Appendix B for more detailed analysis.

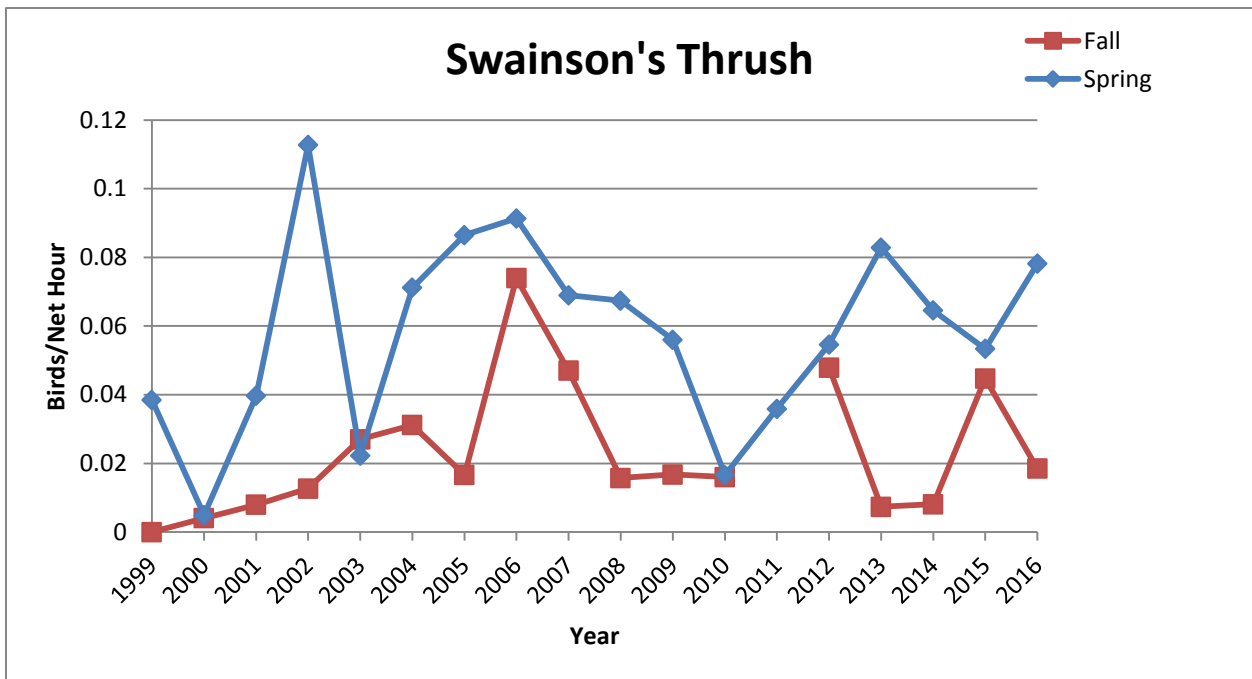


Swainson's Thrush





Number of Swainson's Thrushes banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1994-2016.



Number of Swainson's Thrushes banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix F. Myrtle Warbler (*Setophaga coronata*) Profile.

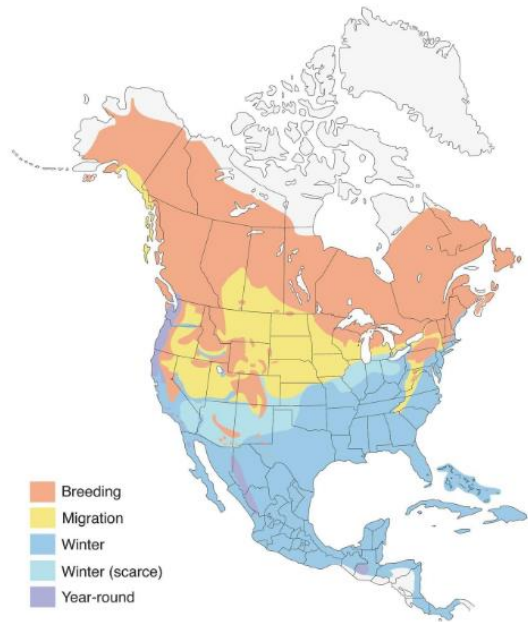
The Yellow-rumped Warbler has two forms, and both occur in South Dakota. “Audubon’s” Warbler nests in the Black Hills but can also range farther east. “Myrtle” Warblers migrate through central South Dakota. We have occasionally netted individuals that are likely hybrids of the two forms. Myrtle Warblers comprised a larger percentage of birds banded during the fall (8.82%; 934) than during the spring (6.18%; 657). Analysis of SDOU sightings for filtered Missouri River counties indicates a slightly better overlap for our fall than spring banding periods with this species’ expected migration periods (Tables 8 and 9. We have had 12 unique recaptures of this species, all during the same season the individuals were banded.

| Myrtle Warbler Measurements (sample sizes in parentheses)* | | | |
|---|--------------------------|---------------------|-----------------------|
| | average all birds | male average | female average |
| wing chord (mm) | 71.3 (1,117) | 73.2 (425) | 69.9 (583) |
| tail (mm) | 55.1 (1,117) | 56.4 (425) | 54.3 (583) |
| weight (g) | 12.6 (1,117) | 13.0 (425) | 12.5 (583) |

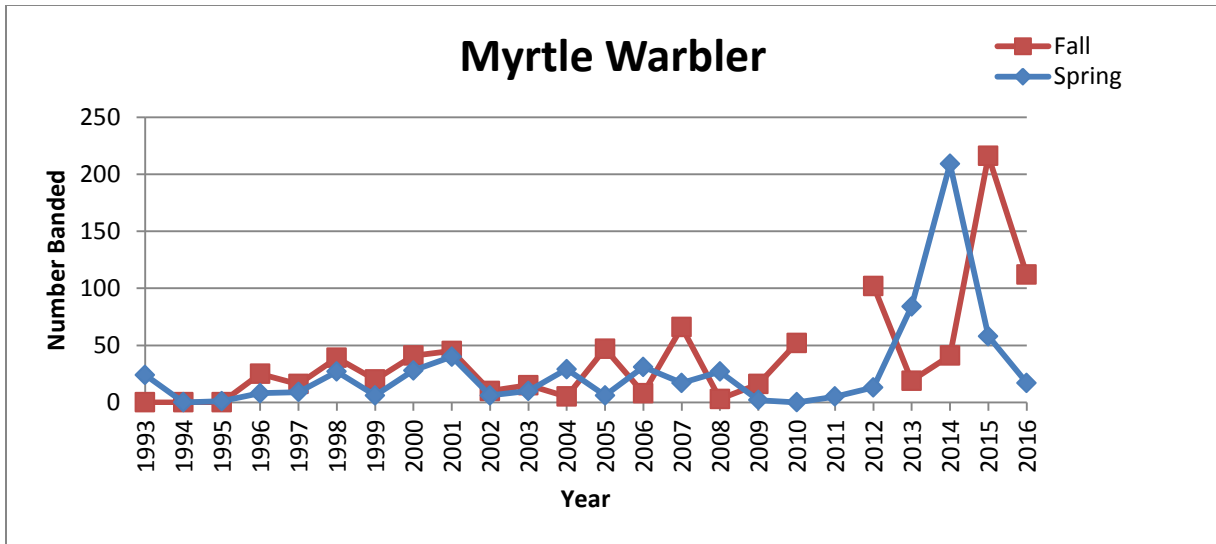
*See Appendix B for more detailed analysis. Male and female totals may not equal all birds total if sex was undetermined.



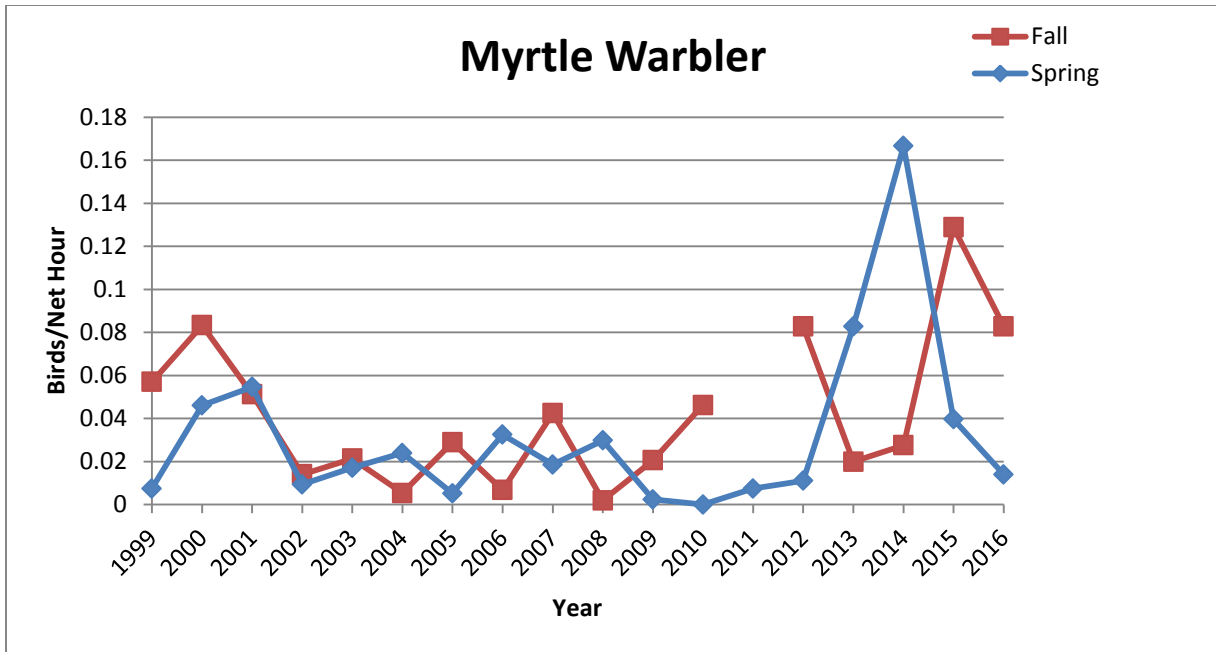
Fall Myrtle Warblers



Male Myrtle Warbler in breeding plumage



Number of Myrtle Warblers banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1993-2016.



Number of Myrtle Warblers banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix G. Common Yellowthroat (*Geothlypis trichas*) Profile.

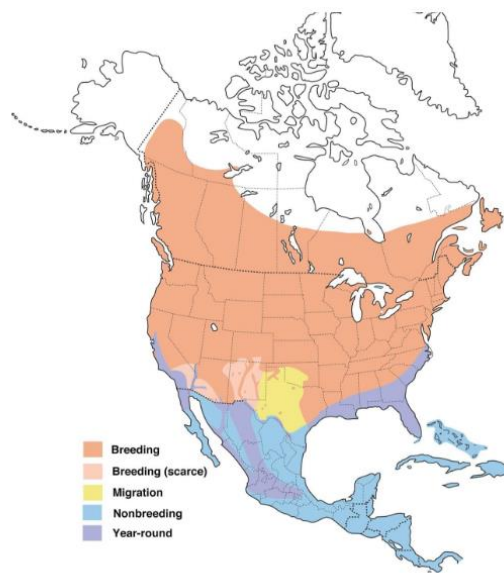
Although the fifth most common species banded overall, 86% (1,088) of Common Yellowthroats were netted at Farm Island, reflecting that area's greater habitat suitability for this species. This was the third most commonly banded species at Farm Island (7.46%). SDOU sightings analysis for migration periods for filtered Missouri River counties shows good overlap with our fall and spring banding periods (Tables 8 and 9). This species had the highest number of unique recaptures at 172 (14.4% of all unique recaptures), with values in all 9 recapture timeframes. The Farm Island banding site is clearly important for both males and females returning to the area to nest. Six recaptured birds were at least 7 (4 males), 8 (1 female), or 9 (1 male) years old.

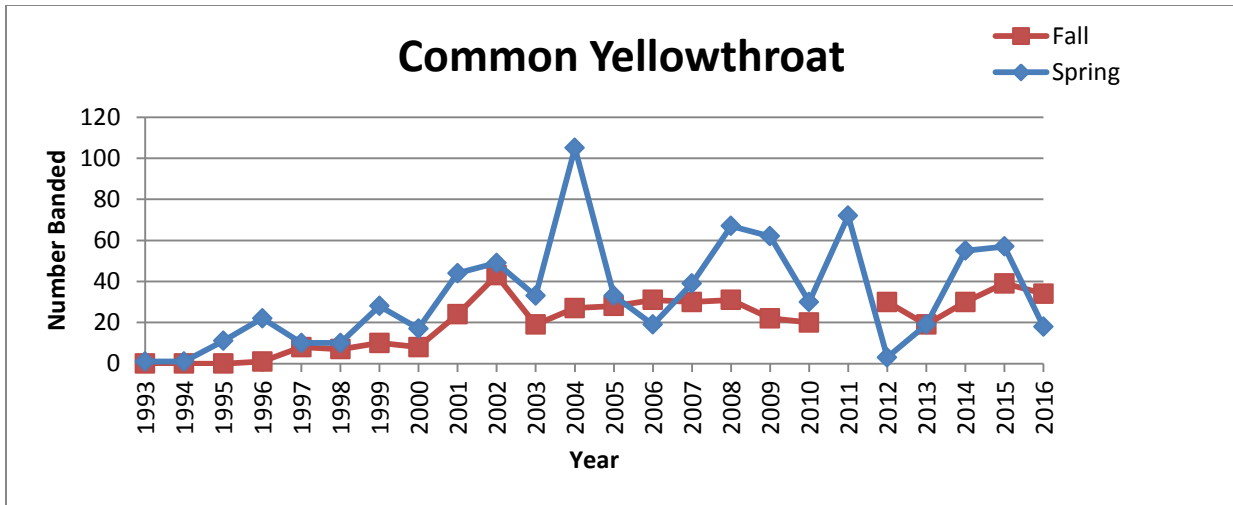
| Common Yellowthroat Measurements (sample sizes in parentheses)* | | | |
|--|--------------------------|---------------------|-----------------------|
| | average all birds | male average | female average |
| wing chord (mm) | 53.5 (889) | 54.5 (599) | 52.1 (357) |
| tail (mm) | 49.1 (889) | 50.0 (599) | 48.1 (357) |
| weight (g) | 10.2 (889) | 10.4 (599) | 9.8 (357) |

*See Appendix B for more detailed analysis. Male and female totals may not equal all birds total if sex was undetermined.

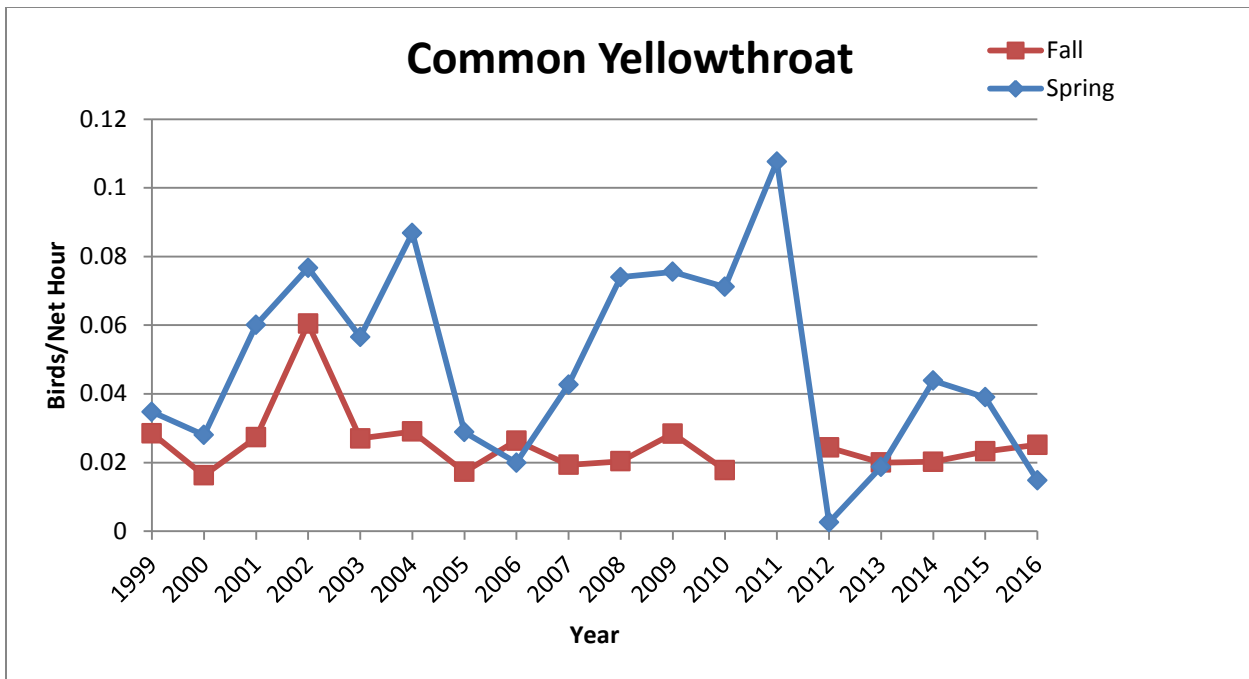


Male (left) and female (right) Common Yellowthroats





Number of Common Yellowthroats banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1993-2016.



Number of Common Yellowthroats banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix H. Least Flycatcher (*Empidonax minimus*) Profile.

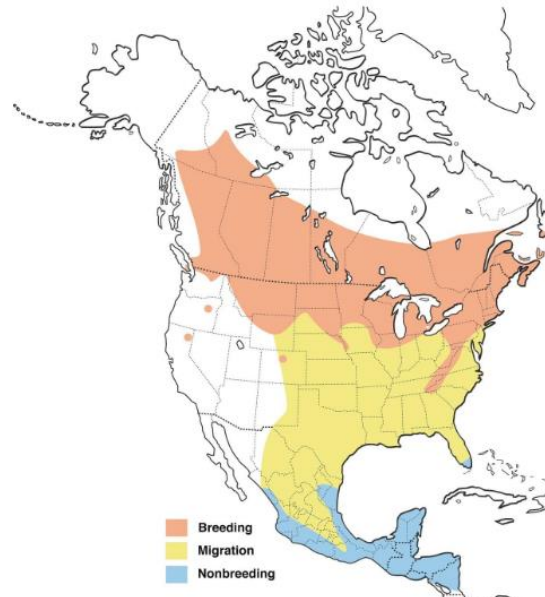
This migratory species nests in central South Dakota, but we assume many netted birds nest elsewhere. More than 75% (837) of birds banded were netted at Farm Island. Least Flycatchers were netted much more commonly during the spring than fall at our sites. Adult Least Flycatchers migrate soon after the end of the nesting season, making it likely that our fall banding periods do not coincide with their fall movements through the area. Analysis of SDOU sightings for the set of filtered Missouri River counties also indicates better overlap for spring migration than fall for this species (Tables 8 and 9). We had 11 unique recaptures of this species, all during the same season the individuals were banded.

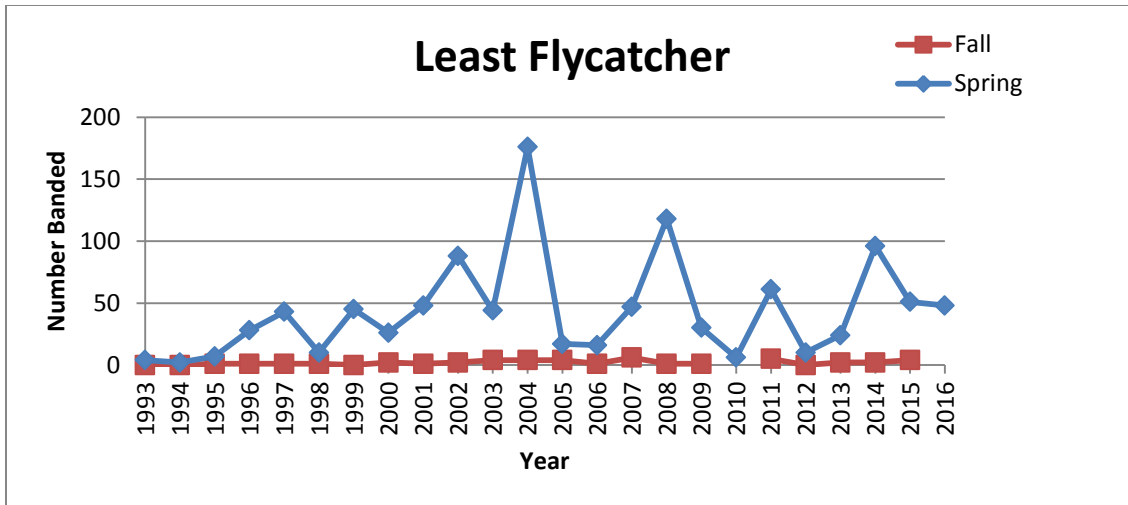
| Least Flycatcher Measurements (sample sizes in parentheses)* | |
|---|--------------------------|
| | average all birds |
| wing chord (mm) | 63.0 (1,086) |
| tail (mm) | 54.0 (768) |
| weight (g) | 11.3 (1,078) |

*See Appendix B for more detailed analysis.

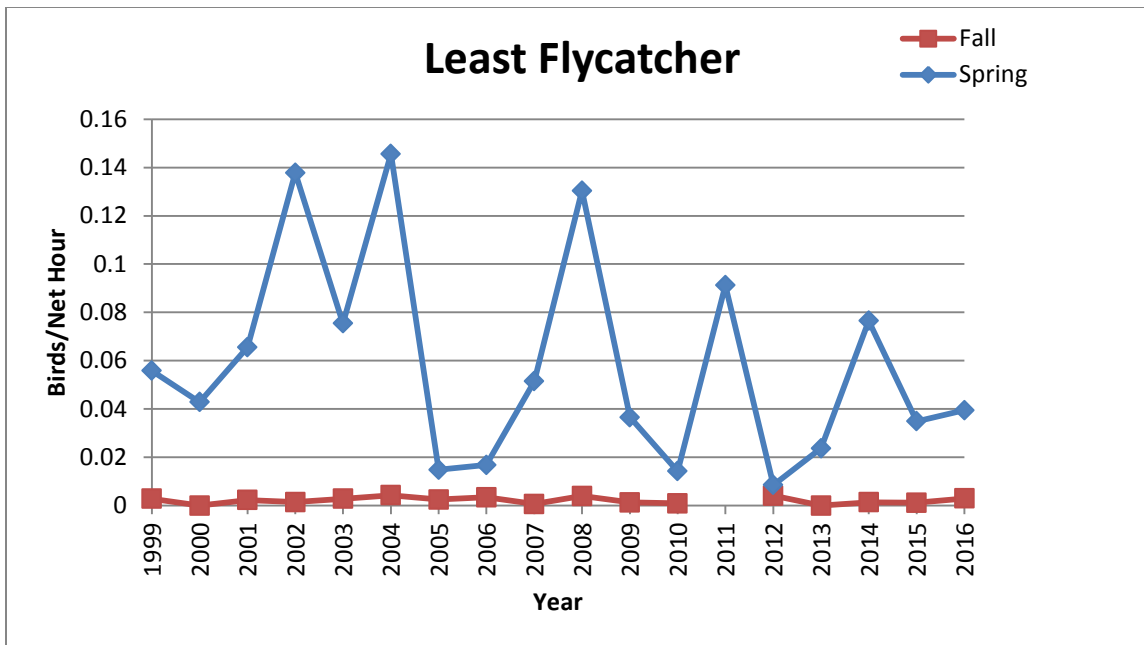


Least Flycatcher





Number of Least Flycatchers banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1993-2016.



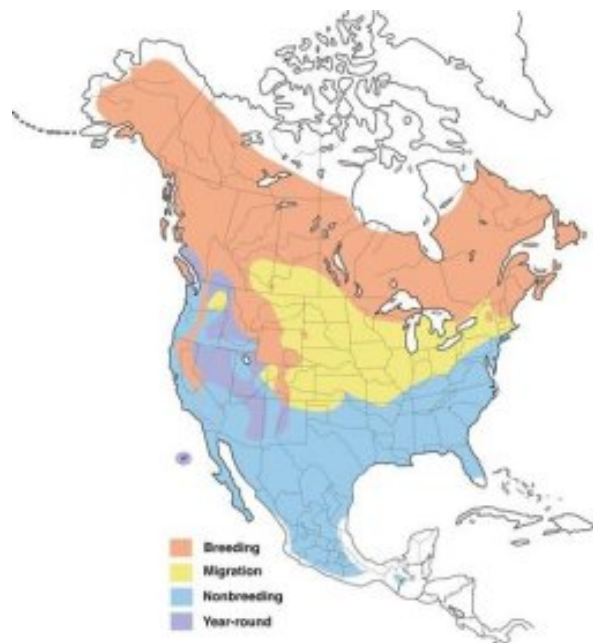
Number of Least Flycatchers banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix I. Ruby-crowned Kinglet (*Regulus calendula*) Profile.

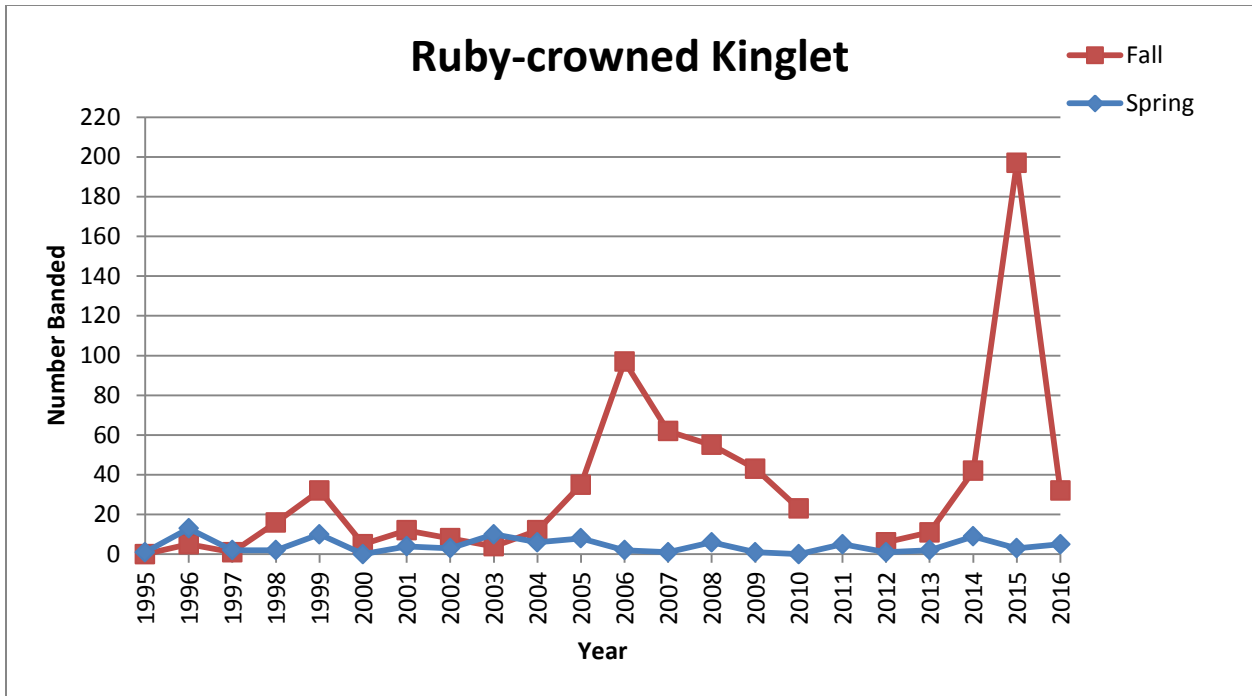
This species nests in the Black Hills but is a migrant in central South Dakota. Comprising nearly 4% (803) of all bird banded, the Ruby-crowned Kinglet has been caught much more frequently during the fall than during spring and in relatively equal amounts between the 2 banding sites. SDOU sightings analysis showed a late spring median date of May 16 for this species, with a better overlap in expected migration for our fall banding seasons (Tables 8 and 9). We have had 13 unique recaptures of this species, all during the same season the individuals were banded.

| Ruby-crowned Kinglet Measurements (sample sizes in parentheses)* | | | |
|---|--------------------------|---------------------|-----------------------|
| | average all birds | male average | female average |
| wing chord (mm) | 56.9 (651) | 58.6 (237) | 55.9 (397) |
| tail (mm) | 41.8 (460) | 43.1 (158) | 41.2 (289) |
| weight (g) | 6.4 (649) | 6.6 (235) | 6.3 (397) |

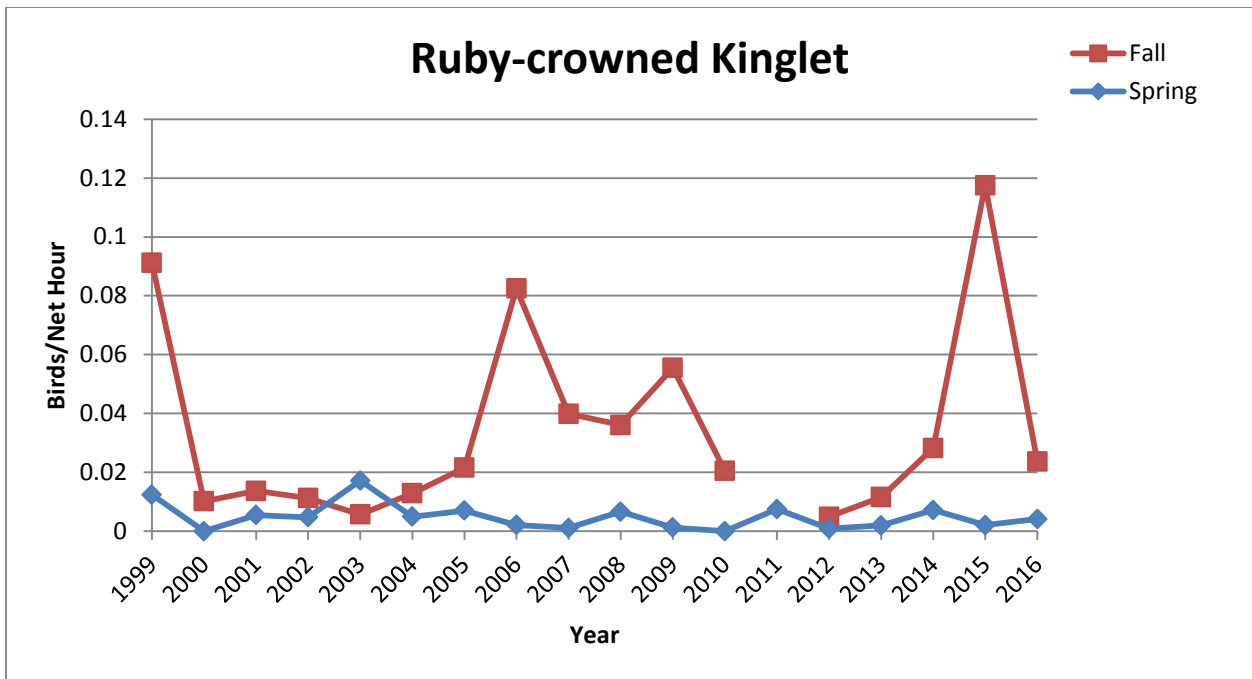
*See Appendix B for more detailed analysis. Male and female totals may not equal all birds total if sex was undetermined.



Male Ruby-crowned Kinglet. The male may flash his ruby crown when excited, but it is not always visible.



Number of Ruby-crowned Kinglets banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1995-2016.



Number of Ruby-crowned Kinglets banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix J. “Traill’s” Flycatcher (*Empidonax traillii*) or (*Empidonax alnorum*) Profile.

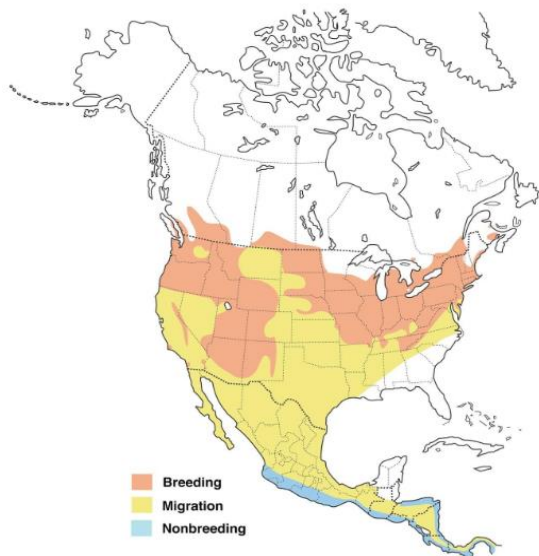
Because of the difficulty of distinguishing between Willow and Alder flycatchers in hand, banders are allowed to identify individuals of either species as “Traill’s” Flycatchers. See the section on this topic earlier in this report. Three-fourths (572) of all Traill’s Flycatchers were banded at Farm Island. Similar to the Least Flycatcher, these species have been banded much more commonly during the spring than during the fall. The SDOU database has relatively few sightings for the filtered Missouri River counties compared to other species in our “Top 20” (Tables 8 and 9). Lowther (1999) summarized Alder Flycatcher detections during fall migration periods at various sites in Alaska and Canada as ranging from mid-July through the end of August. We have had 6 unique recaptures of this species, all during the same season the individuals were banded.

| Traill’s Flycatcher Measurements (sample sizes in parentheses)* | |
|--|--------------------------|
| | average all birds |
| wing chord (mm) | 71.7 (763) |
| tail (mm) | 57.7 (509) |
| weight (g) | 14.3 (750) |

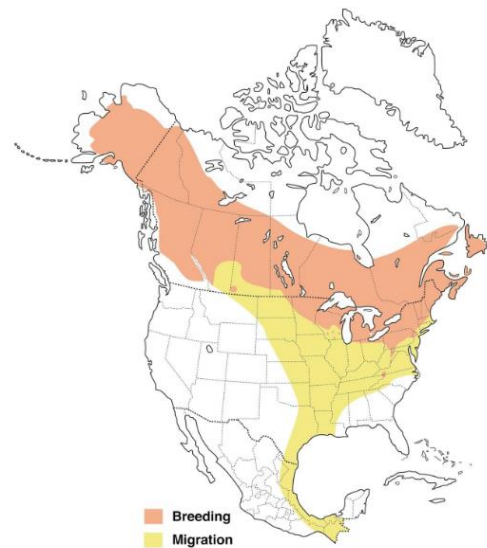
*See Appendix B for more detailed analysis.



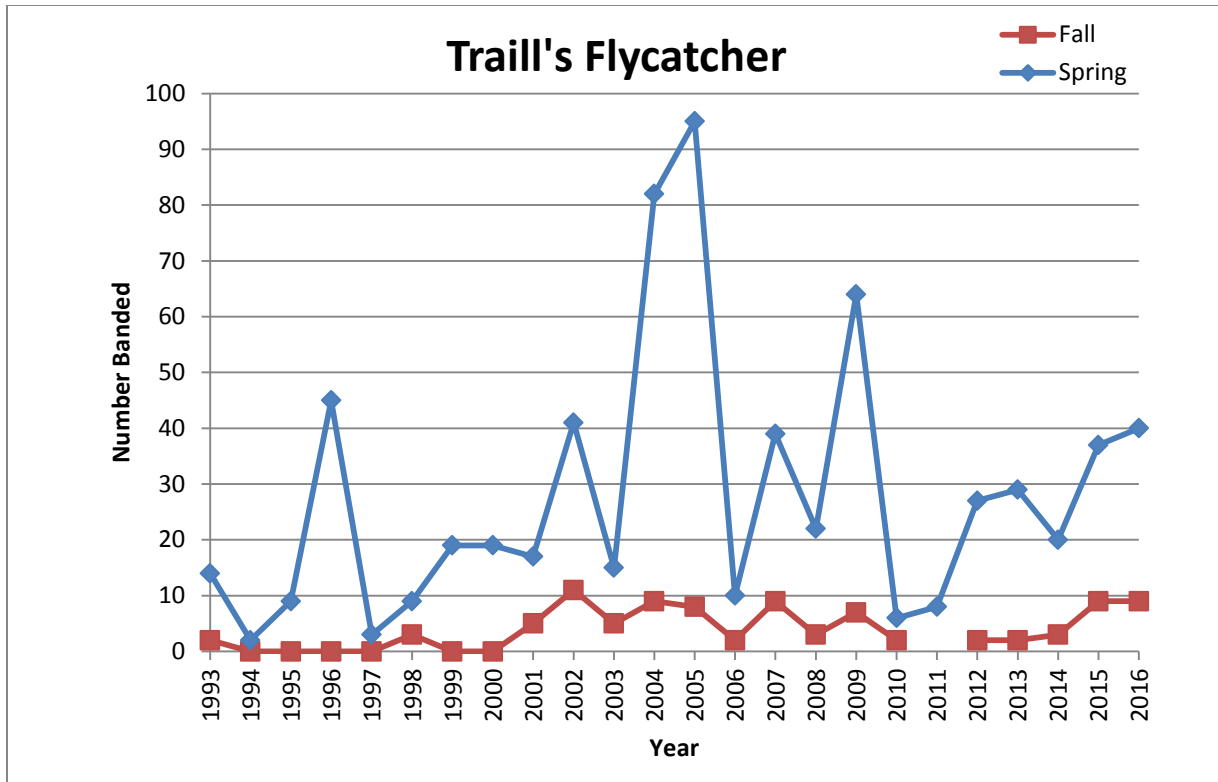
Traill's Flycatcher



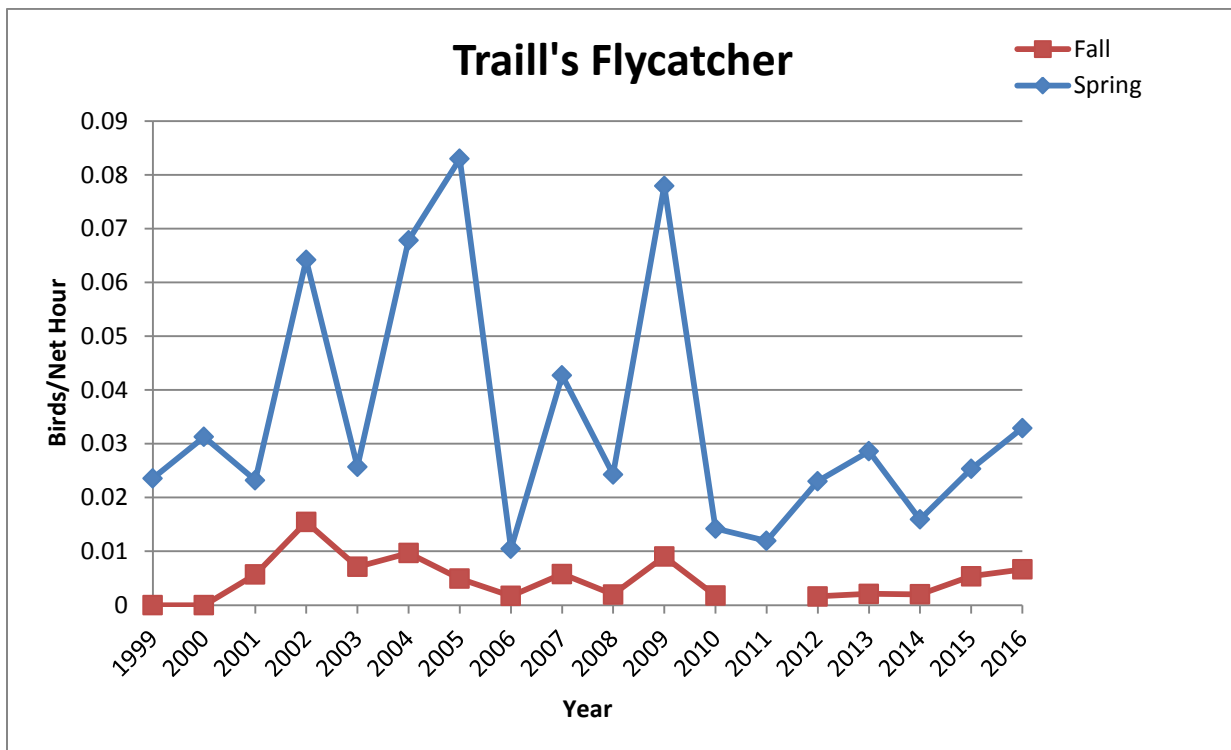
Willow Flycatcher



Alder Flycatcher



Number of Traill's Flycatchers banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1993-2016.



Number of Traill's Flycatchers banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix K. Gray Catbird (*Dumetella carolinensis*) Profile.

This species comprised nearly 3% (619) of all captures at our sites and was among the top 10 at each site. Roughly 2/3 (402) of Gray Catbirds were banded at Farm Island. At 3.64% (385), the Gray Catbird was captured more frequently during the fall seasons. The SDOU sightings analysis of filtered Missouri River counties showed good overlap between expected migration periods and our spring and fall banding periods (Tables 8 and 9). We have had 20 unique recaptures of this species, with 18 during the season the individuals were banded or the next recapture timeframe (next season to 1 year following banding).

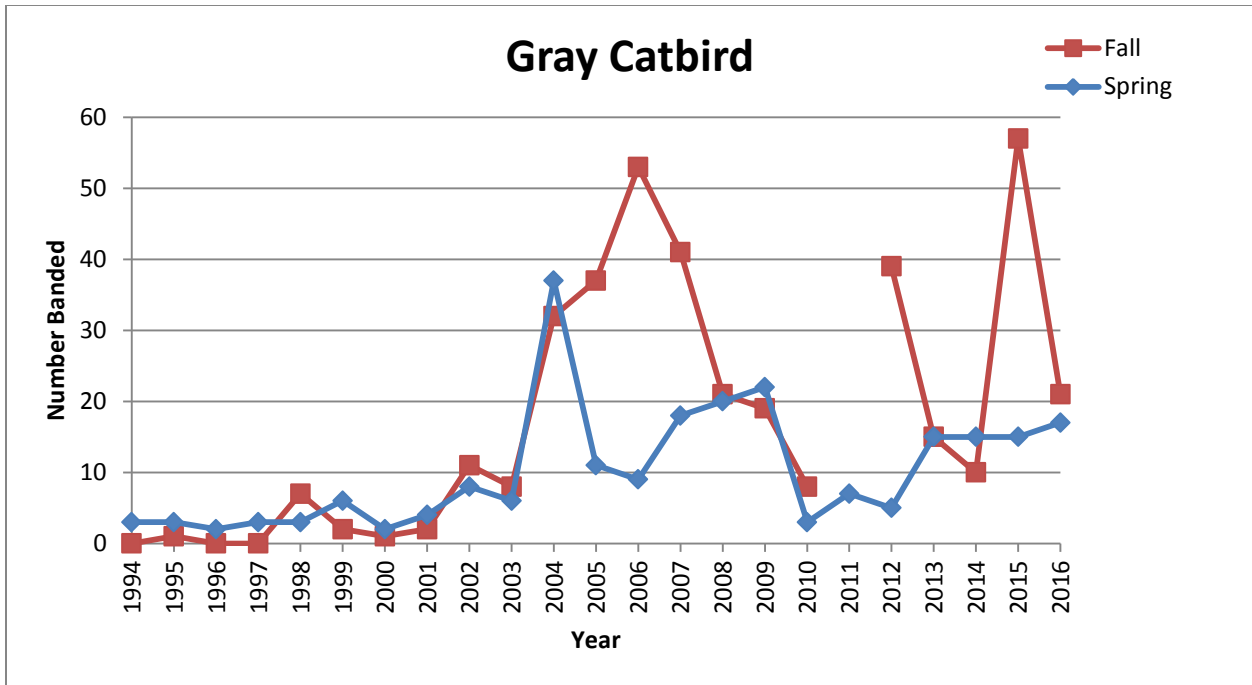
| Gray Catbird Measurements (sample sizes in parentheses)* | |
|---|--------------------------|
| | average all birds |
| wing chord (mm) | 88.7 (589) |
| tail (mm) | 91.8 (431) |
| weight (g) | 38.1 (581) |

*See Appendix B for more detailed analysis.

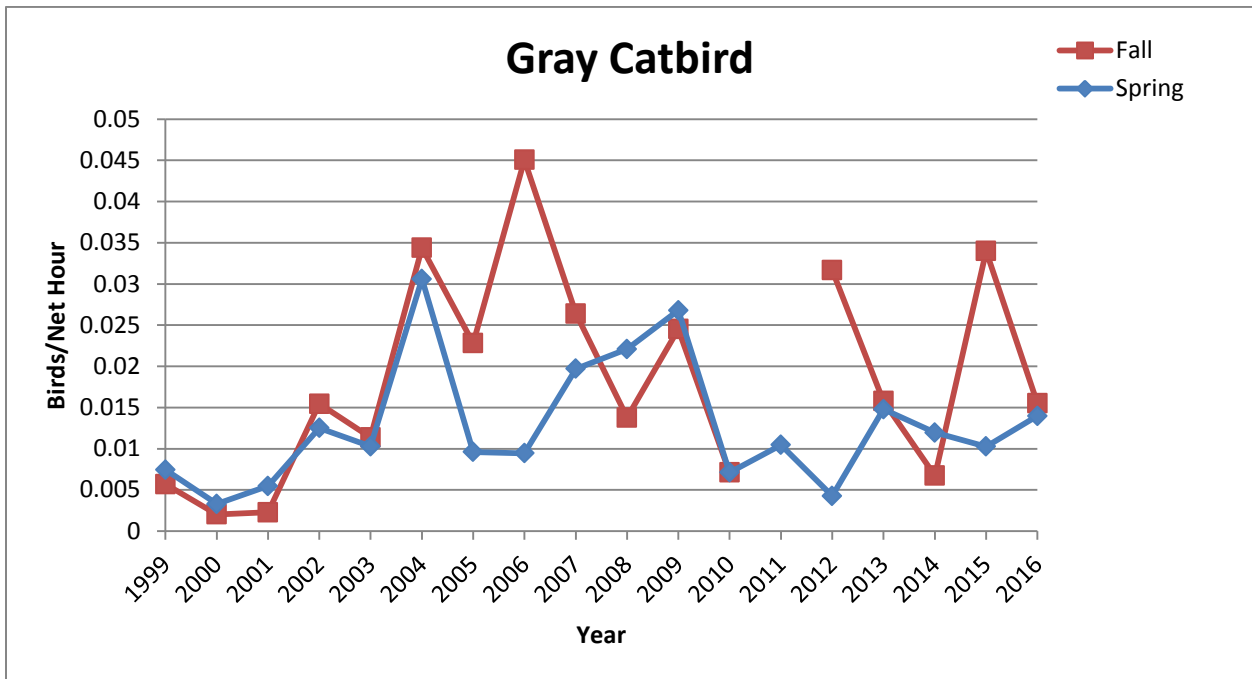


Gray Catbird





Number of Gray Catbirds banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1994-2016.



Number of Gray Catbirds banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix L. House Wren (*Troglodytes aedon*) Profile.

The House Wren is a common breeder in the vicinity of our banding areas, using prevalent natural cavities. It has been netted more frequently during spring than fall banding seasons. A slightly higher percentage (56%; 263) of House Wren was banded at Farm Island. The SDOU sightings analysis of filtered Missouri River counties showed good overlap between expected migration periods and our spring and fall banding periods (Tables 8 and 9). Among nesting species that winter elsewhere, the House Wren was the second most commonly recaptured species after the Common Yellowthroat, with 106 unique recaptures of House Wrens spread among 5 recapture timeframes.

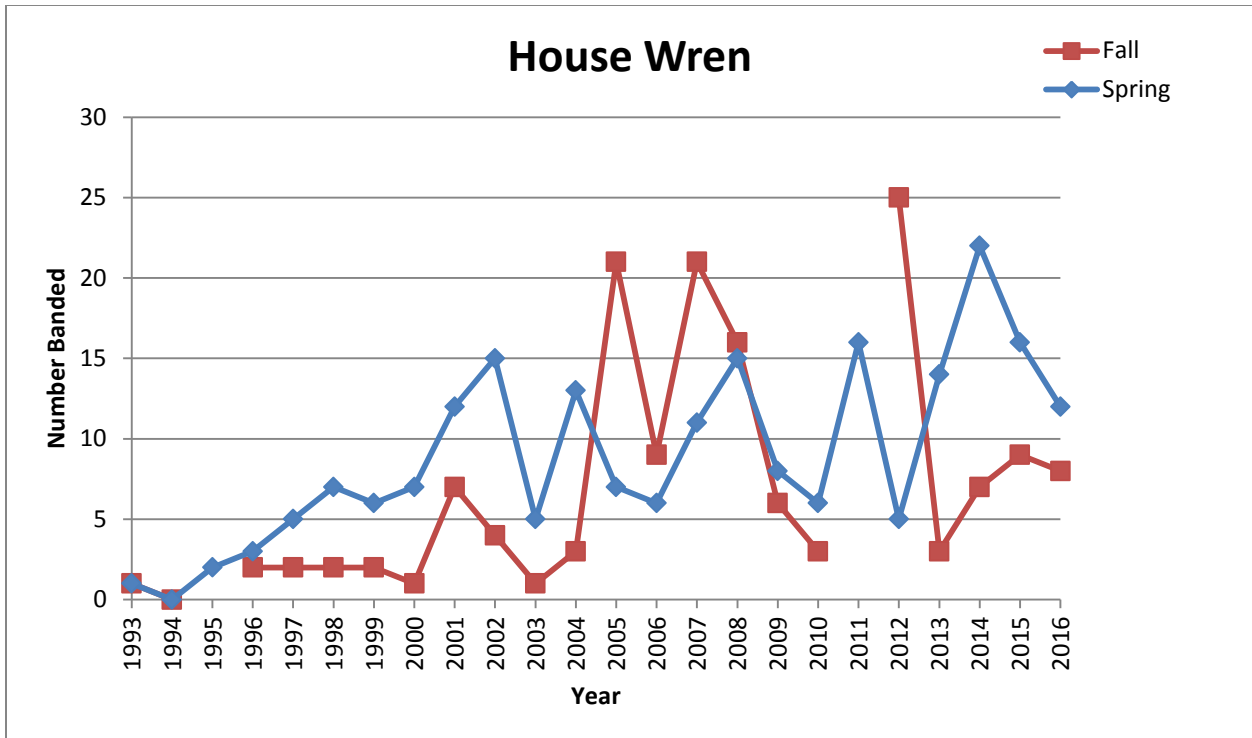
| House Wren Measurements (sample sizes in parentheses)* | |
|---|--------------------------|
| | average all birds |
| wing chord (mm) | 50.6 (458) |
| tail (mm) | 41.9 (355) |
| weight (g) | 10.7 (441) |

*See Appendix B for more detailed analysis.

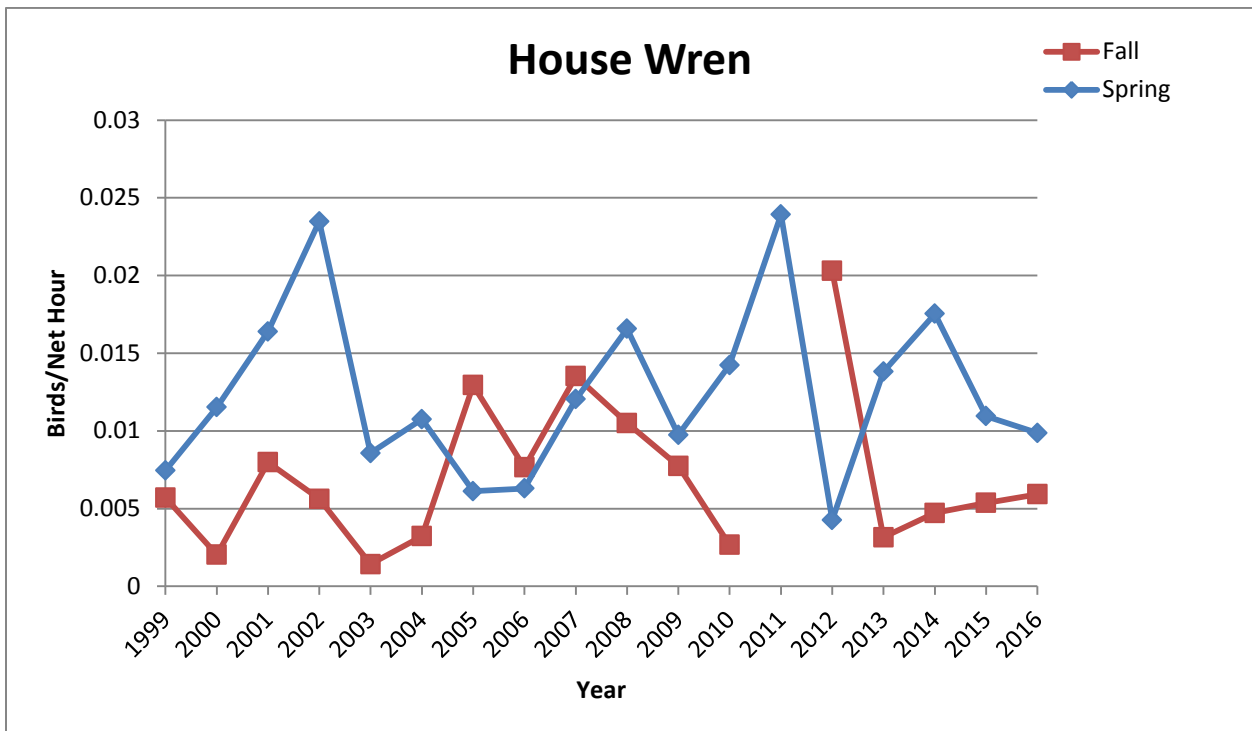


House Wren





Number of House Wrens banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1993-2016.



Number of House Wrens banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix M. Wilson's Warbler (*Cardellina pusilla*) Profile.

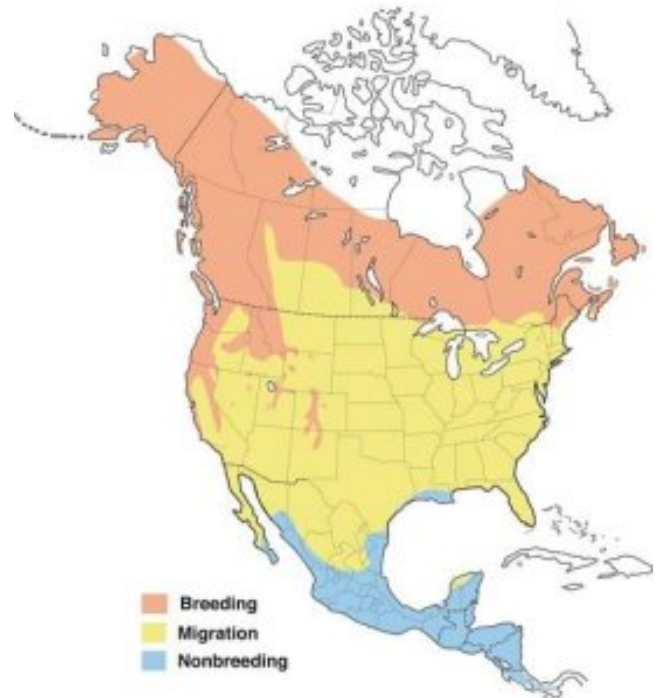
This migratory species was netted more commonly at Farm Island (57%; 262) and during fall breeding seasons. This agrees with the SDOU seasonal reporting analysis for filtered Missouri River counties (Tables 8 and 9). We have had 16 unique recaptures of this species, all during the same season the individuals were banded.

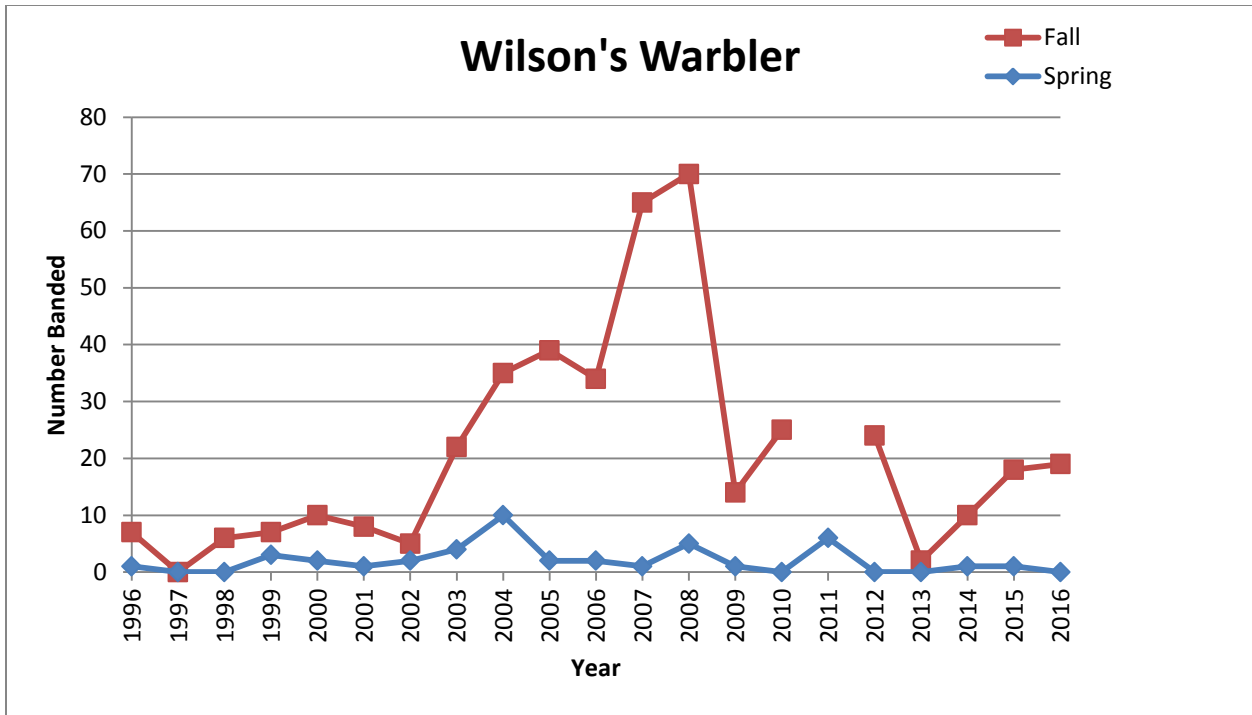
| Wilson's Warbler Measurements (sample sizes in parentheses)* | | | |
|---|--------------------------|---------------------|-----------------------|
| | average all birds | male average | female average |
| wing chord (mm) | 55.9 (452) | 56.6 (299) | 54.6 (145) |
| tail (mm) | 49.4 (280) | 49.7 (186) | 48.8 (93) |
| weight (g) | 8.0 (446) | 8.1 (296) | 7.7 (143) |

*See Appendix B for more detailed analysis. Male and female totals may not equal all birds total if sex was undetermined.

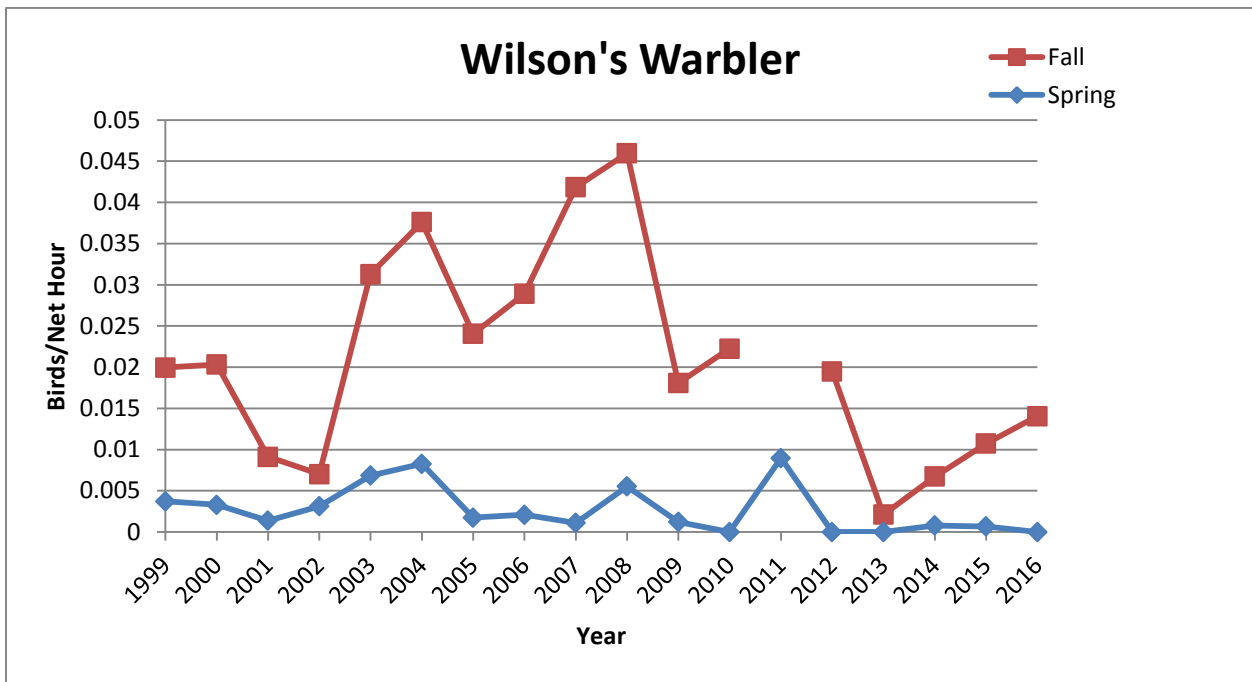


Male Wilson's Warbler





Number of Wilson's Warblers banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1996-2016.



Number of Wilson's Warblers banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix N. White-throated Sparrow (*Zonotrichia albicollis*) Profile.

This species was captured much more frequently at Farm Island (77%; 357) than at Fisherman's Point and more commonly during the fall. Analysis of SDOU sightings for the filtered Missouri River counties indicates somewhat better overlap for expected migration in fall than in spring banding seasons (Tables 8 and 9). We have had 34 unique recaptures of this species, all during the same season the individuals were banded.

| White-throated Sparrow Measurements (sample sizes in parentheses)* | |
|---|--------------------------|
| | average all birds |
| wing chord (mm) | 71.5 (432) |
| tail (mm) | 71.7 (345) |
| weight (g) | 25.2 (432) |

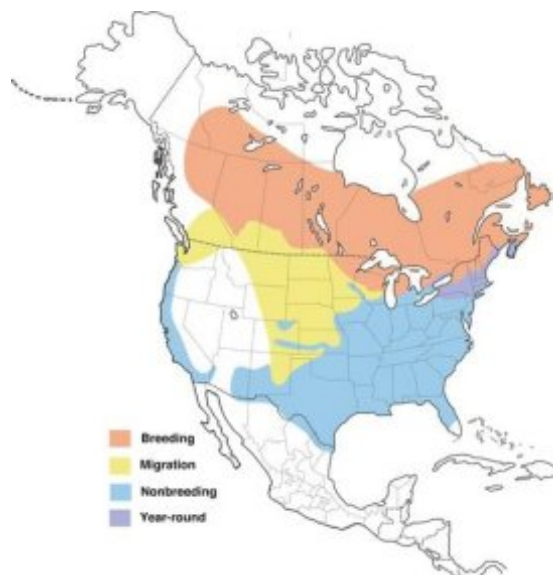
*See Appendix B for more detailed analysis.

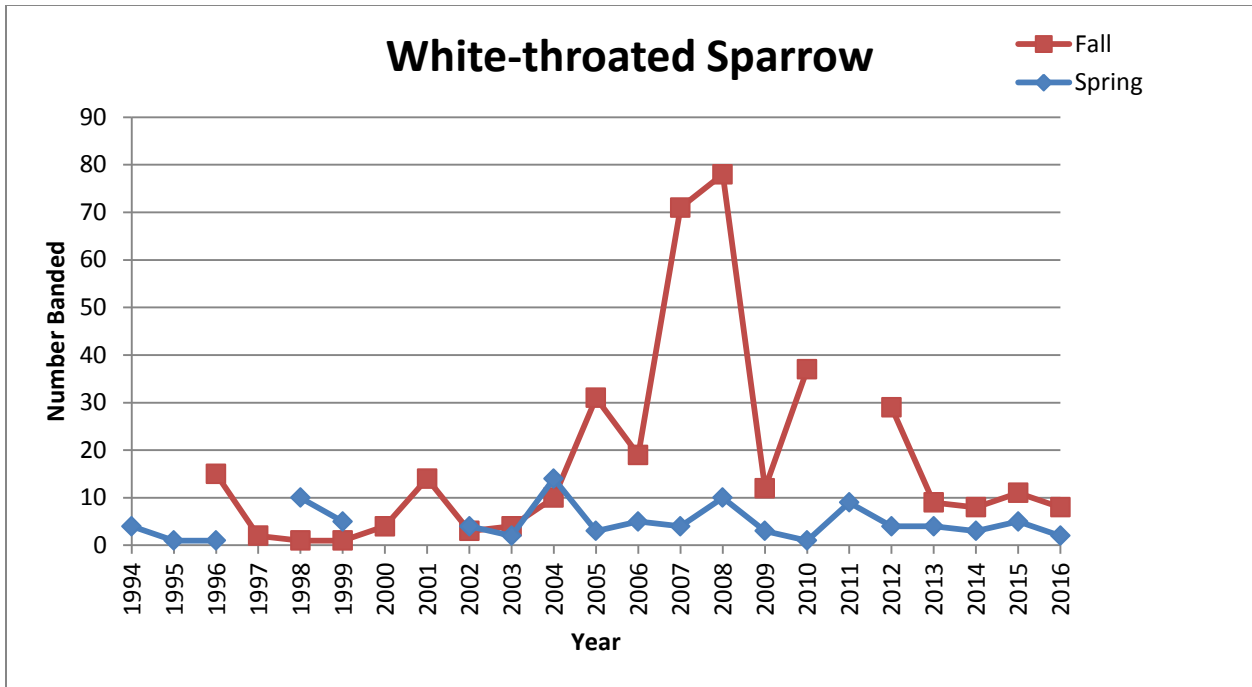


Casey Heimerl with White-throated Sparrow

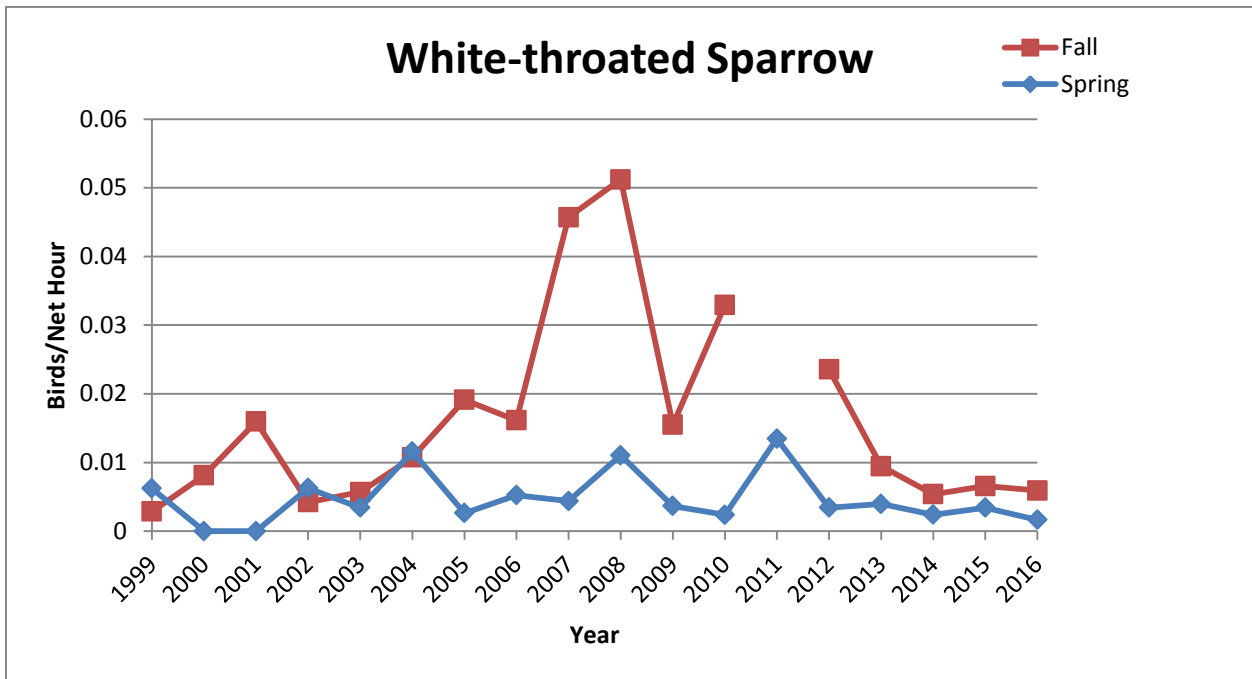


White-throated Sparrow





Number of White-throated Sparrows banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1994-2016.



Number of White-throated Sparrows banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix O. Lincoln's Sparrow (*Melospiza lincolni*) Profile.

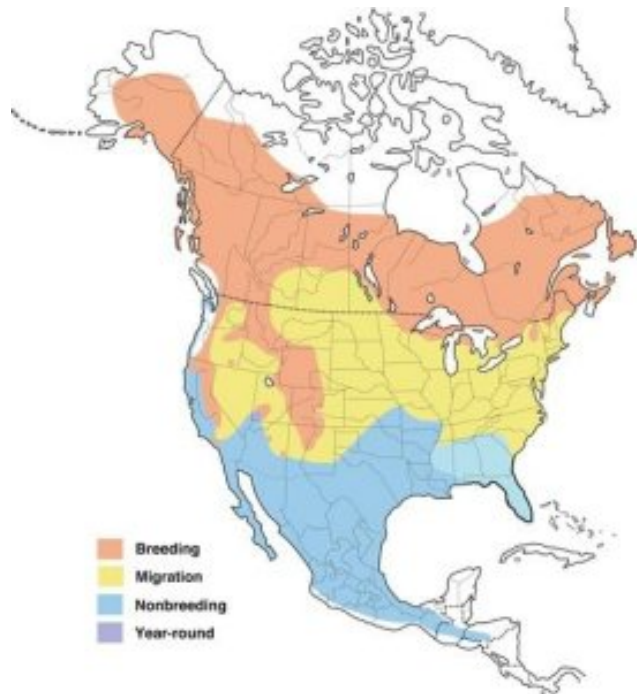
As with other commonly-netted sparrow species at our sites, this migratory species was captured much more frequently at Farm Island (82%; 369). The extreme flooding along the Missouri River during 2011 caused extensive loss of vegetation, shifting sand substrate, and much more open conditions in 2012, particularly at Farm Island. We presume these conditions favored weedy plant species that attracted migrating sparrows, particularly during the fall of 2012. Analysis of SDOU sightings for the filtered Missouri River counties indicates better overlap with our banding seasons for expected migration in fall than in spring (Tables 8 and 9). We have had 26 unique recaptures of this species, all during the same season the individuals were banded.

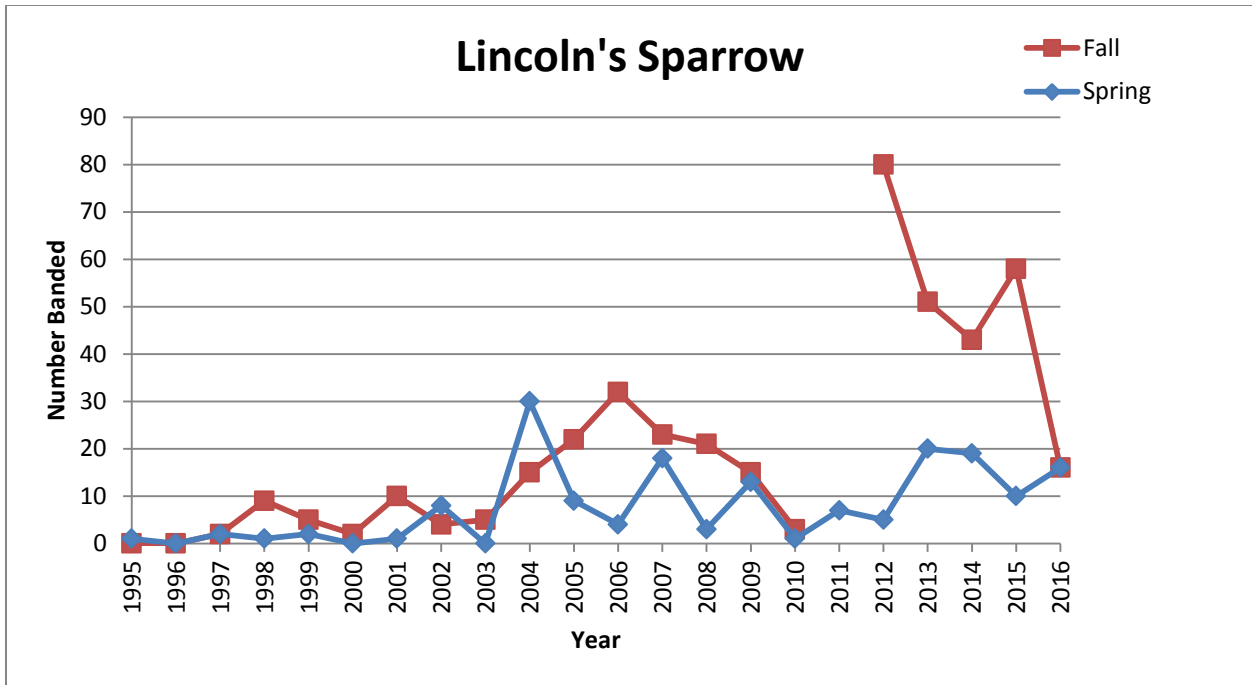
| Lincoln's Sparrow Measurements (sample sizes in parentheses)* | |
|--|-------------------|
| | average all birds |
| wing chord (mm) | 60.8 (401) |
| tail (mm) | 56.6 (357) |
| weight (g) | 16.5 (396) |

*See Appendix B for more detailed analysis.

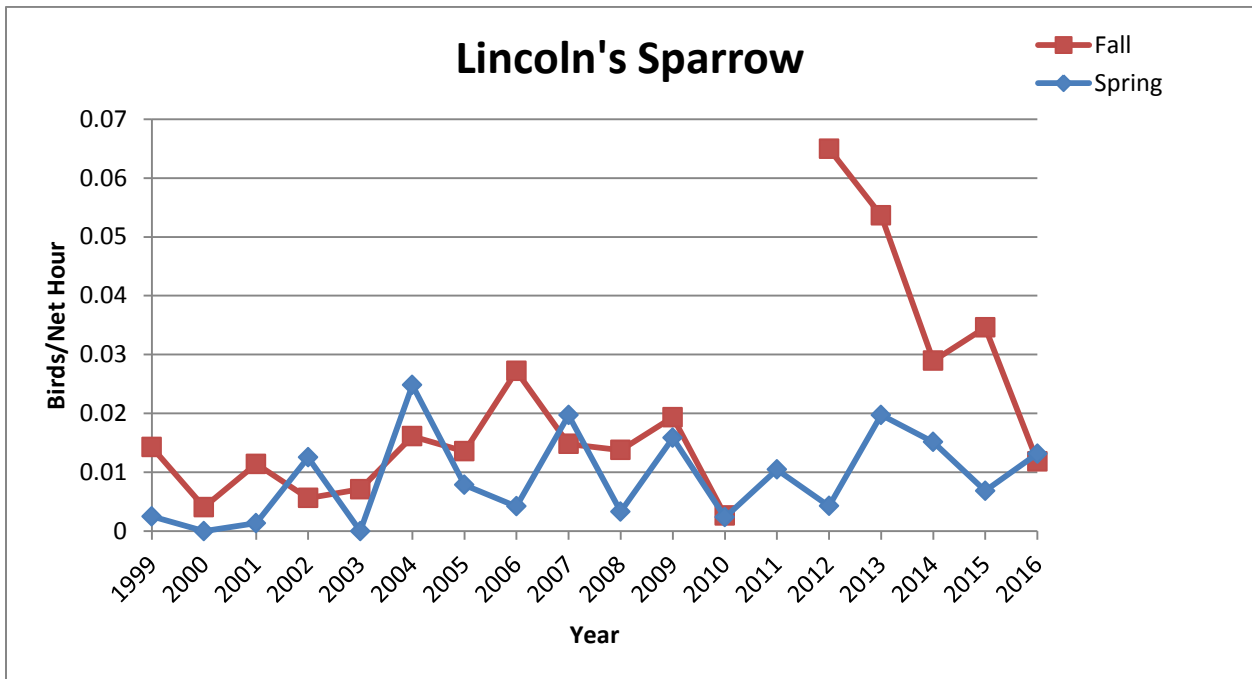


Lincoln's Sparrow





Number of Lincoln's Sparrows banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1995-2016.



Number of Lincoln's Sparrows banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix P. Spotted Towhee (*Pipilo maculatus*) Profile.

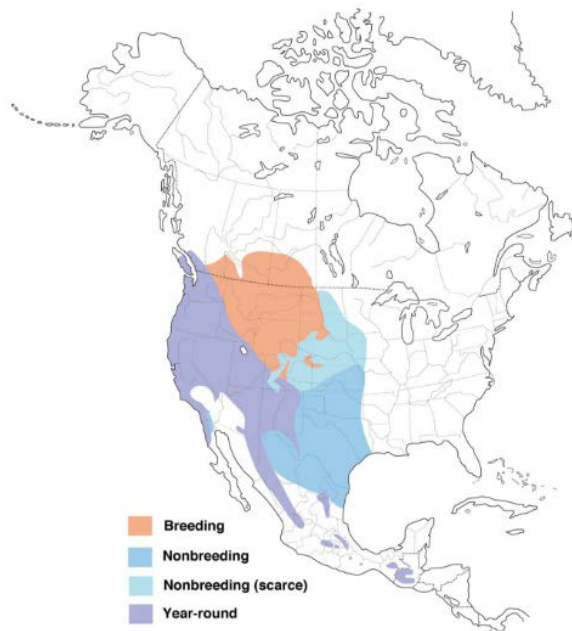
This breeding species was netted much more frequently at Farm Island (72%; 272) compared to Fisherman's Point. This is another migratory species that returns to our sites to breed each year, evidenced by 53 unique recaptures spread across 5 recapture timeframes. Because this species breeds at our sites and has SDOU sightings reported into the winter season, the analysis of median early and late spring and fall dates only yielded one value – an early spring median date of April 16 (Table 8).

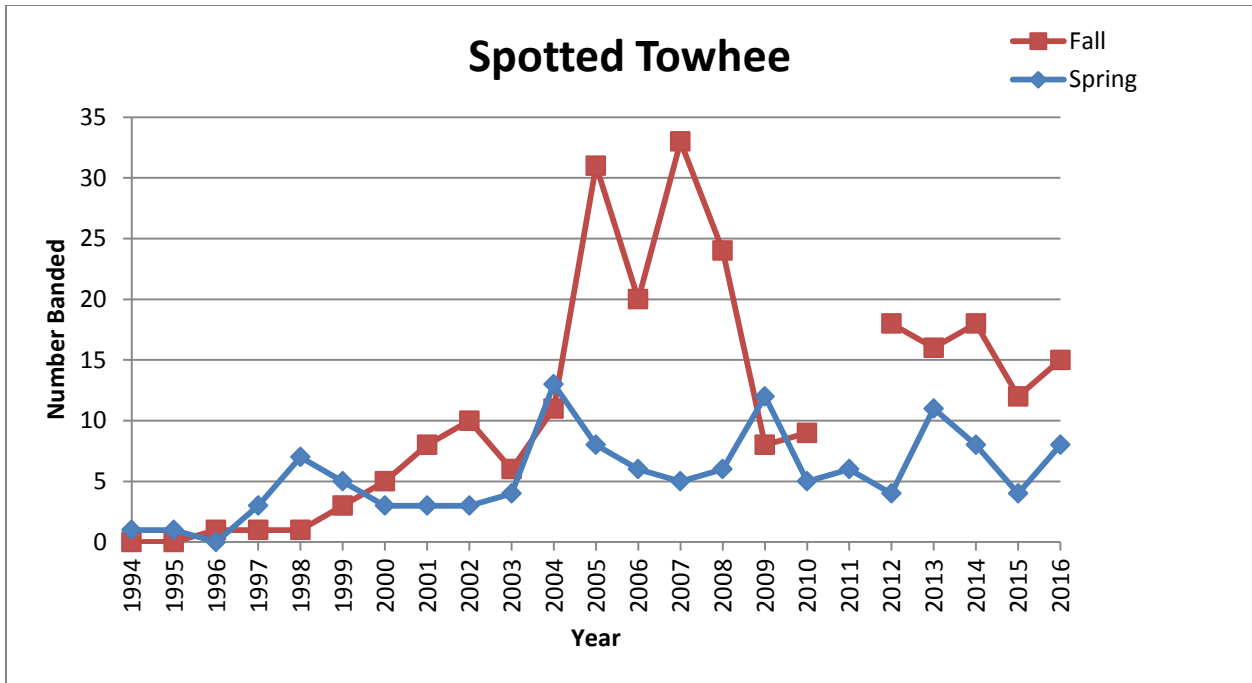
| Spotted Towhee Measurements (sample sizes in parentheses)* | | | |
|---|--------------------------|---------------------|-----------------------|
| | average all birds | male average | female average |
| wing chord (mm) | 83.5 (365) | 85.3 (182) | 81.4 (149) |
| tail (mm) | 95.0 (301) | 96.8 (156) | 93.1 (125) |
| weight (g) | 38.4 (359) | 39.2 (178) | 37.3 (147) |

*See Appendix B for more detailed analysis. Male and female totals may not equal all birds total if sex was undetermined.

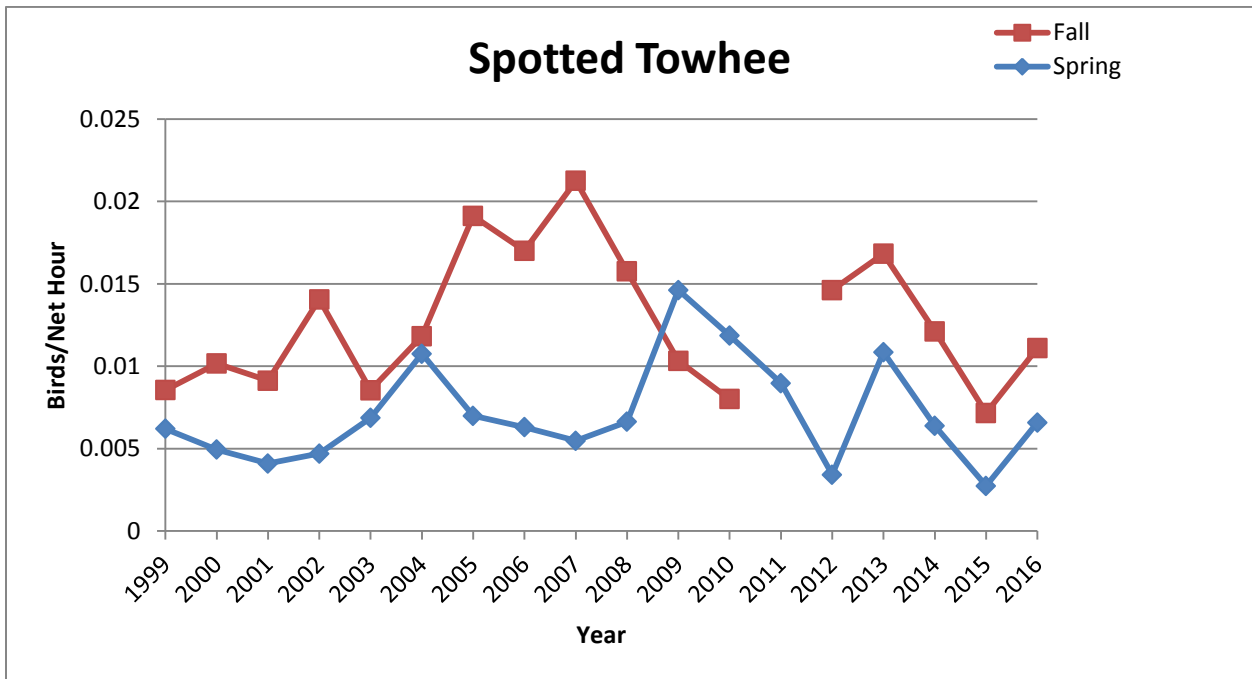


Male (left) and female (right) Spotted Towhees. The red irises indicate these individuals are in at least their second year of life.





Number of Spotted Towhees banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1994-2016.



Number of Spotted Towhees banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix Q. Tennessee Warbler (*Oreothlypis peregrina*) Profile.

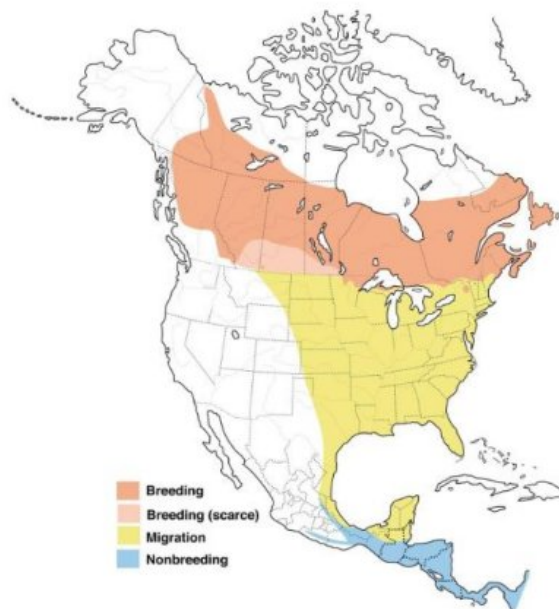
This migratory species was the 9th most commonly netted species during the spring, at 3% (322). Slightly more than half of the Tennessee Warblers (54%; 185) were banded at Fisherman’s Point. Analysis of SDOU sightings for the filtered Missouri River counties showed better than expected overlap with our fall banding seasons (Table 9) than predicted by the figures on the following page. We have had one unique recapture of this species, during the same season the individual was banded.

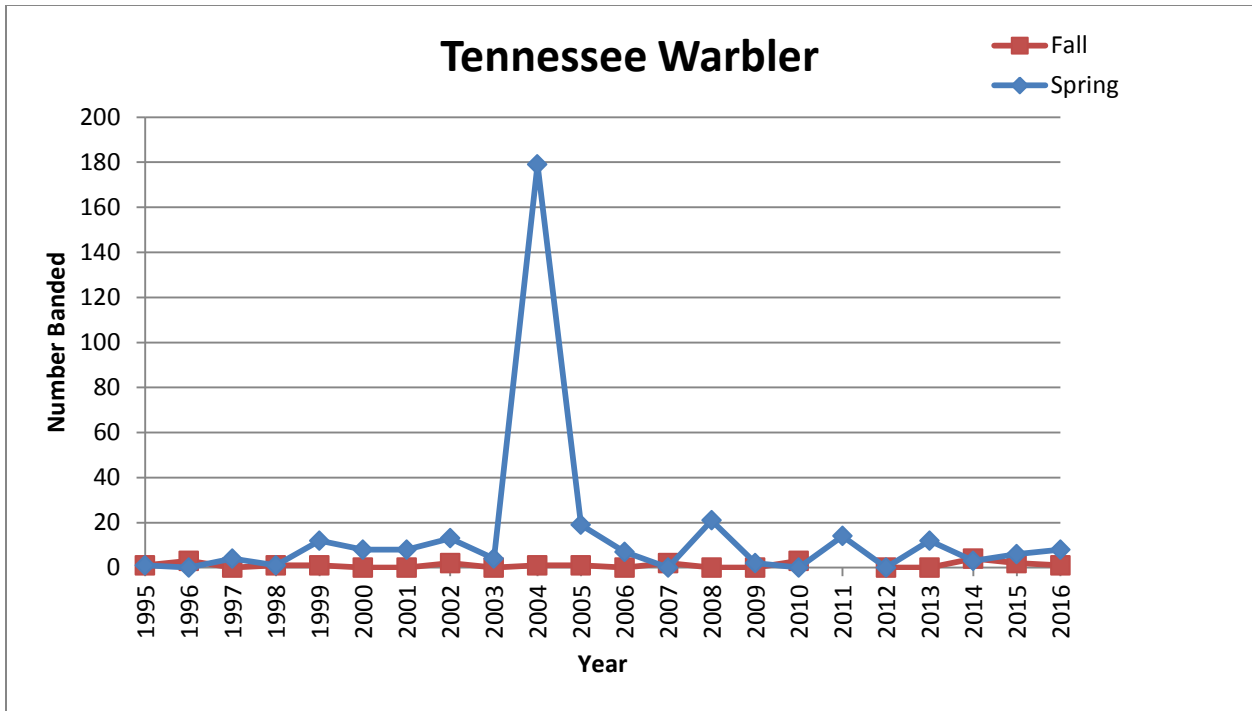
| Tennessee Warbler Measurements (sample sizes in parentheses)* | | | |
|--|--------------------------|---------------------|-----------------------|
| | average all birds | male average | female average |
| wing chord (mm) | 62.5 (340) | 63.7 (170) | 61.3 (145) |
| tail (mm) | 41.4 (130) | 42.3 (66) | 40.0 (46) |
| weight (g) | 11.3 (335) | 11.5 (165) | 11.1 (146) |

*See Appendix B for more detailed analysis. Male and female totals may not equal all birds total if sex was undetermined.

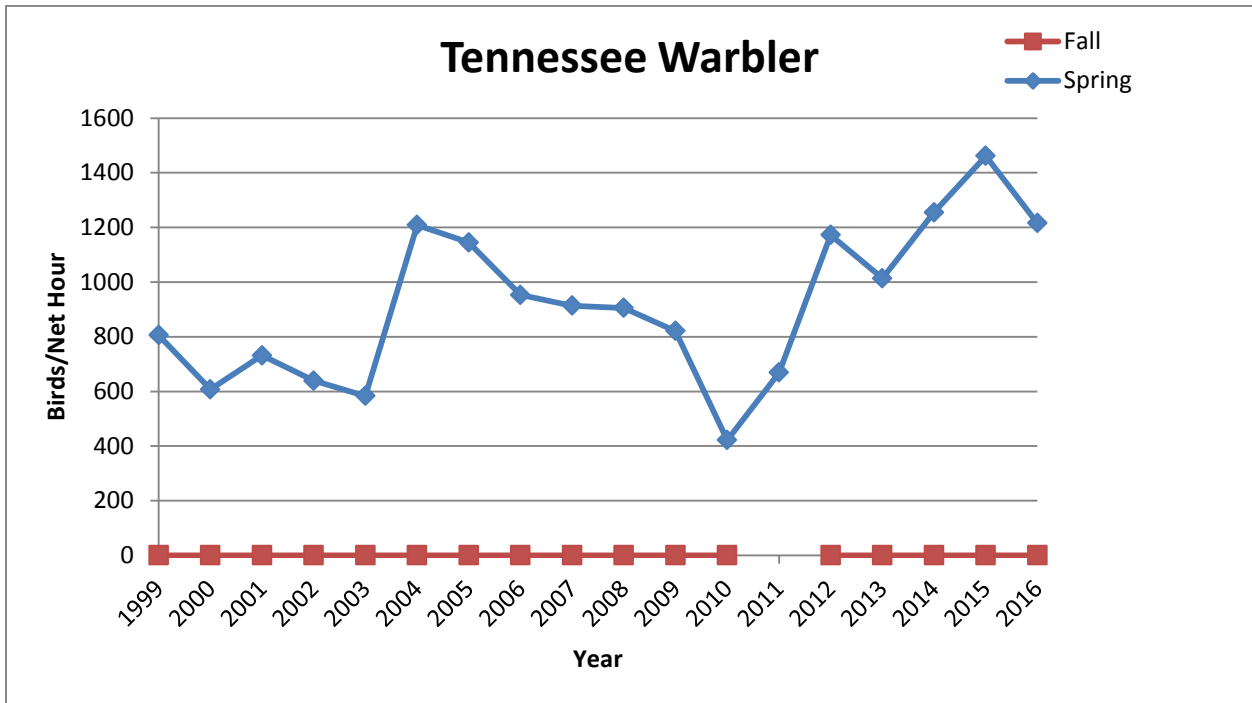


Male Tennessee Warbler





Number of Tennessee Warblers banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1995-2016.



Number of Tennessee Warblers banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix R. Clay-colored Sparrow (*Spizella pallida*) Profile.

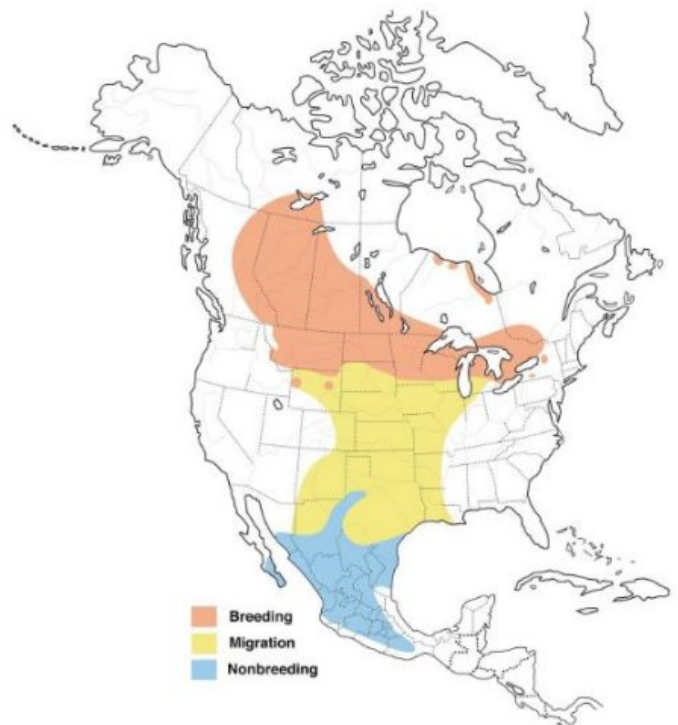
This sparrow breeds in central South Dakota, but in grassland habitats. Data collected during the most recent South Dakota Breeding Bird Atlas categorized the highest level of Clay-colored Sparrow breeding in Hughes County as “possible” and “observed” in Stanley County (Drilling et al. 2018). The majority of Clay-colored Sparrows (69%; 233) were banded at Farm Island. We observed a spike in this species during the fall of 2012, potentially due to vegetative response to scouring from Missouri River flooding during the late spring and summer of 2011. The median late fall date occurs on October 12, after our fall banding period has typically ended (Table 9). We have had three unique recaptures of this species, all during the same season the individual was banded.

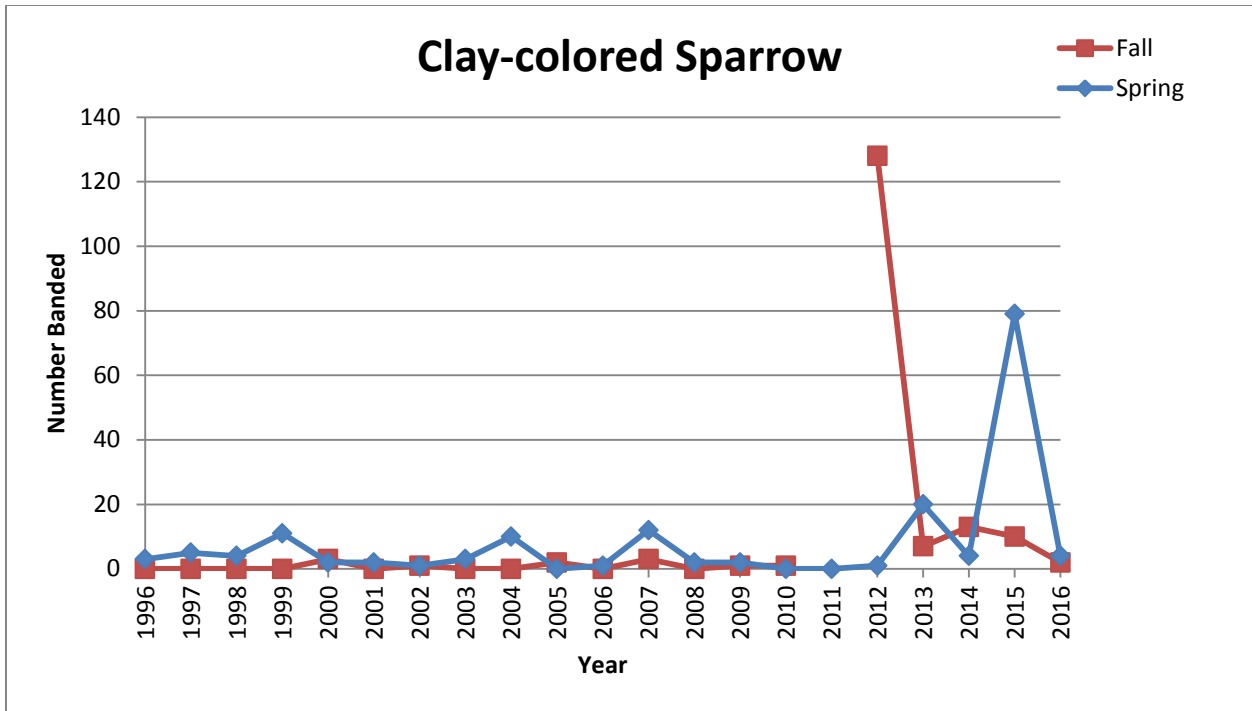
| Clay-colored Sparrow Measurements (sample sizes in parentheses)* | |
|---|--------------------------|
| | average all birds |
| wing chord (mm) | 59.7 (283) |
| tail (mm) | 58.5 (266) |
| weight (g) | 11.3 (279) |

*See Appendix B for more detailed analysis.

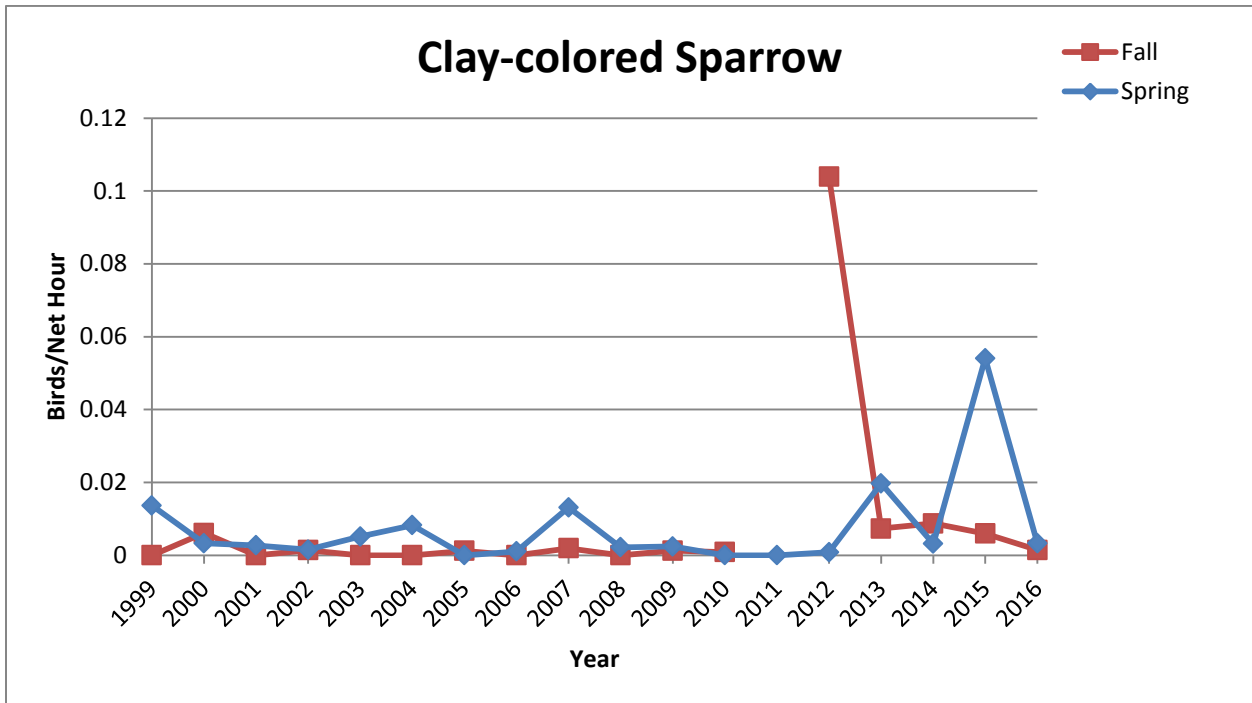


Clay-colored Sparrow





Number of Clay-colored Sparrows banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1996-2016.



Number of Clay-colored Sparrows banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix S. American Redstart (*Setophaga ruticilla*) Profile.

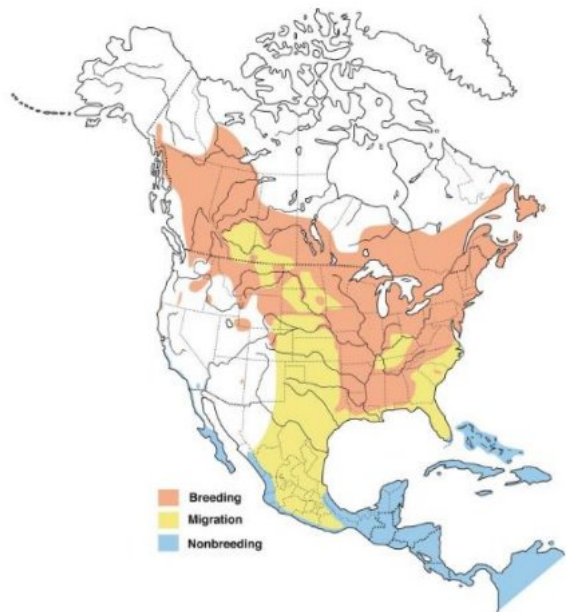
The overwhelming majority of this nesting species were netted at Farm Island (87%; 287). Because this species breeds at our sites, the SDOU sightings analysis yielded median dates for only early spring (May 8) and late fall (September 15). Eight unique recaptures occurred within the same season the individual was banded (7) or from the next season to 1 year since banding (1).

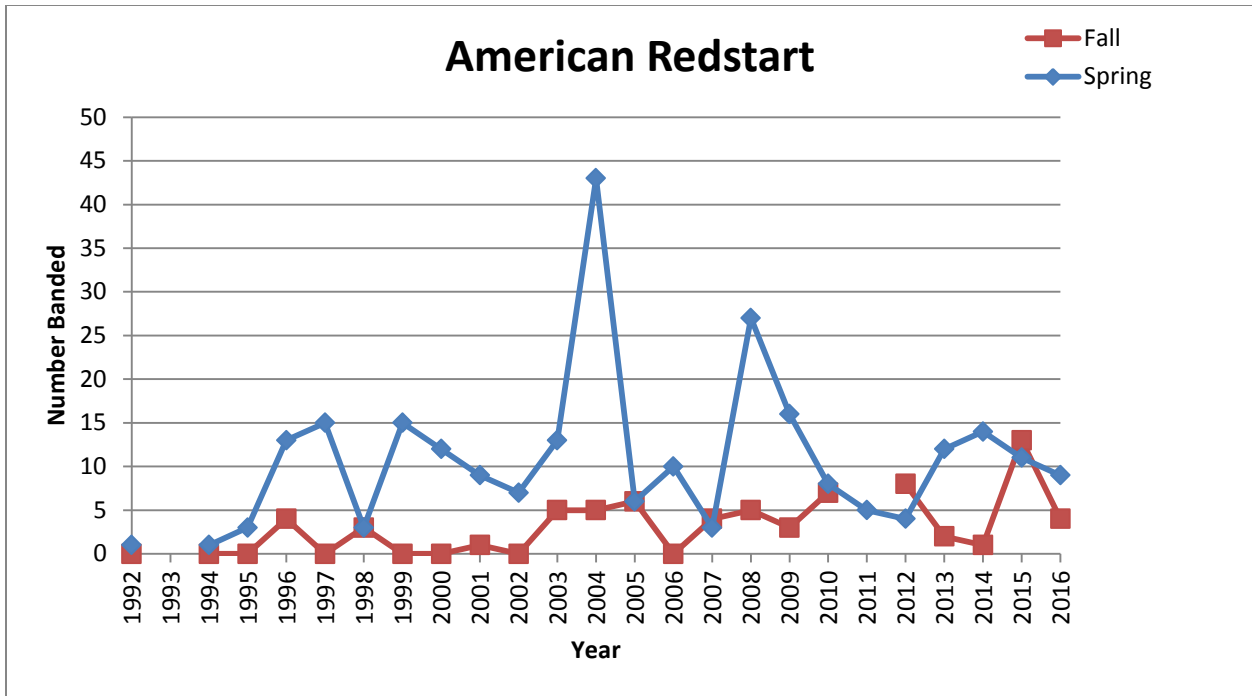
| American Redstart Measurements (sample sizes in parentheses)* | | | |
|--|--------------------------|---------------------|-----------------------|
| | average all birds | male average | female average |
| wing chord (mm) | 60.9 (320) | 62.3 (158) | 59.6 (159) |
| tail (mm) | 55.2 (252) | 56.1 (124) | 54.3 (126) |
| weight (g) | 8.7 (318) | 8.9 (158) | 8.5 (157) |

*See Appendix B for more detailed analysis. Male and female totals may not equal all birds total if sex was undetermined.

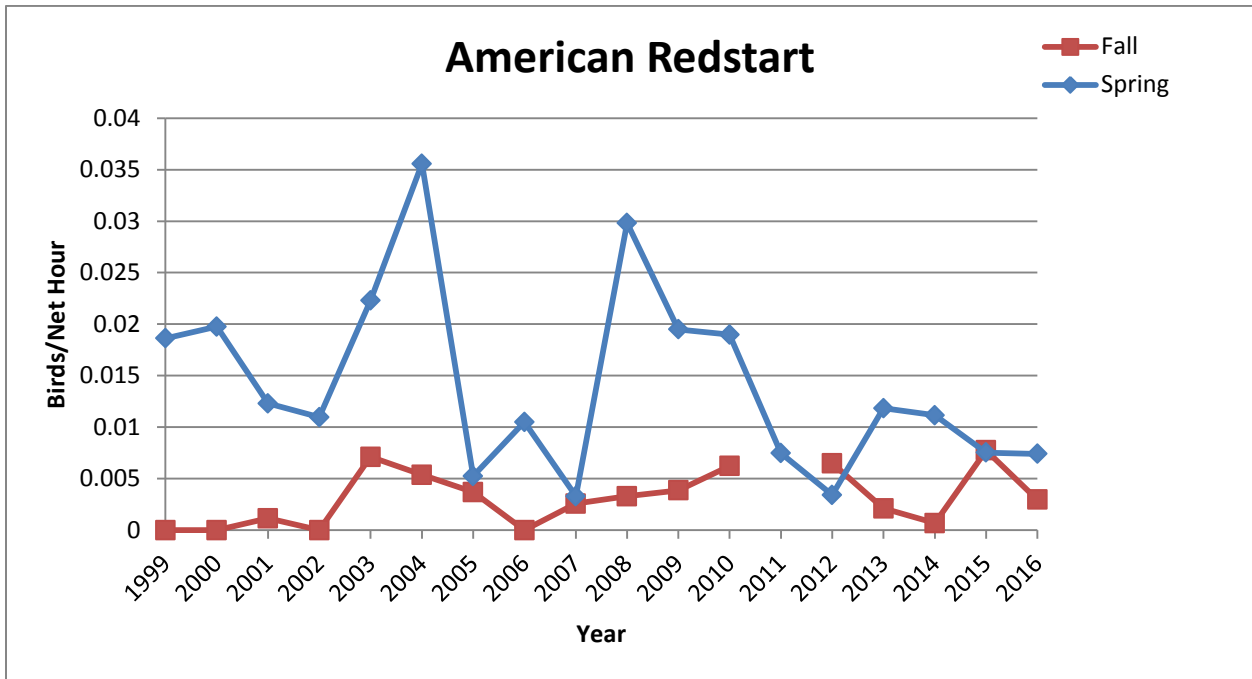


American Redstart male (left) and female (right)





Number of American Redstarts banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1992-2016.



Number of American Redstarts banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix T. Blackpoll Warbler (*Setophaga striata*) Profile.

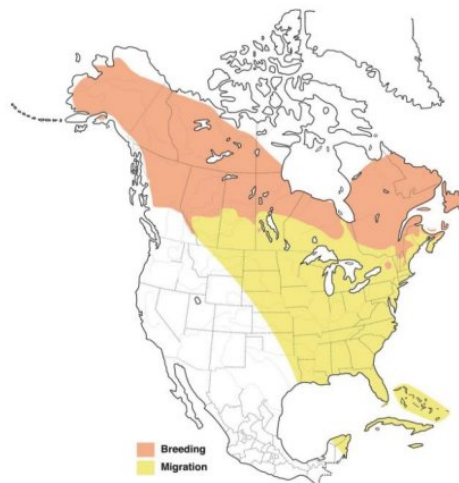
This species has different migration routes during spring and fall. When migrating from breeding grounds to wintering areas in the fall, the majority of individuals travel along the Eastern Seaboard. When returning to boreal forest breeding grounds during the spring, Blackpolls migrate over land in the central part of the continent. Our banding records reflect this pattern. Of 271 Blackpolls banded at our sites, 265 (97.8%) were banded during the spring, with only 6 individuals banded during fall seasons. The SDOU analysis of filtered Missouri River counties shows relatively good overlap between our spring migration season and spring sightings (Table 8). We have had 4 unique recaptures of this species, all during the same season individuals were banded.

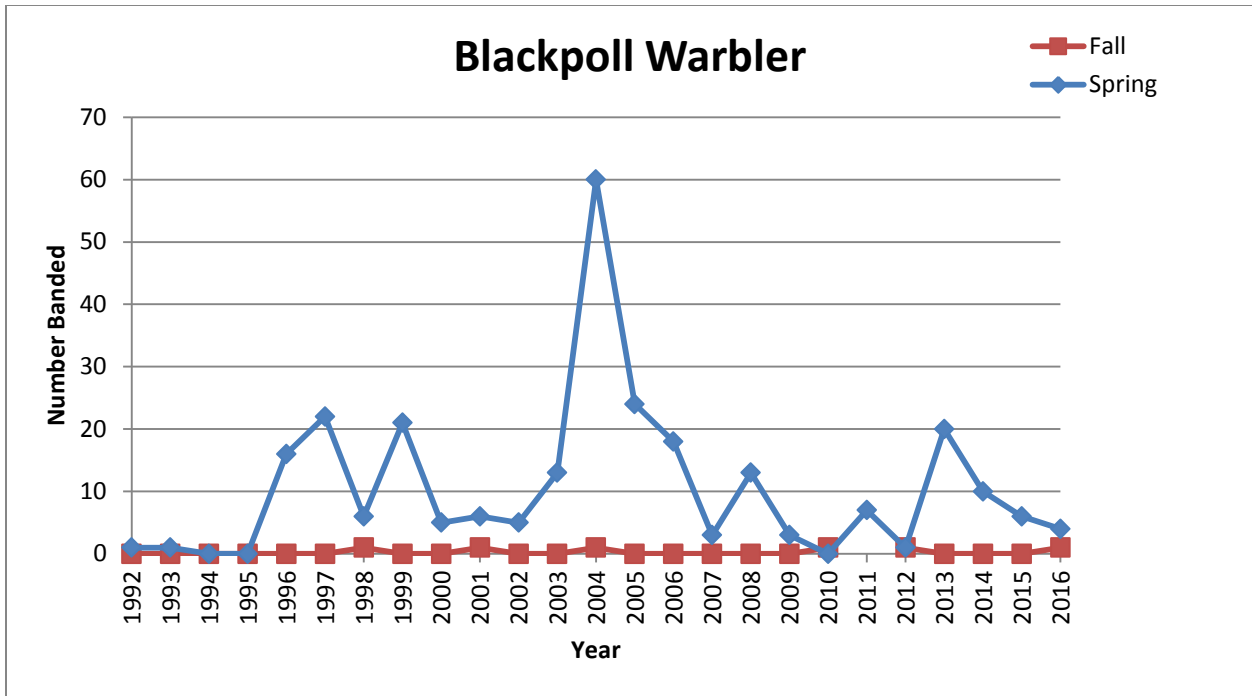
| Blackpoll Warbler Measurements (sample sizes in parentheses)* | | | |
|--|--------------------------|---------------------|-----------------------|
| | average all birds | male average | female average |
| wing chord (mm) | 73.3 (269) | 74.9 (142) | 71.5 (122) |
| tail (mm) | 49.3 (171) | 50.2 (95) | 48.0 (72) |
| weight (g) | 14.4 (269) | 15.0 (143) | 13.7 (121) |

*See Appendix B for more detailed analysis. Male and female totals may not equal all birds total if sex was undetermined.

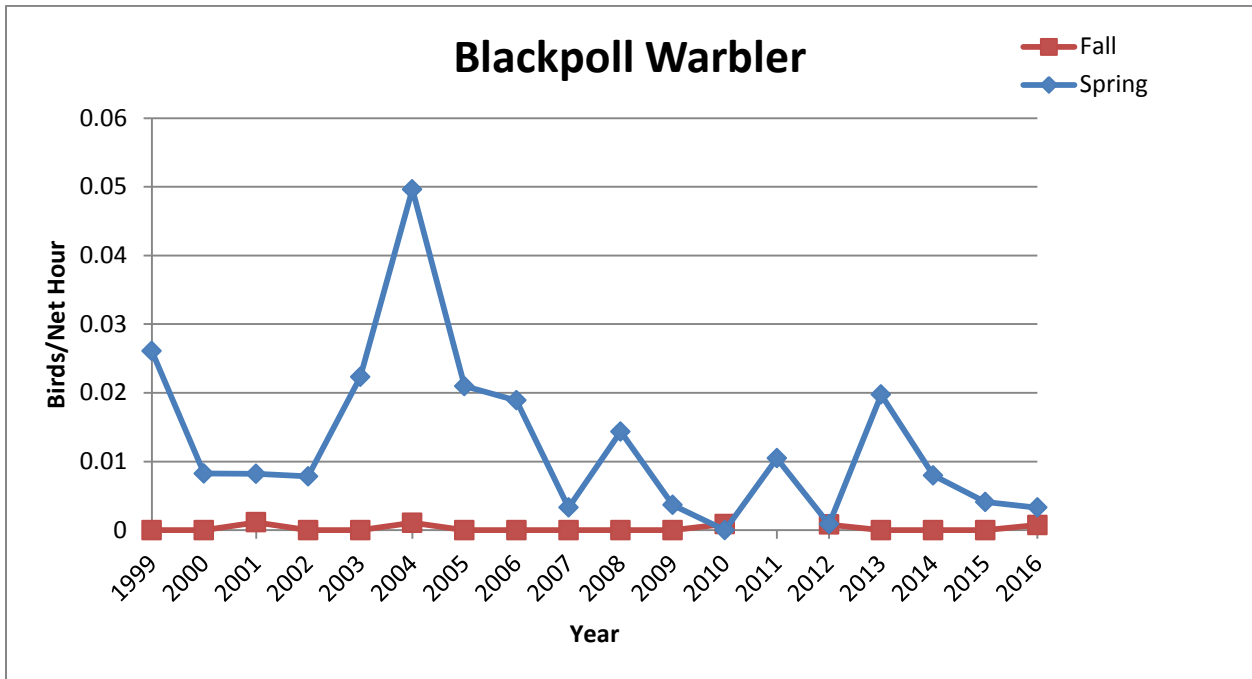


Blackpoll Warbler male (left) and female (right)





Number of Blackpoll Warblers banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1992-2016.



Number of Blackpoll Warblers banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

Appendix U. Warbling Vireo (*Vireo gilvus*) Profile.

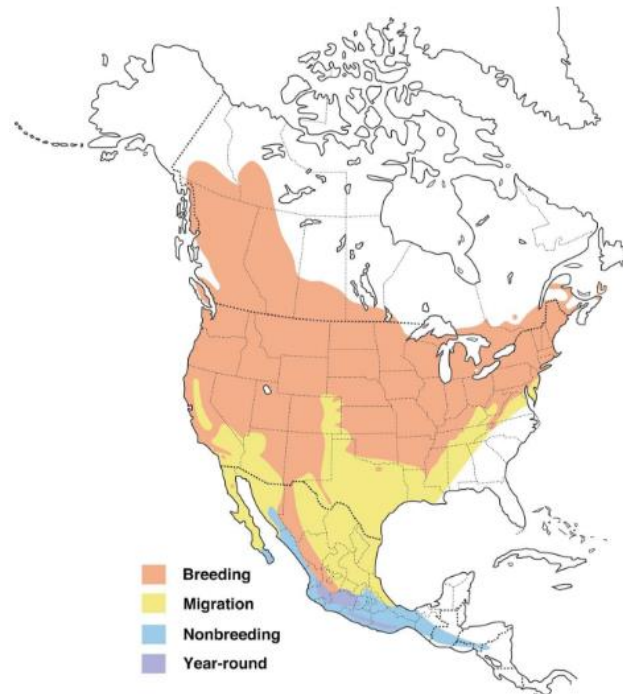
This species breeds in central South Dakota and was captured more frequently at Farm Island (66%; 174) compared to Fisherman's Point. However, 18 of 20 unique recaptures were made at Fisherman's Point. Our sites clearly provide nesting sites for this neotropical migrant, with recaptures occurring in 5 recapture timeframes. Analysis of SDOU sightings for the filtered Missouri River counties shows better overlap for spring sightings with our spring banding season than for the fall categories (Tables 8 and 9).

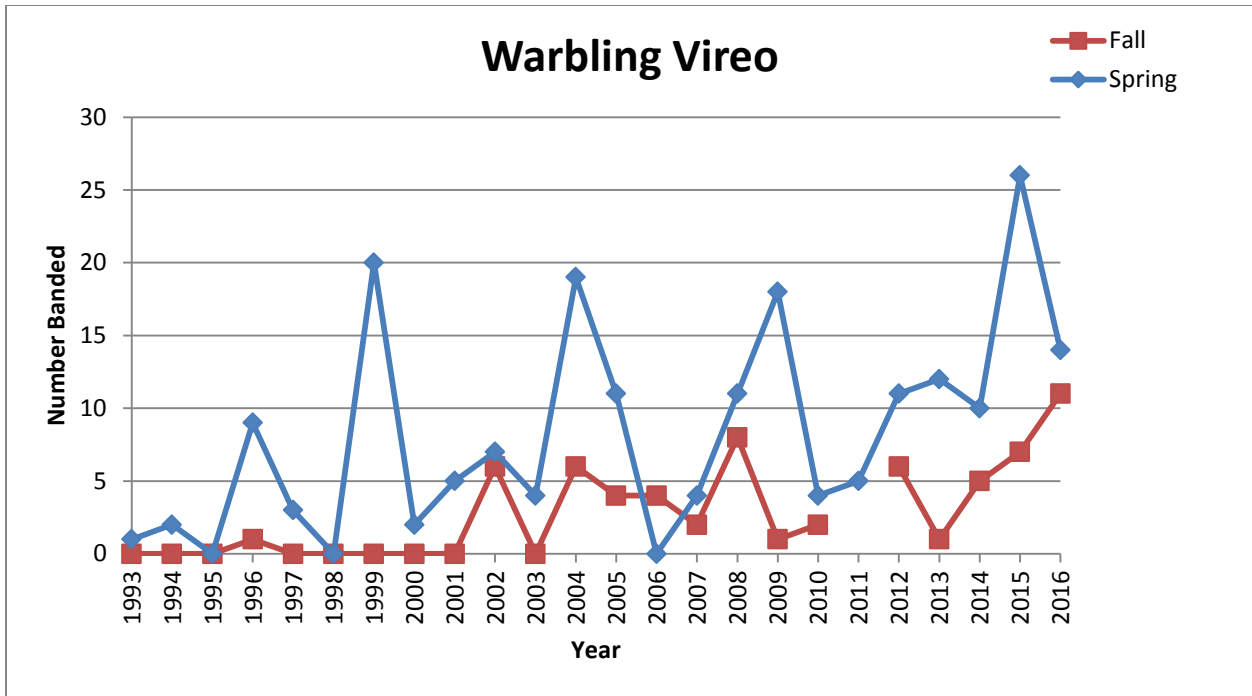
| Warbling Vireo Measurements (sample sizes in parentheses)* | |
|---|--------------------------|
| | average all birds |
| wing chord (mm) | 69.5 (253) |
| tail (mm) | 51.2 (190) |
| weight (g) | 14.7 (254) |

*See Appendix B for more detailed analysis.

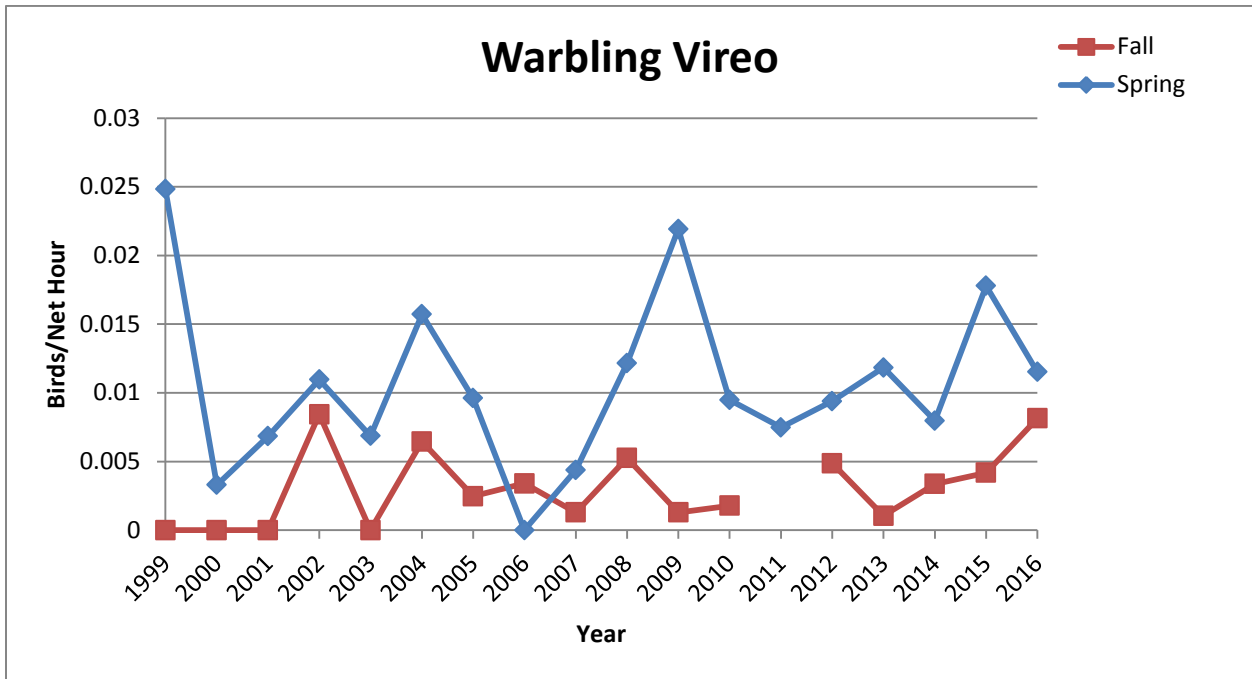


Warbling Vireo





Number of Warbling Vireos banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1993-2016.



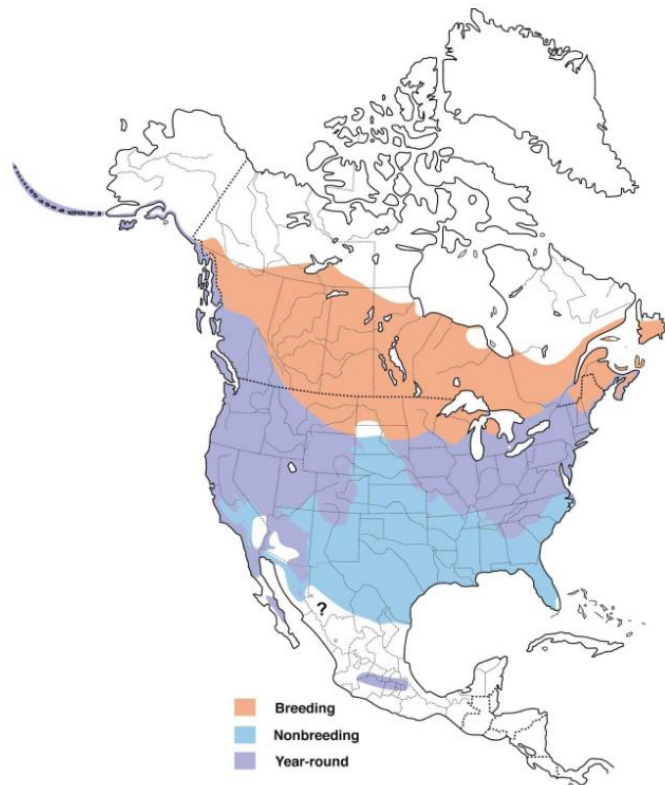
Number of Warbling Vireos banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.

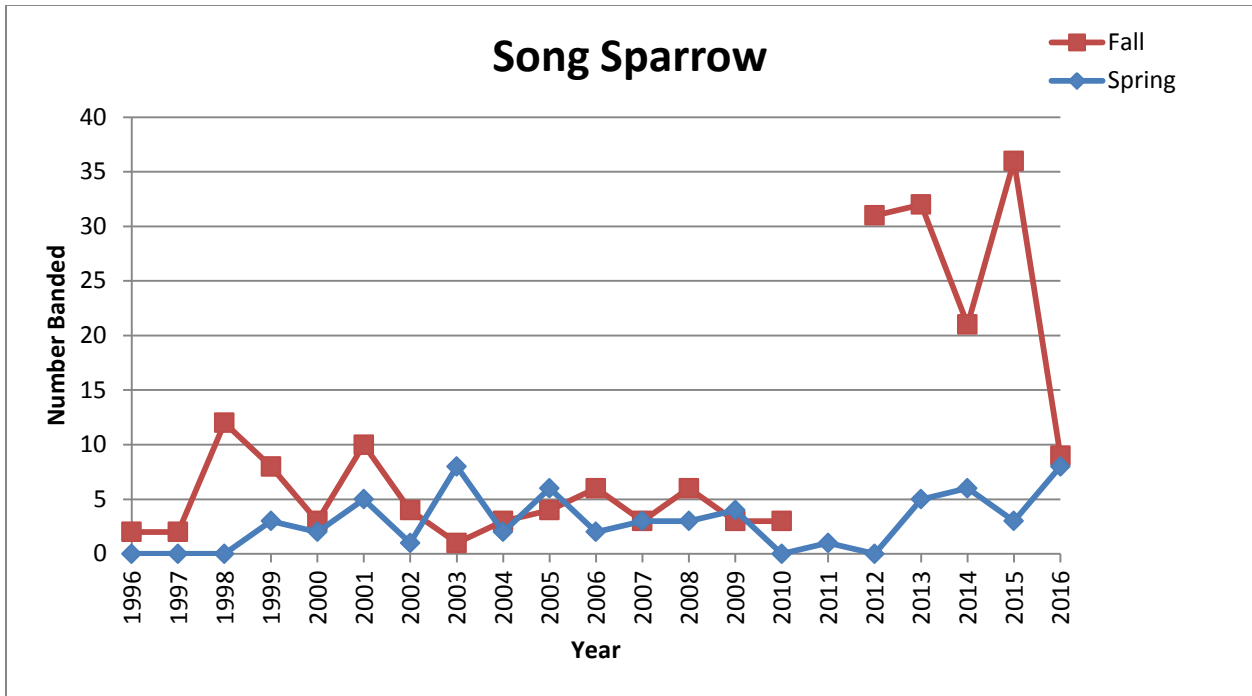
Appendix V. Song Sparrow (*Melospiza melodia*) Profile.

Nearly 77% (240) of Song Sparrows were banded at Farm Island. Similar to a pattern seen with other sparrows, particularly at Farm Island, we saw an increase in the number of Song Sparrows banded during the fall of 2012, with the highest fall number banded for this species peaking in 2015. Analysis of SDOU sightings for this species for the filtered Missouri River counties was not informative, because this species breeds at our sites and has records that extend into winter. We have had 43 unique recaptures of Song Sparrows spread across 4 recapture timeframes, demonstrating the importance of our sites, particularly Farm Island, to returning nesting birds. One Song Sparrow was at least 7 years old when recaptured at Farm Island.

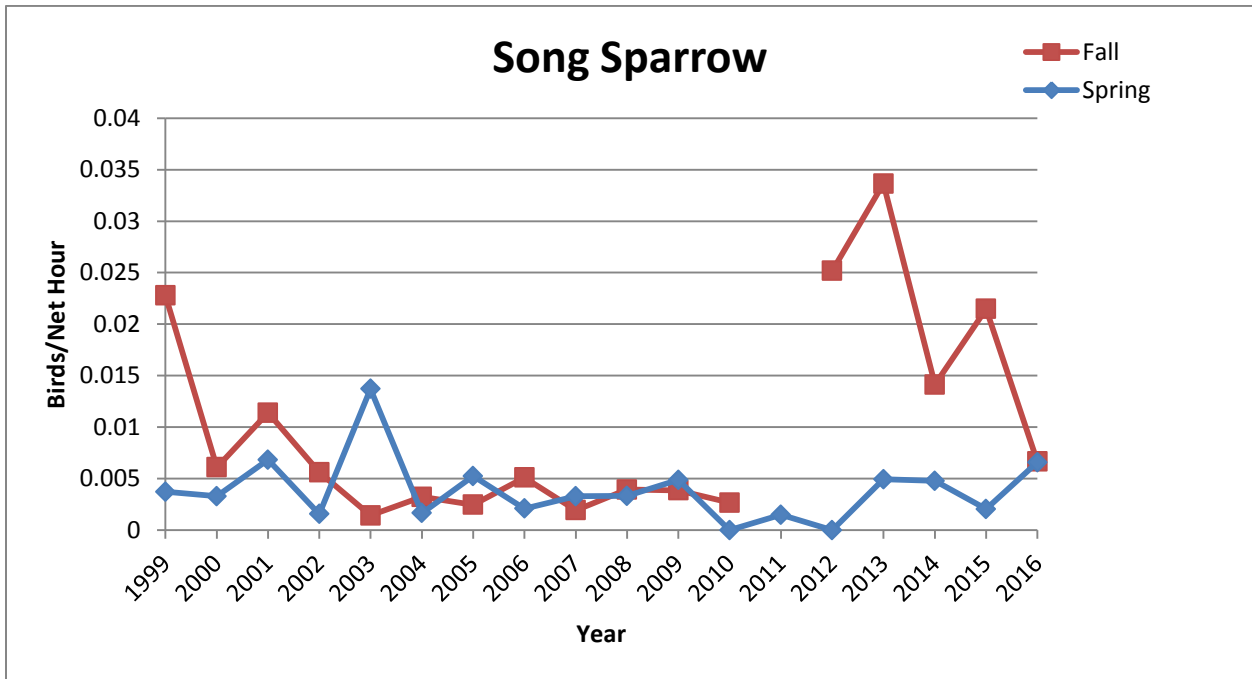
| Song Sparrow Measurements (sample sizes in parentheses)* | |
|---|--------------------------|
| | average all birds |
| wing chord (mm) | 65.1 (235) |
| tail (mm) | 65.7 (212) |
| weight (g) | 20.8 (227) |

*See Appendix B for more detailed analysis.





Number of Song Sparrows banded by season and year for Farm Island and Fisherman's Point banding sites combined from 1996-2016.



Number of Song Sparrows banded per net hour by season and year for Farm Island and Fisherman's Point banding sites combined from 1999-2016.