

**Rushton Woods Banding Station
Willistown Conservation Trust**

Ten Year Songbird Banding Report 2010-2019



Table of Contents

Summary at a Glance	2
Highlights.....	5
Longevity Records	8
Rushton Woods Preserve Banding Station Full 10 Year Report.....	9
Methods and Operations	9
Capture Rates and Totals per Season.....	11
Top Five Species per Season	17
Species Trends	19
Age and Sex Ratios.....	22
Recapture Data	28
Research and Publications at Rushton Woods Preserve	30
Literature Cited.....	31
Appendix A.	32

Summary at a Glance

Ten years of Songbird research at Rushton Woods Preserve

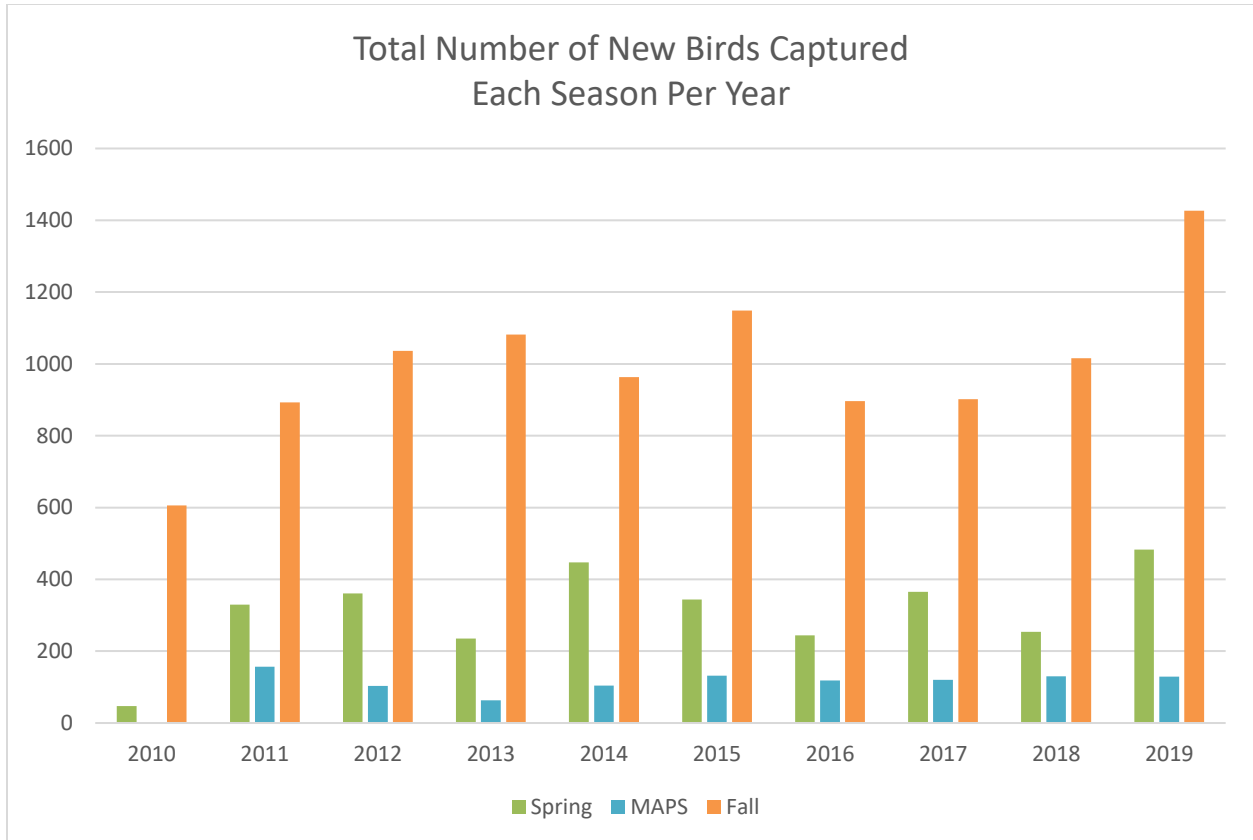
In May 2009, Willistown Conservation Trust (WCT) received a Conservation Grant from the Delaware Valley Ornithological Club (DVOC) and opened the Rushton Woods Preserve Bird Banding Station. Limited banding effort in 2009 ignited a successful bird conservation program connecting science and education through our bird banding station. Located in the shrub-scrub hedgerows at Rushton Woods Farm and Preserve, we have been studying how migratory birds' abundance and diversity is impacted by preserved land with sustainable agriculture practices in close proximity. Banding operations take place in the shrub-scrub hedgerows during each migratory season. Starting with ten fixed net locations in 2010, we have expanded to running sixteen nets in 2019. Among lessons learned are abundance and diversity of songbirds that use the preserve during migration as well as the impact of the quality of habitat available at Rushton. What started as spring and fall migratory songbird banding in 2009 has since grown to include a breeding bird banding program during the summer season. Referred to as MAPS (Monitoring Avian Productivity and Survivorship), we follow a national protocol for our breeding bird banding station, which is managed by the Institute for Bird Populations (www.birdpop.org). Our breeding banding program is operated within Rushton woods where ten fixed net locations have remained consistent since 2011.

Why Band Birds?

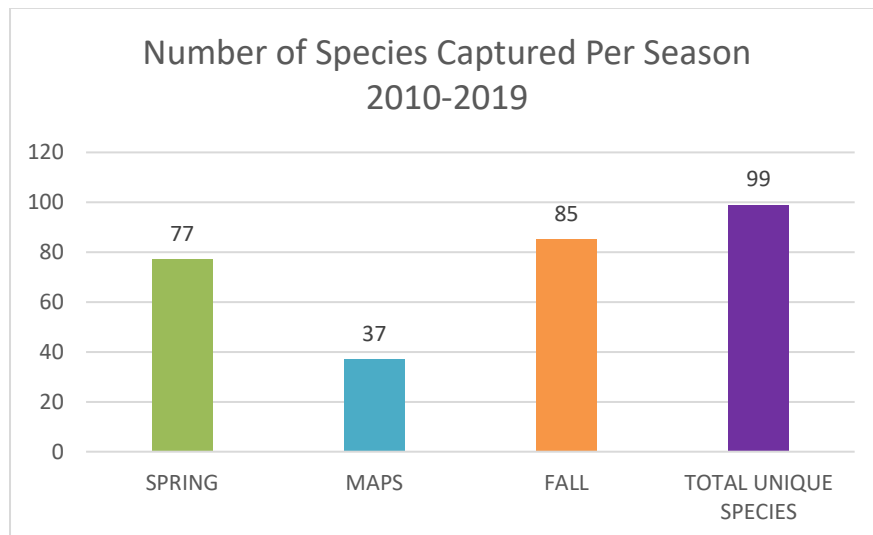
Each year, federally licensed bird banders at RWP capture and tag songbirds with a small aluminum band with a unique identifying number. Bird banding provides valuable information that helps us study dispersal, migration, behavior, social structure, life span, survival rate, reproductive success, and population growth. At RWP, we band to study the seasonal and long term population patterns of migratory, wintering and year-round resident birds. Banding allows us to track individuals, which is important in factoring survival, migratory turnover rates, and longevity.



After 10 years of migratory songbird banding (spring and fall) and 9 years of banding breeding birds (MAPS) at RWP we have banded a total of **14,136** songbirds of **99** species! See Appendix A for a full list of birds captured at RWP from 2010-2019.



Most birds are captured during the fall due to the abundance of newly hatched birds. However, we capture nearly the same number of species in the spring and fall migratory season.



Although we have banded 99 species at RWP, a few species dominate the landscape. Photos by Celeste Sheehan, top left to bottom right: Gray Catbird, White-throated Sparrow, Common Yellowthroat, Wood Thrush, Ovenbird, and Song Sparrow.



Table 1. Top five species during each banding season 2010-2019.

Species	Spring	MAPS	Fall	10 Year Total
Gray Catbird - GRCA	812	351	2349	3512
White-throated Sparrow - WTSP	429		1340	1769
Song Sparrow - SOSP			717	786
Ruby-crowned Kinglet - RCKI			475	581
Common Yellowthroat - COYE	306	57	540	903
American Goldfinch - AMGO	60			354
Ovenbird - OVEN	93	95		309
Veery - VEER		75		264
Wood Thrush - WOTH		186		423

Highlights

In addition to capturing and banding 14,136 birds at Rushton, we have recaptured 3,238 birds, meaning, when we captured the bird, they already had a band. Songbirds have a strong tendency to return year to year to the same breeding and wintering grounds, so many of our recaptures include breeding birds returning and departing, as well as wintering birds returning and departing. Other birds are recaptured only within a single migratory season as they stick around Rushton Woods Preserve to rest and refuel. The songbirds captured as true migrants, just stopping over, are rarely recaptured again at our station or any other. However, in ten years, we have captured two migratory birds that were originally banded at a different station, an American Redstart and an American Goldfinch. Only one bird, a White-throated Sparrow that was banded at RWP was captured at another station. Below are their stories.

On September 3, 2015, we captured an adult female American Redstart at RWP. The bird was originally banded at Kiawah Island Banding Station (KIBS) in South Carolina in the fall of 2014 <http://kiawahislandbanding.blogspot.com/>. These banding stations are 570 miles apart and the bird was presumably on its fall migration when it was encountered at two different stations in two different years. These banding encounters added greatly to our understanding of the migratory pattern of this small songbird.

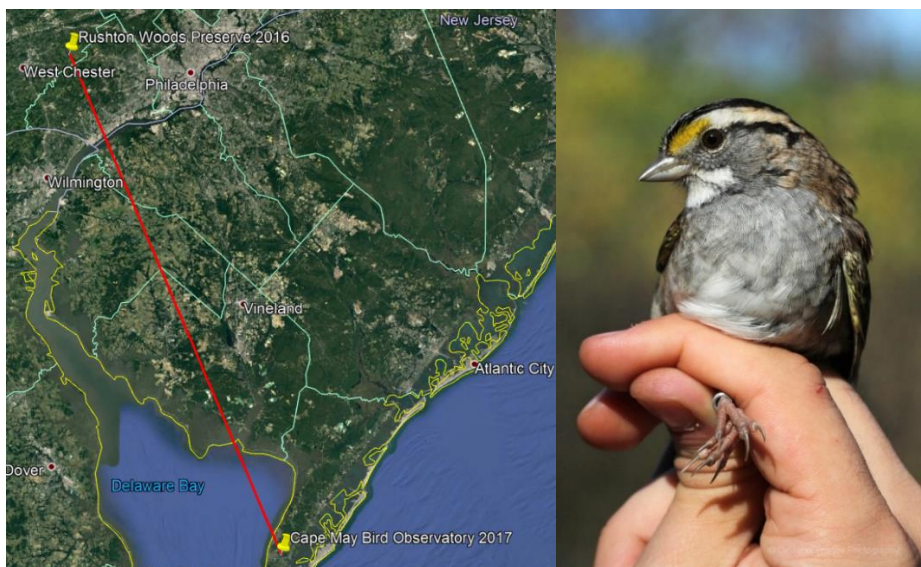


On May 1, 2019, tucked within a large flock of American Goldfinch we discovered a second year (SY) male American Goldfinch that had been banded originally at Foreman's Branch Bird Observatory (FBBO) on 11/25/2018. The young may have hatched in Maryland and dispersed the 58 miles the following spring!



In contrast, only one bird banded at RWP has also been encountered at another banding station.

On October 16, 2016, we banded a White-throated Sparrow at Rushton. The following spring, on March 13, 2017, it was captured at Cape May Bird Observatory, 75 miles to the SE of RWP. One can only imagine that the bird may have continued south in the fall of 2016 after stopping at RWP, and may have been picked up in Cape May during the north-bound spring migration.



Among the droves of Gray Catbirds and White-throated Sparrows, we are occasionally greeted by a rare visitor. After 10 years, there are 8 species that have only been captured once. While they are not rare migrants, some frequent the tops of the trees and have only once encountered our nets.

- Bay-breasted Warbler
- Clay-colored Sparrow
- Cape-may Warbler
- Eastern Kingbird
- Hooded Warbler
- Louisiana Waterthrush
- Yellow-bellied Sapsucker
- Yellow-throated Vireo



Other notable captures include:

- Yellow-breasted Chat (6):
- American Woodcock (2)
- Barn Swallow (4)
- Black-throated Green Warbler (3)
- Common Grackle (2)
- Morning Warbler (4)
- Prairie Warbler (3)
- Red-winged Blackbird (4)
- Wilson's Warbler (4)
- Yellow-billed Cuckoo (2)
- Yellow Warbler (2)



Longevity Records

After banding at Rushton Woods Preserve (RWP), we can start to get a better idea of how long birds live and if they are returning from year to year. The Bird Banding Laboratory (BBL) keeps records of the oldest birds through over a million band records. However, after 10 years, we have a few records of our own.



Veery – At least **10** years old! This male Veery was first captured on June 30, 2011, aged ASY, meaning it was at least in its second year. We have since encountered this bird breeding at Rushton in 2012, 2014, 2015, 2018, 2019! We may have not seen the last of this Veery! The BBL record for Veery is 13 years old.



Common Yellowthroat - At least **9** years old. This male COYE was first captured on May 8, 2012, aged ASY, meaning it was at least in its second year. We have since encountered this bird breeding at Rushton every year except 2016, with the last capture on 5/8/2019. The BBL record for COYE is 11 years old.



Gray Catbird – **9** years old. This male catbird was first captured on May 3, 2012, aged as a SY which tells us we know his exact age. We have since encountered this bird breeding at Rushton in 2013, 2014, 2016, 2018, and 2019. The BBL record for Gray Catbird is 17 years old!



Ovenbird – At least **8** years old! This female Ovenbird was first captured on May 27, 2011, aged ASY, meaning it was at least in its second year. We have since encountered this bird breeding at Rushton in 2014, 2015, 2017. The BBL record for Ovenbird is 11 years old.



Wood Thrush – At least **9** years old! This male Wood Thrush was first captured on October 4, 2011, aged AHY, meaning it was at least in its second year. We have since encountered this bird breeding at Rushton in 2014, 2015 and 2018. The BBL record for Wood Thrush is 10 years old.

Rushton Woods Preserve Banding Station Full 10 Year Report

Here we present a detailed summary of bird banding at Rushton Woods Preserve (RWP) from year to year starting in 2010 when banding efforts became standardized. Results are reported by each season independently in order to compare season to season each year.

Methods and Operations

Songbirds are captured in mist-nets in fixed locations and extracted every 30-40 minutes during migration. Once extracted from the net by trained staff or volunteer, the birds are transferred to a central banding station where each bird is fitted with an aluminum band bearing a unique serial number (U.S. Geological Survey). We measure wing chord to the nearest millimeter (mm) and use a digital scale to determine mass to the nearest tenth of a gram (g). We score subcutaneous fat on an increasing scale of 0–6 (Ralph et al. 1993), with 0 representing no visible fat. When possible we used Pyle's (1997) criteria to determine the sex and age class of the bird (i.e., hatch-year, HY; after hatch-year, AHY).

Figure 1. Rushton Woods Preserve Banding Station operates two monitoring areas, Rushton Farm (RUFA) study area for the monitoring of spring and fall migrants, pictured left; and Rushton Woods Preserve (RWP) study area for the monitoring of breeding birds following MAPS protocol, pictured right.

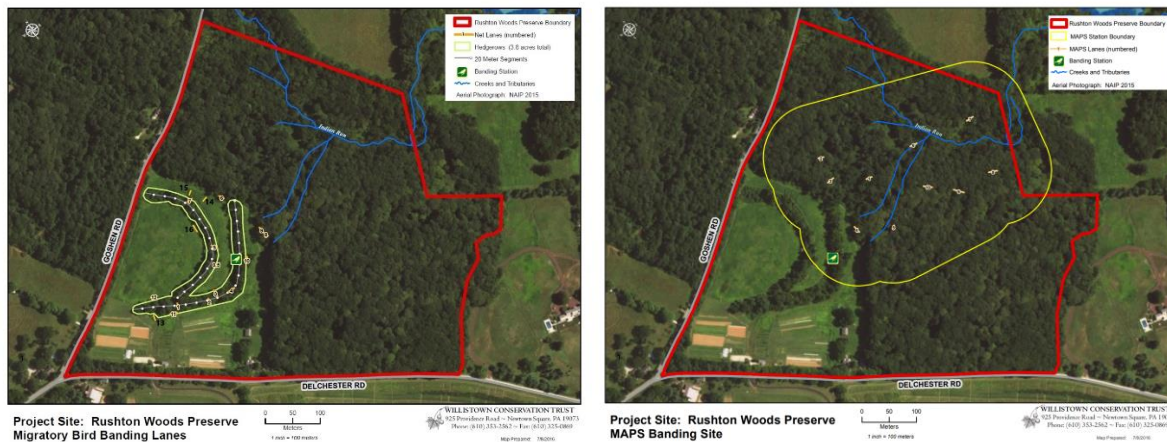


Figure 2. Pictured top left is a mist net, used to capture bird, pictured right are bags used to safely transport birds from the net to the banding station and bottom are banders collecting data from the birds before being safely released.



Federally licensed bird banders processing birds before release.



A Common Yellowthroat released after banding. Photo by Jennifer Mathes.

Capture Rates and Totals per Season

Spring Migration

As migratory songbirds depart their wintering grounds, we open our nets beginning in mid-April to capture and study songbirds that use RWP as a stopover and refueling spot. We typically operate the station three days per week, with our nets open five or six hours beginning a half hour before sunrise (Table 1). Since 2010, we have captured 3,110 birds of 77 species during spring migration (Table 2, Appendix A).

MAPS (Monitory Avian Productivity and Survivorship)

Monitoring of breeding birds did not begin until 2011. During the breeding season, from late May until the beginning of August we move our banding operation from the hedgerows and meadows into the woods of Rushton (Fig. 1). Surrounded by towering American beech and tulip poplar, we follow a strict protocol of a MAPS program as part of the Institute of Bird Populations including more than 1,200 stations across the US and Canada (birdpop.org). We set up 10 stationary nets and operate one day each in eight consecutive ten-day periods (Table 1). Since 2011, we have captured 1,056 of 37 species (Table 3, Appendix A).

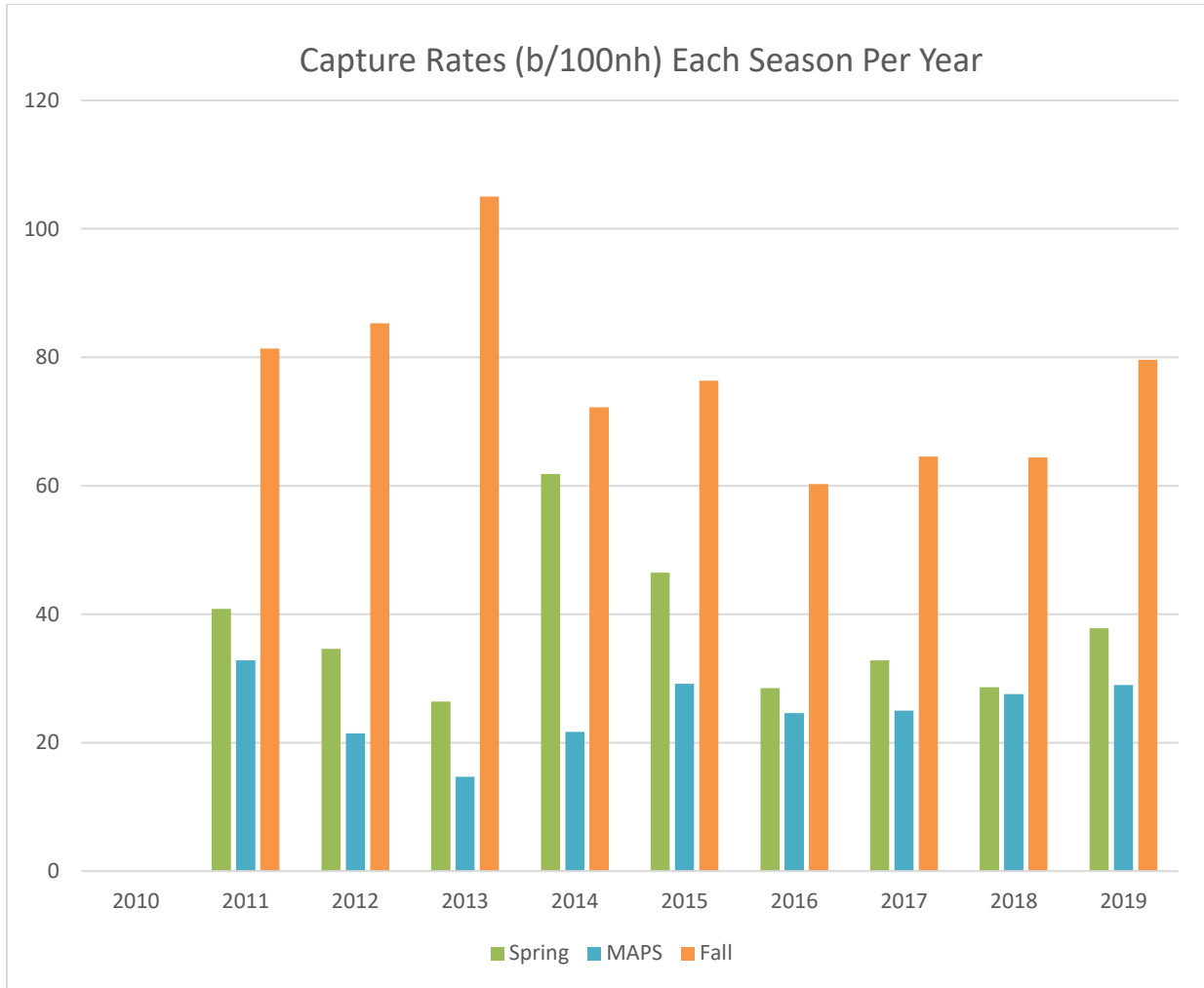
Fall Migration

In late August, the banding operation resumes in the hedgerows and meadows, using the same nets as in spring migration. Again, we run the station three days per week from a half hour before sunrise for five to six hours (Table 1). Since 2010, we have captured 9,970 birds of 85 species during fall migration (Table 4, Appendix A).

Table 1. Effort spent banding during each banding season.

Season/Year	# Days Banding	# New Birds	Total Net Hours	Capture Rate (b/100nh)
Spring 2010	4	47	NA	NA
Spring 2011	16	330	808.0	40.8
Spring 2012	20	361	1044.0	34.6
Spring 2013	14	235	889.8	26.4
Spring 2014	14	447	723.0	61.8
Spring 2015	14	344	740.0	46.5
Spring 2016	15	244	857.0	28.5
Spring 2017	16	365	1111.8	32.8
Spring 2018	14	254	887.3	28.6
Spring 2019	16	483	1276.8	37.8
Season/Year	# Days Banding	# new birds	Total net hours	capture rate (b/100nh)
MAPS 2011	8	157	478.7	32.8
MAPS 2012	8	103	480.0	21.5
MAPS 2013	8	63	428.7	14.7
MAPS 2014	8	104	479.3	21.7
MAPS 2015	8	132	452.7	29.2
MAPS 2016	8	118	480.0	24.6
MAPS 2017	8	120	480.0	25.0
MAPS 2018	8	130	471.3	27.6
MAPS 2019	8	129	445.3	29.0
Season/Year	# Days Banding	# new birds	Total net hours	capture rate (b/100nh)
Fall 2010	25	606	NA	NA
Fall 2011	23	893	1097.6	81.4
Fall 2012	24	1036	1214.8	85.3
Fall 2013	20	1082	1030.3	105.0
Fall 2014	28	963	1333.0	72.2
Fall 2015	28	1149	1505.0	76.3
Fall 2016	24	896	1487.0	60.3
Fall 2017	23	902	1397.4	64.5
Fall 2018	24	1016	1578.1	64.4
Fall 2019	26	1427	1792.5	79.6

Figure 3. Comparison of capture rates (birds captured per 100 hours of net operation) of new birds per season, spring migration (spring), summer breeding (MAPS) and fall migration (fall) per year.



Since 2011, we have spent between 14 and 16 days banding during spring migration, with the exception of 2012 where we banded 23 days. Since we have continued to increase the number of nets in the RUFA banding area, we can use capture rate (birds per net hour) as a way to show the most birds caught compared to the time we spent banding and how many nets we had open to capture birds. For example, in 2014, we captured 447 birds, but only operated with 10.5 nets. In 2019, we capture more birds, 483, but operated 15 nets, which resulted in almost half the birds per net hour than 2014. In the fall we spend on average 24 days banding as the migratory period is much longer in the fall. In contrast, we band on 8 days, specifically spread out during the breeding season.

Table 2. Number of birds captured per year during spring migration.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
New	47	330	361	235	447	344	244	365	254	483	3110
Recap	9	57	125	76	114	94	112	134	120	124	965
Total	56	387	486	311	561	438	356	499	374	607	4075

Table 3. Number of birds captured per year during MAPS.

	2011	2012	2013	2014	2015	2016	2017	2018	2019	TOTALS
New	157	103	63	104	132	118	120	130	129	1056
Recap	87	72	58	88	109	104	90	88	75	771
Total	244	175	121	192	241	222	210	218	204	1827

Table 4. Number of birds captured per year during fall migration.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	TOTAL
New	606	893	1036	1082	963	1149	896	902	1016	1427	9970
Recap	70	115	164	180	163	249	207	158	162	279	1747
Total	676	1008	1200	1262	1126	1398	1103	1060	1178	1706	11717

Figure 4. Comparison of total number of new birds captures per season, spring migration (spring), summer breeding (MAPS) and fall migration (fall) per year.

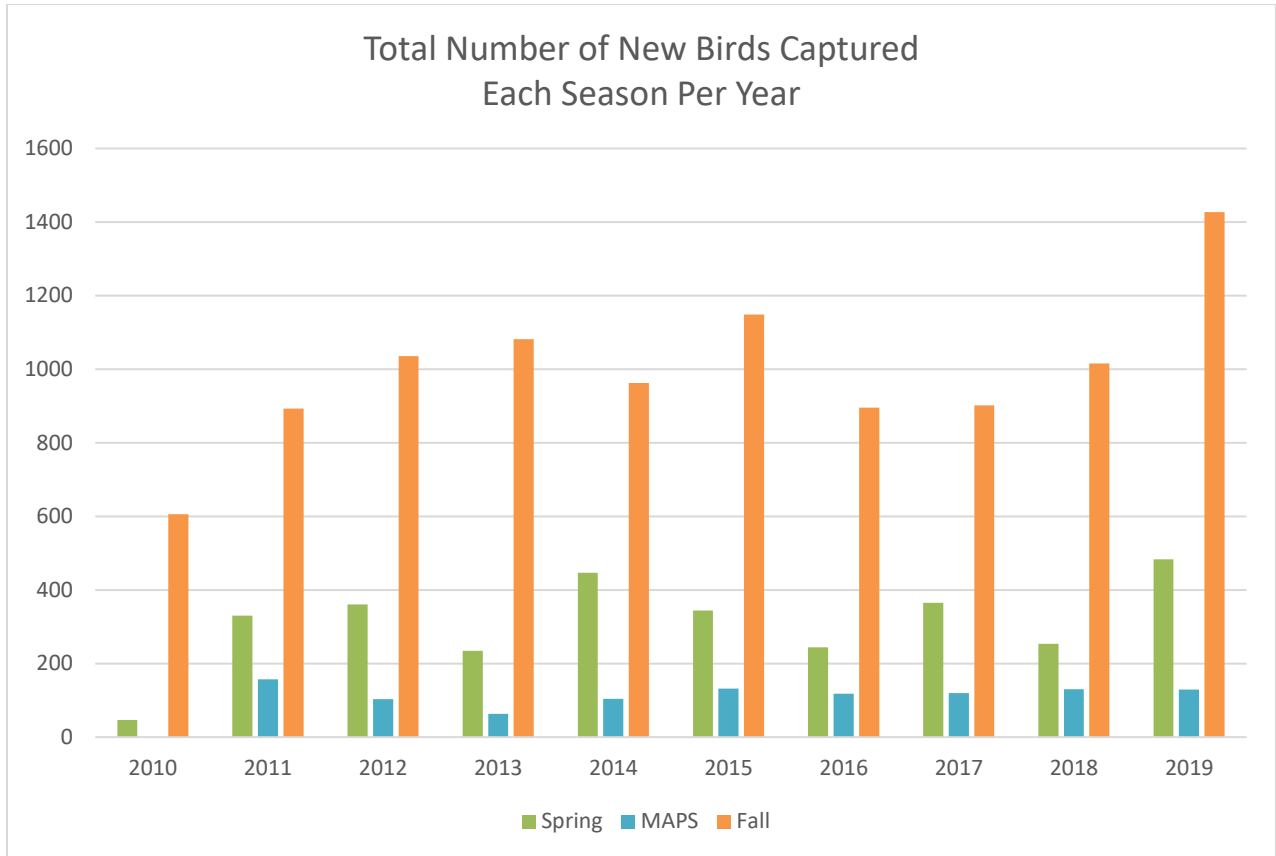
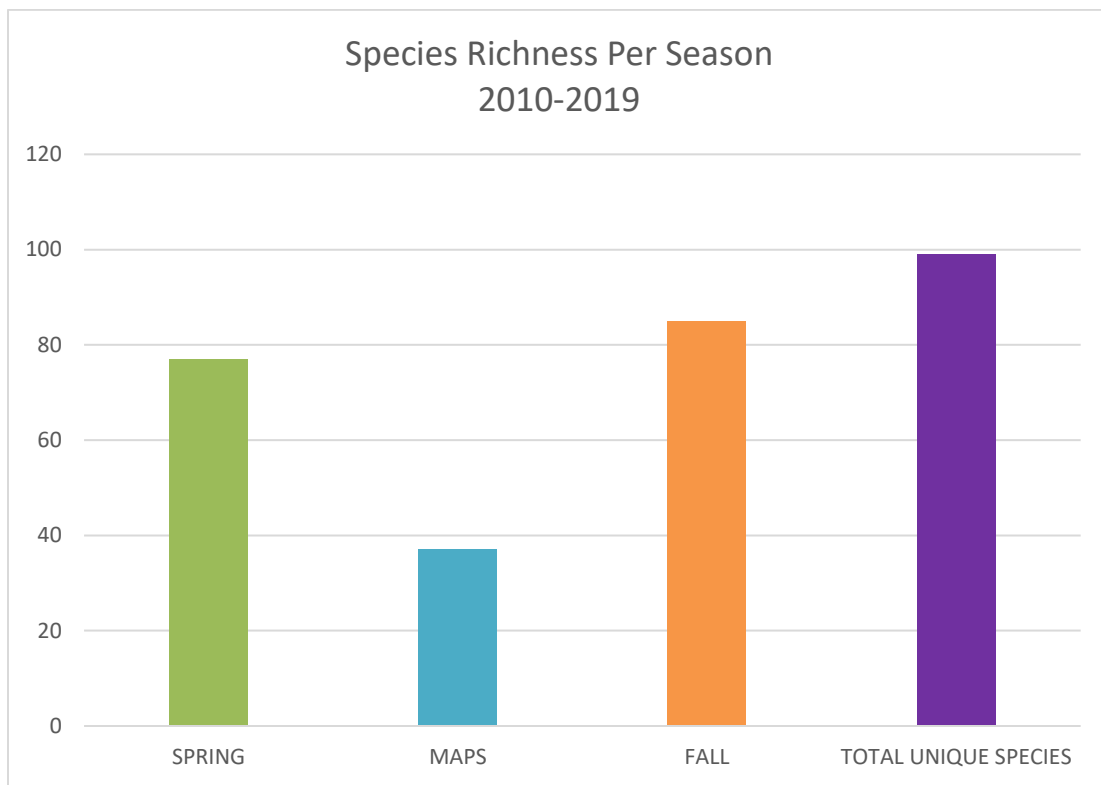


Table 5. Species richness; number of species captured per year during spring migration.

Species Richness	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	TOTAL
Spring	16	45	44	36	52	50	35	41	42	51	77
MAPS		22	18	19	16	19	20	23	20	17	37
Fall	54	54	63	59	63	53	50	51	58	53	85

Figure 5. Total species richness (number of bird species) of unique bird species captured each season after 10 years of banding at Ruston Woods Banding Station.



Our most common species consistently captured every season at RWP is the Gray Catbird (GRCA). In spring, White-throated Sparrow (WTSP), Common Yellowthroat (COYE) and Ovenbird (OVEN) are the next most common species captured. While during the breeding season (MAPS) Wood Thrush (WOTH), Ovenbird (OVEN), Veery (VEER) and Common yellowthroat (COYE) are the most common following the GRCA. In the fall, we most consistently capture White-throated sparrow (WTSP), Song sparrow (SOSP), Ruby-crowned kinglet (RCKI) and Common yellowthroat (COYE) in the greatest numbers. High GRCA captures represent over a quarter of total captures each season after 10 years (Figure 6).

Top Five Species per Season

Table 6. Top five species captured each year during spring migration.

Species	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
GRCA	19	124	98	53	91	87	63	119	67	91
WTSP		30	22	30	103	64	50	36	25	69
COYE	3	33	45	27	59	25	19	39	13	43
OVEN		11	13		15		11			
NOCA							10		14	
AMRO				12					11	
MAWA						14				
HOWR	3			13	12	10				
NOWA			26							
CACH		11								
BAOR	5									
BLJA	2									
AMGO								16		60
BAWW								14		33

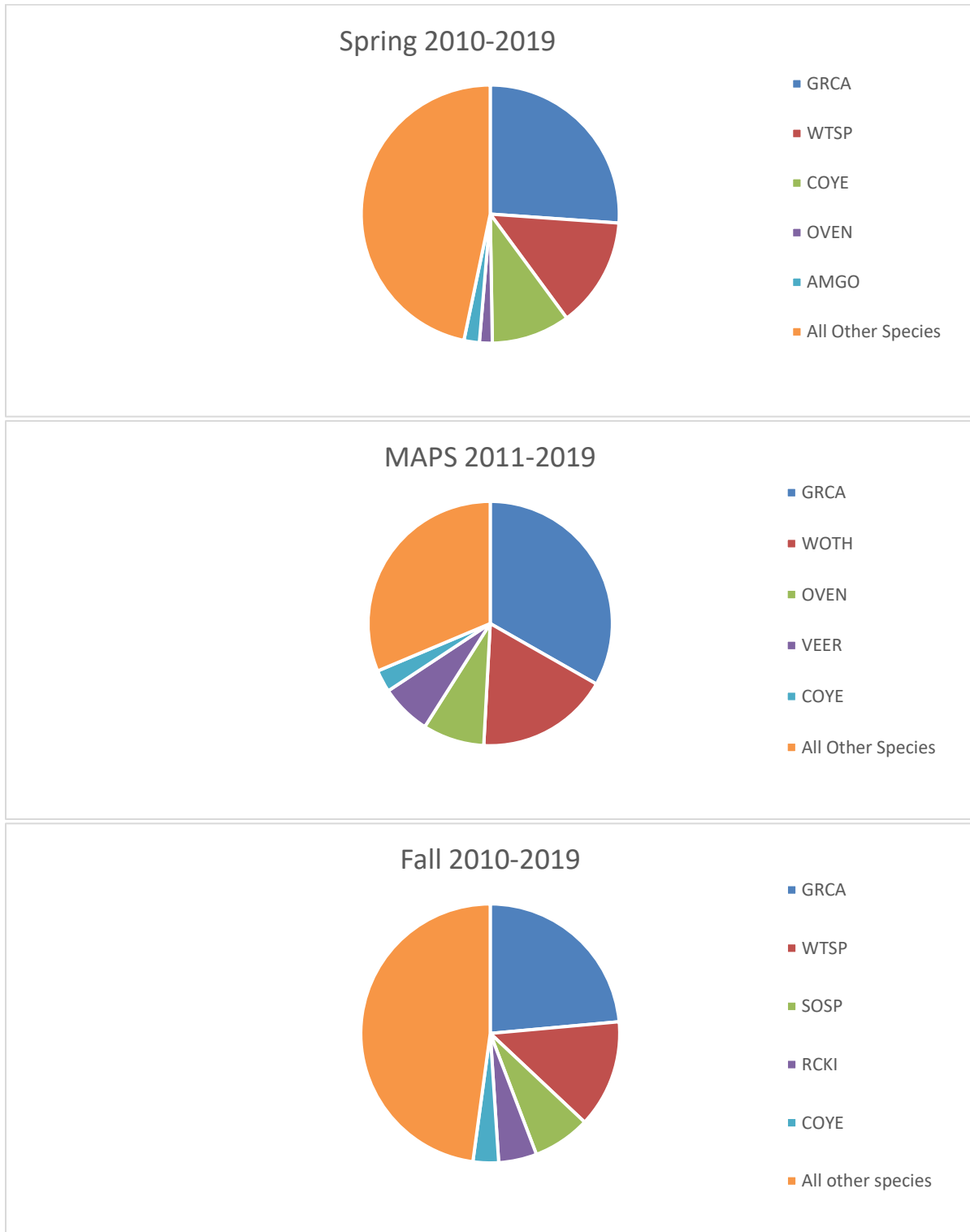
Table 7. Top five species captured each year during MAPS season.

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019
GRCA	49	39	17	34	39	32	40	51	50
WOTH	9	16	15	27	22	23	26	15	33
OVEN	24		5	8	12		8	16	13
VEER	15	10	5	6	12	10		7	6
COYE		7		5			10	9	
CARW			4				4		
DOWO					11	9			
NOCA						6			3
AMRO	17								
CACH		5							

Table 8. Top five species captured during fall migration.

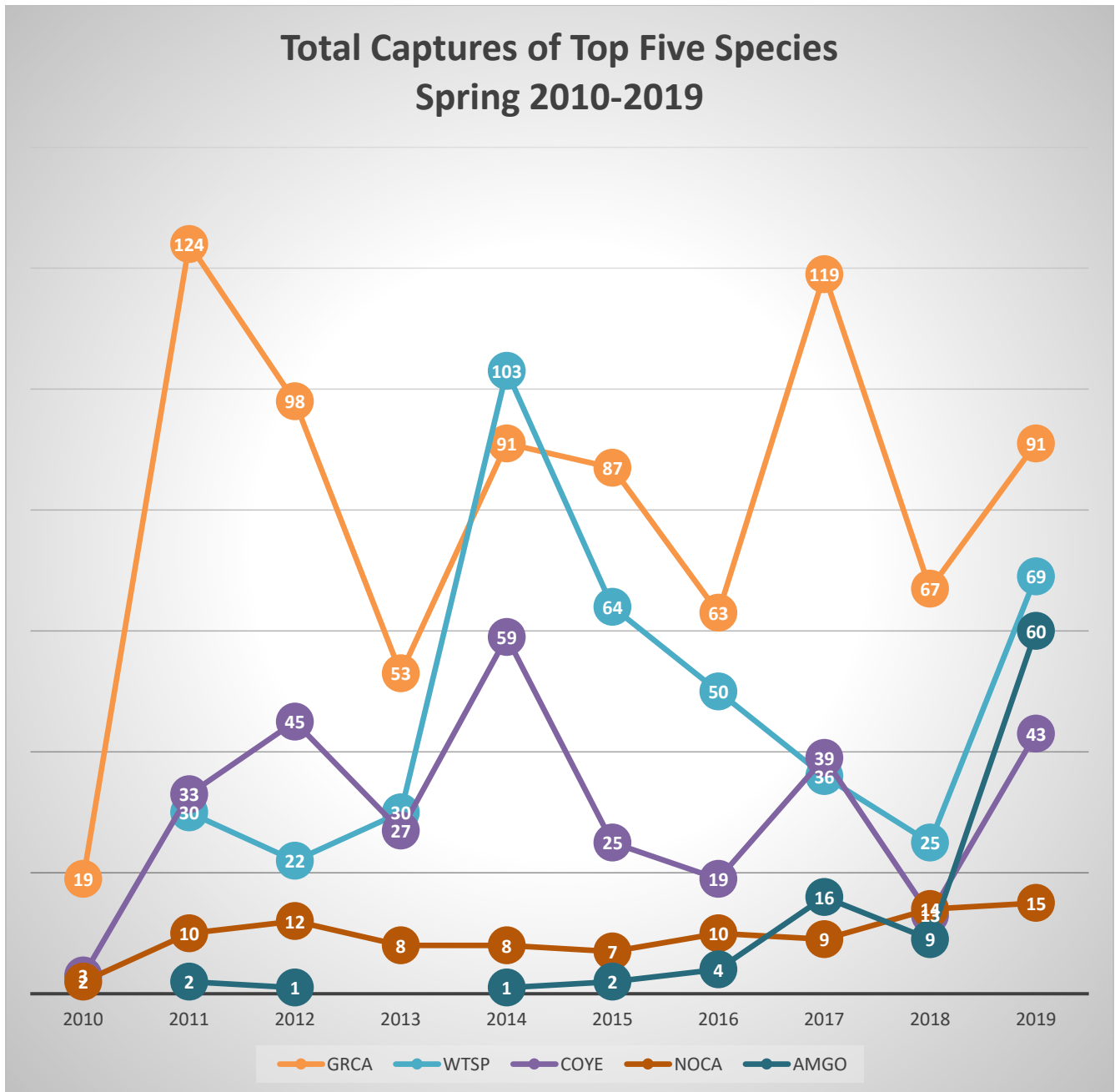
Species	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
GRCA	118	119	254	176	285	422	185	245	136	409
WTSP	113	202	131	165	127	125	138	83	145	111
SOSP		50	67	89	52	101	75	79	99	105
RCKI		44	70	89	55	53		58	106	
COYE					59		49	61	66	83
AMRO	48	42	71				47			
AMGO										119
HETH	32					35				
NOCA	30									

Figure 6. Percentage of top five species captured per season.

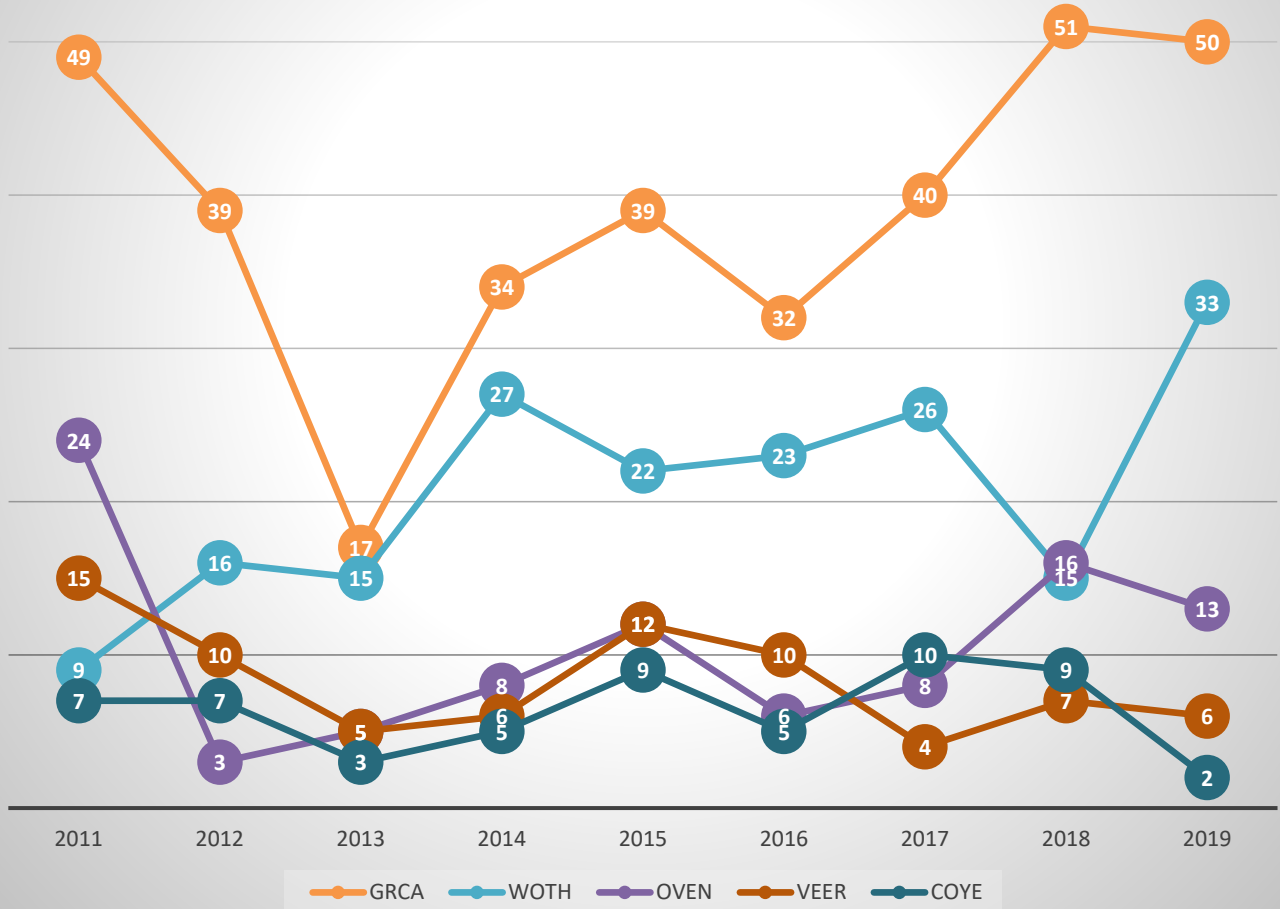


Species Trends

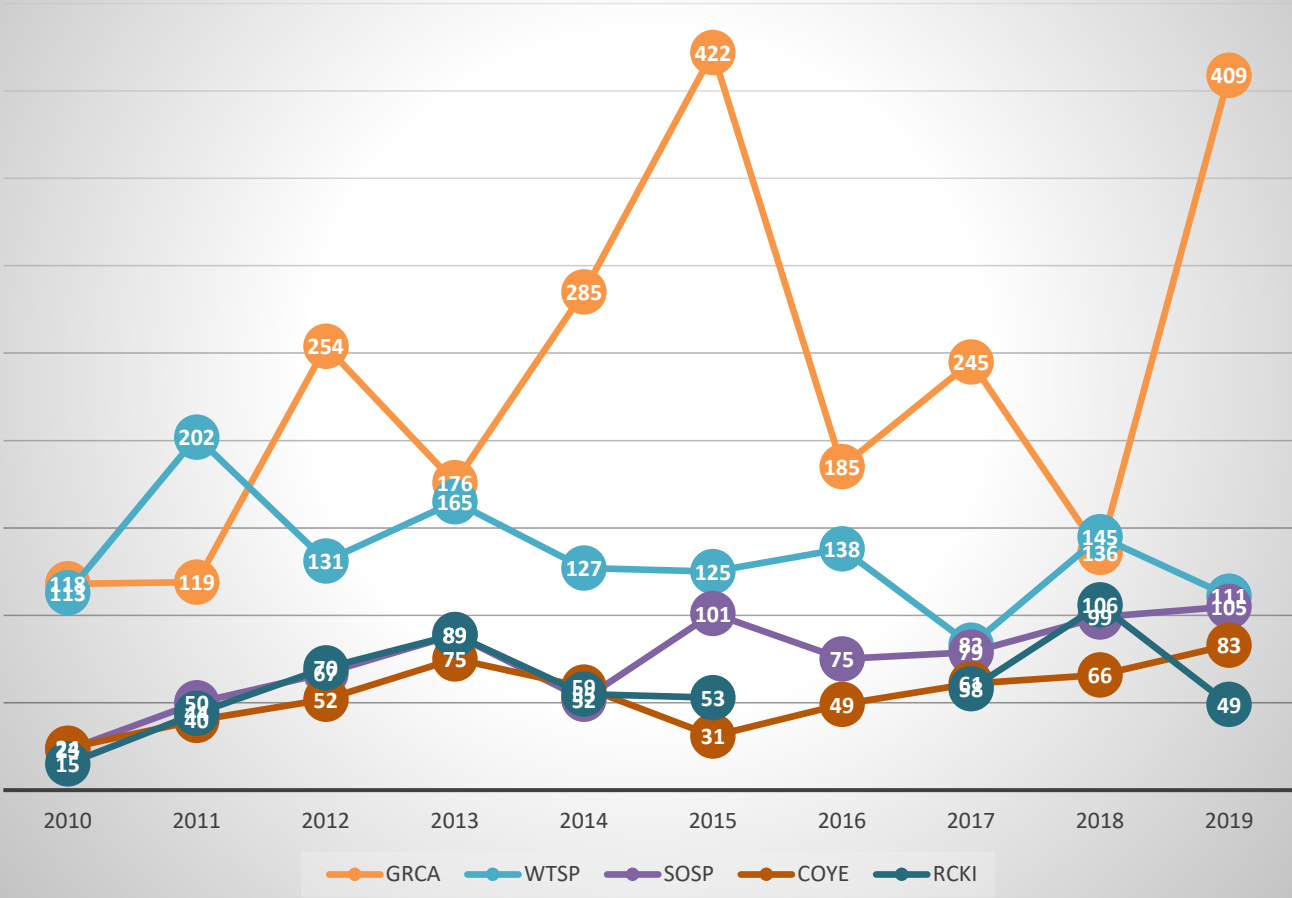
Long-term banding efforts can provide indications of local bird population changes overtime. After 10 years of banding at RWBS on the protected Rushton Woods Preserve, we can only start to see what our local bird populations look like. In such a small period of time, changes may only be due to small weather events or other changes, but with continued effort, we could see trends due to climate change or habitat loss in certain species. Here are the total captures for the top five species per season.



Total Captures of Top Five Species MAPS 2010-2019



Total Captures of Top Five Species Fall 2010-2019



Age and Sex Ratios

Most songbirds follow a regular annual molt pattern where each fall they switch out their feathers for a new, fresh set of feathers. Generally speaking, hatch year birds (HY) replace only body feathers and one tract or a portion of one tract of covert feathers. Each year on January 1, all birds are considered to have a “birthday,” so if they hatched the previous summer they are named second year (SY) birds. In a bird’s second fall and every one after, they replace all body and flight feathers and we can call them, after hatch year (AHY). Occasionally with birds like woodpeckers, molt patterns are evident through their third year (TY) and we are further able to precisely age these birds. So, with a bird in hand, we can look at feather quality to determine a bird’s age (Table 9).

Table 9. Age classes defined.

Abbreviation	Age Class	Meaning of Age Class
HY	Hatch Year	Year of hatching
SY	Second Year	Year after hatching beginning January 1
AHY	After Hatch Year	Any year after hatching
ASY	After Second Year	At least second year or older after hatching
TY	Third Year	Third year since hatching
ATY	After Third Year	At least third year or older since hatching



Photo: Left, a SY Baltimore Oriole and right, an ASY Baltimore Oriole in the spring aged by the older, more brown feathers of the SY compared to the new, fresh feathers of the ASY.

Table 10. Percent of birds captured by age class each year per season.

Percent Captured In Spring										
Age	% in 2010	% in 2011	% in 2012	% in 2013	% in 2014	% in 2015	% in 2016	% in 2017	% in 2018	% in 2019
AHY	25.53	18.79	13.79	20.85	13.42	15.12	12.30	18.90	14.57	9.11
ASY	48.94	29.70	15.64	24.68	32.21	29.94	14.34	27.95	25.20	49.07
ATY	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41
SY	23.40	51.52	43.62	52.34	54.36	54.94	73.36	50.68	59.06	40.99
HY	0.00	0.00	0.40	1.70	0.00		0.00	0.00	0.39	0.21
TY			0.00	0.43			0.41	0.00	0.79	0.21

Percent Captured in MAPS										
Age	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AHY	12.74	1.94	6.35	1.92	6.06	11.02	9.17	14.62	5.43	
ASY	10.19	14.56	15.87	21.15	10.61	11.86	14.17	13.08	18.60	
SY	34.39	30.10	36.51	27.88	37.88	44.92	25.00	42.31	17.83	
HY	42.04	52.43	41.27	47.12	45.45	31.36	50.83	30.00	51.94	
ATY	0.00	0.97	0.00	0.96	0.00	0.00	0.83	0.77	0.00	
TY	0.64					0.85			0.78	

Percent Captured in Fall										
Age	% in 2010	% in 2011	% in 2012	% in 2013	% in 2014	% in 2015	% in 2016	% in 2017	% in 2018	% in 2019
AHY	30.69	22.06	19.40	20.43	14.54	11.84	22.99	11.31	32.78	9.60
HY	63.53	64.95	78.28	77.73	83.59	84.60	73.55	86.25	64.17	88.16
Unkn wn	5.78	12.88	2.22	1.66	1.97	3.48	3.46	2.44	2.46	2.03
ASY		0.11	0.10	0.09	0.21	0.00				
ATY		0.00	0.00	0.00	0.00	0.00				
SY		0.00	0.00	0.00	0.21	0.00			0.59	0.21

Figure 7. Percent of birds captured by age class per year each season. Age classes represent HY (hatch year), SY (second year), AHY (after hatch year), ASY (after second year),

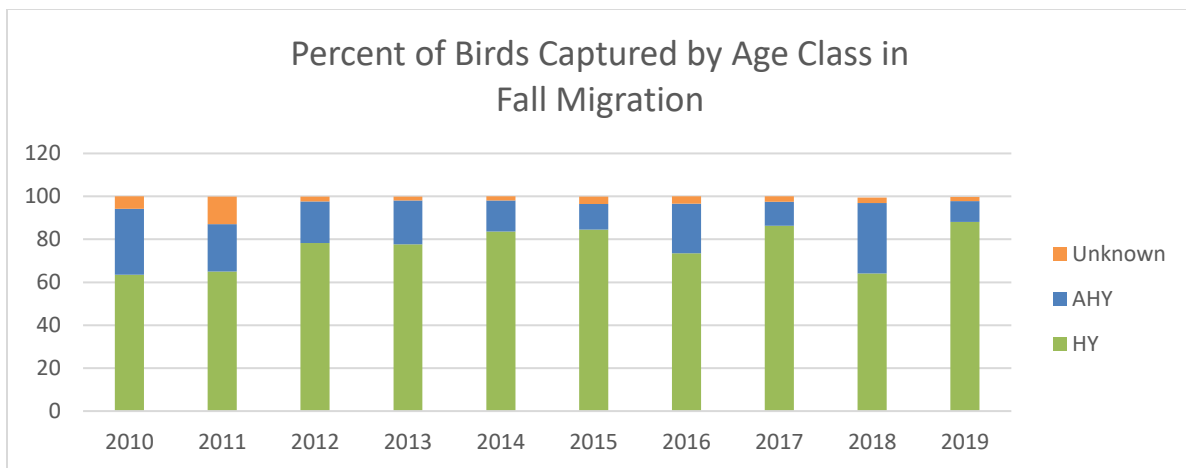
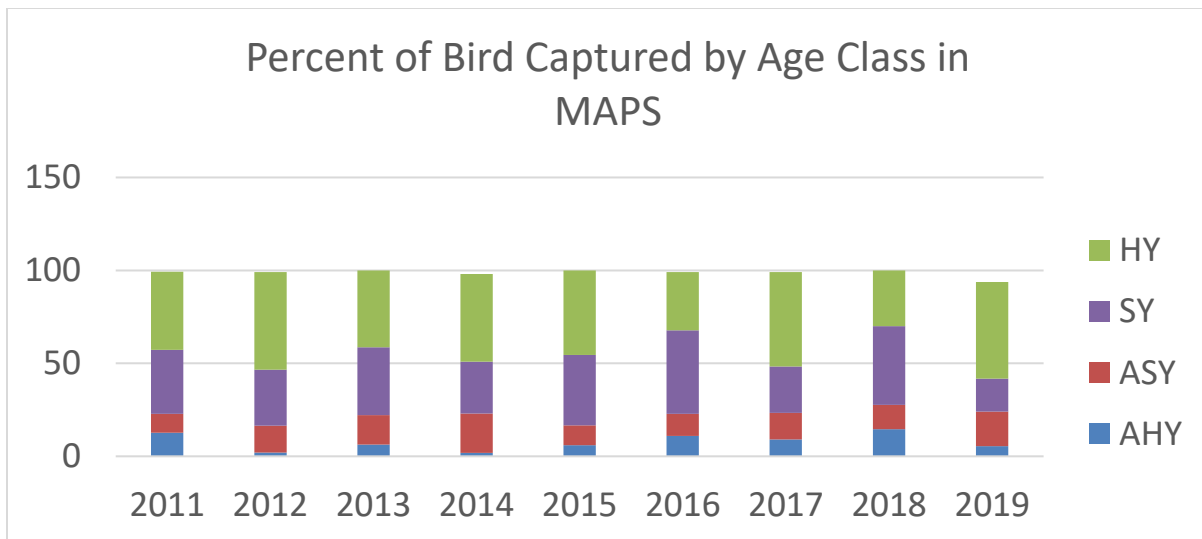
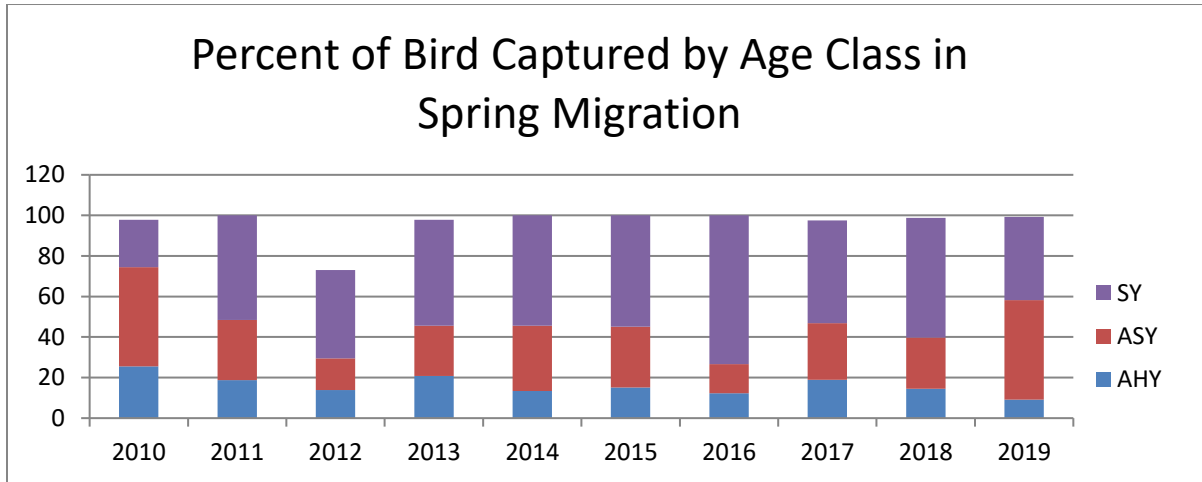


Figure 8. A basic breakdown of total number of young vs. adult birds captured at RWP per season shows RWP is important habitat for young birds. Note that during spring migration second year (SY) birds are the young from the previous summer, thus compared against the known older birds.

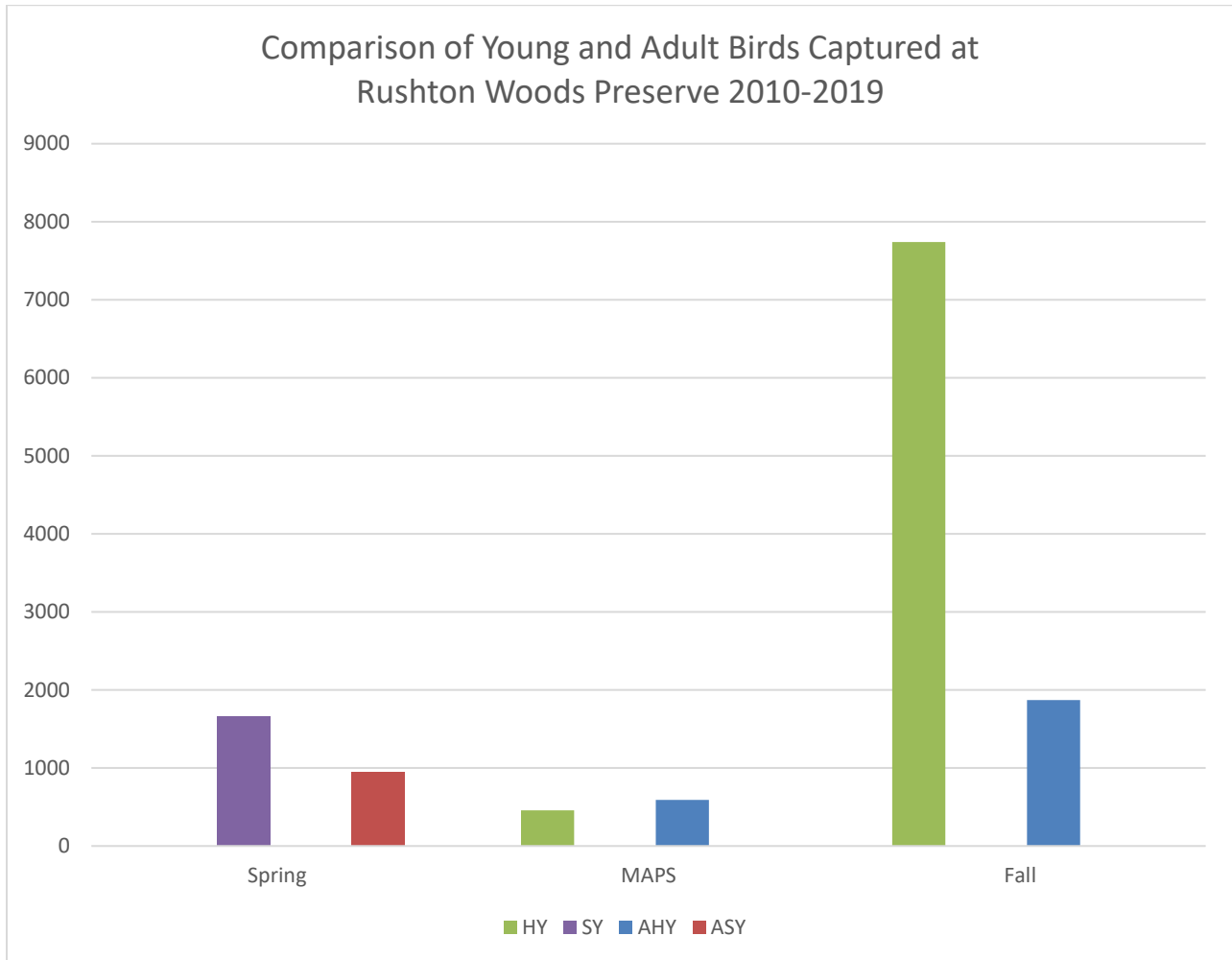
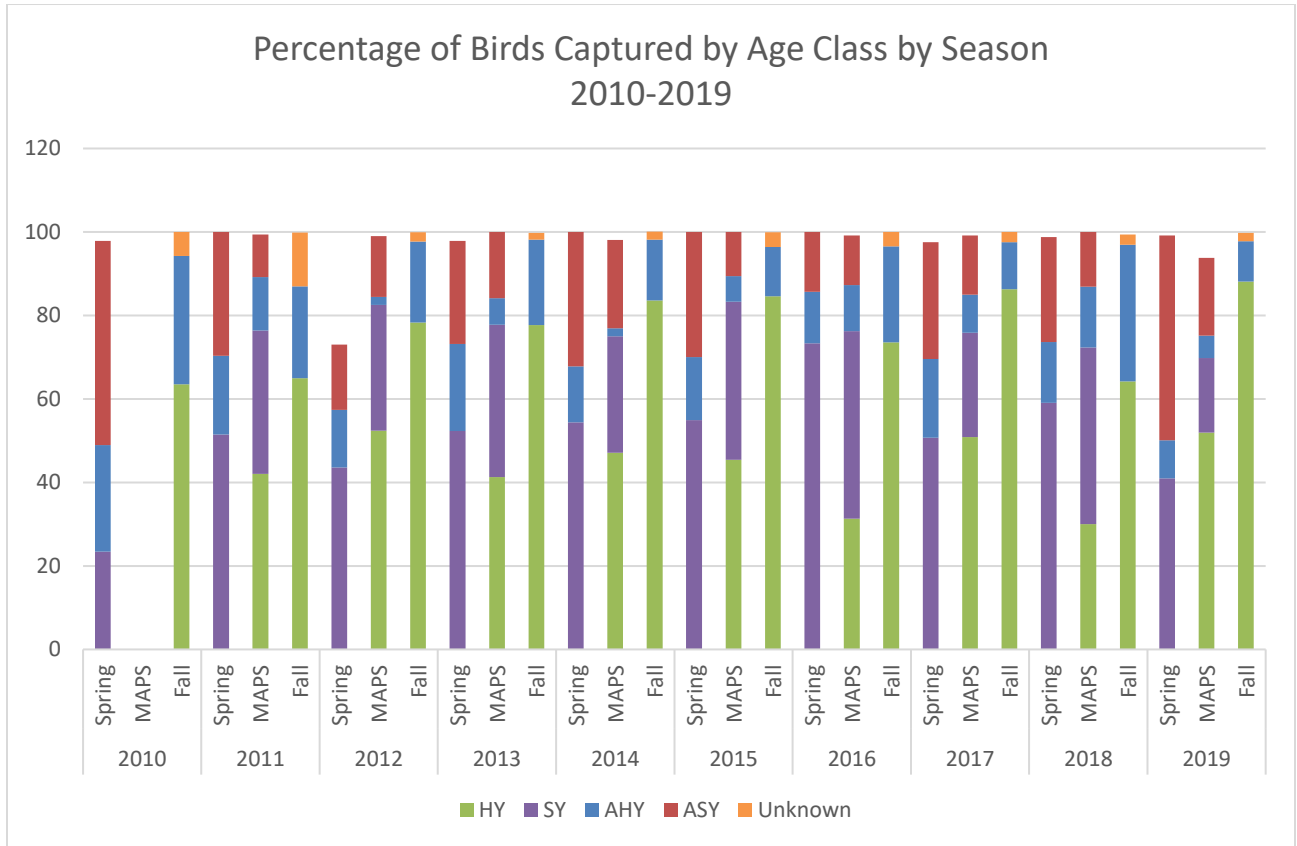
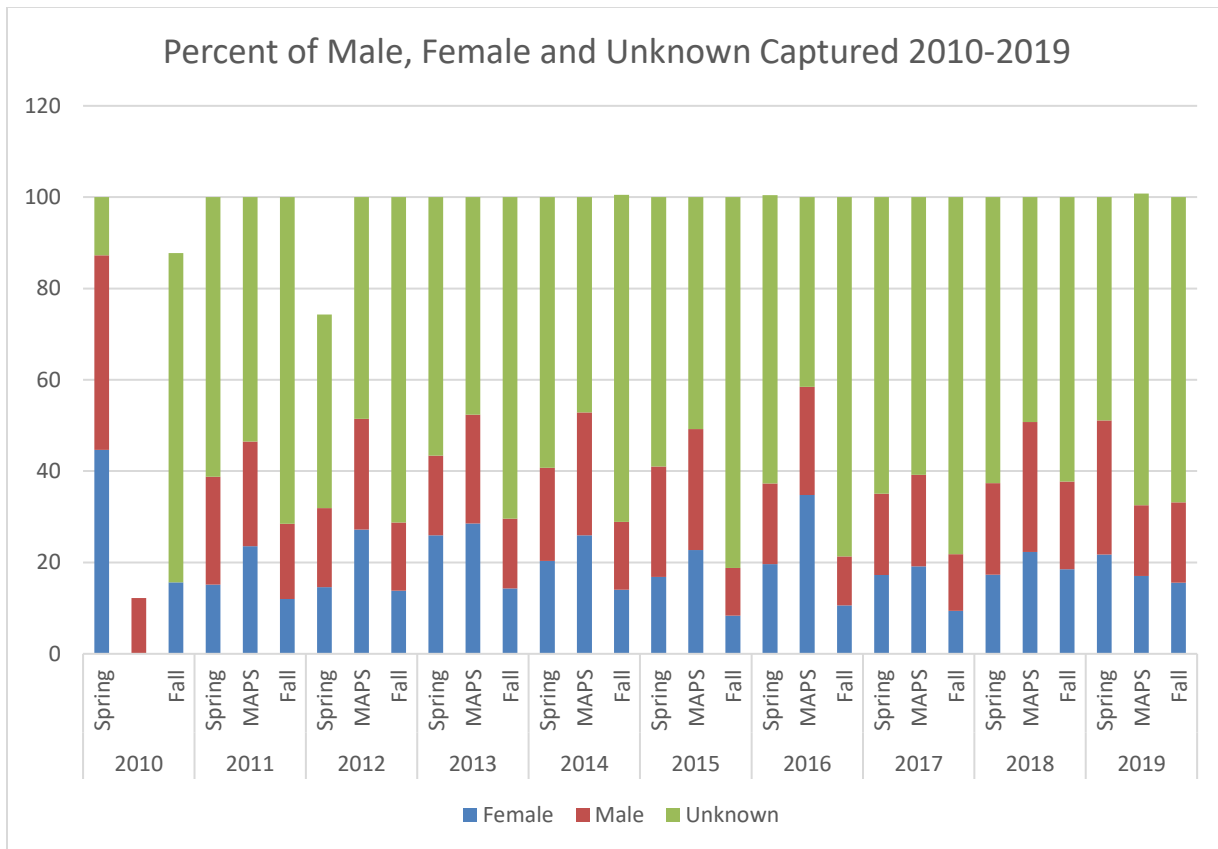


Figure 9. A further breakdown of age classes to compare percentage of birds captured by age class per season each year.



Part of the banding process is used to determine the sex of the bird when possible in order to get a better idea of the species demographics. There are two ways to determine sex of the bird in the hand. One is when a species is sexually dimorphic, where females and males display different plumages. The other is only evident when the bird is in breeding condition, where the females develop a brood patch on their belly and males show an enlarged cloacal protuberance. In addition, young (HY) birds in sexually dimorphic species often display plumages similar to the female, in which case we would not be able to reliably determine the sex. These reasons account for a large number of unknown sex birds at RWP (Figure 10).

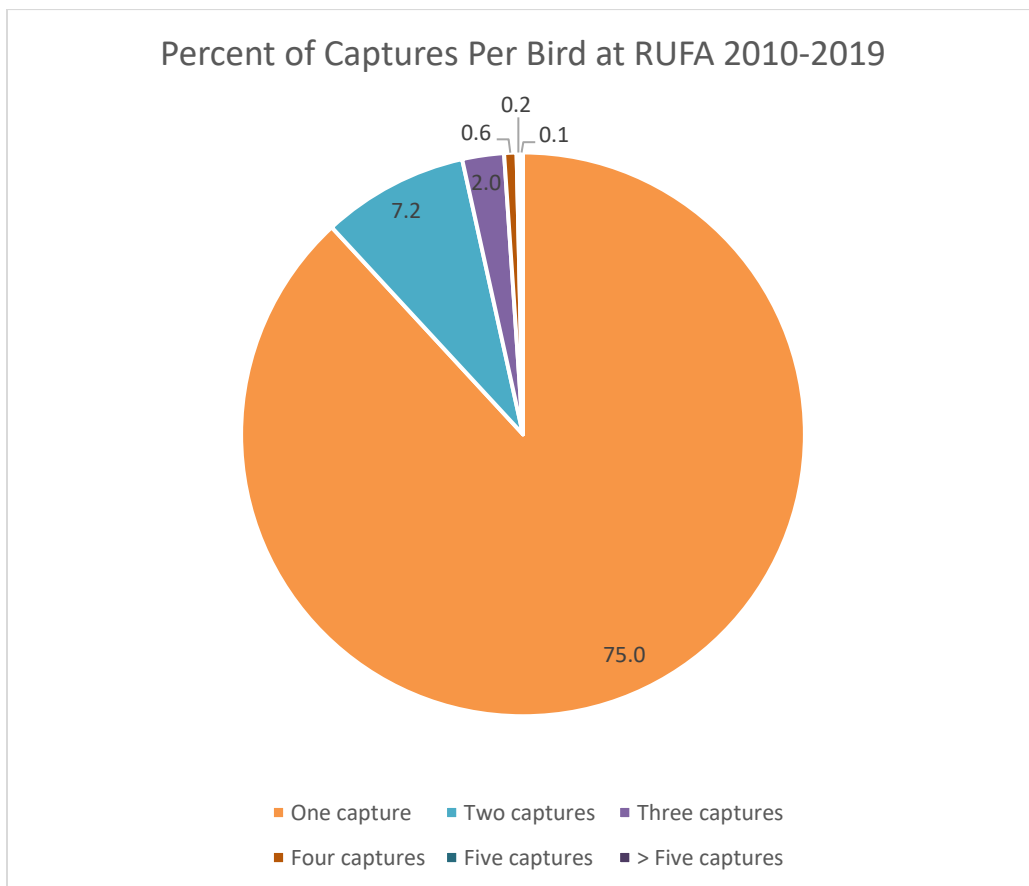
Figure 10. Ratio of male, female and unknown sexed birds captured during each season from 2010-2019.



Recapture Data

When a bird is recaptured at a station it already has a band. Valuable information can be determined when we are able process a bird more than once. Review our longevity records, which show how long some birds that frequent RWP have been alive. By keeping record of the birds we recapture, we can also look at how long the birds are staying at the site during their migratory stopover. Our data show that 75% of our birds are captured once while only seven percent of birds are captured twice.

Figure 11. Representation of the number of times an individual is captured during both migratory periods from 2010-2019.



Among the other 25% of recaptures we have noted a few birds that remained in our research area, thereby taking advantage of the habitat as we were able to record that they gained weight as they used Rushton's resources to fuel up for their next migratory flight. Songbirds typically only gain weight during migration in order to make long overnight flights. During the banding process, we look at subcutaneous fat stores, which are visible under the skin and ranked on a scale from 0-6, with 6 being the most fat. We also weigh the birds in grams. Through recapture data we can see how long birds may be staying at the preserve and if they are gaining weight for migration. Here are few examples:

Figure 12. Subcutaneous fat is visible under the skin of birds and during migration stored fat is commonly seen in the furcular hollow of a bird, just below the throat. Pictured left is a bird with an empty furcular hollow and no fat stores, on the right, the furcular hollow is overfull with fat, stored for a long overnight flight.



Veery – In early September 2017, we captured a Veery twice and documented the bird gained 14.9 grams in only eight days! This bird gained 47% of its body weight from the first time it was weighed.

Black-throated Blue Warbler – In October 2019 this bird gained 2.5 grams over five days at Rushton. That's 28% of its body weight.

Ovenbird – This bird gained 4.3 grams, or 21% of its body weight before leaving Rushton in the fall of 2019.

Worm-eating Warbler – In the fall of 2015 we captured this bird three times between September 3 and October 1, within 27 days. However, this is a different example of an indication of good habitat quality. This bird did not gain weight, but it was a hatch year bird and it is important to note that the hedgerow and meadow habitat is not the preferred breeding habitat for this species. The long length of stay could indicate that RWP was important post-fledging habitat for this bird and hopefully others with availability of food and cover from predators.

Research and Publications at Rushton Woods Preserve

Since data collection is just one step in the process for bird conservation, the banding data has been used in research and collaboration to document importance of how birds use the habitat available at Rushton.

ASSESSING POST-BREEDING DISPERSAL MOVEMENTS OF ADULT AND JUVENILE WOOD THRUSH IN SOUTHEASTERN PENNSYLVANIA

– Amanda Bebel used the Motus Wildlife Tracking System and attached nano-tags to Wood Thrush at RWP. Her analysis determined that forested habitat is critical to both adult and juvenile Wood Thrush. However, juveniles also require early successional habitat during the post-breeding dispersal period especially as migration approaches. This information should be used to better inform management practices for the highly developed Southeastern portion of Pennsylvania. <http://amandabebel.weebly.com/research.html>

ASSESSING HABITAT QUALITY FOR MIGRATORY SONGBIRDS - Alison Fetterman analyzed some of the banding data to look at the weight changes in 16 species during fall migration. Results demonstrate 1) high capture rates compared to other study sites, 2) most individuals using the site are hatching year birds, and 3) all species either gained or maintained mass. Although these results demonstrate that RUFAs provide important stopover habitat for many migrating landbirds in the fall, this site may not be a high quality refueling area for some species. The research is published in the DVOC journal *Cassinia*: https://dvoc.org/wp/wp-content/uploads/2018/01/Cassinia76_43_51_Fetterman.pdf

PROJECT OWLNET – In addition to songbird banding, RWP is a partner of Project OwlNet, which follows specific protocol for tracking migratory Northern Saw-whet Owls (NSWO). We have banded over 800 NSWO since 2010, tagging each fall from mid-October to the end of November.

ACADEMY OF NATURAL SCIENCES OF DREXEL UNIVERSITY FIELD STUDY SITE – Students from Drexel University add to the depth of research at the Rushton Woods Banding Station using additional sampling methods.

- Galen SC, Borner J, Perkins SL, Weckstein JD (2020) Phylogenomics from transcriptomic “bycatch” clarify the origins and diversity of avian trypanosomes in North America. PLoS ONE 15(10): e0240062. <https://doi.org/10.1371/journal.pone.0240062>
- Ray, Suravi. Characterizing Haemosporidian Parasite Prevalence in a Pennsylvania Bird Community. Senior Thesis.

Literature Cited

Pyle, P. (1997). *Identification guide to North American birds: a compendium of information on identifying, ageing, and sexing" near-passerines" and passerines in the hand*. Slate Creek Press.

Ralph, C. J. (1993). *Handbook of field methods for monitoring landbirds* (Vol. 144). Pacific Southwest Research Station.

Appendix A. Full summary of species and individuals banded at Rushton Wood Preserve Banding Station during spring and fall migrations and MAPS breeding bird monitoring from 2010-2019. Banding seasons are marked as: Spring migration (S), MAPS (M), Fall migration (F).

	2010		2011			2012			2013			2014			2015			2016			2017			2018			2019			Grand Total	
Species	S	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F		
ACFL Acadian Flycatcher		3						1	1	1							1			1			1			3		1	13		
AMGO American Goldfinch	4		2		4	1		6			8	1		2		14	4		3	1		2		6		11		6	11	354	
AMRE American Redstart	4		2		1	1		2			8	6		1		9					3		7			14	1	3	53	165	
AMRO American Robin	4			1	4				1					3					4				3	1		6	53	4	2	26	485
AMWO American Woodcock								1						1																2	
BAOR Baltimore Oriole	5		8			2						2		6			1						3			7				34	
BARS Barn Swallow						2								2																4	
BAWW Black-and- white Warbler	1					5		8	2		8	1		2		8	9		10	7		5	1	1		1	4	14	3	27	209

	2010		2011			2012			2013			2014			2015			2016			2017			2018			2019			Grand Total
Species	S	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	
BBWA Bay-breasted Warbler														1																1
BGGN Blue-gray Gnatcatcher												1		4												1		1		7
BHCO Brown-headed Cowbird				1	3				1					1		1	1	2						2	1		2			15
BHVI Blue-headed Vireo															1											1		3		5
BLJA Blue Jay	2		6	4	9	1	1	2	1	1	3	1	2	2	4	2	5	1			1	8	2	2		1	1	3		65
BLPW Blackpoll Warbler					3			1			2			2													3			13
BRCR Brown Creeper		1			3						1		1			2											2			10
BRTH Brown Thrasher		1		1		3		1			2	1	3	1	1			3	1	1	1						1	1		22

	2010		2011			2012			2013			2014			2015			2016			2017			2018			2019			Grand Total	
Species	S	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F		
BTBW Black-throated Blue Warbler					2				1					2						2											
	6		1		7	6		24	0		31	8		1	1		18			1	2		8	2		24	2		39	251	
BTNW Black-throated Green Warbler											1			2																	3
BWWA Blue-winged Warbler				1								1			4								2				2				10
CACH Carolina Chickadee				1	2															1											
	9		1	2	0	5	5	7	4	1	9	5	2	7	5	1	6	4	1	6	6	1	9	5		2	3		4	150	
CARW Carolina Wren																															
	1	5	1	3	5	2	4	11	4	4	13	1	1	5		5	5			8	1	4	8	1	1	9	2	3	13	120	
CAWA Canada Warbler																															
	1		3		1	4		2	2		4	6		5	5		1	3		2				4		1		1	2	47	
CCSP Clay-colored Sparrow																															
																	1														1
CEDW Cedar Waxwing																															
	4							8						1						1							1				15

	2010		2011			2012			2013			2014			2015			2016			2017			2018			2019			Grand Total			
Species	S	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F				
CHSP Chipping Sparrow		1			5			1			17	2		2	8		17	3		2	4		0	3			2		12	119			
CMWA Cape May Warbler																													1	1			
COGR Common Grackle																														2			
CONW Connecticu t Warbler		4			2			3			8			3			6			3			1			4			2	36			
COYE Common Yellowthro at		2	3		4	4		52	2		75	5	5	5	2		31	1		4	3	1	6	1		3	9	66	4	3	2	83	903
CSWA Chestnut- sided Warbler		1				1		1			2	2		5	1		1									2			9	25			
DOWO Downy Woodpeck er		2		1	3	2	2	2	1	1		3	3	2	2		3	1		3	9		1		4	2		2	2	5	5	71	
EABL Eastern Bluebird			1																				4					1		6			

	2010		2011			2012			2013			2014			2015			2016			2017			2018			2019			Grand Total		
Species	S	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F			
EAKI Eastern Kingbird												1																		1		
EAPH Eastern Phoebe					3								1		1			2										4	11			
EASO Eastern Screech Owl		1			4	1		3																					9			
EATO Eastern Towhee		7	1	5	2	9	5	2	6	1	1	18	4	3	1	4	1	24	2	1	4		3	9	3	17	2	7	170			
EAWP Eastern Wood-pewee				2							2				1				1	1	2				1			4	14			
FISP Field Sparrow		2	1		1			4		14	4	7	3		4	5		33	1		2			1		4	3	5	13	4	20	178
FOSP Fox Sparrow		3			5			2			2			1			2						2							17		
GCKI Golden-crowned Kinglet		1			1							1			1									4			16		1	54		
GCTH Gray-cheeked Thrush		3	2		6			8	2		28	3		0	3	1	5	1	1	8	5	2	4		1	7	2	1	9	112		

	2010		2011			2012			2013			2014			2015			2016			2017			2018			2019			Grand Total				
Species	S	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F					
GRCA Gray Catbird	1	1	1											2																				
	1	1	2	4	1	9	3	25	5	1	17	9	3	8	8	3	42	6	3	8	1	4	4	6	5	13	9	5	40					
	9	8	4	9	9	8	9	4	3	7	6	1	4	5	7	9	2	3	2	5	9	0	5	7	1	6	1	0	9			3512		
HAWO Hairy Woodpecker	1	2		1								1	1					2	1		3			2	1	1	1	1				20		
HETH Hermit Thrush		3			2															2		2												
		2			3	6		31	3		37	4		7	2		35	1		3		1		3		25	2		19				274	
HOFI House Finch		1			1	1		3						6						1														
																				3		1				1		2	4				33	
HOWA Hooded Warbler																																		1
HOWR House Wren		1			1	1			1			1	2	1						1		2												
	3	8	8		8	0		20	3		20	2	7	0	1	16				9		3	8		13	5		24					278	
INBU Indigo Bunting	2	2	4	1	0	5		12	4		4	2		6	2		4			8	3		4	5		8	7		20				113	
KEWA Kentucky Warbler								1																										1
LEFL Least Flycatcher												2								1						1		1					5	

	2010		2011			2012			2013			2014			2015			2016			2017			2018			2019			Grand Total														
Species	S	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F															
LISP Lincoln's Sparrow		2		1		2		1			1			3		1		7		2			3		1		5		4		2			5		1		2	43					
LOWA Louisiana Waterthrush					1																																1							
MAWA Magnolia Warbler		1			1								1		1		1															1		0	1	13	207							
MOWA Mourning Warbler		1						1					1		1																						4							
MYWA Myrtle's Yellow- rumped Warbler		4		2		1		6		1		9		4		14		1		2		2		4		4		5		4		0	1		11		26	120						
NAWA Nashville Warbler				2		3				4				1			3												1						1		1	16						
NOCA Northern Cardinal		3		1		1		1		1		4		17		8		2		30		8		4		2		7		2	24		1		1		1	4	6	16	5	3	33	344
NOMO Northern Mockingbird		1		2				1		2		2		1						1																		10						

	2010		2011			2012			2013			2014			2015			2016			2017			2018			2019			Grand Total					
Species	S	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F						
NOPA Northern Parula		1			1			1			4	2															1		4	17					
NOWA Northern Waterthrush	1	3	3		3	2		6	3	3		1	2	1	5		1	2		1	2	1	2	1		12	7		1	81					
NSWO Northern Saw-whet Owl														1																1					
OROR Orchard Oriole												5		1													3			9					
OVEN Ovenbird	1	2	1	2	1	1		3	3	16	3	5	19	1	1	5	2	13	1	6	8	8	8	4	1	1	0	6	14	1	1	6	3	20	309
PRAW Prairie Warbler			2								1																				3				
PUFI Purple Finch		1																													21	37			
RBGR Rose-breasted Grosbeak					2						1	1	2				1												2		1	10			

	2010		2011			2012			2013			2014			2015			2016			2017			2018			2019			Grand Total	
Species	S	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F		
RBWO Red-bellied Woodpecker				1	4		2		1	1		4		1	2	4	1		2	2	3	1		2	2				33		
RCKI Ruby-crowned Kinglet	1				4							5		5						5			10	1					581		
REVI Red-eyed Vireo					1		1	3	1		1		7		2	5				3			1	6		4	7		43		
RWBL Red-winged Blackbird												2											2						4		
SAVS Savannah Sparrow		1				1		1			1		1							2							1		8		
SCJU Slate-colored Junco	2				1									3	1		20			7			2	5		2			90		
SCTA Scarlet Tanager			1			1				1														1		1	1		6		
SOSP Song Sparrow	1	2	3		5	6	1	67	4		89	3	1	2	3	2	1	5		7	5		5	1	9	7	1	99	3	10	786
SSHA Sharp-shinned Hawk		5			1			2			3		1	1												1		2	16		

	2010		2011			2012			2013			2014			2015			2016			2017			2018			2019			Grand Total										
Species	S	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F											
SWSP Swamp Sparrow					3	1						1	1																											
	2		4		0	0		17	6		21	1	2		7		14	5		2			9		6		4		21	1		3		29	273					
SWTH Swainson's Thrush					1									1																										
	3		3		3	5		29	1		19	6		5	8		19	4	2		8			5	2		6	4	4	31	1		14	222						
TEWA Tennessee Warbler					1			2			8																													
																																				19				
TRES Tree Swallow			1						1									4						9												15				
TRFL Traill's Flycatcher			1			1						5		1	3																						22			
TUTI Tufted Titmouse																																						112		
	5		4	3	8	7	1	5	6		8	1		7	3	5	11																							
VEER Veery	2	5			1			1						1			1																					264		
			4	5	4	7	0	9	6	5	12	5	6	1	4	2	28	6	0		3			5	4		3	4	7	12	9	6	20							
WBNU White-breasted Nuthatch									1		2	3		3	1	1		1			5			1															36	
	3		2	2																																				
WCSP White-crowned Sparrow																																								13
	1								3		1																													

	2010		2011			2012			2013			2014			2015			2016			2017			2018			2019			Grand Total
Species	S	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F	S	M	F				
YBCU Yellow-billed Cuckoo																												2		
YBFL Yellow-bellied Flycatcher								1			2			2												1		6		
YBSA Yellow-bellied Sapsucker																										1		1		
YEWA Yellow Warbler							1																			1		2		
YPWA Yellow Palm Warbler																													88	
YSFL Yellow-shafted Flicker																													35	
YTVI Yellow-throated Vireo																													1	
Grand		6	3	1	8	3	1		2			4	1	9	3	1		2	1	8	3	1	9	2	1		4	1		
Total	4	0	3	5	9	6	0	10	3	6	10	4	0	6	4	3	11	4	1	9	6	2	0	5	3	10	8	2	14	14136