



MIGRATION MONITORING AT CABOT HEAD

FALL 2018

by

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*prepared
for*

BRUCE PENINSULA BIRD OBSERVATORY

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Preface

Cabot Head is a promontory of the northeast headland of the upper Bruce Peninsula in south-central Ontario, along the Niagara Escarpment, in the mixed-wood plains ecozone. Cabot Head Research Station (CHRS) is situated on a small spit of land (at 45°15'N, 81°18'W), bordered north by Georgian Bay and south by the western side of Wingfield Basin near the community of Dyer's Bay. In 2001, Cabot Head was designated as an Important Bird Area by Birdlife International for its significant concentrations of migratory bird species, the Red-necked Grebe in particular (Cheskey and Wilson, 2001). Situated in a provincial nature reserve, CHRS is managed jointly by Ontario Parks and Bruce Peninsula Bird Observatory (BPBO).

Precise monitoring of populations is essential to the understanding and management of natural resources. Migration monitoring at observatories across the country can be an effective means of tracking populations of species that nest in remote northern areas of Canada, species for which habitat is rarely sampled by roadside surveys and species that are otherwise difficult to detect during the breeding season (Badzinski and Francis 2000). The Canadian Migration Monitoring Network (CMMN) is a nation-wide, Bird Studies Canada-led initiative, intended to assess changes in bird populations during migration especially for priority species that are not adequately monitored by other programs, such as the Breeding Bird Survey and Christmas Bird Count. There are 25 stations across Canada where data are being collected for each bird species during the Spring and Fall migrations, typically through a standardized capture and observation protocol. BPBO has become a member of CMMN in fall 2003, since demonstrating through data collection starting in 1998 that Cabot Head is a valuable site for monitoring migrating birds.

BPBO was incorporated as a charitable non-profit organization in 2001 to initiate and direct ornithological assessments and monitoring at Cabot Head and surrounding areas. Migration monitoring has been the primary focus of bird research at Cabot Head since 1998. This document reports on results of the fall 2018, migration monitoring season at CHRS.

Executive Summary

In this document, the results of migration monitoring at Cabot Head from the fall of 2018 are summarized and analysed. It is the 17th year of consecutive monitoring following a research protocol that was established in 2002. Keeping a consistent monitoring effort helps ensure that trends can be detected and quantified.

Fall fieldwork began on August 15 and ended on October 31 for a total of 78 consecutive days of coverage. At Cabot Head, a total of 141 species of birds were detected in the standard count area over the course of the field season. Among them, 76 species have been seen every fall. The number of species detected this fall was slightly above the 2002-2017 average of 136 ± 10 (range: 120 species in fall 2017– 156 species in fall 2002). The highest one-day species total was 39, recorded on August 31. Most species are seen only on a few occasions (less than ten days during the whole monitoring period), whereas only a few are observed almost daily. Highlights of the season were the observations of one Black Vulture, a new species for Cabot Head, and of a pair of adult Green Heron, the first time this species was detected in the fall.

In total, 1,403 birds of 67 species were banded and 162 birds of 32 species were recaptured (see Table 1 for an overview of banding data). This is the second lowest banding total ever for the fall season, with most species (49 species, or 73%) banded below average and five species having the lowest banding total (see Appendix I for banding fall totals per year and Appendix II for species detected). No high banding records were broken, although Mourning Warbler and Blue-headed Vireo tied to previous record high numbers.

The fall 2018 migration monitoring season was a success in part thanks to the efforts of the seven volunteers who contributed their time and enthusiasm to the project.

Table 1: Summary of coverage and species detected and banded at CHRS, fall 2018.

	August	September	October	Total
Days with coverage	17	30	31	78
Species detected	79	104	82	140
Days with no banding (% of total)	1 (6%)	7 (23%)	14 (45%)	22 (28%)
MN hours realized (% of potential)	86%	69%	56%	69%
Number of birds banded	233	535	635	1403
Number of species banded	29	54	34	67
Average daily number of birds banded *	15	23	37	25
Maximum daily banding total (with date)	33 (16 Aug.)	69 (30 Sep.)	135 (13 Oct.)	
Minimum daily banding total (with date)	2 (21 Aug.)	4 (20 Sep.)	7 (2 Oct.)	

MN: Mist net.

*: Days with no banding are not included

1.0 Methods

The migration monitoring program at CHRS follows a field protocol (established by Heagy et al., 2003) as it is essential for the production of population indices that data collection be consistent over the long term. Specifically, 15 mist nets are operated for six hours commencing a half hour before sunrise (or later, depending on weather). Personnel also complete a one-hour census along a fixed route, where all bird seen or heard are recorded, usually starting an hour after sunrise. Casual observations are also taken and all of the methods are used to determine a detected total (DT) for each species within the area of the station during the sampling period each day. Supplemental surveys such as visible migration counts and bay watches are completed when circumstances permit. As expected, there is a tremendous variation in diversity and abundance throughout the season (Fig.1).

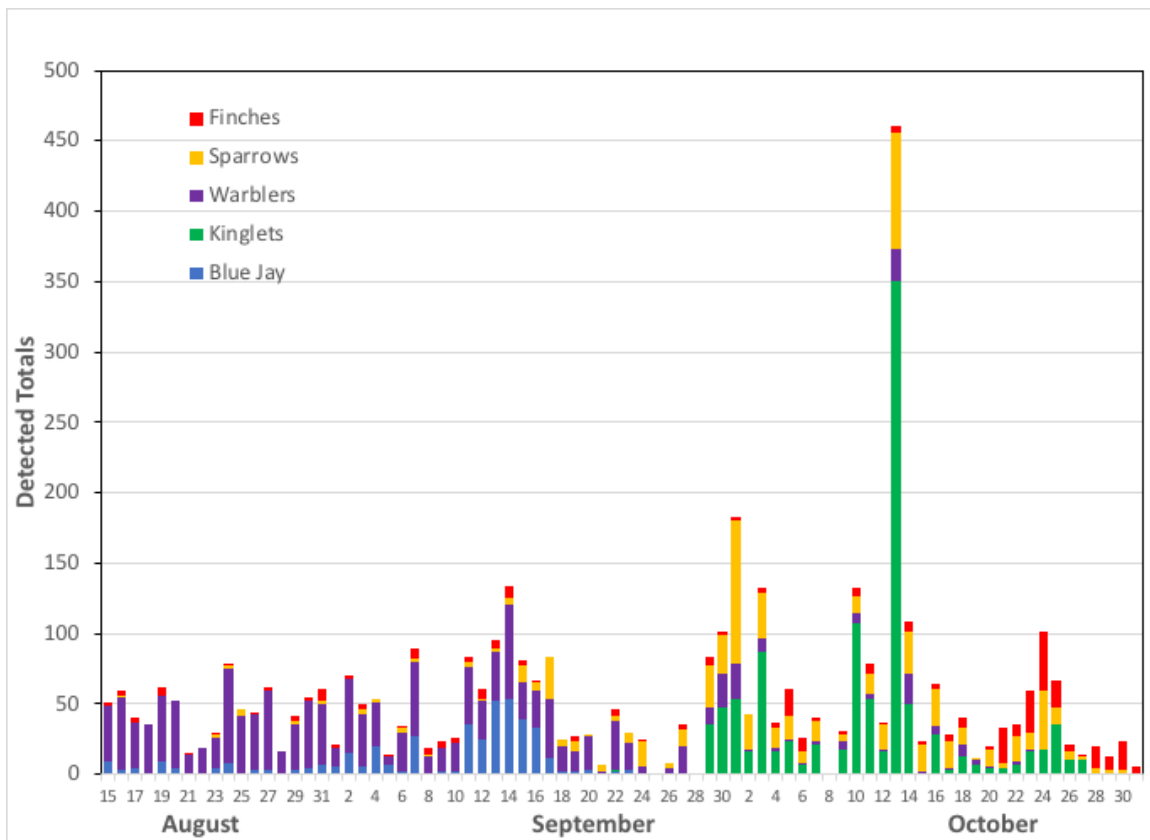


Figure 1. Detected Totals of the most common species throughout the monitoring period at CHRS, fall 2018 (kinglets comprised of both Golden-crowned and Ruby-crowned Kinglets).

2.0 Season Summary

August

Fieldwork for fall migration monitoring began at CHRS on August 15 with fifteen mist nets in operation. August is normally a quiet month of migration in southern Ontario. Banding was possible for every day but one in this period, with only a few net hours lost to bad weather (86% of the potential mist net hours were realized. See Table 1). Specifically, there was only one day with no banding at all due to extremely strong Southwest wind all night and morning of August 28. A total of 79 species, including 17 species of warblers, were detected in August, with an average of 27 species per day (range from a low of 18 species on August 17 to a high of 39 on August 31). Nine species were detected on every single day in August: Double-crested Cormorant, Bald Eagle, Ring-billed Gull, Red-eyed Vireo, Black-capped Chickadee, Red-breasted Nuthatch, Black-throated Green Warbler, American Redstart and Common Yellowthroat. Herring Gull, Ruby-throated Hummingbird, and Myrtle Warbler were missed only on one day in August. A total of 20 species (including the previous ones) were seen on ten days or more during the 17 days of monitoring in August. On the other end of the scale, 25 species were detected only once during this period, with a few species not seen again (including American Woodcock and Mourning Dove). A total of 233 birds of 29 species were banded, well below the 17-year average of 289 ± 76 birds. As in most years, American Redstart was the most common species caught in August, with 26% of the monthly banding total, followed by Black-throated Green Warbler, Common Yellowthroat, and Red-eyed Vireo (13%, 11% and 10% respectively). The banding total for American Redstart in fall 2018 is 83 birds (including 22 individuals banded after August), which is quite below the average of 98 (± 44). However, there are major variations in numbers banded between years, with a low of 44 in fall 2007 and a high of 198 in 2003 (Fig.2).

There has been a resident pair of Bald Eagle at Cabot Head since at least 2009 and they have attempted breeding every year, except the spring spent building a new nest, the third since we discovered them. This fall, it appears that one of the adults was gone and replaced by a four-year-old (based on plumage). It also seems that no young were produced.

The Eastern Whip-poor-will was heard at dawn and dusk only a few times this

fall, compared to previous years. It is not clear why the local birds were less vocal, after a “normal” spring season. There are typically about three singing Eastern Whip-poor-wills in the Cabot Head area.

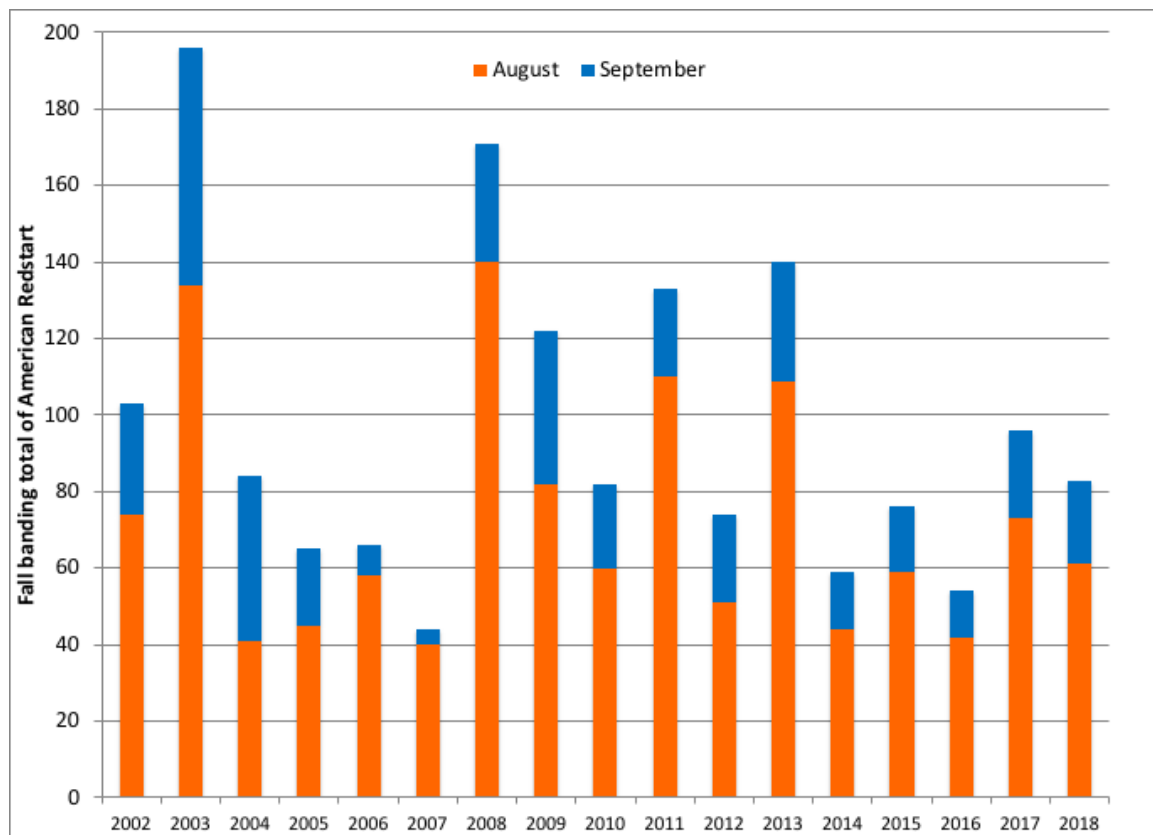


Figure 2. Number of American Redstarts banded in August September during the fall at CHRS, 2002-2018.

In August, migration monitoring is complicated by the presence of local birds. Even though they could also be migratory species, they may not be migrating at the exact time of capture/observation. For example, an American Redstart observed in August may not be migratory, but rather a local bird. Most adult songbirds moult their flight feathers in the summer before starting their migration. However, it appears that adults investing in high levels of reproduction late in the season adopt a unique combination of moult and migration (Norris et al. 2004). It means that a moulting adult may have bred much further north than the location of its moulting, making inferences more complicated. Of the 15 adult American Redstarts captured at Cabot Head this fall, eight of them were in active moult, from August 17 to September 16, in strong contrast to the summer 2017 when all

moulting adults were captured in August. The seven adults with no active moult were captured from August 16 to September 14, but with only two in August. Most of the captures of American Redstarts occur in August: depending on years, from 66% (in 2009) to 93% (in 2003) of all redstarts have already been banded at the end of August, with the fall of 2004 being an outlier with only 48% of American Redstart banded in August (Fig.4). In 2018, 73% of American Redstarts were banded in August.

Nevertheless, migration does occur in August, as shown by the appearance of species that do not breed on the Bruce Peninsula. For example, Greater Yellowlegs was noted first this fall on August 16 and Lesser Yellowlegs on August 31. The first boreal warblers and “true” migrants were the Bay-breasted (detected on August 23), Cape May and Wilson’s (both on August 27) Warblers.

This fall, no Barn Swallows were seen at Cabot Head, which could indicate the end point of the observed constant trend of declining abundance, at multiple scales: locally on the Bruce Peninsula, provincially, according to the Ontario Breeding Bird Atlas, and continentally, according to BBS data. No other swallow species were detected either at Cabot Head this fall.

As mentioned earlier, many species are detected only a few times. That was the case of Caspian Tern, with observations on August 29 and 30 of one bird each, the first detection in the fall since 2014 for this species. On the other hand, no Common Terns were observed this year, only the fifth fall season with no detection. Water levels continue to be at record high, submerging most of the rocks in Wingfield Basin, where bird species like gulls, cormorants, and terns, like to rest. Observations of tern species at Cabot Head, as well as other colonial birds like gulls and cormorants, may depend on breeding success around Georgian Bay.

Another species potentially impacted by high water level is the Spotted Sandpiper. It is observed every fall, albeit in varying numbers. It appears that there are usually only a few individuals present at any given time. Over the years, the highest daily total has been three birds, in three different days in 2003. Observations of Spotted Sandpipers in fall 2018 occurred in only two days with one individual on August 16 and two birds on August 22.

Eastern Bluebird was detected only once on October 3. This species has been detected previously in only six falls of the past 16 seasons, with observations spread

throughout the monitoring period and the latest date on October 18, 2003. Eastern Kingbird, on the other hand, was detected multiple times in August this year, with a maximum of three birds on August 15. This species prefers the marshy margins of the shallow lakes at the base of West and Middle Bluffs: it is thus not rare at Cabot Head and is regularly seen around the station - albeit in small numbers - when moving from and to its preferred habitats. This species has been detected every August since 2002, except in 2012, 2013, and 2014, with usually multiple observations.

In August, there was a conspicuous absence of a usually very common species: Song Sparrows were observed only twice, on August 24 and 25, with only one bird each.

September

Weather in September this year was mostly warm and dry, with many days of strong wind and only four days with showers or rain during the month. As with birds, it is a time of transition between summer and fall. A total of six full days of banding were lost due to high wind and/or rain, as well as two other partial days, resulting in 28% loss of possible mist net hours. A total of 104 species were detected during the month. The most frequently detected species, in decreasing order, were Black-capped Chickadee, Northern Flicker, Myrtle (Yellow-rumped) Warbler, Red-breasted Nuthatch, Ring-billed Gull, and Common Yellowthroat with only a few days in the month missed (83% and more of days with observation for these species). An additional seven species were detected on at least 20 different days, while 57 species were rarely detected (on 5 days or less). A total of 535 birds of 55 species, slightly below the average of 601 ± 188 birds, were banded in September. The most common species caught were Red-breasted Nuthatch (with 84 birds banded, accounting for about 16% of the monthly total), followed by Swainson's Thrush (40 birds banded, i.e. 7.5% of the monthly total), then Golden-crowned Kinglet, Myrtle Warbler and Red-eyed Vireo (about 7% each). Through time, BPBO has documented huge variations in number of banded birds and capture rates in September, with a low of 331 birds in 2007 and a high of 1029 in 2005 (Fig.5). It does not appear that a clear relation exists between numbers of birds banded and mist net hours. In fall 2018, numbers of mist net hours in September were in the low end, whereas numbers of birds banded were around average (Fig.3).

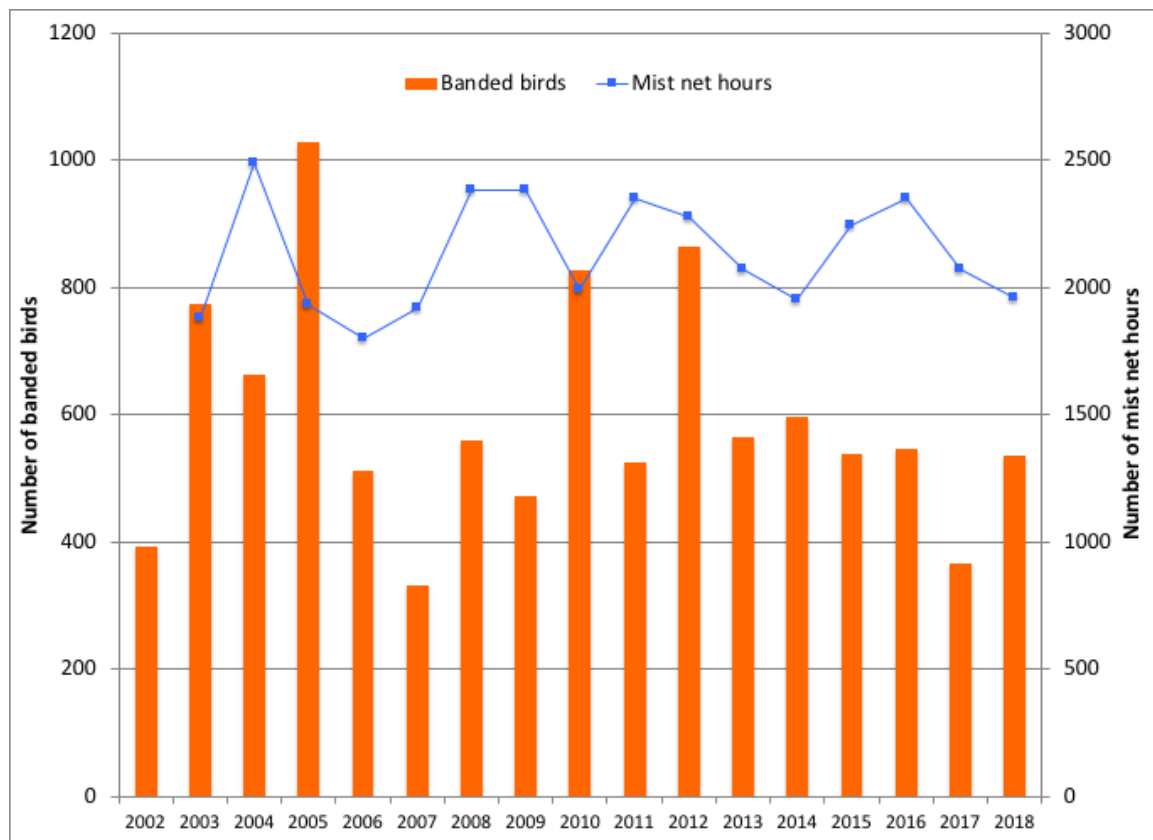


Figure 3. Number of banded birds and mist net hours in September at CHRS, 2002-2018. (NB: mist net hours data are not available in that format for 2002).

September is the most diverse month: 55 species were caught compared to 29 for August and 34 for October and 104 species detected compared to 79 and 82 for August and October, respectively. Many species migrate mainly during this month (i.e., warblers, White-throated Sparrow and Swainson's Thrush), while early migrants are still moving through (American Redstart and Black-and-White Warbler, for example). The earliest individuals of the late migrants can also be encountered at the end of the month (Kinglets, Hermit Thrush, a few species of sparrow). Banding in September was relatively slow with an average of 23 birds a day (range from four to 69 birds). September 29 and 30 were the busiest day for the month, with 59 and 69 birds banded of 13 and 17 species, respectively. There were short showers during the morning of September 29, forcing nets to be closed for two periods of 30 minutes each. All 15 nets were open for six hours on September 30. On both days, captures were concentrated on a few species, mainly Golden- and Ruby-crowned Kinglets, Red-breasted Nuthatch, Slate-coloured Junco (mostly on the 29th),

Brown Creeper (mostly on the 30th), and Nashville Warbler. Daily species-specific captures in September were all in the single digits, except in four occasions: on September 29 and 20, 19 and 17 Golden-crowned Kinglets were banded, respectively. On September 2, 13 Red-eyed Vireos were captured. On September 23, 15 Red-breasted Nuthatches were banded, which represents a record daily high for this species. From 2002 to 2017, there were 389 days in the fall with captures of Red-breasted Nuthatches and only four of them implied ten or more birds, all in the record fall of 2012. In total, 118 birds of this species were banded this fall, the second-highest number after the 2012 record of 166 nuthatches. There was a concurrent high number of sightings throughout the season at Cabot Head, with numerous sightings also reported further south (eBird.org), indicating a strong irruptive movement. Most of the birds captured at Cabot Head were adults, with only 17% of the total being young birds, the lowest percentage over the years. In fall seasons with at least 50 nuthatches banded, proportion of young ranges from 57% in fall 2016 ($n = 82$ birds banded) to 86% in fall 2008 ($n = 93$). Even in fall 2012, when a record 166 nuthatches were banded, 84% of them were young. It seems clear that there must have been a massive breeding failure this summer. It is reported that the black spruce seed crop mostly failed throughout the eastern boreal forest this year.

Swainson's Thrushes were banded in relatively good numbers this fall, with 42 birds banded, although that total is much lower than the previous three falls (Fig.4). Captures were relatively spread out from August 29 and throughout September, with only one capture in October, on the 10th (Fig.5). It is almost the latest date for this species: there was one banded on October 12, 2008, and one on October 15, 2016, while Swainson's Thrushes have only been captured on October 10 in three previous fall banding seasons. Only 12 Gray-cheeked Thrushes were banded this fall, a sharp drop from the last two fall seasons (Fig.4). Migration through Cabot Head for both Gray-cheeked and Swainson's Thrushes is mostly in September. A total of 26 Swainson's and 12 Gray-cheeked Thrushes were marked with nanotags for the second year of this project, which would eventually allow to better determine their respective phenology from Cabot Head southward.

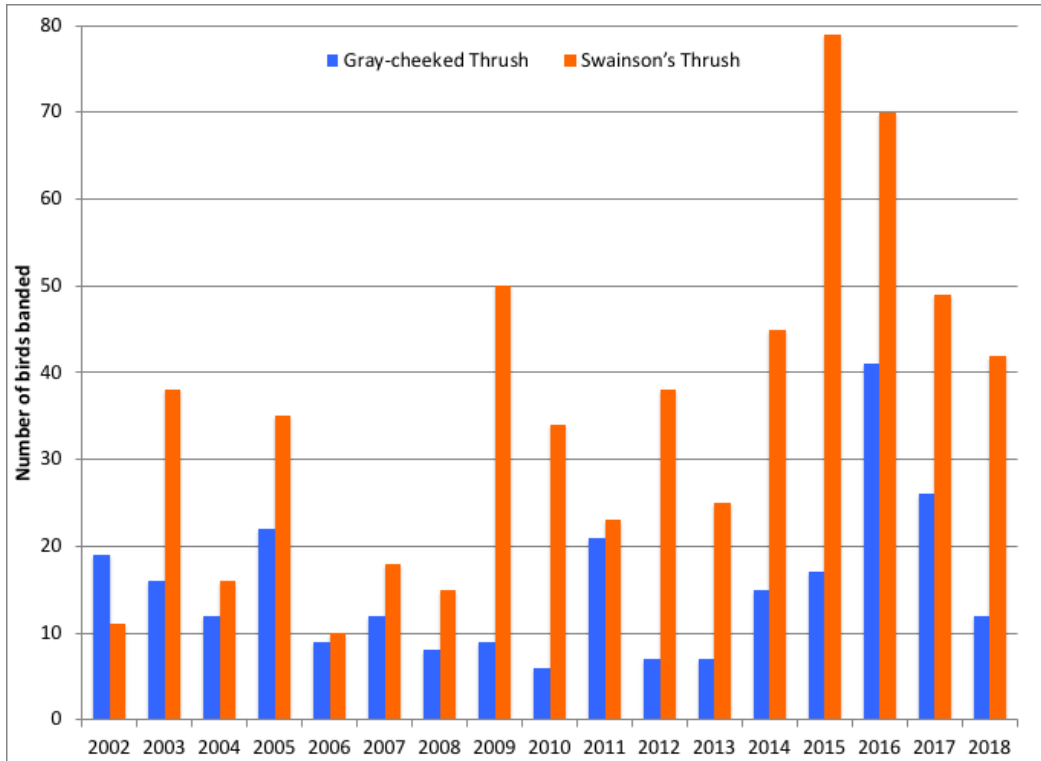


Figure 4. Banding totals of Gray-cheeked and Swainson's Thrushes in the fall at CHRS from 2002 to 2018.

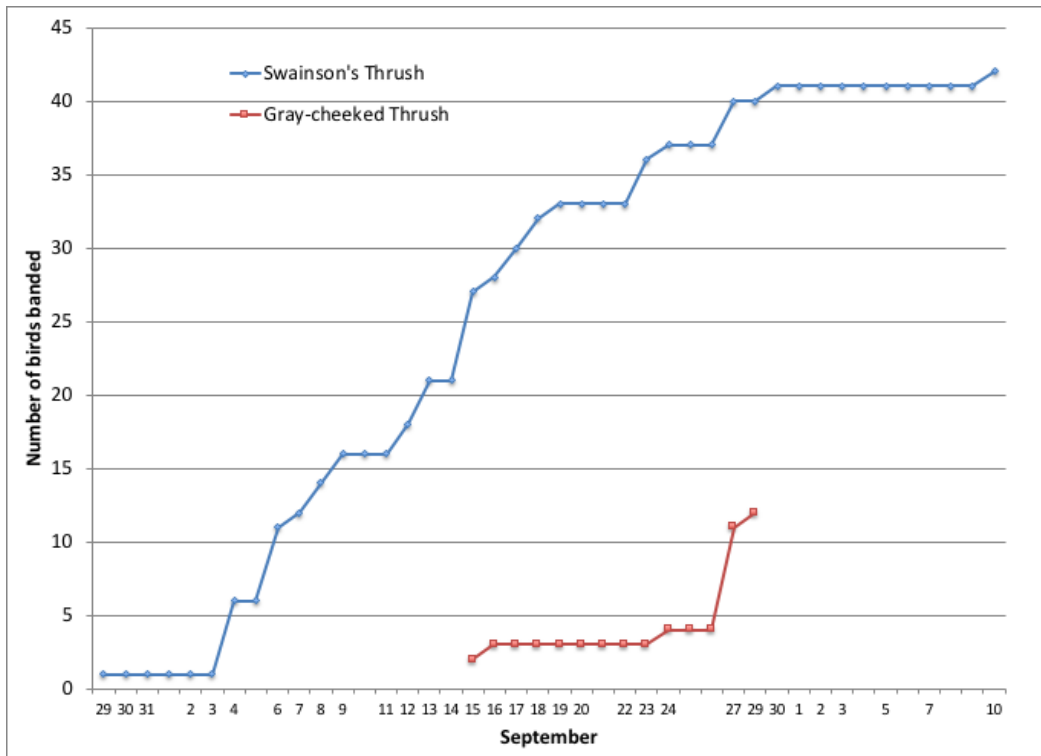


Figure 5. Cumulative numbers of banded Swainson's and Gray-cheeked Thrush in fall 2018 at CHRS. (Missing dates in x-axis represent days with no banding).

Diversity reached some high points throughout the month, especially early and in the middle of the month, with a daily high of 38 species both on September 7 and 17. A total of 60 species were detected between September 14 and 17, the most diverse period of the monitoring period. During these four days, the first Tennessee Warbler was detected on September 14 while the last Ruby-throated Hummingbird of the season was seen on September 16. Wood Duck and Yellow-billed Cuckoo were also seen during this period, their only detection of the season. The group most represented in mid-September was the warblers, with 19 species detected in that period.

Diversity and abundance of warblers peaked from late August to mid-September (Fig.6 and Table 2). In the 5-day period between August 30 and September 3, a total of 16 warbler species was detected, with American Redstart and Myrtle Warbler being the most abundant. Between September 13 and 15, 19 species of warblers were detected, the highest total this fall. The most abundant species were the same as previously noted, in addition to Common Yellowthroat and Black-throated Green Warbler. After 20 days of monitoring, the cumulative number reached 20 species of warblers on September 3. The remaining 57 days of monitoring added only four species (Tennessee, Orange-crowned, Chestnut-sided and Palm Warblers). Warbler diversity and abundance declined sharply after mid-September. A total of 9 species of warblers were detected in October, however, only Myrtle Warblers were seen in significant numbers. Throughout the season, Myrtle Warbler, American Redstart, Black -throated Green Warbler, and Common Yellowthroat were the species most often detected and in the highest numbers (in decreasing order).

Chestnut-sided Warbler is a species commonly observed in spring, almost daily from early May to early June, with numbers peaking in mid- to late May. In the fall season, however, it is much more rarely observed, with only one to six days with detection, ranging over the years from August 16 (in 2011) to September 25 (in 2014) and with two fall seasons without any Chestnut-sided Warbler. This year, the only detection came from a bird caught on September 29, the latest ever. As a rule, almost all species of warblers are observed in greater numbers in spring than in fall. However, the contrast is extreme only for a handful of species, notably Magnolia Warbler, Mourning Warbler, and the aforementioned Chestnut-sided Warbler.

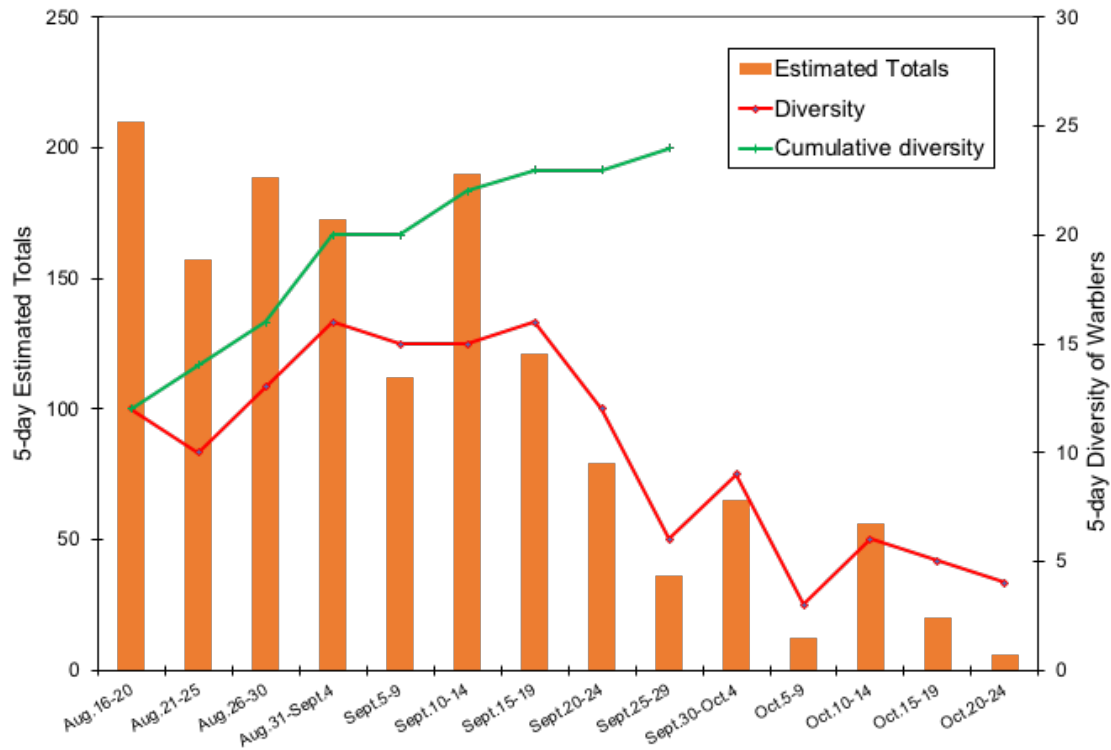


Figure 6. 5-day total numbers of warbler species (right Y-axis) and 5-day Estimated Totals of warblers (all species combined; left Y-axis) at CHRS in fall 2018.

Table 2: Phenology of migration for warbler species, with dates of first and last observation, number of days between first and last observation, number of days with observation, and estimated totals.

	Dates of first and last observations			Number of days		Estimated Total
	August	September	October	between first and last observation	with observation	
Myrtle Warbler ^B	15		30	77	62	476
Common Yellowthroat ^B	15	29		46	42	193
American Redstart ^B	15		20	67	38	317
Black-throated Green Warbler ^B	15	20		37	29	214
Nashville Warbler ^B	16		23	69	20	46
Black-and-White Warbler ^B	15	17		34	18	29
Ovenbird ^B	18		3	47	18	29
Magnolia Warbler ^B	15	22		39	15	19
Western Palm Warbler		10	17	38	13	31
Orange-crowned Warbler		19	22	35	13	30
Bay-breasted Warbler	23	23		32	13	23
Black-throated Blue Warbler ^B	16		1	47	13	16
Wilson's Warbler	27	27		32	12	16
Cape May Warbler	27		2	37	9	13
Mourning Warbler	16	7		23	7	7
Tennessee Warbler		14	10	27	6	10
Canada Warbler ^B	16/29			14	6	8
Pine Warbler ^B	31	22		23	5	6
Blackpoll Warbler		1/17		17	5	5
Northern Waterthrush ^B		1/15		15	4	4
Blackburnian Warbler	16	17		33	3	3
Yellow Warbler ^B	24	14		22	3	3
Northern Parula ^B		2		-	1	1
Chestnut-sided Warbler ^B		29		-	1	1

^B: These species breed on the northern Bruce Peninsula (according to the Ontario Breeding Bird Atlas)

Many species not monitored by banding migrate mostly in September. Canada Geese usually migrate in early September but with large variations across the years (Fig.7). Large movements are strongly influenced by weather: north winds tend to bring numerous flocks flying through. This fall, large flocks were seen later than average. Despite north winds in early September, most of the movements were later in the month, with peaks on the 18th and 19th, days of strong north winds, and on the 29th, when a strong west wind blew. Double-crested Cormorants were seen almost daily from the start of monitoring period until late in September. This species roosts in Wingfield Basin making it difficult to differentiate migrants from local residents. Water levels this year were again at a record high as in the last two years, covering rocks that cormorants (and other birds like gulls) like to use as resting areas. As a consequence, numbers detected were lower than earlier years with cormorants crowding the few rocks still available, as well as the navigation markers.

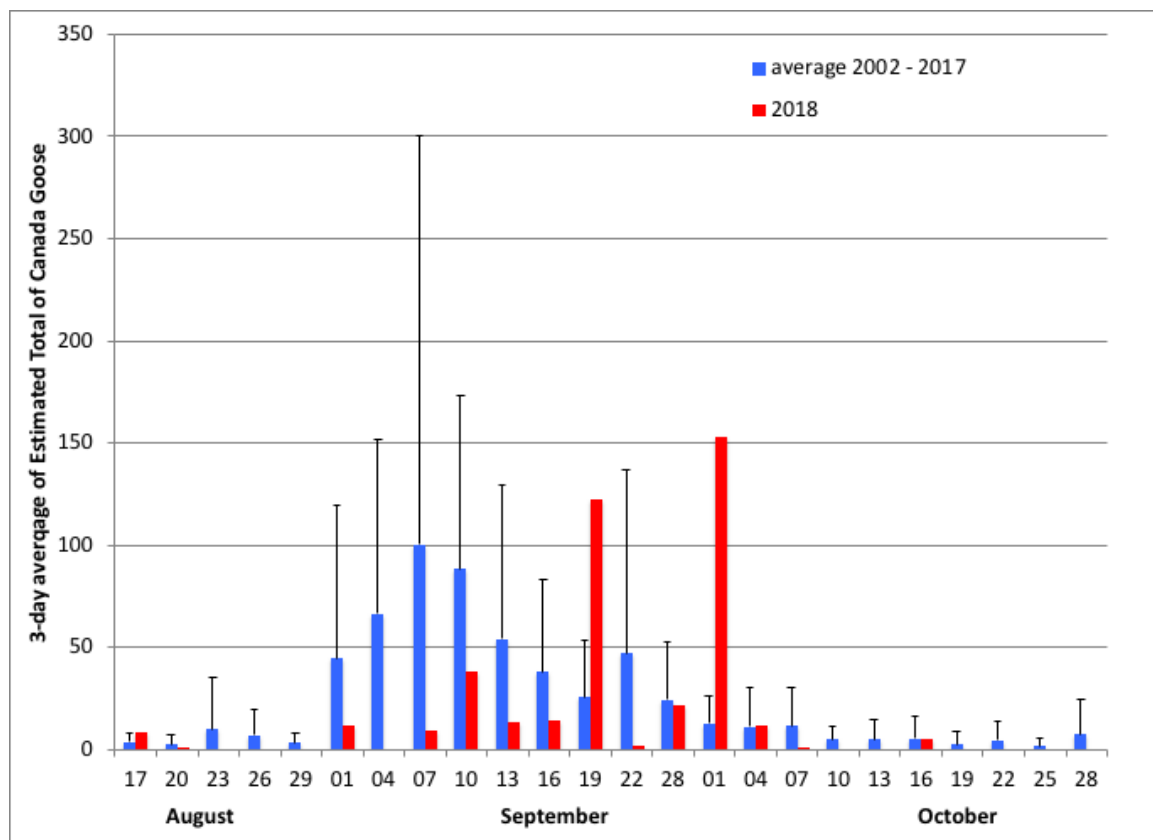


Figure 7. 3-day average of Estimated Totals of Canada Goose for 2018 and the combined years of 2002 to 2017 at CHRS.

The overwhelming majority of Blue Jays and Yellow-shafted Flickers migrate in September: in 2018, 85% and 68% of totals, respectively, occurred during this month. Even though the bulk of migration is in September for both species, their phenology could be quite different (Fig.8&9): in years of small numbers of Yellow-shafted Flickers, their movements through Cabot Head are spread throughout September, whereas Blue Jays almost always tend to peak over a few days in mid-month. That was again the case this fall, as Yellow-shafted Flickers were detected in relatively low numbers, with 91 birds (2002-2017 average of $167 \text{ ET} \pm 108$; low of 72 in 2007 and high of 394 in 2014). The migration peak of Blue Jays occurred in early mid-September, as in previous years: from the 11 to 16, 238 blue jays were counted, representing 57% of the seasonal total of 414 birds (2002-2017 average of $1065 \text{ ET} \pm 551$; low of 490 in 2007 and high of 2825 in 2014). Most of the time, between one half and two-thirds of the Blue Jay season total is detected in a seven-day period. This fall, however, numbers of Blue Jays detected dropped sharply just after the peak, with no birds detected after September 24 (except for one bird on October 25).

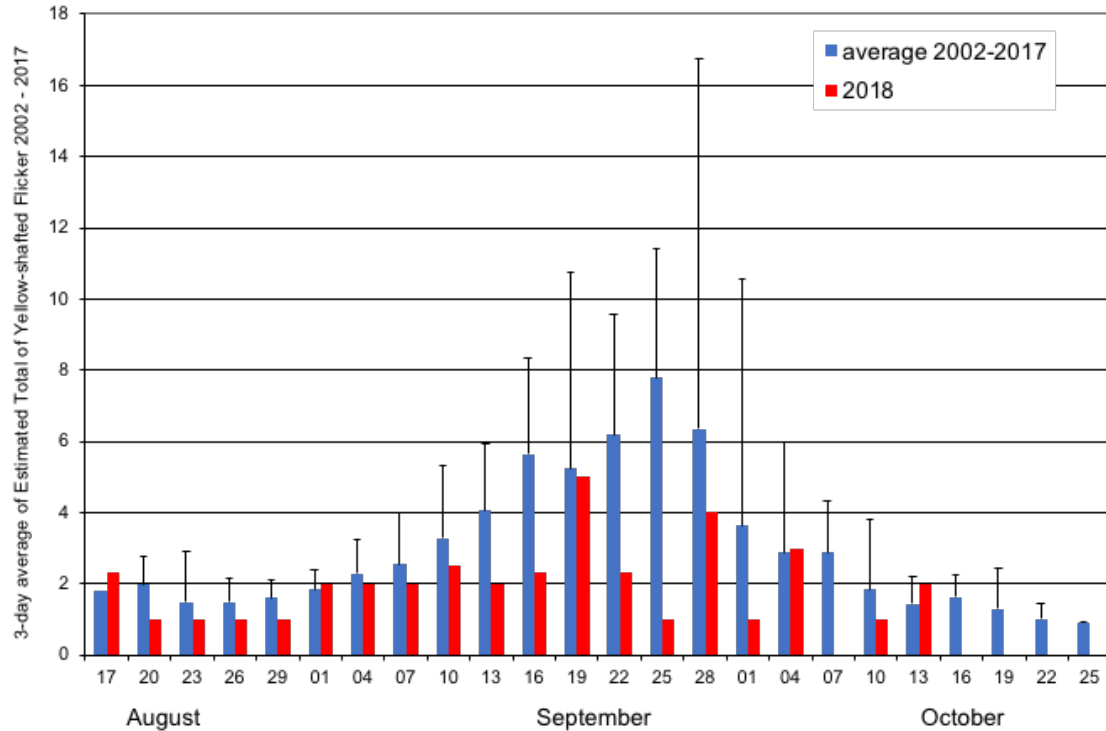


Figure 8. 3-day average of Estimated Totals of Yellow-shafted Flickers for 2018 and the combined years of 2002 to 2017 at CHRS.

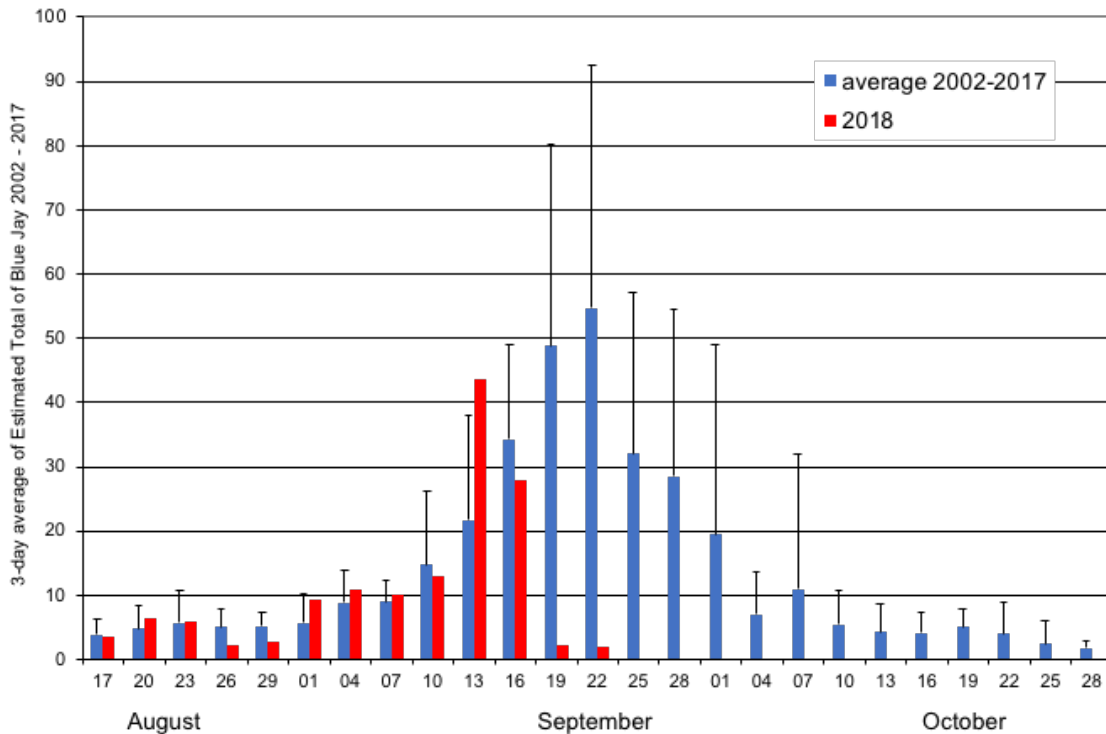


Figure 9. 3-day average of Estimated Totals of Blue Jays for 2018 and the combined years of 2002 to 2017 at CHRS.

Common Loons were seen throughout the entire season with about 64% of all observations made in September. Loons can usually be seen in small rafts on Georgian Bay or flying in a southeast direction, either over water or land. This fall, a total of 141 Common Loons was detected, within the range of totals detected since 2010 (with the exception of the fall of 2014; Fig.10). This species is a strong flyer and moves through the area rapidly, making detection difficult. Another potential problem is that it routinely flies, low or high, over Georgian Bay at any time of the day, which makes accurate monitoring difficult as well. However, detection probabilities should stay relatively consistent between years. It is possible that the apparent decline results in differences in use of Georgian Bay offshore from Cabot Head. In the first few years of monitoring, it was common to see good numbers of loons resting on the water of Georgian Bay, making detection much easier than with birds flying through.

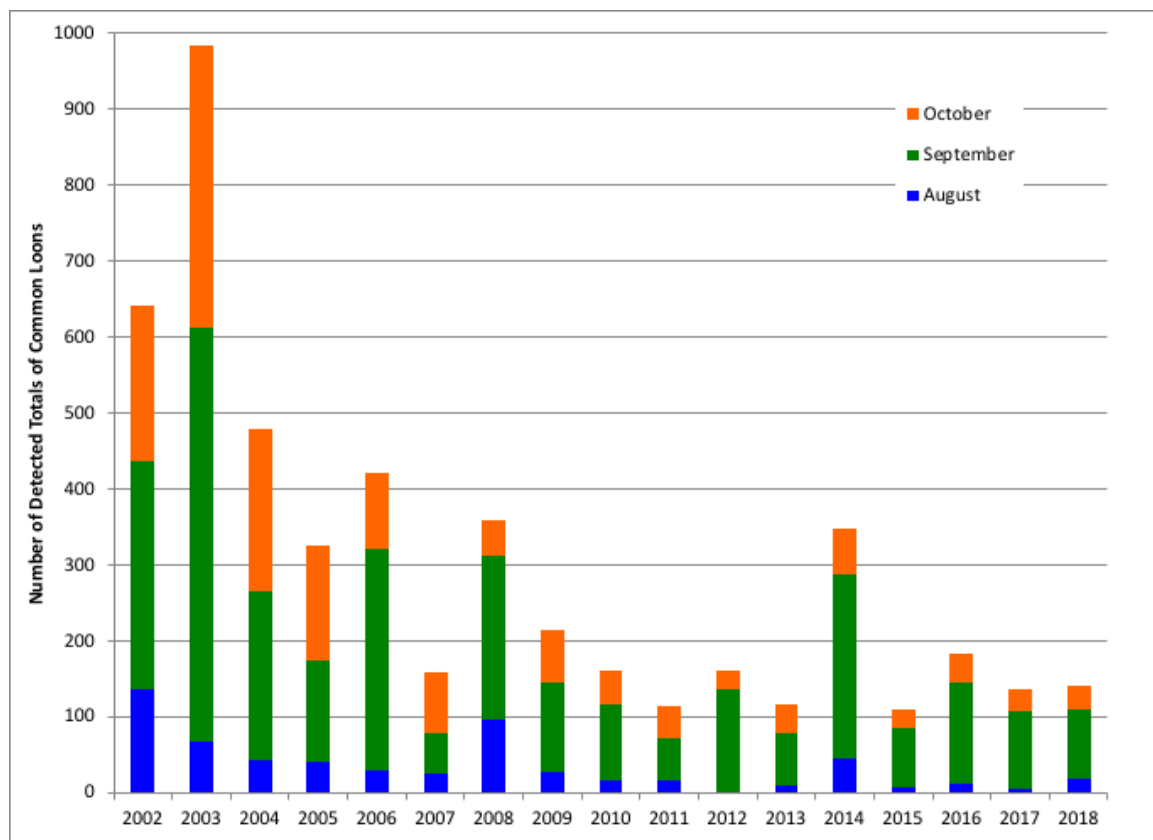


Figure 10. Detected Totals of Common Loons detected at CHRS, in relation to year and time of monitoring.

October

October is usually the busiest – although less diverse - banding period of the fall migration season at CHRS. This was again the case in 2018, as 635 birds of 34 species were banded (45% of the seasonal total), for a daily average of 37 birds captured. Banding was hampered by weather very often in October this year, with 14 days completely lost due to rain and/or wind (45% of the banding period in October!) and one day with only limited monitoring. The most common species caught were Golden-crowned Kinglet, with 199 individuals banded (representing 31% of the monthly total), followed by Black-capped Chickadee and Ruby-crowned Kinglet (with 16% and 12%, respectively of the monthly total). A total of 82 species were detected during the month, including the first Rose-breasted Grosbeak detected in October.

When banding was possible, daily numbers of birds banded in October were very variable, ranging from 7 on October 2 to 135 on October 13, the highest daily total of the season with 57 Golden-crowned Kinglets and 32 Ruby-crowned Kinglets banded (Fig.11). Captures were concentrated in a few days, most notably in the middle of the month, although the second highest daily total was achieved on October 24. A total of 101 birds were banded on that day, with half of them Black-capped Chickadees. Slate-colored Juncos (with 21 birds banded) and Pine Siskins (with 12 birds banded) were the other dominant species during that day. The first Golden-crowned Kinglets were detected on September 22 with barely any observations until the end of September. They arrived in good numbers in early October, with strong movements throughout the month, although much reduced in the second half. Banding was frequently interrupted by strong winds and/or rain during October. One consequence of the bad weather is the second lowest number of mist net hours for the month of October in 17 years (only 44% of the potential mist net hours were realized), which, almost certainly, affected the banding total in October, also the second lowest in 17 years (Fig.12). However, there are large variations in numbers of birds banded and of mist net hours in October. In October 2008, for example, there were only 51 more birds banded than in fall 2018, whereas there was about a thousand more mist net hours realized.

Black-capped Chickadee is a well-known irruptive species: some falls, due to high breeding success, large flocks of young birds disperse across wide areas in search of new

territories. There was a small but notable movement of chickadees this fall at Cabot Head in late October. However, no apparent pattern emerges from 17 years of banding at Cabot Head (Fig.13). The Red-breasted Nuthatch is a species also showing large variations in banded and detected numbers at Cabot Head across the years but with no apparent patterns. This fall, 118 Red-breasted Nuthatches were banded, the second-highest total (Fig.14).

Other species, which migrate mostly in October, were also captured in relatively low numbers this fall. Only 17 White-crowned Sparrow were banded, the lowest total ever. A total of 52 White-throated Sparrows were banded, well below the average of 77 ± 45 birds (range: 32 in 2017 – 199 in 2005). Hermit Thrushes were also banded in below average numbers, with only 21 birds (range: 15 in 2017 – 87 in 2011). Variations in fall banding total are quite important for these three species but, again, weather patterns particularly impacted banding this fall.

A young female Rose-breasted Grosbeak was captured on October 26, the first ever detection of that species during that month. The latest date, previously, was September 26, in 2008. This species is never observed in large numbers in the fall, with between one and ten detections during a season, and no detection at all in four fall seasons. This fall, the capture represents the only observation.

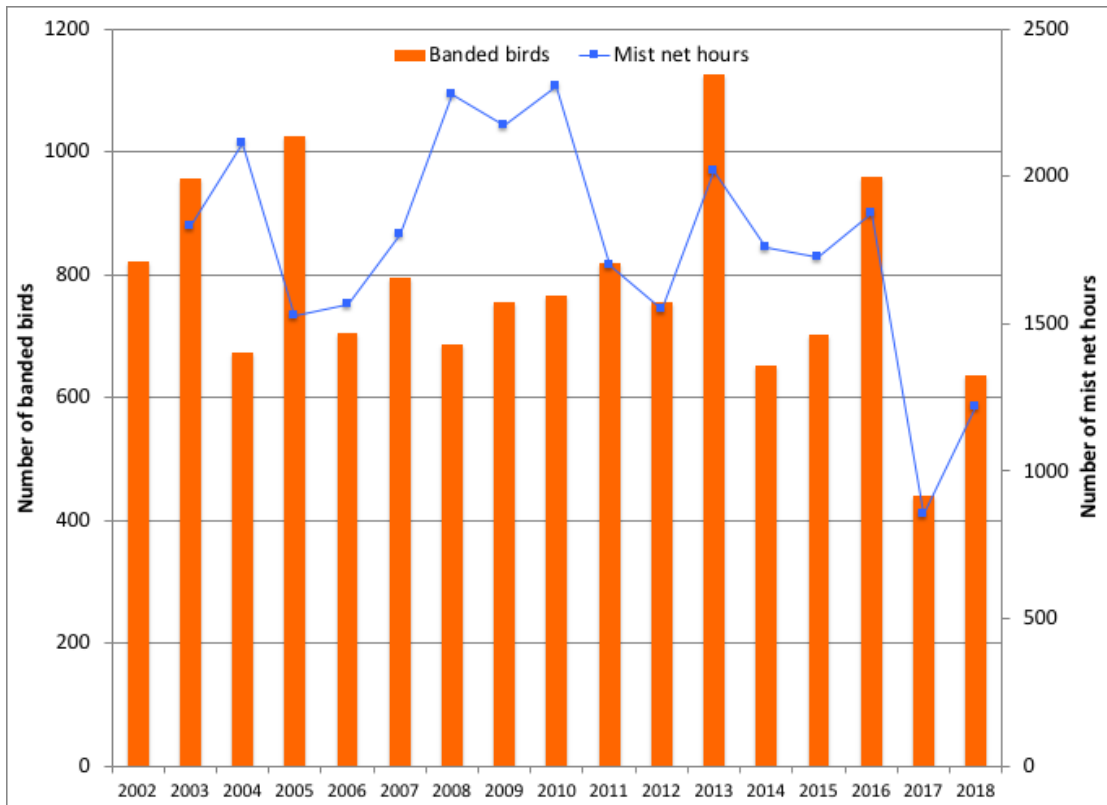


Figure 11. Banding totals and mist net hours for October at CHRS, 2002 - 2018.

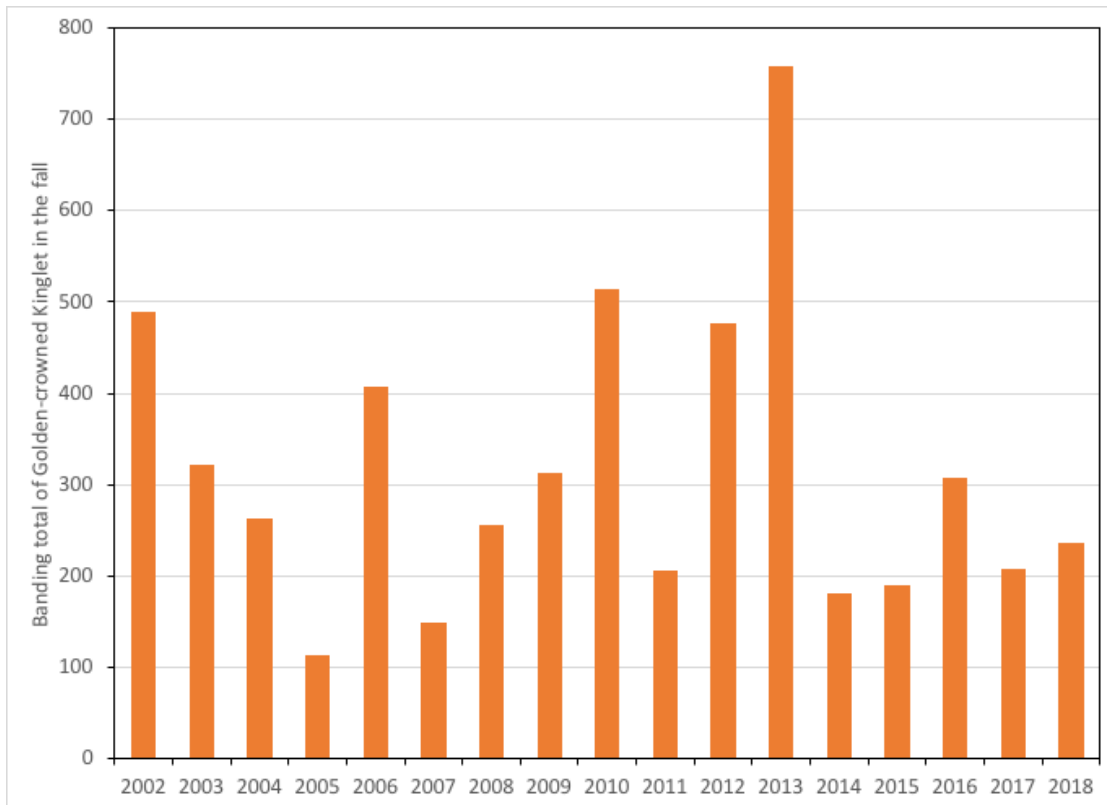


Figure 12. Banding totals for Golden-crowned Kinglets at CHRS, 2002 - 2018.

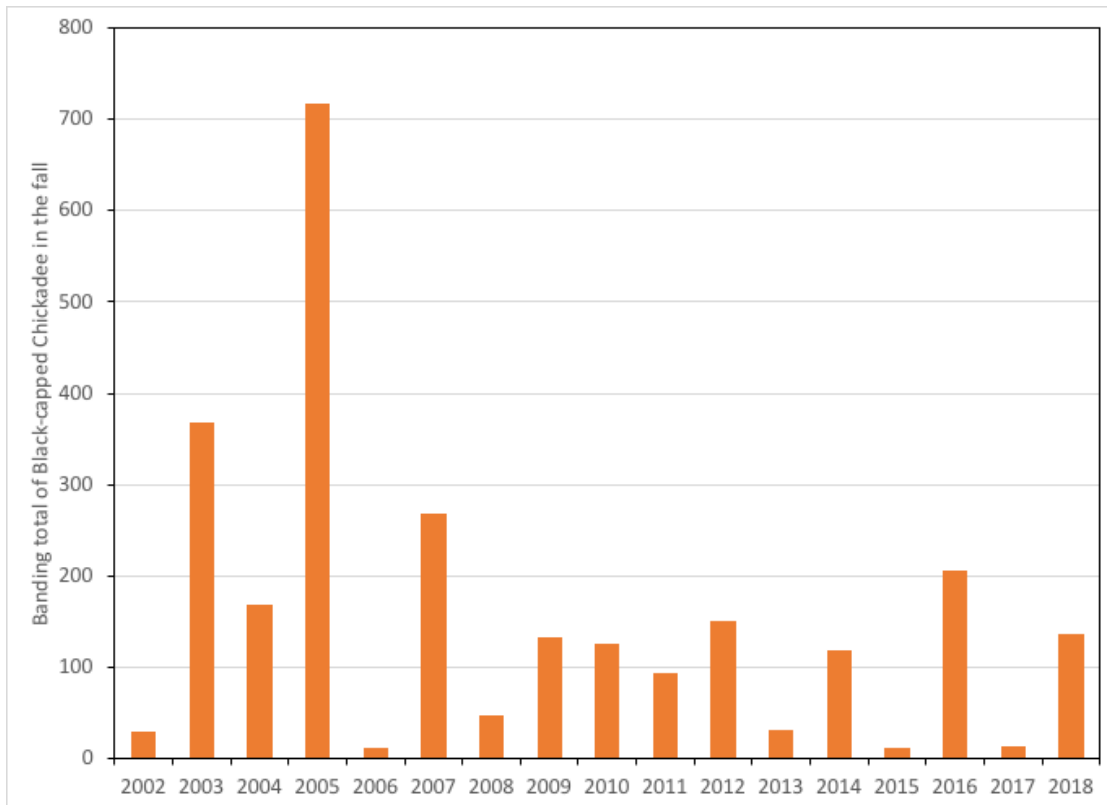


Figure 13. Banding totals for Black-capped Chickadees at CHRS, 2002 - 2018.

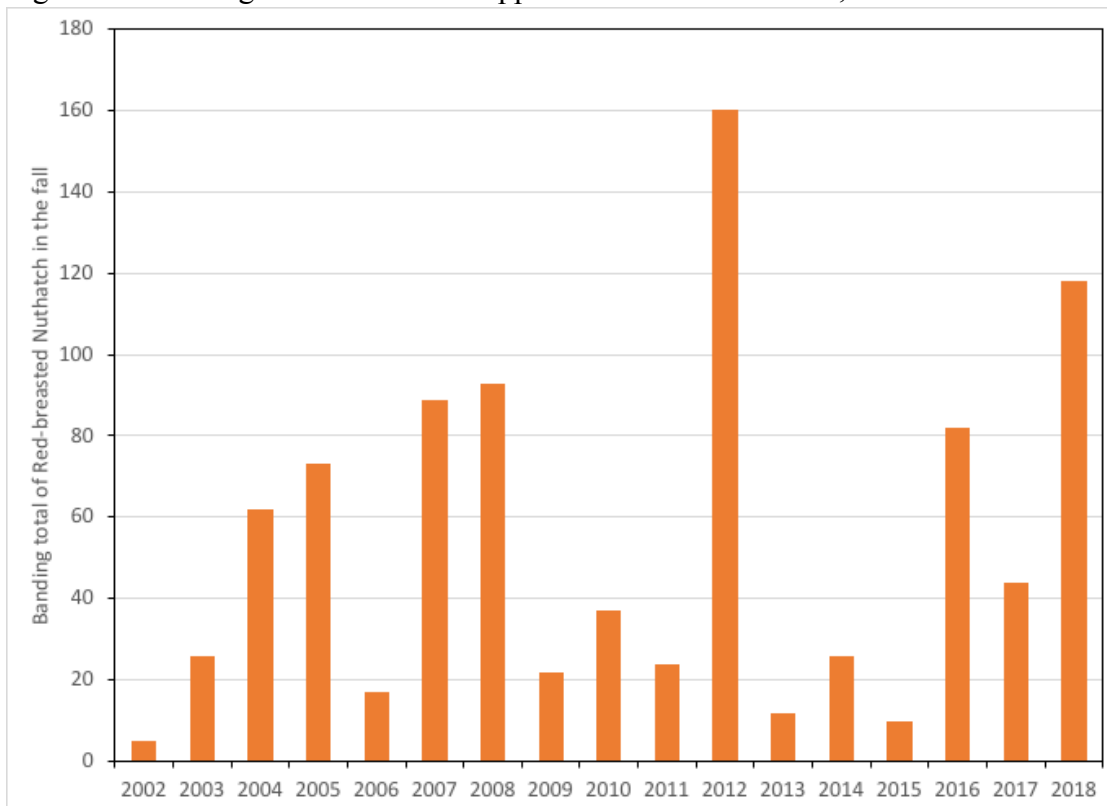


Figure 14. Banding totals for Red-breasted Nuthatches at CHRS, 2002 - 2018.

In October, most warblers have usually already gone through the area with the exception of Orange-crowned and Yellow-rumped Warblers, which are late migrants; it is therefore mostly stragglers that are observed. Nonetheless, an average of $9 (\pm 1)$ species of warblers are detected every October between 2002 and 2017, ranging from a low of 5 species (in 2005, 2007, and 2011) to a high of 15 in 2014, for an overall total of 19 species of warblers. Three species (Orange-crowned, Nashville, and Yellow-rumped Warblers) have been observed every October, with Palm Warbler only missed once in 2004. This fall, nine species of warblers were detected in October, notably a Cape May Warbler on October 2, the first detection in October for that species (see Table 2). The previous latest record was September 27, in 2014 and 2016. All nine species were detected in the first three days of October but up to five species were still detected in mid-October. The Ovenbird on October 3 was only the third time this species was detected in October. American Redstarts have been seen during six previous fall seasons. This fall, one bird was observed on October 3, another one, a young male, was seen on two consecutive days (October 13 and 14), whereas a third one, a male adult, was also observed during two days (October 19 and 20). The latter bird is the second latest observation for American Redstart, with the record being October 25, in 2008. The last Nashville Warbler was on October 23. This species is not uncommon in October but has been detected after that date only in fall 2004, on October 25 and 28. Orange-crowned Warblers were observed from September 19 to October 22, with seven days with observation in October. The latest detection for this species over the years is October 26, 2015. Myrtle Warblers were detected first on August 15, mostly breeders from the Bruce Peninsula. Numbers increased after mid-September, when the much larger population of the boreal forest starts to migrate south, and peaked in late September-early October. The last birds were observed on October 30. It is, by far, the species with the most daily detections in October, with 20 days with observations this fall.

3.0 Noteworthy Observations

A new species, Black Vulture, was added to the area checklist this fall. It was seen flying above Middle Bluff with a few Turkey Vultures on August 19, slowly drifting in a westerly direction. It was seen again on August 23, again in company of some Turkey Vultures. This species has been slowly spreading north, with a regular presence across the Niagara River, on the New York side. According to eBird (ebird.org), between August and November of this year, Black Vultures were seen at the northern tip of the Lower Peninsula of Michigan, around Hamilton in southwest Ontario, and in Abitibi in Québec.

A pair of Green Heron was observed on August 19, 21, and 22, the first detection in fall for this species. There were numerous observations of that species this spring, which is also unusual. On August 31, a young Carolina Wren was banded, the second ever, after a juvenile banded on September 4, 2012. This bird was detected on three other occasions, September 7, 8, and 11.

Some species are banded rarely or in very small numbers in the fall. One Wood Thrush was banded on August 24: this species has been captured in only five fall seasons, whereas it is captured every spring (except in 2013). Wood Thrush breed on the Bruce Peninsula but they do not favor the kind of habitats around the mist nets. Other species are banded more regularly across the years but always in very small numbers. For example, this fall, one young male Belted Kingfisher was banded on September 29. This species was captured in nine previous fall seasons, with one to three birds banded in each season. Likewise, one young male Pileated Woodpecker was banded on September 22, a species captured in nine previous years in very small numbers.

Rusty Blackbirds are seen every fall in variable numbers (from one in 2010 to 91 in 2016). This fall, there was only two observations, with one bird on September 29 and three birds on October 3. Rusty Blackbirds were the only New World Blackbird species detected this fall.

Other noteworthy observations are, in taxonomic order: Two Cackling Geese were seen in a small flock of Canada Goose on September 19. One adult Trumpeter Swan was observed in the afternoon of October 12 on Compass Lake (west of Wingfield Basin). That bird did not have any wing tags. One Chimney Swift was seen this year on August 26, only the sixth fall with an observation. Sandhill Cranes are detected every fall but always in

relatively small numbers and on few occasions. This fall, two birds were seen together on August 16 and 20 and one bird on September 8, 22, and 23. In the late-afternoon of October 16, we observed two first-winter Bonaparte's Gulls flying into Wingfield Basin, struggling against a gale-force wind. These delicate gulls were still present on October 17 and 22, gracing the Basin with their buoyant flight and exquisite features. It is a species rarely seen at Cabot Head, with only a few observations in the falls of 2002, 2003, and 2005, and only once in the spring (of 2009). Given their abundance along the Niagara River in winter, it is possible that they fly over Georgian Bay far from shore. One adult Greater Black-backed Gull was seen far out over Georgian Bay on October 22, the first sighting of this species at Cabot Head in the fall since 2005. It was last seen in the spring of 2011. On October 15, assisted by a gale-force west wind, a Red-throated Loon flew over the bay and disappeared rapidly over the horizon. A Great Egret was observed, also over the bay, on August 27. It is only the fourth fall season with sightings, which usually are of a single individual. The exception was the small flock of six birds on August 19, 2016.

Northern Goshawks were observed on August 30, September 1 and 23, with one bird each. Despite its reclusive and shy behaviour, this species has been missed only in five fall seasons out of 17. Red-tailed Hawks, on the other hand, are observed every fall season but this species can be surprisingly sparse, with half of the 17 fall seasons having only one or two days with detection. There were ten days with observations this fall, for a total of 17 birds. Peregrine Falcons were detected on six occasions, from August 30 to October 2, with a total of ten birds. One adult Red-headed Woodpecker was seen on the afternoon of September 28. One female Red-bellied Woodpecker was seen on October 23.

On the afternoon of October 22, a Northern Shrike, was perched prominently, albeit fleetingly, on trees near the station. It quickly flew across the basin. Northern Shrikes are never seen in any consequential numbers at Cabot Head: three birds in one day being the highest number ever recorded. It is also a late migrant, having been missed in five fall seasons in the previous sixteen. First arrival dates have ranged from October 14 (in 2016) to October 31 (in 2008). Warbling Vireos were observed on September 6, 16, and 17, with one bird each, a species also rarely observed in fall (detected in six other fall seasons). There was three days with observations of Philadelphia Vireos this fall, on September 8, 17, and 23. White-breasted Nuthatches are seen almost every fall (being missed only in

four seasons) but always in a few occasions with only one or two birds at once. This fall, there were four detections of one bird, on September 15 and 27 and on October 17 and 18. Rarely detected, Eastern Bluebirds were heard at the late date of October 3, making 2019 the seventh fall with detections. Finches were quite present this fall, notably Pine Siskins and, to a lesser extent, Common Redpolls. Pine Grosbeaks are much less likely to be seen at Cabot Head, with observations only in six previous fall seasons. This fall, two birds were seen in the afternoon of October 30.

Except for a few species, the monitoring area at Cabot Head does not offer great habitat for ducks, especially dabbling ducks. This fall, a lone American Green-winged Teal was seen flying over Wingfield Basin on October 7, whereas two American Black Ducks were observed flying with two Mallards on October 6. Wood Ducks and Hooded Mergansers use the shallow lakes next to the research area quite extensively. They are therefore seen more frequently during monitoring, albeit still in relatively small numbers. This fall, one Wood Duck was observed on September 16 and one Hooded Merganser was seen on Wingfield Basin on October 18, 21, and 22.

Likewise, the Cabot Head Area is not favorable for shorebird species, except for a few species like Spotted Sandpiper. This fall, a young American Golden-Plover was seen on the shore near the entrance to Wingfield Basin with a young Sanderling. It is possible that the fierce thunderstorm during the previous night, followed by strong wind, grounded the birds for a while. An American Golden-Plover was also seen this fall flying in a flock of Canada Geese on September 18. This species had previously been detected only once, on May 24, 2012. Sanderling was also detected only once, with four birds flying fast on September 2, 2005.

4.0 Banding Data Analysis

With 1403 birds banded of 67 species, the fall 2018 banding total is the second lowest total ever, almost 300 birds less than the 16-year average (1676 ± 341). For the 15 species with more than 20 individuals captured, ten species have banding totals below average and, among the five species above average, only three depart strongly from the seasonal average (Fig.15). Among the 67 species banded this fall, five species have the lowest banding total ever, notably Black-and-White and Magnolia Warblers, and 49

species (73% of the number banded this fall) have banding totals lower than the 2002-2017 average. No species break banding records, although Mourning Warbler and Blue-headed Vireo tied to previous record high numbers.

As usual, daily captures are highly variable, showing high peaks in a few days (Fig.16). This fall, as previously mentioned, weather prevented banding on many days, which affected overall capture rates, especially in October. Capture rates varied greatly on a weekly basis (Fig.17). The capture rate is determined by dividing the number of birds caught in a net by the number of hours for which the net was operated. Thus, variation in capture rate reflects variation in those two parameters, which are themselves dependent upon various conditions (weather being the major one). In comparison to previous falls, weekly capture rates this fall were well above the 2002-2017 average for only three weeks, all three in October, corresponding to peaks in captures (Fig.17). The weekly banding total shows a similar pattern (Fig.18), except that the difference amplitude from average is not as marked. There were two weeks this fall where banding total reached its lowest ever (September 20 – 26, tied with 2017 numbers; and October 4 – 10). Barely any banding was possible during these two weeks, with four days missed in each week. When all years are combined, weekly mist net hours average around 80% in the first eight weeks of fall monitoring but drop to around 60% for the remaining three weeks. However, variations between years are substantial (Fig.19). In 2018, 59% of potential mist net hours was realized, significantly lower than the 2002 – 2017 average of 73% (low of 54% in 2007 and high of 86% in 2008). Coverage varied widely throughout the season. In 2018, mist net hours were near or above average until mid-September but fell well below average afterward, notably in the aforementioned two weeks, when they reached their lowest ever.

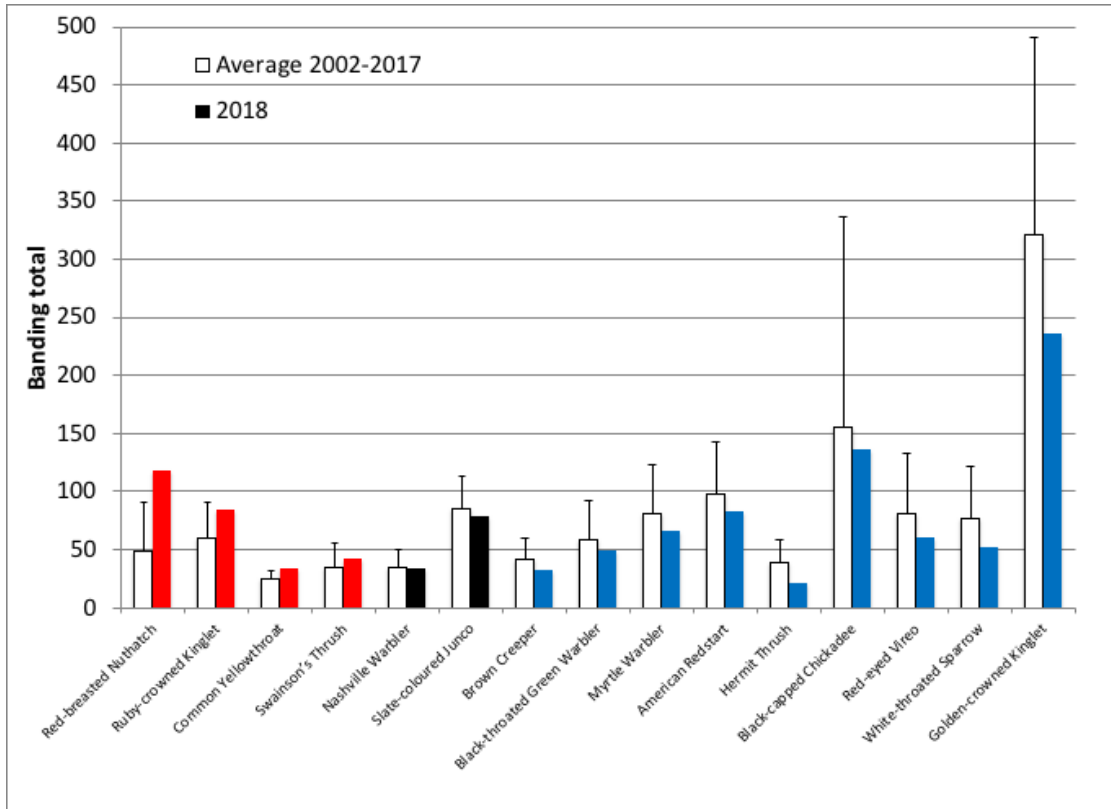


Figure 15. Banding total of the most common captured species compared to average total of 2002-2018 (highest total in red and lowest in blue). Error bars show Standard Deviation.

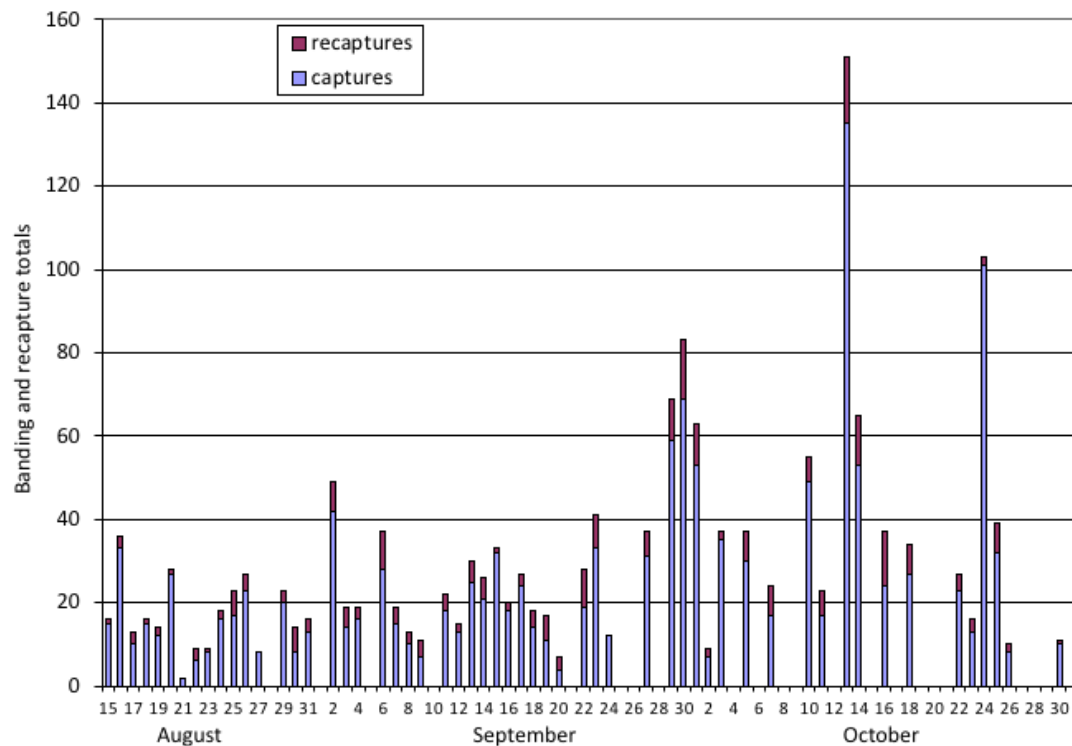


Figure 16. Daily banding and recapture total at CHRS, fall 2018.

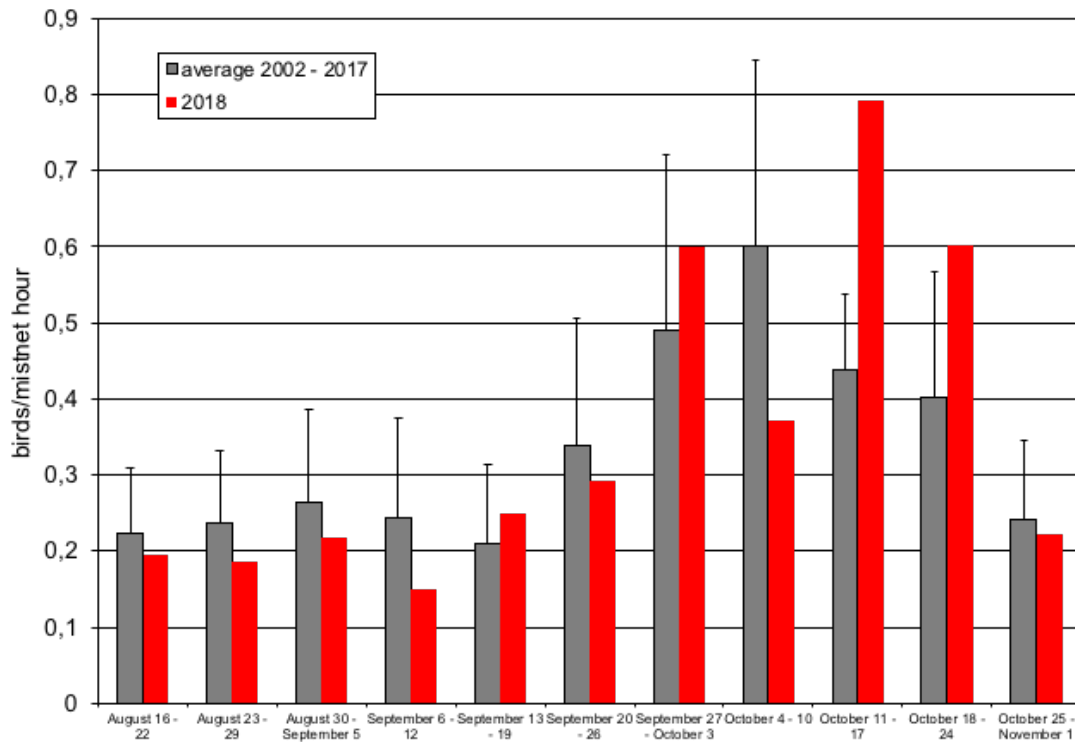


Figure 17. Fall weekly capture rates at CHRS. Error bars show Standard Deviation.

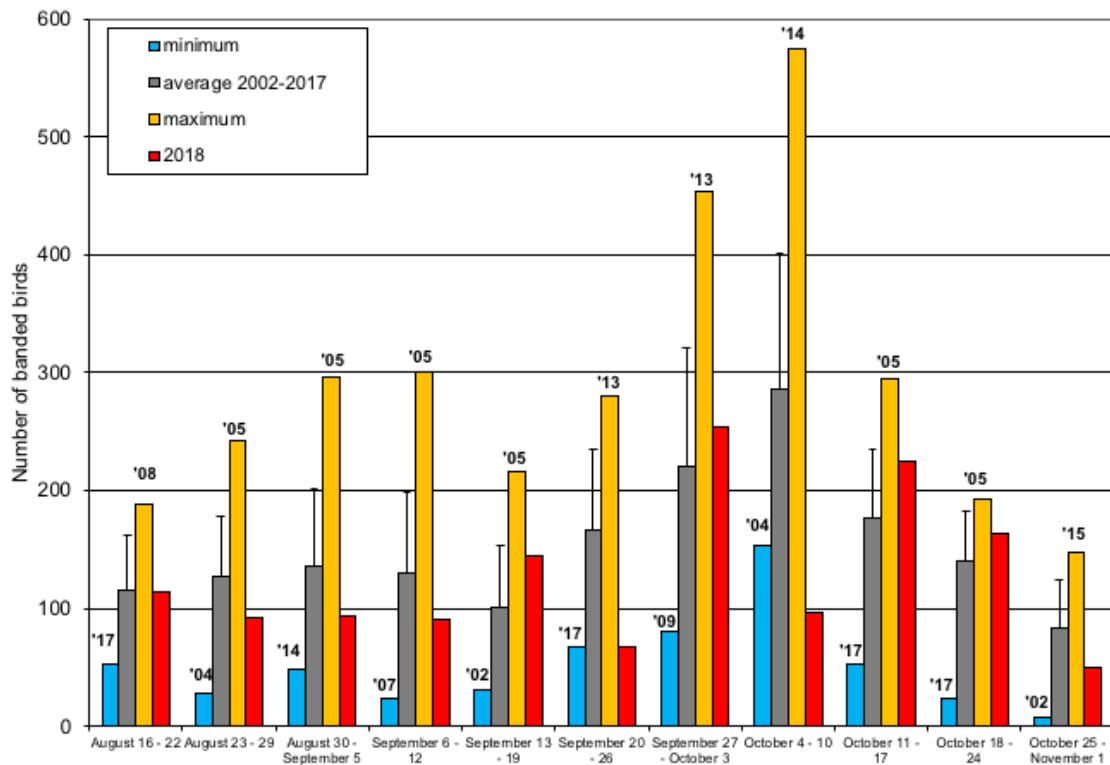


Figure 18. Fall weekly number of banded birds at CHRS. Error bars show Standard Deviation.

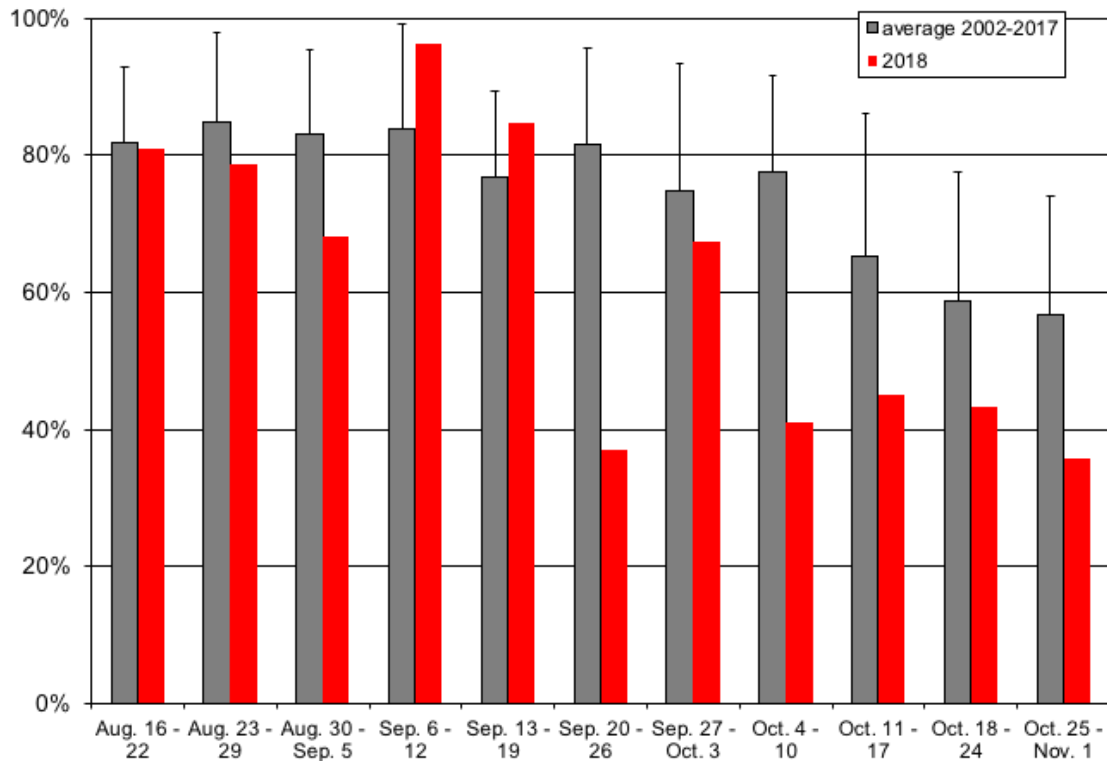


Figure 19. Fall weekly proportion of mist net hours at CHRS. Error bars show Standard Deviation.

4.1 Weather

Weather is a dynamic system at various scales of space and time. It is thus very difficult to determine its effect on migration without precise data at local, regional, and, even, continental, scales. Here, we present data collected daily at the station, wind direction and strength, temperatures, and cloud cover. In most part of Ontario, the summer was marked by dry conditions, in contrast with the wet summer of the previous year, especially in the early part of the season.

At Cabot Head, the dominant characteristic of the season was an abundance of strong to very strong wind (Fig.20). Almost half the season experienced wind of five or more on the Beaufort scale, which often precluded banding. These strong winds were mostly coming from the south or west (35% and 30%, respectively, of the strong winds). Extremely strong, gale-force winds (7 or 8 on the Beaufort scale) occurred surprisingly often this fall, most notably on the fall equinox. On that day, September 21, a massive system moved through, bringing intense south wind, which shifted to the west during the

day. It is the same system that brought tornadoes in the Ottawa area. These gale-force winds were recorded in a total of nine days this season, spread from September 1 to October 23. On the opposite end, there were only three days with no wind at all.

This fall, there were 29 days with periods of precipitation, almost a third of the monitoring period. Rain ranged from light drizzle to heavy thunderstorms. However, its impact is variable, as precipitation can occur outside of the banding period.

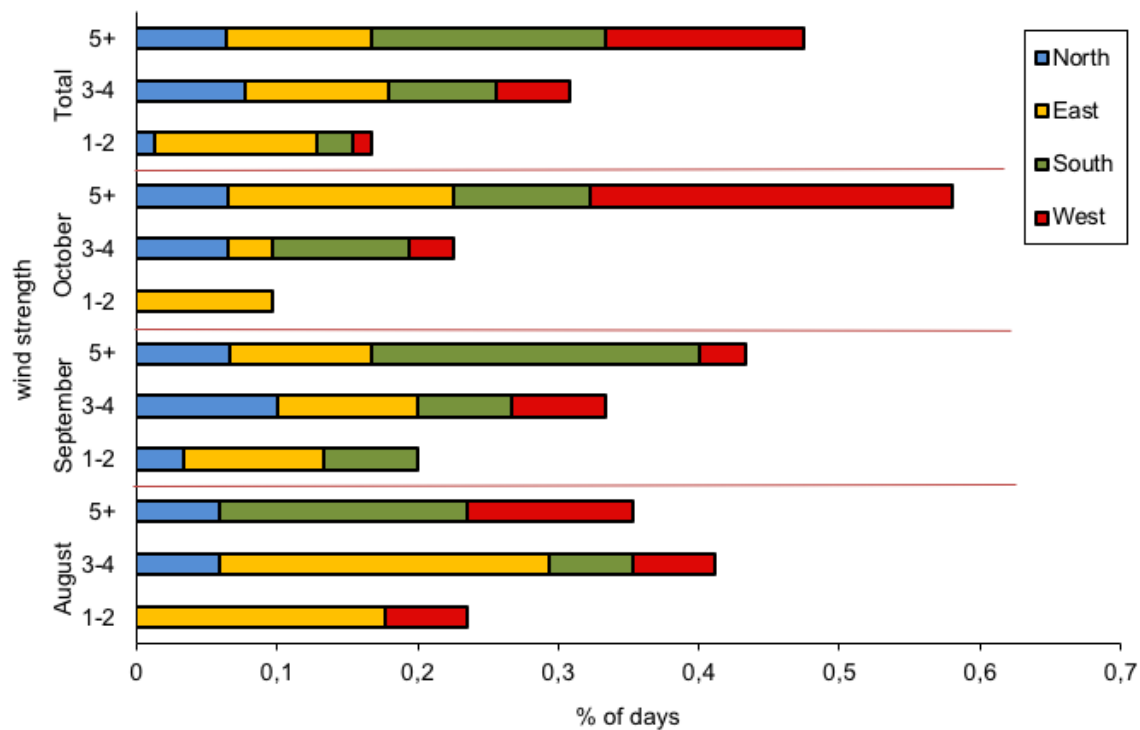


Figure 20. Wind pattern (strength on the Beaufort scale, direction and proportion of time) at CHRS, fall 2018.

4.2 Recaptures

The rate of recapture at Cabot Head was relatively low in fall 2018: a total of 263 recaptures for 162 individuals of 32 species were recaptured from August 15 to October 30 (Table 3). The vast majority (94%) of the 162 recaptured individuals came from birds banded in the fall, representing an overall recapture rate of 11%. There were ten recaptured birds from previous seasons at Cabot Head, comprised of six species banded from fall 2015 to spring 2018 (Table 3). Among them, one male Black-and-White Warbler was banded in the fall of 2015 as a hatch-year (HY). This bird was recaptured every spring from 2016 to 2018. One Red-eyed Vireo was recaptured on August 15, the first day of monitoring. This bird has been recaptured every season of every year since its original banding in spring 2016 as an after-second-year. Very few American Redstarts from previous years were recaptured this fall, with three birds from spring 2018 and one from fall 2017.

Most of the recaptured birds were recaptured only once (115 out of 162 individuals, 71%) or twice (20%). Four Black-capped Chickadees and one Common Yellowthroat (all banded during the fall) were recaptured five times or more. One chickadee was recaptured nine times, whereas the three other ones were recaptured 11 times, more than likely local birds. Two of the recaptured chickadees were banded on August 16, captured at the same time in the same net, and were recaptured nine and 11 times, with five times on the same day, albeit not at the same time nor in the same net.

Within-season recapture rates are variable between species but relatively small (Table 3). For species with significant numbers banded (50 individuals or more), recapture rate in fall 2018 were very low: 4% for Ruby-crowned Kinglets and White-throated Sparrows, 5% for Golden-crowned Kinglets, and 6% for Black-capped Chickadees. But it reaches 16% for Red-eyed Vireos and Red-breasted Nuthatches and 23% for Myrtle Warblers.

For species with ten to 50 banded birds, a few species have high rates of recapture: 51% for Common Yellowthroat (from a total of 34 birds banded during the fall) and 28% of the 18 Ovenbirds banded this fall. These two species forage mostly on the ground or low in the vegetation, which could increase the likelihood of capture. Catharus Thrushes present very different rate of recaptures this fall: 8% of Gray-cheeked Thrushes were recaptured, while 17% of Swainson's and 29% of Hermit Thrushes were recaptured.

Despite being captured in high numbers, only 3 to 11% of Golden-crowned Kinglets are ever recaptured during the season, indicating a quick movement through Cabot Head. Nonetheless, this fall, three Golden-crowned Kinglets were recaptured more than once: one bird banded on October 1 was recaptured twice, with the last time on October 13. Another one, banded on October 5, was recaptured three times, on October 7, 10, and 13. And, finally, a bird banded on October 11 was recaptured on October 13 and 16.

American Redstarts, on the other hand, are usually recaptured in greater proportion and tend to stay longer at Cabot Head. However, this fall, only 8% of newly banded birds were recaptured at least once. Furthermore, most of the recaptured birds were Hatch-Year, with only two adults out of seven redstarts recaptured, about the same proportion of the banded sample: 82% HY in 83 banded American Redstarts and 78% in recaptured birds. Contrary to last year, when all eight recaptured adult American Redstarts were banded before August 25, the two recaptured adult birds this fall were banded in September, a possible indication of a low local population and/or local breeding success this year.

Table 3. Total recaptures by species in relation with year and season of banding (only one recapture per individual is included) at CHRS, fall 2018.

Species	2015	2016	2017	2018		%
	fall	spring	fall	spring	fall	
Yellow-bellied Sapsucker					1	50%
Downy Woodpecker			1		4	25%
Hairy Woodpecker					1	33%
Yellow-Shafted Flicker					1	33%
Blue-headed Vireo					1	8%
Red-eyed Vireo		1			10	16%
Black-capped Chickadee					8	6%
Red-breasted Nuthatch					19	16%
Brown Creeper					4	12%
Carolina Wren					1	100%
Golden-crowned Kinglet					12	5%
Ruby-crowned Kinglet					3	4%
Gray-cheeked Thrush					1	8%
Swainson's Thrush					7	17%
Hermit Thrush					6	29%
Orange-crowned Warbler					1	6%
Nashville Warbler					4	12%
Cape May Warbler					2	29%
Myrtle Warbler					15	23%
Black-throated Green Warbler				2	4	8%
Bay-breasted Warbler					3	20%
Black and White Warbler	1					
American Redstart			1	3	7	8%
Ovenbird					5	28%
Mourning Warbler					2	50%
Common Yellowthroat					14	41%
Wilson's Warbler					2	22%
Canada Warbler				1		
Song Sparrow					1	14%
White-throated Sparrow					2	4%
White-crowned Sparrow					1	6%
Slate-coloured Junco					10	13%
Total	1	1	2	6	152	

%. Proportion of birds banded in fall 2018 recaptured.

4.3 Net Analysis

Mist net locations at Cabot Head have been permanently set in place in 2002 to ensure standardized capture data. This fall, all nets were open for an average of 62 to 66% of the potential time, except for C13, which was open only 48% of the time. This net is the most exposed of all, being closer to the Georgian Bay shore in an open area; it is thus relatively often affected by winds, especially northeast to northwest.

As usual, there was a significant amount of variation in capture rates for each net: captures were localized in a few very productive nets, as in previous seasons (Fig.21). Location, and thus difference in habitats, can explain variation in capture rates. However, differences in species behaviour may also account for variation. The five nets with the highest capture rate (in decreasing order, A1, C15, C14, B9, and B8) accounted for 54% of the total capture during 34% of the realized mist net hours. The least productive nets (in decreasing order, B6, A4, B7, C12, and C13) accounted for only 15% of the total capture during basically the same amount of time (33%).

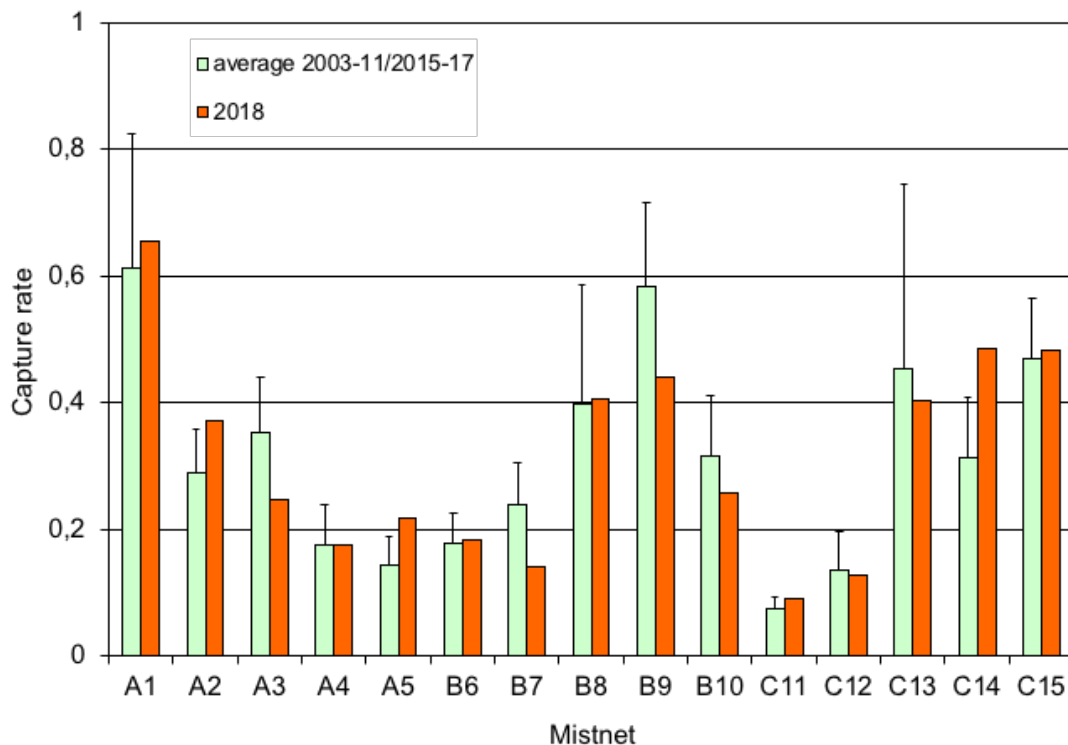


Figure 21. Capture rates per mist net for average 2003-2011/2015 and for 2018 at CHRS (data not available for 2002, 2012, 2013, & 2014).

5.0 Coverage and Protocol

This fall, 37% of the possible mist netting coverage (in hours) was lost due to weather, as high wind and precipitation were significant factors in determining daily net opening and closure (Fig.22). Due to the density of habitat at Cabot Head, at least a portion of the nets can usually be operated on windy days. Coverage was very low this fall as there was no banding in 22 days (out of 78 days, i.e. 28%), the highest number ever in the 17-year period. The daily average for days with banding was a relatively high 78 mist net hours (out of a potential of 90). A census was carried out every day, except during heavy rain.

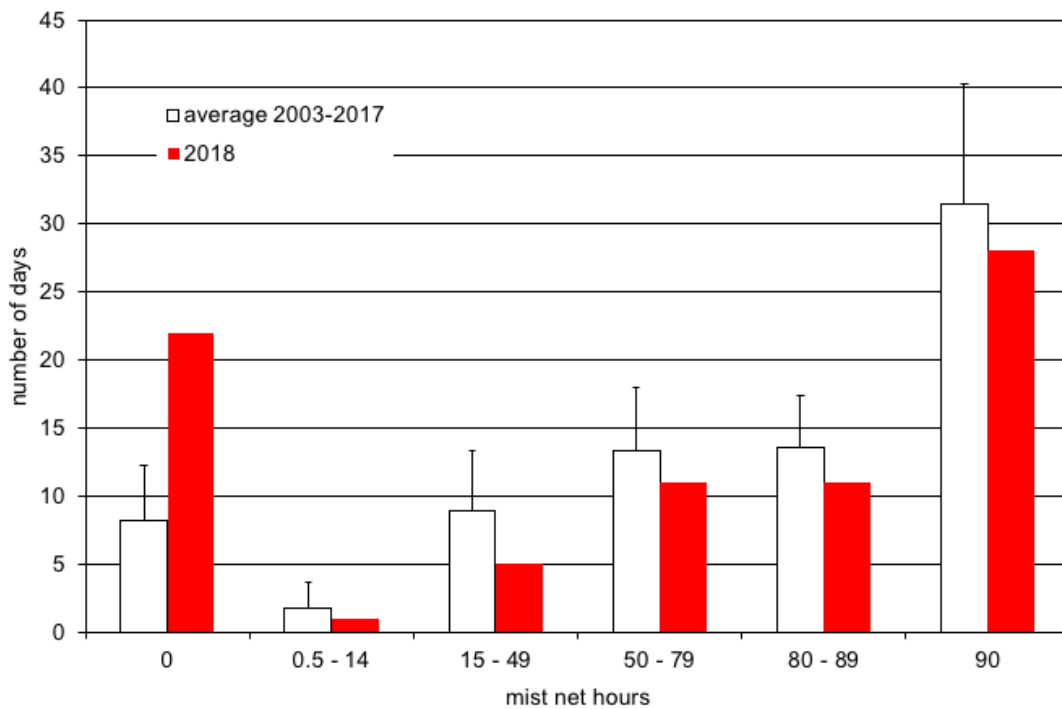


Figure 22. Coverage in mist net hour at CHRS (data not available for 2002), fall 2018.

6.0 Personnel

Seven volunteers contributed a total of 131 person-days to the fall migration monitoring season (Table 4). This fall, we welcomed Yibing Yu, BPBO first volunteer from China. The other volunteers hailed from Ontario, Québec, Massachusetts, and Maryland. Volunteers are an essential part of the success of the operations at Cabot Head and all help is appreciated.

Table 4. Volunteer effort, fall 2018.

20+ Days	10 - 20 Days	3 - 9 Days
Yibing Yu (China)	Sam Moore (MA)	Al Woodhouse (ON)
Ryan Ribeson (Maryland)		Erik Van Den Kieboom (ON)
Valérie Tchang (QC)		Tania Havelka (ON)

7.0 Conclusion

For a seventeenth consecutive fall, bird migration monitoring at Cabot Head was done daily from August 15 to October 31, thanks notably to a dedicated team of volunteers. The continuing monitoring effort throughout the years continually adds detail and refines the picture of bird migration on the Bruce Peninsula.

As always with nature, this fall brought its share of surprises, with one new species, the Black Vulture, detected at the station but, most notably, the very low number of birds banded! The seasonal banding total was the second lowest in 17 falls, with many species having total well below the 2002-2017 average. As in the fall of 2017, an unprecedented numbers of monitoring days were impacted by inclement weather (strong wind and/or rain), negatively influencing the banding and observation. There was an unusual preponderance of strong south and west winds.

In collaboration with Greg Mitchel of Environment and Climate Change Canada, BPBO continued the deployment of nanotags on Swainson's Thrushes and expended it on Gray-cheeked Thrushes.

Continuing migration monitoring at CHRS contributes to the efforts of the CMMN and ultimately to the understanding and monitoring of bird populations.

Acknowledgements

As a non-profit, volunteer-based initiative, BPBO would not be operable without the overwhelming support of its membership, financial supporters and volunteers. BPBO wishes to thank Ontario Parks for their generous on-site management assistance.

The author wishes to thank all the members of Bruce Peninsula Bird Observatory, as well as Ontario Parks for their support during the field season. A special thank is due to Greg Llyod, the new BPBO site manager as he graciously helped me in so many and various ways. I would also like to commend the seven volunteers who helped make the field season efficient and enjoyable.

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Appendix I. Fall banding total 2018 with statistics from 2002-2017

Group	Species	2018	Av. \pm	sdev	Max.	Year	Min.	Year	#
Kingfishers	Belted Kingfisher	1	1,6	0,7	3	2013	1	several years	10
Woodpeckers	Yellow-bellied Sapsucker	2	1,6	0,8	3	2011 - 2014	1	several years	12
	Downy Woodpecker	16	9,6	7,7	31	2009	2	2002	17
	Hairy Woodpecker	3	5,6	3,1	12	2007	2	2005 - 2015	15
	Yellow-Shafted Flicker	3	4,2	2,1	8	2012 - 2016	1	2005	16
	Pileated Woodpecker	1	1,1	0,3	2	2015	1	several years	10
Tyrant Flycatchers	Eastern Wood-pewee	1	1,3	0,6	2	2015	1	2009 - 2013	4
	Yellow-bellied Flycatcher	5	2,7	1,6	7	2014	1	several years	15
	Traill's Flycatcher	5	6,2	3,8	16	2007	1	2011	17
	Least Flycatcher	3	5,1	2,0	9	2013	3	2003 - '09 - '10	16
	Eastern phoebe	1	2,2	1,2	4	2002 - 2008	1		11
Vireos	Blue-headed Vireo	13	6,2	3,7	13	2015	1	2002 - 2007	17
	Philadelphia Vireo	1	2,7	1,7	6	2016	1	several years	13
	Red-eyed Vireo	61	80,5	52,6	239	2005	24	2009	17
Crows & Jays	Blue Jay	1	5,1	3,6	16	2014	1	2007	16
Chickadees	Black-capped Chickadee	137	155,8	180,2	717	2005	11	2015	17
Nuthatches	Red-breasted Nuthatch	118	48,9	41,7	160	2012	10	2015	17
	White-breasted Nuthatch	1	1,3	0,5	2	2007	1	2005 - '15 - '16	5
Creepers	Brown Creeper	33	41,3	18,5	75	2016	19	2009	17
Wrens	Carolina Wren	1	1,0		1	2012			2
	Winter Wren	4	4,7	2,2	8	2007 - '08 - '13	1	2003	16
Kinglets	Golden-crowned Kinglet	236	321,7	169,8	758	2013	113	2005	17
	Ruby-crowned Kinglet	85	59,1	30,9	122	2003	20	2005	17
Thrushes	Veery	2	4,2	2,7	8	2016	1	2010	14
	Gray-cheeked Thrush	12	15,4	9,1	23	2016	6	2010	17
	Swainson's Thrush	42	34,8	20,3	79	2015	10	2006	17
	Hermit Thrush	21	38,9	19,3	87	2011	16	2002	17
	Wood Thrush	1	1,3	0,5	2	2005	1	2006 - '07 - '17	5
	American Robin	3	17,0	8,7	36	2006	1	2007	17
Mockingbirds & Thrashers	Gray Catbird	1	5,4	2,9	17	2002	2	2010 - '14- '16	17
Waxwings	Cedar Waxwing	1	33,7	35,2	117	2005	1	2014	16
Finches	Common Redpoll	1	4,0	2,6	6	2007	1	2010	4
	Pine Siskin	15	27,2	51,8	170	2011	2	2014 - 2016	11
New World Warblers	Tennessee Warbler	6	10,9	12,6	44	2005	2	2009	16
	Orange-crowned Warbler	18	15,4	8,3	28	2014	3	2005	17
	Nashville Warbler	34	34,0	15,8	78	2005	19	2010	17
	Yellow Warbler	1	1,5	0,6	13	2003	1	several years	5
	Chestnut-sided Warbler	1	1,9	1,2	5	2002	1	several years	15
	Magnolia Warbler	11	21,8	5,3	34	2005	16	2012 - 2013	17

New World Warblers	Cape May Warbler	7	3,0	3,3	7	2015	1	several years	13
	Black-thr. Blue Warbler	11	13,3	4,9	22	2002	2	2014	17
	Myrtle Warbler	66	80,4	43,3	204	2005	34	2004	17
	Black-thr. Green Warbler	49	58,6	34,0	120	2002	14	2016	17
	Blackburnian Warbler	1	3,5	2,4	10	2005	1	2012	12
	Palm Warbler	10	7,4	5,7	22	2012	1	2004	17
	Bay-breasted Warbler	15	6,1	5,4	23	2016	1	2009	15
	Blackpoll Warbler	5	12,6	8,2	31	2015	5	2006	17
	Black and White Warbler	9	24,2	7,5	37	2013	12	2006 - 2007	17
	American Redstart	83	98,4	43,9	198	2003	44	2007	17
	Ovenbird	18	18,3	5,4	31	2012	10	2007	17
	Northern Waterthrush	3	6,4	3,7	15	2010	1	2005	17
	Mourning Warbler	4	2,4	1,0	4	2009 - 2012	1	2002	13
	Common Yellowthroat	34	25,3	6,4	39	2010	17	2008	17
	Wilson's Warbler	9	6,8	3,1	12	2009	2	2004	17
	Canada Warbler	6	3,9	2,0	8	2002	1	2004 - 2006	17
New World Sparrows	American Tree Sparrow	4	29,8	26,7	94	2015	11	2002	17
	Chipping Sparrow	1	2,5	1,8	7	2015	1	2003 - '07 - '14	14
	Savannah Sparrow	1	2,6	2,2	8	2007	1	2002 - '14 - '17	11
	Fox Sparrow	1	2,9	1,8	7	2015	1	2003 - '07 - '14	15
	Song Sparrow	7	13,1	5,1	28	2002	7	2015	17
	Lincoln's Sparrow	1	5,9	3,0	13	2010	2	2003	16
	Swamp Sparrow	6	4,3	2,4	11	2003	1	2015	17
	White-throated Sparrow	52	76,9	45,4	199	2005	39	2007	17
	E. White-crowned Sparrow	17	48,7	29,2	126	2007	11	2013	17
	Slate-coloured Junco	79	85,6	26,9	141	2015	47	2002	17
Cardinals & allies	Rose-breasted Grosbeak	1	3,3	2,6	8	2011	1	2002 - '08 - '15	9
	Indigo Bunting	1	2,3	1,9	5	2003 - '04 - '08	1	several years	11
Total of banded birds		1403	1676,1	340,6	2477	2005	1037	2017	17
Number of species banded		67							

Record for fall 2018: highest number highlighted in red; lowest number highlighted in yellow

Black-thr. Blue Warbler: Black-throated Blue Warbler

Black-thr. Green Warbler: Black-throated Green Warbler

E. White-crowned Sparrow: Eastern White-crowned Sparrow

Av. \pm stdev.: Average \pm standard deviation

Max. : Maximum; Min.: Minimum

#: number of fall seasons with banding

Appendix II. Detected Totals of species observed in fall 2018 at Cabot Head Research Station

Group	Species	Season Total	Average	Daily Max.	Daily Min.	Days with obs.	First date	Last date
Ducks, Geese & Swans	Cackling Goose	2		2		1	19 Se.	
	Canada Goose	773	32	210	1	24	15 Au.	29 Oc.
	Wood Duck	1		1		1	16 Se.	
	American Black Duck	2		2		1	6 Oc.	
	Mallard	18	3	12	1	6	31 Au.	7 Oc.
	Green-winged Teal	1		1		1	7 Oc.	
	Ring-necked Duck	7	2	5	1	3	24 Au.	15 Oc.
	White-winged Scoter	32	5	14	1	7	12 Oc.	30 Oc.
	Black Scoter	4		4		1	3 Oc.	
	Long-tailed Duck	68	17	23	7	4	14 Oc.	24 Oc.
	Bufflehead	8	3	6	1	3	18 Oc.	22 Oc.
	Common Goldeneye	15	2	4	1	7	16 Oc.	31 Oc.
	Hooded Merganser	3	1	1	1	3	18 Oc.	22 Oc.
	Common Merganser	97	4	20	1	23	10 Se.	29 Oc.
	Red-breasted Merganser	80	4	14	1	19	22 Se.	24 Oc.
Grouse & Turkeys	Ruffed Grouse	33	2	5	1	16	16 Au.	30 Oc.
Grebes	Horned Grebe	23	3	8	1	8	14 Oc.	30 Oc.
	Red-necked Grebe	40	7	26	1	6	19 Au.	25 Oc.
Pigeons and Doves	Rock Pigeon	5	3	3	2	2	31 Au.	7 Se.
	Mourning Dove	1		1		1	26 Au.	
Cuckoos	Yellow-billed Cuckoo	1		1		1	17 Se.	
Goatsuckers	Eastern Whip-poor-will	2	1	1	1	2	31 Au.	4 Se.
Swifts	Chimney Swift	1		1		1	26 Au.	
Hummingbirds	Ruby-throated Hummingbird	86	3	5	1	32	15 Au.	16 Se.
Cranes	Sandhill Crane	7	1	2	1	5	16 Au.	23 Se.
Plovers	American Golden-Plover	2	1	1	1	2	18 Se.	26 Se.
Sandpipers & Phalaropes	Greater Yellowlegs	8	1	1	1	8	16 Au.	1 Oc.
	Lesser Yellowlegs	2		2		1	31 Au.	
	Solitary Sandpiper	1		1		1	24 Au.	
	Spotted Sandpiper	3	2	2	1	2	15 Au.	22 Au.
	Sanderling	1		1		1	26 Se.	
	American Woodcock	1		1		1	15 Au.	
Gulls & Terns	Bonaparte's Gull	4	1	2	0	3	16 Oc.	22 Oc.
	Ring-billed Gull	347	6	55	1	60	15 Au.	30 Oc.
	Herring Gull	120	2	18	1	49	15 Au.	30 Oc.
	Great Black-backed Gull	1		1		1	22 Oc.	

Group	Species	Season Total	Average	Daily Max.	Daily Min.	Days with obs.	First date	Last date
Gulls & Terns	Caspian Tern	2	1	1	1	2	29 Au.	30 Au.
Loons	Red-throated Loon	1				1	15 Oc.	
	Common Loon	141	3	15	1	47	16 Au.	30 Oc.
Cormorants	Double-crested Cormorant	551	14	37	1	39	15 Au.	16 Oc.
Hérons & Bitterns	Great Blue Heron	38	2	12	1	20	16 Au.	7 Oc.
	Great Egret	1		1		1	27 Au.	
	Green Heron	5	2	2	1	3	19 Au.	22 Au.
Vultures	Black Vulture	2	1	1	1	2	19 Au.	23 Au.
	Turkey Vulture	68	4	12	1	17	19 Au.	19 Se.
Osprey	Osprey	1	1	1	0	2	29 Au.	18 Oc.
Hawks, Kites & Eagles	Bald Eagle	106	2	5	0	56	15 Au.	31 Oc.
	Northern Harrier	9	1	2	1	7	23 Au.	17 Oc.
	Sharp-shinned Hawk	21	2	4	1	12	23 Au.	19 Oc.
	Northern Goshawk	3	1	1	1	3	30 Au.	23 Se.
	Broad-winged Hawk	4	1	1	1	4	3 Se.	8 Se.
	Red-tailed Hawk	17	2	4	1	10	16 Au.	15 Se.
Kingfishers	Belted Kingfisher	46	1	2	1	35	15 Au.	23 Oc.
Woodpeckers	Red-headed Woodpecker	0		0		1	28 Se.	
	Red-bellied Woodpecker	1		1		1	23 Oc.	
	Yellow-bellied Sapsucker	5	1	1	1	5	5 Se.	25 Oc.
	Downy Woodpecker	77	3	8	1	30	19 Au.	30 Oc.
	Hairy Woodpecker	27	1	2	1	21	19 Au.	30 Oc.
	Northern Flicker	93	2	11	1	46	15 Au.	27 Oc.
	Pileated Woodpecker	14	1	2	1	12	24 Au.	22 Oc.
Falcons	American Kestrel	1		1		1	29 Se.	
	Merlin	24	1	2	1	21	20 Au.	25 Oc.
	Peregrine Falcon	10	2	3	1	6	18 Au.	2 Oc.
Tyrant Flycatchers	Eastern Wood-Pewee	6	1	1	1	6	20 Se.	27 Se.
	Yellow-bellied Flycatcher	5	1	2	1	4	22 Au.	18 Se.
	Trail's Flycatcher	10	1	3	1	7	16 Au.	11 Se.
	Least Flycatcher	6	1	1	1	6	30 Au.	7 Se.
	Eastern Phoebe	6	1	1	1	6	11 Se.	16 Oc.
	Eastern Kingbird	9	1	3	1	7	15 Au.	29 Au.
Vireos	Blue-headed Vireo	20	1	2	1	15	2 Se.	13 Oc.
	Warbling Vireo	3	1	1	1	3	6 Se.	17 Se.
	Philadelphia Vireo	3	1	1	1	3	8 Se.	23 Se.
	Red-eyed Vireo	172	5	21	1	38	15 Au.	3 Oc.
Crows & Jays	Blue Jay	416	11	54	1	39	15 Au.	25 Oc.
	American Crow	143	3	7	1	43	15 Au.	16 Oc.

Group	Species	Season Total	Average	Daily Max.	Daily Min.	Days with obs.	First date	Last date
Crows & Jays	Common Raven	134	3	7	1	48	16 Au.	31 Oc.
Larks	Horned Lark	6	3	5	1	2	9 Oc.	30 Oc.
Chickadees	Black-capped Chickadee	1266	17	87	1	73	15 Au.	31 Oc.
Nuthatches	Red-breasted Nuthatch	723	12	43	1	62	15 Au.	26 Oc.
	White-breasted Nuthatch	4	1	1	1	4	15 Se.	18 Oc.
Creepers	Brown Creeper	49	3	6	1	19	23 Se.	26 Oc.
Wrens	Carolina Wren	4	1	1	1	4	31 Au.	11 Se.
	Winter Wren	11	1	2	1	10	20 Au.	27 Oc.
Kinglets	Golden-crowned Kinglet	773	25	200	1	31	22 Se.	30 Oc.
	Ruby-crowned Kinglet	295	13	150	1	23	29 Se.	25 Oc.
Thrushes	Eastern Bluebird	1		1		1	3 Oc.	
	Veery	2	1	1	1	2	30 Au.	4 Se.
	Gray-cheeked Thrush	13	2	7	1	6	15 Se.	30 Se.
	Swainson's Thrush	58	3	7	1	20	29 Au.	10 Oc.
	Hermit Thrush	38	3	5	1	15	2 Se.	24 Oc.
	Wood Thrush	1		1		1	24 Au.	
	American Robin	21	1	2	1	15	16 Au.	22 Oc.
Mockingbirds & Thrashers	Gray Catbird	2	1	1	1	2	23 Se.	11 Oc.
	Brown Thrasher	1		1		1	4 Se.	
Waxwings	Cedar Waxwing	201	8	29	1	25	15 Au.	27 Se.
Pipits	American Pipit	3	1	1	1	3	26 Se.	22 Oc.
Finches	Purple Finch	37	2	4	1	17	3 Se.	18 Oc.
	White-winged Crossbill	1		1		1	27 Au.	
	Common Redpoll	56	7	16	1	8	24 Oc.	31 Oc.
	Pine Siskin	237	7	42	1	36	19 Au.	30 Oc.
	American Goldfinch	79	3	12	1	30	15 Au.	30 Oc.
	Evening Grosbeak	1		1		1	10 Oc.	
Longspurs & Snow Buntings	Snow Bunting	7	4	4	3	2	21 Oc.	30 Oc.
New World Warblers	Tennessee Warbler	10	2	3	1	6	14 Se.	10 Oc.
	Orange-crowned Warbler	30	2	8	1	13	19 Se.	22 Oc.
	Nashville Warbler	46	2	8	1	20	16 Au.	23 Oc.
	Northern Parula	1		1		1	2 Se.	
	Yellow Warbler	3	1	1	1	3	24 Au.	14 Se.
	Chestnut-sided Warbler	1		1		1	29 Se.	
	Magnolia Warbler	19	1	2	1	15	15 Au.	22 Se.
	Cape May Warbler	13	1	3	1	9	27 Au.	2 Oc.
	Black-throated Blue Warbler	16	1	2	1	13	16 Au.	1 Oc.
	Myrtle Warbler	477	8	25	1	63	15 Au.	30 Oc.

Group	Species	Season Total	Average	Daily Max.	Daily Min.	Days with obs.	First date	Last date
New World Warblers	Black-throat. Green Warbler	214	7	29	1	29	15 Au.	20 Se.
	Blackburnian Warbler	3	1	1	1	3	16 Au.	17 Se.
	Pine Warbler	6	1	2	1	5	31 Au.	22 Se.
	Western Palm Warbler	31	2	7	1	13	10 Se.	17 Oc.
	Bay-breasted Warbler	23	2	4	1	13	23 Au.	23 Se.
	Blackpoll Warbler	5	1	1	1	5	3 Se.	22 Se.
	Black-and-white Warbler	29	2	4	1	18	15 Au.	17 Se.
	American Redstart	317	8	21	1	38	15 Au.	20 Oc.
	Ovenbird	29	2	4	1	18	19 Au.	3 Oc.
	Northern Waterthrush	4	1	1	1	4	3 Se.	15 Se.
	Mourning Warbler	7	1	1	1	7	16 Au.	7 Se.
	Common Yellowthroat	193	5	13	1	42	15 Au.	29 Se.
	Wilson's Warbler	16	1	2	1	12	27 Au.	27 Se.
	Canada Warbler	8	1	3	1	6	16 Au.	29 Au.
New World Sparrows	American Tree Sparrow	9	1	2	1	7	22 Oc.	29 Oc.
	Clay-colored Sparrow	1		1		1	22 Se.	
	Chipping Sparrow	40	2	11	1	17	16 Au.	18 Oc.
	Savannah Sparrow	3	1	1	1	3	29 Se.	13 Oc.
	Fox Sparrow	1		1		1	13 Oc.	
	Song Sparrow	40	1	4	1	27	24 Au.	30 Oc.
	Lincoln's Sparrow	3	1	1	1	3	4 Se.	27 Se.
	Swamp Sparrow	7	1	1	1	7	15 Se.	24 Oc.
	White-throated Sparrow	201	6	49	1	35	24 Au.	30 Oc.
	White-crowned Sparrow	212	8	42	1	27	22 Se.	30 Oc.
	Dark-eyed Junco	262	7	49	1	38	6 Se.	30 Oc.
Cardinals & allies	Rose-breasted Grosbeak	1		1		1	22 Oc.	
	Indigo Bunting	1		1		1	12 Se.	
New World Blackbirds	Rusty Blackbird	4	2	3	1	2	29 Se.	3 Oc.

Average: Daily average for days with observation.

Au.: August; Se.: September; Oc.: October