

Iona Island Bird Observatory
2013 Year-end Report

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Iona Island Bird Observatory is a program under non-profit organization, WildResearch.



The Iona Island Bird Observatory is situated at Iona Regional Park. Use of the park is permitted by Metro Vancouver.



sitka foundation

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	5
1. INTRODUCTION	6
1.1. Avian Monitoring Programs	6
1.1. Iona Island Bird Observatory	6
1.1.1. Report Objectives	8
2. IIBO PROGRAMS	8
2.1. Winter Songbird Monitoring Program	8
2.1.1. Introduction	8
2.1.2. Methods	8
2.1.3. Results	9
2.1.1. Discussion	10
2.2. Migration Monitoring Programs	12
2.2.1.1. Introduction	12
2.2.1.2. Methods	12
2.2.1.3. Results	13
2.2.1.4. Discussion	16
2.2.2. Fall Monitoring	17
2.2.2.1. Introduction	17
2.2.2.2. Methods	17
2.2.3. Results	17
2.2.3.1. Discussion	21
CONCLUSIONS	22
ACKNOWLEDGMENTS	22
REFERENCES	23

FIGURES

Figure 1. The IIBO is situated at Iona Beach Regional Park, which was designated as an Important Bird Area.....	7
Figure 2. The IIBO infrastructure during the Winter Songbird Monitoring Program (WSMP).....	7

Figure 4. Captures per net hour for the 2012/2013 Winter Songbird Monitoring Program (WSMP). Banding occurred between November 10th, 2012 and March 24th, 2013. An overall decline in capture rate was noted through the winter monitoring. 10

Figure 5. The male Golden-crowned Kinglet is one of 23 over-wintering species captured at IIBO during the 2012/2013 Winter Songbird Monitoring Program (WSMP). 11

Figure 6. Captures per net hour for the Spring Migration Monitoring Program (SMMP) 2013. Wilson’s Warblers were the main contributor to the peaks in SMMP, with Orange-crowned Warblers contributing in mid-May, and Yellow Warblers contributing at the end of May. 14

Figure 7. Volunteer, Katy Gibb, holding her first Wilson’s Warbler. During the 2013 Spring Migration Monitoring Program (SMMP), 601 Wilson’s Warblers were captured and banded, amounting to more than 45% of the total captures. 14

Figure 8. Captures per net hour for FMMP 2013 by banding date. Yellow Warblers are the main contributor to the peaks in late August and early September, while Yellow-rumped Warblers account for the majority of captures mid to late September and the final peak is mainly Fox Sparrows. 18

Figure 9. Yellow Warblers were the most commonly banded species during the 2013 Fall Migration Monitoring Program (FMMP), amounting to 515 of 1887 newly banded birds. 20

Figure 10. Girl Guide Units visitor releasing a Song Sparrow during the 2013 Fall Migration Monitoring Program (FMMP). 20

TABLES

Table 1. Top five species banded and recaptured during the Winter Songbird Monitoring Program (WSMP), 2012/2013. 10

Table 2. Top five species banded and recaptured during the 2013 Spring Migration Monitoring Program (SMMP). 15

Table 3. A comparison of the top five species banded by abundance in descending order during the Spring Migration Monitoring Program (SMMP), 2010, 2013. 15

Table 4. Age ratios [Second Year (SY) vs. After Second Year (ASY)] of top five species banded during the 2013 Spring Migration Monitoring Program (SMMP). 15

Table 5. Top five species banded and recaptured during the 2013 Fall Migration Monitoring Program (FMMP). 18

Table 6. Top 5 species captured over during the Fall Migration Monitoring Program (FMMP), 2010-2013. 19

Table 7. Age ratios [Hatch Year (AHY) vs. After Hatch Year (AHY)] of top five species banded during the 2013 Fall Migration Monitoring Program (FMMP). 19

EXECUTIVE SUMMARY

Iona Island Bird Observatory (IIBO) was founded in the spring of 2010, and is one of WildResearch's core programs. WildResearch is a registered non-profit organization, with a mission is to identify and develop solutions to conservation issues using a multi-disciplinary approach. Our primary goals are research and monitoring of wildlife including species at risk, environmental education, and community engagement through training and outreach.

WildResearch's IIBO programs monitor avian populations over three seasons on Iona Beach Regional Park via passive mist-netting: Winter, Spring, and Fall. The Winter Songbird Monitoring Program (WSMP)'s long-term objective is to determine over-winter survival rates and species diversity in the area, and runs from November to March. The two migration monitoring programs, Spring Migration Monitoring Program (SMMP) and Fall Migration Monitoring (FMMP) aim to generate population trends, provide general information about annual and long-term trends in breeding productivity and migratory trends. Local information about site stopover length is also of interest to land manager, Metro Vancouver. In addition, the program offers training opportunities for ornithologists, biologists, students, and the general public.

During the 2013 WSMP, high numbers of residents were caught, the majority of which were Fox Sparrows. Overall declines of both capture and recapture rates were documented over the course of the season as the migration period came to a close. Throughout the WSMP, 23 different species were captured, 235 birds were banded, and 452 birds were recaptured. The average capture rate of previously unbanded birds was 0.18 birds/net hour (0.008 birds/hr/m²), and the recapture rate was 0.40 birds/net hour (0.017 birds/hr/m²)

The 2013 SMMP exhibited high capture rates and exceptional diversity, supporting previous SMMP findings that the Iona Island area is ecologically significant for migrant stop-over. During the SMMP 1367 birds were banded of 47 different species with an overall catch rate of 0.89 birds/net hour, 0.70 previously unbanded birds per net hour (0.029 birds/hr/m²) and 0.19 recaptures per net hour (0.008 birds/hr/m²). Wood Warblers, including Wilson's Warblers, dominated the captures during spring migration. Wilson's Warblers comprised more than 45% of total captures.

The 2013 FMMP was also productive for IIBO. A total of 1887 birds were banded of 42 different species with an overall catch rate of 1.19 birds/net hour, 1.02 previously unbanded birds per net hour (0.043 birds/hr/m²), and 0.17 recaptures per net hour (0.007 birds/hr/m²). For the third consecutive year, the Wood Warbler, Yellow Warbler, was the most frequently captured species amounting to 27% of total captures. The high recapture rates for Yellow Warblers, Warbler's suggest these species may use Iona Beach Regional Park as a primary fall migration route.

Over the course of the year more than 80 volunteers donated close to 3000 hours of their time. We would like to extend our thanks to all those who volunteered at IIBO, the hard work and dedication of so many enthusiastic birders ensured the success of the monitoring station.

WildResearch would also like to acknowledge support from Metro Vancouver, funding from the Sitka Foundation, the Province of British Columbia and the Habitat Conservation Trust Fund's Public Conservation Assistance Fund, and the assistance and dedication of all of our volunteers without whom our research programs would not have been possible.

1. INTRODUCTION

1.1. Avian Monitoring Programs

Cities were historically formed near large bodies of water, estuaries, rich productive land and/or riparian areas. These same physical attributes that allowed a city grow in prosperity also made the area innately biologically important. The residual urban green spaces are now refuges, resource sources, dispersal corridors, wintering habitat and migratory stopovers for avian species that have traditionally relied on the landscape that urban areas now occupy (Ohmart, 1994; Bolger, 2001; Melles and Martin, 2003; Sandstrom et al., 2006). WildResearch believes that wildlife use in these semi-natural habitats is important for supporting wildlife communities, and should be further investigated.

1.1. Iona Island Bird Observatory

The IIBO is located within Iona Beach Regional Park, north of the Vancouver International Airport in Greater Vancouver Regional District of Richmond, BC (Figure 1). Birdlife International and its local partners, Bird Studies Canada and BC Nature, have designated Iona Beach Regional Park as an Important Bird Area (IBA). This urban park is an isolated patch of riparian and meadow habitat that is surrounded by an expanding matrix of residential, commercial and industrial development, and been demonstrated in previous years to act as a stop-over for a variety of passerines. In addition to fitting the criteria for a suitable urban study site, its close proximity to an easily accessible public park also allows for ample opportunity for training and public outreach. The IIBO operations throughout most of 2013 were based out of a small building that was erected in the spring of 2013 (Figure 2).

The IIBO is currently one of 9 bird observatories operating in British Columbia, and is one of two bird observatories operating in the Greater Vancouver Regional District, allowing for the opportunity for comparison at a local and regional scale within British Columbia.



Figure 1. The IIBO is situated at Iona Beach Regional Park, which was designated as an Important Bird Area.

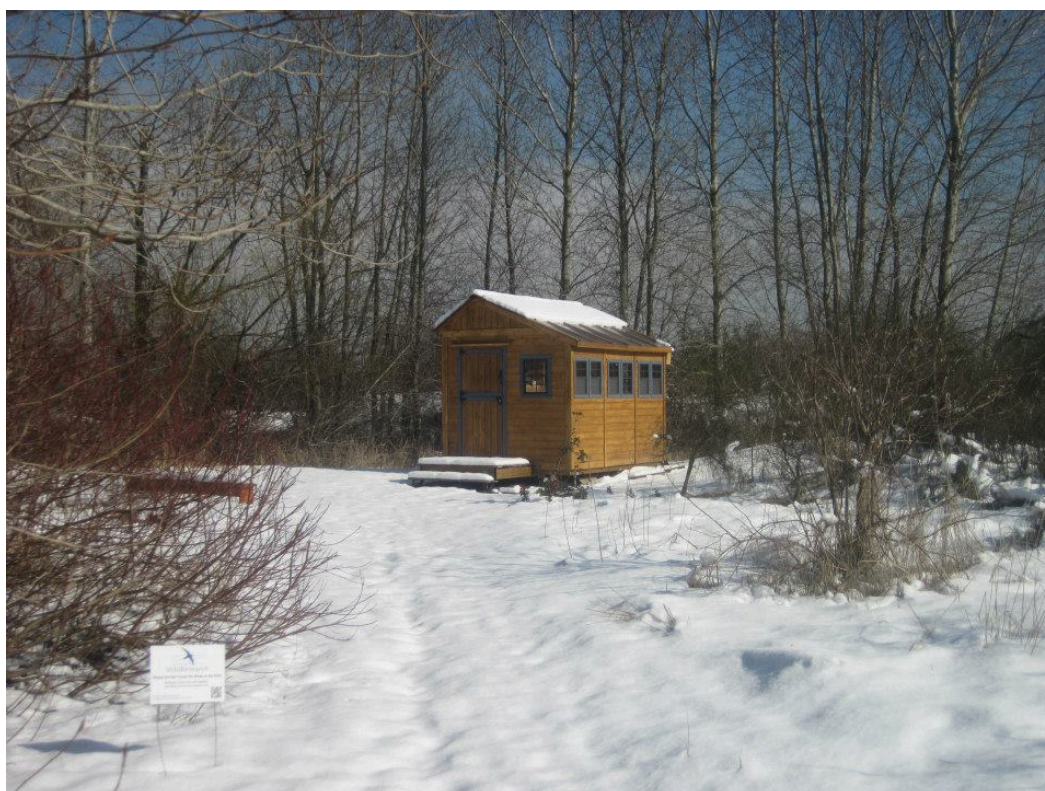


Figure 2. The IIBO infrastructure during the Winter Songbird Monitoring Program (WSMP).

1.1.1. Report Objectives

The 2013 Iona Island Bird Observatory Report summarizes the IIBO program activities in 2013. WildResearch believes that easy access to our yearly activities and results will benefit the scientific community as well as the general public, thus the report will be freely accessible from the WildResearch website. In addition, this report will be distributed to WildResearch members, funders, and land managers that allow WildResearch use of their property.

The 2013 report marks the 4th annual program in IIBO's history. This 2013 report presents the results of the three major programs at IIBO from November 2012 to October 2013. For comparison, the report also discusses data results from previous years.

2. IIBO PROGRAMS

In 2013, WildResearch conducted three monitoring programs at IIBO:

Winter Songbird Monitoring Program (WSMP)

Spring Migration Monitoring Program (SMMP);

Fall Migration Monitoring Program (FMMP).

The main objective of these three programs was to monitor the abundance, diversity, annual productivity, survival and stop-over ecology of birds that use this urban park.

2.1. Winter Songbird Monitoring Program

2.1.1. Introduction

In the late fall of 2010 WildResearch initiated a pilot Winter Songbird Monitoring program. The WSMP was modeled after the Monitoring Avian Winter Survival and MoSI programs run by the Institute for Bird Populations across the southern United States, Central America and the Caribbean (IBP 2011). WildResearch's WSMP was one of few winter monitoring programs utilizing passive mist-netting in Canada. The goal of the WSMP was to provide a better understanding of the ecology of over-wintering songbirds by monitoring their body condition, site persistence, and survival rates at IIBO.

2.1.2. Methods

The WSMP includes constant-effort mist-netting and collection of morphometric and other data (age, sex, wing chord, weight, fat reserves, capture net, time of capture) from each bird captured. IIBO has 14 net lanes that are 12 meters long in pre-determined locations and are located in a cluster at Iona Island Beach Regional Park. Net locations were selected in 2010 and 2011 to represent the diversity of wetland and riparian habitat and plant species compositions found within Iona Regional Park (Bishop and Forrester, 2012). Nets were clustered in a way that allows monitoring of the nets in a timely manner ensuring bird and volunteer safety. The nets were opened half an hour before sunrise and were left open for 6

hours, weather permitting. Nets were closed if weather conditions such as temperature, wind or rain endanger the health or safety of the birds. Nets were checked every 15 to 30 minutes, temperature dependent, the birds are extracted from the nets and brought back to the station for processing. WildResearch aimed to run the WSMP four days per month between November 2012 and March 2013, weather permitting.

In its fourth year, the 2012/2013 WSMP was planned for 20 days between November 10th, 2012 and March 24th, 2013. Rain was a frequent problem resulting in only one banding day in December and the resultant seasonal flooding caused the long-term closure of two nets in the wooded area of IIBO. Despite the weather related issues, annual cumulative mist-netting hours indicate that the effort side of this program will be successful long-term.

2.1.3. Results

In 2013, the WSMP succeeded in running for 17 of the 20 days of the winter season. Over the WSMP, 1295 cumulative mist hours were achieved, 23 different species were captured, a total of 235 new birds were banded, and 452 birds were recaptured. The average new capture rate was 0.18 birds/net hour (0.008 birds/hr/m²), and the recapture rate was 0.40 birds/net hour (0.017 birds/hr/m²) (Figure 3.). At the beginning of the winter monitoring program the new capture rates exceeded recapture rates, however, by the end of the season recapture rates exceeded new capture rates (Figure 3). The most frequently captured species was the Fox Sparrow, amounting to 33% of newly banded birds and 29% of recaptures (Table 1).

In the 2013 WSMP, 13 of the 23 species banded were captured infrequently (n=<5 captures). Golden-crowned Kinglets contributed to more than 23% of recaptures, but only 5% of newly banded birds (Table 1, Figure 5). Despite high numbers of chickadees being recaptured, relatively few individuals were banded (n=4 captures; Table 1).

During the 2012-2013 Winter Songbird Monitoring Program, 32 volunteers accumulated 293 hours over 17 banding days. Of these volunteers, 16 were returning volunteers and 16 were new participants for 2013.

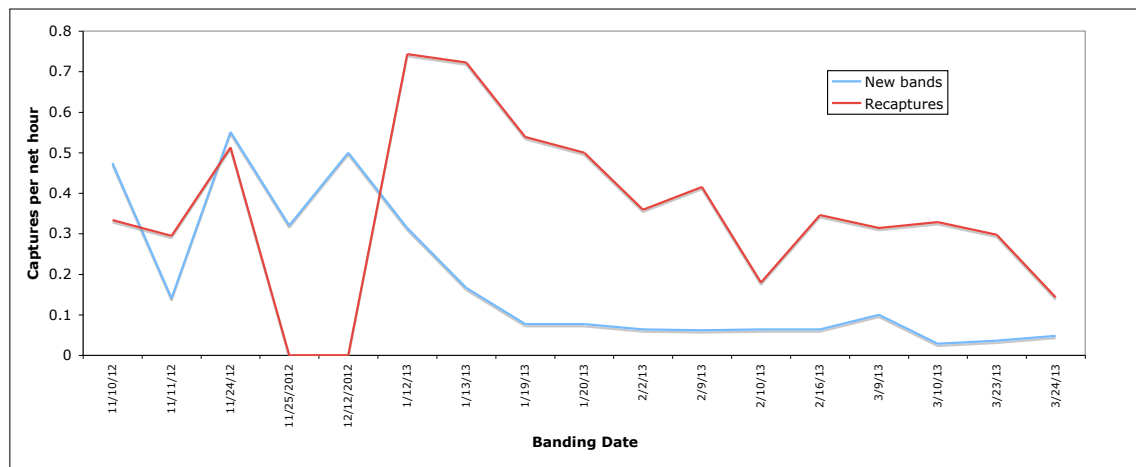


Figure 4. Captures per net hour for the 2012/2013 Winter Songbird Monitoring Program (WSMP). Banding occurred between November 10th, 2012 and March 24th, 2013. An overall decline in capture rate was noted through the winter monitoring.

Table 1. Top five species banded and recaptured during the Winter Songbird Monitoring Program (WSMP), 2012/2013.

Species	Individuals Banded	Species	Number Recaptured
Fox Sparrow	79	Fox Sparrow	131
Song Sparrow	39	Golden-crowned Kinglet	104
House Finch	33	Song Sparrow	86
Golden-crowned Kinglet	18	Black-capped chickadee	38
Ruby-crowned Kinglet	11	Ruby-crowned Kinglet	24

2.1.1. Discussion

The overall capture rate during the 2012/2013 WSMP varied considerably between monitoring dates (0.02 to 0.55), and declined over the course of the winter (Figure 3). The same phenomenon was seen in previous years (Boyd, 2011). This could, in part, be due to the majority of the IBO avian community being banded by mid-program. With little local immigration occurring during winter the new capture rates would be expected to decrease as individuals from the local community are banded. Additionally, a proportion of the banded birds may become familiar with the net locations and chose paths to avoid being recaptured thus decreasing recapture rates. This hypothesis was supported by the increase in recapture rates as the decrease in newly banded birds occurred (Figure 3). Another factor that contributed to the decline in new capture rates included late migrants that were caught in November during the tail-end of their expected migration periods, and not recaptured during the remainder of the winter songbird monitoring program i.e. Barn Swallow and Lincoln Sparrow.



Figure 5. The male Golden-crowned Kinglet is one of 23 over-wintering species captured at IIBO during the 2012/2013 Winter Songbird Monitoring Program (WSMP).

IIBO exhibited a moderate overall capture rate and a high recapture rate in 2013 compared to those reported in previous years at IIBO (Boyd, 2011). Ten species were captured on a regular basis over the last 4 years of monitoring including Black-capped chickadees, Fox Sparrows, Song Sparrows, Golden-crowned Sparrows, Golden-crowned Kinglets, House Finches, Spotted Towhees, Ruby-crowned Kinglets, Pacific Wrens, and Marsh Wrens. This indicates that these songbirds preferentially over-winter at IIBO, and that there is potential for successful population monitoring of winter residents given the continued success of the WSMP.

Throughout the 2013 WSMP, there were few new Black-capped Chickadees banded ($n=4$), despite many recaptures ($n=38$). This is likely a consequence of the same family groups remaining in the area year round. Only 12 individual birds accounted for the 42 captures at the station. This result was similar to results during the 2010 and 2011 WSMP; nine new Black-capped Chickadees were banded in 2010, whereas individuals were recaptured on 51 occasions, and in 2011, eight new individuals were banded, and previously banded individuals were captured on 42 occasions. Golden-crowned Kinglets showed the same trend as Black-capped Chickadees. Despite contributing to 23% to recaptured birds, and 122 captures overall, only 36 individual Golden-crowned Kinglets were actually captured in 2013. This trend is partly due to the individual birds being banded in previous years and returning to Iona Beach Regional Park in 2013, and partly due to the species' high recapture rate. Given these two species' high recapture rates and site fidelity, they would make excellent candidates for future over-winter survival analyses, once sample sizes are sufficient.

With the continued success of the WSMP, over-winter survival analyses can be conducted for species that are frequently captured at IIBO. In 2012, a preliminary overwinter survival analysis was conducted using Fox Sparrow and Spotted Towhee capture and recapture data. These two species held consistently high capture rates in 2013, and in previous years (LeBeau 2012). Results from the analysis suggested that Fox Sparrows and Spotted Towhees using the habitat at Iona Bird Observatory have an average annual survival probability of 64% and 48%, respectively. For these two species, preliminary results suggest that overwinter survival at Iona Regional Park is consistent with studies in other areas (LeBeau 2012). Further analyses are warranted given additional data collected during the 2012/2013 WSMP.

2.2. Migration Monitoring Programs

Many species of migratory birds are not adequately monitored on their breeding or wintering grounds. Migration monitoring offers an opportunity to generate population trends, and can provide information on productivity, migratory trends, and stopover length (Crewe et al. 2008). Stopover length, body condition, and age can also provide information regarding habitat quality for migrant birds (Yong et al. 1998, Crewe et al. 2008). Increases and declines of certain populations can be reliable indicators of the health of not just a particular species, but also of the ecosystems that they utilize (Landres et al., 1998).

2.2.1.1. Introduction

WildResearch initiated the Spring Migration Monitoring Program (SMMP) in 2010 as a pilot project. Now in its fourth year, the goals remain the same: to determine the abundance and diversity of migrants that use the area as a stop-over site, to monitor the arrival dates of spring migrants, and the departure dates of birds that migrate south to overwinter, and to maintain a focus on public education and outreach.

2.2.1.2. Methods

Like the WSMP, the protocol for the SMMP includes constant-effort mist-netting and collection of morphometric and other data from each bird captured. The same net lanes that were used in WSMP were in operation throughout the SMMP and there were no long-term closures of any nets, allowing full use of all 14 nets throughout the program. The nets were opened half an hour before sunrise and were left open for 6 hours, weather permitting. Unlike the WSMP, the SMMP runs daily during fair weather days between mid-April to the end of May. In 2013, 46 days between April and May were scheduled for banding. During the SMMP, feather wear/condition and shape, plumage variation, and eye colouration, are primarily used in aging passerines into two classifications: After-second year (ASY) and Second year (SY). In some cases when these cues were not measurable or distinct enough for classification, individuals were classified as being of unknown age.

In addition to the passive mist-netting, daily point counts were completed at 5 predetermined, permanent locations one hour after sunrise. Each point count ran for 5 minutes and all species that were identified by sight, call, or song were documented. This census covers parts of the survey area where there are no nets and allows identification of

species that are not normally caught in the nets. The daily point counts were completed everyday regardless of whether the nets were opened, and methodology followed standard point count protocol (Martin et al. 1997). Daily estimated totals of birds observed at IIBO were also collected. The daily estimated total (DET) is an estimate of the total number of birds present at IIBO during each day of monitoring. The total is derived from the total number of birds captured, detected during point counts and observed over the course of the monitoring period, and the final tally for each species must not exceed the sum of the categories. All categories of data are integrated to arrive at the best possible estimate of the number of individuals for each species on a given day.

2.2.1.3. Results

The 2013 SMMP ran for 42 of the 46 days scheduled during April and May, resulting in 2695 cumulative nets hours. The remaining four days of the program were lost to inclement weather. Throughout the SMMP, 1877 captures occurred; 510 recaptures and 1367 newly banded birds of 47 different species. Birds were captured at an average of 0.70 new (previously unbanded) birds per net hour (0.029 birds/hr/m²), and 0.19 recaptures per net hour (0.008 birds/hr/m²). Recaptures amounted to 27% of total captures during the SMMP (Figure 6). A daily census performed via timed, fixed-radius, point counts throughout the migration season, detected more than 150 species of birds at IIBO during the SMMP.

Approximately 70% of the birds captured consisted of five species: Wilson's Warblers, Yellow Warblers, Orange-crowned Warblers, Yellow-rumped Warblers and Cedar Waxwings, with Wilson's Warblers amounting to more than 45% of the 1367 birds captured (Table 2). Wilson's Warblers were the main contributors to the high captures per net hour in the SMMP (Max. Capture/net hour=6.22, Figure 6).

The top five most frequent species banded during the 2013 SMMP differed from previous years. Like 2012, warblers dominated the 2013 SMMP program's bird captures, and very few sparrows were captured relative to other years (Table 3).

Age ratios of second-year birds (SY) to After-second year (ASY) birds for the top 5 species captured were between 1:1 and 2:1 (Table 4). However, not all birds banded during SMMP were aged into the SY or ASY categories; approximately 15% of birds were classified as AHY, a category used to indicate an adult bird of unknown age that could not be classified as SY or ASY because of insufficient evidence of their age i.e. plumage coloration or evidence of molt limits.

Over the SMMP, 38 volunteers donated close to 1400 hours of their time ensuring the continued success of the migratory station and gaining practical biological field skills. Many of the volunteers had little to no previous experience banding birds, and were very enthusiastic about holding their first bird in the hand (Figure 7). In keeping with our goal of increasing the public's understanding and appreciation of wild birds, the station provided environmental education to a class of students from BCIT and members of the general public that stopped by IIBO during their walk through Iona Beach Regional Park.

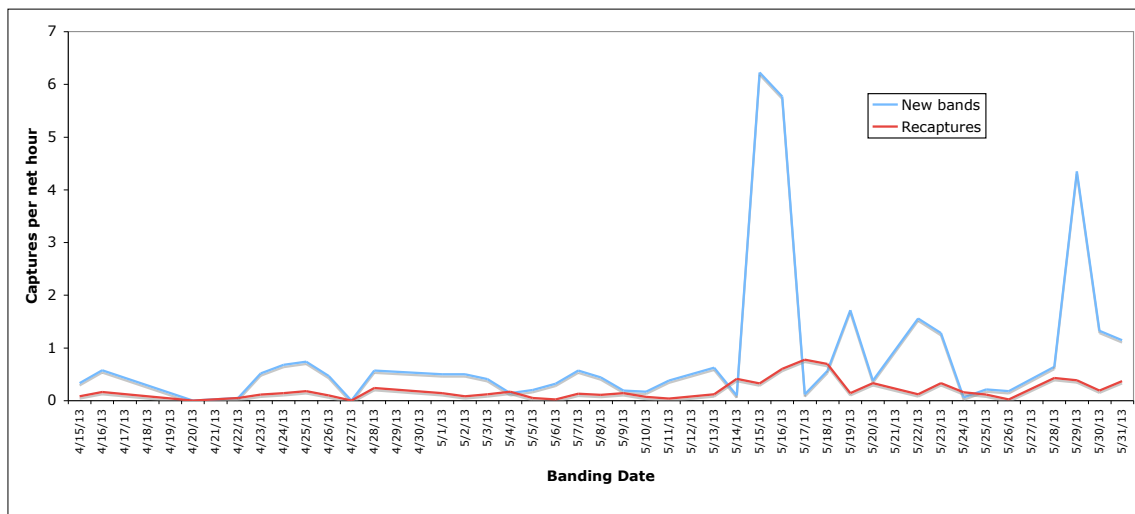


Figure 6. Captures per net hour for the Spring Migration Monitoring Program (SMMP) 2013. Wilson’s Warblers were the main contributor to the peaks in SMMP, with Orange-crowned Warblers contributing in mid-May, and Yellow Warblers contributing at the end of May.

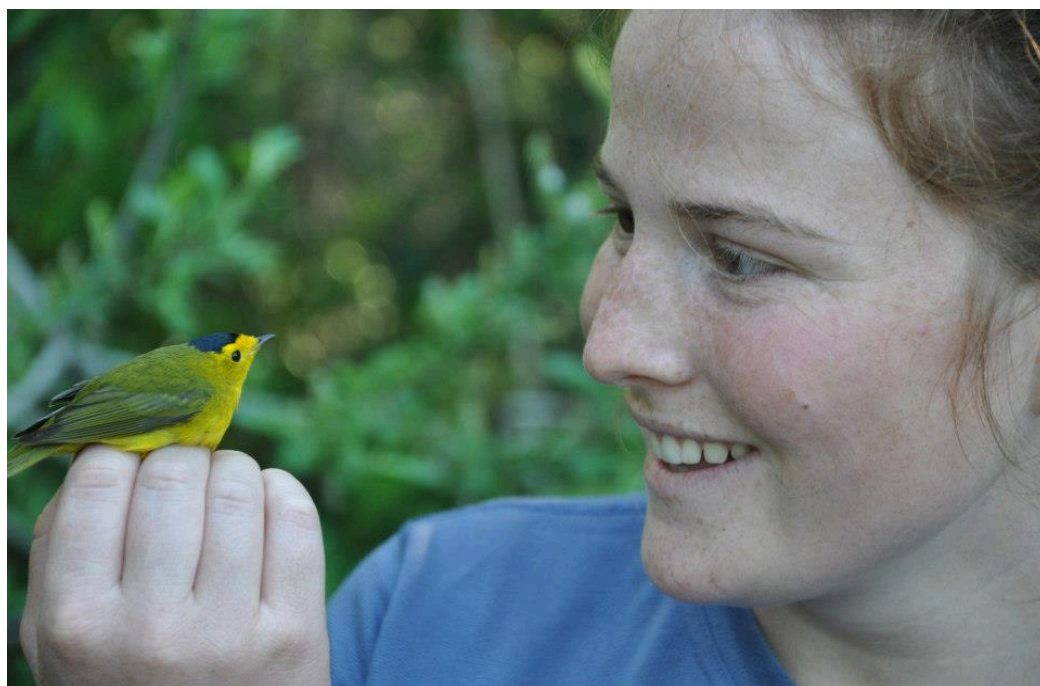


Figure 7. Volunteer, Katy Gibb, holding her first Wilson’s Warbler. During the 2013 Spring Migration Monitoring Program (SMMP), 601 Wilson’s Warblers were captured and banded, amounting to more than 45% of the total captures.

Table 2. Top five species banded and recaptured during the 2013 Spring Migration Monitoring Program (SMMP).

Species	Number Banded	Species	Number Recaptured
Wilson's Warbler	601	Wilson's Warbler	237
Yellow Warbler	125	Marsh Wren	37
Orange-crowned Warbler	109	Song Sparrow	30
Myrtle Warbler	57	Common Yellowthroat	29
Audubon's Warbler	54	Orange-crowned Warbler	27

Table 3. A comparison of the top five species banded by abundance in descending order during the Spring Migration Monitoring Program (SMMP), 2010, 2013.

2010	2011	2012	2013
Wilson's Warbler	Violet-green Swallow	Audubon's Warbler	Wilson's Warbler
Orange-crowned Warbler	Audubon's Warbler	Myrtle Warbler	Yellow Warbler
Ruby-crowned Kinglet	Song Sparrow	Wilson's Warbler	Orange-crowned Warbler
Lincoln's Sparrow	Red-winged Blackbird	Orange-crowned Warbler	Myrtle Warbler
Audubon's Warbler	Tree Swallow	Ruby-crowned Kinglet	Audubon's Warbler

Table 4. Age ratios [Second Year (SY) vs. After Second Year (ASY)] of top five species banded during the 2013 Spring Migration Monitoring Program (SMMP).

Species	Number Aged to SY or ASY	Approximate Ratio (SY:ASY)
Wilson's Warbler	548	2:1
Yellow Warbler	120	1:1
Orange-crowned Warbler	93	2:1
Myrtle Warbler	51	2:1
Audubon's Warbler	47	2:1

2.2.1.4. Discussion

Individual birds need to maximize their breeding success in their northern breeding areas and thus are under pressure to return as early as possible to gain time, acquire the best mate, and the lay stake in the best territories (Francis and Cooke, 1986). There can be a cost associated with arriving too early as birds will not survive on the breeding grounds if they arrive before food becomes available, and early arriving individuals run the risk of an untimely snowfall cutting off food supply or an uncharacteristic cold snap too extreme to survive (Newton, 2007). As our climate continues to change, shifting migratory dates could act as an indicator for how the whole system is changing through time (Hüppop, 2003, Jonzen et al., 2006). For example, the first Yellow warbler of the SMMP was caught on May 14th, May 8th, and April 25th in 2010, 2012 and 2013 respectively. With the continued success of the SMMP, WildResearch will have sufficient long-term data to document migratory date trends.

The top five species banded in the spring migratory program have changed each year since the program began in 2010. Like 2012, warblers dominated the 2013 SMMP program's bird captures, and very few sparrows were captured relative to other years (Table 3). The reason for this annual change remains unknown. Further investigation into the prey availability per year at IIBO is warranted in order to assess whether local food conditions impact site use.

In 2011 it was hypothesized that Fox Sparrows likely migrate in large number through the end of April, explaining why we catch so few during SMMP. This year the station was open from mid-April to the end of May and there were still very few Fox Sparrows caught overall (11 birds, compared to over 150 in Fall Migration). This could indicate that the Fox Sparrows take a different, perhaps more direct route to their breeding grounds in the spring, than they do to their wintering grounds in the fall.

Over time the age classification (ASY vs. SY) data can be used to estimate the relative survivorship of older vs. younger individuals between the periods of fall migration and spring migration, on a per species basis. The birds that could be precisely aged to either second-year (SY) or after-second year (ASY) at IIBO resulted in SY:ASY age ratios of between 1:1 to 2:1 for the top five species captured (Table 4), suggesting that overwinter survival and survival during the spring migration is approximately equal between these two age classes of birds.

Another difference in the 2013 SMMP relative to past SMMP years was the Myrtle to Audubon's ratio for Yellow-rumped Warblers. The Myrtle and Audubon's warblers were captured in nearly equal numbers in 2013 (Table 4), whereas in previous years Audubon's Warblers outnumbered Myrtles (Boyd 2011). This is uncharacteristic of this area (Campbell et al., 2001) and for past years at IIBO. We also saw a much smaller push of Yellow-rumped Warblers in 2013 (n=117) compared to 2012 (n=1445), however weather days when the station remained closed may have overlapped with the push of the Yellow-rumped Warbler movement of 2013.

2.2.2. Fall Monitoring

2.2.2.1. Introduction

The Fall Migration Monitoring program (FMMP) at IIBO was initiated in 2010. Like the SMMP, the FMMP is in its fourth year and the goals remain the same as the SMMP: to determine the abundance and diversity of migrants that use the area as a stop-over, to monitor the arrival dates of fall migrants and the arrival dates of wintering birds, and to maintain a focus on public education and outreach.

2.2.2.2. Methods

Like the SMMP, the protocol for the FMMP includes constant-effort mist-netting and collection of morphometric and other data from each bird captured. The nets were opened half an hour before sunrise and were left open for 6 hours, weather permitting. The same net lanes were used in FMMP that were used in SMMP and WSMP without any long-term closures of nets.

Unlike the SMMP, in their fall migration passerines can be aged into two main age classifications [Hatch year (HY) and After-hatch year (AHY)] by both skull pneumatization and feather shape. Due to the preciseness of these cues for aging very few birds are classified as being of unknown age during the FMMP compared to the SMMP where the cues are less apparent. Contrary to the SMMP, where the station was running every day, the FMMP ran for three days per week in 2013 between late August and late October. Point counts were also omitted in FMMP, as fall migrants tend to be silent and less conspicuous relative to birds migrating north during the spring that are attempting to form pair bonds for the breeding season (Stewart et al., 2002).

2.2.3. Results

The Fall Migration Monitoring Program (FMMP) took place from August 23rd to October 27th, 2013. Banding took place three days per week, resulting in 25 banding days and approximately 1850 net hours. A total of 2206 birds were captured of 42 different species with 1887 newly banded birds and 319 recaptures. During the FMMP, birds were caught at an average of 1.02 new birds per net hour (0.043 birds/hr/m²) and 0.17 recaptures per net hour (0.007 birds/hr/m²). The overall mean catch rate was 1.19 birds/net hour (Figure 8). Recaptures amounted to 14% of total captures in the FMMP.

The top five most frequently banded species in the 2013 FMMP were a mix of warblers and sparrows with the Yellow Warbler being the most frequently captured species in 2013 (Table 5, Figure 9). Warblers and Sparrow were the most commonly captured species throughout the last four years of the FMMP (Table 6). More than 95% of passerines were precisely aged to Hatch-year (HY) and after-hatch-year (AHY) resulting in HY:AHY ratios between 3:1 and 5:1 (Table 7).

During the 2013 FMMP, 47 volunteers donated 1093 hours of their time to help run the IIBO station. WildResearch also hosted a record number of people (82) at IIBO during the Thanksgiving weekend, including BCIT's Conservation Biology class and two Girl Guide Units their parents, and siblings (Figure 10).

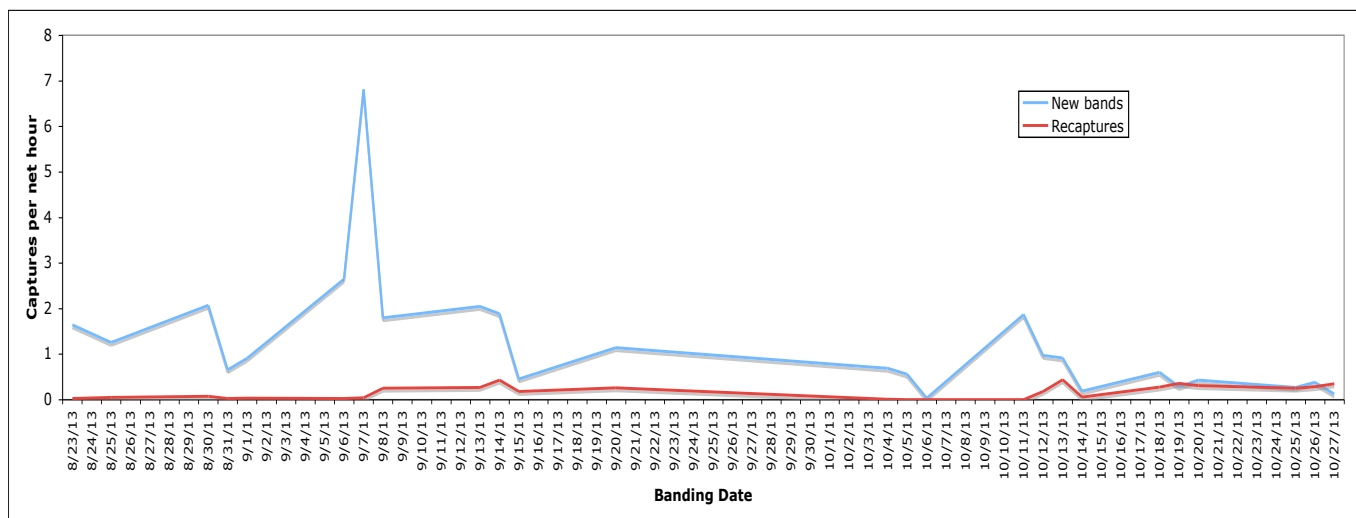


Figure 8. Captures per net hour for FMMP 2013 by banding date. Yellow Warblers are the main contributor to the peaks in late August and early September, while Yellow-rumped Warblers account for the majority of captures mid to late September and the final peak is mainly Fox Sparrows.

Table 5. Top five species banded and recaptured during the 2013 Fall Migration Monitoring Program (FMMP).

Species	Number Banded	Species	Number Recaptured
Yellow Warbler	515	Fox Sparrow	73
Orange-crowned Warbler	189	Yellow Warbler	47
Fox Sparrow	151	Song Sparrow	45
Song Sparrow	127	Ruby-crowned Kinglet	27
Ruby-crowned Kinglet	111	Black-capped chickadee	21

Table 6. Top 5 species captured over during the Fall Migration Monitoring Program (FMMP), 2010-2013.

2010	2011	2012	2013
Yellow Warbler	Fox Sparrow	Yellow Warbler	Yellow Warbler
Orange-crowned Warbler	Song Sparrow	Audubon's Warbler	Orange-crowned Warbler
Common Yellowthroat	Yellow Warbler	Song Sparrow	Fox Sparrow
Lincoln's Sparrow	House Finch	Orange-crowned Warbler	Song Sparrow
Wilson's Warbler	Lincoln's Sparrow	Fox Sparrow	Ruby-crowned Kinglet

Table 7. Age ratios [Hatch Year (AHY) vs. After Hatch Year (AHY)] of top five species banded during the 2013 Fall Migration Monitoring Program (FMMP).

Species	Number Banded	Ratio (HY:AHY)
Yellow Warbler	515	5:1
Orange-crowned Warbler	189	4:1
Fox Sparrow	151	3:1
Song Sparrow	127	4:1
Ruby-crowned Kinglet	111	4:1



Figure 9. Yellow Warblers were the most commonly banded species during the 2013 Fall Migration Monitoring Program (FMMP), amounting to 515 of 1887 newly banded birds.



Figure 10. Girl Guide Units visitor releasing a Song Sparrow during the 2013 Fall Migration Monitoring Program (FMMP).

2.2.3.1. Discussion

During the 2013 FMMP, the top 5 species captured accounted for close to 60% of all captures, with the Yellow Warbler (n=515), accounting for 27% of all birds banded (Table 5). Captures rates of Yellow Warblers were also high in 2010 and 2012 (n=727, n=479, respectively), but not in 2011 when recapture rates of Yellow Warblers were lower (n=130; Table 6). The top 5 species caught during the FMMP in the previous 4 years are not consistent across all years (Table 6). This is partly due to the differences in start and finish dates of the FMMP. For example, in 2010 the FMMP ended in mid-September, thus the migration peaks of the Fox and Song Sparrow were largely missed.

It was suggested in the 2010 IIBO report that IIBO may be located on the principal Yellow Warbler migratory route and that this could provide a valuable research opportunity for future research at the station (Boyd, 2011). The major peak in Yellow Warbler captures occurred over one weekend in 2010, suggesting that continued yearly monitoring over set dates for the FMMP would be required in order to gather accurate trend data. In 2013, the FMMP program ran only on Friday-Sunday of each week, due to limitations in funding. If banding could not be completed over the weekend due to weather the day was missed. Recommendations for future programs include rescheduling banding cancelled banding shifts over a weekday so that data gaps do not potentially miss important migrational movements of individual species. However, scheduling conflicts for Banders-in-Charge and limited volunteer availability upon short notice make this recommendation difficult to accommodate.

The FMMP's mean catch rate of 1.02 previously unbanded birds per net hour was significantly higher than the SMMP's mean catch rate of 0.70 previously unbanded birds per net hour, and is among the highest in Canada (Mackenzie and LeClair, 2014). There were also fewer overall recaptures during fall monitoring than spring monitoring (14% of total captures, compared to 27% of total captures). This could indicate that birds are using the area for a longer period of time in the spring, but it could also due to the period of time and frequency differences of banding dates. WildResearch banded daily over 46 days in the SMMP but only 3 days per week over 66 days in the FMMP, making it possible for the FMMP to have more new captures and fewer recaptures than the SMMP, since individuals are likely to continue to the subsequent migrational stop-over site when weather and wind conditions are favorable (Drake et al. 2014).

Typically, a hatch-year (HY) to after-hatch-year (AHY) ratio of 1:1 to 4:1 is expected during the fall (Ralph, 1971). At IIBO, the HY:AHY ratios for the top five species were consistent or greater than this expected trend, ranging from approximately 3:1 to 5:1 (Table 7). The HY:AHY ratios at IIBO in 2013 were at the higher end of the spectrum and have been in previous years as well. This could be due to the 'coastal effect', where a higher number of young (85-95%) are present at coastal sites than anywhere else along their migration route (Ralph, 1971). This theory is further supported by both the coastal and the Taiga subspecies of Fox Sparrows, Orange-crowned Warblers and Yellow warblers being present at the station.

CONCLUSIONS

Over the last four years WildResearch has accumulated thousands of data points via our passive mist netting at IIBO. WildResearch has also provided training to more than 270 individuals, and held many public demonstrations. Given the continued support from our volunteers, funders, and partners after one more winter season a proper winter survival analysis can be completed for IIBO.

WildResearch has consistently operated IIBO on an annual basis for the last 4 years. In coming years, WildResearch will continue to collect crucial migratory trend data through the migratory projects (SMMP and FMMP). This data takes years to accumulate but will serve as an effective tool for documenting population status and long-term population trends and provide insight to landowners and land use planners about the species and populations using Iona Beach Regional Park throughout their annual cycle. This data will provide information to land managers, and inform how urban parks contribute to regional biodiversity. This trend data is incredibly important in identifying the fluctuations to populations and the effect and timing of limiting factors for these incredible species.

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During the 2012 Spring Migration Monitoring Program, funding was towards installing the banding facilities were provided by the Province of British Columbia and the Habitat Conservation Trust Fund's Public Conservation Assistance Fund. The marked improvement in our banding facilities were enjoyed by the banders-in-charge and volunteers during the 2013 IIBO Programs, especially during cold and rainy days throughout the WSMP. We are pleased to continue use of the building in future years.

Several Banders-in-Charge contributed to the 2013 programs at IIBO. Leena Tirrul, Daniel Froehlich, and Mike Boyd facilitated banding operations by providing training to new volunteers, and facilitated the public outreach experience to those that visited IIBO in 2013.

The Iona Island Bird Observatory is a citizen science run program that could not run efficiently without the help of dedicated volunteers. We thank the many, many, WildResearch members that volunteered at IIBO this year and assisted with banding,

extraction, and data recording, as well as our 2013 volunteer point counters: Peter Candido and Pete Lypkie. We absolutely could not run IIBO without our truly fantastic volunteers, and we admire your enthusiasm and dedication to our program.

WildResearch's IIBO Operations Committee was formed in 2013 to assist overseeing and organizing the maintenance, upkeep and improvement of the Iona Island Bird Observatory. We thank 2012 committee members: Catherine Jardine (Chair), Michael Arbeider (Secretary), Paul Levesque (WildResearch Board Representative), Mike Boyd (WildResearch Board Representative), Alan McKenzie, Christopher DiCorrado, Anna Szeitz, Jeremiah Kennedy, Pablo Jost, Andrew Huang, Ian Thomas, and Jason Currier for their contributions to the Operations Committee. Task completed by the Operations Committee in 2013 included organizing and assisting with IIBO station maintenance and work parties, and completing construction of the new banding facilities. Special thanks to Alan McKenzie for his significant contributions to organizing construction of the banding facilities and fine tuning the inside of the banding hut to maximize banding efficiency. Thanks also to Catherine Jardine for her work on updating and trouble-shooting IIBO banding data management system.

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