

Iona Island Bird Observatory 2014 Annual Report

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Iona Island Bird Observatory (IIBO) is a program run by the non-profit organization, WildResearch.



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



Funding for IIBO in 2014 was provided by the Sitka Foundation, BC Nature, and BC Naturalists' Foundation



Volunteer Scheduling Software for IIBO in 2014 was donated by WhenToHelp



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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, whose mission is to identify and develop solutions to conservation issues using a multi-disciplinary approach. WildResearch's primary goals are research and monitoring of wildlife, environmental education, and community engagement through training and outreach.

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

In 2014, the WSMP monitored large numbers of resident birds. Nearly twice as many previously marked birds were captured ("*recaptured*") compared to newly captured birds. Overall declines of both new capture and recapture rates were recorded over the course of the season as the migration period ended. During the WSMP, 156 birds were monitored for the first time and 297 birds were recaptured. Twenty-one species were observed with a catch rate of 0.21 birds/net/hour for new birds and 0.42 birds/net/hour for recaptures.

In 2014, the 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, 1898 birds were monitored for the first time and 355 birds recaptured. Forty-seven species were observed with a catch rate of 0.829 birds/net/hour for new birds and 0.159 birds/net/hour for recaptures. Wood Warblers, including Wilson's Warblers and Yellow-rumped Warblers dominated the captures during spring migration. The age ratio of second-year to after-second-year birds (SY:ASY) ranged from 1.6:1 to 3.0:1.

In 2014, the FMMP was also productive for IIBO. A total of 1766 birds were monitored for the first time and 395 birds recaptured. Forty-seven species were observed with a catch rate of 1.30 new birds/net/hour and 0.30 recaptures/net/hour. Yellow Warblers were the most commonly caught species, amounting to 36% of total captures, making them the top species for 4 out of 5 years of the FMMP. The high recapture rates for Yellow Warblers, suggests these species use Iona Beach Regional Park as a primary fall migration route. The age ratio of hatch-year to after-hatch-year birds (HY:AHY) ranged from 4.4:1 to 16.2:1.

Avian monitoring at IIBO would not be possible without help from our numerous supporters and volunteers. WildResearch would like to acknowledge support from Metro Vancouver, funding from the Sitka Foundation, BC Nature, and BC Naturalist Foundation. Ninety-two volunteers donated close to 3000 hours of their time to run IIBO in 2014. We extend our sincere 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.

INTRODUCTION

1.1. Avian Monitoring Programs

Cities have historically been formed near large bodies of water, estuaries, rich productive land and/or riparian areas. These same physical attributes that allow a city grow in prosperity also make these areas innately biologically important. The residual urban green spaces now provide refuges, resource sources, dispersal corridors, wintering habitat and migratory stopovers for avian species that traditionally relied on the landscape that urban areas now occupy (Ohmart 1994; Bolger et al. 2001; Melles et al. 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.

1.2. Iona Island Bird Observatory

The Iona Island Bird Observatory (IIBO) is located within Iona Beach Regional Park, north of the Vancouver International Airport in the Greater Vancouver Regional District of Richmond, BC (Figure 1.1). 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. The park has been demonstrated in previous years to act as a stop-over for a variety of passerines (IBA Canada 2015). In addition to fitting the criteria for a suitable urban study site, IIBO's close proximity to an easily accessible public park also allows for ample opportunity for training and public outreach. The IIBO operations throughout 2014 were based out of a small station building that was erected in the spring of 2013 (Figure 1.2).

The IIBO is currently one of nine bird observatories in British Columbia, and is one of two bird observatories operating in the Greater Vancouver Regional District. This allows for the opportunity to compare data at a local and regional scale within British Columbia.

1.2.1. Report Objectives

The Iona Island Bird Observatory 2014 Annual Report summarizes the IIBO program activities in 2014. The 2014 report marks the 5th annual program in IIBO's history. This 2014 report presents the results of the three major programs at IIBO from November 2013 to October 2014. For comparison, the report also discusses data results from previous years.

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.

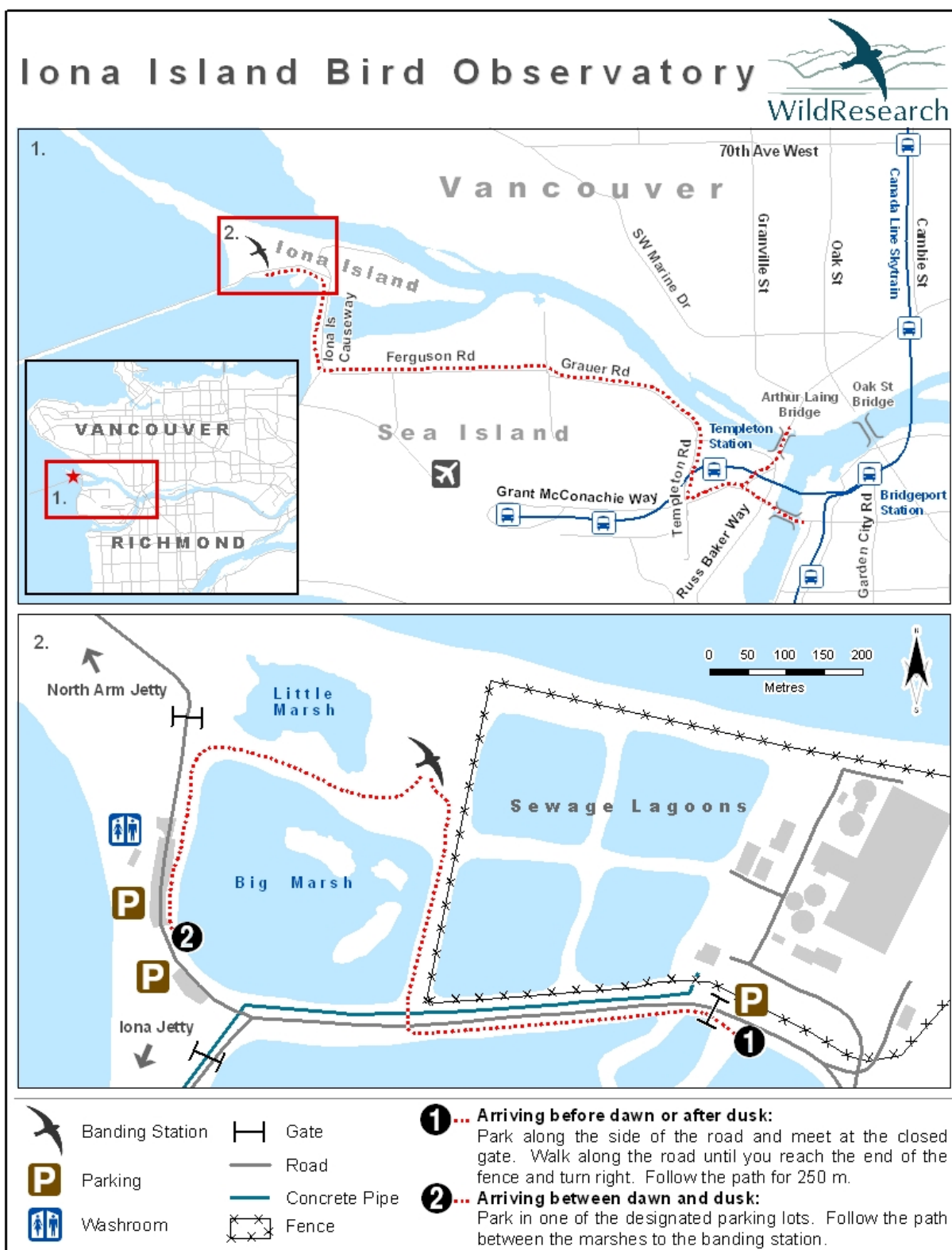


Figure 1.1. The Iona Island Bird Observatory is located at Iona Beach Regional Park in Richmond, British Columbia.



Figure 1.2. The Iona Island Bird Observatory station building being put to full use during the Fall Migration Monitoring Program. Photo credit: Virginia Noble (August 24, 2014).

IIBO PROGRAMS OVERVIEW

In 2014, WildResearch conducted three monitoring programs at IIBO: Winter Songbird Monitoring Program (WSMP), Spring Migration Monitoring Program (SMMP) and 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.

Each program was run using 14 net lanes that are 12 meters long in pre-determined locations in a section of Iona 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; Shariff 2015). 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 endangered the health or safety of the birds. Nets were checked every 15 to 30 minutes, depending on temperature, and the birds were extracted from the nets (Figure 1.3) and brought back to the station for processing.



Figure 1.3. A new trainee watches as a bird is safely removed from a mist-net by an experienced Bander-in-Charge. Photo credit: Paul Leveque (April 30, 2014).

NON-MIGRATORY MONITORING PROGRAM

2.1 Winter Songbird Monitoring Program

2.1.1 Introduction

In the late fall of 2010, WildResearch initiated a pilot WSMP. 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 Iona Beach Regional Park.

2.1.2 Methods

The WSMP included 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.

WildResearch aimed to run the WSMP four days per month between November 2013 and March 2014, weather permitting. Of the 16 planned days, 11 days allowed for monitoring birds with mist-nets. Rain was a frequent problem, resulting in no banding days in December and multiple other days cancelled in other months. Seasonal flooding also caused the long-term closure of two nets in the wooded area of IIBO later in the season.

2.1.3 Results

A total of 453 birds of 21 species were monitored during the WSMP over a cumulative 720 mist net hours at 0.63 birds/net/hour. There were 156 new birds caught at an average rate of 0.21 birds/net/hour, and 297 recapture birds caught at an average rate of 0.42 birds/net/hour. Throughout the season, recapture rates of birds previously caught were higher relative to new birds captured. Overall, the number of species caught per day decreased as the season progressed.

The top five most commonly monitored species; House Finch, Fox Sparrow, Ruby-crowned Kinglet, Spotted Towhee, and Song Sparrow, accounted for 76.91% of all new individuals monitored (Table 2.1), the remaining 14 species never contributed more than 5% per species. The top five most commonly monitored species that had been captured and banded prior (recaptures); Fox Sparrow, Song Sparrow, Spotted Towhee, Black-capped Chickadee, and Golden-crowned Kinglet (Table 2.1), accounted for 83.83% of captures. The sixth most commonly monitored recaptured bird was the Ruby-crowned Kinglet, which were recaptured 24 times (8.08%). The remaining 7 species recaptured were caught less than 4% of the time. A rare capture, the Northern Saw-whet Owl, was observed on one occasion (Figure 2.1). Saw-whet Owls are nocturnal, making them a rare capture for IIBO.



Figure 2.1. Northern Saw-whet Owl (*Aegolius acadicus*) captured during the Winter Monitoring Program. Photo credit: Kim Dohms (Nov 1, 2013).

The House Finch accounted for the highest number of new captures (49 total, 31.4% of new birds), with the majority of them captured at the end of November (Figure 2.2). Fox Sparrows were the next most common new capture (33 total, 21.2% of new birds) and the most common bird recaptured (98 total, 33% of recaptures) (Figure 2.3). The number of birds caught in mist-nets and re-caught during monitoring declined as the season progressed.

During the 2013-2014 Winter Songbird Monitoring Program, 29 volunteers accumulated 409 volunteer hours over 11 banding days. Of these volunteers, 16 were returning volunteers and 13 were new participants.

Table 2.1. Top five species monitored and recaptured during the Winter Songbird Monitoring Program 2013/2014.

Species	Number Monitored for the First Time	Species	Number Recaptured
House Finch	49	Fox Sparrow	98
Fox Sparrow	33	Song Sparrow	48
Ruby-crowned Kinglet	13	Spotted Towhee	38
Spotted Towhee	13	Black-capped Chickadee	36
Song Sparrow	12	Golden-crowned Kinglet	29

2.1.1 Discussion

The decline in the number of birds monitored and the rate of capture is consistent with prior IIBO WSMPs (Boyd 2011; Tirrul 2014). Tirrul (2014) attributed this phenomenon to the possibility that because the majority of the local avian community has been caught at least once by mid-season, and afterwards birds may become familiar with nets later in the season and avoid them.

The Winter Songbird Monitoring Program capture rates for 2013-2014 were comparable to prior seasons, which ranged between 0.18-0.26 birds/net/hour for new birds and 0.40-0.47 birds/net/hour for recaptures in previous years (Boyd 2011; Tirrul 2014). The top five new captures and recaptures were also the same species as in the 2010-2011 season (Boyd 2011), of which many also overlap with the 2012-2013 season (Tirrul 2014): Fox Sparrow, Song Sparrow, House Finch, Black-capped Chickadee, Spotted Towhee, Ruby-crowned Kinglet, and Golden-crowned Kinglet. These species are known winter residents and their sustained high capture and recapture rates ensure the success of the WSMP in determining over-winter survival estimates.

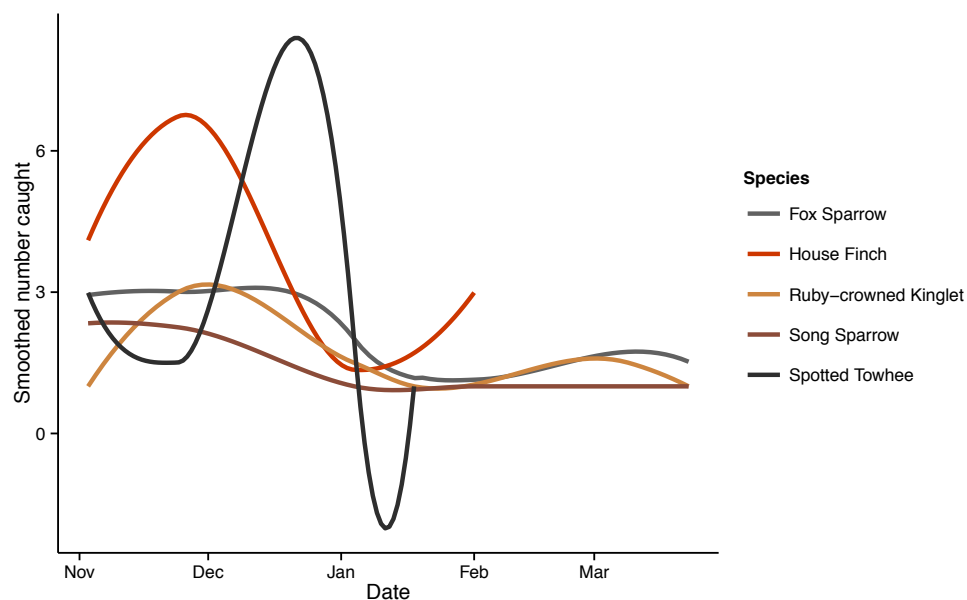


Figure 2.2. General trends in the number of birds caught over the Winter Songbird Monitoring Program, separated by the top five species of birds monitored for the first time. Peaks in curves denote when they were captured in greatest numbers. Note: Lines were fit with local polynomial regression and do not represent the actual number of birds caught each day.

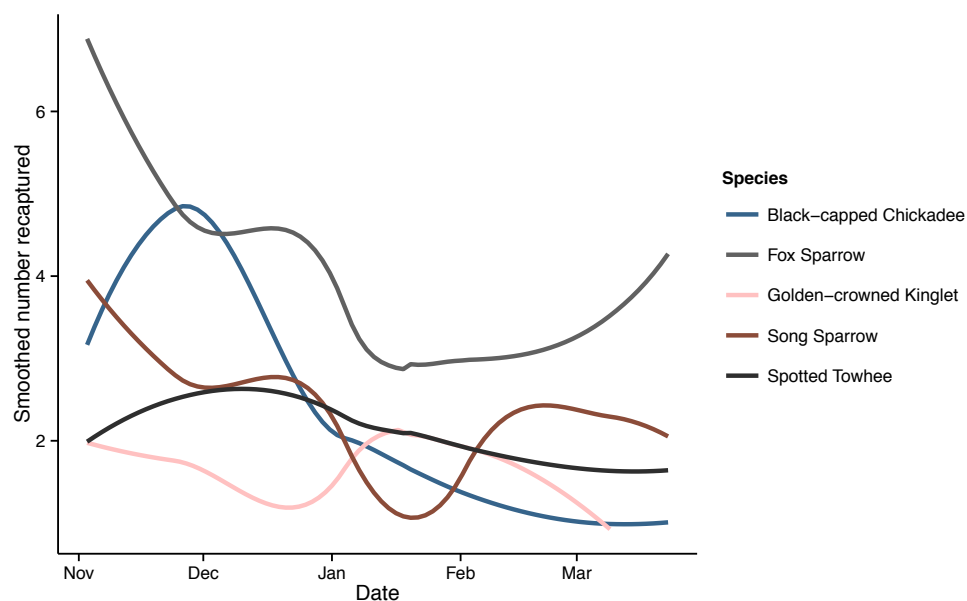


Figure 2.3. General trends in the number of birds caught over the Winter Songbird Monitoring Program, separated by the top five species recaptured. Peaks in curves denote when they were captured in greatest numbers. Note: Lines were fit with local polynomial regression and do not represent the actual number of birds caught each day.

In 2013, a preliminary mark-recapture survival analysis was conducted to assess annual survival rates of two commonly captured species, the Fox Sparrow and the Spotted Towhee (LeBeau 2013). LeBeau (2013) found that Fox Sparrows had an average annual apparent survival of 64 % (± 30.0 SE), which was relatively high compared to a study conducted in California that estimated a survival rate of 35.2 % (Sandercock and Jaramillo 2002). LeBeau suggested this difference might be because Iona Beach Regional Park has higher quality habitat or acts as a refuge for Fox Sparrows. Additional years of WSMP data and vegetation survey data can increase the accuracy of survival estimates and the strength of this hypothesis.

During the 2014 WSMP, two species were recaptured on several occasions, the Fox Sparrow and the Black-capped Chickadees. The 98 recaptured Fox Sparrows in the 2014 WSMP were comprised of 74 individuals that were monitored on multiple occasions. Of these 74 individuals, one was monitored on five occasions over the winter, three were monitored on three different occasions, 14 were monitored twice and 56 were monitored on one occasion. Of the 36 recaptured Black-capped Chickadees during the 2014 WSMP, two were monitored on five occasions, 10 monitored on two occasions and six monitored on only one occasion. This suggest that there are birds whose over-wintering sites are directly overlapping with IIBO, and many more whose over-wintering sites span close enough to IIBO that they are recaptured most winters.

MIGRATION MONITORING PROGRAMS

Many species of migratory birds are not adequately monitored on their breeding or wintering grounds due to time and cost limitations. 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 in 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. 1988).

2.2 Spring Migration Monitoring Program

2.2.1 Introduction

WildResearch initiated the Spring Migration Monitoring Program (SMMP) in 2010 as a pilot project. Now in its fifth 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.

2.2.2 Methods

Like the WSMP, the protocol for the SMMP included constant-effort mist-netting and collection of morphometric and other data from each bird captured. In 2014, there were no long-term closures of any nets, allowing for full use of all 14 nets throughout the program.

Unlike the WSMP, the SMMP ran daily during fair weather days between mid-April to the end of May.

In 2014, 47 days between April 15 and May 31 were scheduled for monitoring, of which 35 days allowed for the use of mist-nets. During the SMMP, feather wear/condition and shape, plumage variation, and eye colouration, were primarily used to categorize passerines into two age 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.

2.2.3 Results

A total of 2253 birds of 47 species were monitored during the SMMP over a cumulative 2178 mist net hours at 0.99 birds/net/hour. There were 1898 new birds caught at an average rate of 0.83 birds/net/hour and there were 355 recapture birds caught at an average rate of 0.16 birds/net/hour. Overall, the number of new birds caught per day decreased as the season progressed, but temporally spaced peaks in capture rate were explained by the differences in species migration timing (Figure 2.3). Recaptured birds amounted to 15.8% of total captures.

Approximately 67% of the birds monitored for the first time consisted of five species: Wilson's Warblers, Audubon's and Myrtle Yellow-rumped Warblers, Orange-crowned Warblers, Ruby-crowned Kinglets, and Yellow Warblers (Table 2.2). On April 26th, 45 Yellow-rumped Warblers of the Myrtle subspecies were monitored, which is the highest number of any single species monitored in a single day at IIBO. This number does not include birds that were caught but released before they were marked and measured, as the volume of birds on this day was too great to monitor every individual in an ethical way.

The top five most common species/sub-species monitored during the 2014 SMMP differed from previous years (Table 2.3). Like the prior two years, warblers were the most common species caught in 2014, but very few sparrows were caught relative to 2010 and 2011. Audubon's Yellow-rumped Warblers are the only species to make the top 5 in every year, whereas, Wilson's Warblers have been the most commonly monitored species three of the five years.

Age ratios of SY to ASY birds for the top five species captured were between 1.6:1 and 3.0:1 (Table 2.4). However, not all birds banded during SMMP were aged into the SY or ASY categories; approximately 13% of birds were classified as AHY or Unknown.

Iona Island Bird Observatory was also fortunate to capture three Barn Swallows in the spring of 2014, one female on April 20th and two males on May 5th (Figure 2.4). Barn Swallows are Blue-listed in British Columbia, and were designated as Threatened by the Committee on the Status of Endangered Wildlife in Canada in 2011 (COSEWIC 2011), but are not on the Species at Risk Act Schedule 1 at the federal level. They are one of the many aerial insectivores that are in decline (North American Bird Conservation Initiative Canada 2012). Barn swallows, in particular, have been reduced to a quarter of their abundance as measured in 1970, likely due to a combination of habitat loss, pesticide use, reduction of prey items, and climate change (North American Bird Conservation Initiative Canada 2012).

Other interesting species not often captured at IIBO included Bullock's Oriole, House Wren, Western Tanager, Downy Woodpecker, Calliope Hummingbird, and Black-throated Grey Warbler (Figure 2.5).

Over the course of the SMMP, 49 volunteers contributed 1,307 volunteer-hours to the Iona Island Bird Observatory monitoring program. Training provided by experienced project coordinators resulted in many beginner volunteers rising to intermediate and advanced training levels, ensuring the continued success of the migratory station and allowing volunteers to gain 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 2.6). 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 British Columbia Institute of Technology (BCIT), a Girl Guide unit, a Vancouver Young Naturalist Club, Nature Vancouver, Delta Naturalists, and members of the general public that stopped by IIBO during their walk through Iona Beach Regional Park.

Table 2.2. Top five species monitored and recaptured during the 2014 Spring Migration Monitoring Program.

Species	Number Monitored for the First Time	Species	Number Recaptured
Wilson's Warbler	318	Wilson's Warbler	51
Audubon's Warbler	311	Song Sparrow	34
Myrtle Warbler	235	Common Yellowthroat	32
Orange-crowned Warbler	224	Ruby-crowned Kinglet	31
Ruby-crowned Kinglet	96	Orange-crowned Warbler	29

Table 2.3. A comparison of the top five species monitored during the Spring Migration Monitoring Program, 2010-2014, by abundance in descending order.

2010	2011	2012	2013	2014
Wilson's Warbler	Violet-green Swallow	Audubon's Warbler	Wilson's Warbler	Wilson's Warbler
Orange-crowned Warbler	Audubon's Warbler	Myrtle Warbler	Yellow Warbler	Audubon's Warbler
Ruby-crowned Kinglet	Song Sparrow	Wilson's Warbler	Orange-crowned Warbler	Myrtle Warbler
Lincoln's Sparrow	Red-winged Blackbird	Orange-crowned Warbler	Myrtle Warbler	Orange-crowned Warbler

Audubon's Warbler	Tree Swallow	Ruby-crowned Kinglet	Audubon's Warbler	Ruby-crowned Kinglet
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Table 2.4. Age ratios Second Year (SY) vs. After Second Year (ASY)] of top five species monitored during the 2014 Spring Migration Monitoring Program.

Species	Number Aged to SY or ASY	Approximate Ratio (SY:ASY)
Wilson's Warbler	290	3.0:1
Audubon's Warbler	273	1.6:1
Myrtle Warbler	192	2.0:1
Orange-crowned Warbler	193	1.6:1
Ruby-crowned Kinglet	83	1.7:1

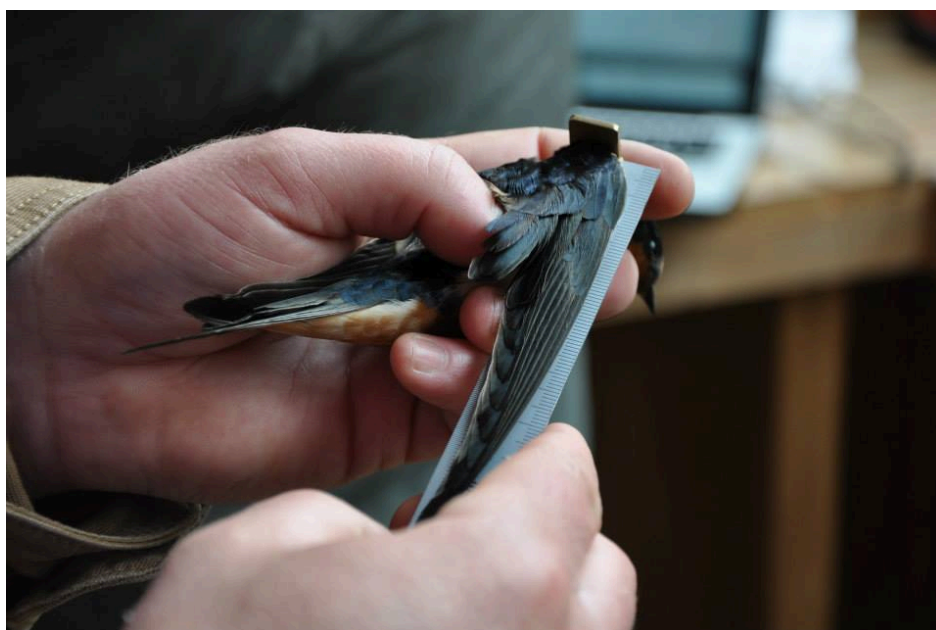


Figure 2.4. Barn Swallow (*Hirundo rustica*) processed at Iona Island Bird Observatory is listed as a Threatened species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Photo credit: Christine Rock (April 19, 2014).



Figure 2.5. Black-throated Grey Warbler (*Setophaga nigrescens*). Photo credit: Christine Rock (May 4, 2014).



Figure 2.6. Girl Guide unit visits Iona Island Bird Observatory. Photo credit: Vanessa Newman (May 24, 2014).

2.2.4 Discussion

Second-year Yellow-rumped Warblers are identified readily into age categories but they cannot always be identified to subspecies. The difficulty of identifying them to subspecies is either because their defined subspecies plumages are not developed by the time that they arrive at Iona Beach Regional Park, or because of the hybridization between the subspecies. (Milá et al. 2011) Although they only contributed to about 3 % of all birds monitored, we observed two peaks in their arrival at IIBO. These two peaks align with the peaks in Audubon's and Myrtle Yellow-rumped Warbler migration (Figure 2.7 and 2.8), suggesting that many of these individuals could not be identified to subspecies because they have not developed their plumages yet as opposed to being hybrids.

Similar to differences in Yellow-rumped Warbler arrival times by subspecies, there is also a double peak in Wilson's Warbler migration (Figure 2.7). This is almost entirely described by the early push of males that aim to arrive at breeding grounds earlier to establish a territory and make nests (Francis and Cooke 1986). The age data presented an expected pattern (Stewart et al. 2002), with the peak migration of ASY birds migrating earlier than SY birds (Figure 2.8). The earlier migration of older birds is hypothesized to be because they are either more experienced or more dominant in the wintering ground and therefore in better shape (Stewart et al. 2002).

Over time, the age classification (ASY vs. SY) data can be used to estimate the relative survivorship of older (ASY) vs. younger (SY) individuals between the periods of fall migration and spring migration, on a per species basis. The range of SY:ASY age ratios increased approximately 1.5 times from 2013 to 2014, suggesting that there is annual variation in survival.

Two similar phenomena were observed in the 2014 SSMP as in the 2013 SMMP. The first being that, relative to past SMMP years, the Yellow-rumped Warblers subspecies ratio of Audubon to Myrtle's was nearly equal (1.3:1 in 2014 and ~1.0:1 in 2013) (Table 2.2), whereas in previous years Audubon's subspecies outnumbered Myrtle subspecies (Boyd 2011). A 1:1 ratio was originally believed to be uncharacteristic of the area (Campbell et al. 2001). The second phenomenon is a smaller push of Yellow-rumped Warblers in 2014 (n=602) and 2013 (n=117) compared to 2012 (n=1445), although, there were three times as many in 2014 as in 2013, suggesting there may be high natural variability in the populations.

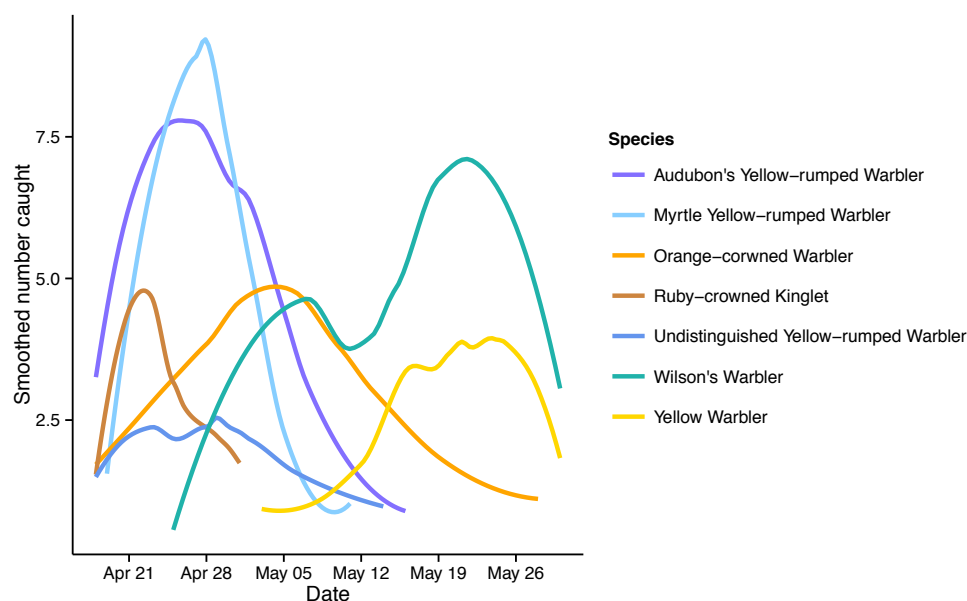


Figure 2.7. General trends in the number of birds captured over the Spring Migration Monitoring Program season, separated by the top six species and subspecies of birds monitored for the first time. Peaks in species curves denote when they were captured in greatest numbers and highlight the different phenology between species (i.e., when they migrate through Iona Beach Regional Park). Lines were fit with local polynomial regression and do not represent the actual number of birds caught each day.

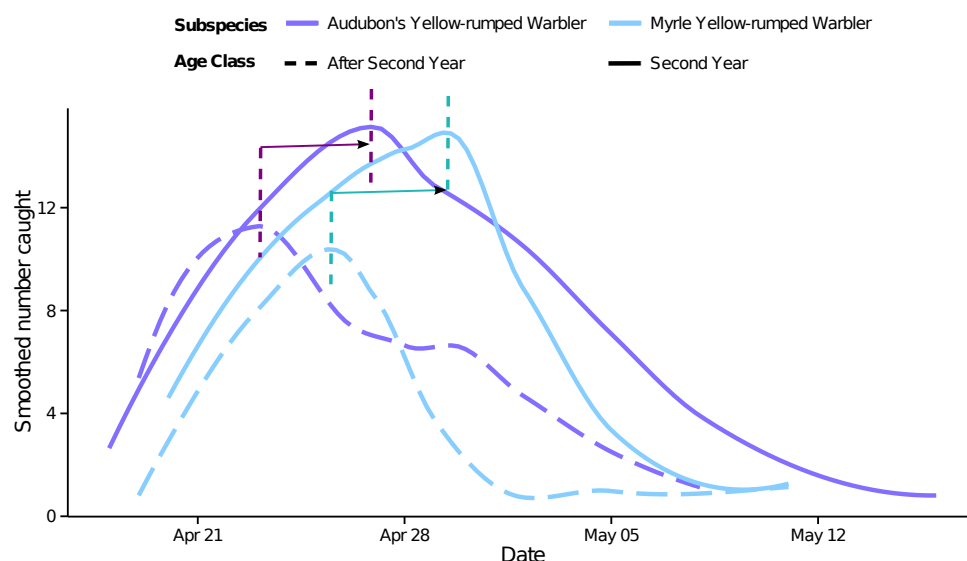


Figure 2.8. Timing of after-second year and second-year Audubon's and Myrtle Yellow-rumped Warblers. The peak of after-second year birds is earlier than second-year birds, as seen in Audubon's and Myrtle Yellow-rumped Warblers. Note: Lines were fit with local polynomial regression and do not represent the actual numbers of birds caught each day.

2.3 Fall Migration Monitoring Program

2.3.1 Introduction

The Fall Migration Monitoring program (FMMP) at IIBO was initiated in 2010. Like the SMMP, the FMMP is in its fifth 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.

2.3.2 Methods

Like the SMMP, the protocol for the FMMP includes constant-effort mist-netting and collection of morphometric and described data from each bird captured.

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 (degree of bone ossification) 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, during which IIBO was running every fair weather day for the duration of the program, the FMMP ran for two days per week in 2014 between August 23rd and October 26th. During this period, the weather allowed for 20 days of monitoring.

2.3.3 Results

A total of 2161 birds of 47 species were monitored during the FMMP over a cumulative 1367 mist net hours at 1.60 birds/net/hour. There were 1766 new birds caught at an average rate of 1.30 birds/net/hour and there were 395 recapture birds caught at an average rate of 0.30 birds/net/hour. Overall, the number of new birds caught per day decreased as the season progressed, but temporally spaced peaks in capture rate were explained by species-specific differences in migration timing (Figure 2.11). The daily number of recaptured individuals did not decrease substantially throughout the season and recaptured birds amounted to 18.3% of total birds monitored.

The top five most commonly monitored species/subspecies in the 2014 FMMP included Yellow Warblers, Yellow-rumped Warbler subspecies, and Song Sparrow (Table 2.5). Yellow Warblers have consistently been the most commonly captured species (four out of five years) and Song Sparrows are the next most consistently high caught species (top five in four out of five years) during the FMMP (Table 2.6). More than 98% of passerines were precisely aged to HY and AHY age classifications, resulting in HY:AHY ratios between 4.4:1 and 16.2:1, respectively (Table 2.7).

Table 2.5. Top five species monitored and recaptured during the 2014 Fall Migration Monitoring Program.

Species	Number 1 st Time Monitored	Species	Number Recaptured
Yellow Warbler	648	Yellow Warbler	129
Audobon's Warbler	130	Song Sparrow	44
Myrtle Warbler	114	Fox Sparrow	38
Song Sparrow	105	Black-capped Chickadee	30
Undistinguished Yellow-rumped Warbler*	87	Ruby-crowned Kinglet	22

* Denotes Yellow-rumped Warbler individuals that were not identified to subspecies

Table 2.6. Top five species monitored over during the Fall Migration Monitoring Program, 2010-2014.

2010	2011	2012	2013	2014
Yellow Warbler	Fox Sparrow	Yellow Warbler	Yellow Warbler	Yellow Warbler
Orange-crowned Warbler	Song Sparrow	Audubon's Warbler	Orange-crowned Warbler	Audobon's Warbler
Common Yellowthroat	Yellow Warbler	Song Sparrow	Fox Sparrow	Myrtle Warbler
Lincoln's Sparrow	House Finch	Orange-crowned Warbler	Song Sparrow	Song Sparrow
Wilson's Warbler	Lincoln's Sparrow	Fox Sparrow	Ruby-crowned Kinglet	Undistinguished Yellow-rumped Warbler*

* Denotes Yellow-rumped Warbler individuals that were not identified to subspecies

Some bird species that made it to observer highlight lists because of their rarity of capture at the station were the Western Tanager, Northern Waterthrush, Cooper's Hawk, Red-shafted Northern Flicker, Nashville Warbler, Tennessee Warbler, and Palm Warbler (Figure 2.9). The Palm Warbler and Tennessee Warbler were IIBO station firsts. Both species ranges do not typically include the Lower Mainland during migration, with the Palm Warbler's range barely entering British Columbia (Wilson and Herbert 2013). However, the Lower Mainland is commonly utilized by several species of sparrows and in one day of monitoring there were 7 species captured in a single net round (Figure 2.10).

During the 2014 FMMP, 71 dedicated volunteers donated 1065 hours of their time to help run the IIBO station. WildResearch also hosted students from BCIT, University of British Columbia (UBC), Fraser Valley University, and Thompson Rivers University in the fall.

Table 2.7. Age ratios [Hatch Year (HY) vs. After Hatch Year (AHY)] of top five monitored during the 2014 Fall Migration Monitoring Program.

Species	Number Monitored	Ratio (HY:AHY)
Yellow Warbler	647	9.4:1
Audubon's Warbler	128	9.7:1
Myrtle Warbler	114	4.4:1
Song Sparrow	102	9.2:1
Undistinguished Yellow-rumped Warbler*	86	16.2:1

* Denotes Yellow-rumped Warbler individuals that were not identified to subspecies



Figure 2.9. The first Palm Warbler (*Setophaga palmarum*) that has been monitored at Iona Island Bird Observatory. Photo credit: Christine Rock (September 27, 2014).



Figure 2.10. Seven species of sparrow caught in one net round. Clockwise from far left: Spotted Towhee, Fox Sparrow, Puget Sound White-crowned Sparrow, White-throated Sparrow, Song Sparrow, Lincoln's Sparrow, Golden-crowned Sparrow. Photo credit: Kim Gilbert (October 5, 2014).

2.3.4 Discussion

During the 2014 FMMP, the top five most commonly monitored species accounted for approximately 61% of all new birds, with the Yellow Warbler ($n=648$), accounting for 37% of all new birds monitored (Table 2.5). The numbers of Yellow Warblers that pass through IIBO were also high in 2010, 2012, and 2013 ($n=727$, $n=479$, $n=515$ respectively), but not in 2011 when the number of Yellow Warblers monitored was lower ($n=130$; Table 2.6).

Of the five years of study, 2014 was the first year that both subspecies of Yellow-rumped Warblers were in the top five species monitored, as well as those whose subspecies was not distinguished (marked as Undistinguished*; Tables 2.5 and 2.6). Similarly to 2013, a ratio close to 1:1 of Audubon's to Myrtle subspecies was observed in 2014, which is quite different than prior observations as great as 14:1 for the southern coast (Campbell et al. 2001). It is interesting to note a similar phenomenon in the peaks of the Undistinguished Yellow-rumped Warbler subspecies to what was observed in the SMMP (Figure 2.11). The two peaks most likely represent the influxes of either subspecies migrating through the area.

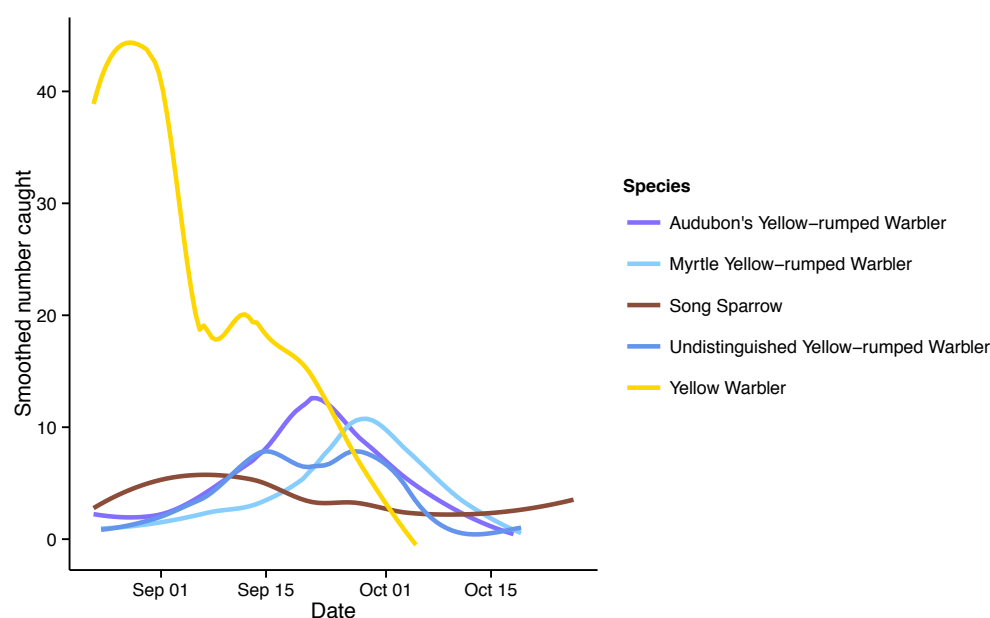


Figure 2.11. General trends in the number of birds caught over the Fall Migration Monitoring Program season, separated by the top five species/subspecies of birds monitored for the first time. Peaks in the species curves denote when they were captured in greatest numbers and highlight the different phenology between species (i.e., when they migrate through Iona Beach Regional Park). Lines were fit with local polynomial regression and do not represent the actual number of birds caught each day.

The age ratios observed at IIBO have shown an interesting pattern for the last two years as seen in our top 5 monitored species (Table 2.7). The ratio of HY:AHY birds is relatively high compared to observations to the south of IIBO, in coastal California (Ralph 1971). Undistinguished Yellow-rump warblers had the largest ratio of HY:AHY, 16:1. However, HY birds are harder to distinguish between the Yellow-rumped Warbler subspecies, Audubon's and Myrtle, whereas adults are easily categorized into their subspecies, which could explain inordinately high number of hatch-years resulting in this ratio. Still, the ratio of HY:AHY birds of Audubon's subspecies, Yellow Warblers, and Song Sparrows was also high (9:1), suggesting that another factor or age-related behavioural difference may be influencing HY birds capture rates during fall migration. Two potential reasons may be that HY birds land more frequently at IIBO or preferentially migrate down the coast while adults migrate elsewhere.

The FMMP's mean catch rate of 1.30 new birds/net/hour was approximately 1.3 times higher than the FMMP's mean catch rates of both 2013 and 2011, (1.02 and 0.95 birds/net/hour, respectively). This capture rate is greater than some of the highest catch rates in Canada (Mackenzie and LeClair 2015). These high and annually increasing capture rates are an indicator of the importance of Iona's Important Bird Area designation and the continued success of IIBO's migratory programs.

CONCLUSIONS

Iona Island Bird Observatory has successfully run several programs for the last five years. In 2014, a total of 4867 birds of 62 species/subspecies were monitored over 4265 mist-net hours. The average capture rate over the three seasons was 1.14 birds/net/hour, with the FMMP having the highest overall capture rate, 1.60 birds/net/hour, and the WSMP having the lowest overall capture rate, 0.63 birds/net/hour.

The diversity and volume of birds monitored at IIBO are two enormous benefits of having a station in Iona Beach Regional Park. By having such availability of birds to monitor so close to a major city, WildResearch has been able to train more than 200 individuals in the past five years. In 2014 alone, 92 volunteers with different levels of experience were able to come to IIBO to help monitor birds, contribute to the station, and increase their skills in both mist-net extractions and handling birds in the process of banding them. Many of the volunteers came out multiple days, and together contributed a total of 2781 hours of their time. Volunteers are critical to the successful operation of IIBO and enrich the experience of learning about birds and conservation for all who visit the station.

WildResearch was also able to host more than 300 individuals through community outreach programs in 2014. The public demonstrations held at IIBO of monitoring birds have grown to include everyone from Girl Guides to BCIT students to the local birders who pass by the station.

Iona Island Bird Observatory is accomplishing WildResearch's three main goals of research and monitoring of wildlife, environmental education, and community engagement. With five years of monitoring completed (including the pilot year in 2010) and the 2015-year currently in operation, WildResearch is preparing to complete a comprehensive multi-year report. This report is needed to fulfill the research portion of WildResearch's goals and to help contribute to a shared knowledge base that can inform conservation efforts. It will provide insight into population trends, their stability, and general demographic information that can help inform landowners and land use planners about the species that use Iona Beach Regional Park. Other possibilities with the multi-year report are to connect annual fluctuations in species phenology or average body condition to environmental and climatic variables and input them into predictive models. To increase the power of models and to strengthen the confidence of trends observed so far, it is necessary to maintain the programs at IIBO in order for further collection of data.

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Several Banders-in-Charge contributed to the 2014 programs at IIBO including Ian Thomas, Azim Shariff, Paul Levesque, Dan Froehlich, Catherine Jardine, and Jeremiah Kennedy. In addition to Banders-in-Charge contributions, WildResearch Directors that contributed volunteer hours towards running the 2014 IIBO program, both on the ground and from afar, include Michael Arbeider, Sarah Nathan, Virginia Noble, Mike Boyd, Elly Knight, Jay Brogan, Emily McAuley, Renae Mackas, and Christine Rock. Renae Mackas, Elly Knight, and Christine Rock completed reviews of this report.

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 2014 committee members: Catherine Jardine (Chair), Michael Arbeider (Secretary), Paul Levesque (WildResearch Board Representative), Alan McKenzie, Anna Szeitz, Jeremiah Kennedy, Pablo Jost, Andrew Huang, Justin Leung, and Ian Thomas, for their contributions to the Operations Committee. Tasks completed by the Operations Committee in 2014 included organizing and assisting with IIBO station maintenance, and organizing the annual bird bag making party at our host's (Ildiko Szabo's) place. A big thanks are owed to Catherine Jardine for her work on updating and trouble-shooting the IIBO banding data management system.

WildResearch's Members' Service Committee Secretary, Mikaela Davis, completed volunteer scheduling in 2014. Mikaela did an exceptional job handling the many requests that WildResearch receives from interested volunteers, was prompt in sending schedule reminders to volunteers, and did a great job creating and maintaining the 2014-banding schedule. Volunteer scheduling software graciously donated by WhenToHelp provided to increase communication between volunteer coordinators and volunteers, offering an efficient way of scheduling and tracking volunteer hours.

The Iona Island Bird Observatory is a citizen science run program that could not operate efficiently without the help of dedicated volunteers. We thank the many WildResearch members that volunteered at IIBO this year and assisted with banding, extraction, and data recording. We absolutely could not run IIBO without our truly fantastic volunteers, and we admire your enthusiasm and dedication to the program.

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APPENDIX

Table A1. Species lists for each IBO program, including a count of the total monitored and the proportion of all birds monitored in a season.

WSMP 2013-2014				SMMP 2014			FMMP 2014		
Species				Species			Species		
Code	Count	Proportion		Code	Count	Proportion	Code	Count	Proportion
1 FOSP	131	28.92		1 WIWA	369	16.38	1 YEWA	777	35.96
2 SOSP	60	13.25		2 AUWA	325	14.43	2 SOSP	149	6.89
3 HOFI	51	11.26		3 MYWA	259	11.5	3 AUWA	141	6.52
4 SPTO	51	11.26		4 OCWA	253	11.23	4 MYWA	122	5.65
5 BCCH	38	8.39		5 RCKI	127	5.64	5 FOSP	104	4.81
6 RCKI	37	8.17		6 LISP	101	4.48	6 COYE	100	4.63
7 GCKI	35	7.73		7 YEWA	99	4.39	7 UYRW	100	4.63
8 GCSP	17	3.75		8 COYE	87	3.86	8 OCWA	78	3.61
9 PAWR	7	1.55		9 AMGO	63	2.8	9 RCKI	74	3.42
10 MAWR	5	1.1		10 UYRW	58	2.57	10 GCKI	68	3.15
11 AMRO	4	0.88		11 SOSP	48	2.13	11 BCCH	55	2.55
12 EUST	4	0.88		12 VGSW	46	2.04	12 SPTO	54	2.5
13 HETH	2	0.44		13 HETH	40	1.78	13 WAVI	54	2.5
14 ORJU	2	0.44		14 CEDW	38	1.69	14 HOFI	51	2.36
15 PUFI	2	0.44		15 GCSP	36	1.6	15 GCSP	35	1.62
16 BEWR	2	0.44		16 MAWR	30	1.33	16 LISP	34	1.57
17 AUWA	1	0.22		17 GCKI	29	1.29	17 WCSP	18	0.83
18 DOWO	1	0.22		18 RWBL	24	1.07	18 WIWA	17	0.79
19 HOSP	1	0.22		19 SPTO	21	0.93	19 PSWS	16	0.74
20 LISP	1	0.22		20 SAVS	20	0.89	20 TRFL	14	0.65
21 OCWA	1	0.22		21 TRES	20	0.89	21 DOWO	10	0.46
				22 BCCH	19	0.84	22 PAWR	10	0.46
				23 FOSP	19	0.84	23 HETH	9	0.42
				24 PSWS	19	0.84	24 CEDW	8	0.37
				25 MGWA	17	0.75	25 MAWR	8	0.37
				26 AMRO	13	0.58	26 ORJU	7	0.32
				27 NRWS	9	0.4	27 SAVS	6	0.28
				28 HAFL	7	0.31	28 WIFL	6	0.28
				29 HOFI	6	0.27	29 AMGO	5	0.23
				30 PSFL	6	0.27	30 SWTH	5	0.23
				31 SWTH	6	0.27	31 MGWA	3	0.14
				32 WAVI	6	0.27	32 PSFL	3	0.14
				33 BHCO	5	0.22	33 AMRO	2	0.09
				34 CLSW	5	0.22	34 NAWA	2	0.09
				35 BTYW	4	0.18	35 RSFL	2	0.09

36	BARS	3	0.13	36	WTSP	2	0.09
37	PUFI	3	0.13	37	YBFL	2	0.09
38	GWCS	2	0.09	38	BRCR	1	0.05
39	ORJU	2	0.09	39	COHA	1	0.05
40	WIFL	2	0.09	40	DEJU	1	0.05
41	BUOR	1	0.04	41	GWCS	1	0.05
42	DOWO	1	0.04	42	NOWA	1	0.05
43	EUST	1	0.04	43	PAWA	1	0.05
44	HOWR	1	0.04	44	PUFI	1	0.05
45	PAWR	1	0.04	45	TEWA	1	0.05
46	TOWA	1	0.04	46	VATH	1	0.05
47	WETA	1	0.04	47	WETA	1	0.05