

DATA REPORT

Bird Monitoring and Banding Project
at Buttertubs West Marsh, Nanaimo, BC

2015



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1. Introduction

In the summer of 2012, the City of Nanaimo and Ducks Unlimited Canada jointly acquired the 27-hectare Buttertubs West Marsh property. This property, which is located west of the Buttertubs Marsh Conservation Area and east of the Nanaimo Parkway (Figure 1), encompasses a mixture of ecosystem types, including marsh and shallow water, riparian areas, upland forest and old-field habitats. Altogether, the Buttertubs West Marsh and adjacent Buttertubs Marsh represent approximately 53 hectares of productive parkland habitat with significant ecological value in an otherwise fragmented urban landscapes (Lepczyk and Warren, 2012). In particular, these green spaces can provide important breeding, stopover and wintering habitats for various bird species (NABCI, 2012).

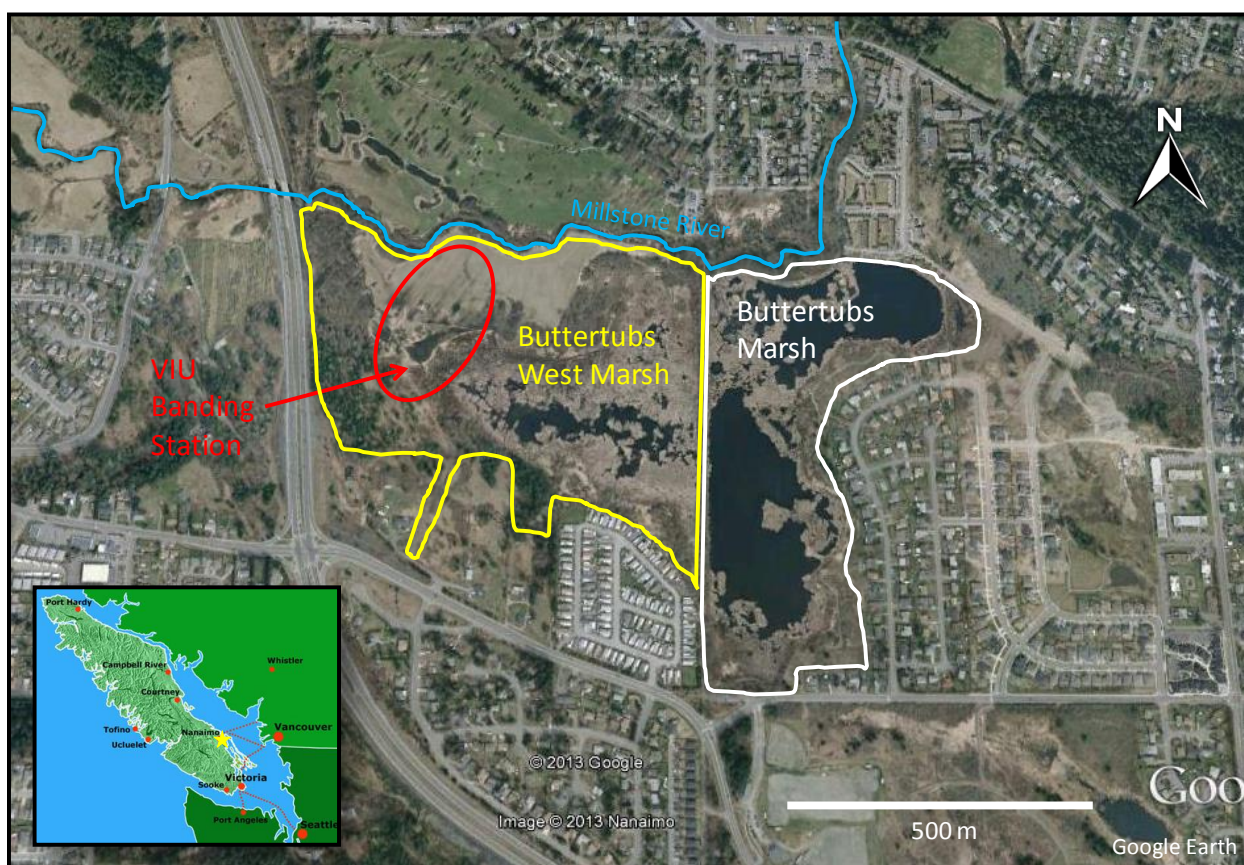


Figure 1. Aerial photograph of the Buttertubs West Marsh in Nanaimo, BC, including the location of the Vancouver Island University (VIU) bird monitoring and banding project.

Since 2013, Vancouver Island University (VIU) has operated a bird monitoring and banding project at Buttertubs West Marsh, with overall objectives to:

- monitor migrant and resident birds to contribute to regional and continent-wide efforts to monitor changes in population levels of these species;

- provide practical educational and training opportunities for VIU students and community volunteers; and,
- conduct public demonstrations where people of all ages can learn about bird identification, ecology, evolution and conservation.

This project was conducted in partnership with the City of Nanaimo, Ducks Unlimited Canada, and the Vancouver Avian Research Centre.

This report summarizes the activities and results of this project during 2015. Project activities are described in the sections below and included:

- songbird monitoring and banding; and,
- swallow nest box monitoring.

Summaries of volunteer effort / training and public demonstration / education are also included.

2. Songbird Monitoring and Banding

2.1. Methods

The general approach used for songbird monitoring and banding included a combination of two activities: bird banding and incidental observations.

2.1.1. *Songbird Banding*

Songbird banding activities were conducted in accordance with Vancouver Island University Animal Use Protocol No. 2012-10-R, Canadian Wildlife Service Bird Banding Office Scientific Permit No. 10720D, 10885 and 10885A, and following procedures and guidance established in the VIU Bird Monitoring and Banding Manual (Demers, 2012), the North American Banding Council (2001a, b), and the Institute for Bird Populations (IBP, 2012).

Between March and October 2015, 19 mist nets were installed for use at Buttertubs West Marsh. Each mist net consisted of a 12 m long by 2.6 m high panel, made of polyester yarn, with 30-mm mesh size. The location of these nets was stratified among the habitat types present at the site (Figure 2). Ten nets (nets no. 1-10) were located in old-field habitat dominated by open expanses of reed canarygrass (*Phalaris arundinacea*) and shrub / tree patches consisting of hardhack (*Spiraea douglasii*) and willows (*Salix* sp.). Five nets (nets no. 11-15) were located in upland forest habitat consisting of Douglas fir (*Pseudotsuga menziesii*), western red cedar (*Thuja plicata*), bigleaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), English oak (*Quercus robur*), and a shrubby understory consisting of thimbleberry (*Rubus parviflorus*), salmonberry (*R. spectabilis*), ocean spray (*Holodiscus discolor*), hardhack and Himalayan blackberry (*R. armeniacus*). Four nets (nets no. R1-R4) were located in riparian habitat along the Millstone River consisting of Nootka rose (*Rosa nutkana*), hardhack, salmonberry and Himalayan blackberry. One additional net (net no. SW) was located in the old-field habitat, and it was only operated between April and early July for the purpose of capturing swallows for the Tree Swallow nest box monitoring.

Net no. 1 was operated as a double-stacked net which consisted of a 12 m long by 5.5 m high panel, with a 0.3 m gap between nets. The upper net was numbered net 1A.

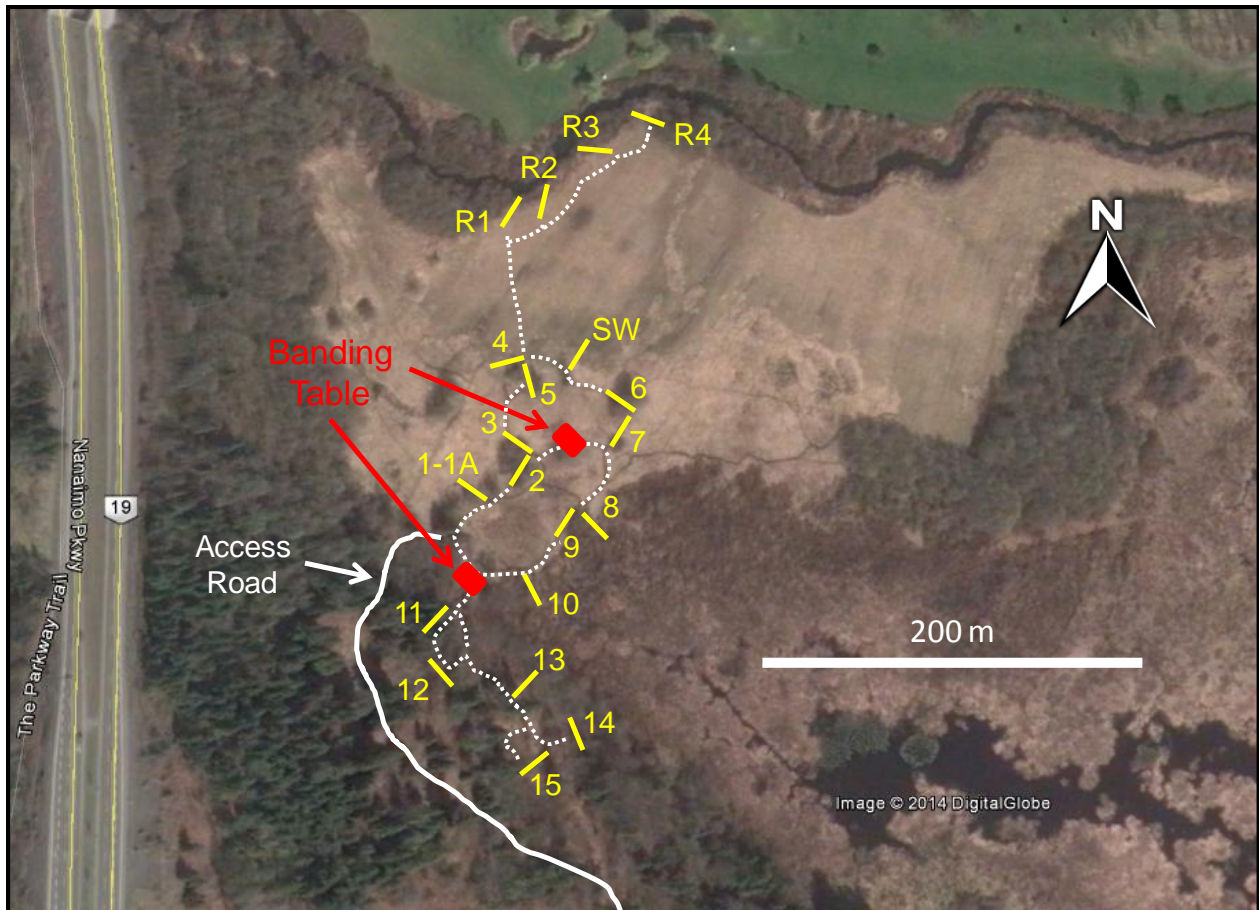


Figure 2. Locations of mist nets and banding table used for songbird banding at Buttertubs West Marsh during 2015. Note that two banding table locations were used during 2015.

Bird banding activities were conducted 1-3 days most weeks between 19 March and 31 October 2015. During each banding day, nets were operated from 30 minutes before sunrise and for a period of up to 6 hours (i.e., until 5.5 hours after sunrise). Nets were checked every 20-30 minutes.

Each captured bird was extracted from the net and transferred into a cloth bag until further processing at the banding table. The banding process for most birds typically involved the following steps: species identification, band application (if unbanded), age and sex determination, fat score, biometrics (wing chord, tail length, weight), and photography (if applicable). Most birds were processed within about 1-2 minutes and then released.

2.1.2. *Incidental Observations*

During bird banding days, all birds detected by sight and sound (other than those captured in mist nets) were counted and recorded as incidental observations. These observations were especially important to account for species that were not targeted by mist netting operations (e.g., waterfowl, raptors, etc.). The combination of banding totals (number of birds captured) and incidental observations provided an estimate of the number of species and individuals present at the site.

2.2. Results

2.2.1. *Songbird banding*

Songbird banding activities were conducted during 37 days between 19 March and 31 October 2015, with a total mist netting effort of 4,358 hours (average: 117.8 net hours / day) (Table 1). A total of 1,915 birds were caught from 52 species. Of these, 1,359 birds were banded and 556 birds (29.0%) were recaptures of previously banded birds. An additional 143 birds were captured and released unbanded (primarily hummingbirds). The average capture rate in 2015 was 43.9 birds / 100 net-hours.

Average daily capture effort increased in 2015 compared to 2013 and 2014, even though banding activities occurred during fewer days (Table 1). The increase in average daily capture effort resulted from a higher number of nets used in 2015. Capture rate in 2015 (43.9 birds per 100 net hours) was intermediate compared to 2013 and 2014 (51.0 and 37.6 birds per 100 net hours, respectively). Variation in yearly capture rate was partly due to the change in the number of nets used during 2015. Additional reasons for the variation in catch rate may include inter-annual variation in habitat use, breeding success and weather. The total number of species captured was also slightly higher in 2015 (52 species) compared to 2013 and 2014 (49 and 46 species, respectively).

Table 1. Mist net capture statistics at Buttertubs West Marsh during 2013-2015.

Parameter	Value		
	2013	2014	2015
Capture effort (net-hours)	3,316	4,960	4,358
Average daily effort (net-hours / day)	57.1	88.6	117.8
Number of birds banded	1,130	1,212	1,359
Number of recaptures	560	654	556
Total	1,690	1,866	1,915
Recapture rate (%)	33.1%	35.0%	29.0
Number of species	49	46	52
Capture rate (birds per 100 net-hours)	51.0	37.6	43.9

Capture rates generally increased between April and October 2015 (Figure 3). During late April and May, capture rates increased slightly in response to the arrival / passage of spring migrants. Post-breeding dispersal resulted in an increase in capture rate in July. Fall migration produced an increase in catch rate between late August and October. Capture rates were generally comparable between years.

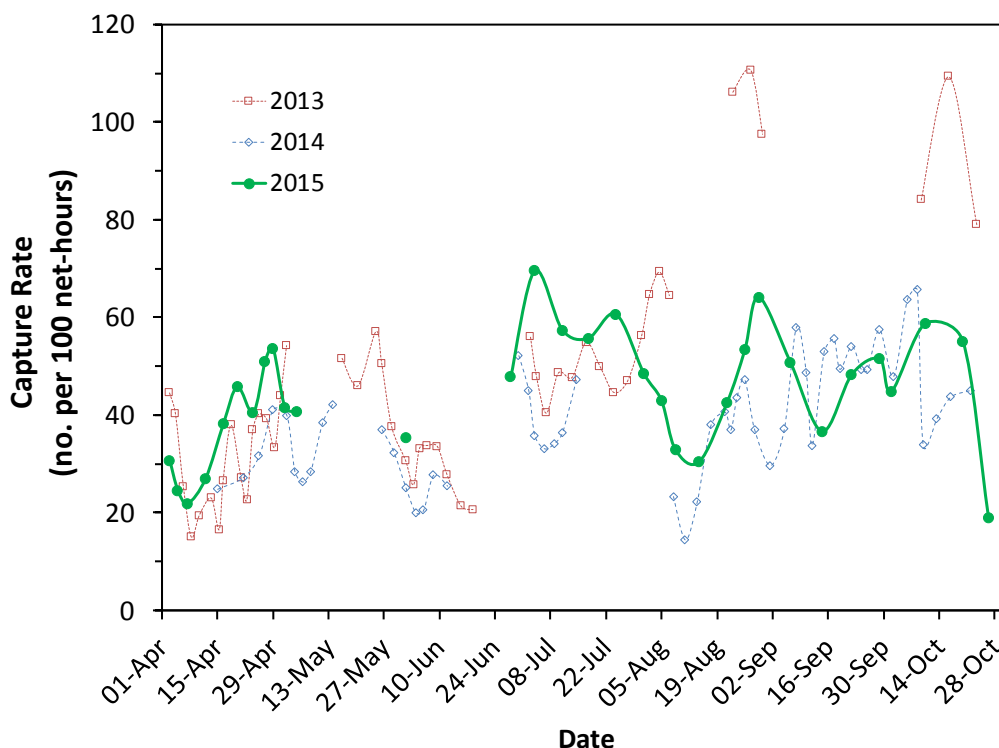


Figure 3. Weekly moving average of capture rate in mist nets at Buttertubs West Marsh during 2013-2015. There was no mist netting activities conducted between May 7-28 and June 6-25, 2015.

The capture rate of mist nets varied across the project site (Table 2). Overall, capture rates were the highest for nets located in the riparian habitat (i.e., nets R1-R4), and for nets located along the interface between the old-field and marsh habitats (i.e., nets 8-10). This pattern is generally consistent with previous years.

Overall, Common Yellowthroat (*Geothlypis trichas*) was the most captured species and represented 15.9% of all birds caught during 2015 (Table 3). Song sparrow (*Melospiza melodia*) was the next most common species and accounted for 10.8% of all birds caught. Spotted Towhee (*Pipilo maculatus*) was the third most common species. All species listed in Table 2 are local breeders at Buttertubs Marsh, with the exception of Lincoln's Sparrow (*M. lincolni*) and Fox Sparrow (*Passerella iliaca*). Tables A.1 and A.2 in Appendix provide a complete summary of all species captured during 2015.

Table 2. Capture statistics by net at Buttertubs West Marsh during 2015.

Net Number	Dates Used	Number Banded	Number Recaptured	Total Number Captured	Net Hours	Capture Rate (Birds / 100 Net hours)
1	All season	47	32	79	216	36.6
1A	All season	49	27	76	216	35.2
2	All season	41	20	61	216	28.3
3	All season	32	18	50	216	23.2
4	All season	23	22	45	216	20.9
5	All season	43	24	67	216	31.1
6	All season	24	17	41	216	19.0
7	All season	51	23	74	216	34.3
8	All season	83	31	114	216	52.9
9	All season	64	23	87	216	40.3
10	All season	85	41	126	216	58.4
11	All season	52	27	79	216	36.6
12	All season	47	28	75	216	34.8
13	All season	43	15	58	216	26.9
14	All season	38	25	63	216	29.2
15	All season	32	29	61	210	29.1
R1	All season	180	42	222	214	103.9
R2	All season	124	28	152	212	71.6
R3	All season	130	33	163	208	78.2
R4	All season	164	42	206	208	98.9
SW	Apr. - Jul.	7	9	16	71	22.6
Totals		1,359	556	1,915	4,358	43.9

The rankings for the top ten species captured during 2015 were generally similar to 2013-2014, with a few exceptions (Table 4). The ranking for Spotted Towhee increased to the third most captured species in 2015, while the ranking for Bushtit decreased to the sixth position in 2015. Oregon Junco (*Junco hyemalis*) was among the ten most captured species in 2015, but not in 2013-2014.

New species in 2015 included Cooper's Hawk (*Accipiter cooperii*), Northern Rough-winged Swallow (*Stelgidopteryx serripennis*), Red-breasted Nuthatch (*Sitta Canadensis*), European Starling (*Sturnus vulgaris*), and Swamp Sparrow (*Melospiza georgiana*). Cooper's Hawk was the first diurnal raptor caught as part of this project. Red-breasted Nuthatch is a common species at the site, which somehow eluded capture since the beginning of the project. Northern Rough-winged Swallow appears to breed along the sandy cut banks of the Millstone River and was

captured in the nets located in the riparian habitat (i.e., nets no. R3, R4). The capture of a Swamp Sparrow was unusual as this species is uncommon on Vancouver Island as it breeds primarily east of the Rocky Mountains. Also of note in 2015 was the first daytime capture of a Barred Owl (*Strix varia*).

Table 3. Fifteen most common species captured in mist nets at Buttertubs West Marsh during 2015.

Common Name	Number Banded	Number Recaptured	Total Number Captured
Common Yellowthroat	191	113	304
Song Sparrow	98	109	207
Spotted Towhee	88	49	137
American Robin	104	26	130
Orange-crowned Warbler	110	11	121
Bushtit	79	35	114
Chestnut-backed Chickadee	53	59	112
Lincoln's Sparrow	67	12	79
Oregon Junco	59	11	70
Bewick's Wren	32	33	65
Purple Finch	52	3	55
Yellow Warbler	36	13	49
Savannah Sparrow	43	1	44
Fox Sparrow	31	8	39
Marsh Wren	23	13	36

The age composition of birds captured varied between seasons and reflected the recruitment of young birds (hatch-year birds) to the population and changes in age assignment associated with the annual moult that occurs after the breeding season (Table 5). Second-year birds (hatched in 2014) were the dominant age group between March and May, while hatch-year birds (hatched in 2015) were the dominant age group between June and October. Overall, 56.1% of birds banded were birds hatched in 2015.

Table 4. Number captured and rank (in parentheses) of the ten species most captured in mist nets at Buttertubs West Marsh during 2013-2015.

Common Name	2013	2014	2015
Common Yellowthroat	493 (1)	310 (1)	304 (1)
Song Sparrow	290 (2)	279 (2)	207 (2)
Spotted Towhee	57(8)	95 (7)	137 (3)
American Robin	88 (4)	114 (4)	130 (4)
Orange-crowned Warbler	61 (7)	99 (6)	121 (5)
Bushtit	91 (3)	148 (3)	114 (6)
Chestnut-backed Chickadee	74 (6)	107 (5)	112 (7)
Lincoln's Sparrow	23 (13)	86 (8)	79 (8)
Oregon Junco	16 (18)	38 (13)	70 (9)
Bewick's Wren	55 (9)	75 (9)	65 (10)

Table 5. Age structure of birds banded at Buttertubs West Marsh during 2015.

Month	Hatch Year (HY)	Second Year (SY)	After Hatch Year (AHY)	After Second Year (ASY)	Other Ages	Total
March	0	22	2	5	0	29
April	0	184	20	74	0	278
May	3	48	3	33	1	88
June	79	23	11	6	0	119
July	172	26	23	2	1	224
August	220	3	23	2	7	255
September	166	1	13	1	7	188
October	122	0	26	0	30	178
TOTAL	762	307	121	123	46	1,359

Birds store fat as a readily accessible source of energy, especially during migration. As expected, the proportion of birds that displayed any visible fat (i.e., fat score >0) was highest during spring (April-May) and fall migration (September-October) (Table 6). Overall, the majority of birds banded (58.3%) did not display any visible fat (fat score = 0).

Table 6. Fat score of birds banded at Buttertubs West Marsh during 2015.

Month	0	1-2	3-5	Total
April	11	6	10	27
April	89	94	94	277
May	31	30	24	85
June	79	34	4	117
July	165	54	4	223
August	175	60	16	251
September	116	47	22	185
October	115	55	5	175
TOTAL	781	380	179	1,340

The 556 recapture events recorded in 2015 involved 347 banded birds (Table 7), of which 72, 97 and 178 individuals were originally banded in 2013, 2014 and 2015, respectively. Overall, 6.4% of individuals banded in 2013 were recaptured in 2015, 8.0% of individuals banded in 2014 were recaptured in 2015, and 13.1% of individuals banded in 2015 were recaptured in 2015. For Common Yellowthroat and Chestnut-backed Chickadee more individuals banded in 2013 were captured in 2015 than individuals banded in 2014. No Bushtit banded in 2013 were recaptured in 2015. These percentages provide crude estimates of between- and within-year survival and site fidelity, although they do not account for individuals which may still have been at the site in 2015 but were not recaptured.

Table 7. Number and percentage of individuals recaptured in 2015 which were originally banded in 2013, 2014 or 2015 for the seven most commonly recaptured species.

Species	Banded in 2013		Banded in 2014		Banded in 2015	
	Number	%	Number	%	Number	%
Common Yellowthroat	18	7.2	4	3.2	28	14.7
Song Sparrow	16	10.7	9	7.3	25	8.6
Chestnut-backed Chickadee	11	20.4	8	17.4	17	32.1
Spotted Towhee	5	10.9	10	14.1	21	23.9
Bushtit	0	0.0	10	11.4	17	21.5
Bewick's Wren	5	16.1	9	25.0	5	15.6
American Robin	5	7.7	7	8.0	9	8.7
All species	72	6.4	97	8.0	178	13.1

Most recapture events involved birds that were recaptured only once during 2015. However, 155 individuals were recaptured more than once since they were banded, and at least 50 individuals were recaptured 5 or more times since they were banded. Some of these frequently recaptured individuals are listed in Table 8. This included a Common Yellowthroat and a Song Sparrow each recaptured 22 times since their original banding date.

Table 8. List of selected individuals recaptured in 2015, which have been recaptured eight or more times at Buttertubs West Marsh during 2013-2015.

Band Number	Species	Sex	Number of Times Recaptured Since Banded	Date Banded	Date of Last Recapture
0942-98712	AMRO	Male	10	17 Apr. 2013	22 Apr. 2015
0942-98768	AMRO	Male	11	8 Aug. 2013	18 Apr. 2015
2591-72406	BEWR	Male	8	2 Apr. 2013	1 Oct. 2015
2591-72456	BEWR	Unknown	8	4 Jul. 2013	4 Sep. 2015
2700-93366	COYE	Male	20	9 Apr. 2013	28 Jul. 2015
2700-93386	COYE	Male	22	22 Apr. 2013	8 Jul. 2015
2700-93399	COYE	Male	20	25 Apr. 2013	4 May 2015
2700-93568	COYE	Male	21	16 Jul. 2013	26 Jun. 2015
2521-71319	MAWR	Unknown	9	15 Aug. 2014	18 Oct. 2015
2700-93378	OCWA	Male	8	17 April 2013	4 May 2015
2581-70122	SOSP	Male	22	26 Mar. 2013	4 Apr. 2015
2581-70277	SOSP	Female	16	1 Aug. 2013	26 Jun. 2015
2581-70120	SOSP	Male	14	25 Mar. 2013	22 Oct. 2015

2.2.2. Overall Species Presence / Absence

Banding totals (number of birds captured) and incidental observations were compiled in the online eBird database (ebird.org). eBird is a public database of bird observations providing scientists, researchers and amateur naturalists with real-time data about bird distribution and abundance. The eBird database can be queried to obtain detailed accounts of species presence / absence and abundance for a given site.

A total of 100 species were observed at Buttertubs West Marsh during 2015 (Table A.3 in Appendix). New species observed in 2015 included Brant (*Branta bernicla*) and the Swamp Sparrow captured during banding. A single Bullock's Oriole (*Icterus bullockii*) was observed at the site during late April and early May. Although this species has been observed breeding around Buttertubs Marsh in the past, the last breeding evidence observed at Buttertubs West Marsh (a female feeding a fledgling) occurred in July 2013. No Cliff Swallow (*Petrochelidon pyrrhonota*) or Townsend's Warbler (*Setophaga townsendi*) were observed at Buttertubs West Marsh during 2015.

3. Swallow Nest Box Monitoring

3.1. Methods

Thirty-one nest boxes were installed in the old-field habitat at Buttertubs West Marsh in early March 2015 and subsequently monitored for use by swallow species (Figure 4). Each nest box was installed approximately 1.5 m above ground and secured to a 2.4-m length of studded T-post. A 0.4-0.6 m length of 10-cm diameter PVC pipe was installed around the T-post below some of the nest boxes to act as a terrestrial predator guard. For each nest box, one of the side walls could be opened to allow for examination of its content.

Nest box monitoring followed the procedures outlined in the VIU Swallow Nest Box Monitoring Manual (Demers, 2013). Nest boxes were monitored every 3-5 days between 5 May and 9 July 2015. Nest boxes were examined for signs of nest building, amount and composition of nesting material, presence and number of eggs, and presence and number of nestlings. Nestlings were banded and weighed when they were approximately 12 days of age. In addition, adults (parents) were captured during the nestling period by setting a trap door in their nest box. Each adult was identified, banded (if unbanded), assessed for age, sex, fat score and biometrics (wing chord, tail length, weight), and released.



Figure 4. Locations of the thirty-one swallow nest box at Buttertubs West Marsh during 2015. Numbers in boxes indicate the nest boxes in which eggs were deposited.

Table 9. Results of nest box monitoring at Buttertubs West Marsh during 2015. Nest box no. 20 received two clutches, and nest box no. 30 had multiple nesting attempts and/or egg dumping (see text).

Nest Box	Nest Building	Number of Eggs	Complete Clutch Date	Mean Hatch Date	Number Fledged	Individuals Banded
1	No	0				
2	No	0				
3	No	0				
4	Yes	5	16 May	30 May	5	All nestlings, both adults
5	Yes	6	14 May	28 May	5	All nestlings, both adults
6	No	0				
7	No	0				
8	No	0				
9	Yes	4	22 May	5 June	3	All nestlings, female only
10	Yes	5	15 May	29 May	0	All nestlings, female only
11	Yes	5	20 May	4 June	5	All nestlings, both adults
12	No	0				
13	No	0				
14	No	0				
15	Yes	6	13 May	27 May	3	All nestlings, both adults
16	Yes	4	23 May	6 Jun	4	All nestlings, female only
17	Yes	5	17 May	31 May	5	All nestlings, both adults
18	Yes	6	10 May	24 May	1	All nestlings, both adults
19	Yes	6	16 May	30 May	6	All nestlings, both adults
20	Yes	6, 4	9 May	23 May	3, 0	All nestlings, both adults
21	Yes	4	20 May	3 June	4	All nestlings, both adults
22	Yes	6	10 May	24 May	6	All nestlings, both adults
23	No	0				
24	Yes	4	14 May	Did not hatch	0	Female only
25	No	0				
26	Yes	6	16 May	30 May	3	All nestlings, both adults
27	No	0				
28	Yes	6	6 June	20 June	4	All nestlings, female only
29	Yes	4	13 May	27 May	3	All nestlings, both adults
30	Yes	12	9 June	23 June	1	All nestlings, female only
31	Yes	5	24 May	Did not hatch	0	Female only
Total		109			61	

3.2. Results

Nineteen of the 31 nest boxes were occupied by Tree Swallows (*Tachycineta bicolor*) and had signs of nest building activities (Table 9). Clutches of 4–6 eggs were eventually laid in all occupied nest boxes. Nest box no. 30 was the subject of repeated nesting attempts, where the number of eggs increased in steps from 2, 4, 8 to 12 eggs. This suggested possible re-nesting attempts (as some older eggs would become buried under new nesting material) and/or egg dumping, where one of more females other than the nesting occupant lay eggs in the box. Nest box no. 30 eventually yielded one fledgling. There was a late nesting attempt in nest box no. 20 (4 eggs found on 9 July) by a new female that appeared after the initial clutch by a different female had fledged, but the nest was abandoned by 16 July.

Of the 32 adult Tree Swallows that were captured, 8 individuals were recaptures from 2014 (4 males, 4 females). One adult female was born at Buttertubs Marsh during 2014 (nest box no. 29) and returned to nest in box no. 10. This was the first case of a Tree Swallow fledged at the site returning to nest as an adult.

Out of 109 eggs laid in all nest boxes, 83 eggs hatched (hatching success: 76.1%) and 61 young birds fledged (fledging success: 56.0%). Fledging success was variable between nest boxes, with some boxes fledging no young while others fledged up to 6 young. The average fledging rate for the entire nest box colony was 3.2 young per nesting pair. Overall, the fledging productivity was higher in 2015 compared to 2014 (2014: 51% fledging success; 2.5 young per nesting pair).

Unlike 2014, no botflies were observed during 2015.

4. Volunteer Effort and Training

As stated above, one of the main objectives of this project is to provide practical educational and training opportunities for Vancouver Island University students and community volunteers. Indeed, this project is only made possible with the participation of many dedicated volunteers. The tasks accomplished by volunteers included, but were not limited to:

- Site preparation and maintenance – vegetation clearing, grass cutting and trimming, footpath maintenance and improvements, net installation and removal, net maintenance.
- Bird monitoring – incidental observations and census.
- Songbird banding – net extraction, bird banding and processing, photography, data scribing, data entry.
- Swallow nest box monitoring – nest box building and installation, monitoring of nest box contents, banding and processing of nestlings and adults, photography, data scribing.
- Training and public education – training of project volunteers and bird banders, providing public education for guests and visitors.

A total of 49 volunteers dedicated 1,793 hours to this project during 2015 (Table 10). Volunteers included students, graduates and employees of Vancouver Island University as well as members

of the community. Volunteers are recognized by name in the Acknowledgements section of this report.

Table 10. Number of volunteers and hours volunteered for the bird monitoring and banding project at Buttertubs West Marsh during 2015.

Volunteer Grouping	Number of Volunteers	Hours on Project
VIU students	27	929
VIU graduates	7	287
VIU employees	3	413
Community volunteers	12	164
TOTAL	49	1,793

Volunteer training was conducted by Dr. Eric Demers and Kim Wetten, with assistance from numerous already trained volunteers. Volunteers received training in bird banding and monitoring activities, and contributed to the processing of birds captured as part of this project (Table 11).

5. Public Demonstrations and Education

Public demonstrations and education are also main objectives of this project. This is achieved through public presentations about the project, through guided on-site visits by individual guests and groups, and off-site public demonstrations. The following public demonstrations and education events were conducted in 2015:

- On-site demonstration to over 50 individual visitors and guests. This included the following groups: Nanoose Naturalists (18 April), Nanaimo Wildbird and Nature Store Sunday Bird Walk (26 April), Cowichan Secondary School (6 May), Probus Club of Nanaimo (5 June), and Nanaimo Community Class (3 October).
- On-site training for 16 students in the VIU BIOL 325 Ornithology course (17 September, 1 and 22 October).
- Off-site public demonstrations at the VIU Deep Bay Marine Field Station (12 April), and the Nanaimo Science and Sustainability (NS3) Kids Camps (10, 17 July).
- Off-site public presentations for the following groups: Nanoose Naturalists (April 9), Probus Club of Nanaimo (13 October), and City of Nanaimo Advisory Committee on Environmental Sustainability (14 October).
- Poster presentation at the Western Bird Banding Association annual meeting in Burnaby, BC (4-6 September).

Table 11. Volunteers (by bander code) who participated in the processing of birds captured as part of the bird monitoring and banding project at Buttertubs West Marsh during 2015. The numbers listed include birds processed as part of regular bird banding and swallow nest box monitoring.

Bander Code	Number of Birds Processed		
	Banded	Recaptures	Total
ALHA	6	1	7
ALLA	4	1	5
BIFR	3	4	7
CANG	58	17	75
CASM	7	5	12
DABA	9	5	14
DAGU	6	3	9
DAWA	1	0	1
DECA	2	0	2
DEJO	79	34	113
DELE	8	1	9
ELHA	152	64	216
EMRA	1	1	2
ERDE	153	60	213
ERFR	13	4	17
GABE	99	37	136
GEDU	21	11	32
HACA	31	8	39
HARU	5	1	6
HEVA	49	18	67
HEWA	12	5	17
HIBL	6	2	8
HIKI	64	32	96
JAKM	5	1	6
JAME	4	4	8
JEKA	38	14	52
KAOV	38	8	46
KIWE	88	53	141
KRBA	21	3	24
KURE	48	23	71
MADI	6	1	7
MAHA	3	0	3
MILE	7	7	14
NIRE	84	40	124
PAMU	16	2	18
RAGR	26	10	36
RESH	15	8	23
SACH	59	20	79
SHJA	22	11	33
SHRE	131	27	158
STPE	6	1	7
STWE	31	9	40
TARI	5	1	6
TASE	8	1	9
TAST	1	4	5
WESI	3	4	7
TOTAL	1,454	566	2,020

6. Acknowledgements

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Bird banding activities were conducted in accordance with Vancouver Island University Animal Use Protocol No. 2012-10-R and VIU Standard Operating Procedure No. ACC-010 and ACC-011, and in accordance with Canadian Wildlife Service Bird Banding Office Scientific Permit No. 10720D / 10885 (Eric Demers) and 10885A (Kim Wetten) to capture and band migratory birds, including authorization to use mist nets for the capture of passerines and other landbirds.

7. References

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8. Appendix

Table A.1. List of all species captured in mist nets at Buttertubs West Marsh during 2015. Subspecies are included in parentheses where applicable.

Common Name	Number banded	Number recaptured	Total number captured
Common Yellowthroat	191	113	304
Song Sparrow	98	109	207
Spotted Towhee	88	49	137
American Robin	104	26	130
Orange-crowned Warbler	110	11	121
Bushtit	79	35	114
Chestnut-backed Chickadee	53	59	112
Lincoln's Sparrow	67	12	79
Dark-eyed Junco (Oregon)	59	11	70
Bewick's Wren	32	33	65
Purple Finch	52	3	55
Yellow Warbler	36	13	49
Savannah Sparrow	43	1	44
Fox Sparrow	31	8	39
Marsh Wren	23	13	36
Ruby-crowned Kinglet	27	5	32
Swainson's Thrush	19	9	28
Golden-crowned Sparrow	26	2	28
Yellow-rumped Warbler (Myrtle)	26	0	26
Willow Flycatcher	20	2	22
Tree Swallow	10	9	19
Steller's Jay	14	2	16
Black-headed Grosbeak	8	6	14
Cedar Waxwing	12	1	13
Wilson's Warbler	11	2	13
House Finch	13	0	13
Brown Creeper	6	6	12
Downy Woodpecker	4	7	11
Warbling Vireo	11	0	11
MacGillivray's Warbler	10	0	10
Hermit Thrush	8	1	9
Chipping Sparrow	9	0	9
Brown-headed Cowbird	5	3	8
Pacific Wren	4	3	7
Yellow-rumped Warbler (Unknown)	6	0	6
Red-winged Blackbird	5	1	6
Pacific-slope Flycatcher	4	1	5
Golden-crowned Kinglet	4	0	4
White-crowned Sparrow (Puget Sound)	4	0	4
American Goldfinch	4	0	4
Red-breasted Sapsucker	3	0	3
Black-throated Gray Warbler	3	0	3
Pine Siskin	3	0	3
Northern Rough-winged Swallow	2	0	2
White-crowned Sparrow (Unknown)	2	0	2
Cooper's Hawk	1	0	1
Virginia Rail	1	0	1
Barred Owl	1	0	1
Northern Flicker (Red-shafted)	1	0	1
Hutton's Vireo	1	0	1
Barn Swallow	1	0	1
Red-breasted Nuthatch	1	0	1
European Starling	1	0	1
Yellow-rumped Warbler (Audubon)	1	0	1
Swamp Sparrow	1	0	1
TOTAL	1,359	556	1,915

Table A.2. (continued)

Date	Cooper's Hawk	Virginia Rail	Barred Owl	Red-breasted Sapsucker	Downy Woodpecker	Northern Flicker	Willow Flycatcher	Pacific-slope Flycatcher	Hutton's Vireo	Warbling Vireo	Steller's Jay	Northern Rough-winged Swallow	Tree Swallow	Barn Swallow	Chestnut-backed Chickadee	Bushtit	Red-breasted Nuthatch	Brown Creeper	Pacific Wren	Marsh Wren	Bewick's Wren	Golden-crowned Kinglet	Ruby-crowned Kinglet	Swainson's Thrush	Hermit Thrush	American Robin	European Starling	Cedar Waxwing	Orange-crowned Warbler	MacGillivray's Warbler	Common Yellowthroat	Yellow Warbler	Yellow-rumped Warbler	Black-throated Gray Warbler	Wilson's Warbler	Chipping Sparrow	Fox Sparrow	Dark-eyed Junco	White-crowned Sparrow	Golden-crowned Sparrow	Savannah Sparrow	Song Sparrow	Lincoln's Sparrow	Swamp Sparrow	Spotted Towhee	Black-headed Grosbeak	Red-winged Blackbird	Brown-headed Cowbird	House Finch	Purple Finch	Pine Siskin	American Goldfinch	Total	
08-Jul				1	1		1	1		1			1	1	1		2	1	2	5			2		10	1	1	4		38	2				1					15		4	1	1	4									102
14-Jul							1	1							1	2	1	2	2				2		1		1			16	1			1	1					1	10		3										47	
21-Jul								1							1	26	2	3	5						4		2		4	13	1				2		2			1	11		7			3						88		
28-Jul				1											1	8		4	5									1		18	3										9		3			3					56			
04-Aug				1			3	1		2					4	1			5	6			1		3					21										1	4		3			1	2				59			
06-Aug							2			2					1	1			2	2					1		1		1	8	2									1	6					8	4	1			44			
11-Aug															6					1			2		3					7	3									5		3			3	2				35				
18-Aug							4			2					1	4				1			1		2			4	1	8											3	3		2				1		38				
25-Aug				1			3			2					17				3				2		2				7	1		1								6	13		2			4				64				
27-Aug							4			1					15	5	1	1			1		4		3					7	5						3			7	4		2			1			64					
01-Sep				1			3			1					10	3			3	1			2		2		2	5		6	2		1							10	9	11		2			16				90			
12-Sep				1							1					1							1		7			2		4										2	2	5		4			1			32				
17-Sep						1				2					1	4				1			1		12			3	4	2						1				1	9	3	5			5				56				
27-Sep	1	1								5					9	4		1	1						2			2	5	1						5	4				2	3		14						60				
01-Oct				2						2					2				2	3	2				4					2	16								1	1	7	1	16							69				
03-Oct										1					1	10		1	1						8		1	1		3										3	4		3		6		1			44				
18-Oct									1	2					6	18			1	2	2	6			4																3	26	4	5		16			1		97			
22-Oct										2						6		2	3	2					1																6	1	1	9			1			47				
31-Oct										1													2																					1						5				
Total	1	1	1	3	11	1	22	5	1	11	16	2	19	1	112	114	1	12	7	36	65	4	32	28	9	130	1	13	121	10	304	49	33	3	13	9	39	70	6	28	44	207	79	1	137	14	6	8	13	55	3	4	1,915	

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Table A.3. List of all species observed at Buttertubs West Marsh during 2015 based on a combination of banding totals and incidental observations. Green rectangles indicate that a species was observed during a given time period. The size of the green rectangles represents the proportion of surveys for which a species was detected. Areas in gray checkerboard indicate that no data are available. Data compiled in and extracted from eBird database.

100 species (+1 other taxa)		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Greater White-fronted Goose	MAP												
Brant	MAP												
Canada Goose	MAP												
Trumpeter Swan	MAP												
Wood Duck	MAP												
American Wigeon	MAP												
Mallard	MAP												
Green-winged Teal	MAP												
Bufflehead	MAP												
Hooded Merganser	MAP												
California Quail	MAP												
Pied-billed Grebe	MAP												
Great Blue Heron	MAP												
Turkey Vulture	MAP												
Osprey	MAP												
Northern Harrier	MAP												
Sharp-shinned Hawk	MAP												
Cooper's Hawk	MAP												
Bald Eagle	MAP												
Red-tailed Hawk	MAP												
Virginia Rail	MAP												
Killdeer	MAP												
Wilson's Snipe	MAP												
Glaucous-winged Gull	MAP												
gull sp.	MAP												
Rock Pigeon	MAP												
Band-tailed Pigeon	MAP												
Eurasian Collared-Dove	MAP												
Barred Owl	MAP												
Black Swift	MAP												
Vaux's Swift	MAP												
Anna's Hummingbird	MAP												
Rufous Hummingbird	MAP												
Belted Kingfisher	MAP												

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Table A.3. (continued)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Red-breasted Sapsucker (MAP)												
Downy Woodpecker (MAP)												
Hairy Woodpecker (MAP)												
Northern Flicker (MAP)												
Pileated Woodpecker (MAP)												
American Kestrel (MAP)												
Merlin (MAP)												
Peregrine Falcon (MAP)												
Willow Flycatcher (MAP)												
Hammond's Flycatcher (MAP)												
Pacific-slope Flycatcher (MAP)												
Northern Shrike (MAP)												
Cassin's Vireo (MAP)												
Hutton's Vireo (MAP)												
Warbling Vireo (MAP)												
Steller's Jay (MAP)												
Northwestern Crow (MAP)												
Common Raven (MAP)												
Northern Rough-winged Swallow (MAP)												
Purple Martin (MAP)												
Tree Swallow (MAP)												
Violet-green Swallow (MAP)												
Barn Swallow (MAP)												
Chestnut-backed Chickadee (MAP)												
Bushtit (MAP)												
Red-breasted Nuthatch (MAP)												
Brown Creeper (MAP)												
Pacific Wren (MAP)												
Marsh Wren (MAP)												
Bewick's Wren (MAP)												
Golden-crowned Kinglet (MAP)												
Ruby-crowned Kinglet (MAP)												
Swainson's Thrush (MAP)												
Hermit Thrush (MAP)												
American Robin (MAP)												
Varied Thrush (MAP)												
European Starling (MAP)												
Cedar Waxwing (MAP)												
Orange-crowned Warbler (MAP)												
MacGillivray's Warbler (MAP)												
Common Yellowthroat (MAP)												

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Table A.3. (continued)

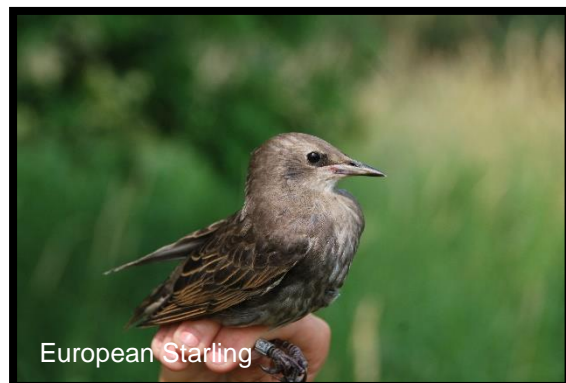
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Yellow Warbler (MAP)				■	■	■	■	■	■	■	■	
Yellow-rumped Warbler (MAP)			■	■	■	■			■	■		
Black-throated Gray Warbler (MAP)				■				■	■			
Wilson's Warbler (MAP)				■	■	■	■	■	■			
Chipping Sparrow (MAP)						■	■					
Fox Sparrow (MAP)	■	■	■	■	■				■	■	■	■
Dark-eyed Junco (MAP)	■	■	■	■	■				■	■	■	■
White-crowned Sparrow (MAP)				■	■		■	■				
Golden-crowned Sparrow (MAP)	■	■	■	■	■				■	■	■	■
Savannah Sparrow (MAP)				■	■	■	■	■	■	■		
Song Sparrow (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
Lincoln's Sparrow (MAP)				■	■			■	■	■		■
Swamp Sparrow (MAP)											■	
Spotted Towhee (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
Western Tanager (MAP)					■		■	■				
Black-headed Grosbeak (MAP)				■	■	■	■					
Red-winged Blackbird (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
Brewer's Blackbird (MAP)				■	■	■	■	■	■			
Brown-headed Cowbird (MAP)				■	■	■	■					
Bullock's Oriole (MAP)				■	■							
House Finch (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
Purple Finch (MAP)			■	■	■	■	■	■	■	■		
Red Crossbill (MAP)					■							
Pine Siskin (MAP)	■	■	■	■	■	■	■			■	■	■
American Goldfinch (MAP)				■	■	■	■	■	■	■		
Evening Grosbeak (MAP)							■					

Photos A.1. Sample photographs for the VIU Bird Monitoring and Banding Project at Buttertubs West Marsh during 2015. Photos courtesy of E. Demers.

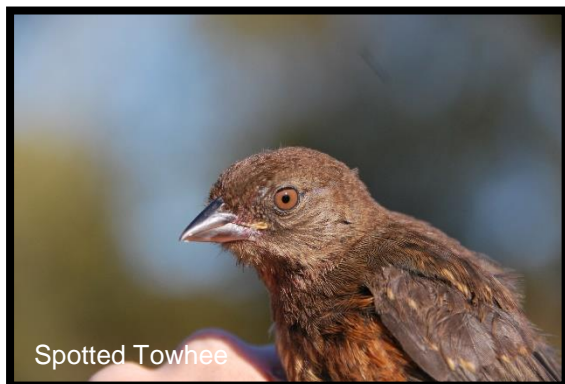


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Photos A.1. (continued)



Photos A.1. (continued)



Photos A.1. (continued)

