

DATA REPORT

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

2014



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10 November 2014

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Disclaimer Note:

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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).

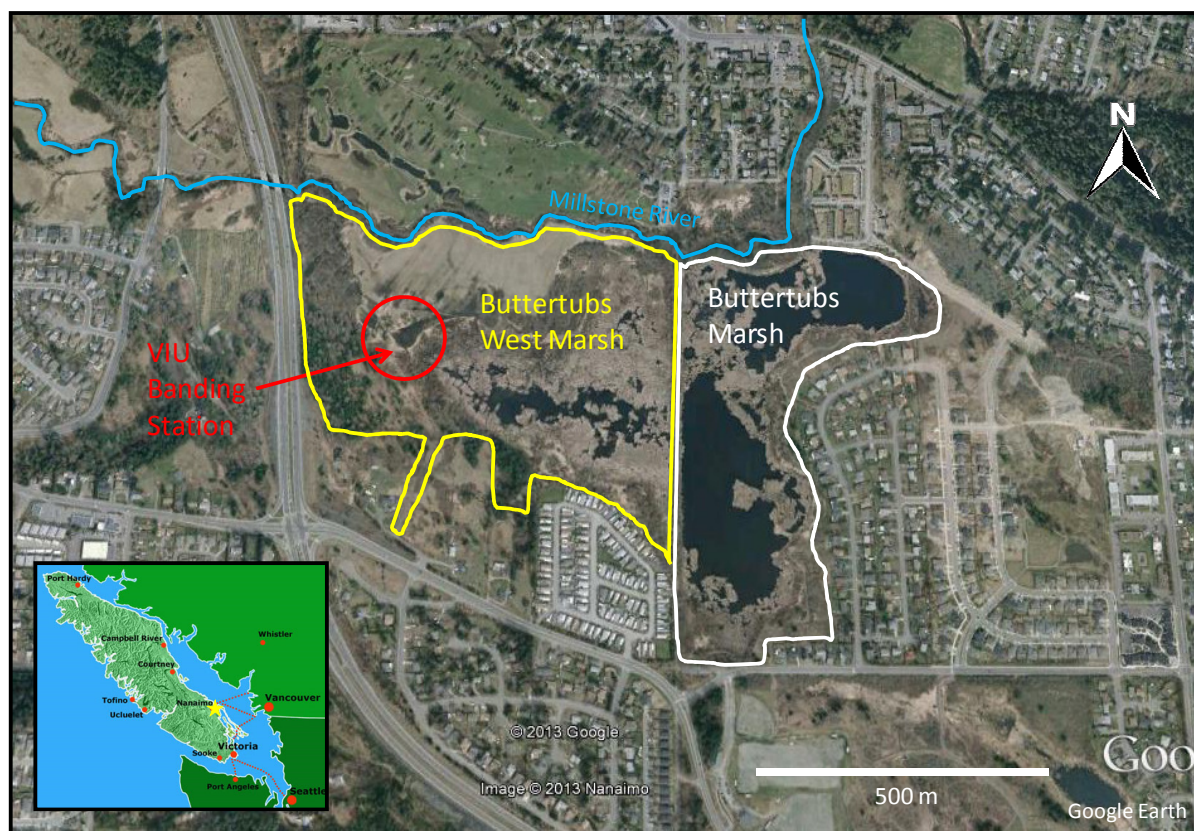


Figure 1. Aerial photograph of the Buttertubs West Marsh in Nanaimo, BC, including the location of the Vancouver Island University (VIU) bird monitoring and banding project.

Since 2013, Vancouver Island University 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 close collaboration with the Vancouver Avian Research Centre, which operates a bird monitoring and banding station at Colony Farm Regional Park, in Coquitlam, BC, and in partnership with the City of Nanaimo and Ducks Unlimited Canada.

This report summarizes the activities and results of this project during 2014. 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, 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 April and October 2014, 17 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*). Two nets (no. R1-R2) were located in riparian habitat along the Millstone River consisting of Nootka rose (*Rosa nutkana*), hardhack, salmonberry and Himalayan blackberry.

Nets were installed in stages with 15 nets installed in early April (nets 1-15), and two nets installed in early September (nets R1-R2). In addition, net no. 1 was modified in mid-August by adding another net above the existing net. The resulting double-stacked nets 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. Net no. 15 was removed during early October when it was severely damaged by an unknown animal (likely a deer).

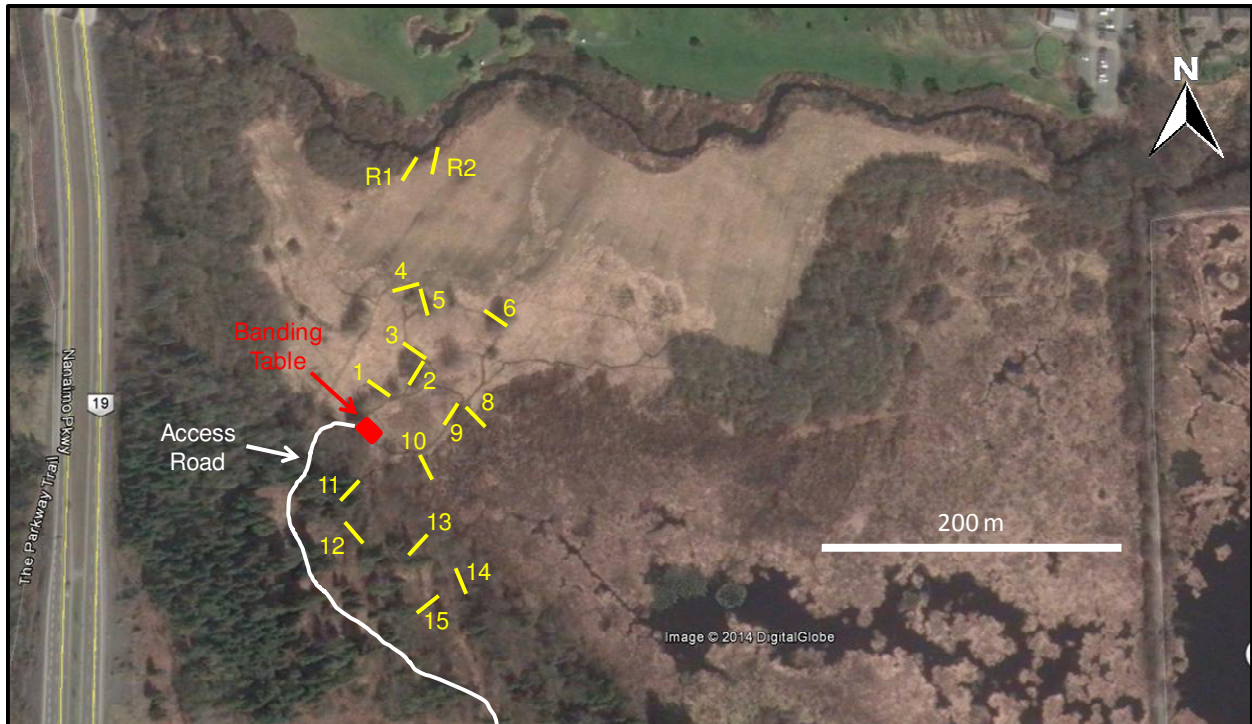


Figure 2. Locations of mist nets and banding table used for songbird banding at Buttertubs West Marsh during April-October 2014. Note that many nets were renumbered in 2014.

Bird banding activities were conducted 1-3 days each week between 12 April and 26 October 2014. 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 to the number of species and individuals present at the site.

2.2. Results

2.2.1. *Songbird banding*

Songbird banding activities were conducted during 56 days between 12 April and 26 October 2014, with a total mist netting effort of 4,960 hours (average: 88.6 net hours / day) (Table 1). A total of 1,866 birds were caught from 46 species. Of these, 1,212 birds were banded and 654 birds (35.0%) were recaptures of previously banded birds. An additional 118 birds were captured and released unbanded (primarily hummingbirds). The average capture rate in 2014 was 37.6 birds / 100 net-hours.

Although capture effort and total number of birds captured were higher in 2014, the average capture rate was 26% lower than in 2013. This reduction in capture rate was partly due to a change in daily netting effort in 2014, which was maintained near 6 hours during each banding day. In 2013, daily netting effort was often less than 6 hours (average: 57.1 net hours / day) and focussed during the earlier part of the day, when capture rate tends to be higher, which likely resulted in inflated capture rates. Additional reasons for the decrease in catch rate may include inter-annual variation in habitat use, breeding success and weather. The total number of species captured was also slightly lower in 2014 (46 species) than in 2013 (49 species).

Table 1. Mist net capture statistics at Buttertubs West Marsh during 2013 and 2014.

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

Capture rates generally increased between April and October 2014 (Figure 4). 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 August and October. Capture rates were generally comparable between years during April to July, but differed greatly during August to October. The effect of fall migration on capture rates was not as great in 2014 as it was during 2013.

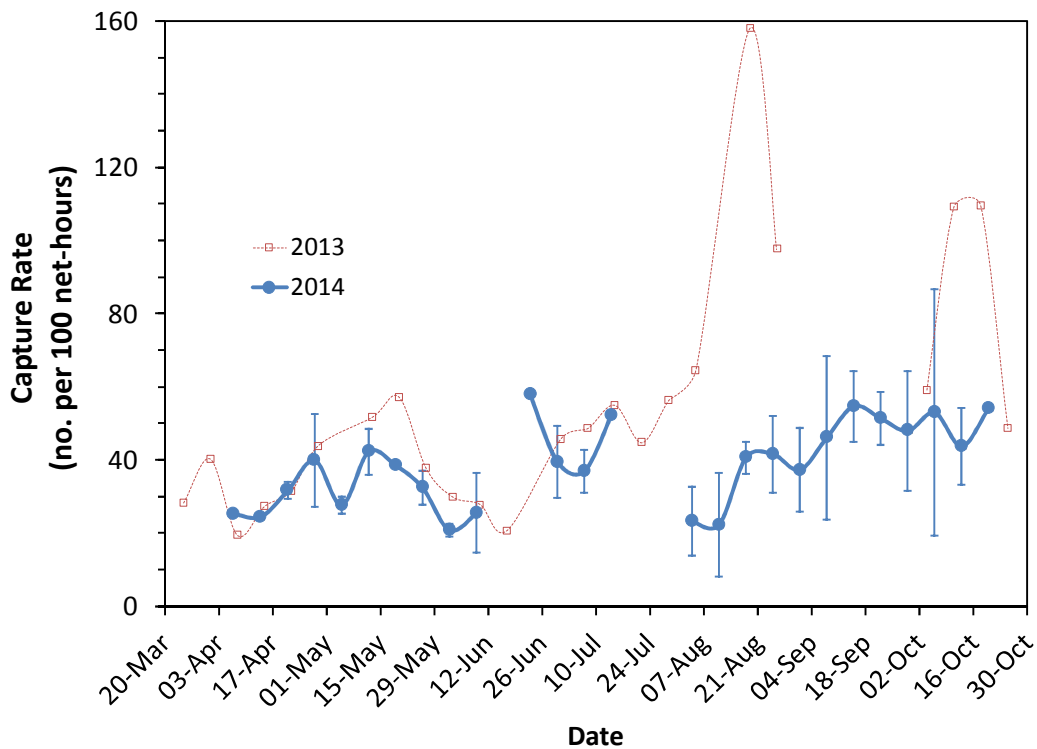


Figure 3. Average weekly capture rate (± 1 standard deviation) in mist nets at Buttertubs West Marsh during 2013 and 2014. Error bars are only shown for 2014.

The capture rate of mist nets varied across the project site (Table 2). Overall, capture rates were higher for nets located in the old-field (i.e., nets 1-10) and riparian (i.e., nets R1-R2) habitats than for nets located in the upland forest habitat (i.e., nets 11-15). Note that the riparian nets were only used during September and October when more birds are expected to be present, resulting in inflated catch rates when compared to other nets.

Overall, Common Yellowthroat (*Geothlypis trichas*) was the most captured species and represented 16.7% of all birds caught during 2014 (Table 3). Song sparrow (*Melospiza melodia*) was the next most common species and accounted for 15.0% of all birds caught. Bushtit (*Psaltriparus minimus*) was the third most common species and this species was often captured in groups of 5-10 individuals from actively foraging flocks. All species listed in Table 2 are local breeders at Buttertubs Marsh, with the exception of Lincoln's Sparrow (*M. lincolnii*).

Tables A.1 and A.2 in Appendix provide a complete summary of all species captured during 2014.

Table 2. Capture statistics by net at Buttertubs West Marsh during April-October 2014.

Net Number	Date Installed	Number Banded	Number Recaptured	Total Number Captured	Net Hours	Capture Rate (Birds / 100 Net hours)
1	5 April	78	29	107	315	34.0
1A	13 August	35	30	65	136	47.8
2	5 April	80	42	122	315	38.7
3	5 April	50	26	76	315	24.1
4	5 April	44	22	66	309	21.4
5	5 April	50	35	85	315	27.0
6	5 April	60	43	103	315	32.7
7	5 April	80	34	114	315	36.2
8	5 April	154	43	197	315	62.5
9	5 April	71	57	128	315	40.6
10	5 April	130	64	194	315	61.6
11	5 April	72	31	103	314	32.8
12	5 April	37	26	63	307	20.5
13	5 April	41	36	77	307	25.1
14	5 April	58	46	104	307	33.9
15	5 April	29	32	61	270	22.6
R1	5 September	68	37	105	89	118.0
R2	5 September	75	21	96	89	107.9
Totals		1,212	654	1,866	4,960	37.6

The rankings for the top ten species captured during 2014 were similar to 2013, with a few exceptions (Table 4). The ranking for Marsh Wren (*Cistothorus palustris*) decreased from the fifth most captured species in 2013 to eleventh in 2014. Lincoln's Sparrow and Purple Finch (*Carpodacus purpureus*) were among the ten most captured species in 2014, but not in 2013.

New species in 2014 included Virginia Rail (*Rallus limicola*), Northern Flicker (*Colaptes auratus*), Hammond's Flycatcher (*Empidonax hammondii*), Red-eyed Vireo (*Vireo olivaceus*) and Black-throated Gray Warbler (*Setophaga nigrescens*). Also of note in 2014 were increases in the number of captures of Steller's Jay (*Cyanocitta stelleri*), Golden-crowned Kinglet (*Regulus satrapa*), Savannah Sparrow (*Passerculus sandwichensis*) and Golden-crowned Sparrow (*Zonotrichia atricapilla*) compared with 2013 (not shown). Only one Red-winged

Blackbird (*Agelaius phoeniceus*) was caught in 2014, even though this species is commonly observed at Buttertubs West Marsh.

Table 3. Fifteen most common species captured in mist nets at Buttertubs West Marsh during April-October 2014.

Common Name	Number Banded	Number Recaptured	Total Number Captured
Common Yellowthroat	126	184	310
Song Sparrow	124	155	279
Bushtit	88	60	148
American Robin	88	26	114
Chestnut-backed Chickadee	46	61	107
Orange-crowned Warbler	88	11	99
Spotted Towhee	71	24	95
Lincoln's Sparrow	73	13	86
Bewick's Wren	36	39	75
Purple Finch	40	6	46
Marsh Wren	27	16	43
Swainson's Thrush	27	13	40
Oregon Junco	30	8	38
Yellow Warbler	33	2	35
Savannah Sparrow	26	0	26

Table 4. Number captured and rank (in parentheses) of the ten species most captured in mist nets at Buttertubs West Marsh during 2013 and 2014.

Common Name	2013	2014
Common Yellowthroat	493 (1)	310 (1)
Song Sparrow	290 (2)	279 (2)
Bushtit	91 (3)	148 (3)
American Robin	88 (4)	114 (4)
Chestnut-backed Chickadee	74 (6)	107 (5)
Orange-crowned Warbler	61 (7)	99 (6)
Spotted Towhee	57(8)	95 (7)
Lincoln's Sparrow	23 (13)	86 (8)
Bewick's Wren	55 (9)	75 (9)
Purple Finch	21 (14)	46 (10)

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 molt that occurs after the breeding season (Table 5). Second-year birds (hatched in 2013) were the dominant age group between April and May, while hatch-year birds (hatched in 2014) were the dominant age group between June and October. Overall, 61.3% of birds banded were birds hatched in 2014.

Table 5. Age structure of birds banded at Buttertubs West Marsh during April-October 2014.

Month	Hatch Year (HY)	Second Year (SY)	After Hatch Year (AHY)	After Second Year (ASY)	Other Ages	Total
April	0	30	4	13	1	48
May	12	88	16	39	1	156
June	41	23	16	14	0	94
July	136	25	13	8	1	183
August	194	6	28	1	6	235
September	234	1	68	1	21	325
October	126	0	19	1	25	171
TOTAL	743	173	164	77	55	1,212

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 (69.1%) did not display any visible fat (fat score = 0).

Table 6. Fat score of birds banded at Buttertubs West Marsh during April-October 2014.

Month	0	1-2	3-5	Total
April	21	17	9	47
May	76	51	22	149
June	82	11	1	94
July	155	26	0	181
August	184	46	4	234
September	195	99	24	318
October	109	49	8	166
TOTAL	822	299	68	1,189

The 654 recapture events reported in this project involved 337 banded birds (Table 7), of which 149 and 188 individuals were originally banded in 2013 and 2014, respectively. Overall, 13.2% of individuals banded in 2013 were recaptured in 2014, and 15.5% of individuals banded in 2014 were recaptured in 2014. For Song Sparrow, Chestnut-backed Chickadee and Bewick's Wren, at least one out of five banded individuals (i.e., >20%) were recaptured between years and within 2014. Of the 250 Common Yellowthroat banded in 2013 (not shown), 46 (18.4%) individuals were recaptured in 2014. 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 2014 but were not recaptured.

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

Species	Banded in 2013		Banded in 2014	
	Number	%	Number	%
Common Yellowthroat	46	18.4	18	14.3
Song Sparrow	31	20.7	33	26.6
Bushtit	9	12.0	32	36.4
Chestnut-backed Chickadee	19	35.2	22	47.8
Bewick's Wren	7	22.6	12	33.3
Spotted Towhee	5	10.9	12	16.9
All species	149	13.2	188	15.5

Most recapture events involved birds that were recaptured only once during 2014. However, 285 individuals were recaptured more than once, and at least 35 individuals were recaptured 5 or more times. These frequently recaptured individuals are listed in Table 8. This included a Song Sparrow and a Common Yellowthroat which were recaptured 20 and 17 times since their original banding date, respectively.

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 99 species were observed at Buttertubs West Marsh between January and October 2014 (Table A.2 in Appendix).

Table 8. List of selected individuals recaptured six or more times at Buttertubs West Marsh during 2013 and 2014.

Band Number	Species	Age	Sex	Number of Times Recaptured Since Banded	Date Banded	Date of Last Recapture
0942-98712	AMRO	ASY	Male	9	17 Apr. 2013	10 Jun. 2014
0942-98768	AMRO	SY	Male	6	8 Aug. 2013	3 Jun. 2014
2581-70120	SOSP	ASY	Male	13	25 Mar. 2013	11 Oct. 2014
2581-70122	SOSP	ASY	Male	20	26 Mar. 2013	2 Jul. 2014
2581-70277	SOSP	SY	Female	14	1 Aug. 2013	27 Aug. 2014
2521-71296	BEWR	HY	Unknown	8	17 Jul. 2014	26 Oct. 2014
2591-72456	BEWR	SY	Unknown	7	4 Jul. 2013	18 Oct. 2014
2581-70152	SWTH	ASY	Male	7	16 May 2013	28 Jun. 2014
2700-93366	COYE	ASY	Male	13	9 Apr. 2013	6 Sep. 2014
2700-93386	COYE	ASY	Male	17	22 Apr. 2013	4 Sep. 2014
2700-93399	COYE	ASY	Male	14	25 Apr. 2013	2 Jul. 2014
2700-93422	COYE	ASY	Male	13	2 May. 2013	22 Aug. 2014
2700-93568	COYE	ASY	Male	16	16 Jul. 2013	11 Sep. 2014

3. Swallow Nest Box Monitoring

3.1. Methods

Twenty-five nest boxes were installed in the old-field habitat at Buttertubs West Marsh in early March 2014 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 each nest box 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 1 May and 11 July 2014. 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, assessed for age, sex, fat score and biometrics (wing chord, tail length, weight), and released.



Figure 4. Locations of the twenty-five swallow nest box at Buttertubs West Marsh during May-July 2014.

3.2. Results

Twelve of the twenty-five nest boxes were occupied by Tree Swallows (*Tachycineta bicolor*) and had signs of nest building activities (Table 9). One nest box was occupied by Violet-green Swallows (*T. thalassina*). Clutches of 2-6 eggs were eventually laid in 12 nest boxes.

Of the 19 adult Tree Swallows that were captured, 4 individuals were recaptures from 2013. Interestingly, the same pair that occupied nest box 8 during 2013 nested in nest box 14 during 2014. This pair successfully produced 4 fledglings during both years. The other two individuals banded in 2013 did not nest at Buttertubs West Marsh during 2014. None of the nestlings banded in 2013 were captured in 2014.

Out of 59 eggs laid in all nest boxes, 46 eggs hatched (hatching success: 78%) and 30 young birds fledged (fledgling success: 51%). Fledgling success was highly variable between nest boxes, with some boxes fledging no young while others fledged up to 5 young. The average fledgling rate for the entire nest box colony was 2.5 young per nesting pair.

Incidental observations suggested that many of the nestlings that did not fledge were infested with botflies. By comparison, no botflies were observed during 2013. The contribution of botflies to nestling death is not known, but could be evaluated in future years.

Table 9. Results of nest box monitoring at Buttertubs West Marsh during May-July 2014. Note: Nest box no. 16 was occupied by Violet-green Swallows.

Nest Box	Nest Building	Number of Eggs	Complete Clutch Date	Mean Hatch Date	Number Fledged	Individuals Banded
1	No	0				
2	Yes	0				
3	No	0				
4	No	0				
5	Yes	4	25 May	9 June	0	All nestlings, female only
6	No	0				
7	Yes	5	16 May	30 May	4	All nestlings, both adults
8	Yes	5	19 May	2 June	4	All nestlings, both adults
9	No	0				
10	No	0				
11	Yes	6	16 May	30 May	6	All nestlings, both adults
12	No	0				
13	No	0				
14	Yes	5	16 May	30 May	4	All nestlings, both adults
15	Yes	2	24 June	8 July	0	All nestlings, female only
16	Yes	5	30 May	Did not hatch	0	
17	No	0				
18	No	0				
19	Yes	5	27 June	11 July	3	All nestlings, both adults
20	Yes	5	4 June	Did not hatch	0	Female only
21	No	0				
22	Yes	6	16 May	30 May	2	All nestlings, both adults
23	Yes	5	16 May	30 May	3	All nestlings, both adults
24	Yes	6	20 May	4 June	5	All nestlings, both adults
25	No	0				
Total		59			30	

4. Volunteer Effort and Training

As stated above, one of the main objectives of this project was to provide practical educational and training opportunities for Vancouver Island University students and community volunteers.

Indeed, this project was 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 37 volunteers dedicated 1,825 hours to this project during 2014 (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 April-October 2014.

Volunteer Grouping	Number of Volunteers	Hours on Project
VIU students	21	705
VIU graduates	11	323
VIU employees	2	535
Community volunteers	3	262
TOTAL	37	1,825

Volunteer training was conducted by Dr. Eric Demers (Bander-in-Charge). Thirty-three volunteers received training in bird banding and monitoring activities, and contributed to the processing of birds captured as part of this project (Table 11).

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 April-October 2014. 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
ALWI	5	6	11
ALZI	2	3	5
BLDU	14	5	19
CAWA	5	1	6
DEBW	19	4	23
ELHA	66	33	99
EMTR	9	3	12
ERDE	117	74	191
GABE	87	47	134
GEDU	319	149	468
HACA	19	13	32
HEVA	77	32	109
HEWA	64	18	82
HIKI	66	37	103
JAME	12	7	19
KIWE	13	11	24
LEWA	2	0	2
LYPA	2	0	2
MADI	0	1	1
MEMO	63	43	106
PAGR	3	3	6
PAMU	11	10	21
RAGR	11	10	21
RESH	87	48	135
RYAB	2	1	3
RYCA	1	2	3
SACH	61	31	92
SHJA	94	48	142
TARI	5	10	15
TRBA	11	5	16
TRDO	9	10	19
WESI	1	1	2
WYTA	5	0	5
TOTAL	1,262	666	1,928

5. Public Demonstrations and Education

Public demonstrations and education were also main objectives of this project. This was 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 between January and October 2014:

- On-site demonstration to over 35 individual visitors and guests, many of which subsequently became project volunteers.
- Presentation to the Advisory Committee on Environmental Sustainability, City of Nanaimo (14 April).
- Off-site public demonstrations at Milner Gardens & Woodland, Qualicum Beach (15 July, 12 August).
- Off-site public demonstrations for the Nanaimo Science and Sustainability (NS3) Kids Camps, VIU Nanaimo Campus (8, 14 August).

6. Acknowledgements

This project would not have been possible without a dedicated group of volunteers, contributors and partners (any omission is unintended): R. Abbott, M. Angelstad, G. Ball, T. Barrington, K. Barry, G. Beisel, K. Bortolin, S. Bowering, D. Buffett, C. Butterworth, R. Cannings, H. Carolsfeld, R. Cathers, S. Chalmers, T. Davis, L. Demattia, E. Demers, M. Dietterle, T. Douglas, B. Dudeck, G. Duncan, S. Fraser, L. Gillis, P. Greig, R. Greiter, J. Hall, A. Hampshire, E. Hampshire, R. Harding, S. James, H. Kimura, G. Klimes, C. Matthews, D. Matthews, J. Melvin, B. Merrilees, M. Morgan, P. Musto, R. Nilson, L. Parker, M. Paskevicius, O. Peer, T. Ridgway, O. Roscow, C. Seibert, R. Shelling, W. Simms, W. Taylor, E. Tranfield, L. Ware, H. Wathen, C. Watson, K. Wetten, D. Wheeler, J. Whitelaw, A. Wilschut, A. Zimich, and H. van Vliet.

This project was conducted as a close partnership with the Vancouver Avian Research Centre and under the guidance of Master Bander Derek Matthews.

Vancouver Island University, the City of Nanaimo, the Nanaimo Parks, Recreation and Culture Commission, Ducks Unlimited Canada, Milner Gardens & Woodland, the Nanaimo and Sustainability Society (NS3) and the Backyard Wildbird and Nature Store are acknowledged for their support of this project.

Funding was provided by the Vancouver Island University Research Awards Committee Research Fund, the Andy Spencer Bamfield Research Fellowship, the VIU Travel & Conference Fund, the VIU Work-Opportunities program and the VIU employee Professional Development Fund.

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 (Eric Demers) and 10720 (Derek Matthews) to capture and band migratory birds, including authorization to use mist nets for the capture of passerines, other landbirds, Northern Saw-whet Owl and hummingbirds (Debbie Wheeler).

7. References

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8. Appendix

Table A.1. List of all species captured in mist nets at Buttertubs West Marsh during April-October 2014. Subspecies are included in parentheses where applicable.

Common Name	Number banded	Number recaptured	Total number captured
Common Yellowthroat	126	184	310
Song Sparrow	124	155	279
Bushtit	88	60	148
American Robin	88	26	114
Chestnut-backed Chickadee	46	61	107
Orange-crowned Warbler	88	11	99
Spotted Towhee	71	24	95
Lincoln's Sparrow	73	13	86
Bewick's Wren	36	39	75
Purple Finch	40	6	46
Marsh Wren	27	16	43
Swainson's Thrush	27	13	40
Dark-eyed Junco (Oregon)	30	8	38
Yellow Warbler	33	2	35
Savannah Sparrow	26	0	26
Fox Sparrow	19	4	23
Ruby-crowned Kinglet	22	0	22
Brown-headed Cowbird	12	9	21
Steller's Jay	19	2	21
Wilson's Warbler	20	0	20
Brown Creeper	13	6	19
Yellow-rumped Warbler (Myrtle, Audubon)	19	0	19
Golden-crowned Kinglet	16	2	18
Downy Woodpecker	13	4	17
Golden-crowned Sparrow	17	0	17
Cedar Waxwing	15	0	15
House Finch	14	0	14
Warbling Vireo	13	0	13
Willow Flycatcher	11	0	11
Hermit Thrush	11	0	11
Tree Swallow	5	3	8
MacGillivray's Warbler	8	0	8
Pacific Wren	7	1	8
Black-headed Grosbeak	5	2	7
Red-breasted Sapsucker	6	1	7
White-crowned Sparrow (Puget Sound)	6	0	6
American Goldfinch	3	1	4
Pacific-slope Flycatcher	4	0	4
Hammond's Flycatcher	3	0	3
Black-throated Gray Warbler	2	0	2
Northern Flicker (Red-shafted)	2	0	2
Red-winged Blackbird	1	0	1
Chipping Sparrow	1	0	1
Hairy Woodpecker	0	1	1
Red-eyed Vireo	1	0	1
Virginia Rail	1	0	1
TOTAL	1,212	654	1,866

Table A.2. (continued)

Date	Virginia Rail	Red-breasted Sapsucker	Downy Woodpecker	Hairy Woodpecker	Northern Flicker	Willow Flycatcher	Hammond's Flycatcher	Pacific-slope Flycatcher	Warbling Vireo	Red-eyed Vireo	Steller's Jay	Tree Swallow	Chestnut-backed Chickadee	Bush-tit	Brown Creeper	Pacific Wren	Marsh Wren	Bewick's Wren	Golden-crowned Kinglet	Ruby-crowned Kinglet	Swainson's Thrush	Hermit Thrush	American Robin	Cedar Waxwing	Orange-crowned Warbler	MacGillivray's Warbler	Common Yellowthroat	Yellow Warbler	Yellow-rumped Warbler	Black-throated Gray Warbler	Wilson's Warbler	Spotted Towhee	Chipping Sparrow	Savannah Sparrow	Fox Sparrow	Song Sparrow	Lincoln's Sparrow	White-crowned Sparrow	Golden-crowned Sparrow	Dark-eyed Junco	Black-headed Grosbeak	Red-winged Blackbird	Brown-headed Cowbird	Purple Finch	House Finch	American Goldfinch	Total
02-Jul													4			5	3			2		2		1	11	1					2				6							1	2	2		42	
03-Jul						1		1					1	2			1			2		1				10					3				6	1					3	7			39		
05-Jul						1								1	1		1	3						1	1	7					1			4							1	4			26		
08-Jul		2	1					1					1			1		1				1				9					1			9							7	2			36		
10-Jul		1							1				1			2	3			1						9			1	1				8							1			1	29		
12-Jul								1					2		2	4				1				1	7					4			13	1						1		1		38			
17-Jul							1						14				1			3		2			8						1		16					1						47			
07-Aug				1									3	2	3	1						1			4					1	2		5					1			3			3	27		
09-Aug								1					2	1	1					1		2			2					1			3								1			1	15		
13-Aug						1									1	1	3									1							4												11		
15-Aug		1											6	4		2	2					3		1	1	6			2	1			2												31		
20-Aug													6			3	1		3		4			2	1	11			1	1			6	1	1							1				42	
22-Aug									3	1			5	7		1	3					1		1	1	6						4													33		
23-Aug		2				1							2	6		3								1	5	1						2		7	1	1		1				2				35	
25-Aug						1	1						4	3			1			1		1		16	8	1						1		5	3											46	
27-Aug	1					2		1					3	2	1	2	1			3				5	6						1			9	3							2				42	
30-Aug		1						2					2	1	1					2		1				3						1		4	11											29	

(continued on next page)

Table A.2. List of all species observed at Buttertubs West Marsh during January-October 2014 based on a combination of banding totals and incidental observations. Green rectangles indicate that a species was observed during a given time period. Areas in gray checkerboard indicate that no data are available. The size of the green rectangles represents the proportion of surveys for which a species was detected. Data compiled in and extracted from eBird database.

99 species (+0 other taxa)		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Greater White-fronted Goose	MAP												
Canada Goose	MAP												
Wood Duck	MAP												
Gadwall	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												
Sandhill Crane	MAP												
Killdeer	MAP												
Greater Yellowlegs	MAP												
Wilson's Snipe	MAP												
Glaucous-winged Gull	MAP												
Band-tailed Pigeon	MAP												
Eurasian Collared-Dove	MAP												
Great Horned Owl	MAP												
Barred Owl	MAP												
Black Swift	MAP												
Vaux's Swift	MAP												
Anna's Hummingbird	MAP												
Rufous Hummingbird	MAP												
Belted Kingfisher	MAP												
Red-breasted Sapsucker	MAP												
Downy Woodpecker	MAP												
Hairy Woodpecker	MAP												
Northern Flicker	MAP												
Pileated Woodpecker	MAP												

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Table A.2. (continued)

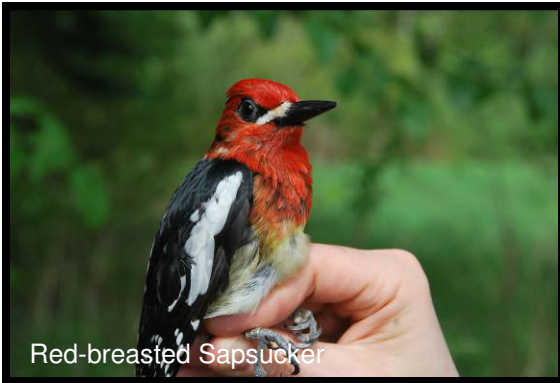
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
American Kestrel	MAP												
Merlin	MAP												
Peregrine Falcon	MAP												
Western Wood-Pewee	MAP												
Willow Flycatcher	MAP												
Hammond's Flycatcher	MAP												
Pacific-slope Flycatcher	MAP												
Hutton's Vireo	MAP												
Warbling Vireo	MAP												
Red-eyed Vireo	MAP												
Steller's Jay	MAP												
Northwestern Crow	MAP												
Common Raven	MAP												
Purple Martin	MAP												
Tree Swallow	MAP												
Violet-green Swallow	MAP												
Barn Swallow	MAP												
Cliff 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												
Yellow Warbler	MAP												
Yellow-rumped Warbler	MAP												
Black-throated Gray Warbler	MAP												
Townsend's Warbler	MAP												
Wilson's Warbler	MAP												

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Table A.2. (continued)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spotted Towhee (MAP)	█	█	█	█	█	█	█	█	█	█	█	█
Chipping Sparrow (MAP)					█	█	█					
Savannah Sparrow (MAP)				█	█	█	█	█	█	█	█	█
Fox Sparrow (MAP)	█	█	█	█	█			█	█	█	█	█
Song Sparrow (MAP)	█	█	█	█	█	█	█	█	█	█	█	█
Lincoln's Sparrow (MAP)				█	█			█	█	█	█	█
White-crowned Sparrow (MAP)			█	█	█	█	█	█	█	█		
Golden-crowned Sparrow (MAP)			█	█	█			█	█	█	█	█
Dark-eyed Junco (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)			█	█	█	█	█	█	█	█		
Pine Siskin (MAP)									█	█		
American Goldfinch (MAP)				█	█	█	█	█	█	█	█	█

Photos A.1. Sample photographs for the VIU Bird Monitoring and Banding Project at Buttertubs Marsh West during 2014. Photos courtesy of E. Demers.



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Photos A.1. (continued)

