

DATA REPORT

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

2016



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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).

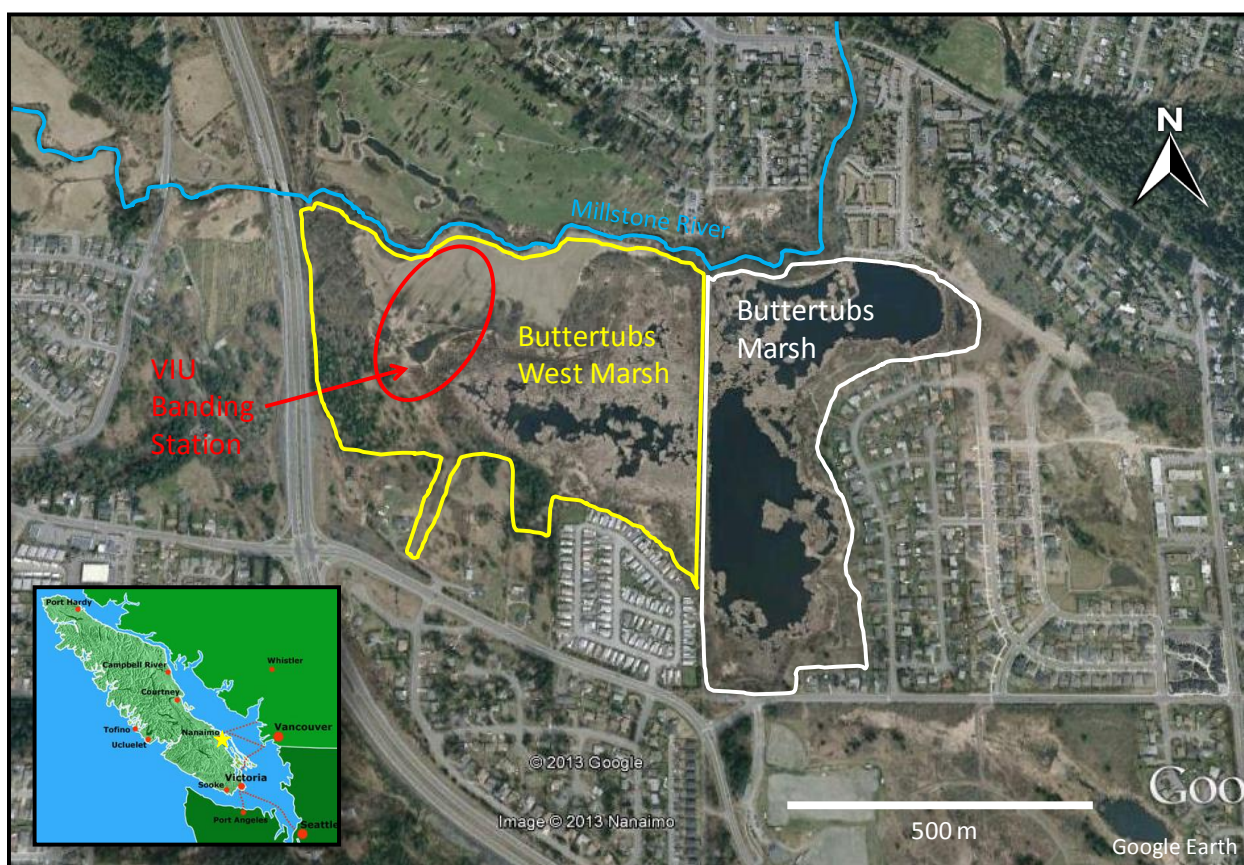


Figure 1. Aerial photograph of the Buttertubs West Marsh in Nanaimo, BC, including the location of the Vancouver Island University (VIU) bird monitoring and banding project.

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 and Ducks Unlimited Canada.

This report summarizes the activities and results of this project during 2016. 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. A new banding shelter was built in February 2016, with funding provided by Ducks Unlimited Canada.

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. 10885 and 10885A, and following procedures and guidance established in the VIU Bird Monitoring and Banding Manual (Demers, 2015), the North American Banding Council (NABC, 2001a,b), and the Institute for Bird Populations (IBP, 2012).

Between March and October 2016, 20 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*). Five nets (nets no. R1-R5) were located in riparian habitat along the Millstone River consisting of Nootka rose (*Rosa nutkana*), hardhack, salmonberry, and Himalayan blackberry.

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.

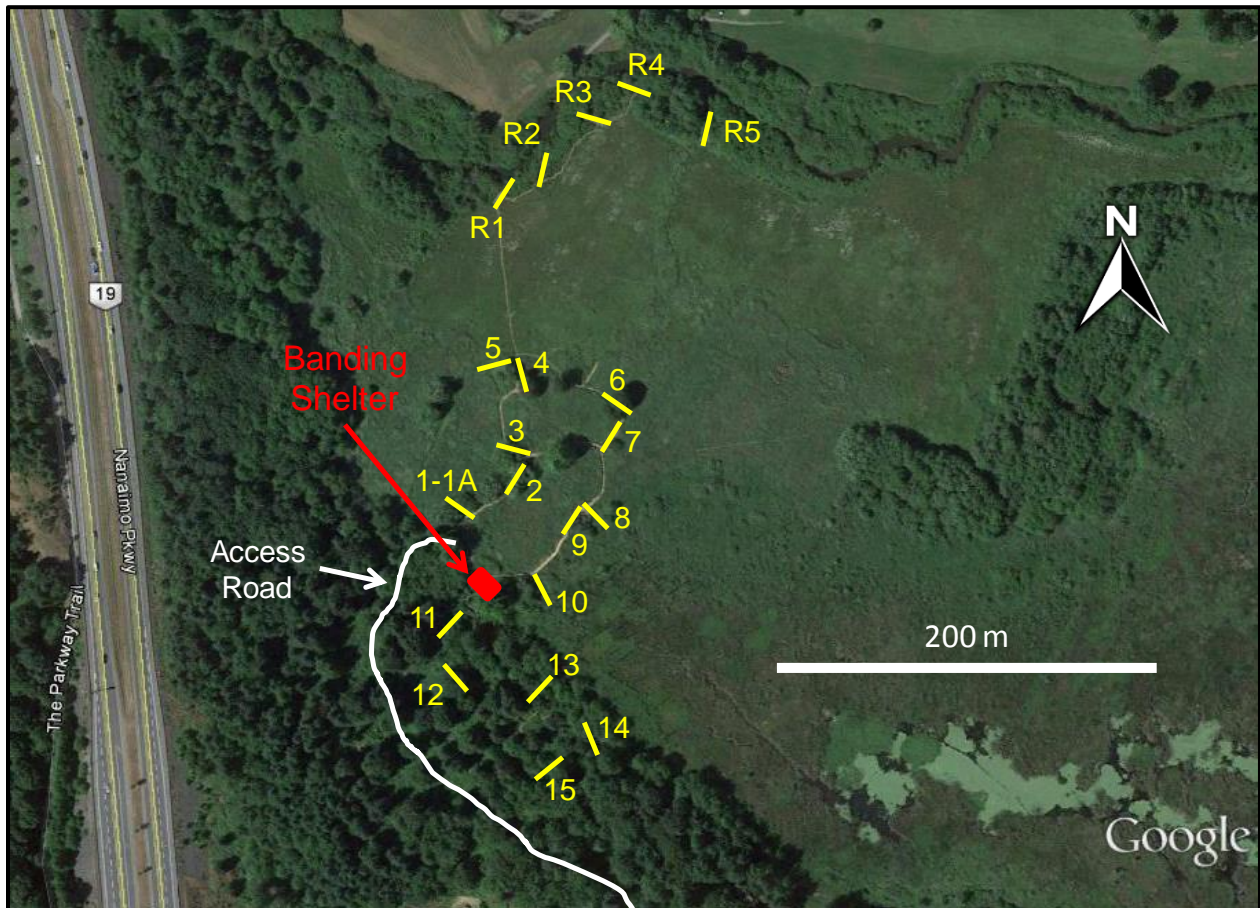


Figure 2. Locations of mist nets and banding shelter used for songbird banding at Buttertubs West Marsh during 2016.

Bird banding activities were conducted 1-3 days most weeks between 18 March and 22 October 2016. 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 shelter. 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 73 days between 18 March and 22 October 2016, with a total mist netting effort of 8,648 hours (average: 118.5 net hours / day) (Table 1). A total of 3,564 birds were caught from 57 species. Of these, 2,352 birds were banded and 1,212 birds (34.0%) were recaptures of previously banded birds. An additional 300 birds were captured and released unbanded (primarily hummingbirds). The average capture rate in 2016 was 41.2 birds / 100 net-hours. Sample photos are available in Photos A.1 in Appendix. Detailed results for the 2013-2015 seasons are provided in Demers (2013a, 2014, 2016).

The total capture effort deployed in 2016 (8,648 net-hours) was almost double the effort used in 2013-2015 (Table 1). This included the addition of a new net in 2016 (net R5). Capture rate in 2016 (41.2 birds per 100 net-hours) similar to the rate observed in 2015, and intermediate compared to 2013 and 2014. Variation in yearly capture rate is partly due to changes in the number of nets used. Additional reasons for the variation in catch rate may include inter-annual variation in habitat use, breeding success, and weather conditions. The total number of species captured was higher in 2016 (57 species) compared to 2013-2015 (49-52 species), which likely resulted from a greater number of banding days that spanned the entire period from March to October.

Table 1. Mist net capture statistics at Buttertubs West Marsh during 2013-2016.

Parameter	Value			
	2013	2014	2015	2016
Capture effort (net-hours)	3,316	4,960	4,358	8,648
Average daily effort (net-hours / day)	57.1	88.6	117.8	118.5
Number of birds banded	1,130	1,212	1,359	2,352
Number of recaptures	560	654	556	1,212
Total	1,690	1,866	1,915	3,564
Recapture rate (%)	33.1	35.0	29.0	34.0
Number of species	49	46	52	57
Capture rate (birds per 100 net-hours)	51.0	37.6	43.9	41.2

Capture rates generally increased between April and October 2016 (Figure 3). Unlike previous years, capture rates during late April and May did not increase significantly in response to the arrival / passage of spring migrants. There was a strong post-breeding dispersal period in late June early July which resulted some of the highest capture rates observed as part of this project (e.g., 132 birds captured on 25 June 2016). Capture rates during fall migration in 2016 (late August to October) were generally comparable to previous years.

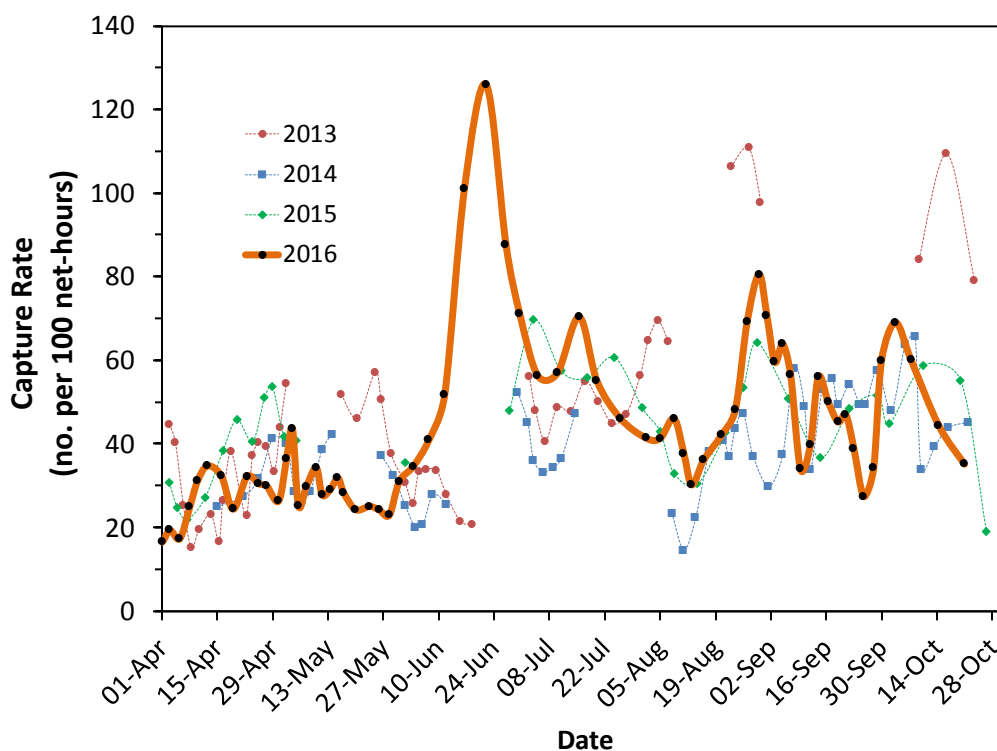


Figure 3. Weekly moving average of capture rate in mist nets at Buttertubs West Marsh during 2013-2016.

The capture rate of mist nets varied across the project site (Table 2). Overall, capture rates were the highest for nets located near the interface between the old-field and marsh habitats (i.e., nets 7, 8, 10), and for nets located in the riparian habitat (i.e., nets R1-R3). This pattern was generally consistent with previous years.

Overall, Common Yellowthroat (*Geothlypis trichas*) was the most captured species and represented 17.0% of all birds caught during 2016 (Table 3). Song sparrow (*Melospiza melodia*) was the next most common species and accounted for 9.8% of all birds caught. These two species have been the most commonly caught species each year since 2013. All species listed in Table 3 are local breeders at Buttertubs Marsh, with the exception of Lincoln's Sparrow (*M. lincolnii*) and Fox Sparrow (*Passerella iliaca*). Tables A.1 and A.2 in Appendix provide a complete summary of all species captured during 2016.

Table 2. Capture statistics by net at Buttertubs West Marsh during 2016.

Net Number	Number Banded	Number Recaptured	Total Number Captured	Net Hours	Capture Rate (Birds / 100 Net hours)
1	88	63	151	404	37.4
1A	89	77	166	403	41.2
2	71	45	116	415	28.0
3	69	49	118	422	28.0
4	103	47	150	414	36.2
5	72	26	98	412	23.8
6	129	55	184	420	43.8
7	130	87	217	410	52.9
8	199	86	285	423	67.4
9	126	54	180	423	42.6
10	129	90	219	420	52.1
11	65	46	111	411	27.0
12	53	50	103	411	25.1
13	52	42	94	403	23.3
14	85	57	142	403	35.2
15	55	39	94	403	23.3
R1	193	79	272	415	65.5
R2	227	54	281	415	67.7
R3	187	69	256	415	61.7
R4	133	51	184	415	44.3
R5	97	46	143	394	36.3
Totals	2,352	1,212	3,564	8,648	---

There were changes in the rankings for the top ten species captured during 2016 (Table 4). The most significant changes were significant increase in captures of Lincoln's Sparrow and Savannah Sparrow (*Passerculus sandwichensis*). Lincoln's Sparrow was the third most captured species in 2016, whereas it was the eight most captured species in 2014 and 2015. Savannah Sparrow was the seventh most captured species in 2016, whereas it was less common and did not feature in the top 10 positions during previous years. The increased captures for these two species since 2013 may in part be related with the advanced succession in the old field habitat (last mowed prior to 2012), which these two species use during spring and fall migration. The ranking for Bushtit (*Psaltriparus minimus*) decreased to the ninth position in 2016.

New species captured at Buttertubs West Marsh in 2016 included Wilson's Snipe (*Gallinago delicata*), Western Wood-Pewee (*Contopus sordidulus*), Cassin's Vireo (*Vireo cassinii*), House

Wren (*Troglodytes aedon*), Western Tanager (*Piranga ludoviciana*), and White-throated Sparrow (*Zonotrichia albicollis*). Wilson's Snipe and Western Tanager are common at the site during part of the year, but had eluded capture since the beginning of the project. Western Wood-Pewee and Cassin's Vireo are uncommon at this site, whereas House Wren generally uncommon in the Nanaimo area. The capture of a White-throated Sparrow was unusual as this species is uncommon on Vancouver Island as it breeds primarily in the central and northeast areas of British Columbia.

Table 3. Fifteen most common species captured in mist nets at Buttertubs West Marsh during 2016.

Common Name	Number Banded	Number Recaptured	Total Number Captured
Common Yellowthroat	326	279	605
Song Sparrow	147	202	349
Lincoln's Sparrow	216	77	293
American Robin	179	53	232
Orange-crowned Warbler	174	42	216
Spotted Towhee	124	86	210
Savannah Sparrow	155	7	162
Chestnut-backed Chickadee	50	88	138
Bushtit	69	63	132
Bewick's Wren	50	80	130
Yellow Warbler	91	36	127
Purple Finch	95	22	117
Swainson's Thrush	61	43	104
Oregon Junco	61	17	78
Fox Sparrow	37	29	66

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 2015) were the dominant age group between March and May, while hatch-year birds (hatched in 2016) were the dominant age group between June and October. Overall, 61.2% of birds banded were birds hatched in 2016.

Table 4. Number captured and rank (in parentheses) of the ten species most captured in mist nets at Buttertubs West Marsh during 2013-2016.

Common Name	2013	2014	2015	2016
Common Yellowthroat	493 (1)	310 (1)	304 (1)	605 (1)
Song Sparrow	290 (2)	279 (2)	207 (2)	349 (2)
Lincoln's Sparrow	23 (13)	86 (8)	79 (8)	293 (3)
American Robin	88 (4)	114 (4)	130 (4)	232 (4)
Orange-crowned Warbler	61 (7)	99 (6)	121 (5)	216 (5)
Spotted Towhee	57 (8)	95 (7)	137 (3)	210 (6)
Savannah Sparrow	4 (33)	26 (15)	44 (13)	162 (7)
Chestnut-backed Chickadee	74 (6)	107 (5)	112 (7)	138 (8)
Bushtit	91 (3)	148 (3)	114 (6)	132 (9)
Bewick's Wren	55 (9)	75 (9)	65 (10)	130 (10)

Table 5. Age structure of birds banded at Buttertubs West Marsh during 2016.

Month	Hatch Year (HY)	Second Year (SY)	After Hatch Year (AHY)	After Second Year (ASY)	Other Ages	Total
March		70	15	10	1	96
April		130	43	70		243
May	22	175	18	74	2	291
June	278	55	21	13		367
July	213	33	4	8		258
August	406	6	24		2	438
September	398		100		5	503
October	122		33		1	156
TOTAL	1,439	469	258	175	11	2,352

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 (March-May) and fall migration (September-October) (Table 6). Overall, the majority of birds banded (63.2%) did not display any visible fat (fat score = 0).

Table 6. Fat score of birds banded at Buttertubs West Marsh during 2016.

Month	0	1-2	3-5	Total
March	55	26	13	94
April	122	51	68	241
May	131	55	92	278
June	266	87	3	356
July	202	48	6	256
August	297	95	41	433
September	302	139	60	501
October	85	53	17	155
TOTAL	1,460	554	300	1,340

The 1,212 recapture events recorded in 2016 involved 634 banded birds (Table 7), of which 41, 51, 101 and 441 individuals were originally banded in 2013, 2014, 2015 and 2016, respectively. Overall, 3.6% of individuals banded in 2013 were recaptured in 2016, 4.0% of individuals banded in 2014 were recaptured in 2016, 6.9% of individuals banded in 2015 were recaptured in 2016, and 18.1% of individuals banded in 2016 were recaptured in 2016. 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 2016 but were not recaptured.

Table 7. Number and percentage of individuals recaptured in 2016 which were originally banded in 2013, 2014, 2015, or 2016 for the seven most commonly recaptured species.

Species	Banded in 2013		Banded in 2014		Banded in 2015		Banded in 2016	
	No.	%	No.	%	No.	%	No.	%
Common Yellowthroat	12	4.8	3	2.4	16	8.4	92	28.2
Song Sparrow	8	5.3	7	5.6	11	11.2	51	34.7
Chestnut-backed Chickadee	6	11.1	7	15.2	12	22.6	23	46.0
Spotted Towhee	0	0.0	7	9.9	12	13.6	32	25.8
Bewick's Wren	2	6.5	2	5.6	6	18.8	16	32.0
Bushtit	0	0.0	2	2.3	7	8.9	35	50.7
American Robin	2	3.1	7	8.0	7	6.7	16	8.9
All species	41	3.6	51	4.0	101	6.9	441	18.1

Most recapture events involved birds that were recaptured only once during 2016. However, 310 individuals were recaptured more than once since they were banded, and at least 74 individuals were recaptured 5 or more times since they were banded. Some of these frequently recaptured individuals are listed in Table 8. This included two Common Yellowthroat and a Song Sparrow recaptured 27-31 times since their original banding date.

Table 8. List of selected individuals recaptured in 2016, which have been recaptured 6 or more times at Buttertubs West Marsh during 2013-2016.

Band Number	Species	Sex	Number of Times Recaptured Since Banded	Date Banded	Date of Last Recapture
0942-98803	AMRO	Female	12	26 Apr. 2014	1 Jun. 2016
2621-82477	BEWR	Unknown	11	25 Jun. 2016	9 Oct. 2016
2710-96680	CBCH	Male	6	18 Sep. 2014	1 Jun. 2016
2700-93366	COYE	Male	27	9 Apr. 2013	18 Sep. 2016
2700-93399	COYE	Male	31	25 Apr. 2013	2 Jul. 2016
2521-71319	MAWR	Unknown	10	15 Aug. 2014	2 Sep. 2016
2700-93378	OCWA	Male	12	17 Apr. 2013	14 Jun. 2016
2581-70122	SOSP	Male	29	26 Mar. 2013	27 May 2016
2561-31640	SPTO	Male	7	2 Apr. 2015	9 Jun. 2016
2700-93449	YEWA	Male	7	17 May 2013	18 May 2016

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 114 species were observed at Buttertubs West Marsh during 2016 (Table A.3 in Appendix). New species observed in 2016 included Snow Goose (*Chen caerulescens*), Northern Shoveler (*Anas clypeata*), Common Merganser (*Mergus merganser*), Common Loon (*Gavia immer*), House Wren¹, White-throated Sparrow¹, Western Meadowlark (*Sturnella neglecta*), and Common Redpoll (*Acanthis flammea*). A single male Bullock's Oriole (*Icterus bullockii*) was observed at the site during 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. A total of 126 species has been observed at Buttertubs West since the beginning of this project in 2013.

¹ Captured during banding.

3. Swallow Nest Box Monitoring

3.1. Methods

Thirty nest boxes were available in the old-field habitat at Buttertubs West Marsh and 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. 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, 2013b). 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.

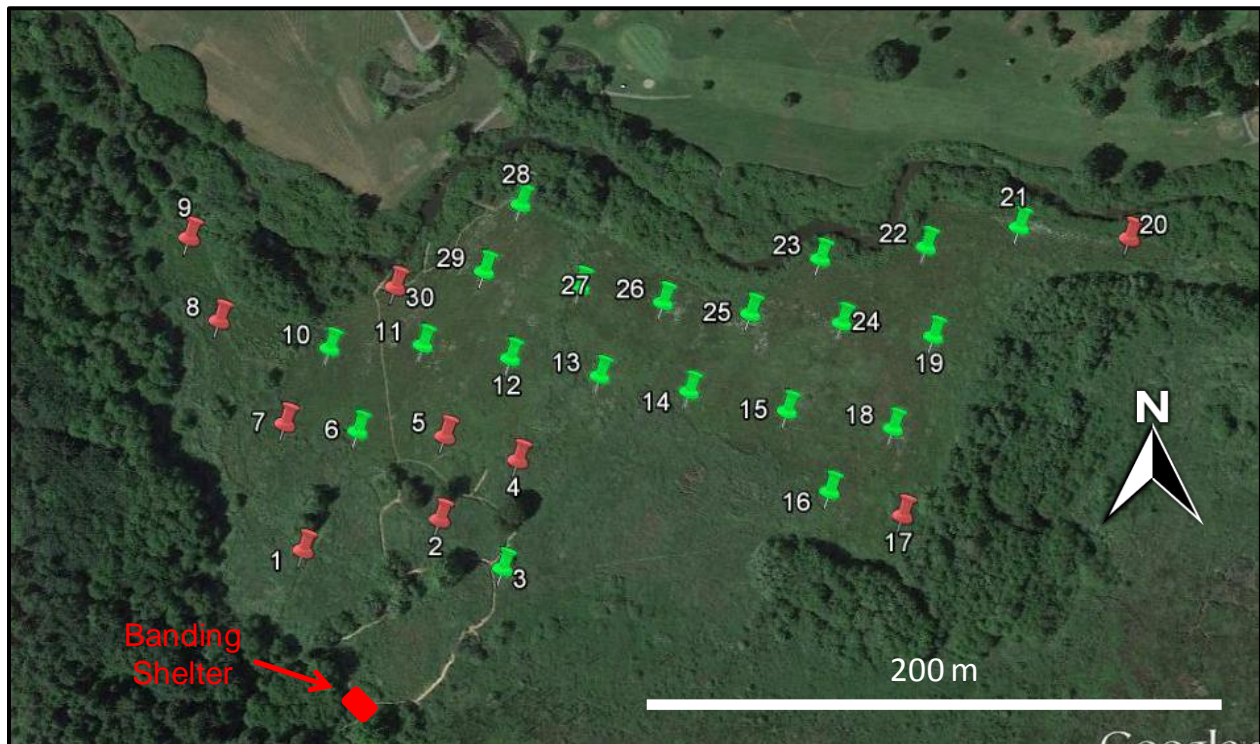


Figure 4. Locations of the thirty swallow nest boxes at Buttertubs West Marsh during 2016. Green and red pointers indicate whether eggs were deposited in the nest box or not, respectively.

Table 9. Results of nest box monitoring at Buttertubs West Marsh during 2016. Nest boxes no. 11, 22 and 26 received two clutches (see text). DNH = Did not hatch; F = Female; M = Male; N = Nestlings.

Nest Box	Nest Building	Number of Eggs	Complete Clutch Date	Mean Hatch Date	Number Fledged	Individuals Banded / Processed
1	No	0				
2	No	0				
3	Yes	5	10 May	24 May	5	F, M, N
4	No	0				
5	No	0				
6	Yes	5	16 May	DNH	0	F
7	No	0				
8	No	0				
9	No	0				
10	Yes	6	13 May	DNH	0	F
11	Yes	6, 2	8 May, Jun. 14	22 May, DNH	0, 0	Clutch 1: F, M Clutch 2: None
12	Yes	5	7 May	21 May	5	F, M, N
13	Yes	5	11 May	25 May	5	F, M, N
14	Yes	5	8 May	22 May	4	F, M, N
15	Yes	4	14 May	28 May	1	F, M, N
16	Yes	5	16 May	24 May	3	F, M, N
17	No	0				
18	Yes	6	9 May	23 May	2	F, M, N
19	Yes	5	9 Jun.	DNH	0	Female only
20	Yes	0				
21	Yes	5	19 May	2 Jun.	2	F, M, N
22	Yes	6, 6	11 May, 8 Jun.	DNH, 22 Jun.	0, 3	Clutch 1: F, M Clutch 2: F, M, N
23	Yes	3	18 May	DNH	0	F
24	Yes	6	9 May	23 May	1	F, M, N
25	Yes	4	11 May	25 May	4	F, M, N
26	Yes	6, 5	6 May, 22 Jun.	20 May, 6 Jul.	6, 0	Clutch 1: F, M, N Clutch 2: F
27	Yes	5	10 May	24 May	3	F, M, N
28	Yes	4	3 Jul.	DNH	0	F
29	Yes	6	10 May	24 May	2	F, M, N
30	No	0				
Total		115			46	

Table 10. Summary of Tree Swallow nesting productivity at Buttertubs West Marsh during 2013-2016. All percentages are calculated relative to the number of eggs laid.

Parameter	2013	2014	2015	2016
Number of boxes	10	25	30	30
Number of boxes with eggs (%)	4 (40%)	12 (48%)	19 (63%)	20 (67%)
Number of eggs laid	20	59	109	115
Mean clutch size (range)	5.0	4.9 (2-6)	5.1 (4-6)	5.0 (2-6)
Number of eggs hatched (%)	10 (50%)	46 (78%)	83 (76%)	78 (68%)
Number of nestlings banded (%)	8 (40%)	41 (69%)	74 (68%)	68 (59%)
Number fledged (%)	8 (40%)	30 (51%)	61 (56%)	46 (40%)
Fledging rate (young per pair)	2.0	2.5	3.2	2.1

3.2. Results

Twenty of the 30 nest boxes were occupied by Tree Swallows (*Tachycineta bicolor*) and had signs of nest building activities (Table 9). Nest box no. 20 had signs of nest building by Chestnut-backed Chickadee (grasses, mosses), although no eggs were ever laid in this box or adults observed. Clutches of 2-6 eggs were eventually laid in all nest boxes by Tree Swallows. Nest boxes no. 11, 22, and 26 were the subject of repeated nesting attempts.

Nineteen adult females and 15 adult males were captured. The same female and male re-nested in nest box no. 22. The female that nested in nest box no. 29 re-nested later in nest box no. 28. Of the 34 adult Tree Swallows captured, 16 individuals had nested at Buttertubs West Marsh during 2015 (9 females, 7 males), and 4 individuals had nested at Buttertubs West Marsh during 2014 (1 female, 3 males). Interestingly, the pair that occupied nest box no. 24 during 2015 nested in the same nest box in 2016. One adult male was banded as a nestling at Buttertubs West Marsh in 2014 and returned to nest 2016. This was only the second case of a Tree Swallow fledged at the site returning to nest as an adult.

Out of 115 eggs laid in all nest boxes, 78 eggs hatched (hatching success: 67.8%), 68 nestlings were banded around day 12 (day 12 survival: 68%), and 46 young birds fledged (fledging success: 40.0%) (Tables 9 and 10). 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 2.1 young per nesting pair.

Overall, the fledging productivity was lower in 2016 compared to 2014 (51% fledging success; 2.5 young per nesting pair) and 2015 (56% fledging success; 3.2 young per nesting pair).

Approximately 10% fewer eggs hatched in 2016 compared to 2014 and 2015. Survival of hatched young to day 12 when they were banded was 87%, which was comparable to 2014 and 2015 (89% both years). These results suggest that the lower fledging success in 2016 was due to lower hatching success and survival between day 12 and fledging. Observations from nest checks conducted after fledging indicated that most dead nestlings were fully grown and appeared ready to fledge, suggesting that nestling mortality was highest in the last days of the nesting period (i.e., day 17-20).

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 56 volunteers dedicated 2,471 hours to this project during 2016 (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 11. Number of volunteers and hours volunteered for the bird monitoring and banding project at Buttertubs West Marsh during 2016.

Volunteer Grouping	Number of Volunteers	Hours on Project
VIU students	20	558
VIU graduates	14	830
VIU employees	4	721
Community volunteers	18	362
TOTAL	56	2,471

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 12).

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 2016:

- On-site demonstration to over 100 individual visitors and guests. This included the following groups: Davis Road Elementary, Ladysmith (April 20); Fairview Community School, Nanaimo (May 2); École Quarterway (May 12); Naturekids Explorers (May 15); Grandkids University (July 8); private group (August 14); Backyard Wildbird and Nature store, birding group (September 11).
- On-site visit for 16 students in VIU RMOT 401 Wildlife Management (April 13).
- Off-site presentation for 48 students in VIU BIOL 202 Ecology (March 18).
- On April 25, we welcome a TV crew from Québec for the filming of an episode of Fou des Oiseaux on Unis (Shaw Channel 912). The episode featuring the VIU Bird Banding project aired on October 5, 2016 (<http://unis.ca/fou-des-oiseaux?e=q5guzd3zdukwc>). An excerpt with English subtitles is available here: <http://tinyurl.com/hmpxfrd>

Social media played a large part in public outreach and education of this project. The project website and Facebook page were maintained during this project. This allowed online followers to not only learn about the project, but to also gain insight on banding procedures, species identification, bird behaviour, and more. The project website and Facebook page can be found at the following links:

- Project website: <http://wordpress.viu.ca/viubirdbanding/>
- Facebook page: <https://www.facebook.com/VIUBandingStation/>

Table 12. 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 2016. 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
ACAL	1	1	2
ALKI	1	1	2
ALLA	21	12	33
ANMO	15	6	21
BLDU	354	159	513
BRHE	5	0	5
BRHO	1	1	2
CANG	4	1	5
CASM	13	7	20
CLAW	2	0	2
DEJO	26	23	49
ELHA	149	76	225
EMRA	40	21	61
ERDE	362	228	590
GABE	58	38	96
GEDU	18	9	27
GUYM	62	23	85
HABE	0	1	1
HABA	13	13	26
HEVA	32	15	47
HIKI	97	61	158
KAOV	5	2	7
KIWE	318	151	469
KRBA	3	4	7
LORO	4	4	8
MICO	176	92	268
MILO	1	1	2
NIRE	66	31	97
PAJO	6	4	10
PAMU	15	8	23
RAGR	43	26	69
RYHA	171	78	249
SACH	90	53	143
SHJA	206	62	268
STPE	2	2	4
STWE	23	13	36
TAMS	20	7	27
TASE	3	2	5
TRFO	6	4	10
TOTAL	2,432	1,240	3,672

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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. 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.

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8. Appendix

Table A.1. List of all species captured in mist nets at Buttertubs West Marsh during 2016. Subspecies are included in parentheses where applicable.

Common Name	Number banded	Number recaptured	Total number captured
Common Yellowthroat	326	279	605
Song Sparrow	147	202	349
Lincoln's Sparrow	216	77	293
American Robin	179	53	232
Orange-crowned Warbler	174	42	216
Spotted Towhee	124	86	210
Savannah Sparrow	155	7	162
Chestnut-backed Chickadee	50	88	138
Bushtit	69	63	132
Bewick's Wren	50	80	130
Yellow Warbler	91	36	127
Purple Finch	95	22	117
Swainson's Thrush	61	43	104
Dark-eyed Junco (Oregon)	61	17	78
Fox Sparrow	37	29	66
Wilson's Warbler	42	2	44
Willow Flycatcher	40	3	43
Marsh Wren	34	9	43
Golden-crowned Sparrow	38	4	42
Ruby-crowned Kinglet	30	7	37
House Finch	32	3	35
Warbling Vireo	29	4	33
Yellow-rumped Warbler (Myrtle)	27		27
Brown Creeper	11	11	22
Chipping Sparrow	18	3	21
Pacific-slope Flycatcher	16	3	19
Violet-green Swallow	18		18
Downy Woodpecker	9	9	18
Golden-crowned Kinglet	15	2	17
MacGillivray's Warbler	15	1	16
Brown-headed Cowbird	8	7	15
Black-headed Grosbeak	11	4	15
Hermit Thrush	13	2	15
Red-winged Blackbird	9	2	11
Tree Swallow	7	4	11
White-crowned Sparrow (Puget Sound)	9		9
Pacific Wren	8		8
White-crowned Sparrow (Unknown)	7		7
American Goldfinch	7		7
Hammond's Flycatcher	6		6
Barn Swallow	6		6
Hutton's Vireo	1	5	6
Yellow-rumped Warbler (Audubon)	6		6
White-crowned Sparrow (Gambel)	6		6
Red-breasted Nuthatch	6		6
Yellow-rumped Warbler (Unknown)	4		4
Pine Siskin	4		4
Red-breasted Sapsucker	2	2	4
Cedar Waxwing	3		3
Northern Rough-winged Swallow	3		3
Northern Shrike	2	1	3
Black-throated Gray Warbler	2		2
Wilson's Snipe	2		2
House Wren	2		2
Northern Flicker (Red-shafted)	2		2
Cassin's Vireo	1		1
Dark-eyed Junco (Unknown)	1		1
Western Tanager	1		1
White-throated Sparrow	1		1
Western Wood-Pewee	1		1
European Starling	1		1
Hairy Woodpecker	1		1
TOTAL	2,352	1,212	3,564

Table A.2. (continued)

Date	Wilson's Snipe	Red-breasted Sapsucker	Hairy Woodpecker	Downy Woodpecker	Northern Flicker	Western Wood-Pewee	Willow Flycatcher	Hammond's Flycatcher	Pacific-slope Flycatcher	Northern Shrike	Hutton's Vireo	Cassin's Vireo	Warbling Vireo	Northern Rough-winged Swallow	Tree Swallow	Violet-green Swallow	Barn Swallow	Chestnut-backed Chickadee	Bushtit	Red-breasted Nuthatch	Brown Creeper	House Wren	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	White-throated Sparrow	Savannah Sparrow	Song Sparrow	Lincoln's Sparrow	Spotted Towhee	Western Tanager	Black-headed Grosbeak	Red-winged Blackbird	Brown-headed Cowbird	House Finch	Purple Finch	Pine Siskin	American Goldfinch	Total			
02-May																															1		3	6					2					2	3	1								1							19
03-May			1														1	1	1							2				2	5		8	1	10	3			8			5			7	3	8						1				1	1	68		
05-May														1						1									1			3	7	3			3			2			3	1	4	2					1		5				37				
06-May																	1													3	1		2	1	6	1			2			2			1	1	1	1						1			24				
09-May											1						1											1	1	2		12	3	1			3			1		9	2	2	3				1	2		1	2			1	46				
11-May	1								1									1		2						1			2		7	2	3								8	3	5									1			38						
12-May	1										1									2									1		5	1	5	4			1					2	4	1	3								1		32						
15-May			2					2			2		1				1										1	2		1	1	7	6			1						1	6	1	2				4						41						
16-May			2							1								2		1				1			4	7		1	4	6				3						2	1			1			3					39							
18-May	1									1							1			1								2	3		1	1	7	4			2					1	4			1			1				1	32							
22-May			1										4					1											5	1			6	2			2							4	1	1			1				1			29					
25-May														2																1	7		8	1	4	1			3						2		2	3								34					
27-May																					3							3	3		2	7	8			1								2													26				
30-May			1																							2	2	3		7	5	4												7													31				
01-Jun							1	1									5	4	1							2	1	2		5	4	7			1								6	1		2			4							47					
06-Jun									1								2	5								2	4			11	2	2												6	2								3				40				
09-Jun		1	1	1													3	17	1							4	1	1		3	13	2							1				2	3	2	2			3						61						
14-Jun		2		1																				4		2	5		5	13	1					12							3	4	1	1		2								56					

(continued on next page)

Table A.2. (continued)

Date	Wilson's Snipe	Red-breasted Sapsucker	Hairy Woodpecker	Downy Woodpecker	Northern Flicker	Western Wood-Pewee	Willow Flycatcher	Hammond's Flycatcher	Pacific-slope Flycatcher	Northern Shrike	Hutton's Vireo	Cassin's Vireo	Warbling Vireo	Northern Rough-winged Swallow	Tree Swallow	Violet-green Swallow	Barn Swallow	Chestnut-backed Chickadee	Bushtit	Red-breasted Nuthatch	Brown Creeper	House Wren	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	White-throated Sparrow	Savannah Sparrow	Song Sparrow	Lincoln's Sparrow	Spotted Towhee	Western Tanager	Black-headed Grosbeak	Red-winged Blackbird	Brown-headed Cowbird	House Finch	Purple Finch	Pine Siskin	American Goldfinch	Total
02-Sep			1		3		1		1	3					1	1							2	1		3		5			3		10	1			2						7	4	22	3							1					75
04-Sep							2										1	2							2		9		4			4	1	9	3									11	4	19	4										75	
06-Sep					4		2			3							6	3						2	1		1				7		8	10							6			11	2	16	4									86		
08-Sep							2										1	3							1	2		4		1		2		9						1	1			1	1		4	5	7	11							56	
11-Sep																									1		2		5					5	1							1		2	2	5	5								29			
13-Sep											1						7	2		1			1	4	1	2		2		1		1		7	5							3		1		4	7	17	6						71			
15-Sep																	1	1						1	1	1	1	1	2		1	4		11	4	1	1					3			1	4	18	12					1				70	
18-Sep																	2	2	1				1	1	2		1				4		10		2							6			2	5	8	8								56		
20-Sep										1							2	8					1	1	2		2	1				4		11		3						3		1		3	3	4	6			2				58		
22-Sep											1						3	1							1	1		1		6		1		9	1	4						2	2	2	2		2	8	8	5						60		
24-Sep																	6							1	1		3				6		4		4								1		1		2	1	1	7						38		
27-Sep																	3	1							1		1		4				3		1								1		1	1	1	1	1	2						23		
29-Sep																	1	4					1	3		2	2		3				4		8								5	4		1		7	6	4						55		
01-Oct								1																		1		4					1		6								1	3	1		1	5		8						32		
06-Oct			1					2									10	9		1			2	4	1	5	1	1				2		2									1	11	1	2		1	5	6	10						78	
09-Oct																	5	3					1	3	9	6		5	2				1											5	9		3	7	2	10							72	
20-Oct																									2	1																			13			3		9			1				29	
22-Oct	2		1							1	1						2	1					1	3	1	5		9															1	8			7		7								50	
Total	2	4	1	18	2	1	43	6	19	3	6	1	33	3	11	18	6	138	132	6	22	2	8	43	130	17	37	104	15	232	1	3	216	16	605	127	37	2	44	21	66	79	22	42	1	162	349	293	210	1	15	11	15	35	117	4	7	3,564

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Table A.3. List of all species observed at Buttertubs West Marsh during 2016 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.

114 species (+0 other taxa)		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Greater White-fronted Goose	MAP												
Snow Goose	MAP												
Canada Goose	MAP												
Trumpeter Swan	MAP												
Wood Duck	MAP												
American Wigeon	MAP												
Mallard	MAP												
Northern Shoveler	MAP												
Northern Pintail	MAP												
Green-winged Teal	MAP												
Ring-necked Duck	MAP												
Bufflehead	MAP												
Hooded Merganser	MAP												
Common Merganser	MAP												
California Quail	MAP												
Common Loon	MAP												
Pied-billed Grebe	MAP												
Double-crested Cormorant	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												
Wilson's Snipe	MAP												
Greater Yellowlegs	MAP												
Glaucous-winged Gull	MAP												
Rock Pigeon	MAP												
Band-tailed Pigeon	MAP												
Eurasian Collared-Dove	MAP												
Great Horned Owl	MAP												
Barred Owl	MAP												

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Table A.3. (continued)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Common Nighthawk	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	■	■	■	■	■	■	■	■	■	■	■
American Kestrel	MAP	■	■						■		■	■
Merlin	MAP	■	■	■	■		■	■	■	■	■	■
Peregrine Falcon	MAP	■	■	■							■	■
Western Wood-Pewee	MAP	■	■			■					■	■
Willow Flycatcher	MAP	■	■		■	■	■	■	■	■	■	■
Hammond's Flycatcher	MAP	■	■		■		■	■	■	■	■	■
Pacific-slope Flycatcher	MAP	■	■		■	■	■	■	■	■	■	■
Northern Shrike	MAP	■	■	■							■	■
Hutton's Vireo	MAP	■	■	■	■	■	■	■	■	■	■	■
Cassin'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	■	■	■	■	■	■	■	■	■	■	■
House Wren	MAP	■	■				■	■	■		■	■
Pacific Wren	MAP	■	■	■	■	■		■	■	■	■	■
Marsh Wren	MAP	■	■	■	■	■	■	■	■	■	■	■
Bewick's Wren	MAP	■	■	■	■	■	■	■	■	■	■	■
Golden-crowned Kinglet	MAP	■	■	■	■	■		■	■	■	■	■
Ruby-crowned Kinglet	MAP	■	■	■	■	■			■	■	■	■

(continued on next page)

Table A.3. (continued)

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

KEY: ■ = insufficient data |  = rare to widespread

Photos A.1. Sample photographs for the VIU Bird Monitoring and Banding Project at Buttertubs West Marsh during 2016. Photos courtesy of E. Demers.



Northern Shrike



Northern Flicker (male)



Yellow-rumped Warbler (Audubon, male)



Violet-green Swallow (female and male)



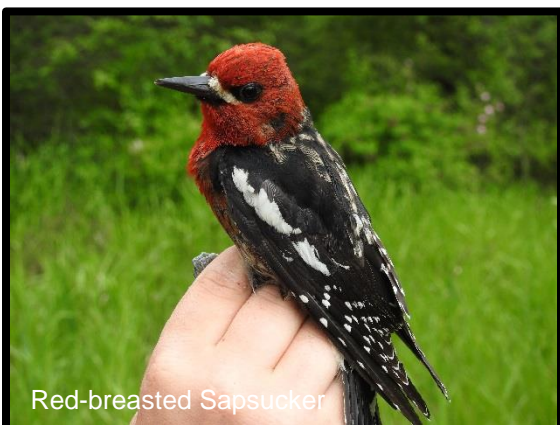
Crew for filming Fou des Oiseaux



White-crowned Sparrow (Gambel's)

(continued on next page)

Photos A.1. (continued)



Photos A.1. (continued)



Public demonstration for NatureKids



Tree Swallow nestlings



Willow Flycatcher (left)
Pacific-slope Flycatcher (right)



Western Wood-pewee



Anna's Hummingbird (male)



Barn Swallow (male)

Photos A.1. (continued)

