

# DATA REPORT

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

2017



Report prepared by:

Dr. Eric Demers (Vancouver Island University)



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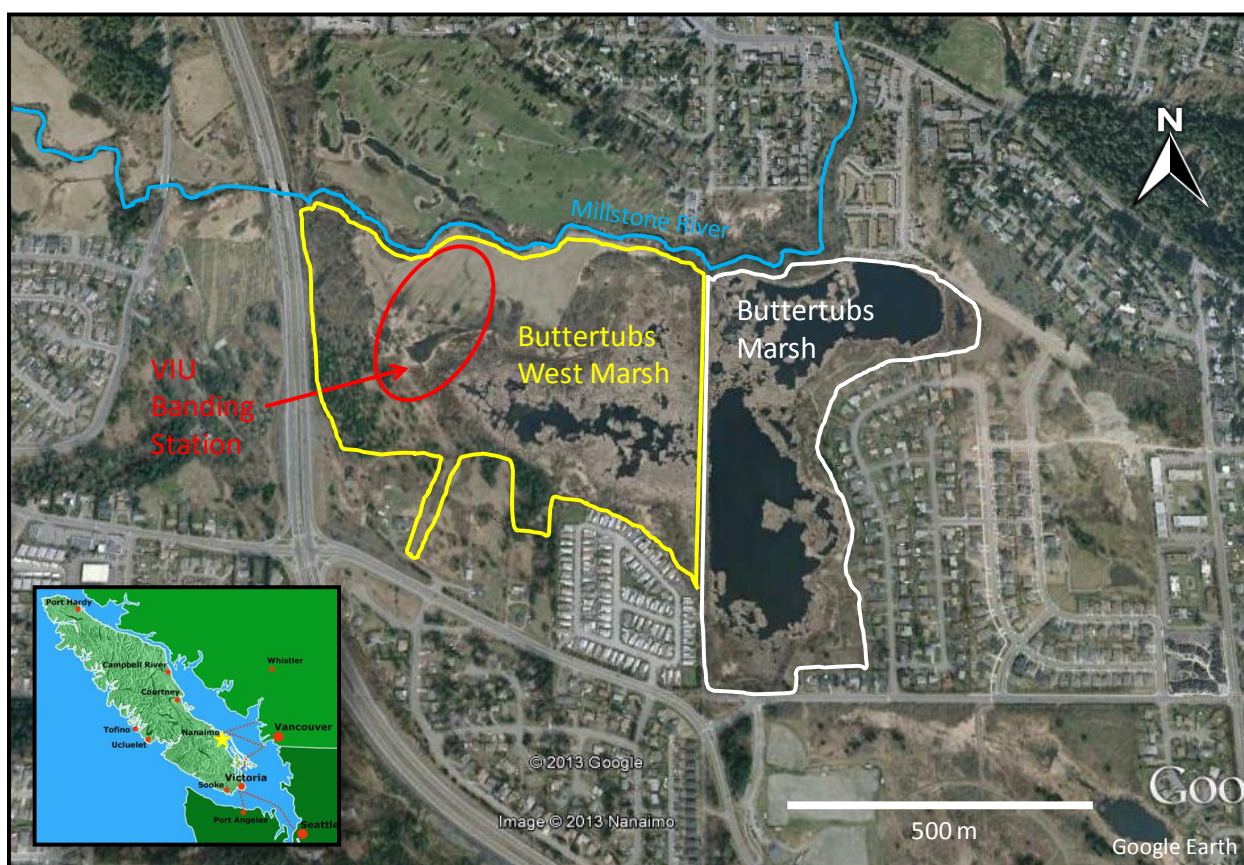
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### Disclaimer Note:

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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 landscape (Lepczyk and Warren, 2012). 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 2017. 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

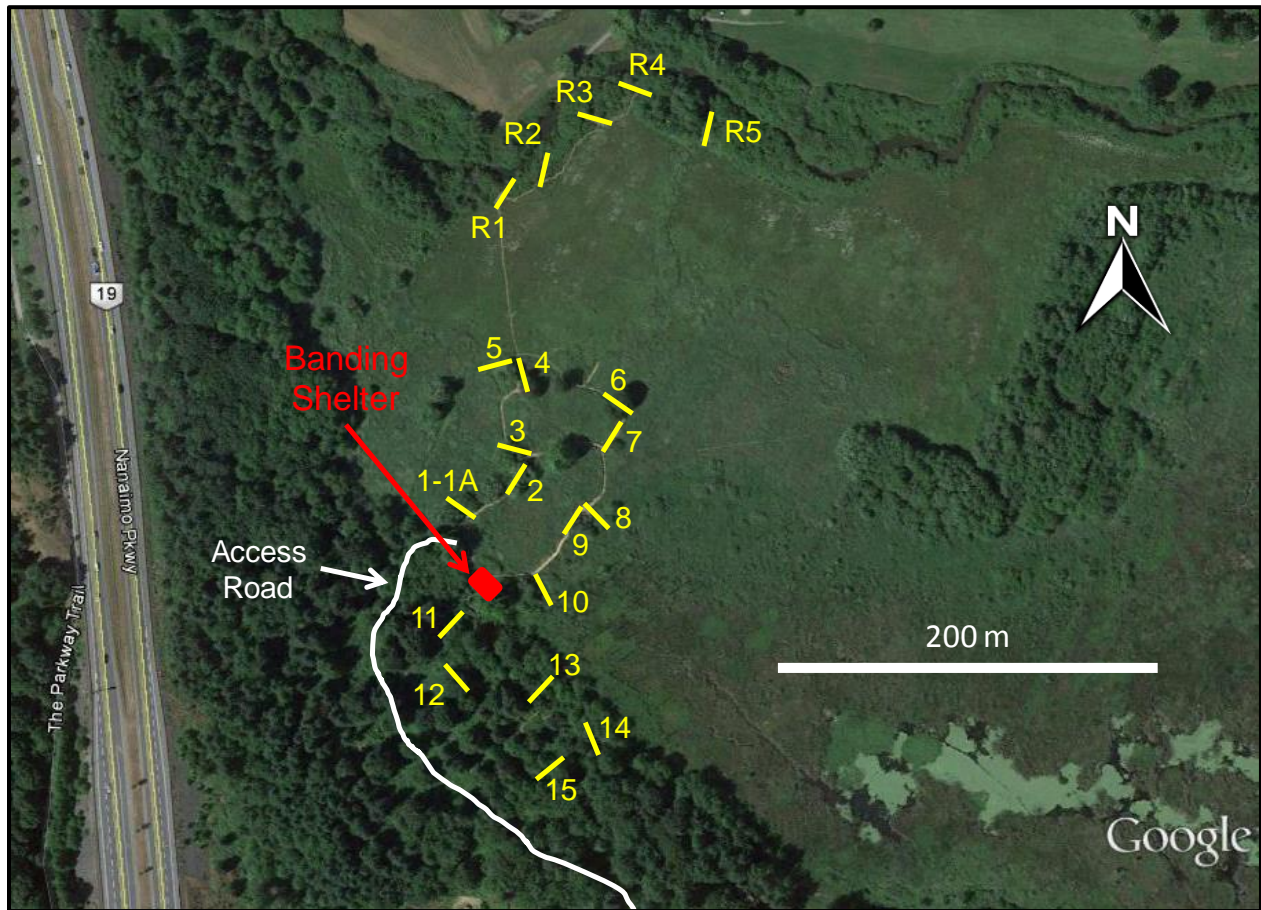
The general approach used for songbird monitoring and banding included a combination of two activities: bird banding and incidental observations.

#### 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. 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 2017, 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 2017.

Bird banding activities were conducted 1-3 days most weeks between 31 March and 26 October 2017. 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 15-20 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*

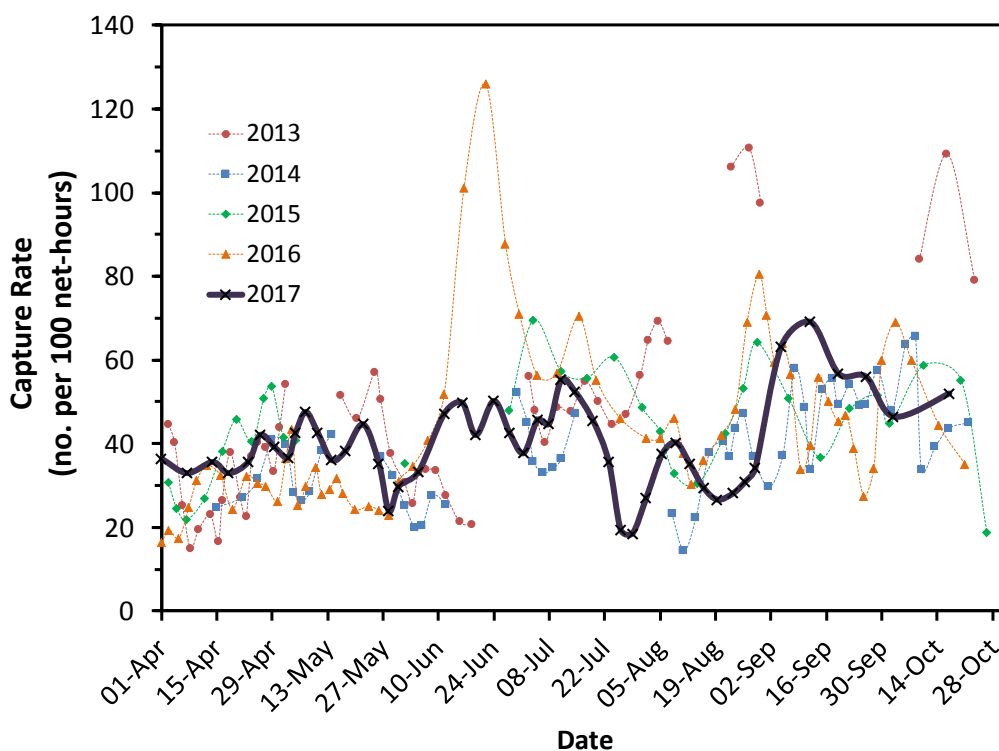
Songbird banding activities were conducted during 48 days between 31 March and 26 October 2017, with a total mist netting effort of 5,874 hours (average: 122.4 net hours / day) (Table 1). A total of 2,378 birds were caught from 55 species. Of these, 1,661 birds were banded and 717 birds (30.2%) were recaptures of previously banded birds. An additional 208 birds were captured and released unbanded (primarily hummingbirds). The average capture rate in 2017 was 40.5 birds / 100 net-hours.

The total capture effort deployed in 2017 (5,874 net-hours) was the second highest since the beginning of the project in 2013 (Table 1). There was no change in layout or number of nets used between 2016 and 2017. Capture rate in 2017 (40.5 birds per 100 net-hours) was similar to the rate observed in 2015 and 2016, and intermediate compared to 2013 and 2014. Variation in yearly capture rate is partly due to changes in the number of nets used during the first few years. Additional reasons for the variation in catch rate may include inter-annual variation in habitat use, breeding success, weather conditions, and number and timing of banding days. The total number of species captured in 2017 (55 species) was at the upper end of the range for 2015-2016 (46-57 species).

**Table 1.** Mist net capture statistics at Buttertubs West Marsh during 2013-2017.

Parameter	Value				
	2013	2014	2015	2016	2017
Capture effort (net-hours)	3,316	4,960	4,358	8,648	<b>5,874</b>
Average daily effort (net-hours / day)	57.1	88.6	117.8	118.5	<b>122.4</b>
Number of birds banded	1,130	1,212	1,359	2,352	<b>1,661</b>
Number of recaptures	560	654	556	1,212	<b>717</b>
Total number of birds captured	1,690	1,866	1,915	3,564	<b>2,378</b>
Recapture rate (%)	33.1	35.0	29.0	34.0	<b>30.2</b>
Number of species	49	46	52	57	<b>55</b>
Capture rate (birds per 100 net-hours)	51.0	37.6	43.9	41.2	<b>40.5</b>

Capture rates generally increased between April and October 2017 (Figure 3), although the increase was not as pronounced as during some of the previous years. There was no strong increase in capture rates during May in response to the arrival / passage of spring migrants. Similarly, capture rates did not show an increase in July or August due to dispersing of young birds. Capture rates during fall migration in 2017 (September) were generally higher comparable to previous years, although banding occurred during fewer fall days.



**Figure 3.** Weekly moving average of capture rate in mist nets at Buttertubs West Marsh during 2013-2017.

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-R5), and for nets located near the interface between the old-field and marsh habitats (i.e., nets 8-10). This pattern was generally consistent with previous years.

Overall, Common Yellowthroat (*Geothlypis trichas*) was the most captured species and represented 15.2% of all birds caught during 2017 (Table 3). Song sparrow (*Melospiza melodia*) was the next most common species and accounted for 10.6% 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, except for Lincoln's Sparrow (*M. lincolnii*). Tables A.1 and A.2 in Appendix provide a complete summary of all species captured during 2017.

**Table 2.** Capture statistics by net at Buttertubs West Marsh during 2017.

Net Number	Number Banded	Number Recaptured	Total Number Captured	Net Hours	Capture Rate (Birds / 100 Net hours)
1	68	35	103	279	36.9
1A	48	23	71	279	25.5
2	52	38	90	282	31.9
3	46	22	68	282	24.1
4	47	28	75	281	26.7
5	35	19	54	277	19.5
6	74	31	105	282	37.2
7	80	20	100	279	35.9
8	128	49	177	282	62.8
9	72	41	113	282	40.0
10	77	45	122	282	43.2
11	51	32	83	282	29.5
12	29	19	48	282	17.0
13	26	31	57	277	20.6
14	56	31	87	277	31.5
15	43	22	65	277	23.5
R1	161	61	222	279	79.6
R2	173	53	226	279	81.1
R3	138	36	174	279	62.4
R4	159	42	201	279	72.1
R5	98	39	137	279	49.1
Totals	1,661	717	2,378	5,874	---

There were changes in the rankings for the top 10 species captured during 2017 (Table 4). The most significant change was an increase in capture of Yellow Warbler (*Setophaga petechia*), which was the sixth most captured species in 2017, whereas it was not in the top 10 species during 2014-2016. The rankings for Bushtit (*Psaltriparus minimus*) and Chestnut-backed Chickadee (*Poecile rufescens*) have gradually moved towards the bottom of the top 10 species since 2013.

New species captured at Buttertubs West Marsh in 2017 included Olive-sided Flycatcher (*Contopus cooperi*) and Brewer's Blackbird (*Euphagus cyanocephalus*). Olive-sided Flycatcher, which was recently designated as "threatened" under the federal Species at Risk, is uncommon at Buttertubs Marsh during spring migration. Only a few individuals have been observed at the site since the beginning of the project in 2013. Brewer's Blackbird are common around Nanaimo, but



they generally occur at Buttertubs Marsh during summer when groups can be seen feeding in the old-field habitat along with Red-winged Blackbird (*Agelaius phoeniceus*).

**Table 3.** Fifteen most common species captured in mist nets at Buttertubs West Marsh during 2017.

Common Name	Number Banded	Number Recaptured	Total Number Captured
Common Yellowthroat	168	193	361
Song Sparrow	141	112	253
American Robin	109	54	163
Spotted Towhee	83	61	144
Orange-crowned Warbler	132	11	143
Yellow Warbler	89	37	126
Lincoln's Sparrow	114	7	121
Savannah Sparrow	114	6	120
Bushtit	68	29	97
Chestnut-backed Chickadee	52	43	95
Purple Finch	72	18	90
Bewick's Wren	28	34	62
Oregon Junco	46	8	54
Cedar Waxwing	47	3	50
Wilson's Warbler	50		50

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 2016) were the dominant age group between March and May, while hatch-year birds (hatched in 2017) were the dominant age group between June and October. Overall, 54.5% of birds banded were birds hatched in 2017.

**Table 4.** Number captured and rank (in parentheses) of the ten species most captured in mist nets at Buttertubs West Marsh during 2013-2017.

Common Name	2013	2014	2015	2016	2017
Common Yellowthroat	493 (1)	310 (1)	304 (1)	605 (1)	361 (1)
Song Sparrow	290 (2)	279 (2)	207 (2)	349 (2)	253 (2)
American Robin	88 (4)	114 (4)	130 (4)	232 (4)	163 (3)
Spotted Towhee	57 (8)	95 (7)	137 (3)	210 (6)	144 (4)
Orange-crowned Warbler	61 (7)	99 (6)	121 (5)	216 (5)	143 (5)
Yellow Warbler	55 (9)	35 (14)	49 (12)	127 (11)	126 (6)
Lincoln's Sparrow	23 (13)	86 (8)	79 (8)	293 (3)	121 (7)
Savannah Sparrow	4 (33)	26 (15)	44 (13)	162 (7)	120 (8)
Bushtit	91 (3)	148 (3)	114 (6)	132 (9)	97 (9)
Chestnut-backed Chickadee	74 (6)	107 (5)	112 (7)	138 (8)	95 (10)

**Table 5.** Age structure of birds banded at Buttertubs West Marsh during 2017.

Month	Hatch Year (HY)	Second Year (SY)	After Hatch Year (AHY)	After Second Year (ASY)	Other Ages	Total
March		20	12	3		35
April		81	16	43		140
May	11	188	19	90	1	309
June	122	80	16	20	4	242
July	232	42	17	3	4	298
August	246	4	16	1	2	269
September	213	1	39		12	265
October	81		11		11	103
TOTAL	905	416	146	160	34	1,661

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 (71.5%) did not display any visible fat (fat score = 0).

**Table 6.** Fat score of birds banded at Buttertubs West Marsh during 2017.

Month	0	1-2	3-5	Total
March	20	9	6	35
April	53	32	51	136
May	116	64	125	305
June	205	26	3	234
July	267	27		294
August	220	47	1	268
September	201	34	21	256
October	83	12	7	102
TOTAL	1,165	251	214	1,630

The 717 recapture events recorded in 2017 involved 417 banded birds (Table 7), of which 17, 23, 42, 128, and 207 individuals were originally banded in 2013, 2014, 2015, 2016, and 2017, respectively. Overall, 1.5% of individuals banded in 2013 were recaptured in 2017, 1.9% of individuals banded in 2014 were recaptured in 2017, 3.1% of individuals banded in 2015 were recaptured in 2017, 5.4% of individuals banded in 2016 were recaptured in 2017, and 12.5% of individuals banded in 2017 were recaptured in 2017. 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 2017 but were not recaptured.

**Table 7.** Number and percentage of individuals recaptured in 2017 which were originally banded in 2013, 2014, 2015, 2016, or 2017 for the ten most commonly recaptured species.

Species	Banded in 2013		Banded in 2014		Banded in 2015		Banded in 2016		Banded in 2017	
	No.	%	No.	%	No.	%	No.	%	No.	%
Common Yellowthroat	7	2.8	3	2.4	5	2.6	29	8.9	38	22.6
Song Sparrow	6	4.0	2	1.6	6	6.1	9	6.1	33	23.4
Spotted Towhee	0	0.0	3	4.2	7	8.0	15	12.1	14	16.9
American Robin	1	1.5	0	0.0	4	3.8	6	3.4	16	14.7
Chestnut-backed Chickadee	0	0.0	2	4.3	4	7.5	11	22.0	12	23.1
Yellow Warbler	1	2.0	2	6.1	0	0.0	3	3.3	9	10.1
Bewick's Wren	0	0.0	1	2.8	1	3.1	2	4.0	8	28.6
Swainson's Thrush	0	0.0	4	14.8	2	10.5	8	13.1	5	27.8
Bushtit	0	0.0	0	0.0	3	3.8	6	8.7	14	20.6
Purple Finch	0	0.0	0	0.0	0	0.0	7	7.4	8	11.1
All species	17	1.5	23	1.9	42	3.1	128	5.4	207	12.5

Most recapture events involved birds that were recaptured only once during 2017. However, 215 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 a Common Yellowthroat and a Song Sparrow recaptured over 30 times since their original banding date.

**Table 8.** List of selected individuals recaptured in 2017, which have been recaptured 6 or more times at Buttertubs West Marsh during 2013-2017.

Band Number	Species	Sex	Number of Times Recaptured Since Banded	Date Banded	Date of Last Recapture
1352-50107	AMRO	Male	8	9 Apr. 2015	21 Jun. 2017
2521-71528	BEWR	Unknown	10	30 Jun. 2015	28 Sep. 2017
2691-51455	SWTH	Male	8	6 Jun. 2016	30 Aug. 2017
2700-93399	COYE	Male	42	25 Apr. 2013	24 Sep. 2017
2691-51371	DOWO	Female	7	11 Apr. 2016	14 Jun. 2017
2700-93378	OCWA	Male	13	17 Apr. 2013	25 Apr. 2017
2581-70122	SOSP	Male	32	26 Mar. 2013	21 Jun. 2017
2561-03799	SPTO	Female	7	28 Jun. 2014	2 May 2017
2700-93449	YEWA	Male	11	17 May 2013	18 Jun. 2017

### 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](http://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.

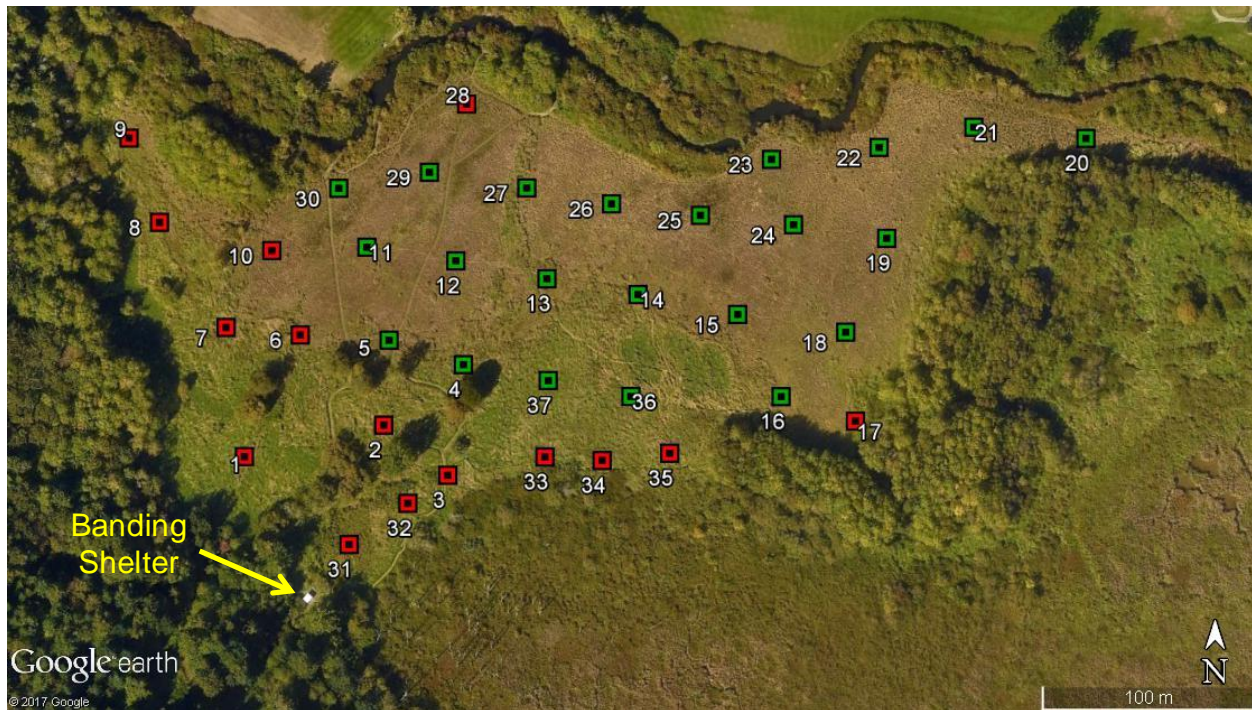
A total of 103 species were observed at Buttertubs West Marsh during 2017 (Table A.3 in Appendix). The only new species observed in 2017 was Mew Gull (*Larus canus*). No Bullock's Oriole (*Icterus bullockii*) was observed at the site during 2017. A total of 132 species have been observed at Buttertubs West since the beginning of this project in 2013.

### 3. Swallow Nest Box Monitoring

#### 3.1. Methods

Thirty-seven 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, 2013). Nest boxes were monitored every 3-5 days between 1 May and 27 July 2017. 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 37 swallow nest boxes at Buttertubs West Marsh during 2017. Green and red squares indicate whether eggs were deposited in the nest box or not, respectively.

**Table 9.** Results of nest box monitoring at Buttertubs West Marsh during 2017. Nest boxes no. 11, 12, 19, 22, and 29 received two clutches (see text). DNH = Did not hatch; F = Female; M = Male; N = Nestlings. Note: Nest box 30 was occupied by Violet-green Swallow.

Nest Box	Nest Building	Number of Eggs	Complete Clutch Date	Mean Hatch Date	Number Fledged	Individuals Banded / Processed
1	No					
2	No					
3	No					
4	Yes	5	28 May	11 Jun	5	F, N
5	Yes	6	11 May	DNH	0	F
6	No					
7	No					
8	No					
9	No					
10	No					
11	Yes	3, 5	10 May, 29 May	DNH, 12 Jun	0, 4	Clutch 1: None Clutch 2: F, M, N
12	Yes	5, 3	11 May, 1 Jun.	DNH, 15 Jun.	0, 3	Clutch 1: F Clutch 2: F, M, N
13	Yes	5	14 May	28 May	1	F, M, N
14	Yes	5	20 Jun.	DNH	0	F
15	Yes	5	16 May	31 May	4	F, M, N
16	Yes	5	29 May	12 Jun.	0	F
17	No	0				
18	Yes	6	9 May	23 May	6	F, M, N
19	Yes	5, 7	9 May, 29 May	DNH, 12 Jun.	0, 3	Clutch 1: F Clutch 2: F, M, N
20	Yes	1	10 May	DNH	0	None
21	Yes	5	26 May	9 Jun.	0	F
22	Yes	6, 4	8 May, 25 Jun.	22 May, DNH	5, 0	Clutch 1: F, M, N Clutch 2: None
23	Yes	6	16 May	31 May	0	F
24	Yes	6	9 May	24 May	3	F, N
25	Yes	6	14 May	28 May	6	F, M, N
26	Yes	6	16 May	31 May	3	F, M, N
27	Yes	7	8 May	22 May	2	F, N
28	No					
29	Yes	5, 5	10 May, 28 May	DNH, 11 Jun.	0, 4	Clutch 1: F Clutch 2: F, M, N
30	Yes	5	30 May	DNH	0	F
31	No					
32	No					
33	No					
34	No					
35	No					
36	Yes	6	15 May	29 May	2	F, M, N
37	Yes	5	22 May	5 Jun.	1	F, N
Total		138			52	

**Table 10.** Summary of Tree Swallow nesting productivity at Buttertubs West Marsh during 2013-2017.

Parameter	2013	2014	2015	2016	2017
Number of boxes	10	25	30	30	<b>37</b>
Number of boxes with eggs (% of boxes with eggs)	4 (40%)	12 (48%)	19 (63%)	20 (67%)	<b>22 (59%)</b>
Number of eggs laid	20	59	109	115	<b>138</b>
Mean clutch size (range)	5	4.9 (2-6)	5.1 (4-6)	5.0 (2-6)	<b>5.1 (1-7)</b>
Number of eggs hatched (% eggs hatched)	10 (50%)	46 (78%)	83 (76%)	78 (68%)	<b>82 (59%)</b>
Number of nestlings banded (% nestlings banded)	8 (80%)	41 (89%)	74 (89%)	68 (87%)	<b>69 (84%)</b>
Number fledged (% nestlings fledged)	8 (80%)	30 (65%)	61 (73%)	46 (59%)	<b>52 (63%)</b>
Fledging rate (young per pair)	2.0	2.5	3.2	2.1	<b>2.0</b>

### 3.2. Results

Twenty-one of the 37 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 Swallow (*Tachycineta thalassina*), although the eggs did not hatch in this box. A single egg was laid in nest box no. 20 with minimal nest building and no adults observed, which may have been a case of egg dumping by female. Clutch sizes ranged from 1-7 eggs with an average of 5.1 eggs per clutch, which was consistent with previous years. Nest boxes no. 11, 12, 19, 22, and 29 were the site of repeated nesting attempts.

Twenty-three adult females and 11 adult males were captured. The same female nested in nest box no. 4 after her first attempt failed in nest box no. 5. Re-nesting events in nest boxes no. 11, 12, 19 and 29 involved different females during the first and second nests. Of the 34 adult Tree Swallows captured, 3 individuals had nested at Buttertubs West Marsh during 2014 (3 males), 6 individuals had nested at Buttertubs West Marsh during 2015 (4 females, 2 males), and 9 individuals had nested at Buttertubs West Marsh during 2016 (6 females, 3 males). Interestingly, the same pair that occupied nest box no. 3 during 2016 nested in nearby nest box no. 36 in 2017. Two males that were banded as a nestling at Buttertubs West Marsh returned to nest in 2017. One of these males was born in 2014 and returned to nest in 2016 and 2017, the other male was born in 2015 and returned to nest in 2017. No female born at Buttertubs West Marsh has yet returned to nest at the site, suggesting female dispersal from the natal site and/or limited survival of young birds.

Out of 138 eggs laid, 82 eggs hatched (hatching success: 59%), 69 nestlings were banded around day 12 (nestling survival to day 12: 84%), and 52 young birds fledged (nestling survival to fledging: 63%) (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 2.0 young per nesting pair.

Overall, the fledging productivity was similar to 2016 (2.1 young per nesting pair), but lower compared to 2014 and 2015 (2.5 and 3.2 young per nesting pair, respectively). Hatching rate was lower in 2017 (59%) compared to 2014-2016 (68-78%). Survival of young from hatching to day 12 was 84%, which was slightly lower compared to 2014-2016 (87-89%). Survival from hatching to fledging in 2017 (63%) was within the ranged observed in 2014-2016 (59-73%). These results suggest that the lower fledging success in 2017 was mainly due to lower hatching success and survival between hatching and day 12. Field observations suggested that cool and wet weather conditions during the period of 10-20 May 2017 may have in part led to reduced productivity. Compared to 2014-2016, air temperature averaged 5°C lower and at least 4 times more rain fell during this period in 2017.

#### **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, 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 52 volunteers dedicated 2,427 hours to this project during 2017 (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 2017.

<b>Volunteer Grouping</b>	<b>Number of Volunteers</b>	<b>Hours on Project</b>
VIU students	34	1329
VIU graduates	11	511
VIU employees	2	334
Community volunteers	5	253
<b>TOTAL</b>	<b>52</b>	<b>2,427</b>

\*

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 2017:

- On-site demonstration to over 150 individual visitors and guests. This included the following groups: Naturekids Explorers (May 6); Nanaimo Christian School (May 9, 12, 16, 19); VIU Centre for Innovation and Excellence in Learning (May 25); private group (May 27); High School @ VIU (May 30); École North Oyster Elementary (June 1).
- On-site training for 19 students in the VIU BIOL 325 Ornithology course (14, 28 September; 26 October).
- On-site visit for 24 students in VIU GEOG 101 Environmental Geography (July 12).
- Off-site presentation for 48 students in VIU BIOL 202 Ecology (March 17); BC Ministry of Forest, Lands and Natural Resource Operations (April 4).

Social media plays a large part in public outreach and education of this project. Project news, results and photos are shared on the project website (<http://wordpress.viu.ca/viubirdbanding/>) and Facebook page (<https://www.facebook.com/VIUBandingStation>). This allows online followers to not only learn about the project, but to also gain insight on banding procedures, species identification, bird behaviour and more.

\*

**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 2017. 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
ALLO	63	32	95
ALMC	4	1	5
AMFR	31	11	42
ANBO	4	0	4
ANGA	9	8	17
ANMO	2	2	4
AVBR	163	61	224
BELA	64	42	106
BLDU	2	0	2
BRHE	11	1	12
BRJU	32	13	45
BRTI	5	1	6
CABR	62	17	79
CANG	36	3	39
CHCL	5	0	5
CHYO	22	6	28
DEJO	20	3	23
ELHA	24	15	39
EPSH	12	7	19
ERDE	141	79	220
ERGR	5	2	7
EVHE	16	7	23
GABE	107	56	163
HAHA	10	8	18
HEVA	13	6	19
JUDE	1	0	1
KAOV	58	16	74
KIBA	10	1	11
KIWE	79	38	117
LALA	1	1	2
LEWA	13	1	14
MAAN	6	1	7
MAHA	4	1	5
MEQU	1	0	1
MEWI	5	0	5
MICO	7	9	16
MIJU	1	0	1
MIWA	179	102	281
MIZV	1	3	4
NIIR	2	1	3
NIRE	8	1	9
OROS	9	4	13
PADA	0	2	2
PAMO	26	8	34
RYHA	220	98	318
RYLA	1	1	2
SASP	214	60	274
SHGO	0	2	2
SHJA	17	6	23
STWE	2	1	3
TABR	1	0	1
<b>TOTAL</b>	<b>1,729</b>	<b>738</b>	<b>2,467</b>

## 6. Acknowledgements

This project would not be possible without a dedicated group of volunteers, contributors and partners (any omission is unintended): M. Angelstad, K. Barrett, G. Beisel, A. Borris, C. Bright, A. Brophy, T. Brouwer, M. Bryson, C. Clement, M. Coleing, B. Cousens, J. Crichton, J. Deal, K. Decker, E. Demers, A. Douglas-Morris, B. Dudeck, A. Friesen, A. Gauvin, S. Goyal, E. Greavison, D. Gullison, H. Hall, E. Hampshire, R. Hardisty, M. Hayward, B. Heese, E. Hessels, N. Irg, S. James, D. Johnson, P. Jost, M. Juarez, B. Judson, L. Lacey, B. Laforge, A. Lamberton, R. Lampman, K. Langelier, C. Lee, A. Loewen, A. McDonald, P. Monteiro, K. Mutafov, C. Nguyen, O. Osborne, K. Ovcharov, S. Pearce, M. Quin, N. Renaud, C. Rispin, H. Rueggeberg, C. Rycroft, T. Seebacher, R. Segal, E. Shemming, S. Simard-Provencal, B. Timmer, H. Tomlin, L. Ware, M. Warrington, K. Wetten, S. Wetten, M. Wilkins, C. Youngren, M. Zvekic, and H. van Vliet

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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 2017. Subspecies are included in parentheses where applicable.

Common Name	Number banded	Number recaptured	Total number captured
Common Yellowthroat	168	193	361
Song Sparrow	141	112	253
American Robin	109	54	163
Spotted Towhee	83	61	144
Orange-crowned Warbler	132	11	143
Yellow Warbler	89	37	126
Lincoln's Sparrow	114	7	121
Savannah Sparrow	114	6	120
Bushtit	68	29	97
Chestnut-backed Chickadee	52	43	95
Purple Finch	72	18	90
Bewick's Wren	28	34	62
Dark-eyed Junco (Oregon)	46	8	54
Cedar Waxwing	47	3	50
Swainson's Thrush	18	32	50
Wilson's Warbler	50		50
Fox Sparrow	36	11	47
Brown-headed Cowbird	15	15	30
Marsh Wren	25	4	29
Red-winged Blackbird	28		28
Willow Flycatcher	25	3	28
Black-headed Grosbeak	15	9	24
Warbling Vireo	14	5	19
Brown Creeper	11	4	15
American Goldfinch	12	2	14
Ruby-crowned Kinglet	13	1	14
Yellow-rumped Warbler (Myrtle)	13		13
Downy Woodpecker	7	5	12
Pacific-slope Flycatcher	11		11
Steller's Jay	9	1	10
Tree Swallow	3	7	10
Hermit Thrush	9		9
Red-breasted Sapsucker	8	1	9
MacGillivray's Warbler	8		8
Chipping Sparrow	7		7
Golden-crowned Sparrow	7		7
Yellow-rumped Warbler (Unknown)	6		6
Black-throated Gray Warbler	5		5
Hammond's Flycatcher	5		5
Pacific Wren	4		4
Northern Flicker (Red-shafted)	3		3
Northern Rough-winged Swallow	3		3
Varied Thrush	3		3
White-crowned Sparrow (Unknown)	3		3
White-throated Sparrow	3		3
European Starling	2		2
Golden-crowned Kinglet	2		2
Hairy Woodpecker	1	1	2
Hutton's Vireo	2		2
Violet-green Swallow	2		2
White-crowned Sparrow (Puget Sound)	2		2
Yellow-rumped Warbler (Audubon)	2		2
Barn Swallow	1		1
Brewer's Blackbird	1		1
House Finch	1		1
Olive-sided Flycatcher	1		1
Pine Siskin	1		1
Red-breasted Nuthatch	1		1
<b>TOTAL</b>	<b>1,661</b>	<b>717</b>	<b>2378</b>



Table A.2. (continued)

Date	Red-breasted Sapsucker	Hairy Woodpecker	Downy Woodpecker	Northern Flicker	Olive-sided Flycatcher	Willow Flycatcher	Hammond's Flycatcher	Pacific-slope Flycatcher	Hutton's Vireo	Warbling Vireo	Northern Rough-winged Swallow	Steller's Jay	Tree Swallow	Violet-green Swallow	Barn Swallow	Chestnut-backed Chickadee	Bush-tit	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	Varied Thrush	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	Black-headed Grosbeak	Red-winged Blackbird	Brown-headed Cowbird	Brewer's Blackbird	House Finch	Purple Finch	Pine Siskin	American Goldfinch	Total
01-Jun		1																1					3	4				2		13	3											5				3	1			1	39					
09-Jun		1			1				1														2	7				15		7	2												8								1	45				
14-Jun	1	3			1				2	1						5	1							1	18			10	2	9	2												4	2	8						4	74				
18-Jun													3			2	2						1			1		6	2	5	3												2	1	1	1						30				
21-Jun						2							1			1	3					2		1	8			1	4	4	2							1				6	3	4	4			6			53					
27-Jun	1	1	2		1											3	8	1				6	4	3				1	8	9	2										8	1	3				9			72						
29-Jun	1	1					1		2							3				2	1		1	2		1	2		5	1											7	4		1		1			36							
04-Jul	1	2			2				1							3						1	4	1	2					13	1											12	1	1	3	3		9			60					
06-Jul	1								1							1	1					1	3		2			1	1	6	1							1			18	3	1	5		8			55							
10-Jul	1				1											1	6	2		3	3				2					13	1					1		1		1	9	4	1	1		7			58							
12-Jul						1	1									8						2	3	1				5	1	23	3										20	5		1		7			81							
17-Jul																2		1		3	5		4	4				1		17	1									2	9	2						51								
21-Jul							1									4	8	2		1	4		1	2		2		1	2	1	10	3									12	4				3			62							
25-Jul																1				2	2				1				1	7	3						1			1	6	1							26							
27-Jul							1	1								1					1	1								10	3										2	2							23							
31-Jul								1								1	3	1		2					1			1		3	1										4	2		2					23							

(continued on next page)

Table A.2. (continued)

Date	Red-breasted Sapsucker	Hairy Woodpecker	Downy Woodpecker	Northern Flicker	Olive-sided Flycatcher	Willow Flycatcher	Hammond's Flycatcher	Pacific-slope Flycatcher	Hutton's Vireo	Warbling Vireo	Northern Rough-winged Swallow	Steller's Jay	Tree Swallow	Violet-green Swallow	Barn Swallow	Chestnut-backed Chickadee	Bush-tit	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	Varied Thrush	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	Black-headed Grosbeak	Red-winged Blackbird	Brown-headed Cowbird	Brewer's Blackbird	House Finch	Purple Finch	Pine Siskin	American Goldfinch	Total			
03-Aug							1									3									3		1	4	2	6	3					1				5	2		2			3													36
08-Aug					2				1					2	5	2	1	4							1				8	2	8	3				1						2	4		1				1	2						50			
10-Aug				1	1										2		1	2	2					3					5		11	9				4					3	3		3											50				
15-Aug					4		2											2	3	1			2	2							12	1										4		2									2			37			
17-Aug	1				2				1					9	1	1					1		1						1	9	1										4		2	1					2			37							
22-Aug					2									7						1	1				4			1	1	5											4	1	1					2			30								
25-Aug					2				1					1	1									3	1				1	8	2		5			1				1	8		5				1			41									
28-Aug					3		1	1						2										3	3						9	1					2				5	1	3				3			37									
30-Aug					2	1	1	1	2					6								2		4	1				2	9	4									5	3	4				1	1		49										
10-Sep					1									1				1	2	1			2	3					18	9	4						1				15	10	37	3				2		110									
14-Sep										1													4	4					1	8	2						1	2	4	13	4	11	8				1			64									
24-Sep														3	4			2	2			2			5				10	6		2							1	3	5	8	12							79									
28-Sep										2				4	2			1	2			1	1	5							2	3							4	6	10	7							62										
08-Oct										6					3				1				1	6	3				1			1								11	10		1	1	2	4	3			1		55							
26-Oct										1				1	5			1	3	2			3		1															12	24		1			9	12			1		76							
Total	9	2	12	3	1	28	5	11	2	19	3	10	10	2	1	95	97	1	15	4	29	62	2	14	50	9	163	3	2	50	143	8	361	126	21	5	50	7	47	54	5	7	3	120	253	121	144	24	28	30	1	1	90	1	14	2,378			

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**Table A.3.** List of all species observed at Buttertubs West Marsh during 2017 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.

103 species (+2 other taxa)		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<a href="#">Canada Goose</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Trumpeter Swan</a>	MAP	█		█	█						█		
<a href="#">Wood Duck</a>	MAP			█	█	█		█	█		█		
<a href="#">American Wigeon</a>	MAP										█		
<a href="#">Mallard</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Northern Pintail</a>	MAP	█									█		
<a href="#">Green-winged Teal</a>	MAP	█		█			█	█	█	█	█		
<a href="#">Ring-necked Duck</a>	MAP	█	█	█									
<a href="#">Bufflehead</a>	MAP	█	█	█	█	█							
<a href="#">Hooded Merganser</a>	MAP		█			█							
<a href="#">Common Merganser</a>	MAP			█		█		█	█		█		
<a href="#">California Quail</a>	MAP			█	█	█	█	█	█	█			
<a href="#">Great Blue Heron</a>	MAP	█	█	█	█	█	█	█	█	█	█		
<a href="#">Turkey Vulture</a>	MAP			█	█	█	█	█	█	█	█	█	
<a href="#">Northern Harrier</a>	MAP									█	█	█	
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<a href="#">Sharp-shinned Hawk</a>	MAP			█						█	█		
<a href="#">Cooper's Hawk</a>	MAP	█	█	█		█			█	█	█	█	█
<a href="#">Bald Eagle</a>	MAP		█	█	█	█	█	█	█	█	█	█	█
<a href="#">Red-tailed Hawk</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Virginia Rail</a>	MAP			█	█	█	█				█		
<a href="#">Killdeer</a>	MAP					█					█		
<a href="#">Wilson's Snipe</a>	MAP	█	█	█	█	█							█
<a href="#">Mew Gull</a>	MAP				█								
<a href="#">Glaucous-winged Gull</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Rock Pigeon</a>	MAP			█	█			█					
<a href="#">Band-tailed Pigeon</a>	MAP			█	█	█	█	█	█	█	█	█	█
<a href="#">Eurasian Collared-Dove</a>	MAP	█	█	█	█	█	█	█		█			
<a href="#">Great Horned Owl</a>	MAP				█					█	█		
<a href="#">Barred Owl</a>	MAP			█	█	█		█	█		█		
<a href="#">Common Nighthawk</a>	MAP						█		█				

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**Table A.3.** (continued)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<a href="#">Black Swift</a>	<a href="#">MAP</a>						■	■					
<a href="#">Vaux's Swift</a>	<a href="#">MAP</a>									■			
<a href="#">Anna's Hummingbird</a>	<a href="#">MAP</a>	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Rufous Hummingbird</a>	<a href="#">MAP</a>				■	■	■	■	■	■	■	■	■
<a href="#">hummingbird sp.</a>	<a href="#">MAP</a>					■							
<a href="#">Belted Kingfisher</a>	<a href="#">MAP</a>			■					■	■	■	■	■
<a href="#">Red-breasted Sapsucker</a>	<a href="#">MAP</a>			■	■	■	■	■	■	■	■	■	■
<a href="#">Downy Woodpecker</a>	<a href="#">MAP</a>	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Hairy Woodpecker</a>	<a href="#">MAP</a>					■	■	■			■	■	■
<a href="#">Northern Flicker</a>	<a href="#">MAP</a>	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Pileated Woodpecker</a>	<a href="#">MAP</a>				■	■	■	■	■	■	■	■	■
<a href="#">Merlin</a>	<a href="#">MAP</a>			■	■		■	■	■	■	■	■	■
<a href="#">Peregrine Falcon</a>	<a href="#">MAP</a>	■			■	■					■	■	■
<a href="#">Olive-sided Flycatcher</a>	<a href="#">MAP</a>					■	■						
<a href="#">Willow Flycatcher</a>	<a href="#">MAP</a>					■	■	■	■	■			
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<a href="#">Hammond's Flycatcher</a>	<a href="#">MAP</a>					■		■	■	■			
<a href="#">Pacific-slope Flycatcher</a>	<a href="#">MAP</a>				■	■	■	■	■	■			
<a href="#">Northern Shrike</a>	<a href="#">MAP</a>			■	■								
<a href="#">Hutton's Vireo</a>	<a href="#">MAP</a>				■					■			
<a href="#">Cassin's Vireo</a>	<a href="#">MAP</a>					■							
<a href="#">Warbling Vireo</a>	<a href="#">MAP</a>					■	■	■	■	■			
<a href="#">Steller's Jay</a>	<a href="#">MAP</a>								■	■	■	■	■
<a href="#">Northwestern Crow</a>	<a href="#">MAP</a>	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Common Raven</a>	<a href="#">MAP</a>	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Northern Rough-winged Swallow</a>	<a href="#">MAP</a>					■	■	■					
<a href="#">Purple Martin</a>	<a href="#">MAP</a>				■	■	■	■	■				
<a href="#">Tree Swallow</a>	<a href="#">MAP</a>			■	■	■	■	■	■	■	■	■	■
<a href="#">Violet-green Swallow</a>	<a href="#">MAP</a>			■	■	■	■	■					
<a href="#">Barn Swallow</a>	<a href="#">MAP</a>					■	■	■	■	■			
<a href="#">Cliff Swallow</a>	<a href="#">MAP</a>					■							

(continued on next page)

**Table A.3.** (continued)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<a href="#">Chestnut-backed Chickadee</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Bushtit</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Red-breasted Nuthatch</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Brown Creeper</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Pacific Wren</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Marsh Wren</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Bewick's Wren</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Golden-crowned Kinglet</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Ruby-crowned Kinglet</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Swainson's Thrush</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Hermit Thrush</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">American Robin</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Varied Thrush</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">European Starling</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Cedar Waxwing</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<a href="#">Orange-crowned Warbler</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">MacGillivray's Warbler</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Common Yellowthroat</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Yellow Warbler</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Yellow-rumped Warbler</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Black-throated Gray Warbler</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Wilson's Warbler</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Chipping Sparrow</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Fox Sparrow</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Dark-eyed Junco</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">White-crowned Sparrow</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Golden-crowned Sparrow</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">White-throated Sparrow</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Savannah Sparrow</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█
<a href="#">Song Sparrow</a>	MAP	█	█	█	█	█	█	█	█	█	█	█	█

**Table A.3.** (continued)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<a href="#">Lincoln's Sparrow</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Spotted Towhee</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Western Tanager</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Black-headed Grosbeak</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Western Meadowlark</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Red-winged Blackbird</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Brown-headed Cowbird</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Brewer's Blackbird</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">House Finch</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Purple Finch</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">House/Purple Finch</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Red Crossbill</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">Pine Siskin</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">American Goldfinch</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■
<a href="#">House Sparrow</a> (MAP)	■	■	■	■	■	■	■	■	■	■	■	■

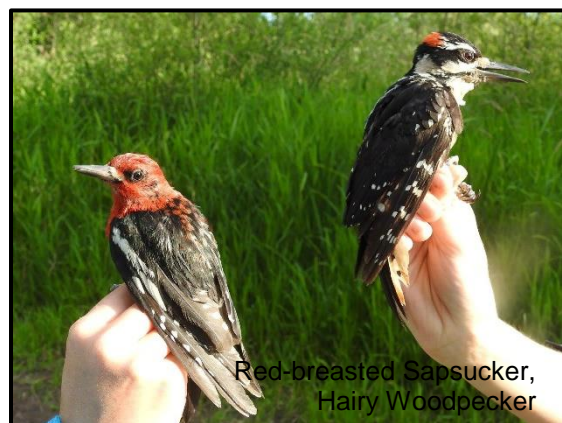
**KEY:** ■ = insufficient data |  = rare to widespread

**Photos A.1.** Sample photographs for the VIU Bird Monitoring and Banding Project at Buttertubs West Marsh during 2017. Photos courtesy of E. Demers.



(continued on next page)

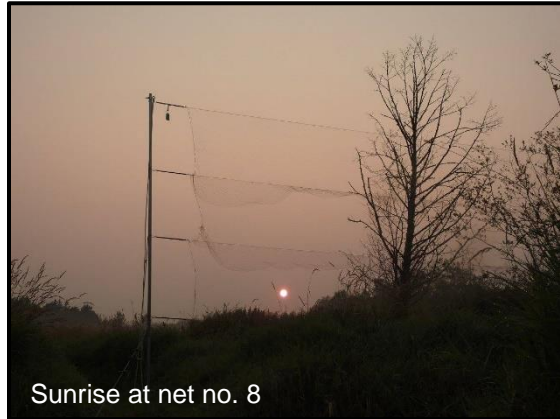
Photos A.1. (continued)



Photos A.1. (continued)



Brown-headed Cowbird (male, female)



Sunrise at net no. 8



Black-throated Gray Warbler (female, male)



Varied Thrush



BIOL 325 class and banders



White-throated Sparrow