

DATA REPORT

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

2019



Gray Catbird

Report prepared by:

Dr. Eric Demers (Vancouver Island University)



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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, 2019).

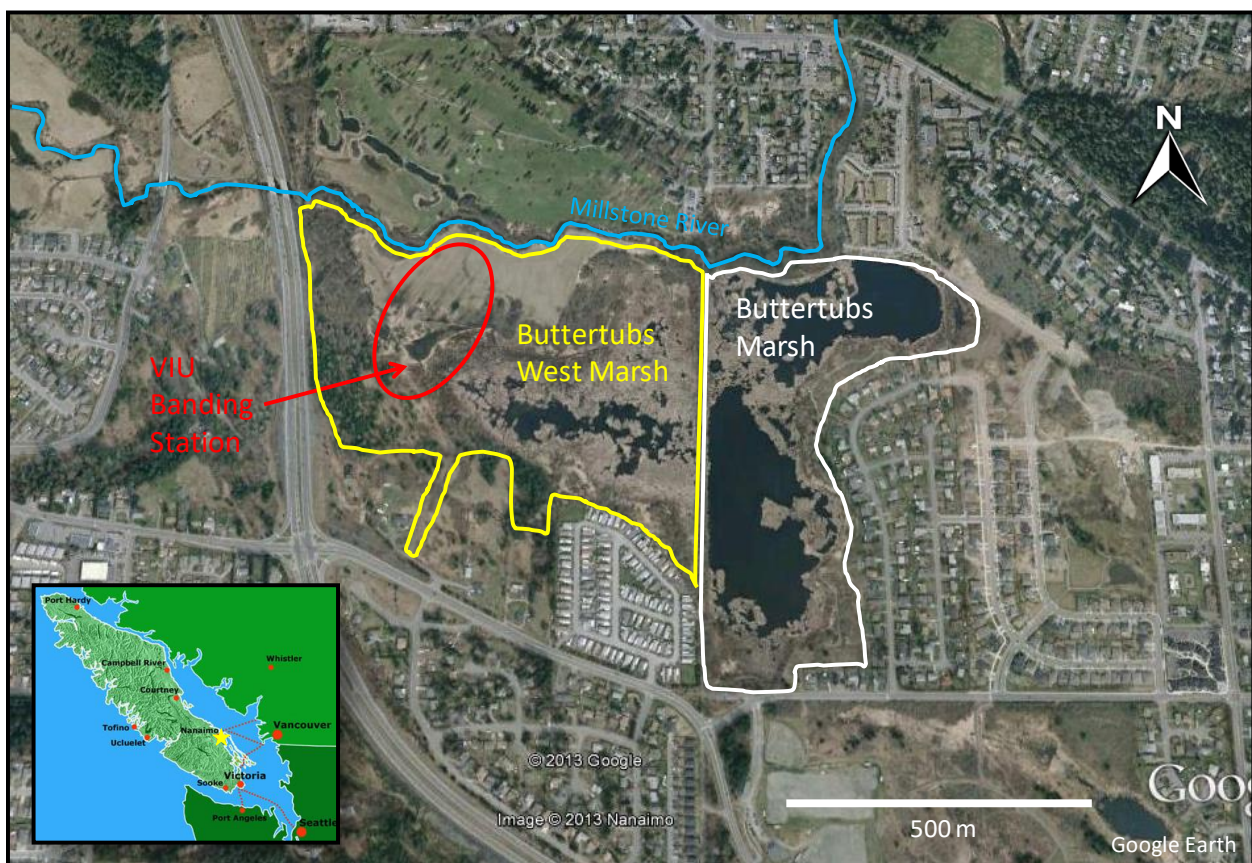


Figure 1. Aerial photograph of the Buttertubs West Marsh in Nanaimo, BC, including the location of the Vancouver Island University (VIU) bird monitoring and banding project.

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 2019. 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 / 100063, Canadian Wildlife Service Bird Banding Office Scientific Permit No. 10885, 10885A and 10885B, and following procedures and guidance established in the VIU Bird Monitoring and Banding Manual (Demers, 2019), the North American Banding Council (NABC, 2001a,b), and the Institute for Bird Populations (IBP, 2012).

Between April and October 2019, 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.

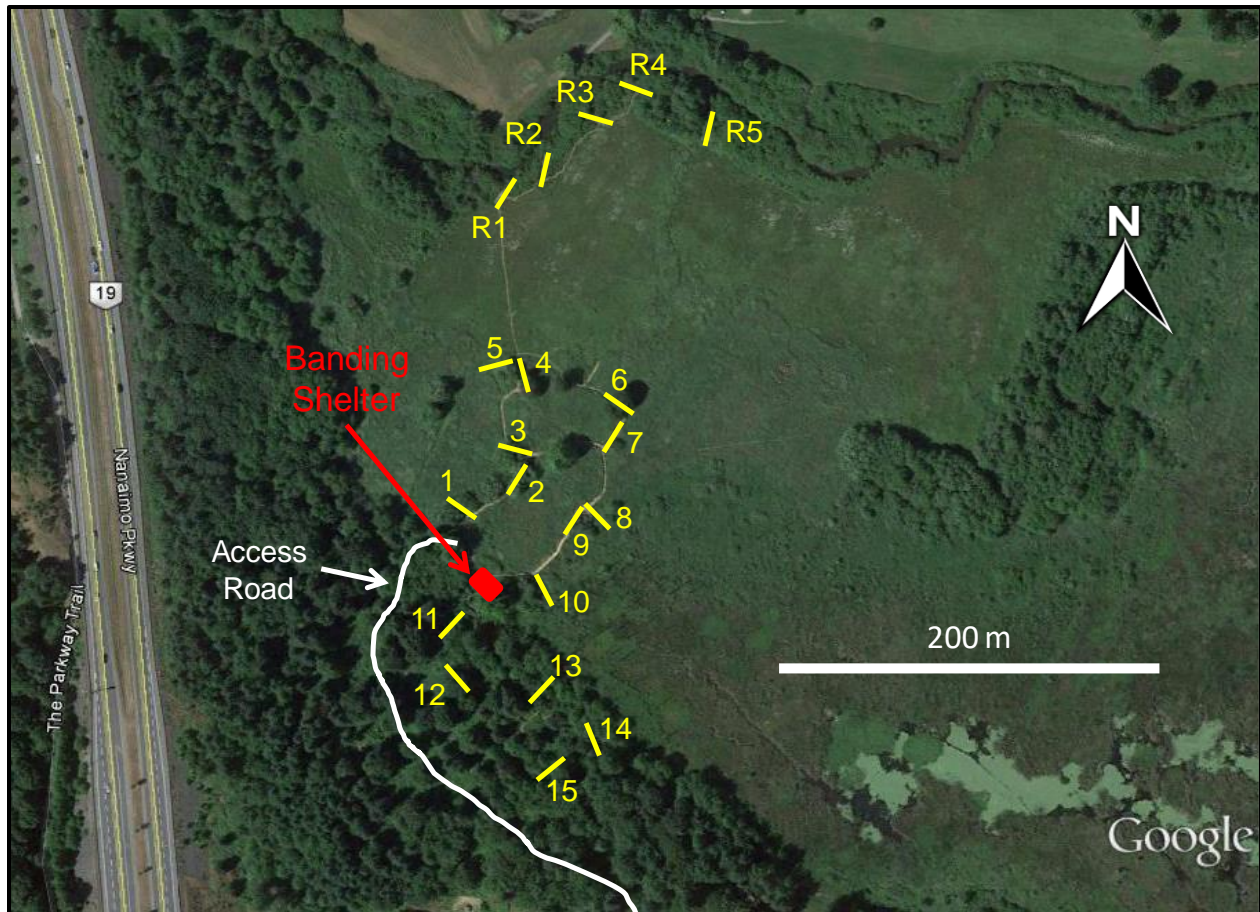


Figure 2. Locations of mist nets and banding shelter used for songbird banding at Buttertubs West Marsh during 2019.

Bird banding activities were conducted 1-2 days most weeks between 2 April and 14 October 2019. 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 28 days between 2 April and 14 October 2019, with a total mist netting effort of 3,263 hours (average: 116.3 net hours / day) (Table 1). A total of 1,631 birds were caught from 48 species. Of these, 1,204 birds were banded and 427 birds (26.2%) were recaptures of previously banded birds. An additional 88 birds were captured and released unbanded (primarily hummingbirds). The average capture rate in 2019 was 50.0 birds / 100 net-hours.

The total capture effort deployed in 2019 (3,263 net-hours) was the lowest in the last 5 years (Table 1). There was no change in layout or number of nets used between 2017 and 2019. Capture rate in 2019 (50.0 birds per 100 net-hours) was the second highest observed since the beginning of the project in 2013. Reasons for the higher capture rate in 2019 are unknown but may include inter-annual variation in habitat use, breeding success, weather conditions, and the number and timing of banding days. The total number of species captured in 2019 (49 species) was slightly lower than for the last few years (49-57 species in 2015-2018).

Table 1. Mist net capture statistics at Buttertubs West Marsh during 2015-2019.

Parameter	Value				
	2015	2016	2017	2018	2019
Capture effort (net-hours)	4,358	8,648	5,874	3,340	3,263
Average daily effort (net-hours / day)	117.8	118.5	122.4	111.3	116.6
Number of birds banded	1,359	2,352	1,661	1,279	1,204
Number of recaptures	556	1,212	717	468	427
Total number of birds captured	1,915	3,564	2,378	1,747	1,631
Recapture rate (%)	29.0	34.0	30.2	26.8	26.2
Number of species	52	57	55	49	48
Capture rate (birds per 100 net-hours)	43.9	41.2	40.5	52.3	50.0

Compared to previous years, capture rates were high in April, May, and in September 2019 (Figure 3). Catch rates during late April and early May were the highest observed for this project since 2013 and corresponded with the arrival / passage of spring migrants. Capture rates during fall migration in 2019 (September) were relatively high compared to previous years.

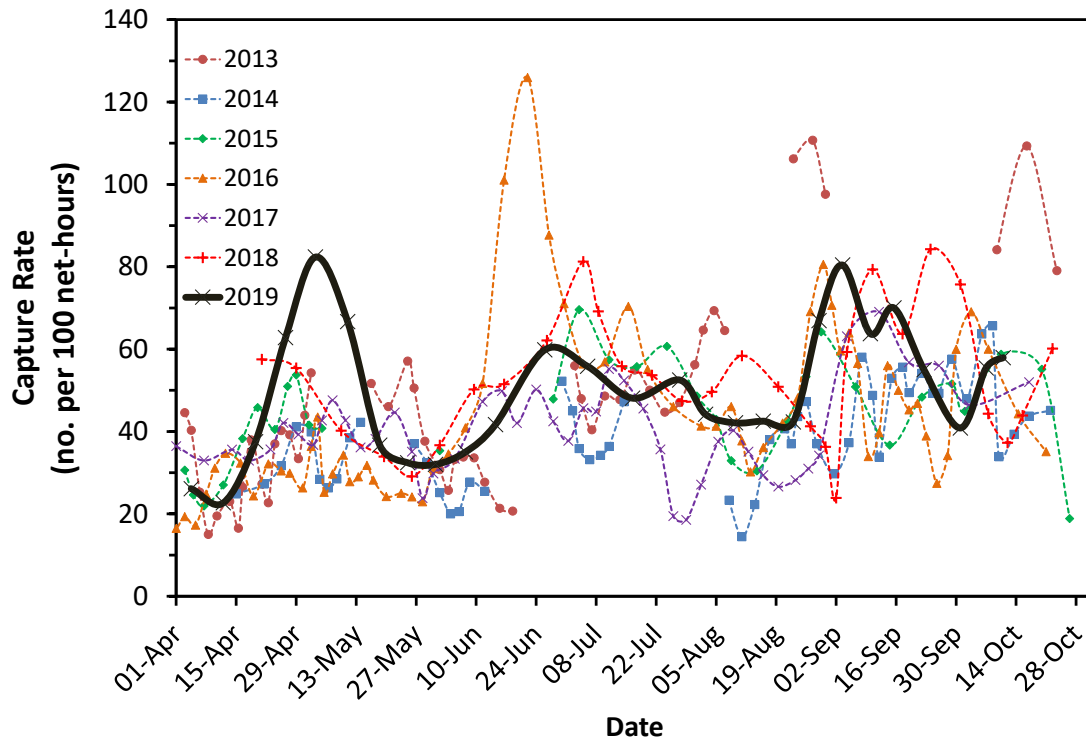


Figure 3. Weekly moving average of capture rate in mist nets at Buttertubs West Marsh during 2013-2019.

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

Overall, Common Yellowthroat (*Geothlypis trichas*) was the most captured species and represented 14.2% of all birds caught during 2019 (Table 3). Orange-crowned Warbler (*Vermivora celata*) was the second most common species and accounted for 10.3% of all birds caught. This was the first time since the beginning of the project that Song sparrow (*Melospiza melodia*) was not the second most caught species (no. 3 in 2019). All species listed in Table 3 are local breeders at Buttertubs Marsh, except for Lincoln's Sparrow (*M. lincolni*). Tables A.1 and A.2 in Appendix provide a complete summary of all species captured during 2019.

Table 2. Capture statistics by net at Buttertubs West Marsh during 2019.

Net Number	Number Banded	Number Recaptured	Total Number Captured	Net Hours	Capture Rate (Birds / 100 Net hours)
1	61	40	101	167	60.5
2	42	25	67	167	40.2
3	41	14	55	167	33.0
4	26	9	35	167	21.0
5	21	15	36	161	22.3
6	22	15	37	162	22.9
7	58	20	78	165	47.3
8	142	34	176	167	105.5
9	85	29	114	167	68.3
10	69	24	93	167	55.7
11	24	19	43	167	25.8
12	29	18	47	167	28.2
13	26	13	39	167	23.4
14	42	25	67	166	40.4
15	30	18	48	167	28.8
R1	128	25	153	156	98.4
R2	127	19	146	156	93.9
R3	112	19	131	155	84.4
R4	57	30	87	153	56.9
R5	62	16	78	155	50.3
Totals	1,204	427	1,631	3,263	---

There were changes in the rankings for the top 10 species captured during 2019 (Table 4). The most significant changes were an increase in ranking for Bewick's Wren (*Thryomanes bewickii*) and a decrease for American Robin (*Turdus migratorius*) compared to previous years.

Only one new species was captured at Buttertubs West Marsh in 2019: a Gray Catbird (*Dumetella carolinensis*) captured on 8 September 2019. This capture was unusual as this species is uncommon on Vancouver Island. This individual had been observed or heard in the vicinity of nets 10 and 13 from first detection at the site on 26 July 2019.

Table 3. Fifteen most common species captured in mist nets at Buttertubs West Marsh during 2019.

Common Name	Number Banded	Number Recaptured	Total Number Captured
Common Yellowthroat	123	108	231
Orange-crowned Warbler	156	12	168
Song Sparrow	72	71	143
Spotted Towhee	78	30	108
Bushtit	62	29	91
Lincoln's Sparrow	86	5	91
American Robin	70	12	82
Bewick's Wren	42	36	78
Chestnut-backed Chickadee	43	31	74
Purple Finch	55	7	62
Swainson's Thrush	37	24	61
Yellow Warbler	45	10	55
Oregon Junco	48	4	52
Yellow-rumped Warbler	45	1	46
Fox Sparrow	19	9	28

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 2018) were the dominant age group between April and May, while hatch-year birds (hatched in 2019) were the dominant age group between June and October. Overall, 56.2% of birds banded were birds hatched in 2019. This percentage was lower than during previous years mainly due to the higher number of second-year or older birds captured during April and May.

Table 4. Number captured and rank (in parentheses) of the ten species most captured in mist nets at Buttertubs West Marsh during 2015-2019.

Common Name	2015	2016	2017	2018	2019
Common Yellowthroat	304 (1)	605 (1)	361 (1)	281 (1)	231 (1)
Orange-crowned Warbler	121 (5)	216 (5)	143 (5)	77 (8)	168 (2)
Song Sparrow	207 (2)	349 (2)	253 (2)	187 (2)	143 (3)
Spotted Towhee	137 (3)	210 (6)	144 (4)	102 (6)	108 (4)
Bushtit	114 (6)	132 (9)	97 (9)	120 (4.5)	91 (5.5)
Lincoln's Sparrow	79 (8)	293 (3)	121 (7)	133 (3)	91 (5.5)
American Robin	130 (4)	232 (4)	163 (3)	120 (4.5)	82 (7)
Bewick's Wren	65 (10)	130 (10)	62 (12)	55 (11)	78 (8)
Chestnut-backed Chickadee	112 (7)	138 (8)	95 (10)	67 (9)	74 (9)
Purple Finch	55 (11)	117 (12)	90 (11)	78 (7)	62 (10)

Table 5. Age structure of birds banded at Buttertubs West Marsh during 2019.

Month	Hatch Year (HY)	Second Year (SY)	After Hatch Year (AHY)	After Second Year (ASY)	Other Ages	Total
April		50	6	27	1	84
May	13	162	13	31		219
June	49	22	7	7		85
July	136	19	35	2		192
August	140	2	25		2	169
September	233		44		26	303
October	106		34		12	152
TOTAL	677	255	164	67	41	1,204

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) (Table 6). Overall, the majority of birds banded (68.0%) did not display any visible fat (fat score = 0).

Table 6. Fat score of birds banded at Buttertubs West Marsh during 2019.

Month	0	1-2	3-5	Total
April	34	23	27	84
May	96	38	77	211
June	59	22	3	84
July	159	29	0	188
August	138	25	4	167
September	204	56	42	302
October	115	23	9	147
TOTAL	805	216	162	1,228

The 427 recapture events recorded in 2019 involved 287 banded birds (Table 7), of which 42 individuals were banded in 2013-2016, and 21, 83, and 141 individuals were originally banded in 2017, 2018, and 2019, respectively. Overall, 0.5% of individuals banded in 2013-2016 were recaptured in 2019, 1.0% of individuals banded in 2017 were recaptured in 2019, 5.5% of individuals banded in 2018 were recaptured in 2019, and 9.7% of individuals banded in 2019 were recaptured in 2019. 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 2019 but were not recaptured.

Table 7. Number and percentage of individuals recaptured in 2019 which were originally banded in 2016 or before, 2017, 2018 or 2019 for the ten most commonly recaptured species.

Species	Banded in 2016 or before		Banded in 2017		Banded in 2018		Banded in 2019	
	No.	%	No.	%	No.	%	No.	%
Common Yellowthroat	10	1.1	5	3.0	15	8.8	18	14.6
Song Sparrow	7	1.2	3	2.1	10	9.9	14	18.4
Bewick's Wren	1	0.6	1	3.6	5	16.7	10	20.0
Chestnut-backed Chickadee	3	1.0	1	1.9	8	15.1	16	28.1
Spotted Towhee	4	0.9	2	2.4	7	9.1	13	14.6
Bushtit	0	0.0	0	0.0	9	11.1	15	23.1
Swainson's Thrush	1	0.6	0	0.0	4	12.5	9	23.7
Orange-crowned Warbler	0	0.0	1	0.8	0	0.0	5	3.2
American Robin	2	0.4	1	0.9	4	3.8	1	1.4
Yellow Warbler	2	0.8	0	0.0	2	4.9	1	2.2
All species	42	0.5	21	1.0	83	5.5	141	9.7

Most recapture events involved birds that were recaptured only once during 2019. However, 225 individuals were recaptured more than once since they were banded, and at least 35 individuals were recaptured 6 or more times since they were banded. Some of these frequently recaptured individuals are listed in Table 8. Unfortunately, Common Yellowthroat 2700-93399 (“Wayne”) and Song Sparrow 2581-70122 (“Blair”), which had been captured many times during 2013-2018 were not captured during 2019. The oldest known recaptured bird was an American Robin (0942-98752) which was originally banded as a second-year individual on 18 June 2013; this bird was 7 years old in 2019.

Table 8. List of selected individuals recaptured in 2019, which have been recaptured 6 or more times at Buttertubs West Marsh during 2014-2019.

Band Number	Species	Sex	Number of Times Recaptured Since Banded	Date Banded	Date of Last Recapture
1881-87777	BEWR	Female	9	4 Jul. 2018	16 May 2019
2691-51461	BHCO	Female	8	6 Jun. 2016	19 Jun. 2019
2561-31836	BHGR	Male	6	9 Jun. 2016	23 May 2019
2730-48724	CBCH	Male	8	7 Apr. 2016	8 May. 2019
2780-62195	COYE	Male	21	31 Jul. 2016	5 Jul. 2019
2691-51371	DOWO	Female	8	15 May 2014	16 May 2019
2561-03789	RBSA	Unknown	6	10 May 2014	19 Jun. 2019
2691-51204	SOSP	Male	26	26 Jun. 2015	6 Oct. 2019
2561-03799	SPTO	Female	10	28 Jun. 2014	17 Apr. 2019
2581-70517	SWTH	Male	8	3 Jul. 2014	5 Jul. 2019
2730-48859	YEWA	Male	7	29 Apr. 2016	8 May 2019

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 95 species were observed at Buttertubs West Marsh during 2019 (Table A.3 in Appendix). New species observed in 2019 were Gray Catbird and House Sparrow (*Passer domesticus*). It is interesting to note that although House Sparrow is a common species in surrounding residential areas, but this species has rarely been observed at Buttertubs West Marsh. A total of 129 species have been observed at Buttertubs West Marsh since the beginning of this project in 2013.

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 5). 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 boxes are cleaned out each year after the nesting season.

Nest box monitoring followed the procedures outlined in the VIU Swallow Nest Box Monitoring Manual (Demers, 2019). Nest boxes were monitored every 3-5 days between 29 April and 24 July 2019. 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.

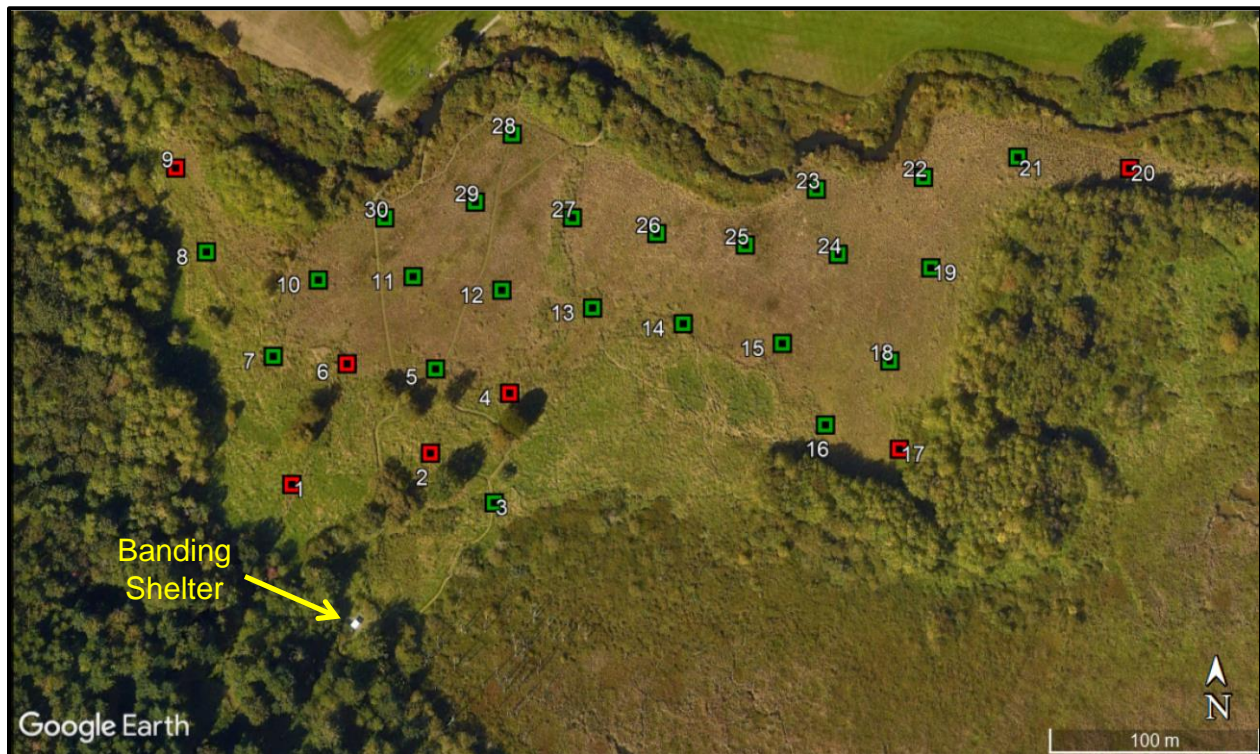


Figure 5. Locations of the 30 swallow nest boxes at Buttertubs West Marsh during 2019. Green and red squares indicate whether eggs were deposited in the nest box or not, respectively. All occupied nest boxes were used by Tree Swallows, except Violet-green Swallow and Bewick's Wren which nested in nest box no. 5 and 28, respectively.

Table 9. Results of nest box monitoring at Buttertubs West Marsh during 2019. Nest boxes no. 12, 15, 19, 22, 23, 27, and 29 received two clutches (see text). TRES = Tree Swallow, VGSW = Violet-green Swallow, BEWR = Bewick's Wren; DNH = Did not hatch; F = Female; M = Male; N = Nestlings.

Nest Box	Nest Building	Species	Number of Eggs	Complete Clutch Date	Mean Hatch Date	Number Fledged	Individuals Banded / Processed
1	No						
2	No						
3	Yes	TRES	6	13 May	27 May	5	F, N
4	No						
5	Yes	VGSW	4	9 Jun.	23 Jun.	4	F, N
6	No						
7	Yes	TRES	5	13 May	27 May	5	F, N
8	Yes	TRES	5	27 May	10 Jun.	4	F, N
9	No						
10	Yes	TRES	5	15 May	29 May	4	F, N
11	Yes	TRES	6	13 May	27 May	3	F, N
12	Yes	TRES	Clutch 1: 5 Clutch 2: 4	8 May 27 May	DNH 10 Jun.	0 4	F F, N
13	Yes	TRES	6	5 May	19 May	3	F, M, N
14	Yes	TRES	7	21 May	4 Jun.	6	F, N
15	Yes	TRES	Clutch 1: 6 Clutch 2: 4	11 May 27 Jun.	25 May DNH	4 0	F, N F
16	Yes	TRES	6	19 May	2 Jun.	3	F, N
17	No						
18	Yes	TRES	3	11 May	25 May	3	F, N
19	Yes	TRES	Clutch 1: 3 Clutch 2: 2	29 Apr. 30 May	DNH 13 Jun.	0 1	--- N
20	No						
21	Yes	TRES	4	8 May	22 May	4	F, N
22	Yes	TRES	Clutch 1: 7 Clutch 2: 5	12 May 1 Jun.	DNH 15 Jun.	0 5	F F, N
23	Yes	TRES	Clutch 1: 6 Clutch 2: 4	12 May 4 Jun.	DNH 18 Jun.	0 3	F F, N
24	Yes	TRES	7	13 May	27 May	5	F, N
25	Yes	TRES	6	6 May	20 May	6	F, M, N
26	Yes	TRES	6	13 May	27 May	4	F, N
27	Yes	TRES	Clutch 1: 5 Clutch 2: 6	14 May 8 Jun.	DNH 22 Jun.	0 4	F F, N
28	Yes	BEWR	5	22 Apr.	6 May	5	F, N
29	Yes	TRES	Clutch 1: 5 Clutch 2: 3	8 May 28 Jun.	22 May 12 Jul.	4 0	F, N ---
30	Yes	TRES	6	15 May	29 May	4	F, N
Total			150			93	

Table 10. Summary of Tree Swallow nesting productivity at Buttertubs West Marsh during 2015-2019. Violet-green Swallow and Bewick's Wren productivity data are not included.

Parameter	2015	2016	2017	2018	2019
Number of boxes	30	30	37	30	30
Number of boxes with eggs (% of boxes with eggs)	19 (63%)	20 (67%)	22 (59%)	24 (80%)	21 (70%)
Number of eggs laid	109	115	138	135	141
Mean clutch size (range)	5.1 (4-6)	5.0 (2-6)	5.1 (1-7)	5.0 (1-7)	5.0 (2-7)
Number of eggs hatched (% eggs hatched)	83 (76%)	78 (68%)	82 (59%)	115 (85%)	106 (75%)
Number of nestlings banded (% nestlings banded)	74 (89%)	68 (87%)	69 (84%)	105 (91%)	97 (92%)
Number fledged (% nestlings fledged)	61 (73%)	46 (59%)	52 (63%)	62 (54%)	84 (79%)
Fledging rate (young per pair)	3.2	2.1	2.0	2.3	3.0

3.2. Results

Twenty-four of the 21 nest boxes were occupied by Tree Swallows (*Tachycineta bicolor*) and had signs of nest building activities (Table 9). One box was occupied by Violet-green Swallow (*Tachycineta thalassina*) and one box was occupied by Bewick's Wren. The latter two species successfully fledged all eggs laid in their nest boxes (Violet-green Swallow: 4 fledglings; Bewick's Wren: 5 fledglings).

Clutch sizes for Tree Swallows ranged from 2-7 eggs with an average of 5.0 eggs per clutch, which was consistent with previous years. Seven nest boxes were the site of repeated nesting attempts, most of which involving different females during the first and second nests. This was the highest rate of re-nesting observed since monitoring began in 2013. In all of these cases, only one of the clutches produced fledglings, most often the second clutch.

Twenty-five adult females and 2 adult males were captured. Fewer males were captured in 2019 than in previous years due to the significantly longer time required to capture males and reduced volunteer availability. Of the 25 adult female Tree Swallows captured, 2 individuals had nested at Buttertubs West Marsh during 2015 and 2016, 4 individuals had nested during 2017, and 7 individuals had nested during 2018. Two females nested in the same box during 2018 and 2019. One male has re-nested in box no. 25 each year since 2016, and with the same female in 2018 and 2019. Two females that were originally banded as nestlings at Buttertubs West Marsh returned to nest in 2019.

Out of 141 Tree Swallow eggs laid, 106 eggs hatched (hatching success: 75%), 97 nestlings were banded around day 12 (nestling survival to day 12: 92%), and 84 young birds fledged (nestling survival to fledging: 79%) (Tables 9 and 10). Fledging success was variable between nest boxes, although all boxes with hatched eggs fledged at least one young. The average fledging rate for the entire nest box colony was 3.0 young per nesting pair.

Overall, the fledging productivity was the second highest since 2015. Hatching rate was higher in 2019 (85%) compared to 2014-2017 (59-78%). Although hatching rate in 2019 (75%) was average compared to 2015-2018, survival of young from hatching to day 12 (92%) and fledging (79%) were the highest for the last 5 years. These results suggest that higher survival during the nestling phase resulted in the higher productivity in 2019. Field observations suggested that favourable weather during the month of June 2019 (mean temperature: 16.4°C; total rainfall: 13 mm; number of days with no precipitation: 22 days) may have in part led to higher productivity. In previous years (2016-2018), periods of less favourable weather coincided with the vulnerable pre-fledging days and were associated with lower productivity.

A single nestling in one nest box (no. 29) was infested with twelve parasitic blowfly larvae and did not survive. Interestingly, the other four nestlings in this box did not host any larvae and all fledged.

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 51 volunteers dedicated 1,703 hours to this project during 2019 (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 2019.

Volunteer Grouping	Number of Volunteers	Hours on Project
VIU students	32	1,081
VIU graduates	9	264
VIU employees	4	268
Community volunteers	6	90
TOTAL	51	1,703

Volunteer training was conducted by Dr. Eric Demers, Samuelle Simard-Provençal 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 2019:

- On-site demonstration to over 20 individual visitors and guests: VIU Grandkids University (July 5).
- On-site demonstration for 40 students: VIU GEOG 101 Environmental Geography (June 5); VIU BIOL 325 Ornithology course (September 19, October 10).
- Off-site demonstration for 20 elementary school children: École Océane (June 11; VIU Nanaimo Campus).
- Off-site demonstration for 25 students: VIU RMOT 275 Wildlife Techniques (September 23, 30; October 7, 28; VIU Nanaimo Campus).
- Off-site presentation for students in VIU BIOL 202 Ecology (March 13); VIU Science & Technology Lecture Series (March 20).

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 2019. 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
ALBA	265	82	347
AVBR	54	17	71
BELA	26	8	34
BRJU	14	4	18
CEVA	17	5	22
CHBR	38	16	54
CHYO	7	3	10
DASH	1		1
DAVA	2		2
DAZU	7	1	8
EMAS	7	1	8
EMMI	2		2
EMSP	2		2
ERDE	120	28	148
EVHE	45	21	66
GABE	28	9	37
GEVA	106	52	158
HEHO	19	5	24
HEVA	58	20	78
HIKI	1	1	2
HISA	1	1	2
JAMU	9	4	13
JOAR	3	1	4
JOFM	9	1	10
JOHO	1	1	2
KEGO	4		4
KIWE		2	2
LIEG	2	3	5
LONI	5	4	9
MAFR	2		2
MAMR		1	1
MAWA	30	10	40
MAWL	9	1	10
MAWR		1	1
MEKO	1	1	2
MEMR	1		1
MEQU	1	2	3
NADU	3		3
OLMU	137	45	182
PAMO	24	3	27
REAP	18	6	24
ROCH	10	2	12
RYHA	23	1	24
SAHU	7	5	12
SARS	7	7	14
SASP	178	47	225
SHJA	5		5
SHKE	16	1	17
VIWO	14	8	22
TOTAL	1,339	431	1,770

6. Acknowledgements

This project would not be possible without a dedicated group of volunteers, contributors and partners (any omission is unintended): M. Angelstad, R. Aplin, J. Archambault, E. Ascui, A. Badger, G. Beisel, C. Brewster, A. Brophy, M. Byrne, R. Byrne, R. Chicalo, E. Demers, N. Duifhuis, L. Eggert, J. Filgate-Mcnabb, M. Friman, K. Gourlay, R. Hardisty, E. Hessels, J. Holden, H. Holmes, S. Hunt, S. James, B. Judson, S. Keast, H. Kimura, M. Kollman, B. Laforge, E. Mills, P. Monteiro, M. Mrus, J. Muir, O. Murphy, L. Nichols, M. Quin, A. Ramey, H. Sato, D. Shworan, S. Simard-Provençal, E. Simard-Provençal, S. Spencer, G. van der Voort, H. van Vliet, C. van Woesnel, D. Vanbergen, M. Wagenaar, K. Wetten, V. Woodward, M. Wright-LaGreca, C. Youngren, and D. Zuloaga.

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Bird banding activities were conducted in accordance with Vancouver Island University Animal Use Protocol No. 2012-10-R / 100063 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), 10885A (Kim Wetten) and 10885B (Samuelle Simard-Provençal) to capture and band migratory birds, including authorization to use mist nets for the capture of passerines and other landbirds.

7. References

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8. Appendix

Table A.1. List of all species captured in mist nets at Buttertubs West Marsh during 2019. Subspecies are included in parentheses where applicable.

Common Name	Number banded	Number recaptured	Total number captured
Common Yellowthroat	123	108	231
Orange-crowned Warbler	156	12	168
Song Sparrow	72	71	143
Spotted Towhee	78	30	108
Bushtit	62	29	91
Lincoln's Sparrow	86	5	91
American Robin	70	12	82
Bewick's Wren	42	36	78
Chestnut-backed Chickadee	43	31	74
Purple Finch	55	7	62
Swainson's Thrush	37	24	61
Yellow Warbler	45	10	55
Dark-eyed Junco (Oregon)	48	4	52
Fox Sparrow	19	9	28
Yellow-rumped Warbler (Myrtle)	25	1	26
Savannah Sparrow	24		24
Willow Flycatcher	21	1	22
Cedar Waxwing	17	2	19
Wilson's Warbler	17	1	18
Yellow-rumped Warbler (Audubon)	15		15
Golden-crowned Sparrow	14		14
Warbling Vireo	11	2	13
Marsh Wren	10	2	12
Brown Creeper	10	1	11
Tree Swallow	5	6	11
Ruby-crowned Kinglet	11		11
American Goldfinch	10		10
Black-headed Grosbeak	3	6	9
Steller's Jay	5	4	9
Pine Siskin	9		9
Red-winged Blackbird	8	1	9
Brown-headed Cowbird	6	2	8
MacGillivray's Warbler	7		7
Hermit Thrush	7		7
Downy Woodpecker	3	3	6
Red-breasted Sapsucker		6	6
Yellow-rumped Warbler (unknown ssp.)	5		5
Violet-green Swallow	4		4
Pacific-slope Flycatcher	3		3
Hammond's Flycatcher	3		3
House Finch	2		2
Pacific Wren	2		2
Chipping Sparrow	2		2
Black-throated Gray Warbler	2		2
Hutton's Vireo	1	1	2
Northern Rough-winged Swallow	1		1
Gray Catbird	1		1
Varied Thrush	1		1
House Wren	1		1
Golden-crowned Kinglet	1		1
Dark-eyed Junco (Slate-colored)	1		1
TOTAL	1,279	468	1,747

Table A.2. Number of all species captured during each day of mist netting at Buttertubs West Marsh during 2019.

Date	Red-breasted Sapsucker	Downy Woodpecker	Willow Flycatcher	Hammond's Flycatcher	Pacific-slope Flycatcher	Hutton's Vireo	Warbling Vireo	Steller's Jay	Chestnut-backed Chickadee	Northern Rough-winged Swallow	Tree Swallow	Violet-green Swallow	Bush-tit	Golden-crowned Kinglet	Ruby-crowned Kinglet	Brown Creeper	House Wren	Pacific Wren	Marsh Wren	Bewick's Wren	Gray Catbird	Varied Thrush	Swainson's Thrush	Hermit Thrush	American Robin	Cedar Waxwing	House Finch	Purple Finch	Pine Siskin	American Goldfinch	Chipping Sparrow	Fox Sparrow	Dark-eyed Junco	Golden-crowned Sparrow	Savannah Sparrow	Song Sparrow	Lincoln's Sparrow	Spotted Towhee	Red-winged Blackbird	Brown-headed Cowbird	Orange-crowned Warbler	MacGillivray's Warbler	Common Yellowthroat	Yellow Warbler	Yellow-rumped Warbler	Black-throated Gray Warbler	Wilson's Warbler	Black-headed Grosbeak	Total			
02-Apr									4	1	2	1	1						2				3					2	5	6			5	2												1					35	
09-Apr									2			1		2									3					3		3			1	5		1	1															22
17-Apr	2								2									1	2			1	2			1	2	1							6	2							4	1						27		
24-Apr	1								2	1	1	2		2						2			1	2			3	2			2	1	3	3	4	5					11	13		1	1				63			
01-May								1	1	4						1				2			6			2								5	7	18	3		1	16		10	4	3				84				
08-May	1			1		1			2	1		5								2			1					2				3	1	3	16	2		3	42	2	10	3	1		6	2	110					
16-May	1	1							2	2									1			2	1		1			1				1	1	5	1				7	1	12	6		4		50						
23-May	1								2	1												4	3			2	1										1		3	7	8		1	4	38							
29-May								1							5				1				6	6		2							2		1		1	1		8	5					39						
05-Jun		1																	2			3	2	4		1								4	3	5		1		8	3					37						
12-Jun	1	3		1				2			1							1	2			4	1	3		2				1			7	2	1		1		10	3				1		47						
19-Jun	2				1	1		2	1		8							1	4			4	2		1	9								6	1	2	3	3		2							53					
05-Jul								2			3	12								7		6	1	1		5			2					1	13	2		2		25	1						83					
09-Jul															1		1	2				4	2		8								7	1				1	8	1				1		37						
26-Jul	1							3			11									7		2	6	3		3							3	3		7		4	2	10	6				1	72						

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Table A.2. (continued)

Date	Red-breasted Sapsucker	Downy Woodpecker	Willow Flycatcher	Hammond's Flycatcher	Pacific-slope Flycatcher	Hutton's Vireo	Warbling Vireo	Steller's Jay	Chestnut-backed Chickadee	Northern Rough-winged Swallow	Tree Swallow	Violet-green Swallow	Bushtit	Golden-crowned Kinglet	Ruby-crowned Kinglet	Brown Creeper	House Wren	Pacific Wren	Marsh Wren	Bewick's Wren	Gray Catbird	Varied Thrush	Swainson's Thrush	Hermit Thrush	American Robin	Cedar Waxwing	House Finch	Purple Finch	Pine Siskin	American Goldfinch	Chipping Sparrow	Fox Sparrow	Dark-eyed Junco	Golden-crowned Sparrow	Savannah Sparrow	Song Sparrow	Lincoln's Sparrow	Spotted Towhee	Red-winged Blackbird	Brown-headed Cowbird	Orange-crowned Warbler	MacGillivray's Warbler	Common Yellowthroat	Yellow Warbler	Yellow-rumped Warbler	Black-throated Gray Warbler	Wilson's Warbler	Black-headed Grosbeak	Total
31-Jul		1		1		1			7			6						1	5			2		1	1							1	3		2				8	1	8	2		1	2		54		
07-Aug		2					1					9	1		1					8			3		2		1	1					8		3			3		8	1					52			
14-Aug		1					2		3			6							2	5			2		1		5						5		1			2		8	5		1			49			
20-Aug		4	2				2		9						1		1		3			1		1			3					1	4	7	2			2		10						53			
28-Aug		2					1		3										1	3			2		1		1					4	7	4	2			3		12	1					47			
01-Sep		4					2	1	15			4							1	3			8		1		4					2	7	13	2			15		24	6					112			
08-Sep		2	1	1			1					8								2	1		9		3		3					1	5	7	6			12		17	2					81			
14-Sep									2			1								1			1		3		5						2	9	7			16		6	1					54			
19-Sep								2	1			7		2	1					3			3	1	7		1				2	1	1	1	6	4	11		10		10	1	20	1			96		
28-Sep							1		1			5		1				1					1		12							1	1	2	2			4				3				35			
06-Oct								1	1			3							1	3					3		1				3	12			9	2	14		2		1	6				62			
10-Oct	1						5	5						2	1		1			3	1		3	1							6	7	3		4	2	17					9				71			
14-Oct	2															1			1	3											6	31	1		5	1	11									68			
Total	6	6	22	3	3	2	13	9	74	1	11	4	91	1	11	11	1	2	12	78	1	1	61	7	82	19	2	62	9	10	2	28	53	14	24	143	91	108	9	8	168	7	231	55	46	2	18	9	1,631





























































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Table A.3. List of all species observed at Buttertubs West Marsh during 2019 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.

95 species (+1 other taxa)			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Canada Goose														
Wood Duck														
Northern Shoveler														
Mallard														
Green-winged Teal														
Ring-necked Duck														
Bufflehead														
Hooded Merganser														
California Quail														
Rock Pigeon														
Band-tailed Pigeon														
Eurasian Collared-Dove														
Common Nighthawk														
Anna's Hummingbird														
Rufous Hummingbird														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Virginia Rail														
Killdeer														
Wilson's Snipe														
Glaucous-winged Gull														
gull sp.														
Great Blue Heron														
Turkey Vulture														
Osprey														
Northern Harrier														
Cooper's Hawk														
Bald Eagle														
Red-tailed Hawk														
Barred Owl														
Belted Kingfisher														
Red-breasted Sapsucker														

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Table A.3. (continued)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Downy Woodpecker	 												
Hairy Woodpecker	 												
Pileated Woodpecker	 												
Northern Flicker	 												
Merlin	 												
Peregrine Falcon	 												
Olive-sided Flycatcher	 												
Western Wood-Pewee	 												
Willow Flycatcher	 												
Hammond's Flycatcher	 												
Pacific-slope Flycatcher	 												
Hutton's Vireo	 												
Cassin's Vireo	 												
Warbling Vireo	 												
Steller's Jay	 												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northwestern Crow	 												
Common Raven	 												
Chestnut-backed Chickadee	 												
Northern Rough-winged Swallow	 												
Purple Martin	 												
Tree Swallow	 												
Violet-green Swallow	 												
Barn Swallow	 												
Bushtit	 												
Golden-crowned Kinglet	 												
Ruby-crowned Kinglet	 												
Red-breasted Nuthatch	 												
Brown Creeper	 												
House Wren	 												
Pacific Wren	 												

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Table A.3. (continued)

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Marsh Wren														
Bewick's Wren														
European Starling														
Gray Catbird														
Varied Thrush														
Swainson's Thrush														
Hermit Thrush														
American Robin														
Cedar Waxwing														
House Sparrow														
Evening Grosbeak														
House Finch														
Purple Finch														
Pine Siskin														
American Goldfinch														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chipping Sparrow														
Fox Sparrow														
Dark-eyed Junco														
White-crowned Sparrow														
Golden-crowned Sparrow														
Savannah Sparrow														
Song Sparrow														
Lincoln's Sparrow														
Spotted Towhee														
Red-winged Blackbird														
Brown-headed Cowbird														
Brewer's Blackbird														
Orange-crowned Warbler														
MacGillivray's Warbler														
Common Yellowthroat														

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Table A.3. (continued)

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Yellow Warbler														
Yellow-rumped Warbler														
Black-throated Gray Warbler														
Wilson's Warbler														
Western Tanager														
Black-headed Grosbeak														

KEY: = insufficient data | = rare to widespread

Photos A.1. Sample photographs for the VIU Bird Monitoring and Banding Project at Buttertubs West Marsh during 2019. Photos courtesy of S. Simard-Provençal and E. Demers.



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Photos A.1. (continued)



Photos A.1. (continued)

