DATA REPORT

Bird Monitoring and Banding Project

at Buttertubs West Marsh, Nanaimo, BC

2020

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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).

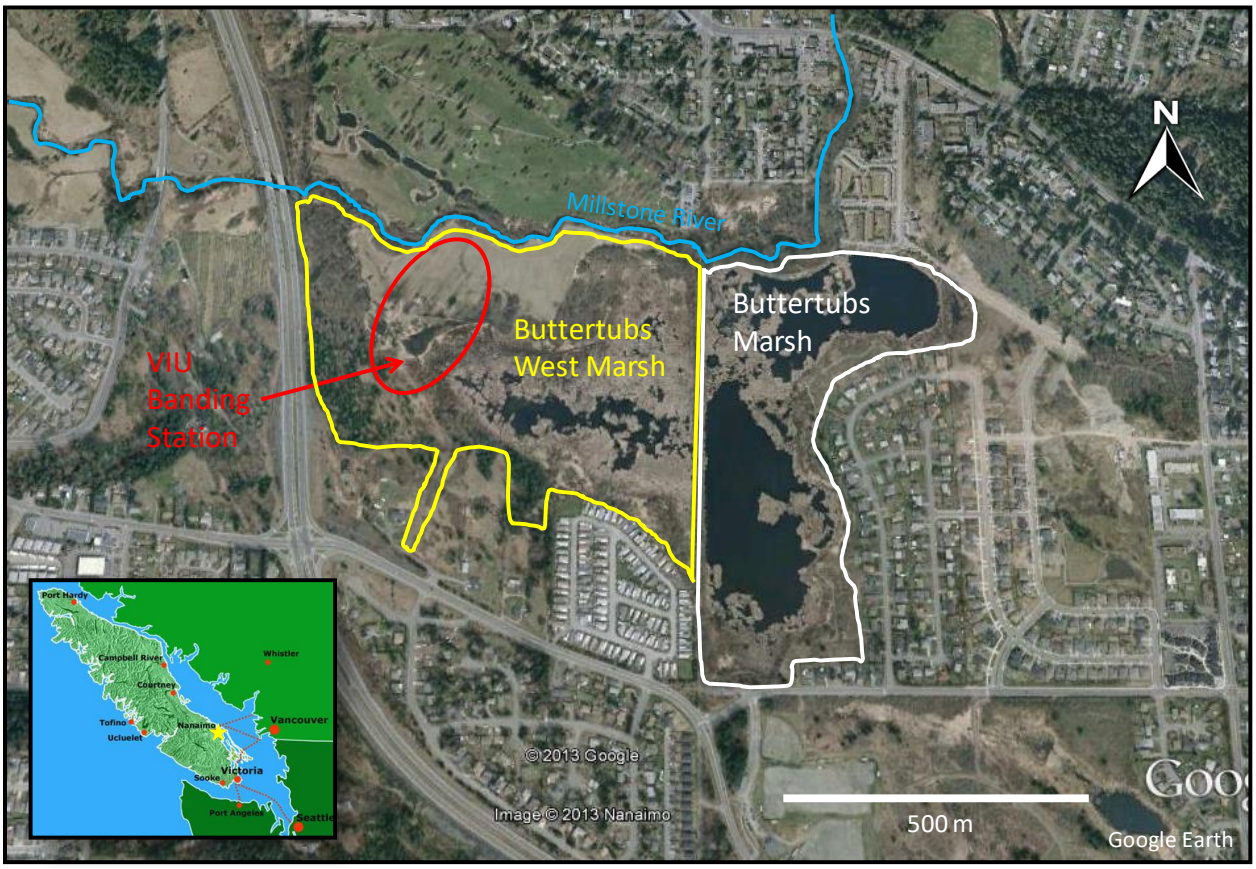

Figure 1. Aerial photograph of the Buttertubs West Marsh in Nanaimo, BC, including the location of the Vancouver Island University (VIU) bird monitoring and banding project.

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, Ducks Unlimited Canada, and The Nature Trust of BC.

This report summarizes the activities and results of this project during 2020. 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. 100063, Canadian Wildlife Service Bird Banding Office Scientific Permit No. 10885 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 March and October 2020, 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.

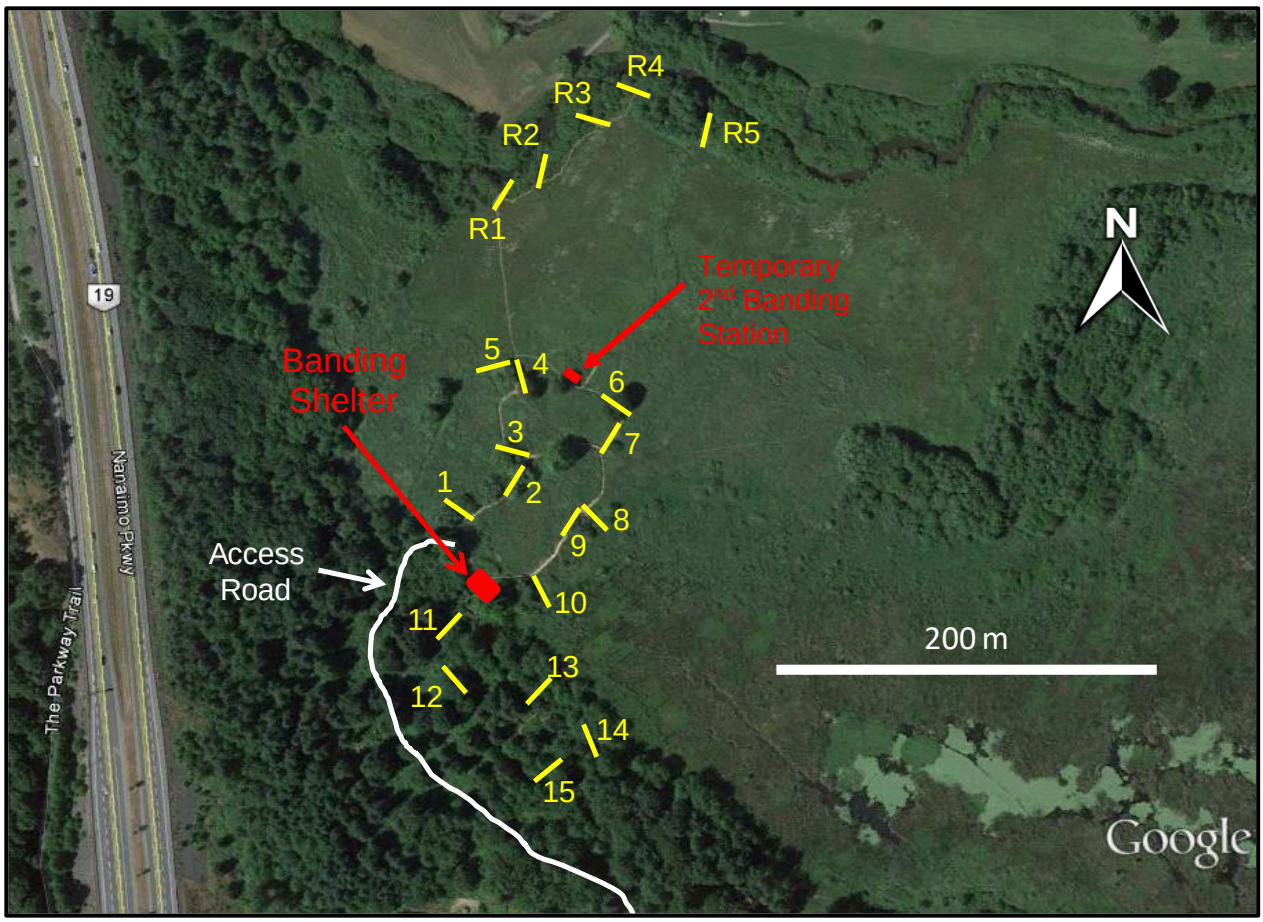

Figure 2. Locations of mist nets and banding shelters used for songbird banding at Buttertubs West Marsh during 2020.

Bird banding activities were conducted 1-2 days most weeks between 24 March and 2 October 2020. 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.

Some minor changes to methods occurred due to the COVID-19 pandemic provincial health regulations. With health guidelines restricting contact of individuals outside of a social bubble, most of the banding was operated by S. Simard-Provençal and E. Demers individually or together. As such, a second temporary banding station was set up between nets four and six to allow both Banders in Charge to run the all nets and limit contact and sharing of tools. The temporary station was also used when only one Bander in Charge was present, running the station alone. During such

days, at most half of the nets were opened, and the temporary station was used to ensure proximity to the nets in ues and facilitate more efficient net checks.

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 39 days between 24 March and 2 October 2020, with a total mist netting effort of 2,981 hours (average: 76.4 net hours / day) (Table 1). A total of 1,511 birds were caught from 53 species. Of these, 1,105 birds were banded and 406 birds (26.9%) were recaptures of previously banded birds. An additional 109 birds were captured and released unbanded (primarily hummingbirds). The average capture rate in 2020 was 50.7 birds / 100 net-hours.

Table 1. Mist net capture statistics at Buttertubs West Marsh during 2016-2020.

Parameter	Value				
	2016	**2017**	**2018**	**2019**	**2020**
Capture effort (net-hours)	8,648	5,874	3,340	3,263	**2,981**
Average daily effort (net-hours / day)	118.5	122.4	111.3	116.6	**76.4**
Number of birds banded	2,352	1,661	1,279	1,204	**1,105**
Number of recaptures	1,212	717	468	427	**406**
Total number of birds captured	3,564	2,378	1,747	1,631	**1,511**
Recapture rate (%)	34.0	30.2	26.8	26.2	**26.9**
Number of species	57	55	49	48	**53**
Capture rate (birds per 100 net-hours)	41.2	40.5	52.3	50.0	**50.7**

The total capture effort deployed in 2020 (2,981 net-hours) was the lowest in the last 5 years (Table 1). There was no change in layout or number of nets used between 2018 and 2020. Capture rate in 2020 (50.7 birds per 100 net-hours) was the second highest observed since the beginning of the project in 2013. The higher capture rate in 2020 was partly due to selective use of a subset of more productive nets (e.g., riparain nets) during some banding days, along with possible 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 2020 (53 species) was average compared to the last few years (49-57 species in 2015-2019).

Compared to previous years, capture rates were high in April, July, and in September 2020 (Figure 3). Catch rates during July were among the highest observed for this project since 2013. Capture rates during spring and fall migration in 2020 (April / May and September, respectively) were relatively high compared to previous years.

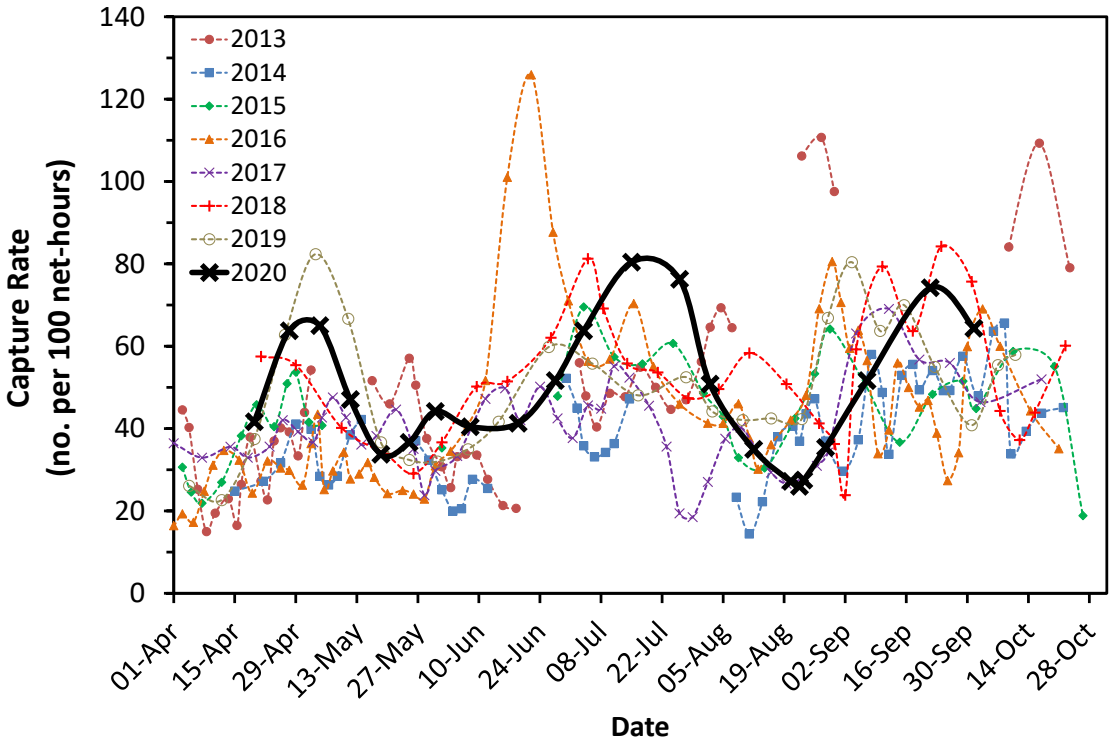

Figure 3. Weekly moving average of capture rate in mist nets at Buttertubs West Marsh during 2013-2020.

The capture rate of mist nets varied across the project site (Table 2). Overall, capture rates were the highest for net 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 13.6% of all birds caught during 2020 (Table 3). Song Sparrow (*Melospiza melodica*) was the second most common species and accounted for 8.1% of all birds caught. 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 2020. Photos of some of the birds captured in 2020 are shown in Photos A.1 in Appendix.

Table 2. Capture statistics by net at Buttertubs West Marsh during 2020.

Net Number	Number Banded	Number Recaptured	Total Number Captured	Net Hours	Capture Rate (Birds / 100 Net hours)
1	52	24	76	140	54.4
2	34	23	57	140	40.8
3	40	9	49	140	35.1
4	34	10	44	129	34.2
5	35	13	48	134	36.0
6	41	16	57	151	37.9
7	36	22	58	155	37.5
8	85	25	110	151	73.0
9	64	26	90	151	59.7
10	48	24	72	151	47.8
11	25	18	43	138	31.2
12	8	16	24	132	18.2
13	24	12	36	128	28.1
14	28	16	44	126	34.8
15	25	12	37	126	29.3
R1	123	30	153	174	87.9
R2	166	37	203	180	113.0
R3	119	31	150	180	83.5
R4	56	18	74	180	41.2
R5	62	24	86	180	47.9
Totals	1,105	406	1,511	2,986	---

There were changes in the rankings for the top 10 species captured during 2020 (Table 4). The most significant changes were increases in ranking for Yellow Warbler (*Setophaga petechia*), Bewick's Wren (*Thryomanes bewickii*) and Purple Finch (*Haemorhous purpureus*), and a decrease in ranking for Lincoln's Sparrow (*Melospiza lincolnii*) compared to previous years.

Three new species were captured at Buttertubs West Marsh in 2020. A Lazuli Bunting (*Passerina amoena*) was captured on 26 May 2020. This capture was unusual as this species is uncommon on Vancouver Island. This individual had not been observed or heard in the vicinity before its capture. Two juvenile Purple Martins (*Progne subis*) were captured on 22 August 2020. Both individuals were already banded as part of the Georgia Basin Ecological Assessment and Restoration Society (GBEARS) project to monitor Purple Martin recovery on Vancouver Island. These individuals had been banded at Newcastle and Ladysmith nesting colonies. A House Sparrow (*Passer domesticus*) was captured on 1 May 2020 but it escpaed before processing.

Table 3. Fifteen most common species captured in mist nets at Buttertubs West Marsh during 2020.

Common Name	Number Banded	Number Recaptured	Total Number Captured
Common Yellowthroat	120	86	206
Song Sparrow	65	57	122
Yellow Warbler	76	22	98
American Robin	74	18	92
Bewick's Wren	46	35	81
Purple Finch	74	5	79
Spotted Towhee	48	28	76
Orange-crowned Warbler	66	9	75
Lincoln's Sparrow	72	2	74
Bushtit	43	29	72
Chestnut-backed Chickadee	34	25	59
Savannah Sparrow	48	4	52
Swainson's Thrush	21	27	48
Cedar Waxwing	31	2	33
Marsh Wren	22	9	31

Table 4. Number captured and rank (in parentheses) of the ten species most captured in mist nets at Buttertubs West Marsh during 2016-2020.

Common Name	2016	2017	2018	2019	2020
Common Yellowthroat	605 (1)	361 (1)	281 (1)	231 (1)	**206 (1)**
Song Sparrow	349 (2)	253 (2)	187 (2)	143 (3)	**122 (2)**
Yellow Warbler	127 (11)	126 (6)	53 (12)	55 (12)	**98 (3)**
American Robin	232 (4)	163 (3)	120 (4.5)	82 (7)	**92 (4)**
Bewick's Wren	130 (10)	62 (12)	55 (11)	78 (8)	**81 (5)**
Purple Finch	117 (12)	90 (11)	78 (7)	62 (10)	**79 (6)**
Spotted Towhee	210 (6)	144 (4)	102 (6)	108 (4)	**76 (7)**
Orange-crowned Warbler	216 (5)	143 (5)	77 (8)	168 (2)	**75 (8)**
Lincoln's Sparrow	293 (3)	121 (7)	133 (3)	91 (5.5)	**74 (9)**
Bushtit	132 (9)	97 (9)	120 (4.5)	91 (5.5)	**72 (10)**

The age composition of birds captured varied between seasons and reflected the recruitment of young birds (hatch-year birds) to the population and changes in age assignment associated with

the annual moult that occurs after the breeding season (Table 5). Second-year birds (hatched in 2019) were the dominant age group between March and May, while hatch-year birds (hatched in 2020) were the dominant age group between June and October. Overall, 49.4% of birds banded were birds hatched in 2020. This percentage was lower than during previous years mainly due to the higher numbers of second-year or older birds captured during April and May.

Table 5. Age structure of birds banded at Buttertubs West Marsh during 2020.

Month	Hatch Year (HY)	Second Year (SY)	After Hatch Year (AHY)	After Second Year (ASY)	Other Ages	Total
March		8	3	2		13
April		82	16	24		122
May	6	168	16	51	1	242
June	116	49	16	9		190
July	168	11	28	3		210
August	116	1	19		3	139
September	71		17		7	95
October	69		15		10	94
TOTAL	546	319	130	89	21	1,105

Table 6. Fat score of birds banded at Buttertubs West Marsh during 2020.

Month	0	1-2	≥3	Total
March	9	4	0	13
April	55	40	25	120
May	157	38	30	225
June	170	15	1	186
July	180	22	0	202
August	94	41	4	139
September	53	31	9	93
October	74	15	4	93
TOTAL	792	206	73	1,183

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 (66.9%) did not display any visible fat (fat score = 0).

Table 7. Number and percentage of individuals recaptured in 2020 which were originally banded in 2017 or before, 2018, 2019 or 2020 for the nine most commonly recaptured species.

Species	Banded in 2017 or before		Banded in 2018		Banded in 2019		Banded in 2020	
	No.	%	No.	%	No.	%	No.	%
Common Yellowthroat	7	2.8	6	3.1	12	7.1	18	14.6
Song Sparrow	10	6.0	5	4.0	5	3.5	12	15.8
Bewick's Wren	2	5.1	4	11.1	3	10.7	12	24.0
Bushtit	3	3.3	6	6.5	6	8.8	9	13.8
Spotted Towhee	2	2.1	2	1.9	9	10.8	7	7.9
Swainson's Thrush	2	8.0	1	4.2	8	44.4	2	5.3
Chestnut-backed Chickadee	1	1.3	3	4.1	7	13.5	6	10.5
Yellow Warbler	1	2.0	1	2.0	1	1.1	8	17.8
American Robin	5	7.1	2	1.5	4	3.7	4	5.6
All Species	41	0.4	41	2.7	79	5.5	127	9.2

Table 8. List of selected individuals recaptured in 2020, which have been recaptured 7 or more times at Buttertubs West Marsh during 2013-2020.

Band Number	Species	Sex	Number of Times Recaptured Since Banded	Date Banded	Date of Last Recapture
1352-50107	AMRO	Male	9	9 Apr. 2015	18 May 2020
2051-97852	BEWR	Unknown	9	14 Aug. 2018	29 Mar. 2020
2561-31836	BHGR	Male	7	9 Jun. 2016	13 Jun. 2020
2730-48724	CBCH	Male	10	7 Apr. 2016	12 Sep. 2020
2780-62407	COYE	Female	19	31 Jul. 2016	2 Oct. 2020
2691-51204	SOSP	Male	28	26 Jun. 2015	13 Jun. 2020
2561-31862	SPTO	Male	10	10 Aug. 2016	1 May 2020
2771-59212	SWTH	Male	10	16 May 2019	2 Sep. 2020

The 406 recapture events recorded in 2020 involved 288 banded birds (Table 7), of which 41 individuals were banded in 2013-2017, and 41, 79, and 127 individuals were originally banded in 2018, 2019 and 2020, respectively. Overall, 0.4% of individuals banded in 2013-2017 were recaptured in 2020, 2.7% of individuals banded in 2018 were recaptured in 2020, 5.5% of

individuals banded in 2019 were recaptured in 2020, and 9.2% of individuals banded in 2020 were recaptured in 2020. 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 2020 but were not recaptured.

Most recapture events involved birds that were recaptured only once during 2020. However, 137 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. 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 8 years old in 2020.

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 2020 (Table A.3 in Appendix). Two new species were observed in 2020: Say's Phoebe (*Sayornis saya*) and Lazuli Bunting. A total of 139 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-six 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 24 April and 2 August 2020. 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, adult females 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.

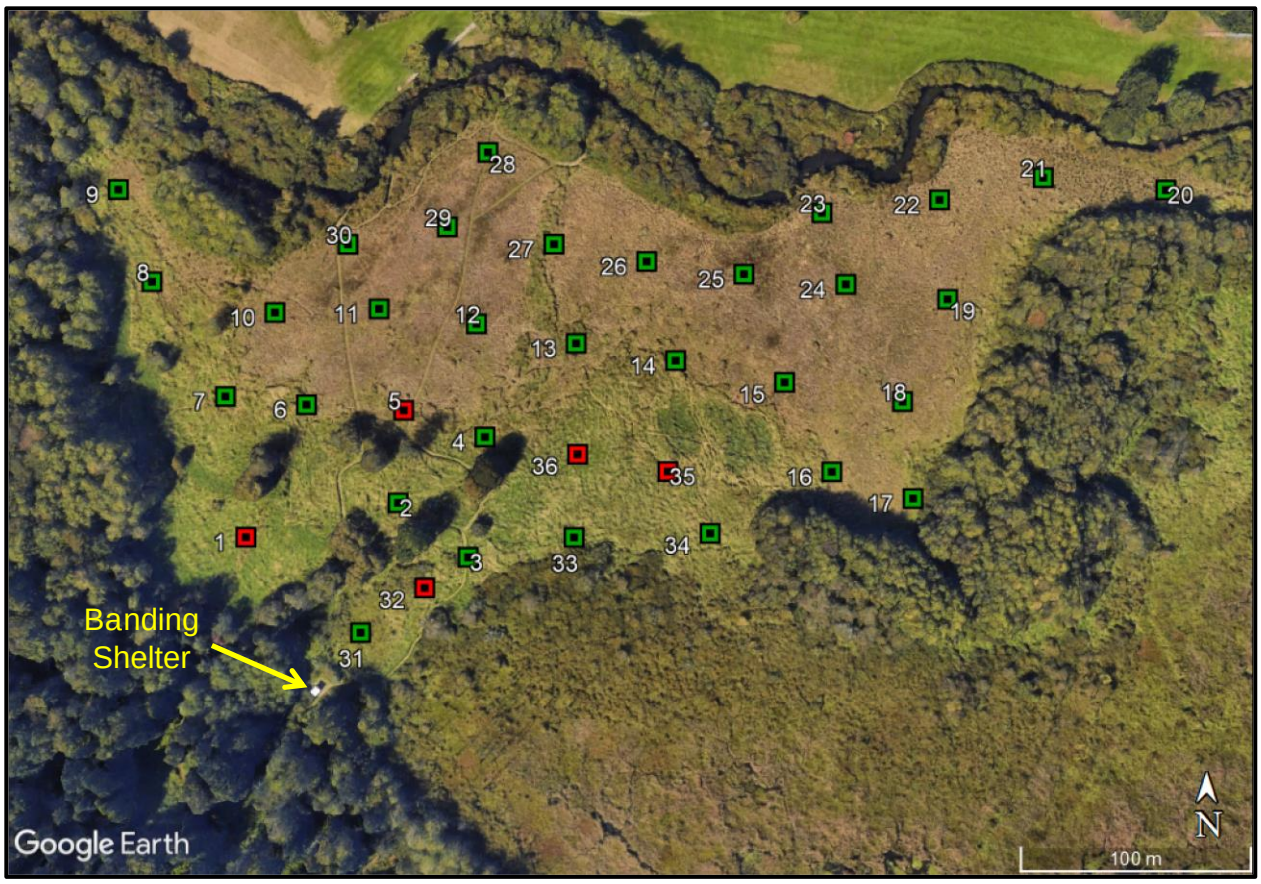

Figure 5. Locations of the 36 swallow nest boxes at Buttertubs West Marsh during 2020. Green and red squares indicate whether eggs were deposited in the nest box or not, respectively. All occupied nest boxes were used by Tree Swallows, except two Violet-green Swallow which nested in nest box no. 20 and 33, respectively.

3.2. Results

Twenty-nine of the 36 nest boxes were occupied by Tree Swallows (*Tachycineta bicolor*) and had signs of nest building activities (Table 9). Two boxed were occupied by Violet-green Swallows (*Tachycineta thalassina*). The latter species successfully fledged all eggs laid in their nest boxes (4-5 eggs and 4-5 fledglings; 100% fledging success).

Clutch sizes for Tree Swallows ranged from 2-7 eggs with an average of 5.1 eggs per clutch (Table 10), which was consistent with previous years. Nine 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 most of these cases, only one of the clutches produced fledglings, most often the second clutch, but there were two cases where both clutches produced at least one fledgling, and two cases where only the first clutch produced fledglings.

Table 9. Results of nest box monitoring at Buttertubs West Marsh during 2020. Nest boxes no. 7, 11, 19, 22, 24, 25, 26, 27, and 29 received two clutches (see text). TRES = Tree Swallow, VGSW = Violet-green Swallow, DNH = Did not hatch; F = Female; N = Nestlings.

Nest Box	Nest Building	Species	Number of Eggs	Complete Clutch Date	Mean Hatch Date	Number Fledged	Individuals Banded / Processed
1	No						
2	Yes	TRES	5	19 May	02 Jun.	4	F, N
3	Yes	TRES	5	18 May	DNH	0	F
4	Yes	TRES	4	22 May	6 Jun.	0	F
5	No						
6	Yes	TRES	5	16 May	30 May	5	F, N
7	Yes	TRES	Clutch 1: 4 Clutch 2: 5	14 May 15 Jun.	DNH 29 Jun.	0 4	F F, N
8	Yes	TRES	6	12 May	26 May	0	F
9	Yes	TRES	5	29 Jun.	13 Jul.	4	N
10	Yes	TRES	5	18 Jun.	2 Jul.	4	F, N
11	Yes	TRES	Clutch 1: 6 Clutch 2: 4	10 May 25 June	24 May DNH	1 0	F, N F
12	Yes	TRES	5	13 May	27 May	4	F, N
13	Yes	TRES	6	15 May	29 May	0	F
14	Yes	TRES	5	14 May	28 May	0	F
15	Yes	TRES	6	16 May	30 May	5	F, N
16	Yes	TRES	7	17 May	31 May	0	F
17	Yes	TRES	5	26 May	DNH	0	F
18	Yes	TRES	6	11 May	25 May	0	F
19	Yes	TRES	Clutch 1: 5 Clutch 2: 5	7 May 2 Jun.	DNH 16 Jun.	0 2	F N
20	Yes	VGSW	4	30 May	13 Jun.	4	F, N
21	Yes	TRES	5	13 May	27 May	5	F, N
22	Yes	TRES	Clutch 1: 4 Clutch 2: 4	1 May 27 Jun.	15 May 11 Jul.	4 2	F, N N
23	Yes	TRES	6	14 May	28 May	3	F, N
24	Yes	TRES	Clutch 1: 7 Clutch 2: 5	12 May 27 Jun.	26 May 11 Jul.	0 2	F F, N
25	Yes	TRES	Clutch 1: 5 Clutch 2: 5	19 May 26 Jun.	2 Jun. 10 Jul.	0 5	F F, N
26	Yes	TRES	Clutch 1: 6 Clutch 2: 2	27 Apr. 14 Jun.	11 May DNH	3 0	F, N
27	Yes	TRES	Clutch 1: 5 Clutch 2: 4	14 May 4 Jul.	28 May 18 Jul.	3 1	F, N F, N
28	Yes	TRES	6	16 May	30 May	2	F, N
29	Yes	TRES	Clutch 1: 6 Clutch 2: 4	14 May 25 Jun.	28 May 9 Jul.	0 2	F F, N
30	Yes	TRES	5	16 May	30 May	4	F, N
31	Yes	TRES	5	21 May	4 Jun.	2	F, N
32	No						
33	Yes	VGSW	5	24 May	7 Jun.	5	F, N
34	Yes	TRES	5	19 May	2 Jun.	5	F, N
35	No						
36	No						
Total			202 (193 TRES; 9 VGSW)			85 (76 TRES; (9 VGSW))	

Table 10. Summary of Tree Swallow nesting productivity at Buttertubs West Marsh during 2016-2020. Violet-green Swallow and Bewick's Wren productivity data are not included.

Parameter	2016	2017	2018	2019	2020
Number of boxes	30	37	30	30	**36**
Number of boxes with eggs (% of boxes with eggs)	20 (67%)	22 (59%)	24 (80%)	21 (70%)	**29 (81%)**
Number of eggs laid	115	138	135	141	**193**
Mean clutch size (range)	5.0 (2-6)	5.1 (1-7)	5.0 (1-7)	5.0 (2-7)	**5.1 (2-7)**
Number of eggs hatched (% eggs hatched)	78 (68%)	82 (59%)	115 (85%)	106 (75%)	**148 (77%)**
Number of nestlings banded (% nestlings banded)	68 (87%)	69 (84%)	105 (91%)	97 (92%)	**92 (62%)**
Number fledged (% nestlings fledged)	46 (59%)	52 (63%)	62 (54%)	84 (79%)	**76 (51%)**
Fledging rate (young per pair)	2.1	2.0	2.3	3.0	**2.0**

Thirty-four adult females were captured. No males were captured in 2020, due to the significantly longer time required to capture males and reduced volunteer availability. Of the 34 adult female Tree Swallows captured, one individual had nested at Buttertubs West Marsh during 2017, 2018, and 2019, two individuals had nested during 2018 and 2019, and six individuals had nested during 2019. Three females nested in the same box during both 2019 and 2020. Four females that were originally banded in 2019 and one female that was originally banded in 2018 as nestlings at Buttertubs West Marsh returned to nest in 2020. For the first time since the beginning of this project, a female successfully produced fedglings in two successive nesting attempts (1st attempt: Box no. 26, 3 fledglings; 2nd attempt: Box no. 25, 5 fledglings).

Out of 193 Tree Swallow eggs laid, 148 eggs hatched (hatching success: 77%), 92 nestlings were banded around day 12 (nestling survival to day 12: 62%), and 76 young birds fledged (nestling survival to fledging: 51%) (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 2.0 young per nesting pair.

Overall, the fledging rate was among the lowest since 2013. Hatching rate was average in 2020 (77%) compared to 2014-2019 (59-85%). Although hatching rate in 2020 was average compared to 2014-2019, survival of young from hatching to day 12 (62%) and fledging (51%) were the lowest for the last 7 years. These results suggest that lower survival during the nestling phase resulted in the lower productivity in 2020, especially during the first 12 days after hatching. Field observations suggested that unfavourable precipitation during the month of June 2020 (total rainfall: 33.8 mm; number of days with precipitation: 12 days; data from The Weather Network)

may have in part led to lower productivity. In previous years (2016-2018), periods of less favourable weather also coincided with the vulnerable pre-fledging days and were associated with lower productivity.

Several nest boxes had nestlings that were infested with parasitic blowfly larvae, *Trypocalliphora braueri*. It is unknown if the presence of these parasites greatly lowered survival success of nestlings, as the rainfall and the parasites both coincided in the nestling development period. Some entire clutches died before parasites could be extracted, but 9 blow flies from two successful nests (Boxes no. 26 and 27) were collected as larvae and were pupated to adults. The adults were pinned and will be accessioned to the Royal BC Museum collection.

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.

Fewer volunteers contributed to the project in 2020 dues to the COVID-19 pandemic. A total of 10 volunteers dedicated 438 hours to this project during 2020 (Table 11). 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 2020.

Volunteer Grouping	Number of Volunteers	Hours on Project
VIU students	6	258
VIU graduates	1	30
VIU employees	1	126
Community volunteers	2	24
TOTAL	10	438

Volunteer training was conducted by Dr. Eric Demers and Samuelle Simard-Provençal. Volunteers received training in bird banding and monitoring activities and contributed to the processing of birds captured as part of this project (Table 12).

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 2020. 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
EDRO	1	1	2
EMSP		1	1
ERDE	321	181	502
HEVA	78	16	94
JOFM	1		1
LASM	8	5	13
MAWA	3	1	4
NIRI	67	11	78
SASP	744	218	962
TOTAL	1,223	434	1,657

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 2020:

- On-site demonstration for 19 students: VIU BIOL 325 Ornithology (1 October).
- Off-site demonstration and training for 21 students: VIU RMOT 275 Wildlife Techniques (28 September; 5, 19, 20, and 27 October; VIU Nanaimo Campus).
- Off-site presentation for students in VIU BIOL 202 Ecology (11 March); Victoria Natural History Society (22 April).

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.

This year, a series of bird banding videos were produced by Samuelle Simard-Provençal to visually document our banding procedures and use as education / training material. The following videos were published on Youtube:

- How to Band a Bird [https://youtu.be/wrBTllhu5Sc].
- Tree Swallow Monitoring [https://youtu.be/29r_akSZLaw].
- Quick Intro to Mist Net Set-Up [https://youtu.be/nrd3PmmYT_k].
- Understanding Brood Patches (BP), Cloacal Protuberances (CP), and Skulling (SK) [https://youtu.be/R09xPG7N8OM].

6. Acknowledgements

This project would not be possible without a dedicated group of volunteers, contributors and partners (any omission is unintended): E. Demers, J. Filgate-Mcnabb, M. Lester, N. Richardson, E. Rowe, S. Simard-Provençal, E. Simard-Provençal, L. Smith, H. van Vliet, and M. Wagenaar.

Vancouver Island University, the City of Nanaimo, Ducks Unlimited Canada, and the Nature Trust of BC are acknowledged for their support of this project.

Funding was provided by VIU employee Professional Development Fund.

Bird banding activities were conducted in accordance with Vancouver Island University Animal Use Protocol No. 100063, 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 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 2020. Subspecies are included in parentheses where applicable.

Common Name	Number banded	Number recaptured	Total number captured
Common Yellowthroat	120	86	206
Song Sparrow	65	57	122
Yellow Warbler	76	22	98
American Robin	74	18	92
Bewick's Wren	46	35	81
Purple Finch	74	5	79
Spotted Towhee	48	28	76
Orange-crowned Warbler	66	9	75
Lincoln's Sparrow	72	2	74
Bushtit	43	29	72
Chestnut-backed Chickadee	34	25	59
Savannah Sparrow	48	4	52
Swainson's Thrush	21	27	48
Cedar Waxwing	31	2	33
Marsh Wren	22	9	31
Ruby-crowned Kinglet	26	1	27
Tree Swallow	15	9	24
House Finch	20		20
Wilson's Warbler	20		20
Willow Flycatcher	18	1	19
Fox Sparrow	17	1	18
Black-headed Grosbeak	10	6	16
Downy Woodpecker	5	11	16
Oregon Junco	11	3	14
Golden-crowned Sparrow	14		14
Warbling Vireo	13		13
MacGillivray's Warbler	12		12
American Goldfinch	9	2	11
Red-breasted Sapsucker	8	3	11
Pacific-slope Flycatcher	10		10
Brown-headed Cowbird	4	6	10
Yellow-Rumped Warbler (Myrtle)	8		8
Brown Creeper	5	1	6
Steller's Jay	4		4
Red-winged Blackbird	4		4
Chipping Sparrow	3		3
Red-breasted Nuthatch	2	1	3
Violet-green Swallow	3		3
Hermit Thrush	3		3
Hairy Woodpecker	3		3
White-crowned Sparrow (Puget Sound)	2		2
Purple Martin		2	2
White-throated Sparrow	1	1	2
Golden-crowned Kinglet	2		2
Pine Siskin	2		2
Yellow-Rumped Warbler (Audubon)	2		2
Wilson's Snipe	1		1
Lazuli Bunting	1		1
House Wren	1		1
Yellow-rumped Warbler (unknown ssp.)	1		1
Hammond's Flycatcher	1		1
Barred Owl	1		1
Pacific Wren	1		1
Northern Rough-winged Swallow	1		1
Hutton's Vireo	1		1
TOTAL	1,105	406	1,511

Table A.2. Number of all species captured during each day of mist netting at Buttertubs West Marsh during 2020.

Date	Wilson's Snipe	Barred Owl	Red-breasted Sapsucker	Downy Woodpecker	Hairy Woodpecker	Willow Flycatcher	Hammond's Flycatcher	Pacific-slope Flycatcher	Hutton's Vireo	Warbling Vireo	Steller's Jay	Chestnut-backed Chickadee	Northern Rough-winged Swallow	Purple Martin	Tree Swallow	Violet-green Swallow	Bushtit	Golden-crowned Kinglet	Ruby-crowned Kinglet	Red-breasted Nuthatch	Brown Creeper	House Wren	Pacific Wren	Marsh Wren	Bewick's Wren	Swainson's Thrush	Hermit Thrush	American Robin	Cedar Waxwing	House Finch	Purple Finch	Pine Siskin	American Goldfinch	Chipping Sparrow	Fox Sparrow	White-crowned Sparrow	Golden-crowned Sparrow	White-throated Sparrow	Savannah Sparrow	Song Sparrow	Lincoln's Sparrow	Spotted Towhee	Red-winged Blackbird	Brown-headed Cowbird	Orange-crowned Warbler	Oregon Junco	MacGillivray's Warbler	Common Yellowthroat	Yellow Warbler	Yellow-rumped Warbler	Wilson's Warbler	Black-headed Grosbeak	Lazuli Bunting	Total
Mar-24												3						1	2						1															2		1				2							12
Mar-25												3					3		2		2				1			1																		1							13
Mar-29																			1						2			1														2											6
Apr-02												3					1											2																										6
Apr-08				2								5			2		6		10	1					2			3							3					3	4	3			1	1		1			1			48
Apr-13															2				3						1			1							1					1		1				1							11
Apr-15				1								1					4		2					1	1			3							1		1		1	4	9	3			5			2					39
Apr-24					1										1		4		2						2		1	4			2					1		1	8	8	1		2	7			12		4			61
Apr-27												1			2	1																			1		1		2		4	2			5			4		1			24
May-01	1	1		2				1							7		1		1							2	2	2		1		2				3		4	3	10	3		2	12	1	1	22	3	1	5		92
May-04																																						2							4		1	2	1			1	11
May-08			2									4			3					1			1	1	2		2			1		2				5		4	6	6			1	5		1	4	8	1	3	1		64
May-11																																						5	1				1	1				8		1			17
May-15			1	1				2				1			3	1									1	7		4			2							1	3		3			4			7	7			1		49
May-18					2				1						1													2	1	1																	5		1			14
May-22										1					1								1		2			1			1								1		1		1				4	2					16
May-23																								1				3			1		3					2	1								3	5					19
May-26										2							1											1	4																2		2		16		5	1	1	35
May-28				2		1		1																1	1	1		1	3		2		3								1	1					1	6			3		28

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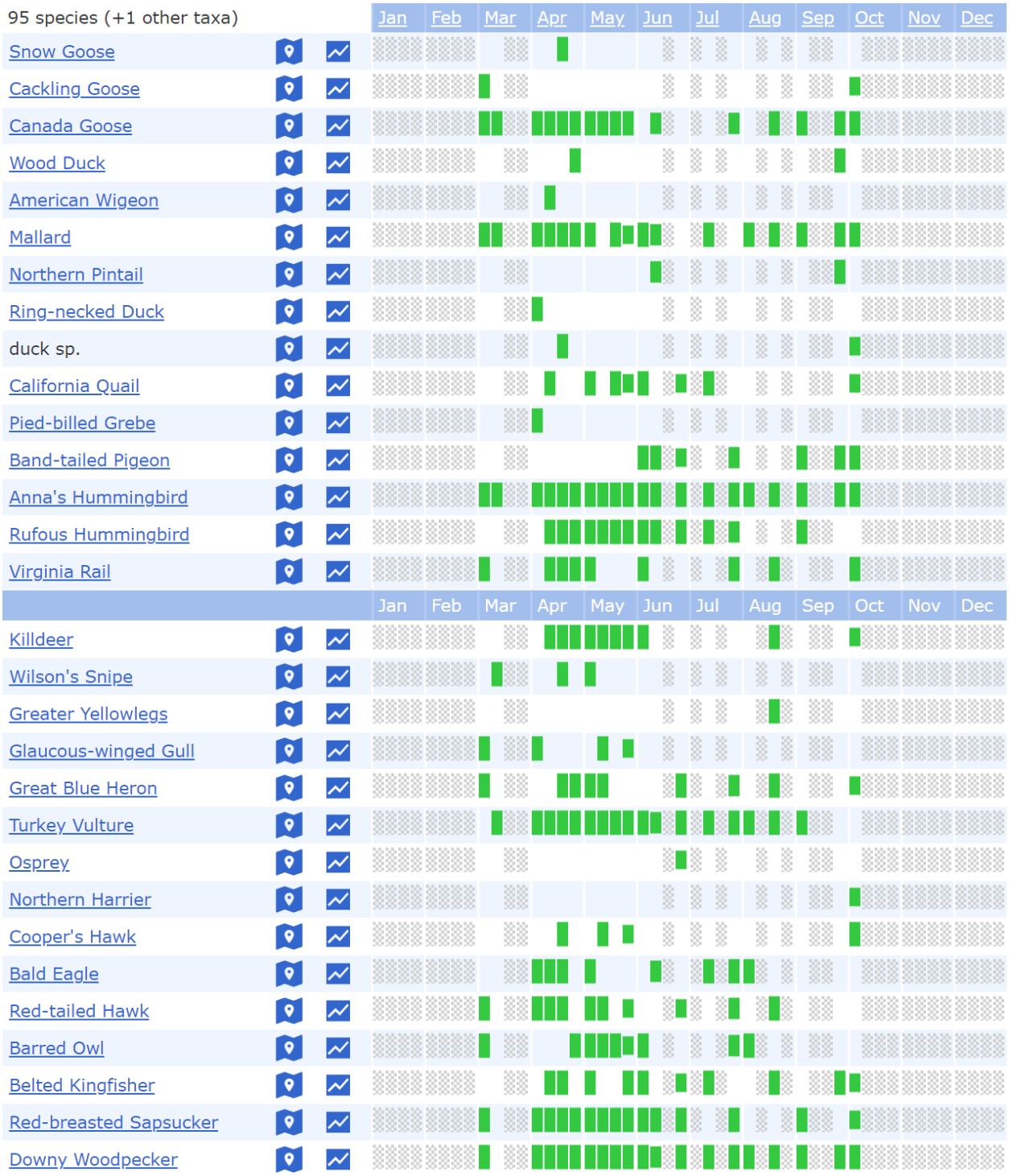
Table A.2. (continued)

Date	Wilson's Snipe	Barred Owl	Red-breasted Sapsucker	Downy Woodpecker	Hairy Woodpecker	Willow Flycatcher	Hammond's Flycatcher	Pacific-slope Flycatcher	Hutton's Vireo	Warbling Vireo	Steller's Jay	Chestnut-backed Chickadee	Northern Rough-winged Swallow	Purple Martin	Tree Swallow	Violet-green Swallow	Bushtit	Golden-crowned Kinglet	Ruby-crowned Kinglet	Red-breasted Nuthatch	Brown Creeper	House Wren	Pacific Wren	Marsh Wren	Bewick's Wren	Swainson's Thrush	Hermit Thrush	American Robin	Cedar Waxwing	House Finch	Purple Finch	Pine Siskin	American Goldfinch	Chipping Sparrow	Fox Sparrow	White-crowned Sparrow	Golden-crowned Sparrow	White-throated Sparrow	Savannah Sparrow	Song Sparrow	Lincoln's Sparrow	Spotted Towhee	Red-winged Blackbird	Brown-headed Cowbird	Orange-crowned Warbler	Oregon Junco	MacGillivray's Warbler	Common Yellowthroat	Yellow Warbler	Yellow-rumped Warbler	Wilson's Warbler	Black-headed Grosbeak	Lazuli Bunting	Total
Jun-01																																							1						1					1		3
Jun-03			1	2		1		1		1						1	1			1	1			1	2	4		4	10		2								3			1	1	1		5	6				50
Jun-13				2											1		1							1	4	4		2	5		1								2		4						2				2		31
Jun-14						1									1										2														3		1	1		2			2	3				16
Jun-18												4													3	1		1											6			1		4		2					22
Jun-21			3	1		2						4																3			2								1							1	3			1	21
Jun-25			2									2													6	1		15			2								4		2		1	3		7	3			4	52
Jun-30			1					1		2		1					9							3	5	3		6	2	11	8							1	3		1		1		6			7	1				72
Jul-08										2		4	1				4	1						3	10	4		3	1	5	2			2				1	6		2				3		1	23	2			1	81
Jul-22				2		2				1		5					7					1		7	9	2		7	3	4	10				1			7	6		3				1		4	19	7	1	3		112
Jul-30			1														3				2			1	6	7		3	2		8		1						16		5				1			10	5				71
Aug-05												3					1				1				4			2			9		2					3	7		3							13	2		1		51
Aug-19						2						1					4							3	2	1		3			3				1			2	1		2							7					32
Aug-22				1		1		2		1				2			4							2	2						4							1	1		2							6					29
Aug-23						3											2																				3	1		1			1		1	8					20
Aug-24						1		1				1					2							2		3		2			1							3	3		1			3		1	11			1		36
Sep-02						3	1	1		3		4					4							1	2	4					8							3	3	4	3			2			3					49
Sep-12					1							5					2							2	3	2					5			3		2		5	4	20	2			1			13	5				75
Oct-01					1						3	2					8		1				1	1	5			9			4			3		1	1		14	7	13			5		3			1			83
Oct-02											1	2							3						2			1			1			6			1		5	2	10			3		2			1			40
Total	1	1	11	16	3	19	1	10	1	13	4	59	1	2	24	3	72	2	27	3	6	1	1	31	81	48	3	92	33	20	79	2	11	3	18	2	14	2	52	122	74	76	4	10	75	14	12	206	98	11	20	16	1	1,511

Table A.3. List of all species observed at Buttertubs West Marsh during 2020 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.



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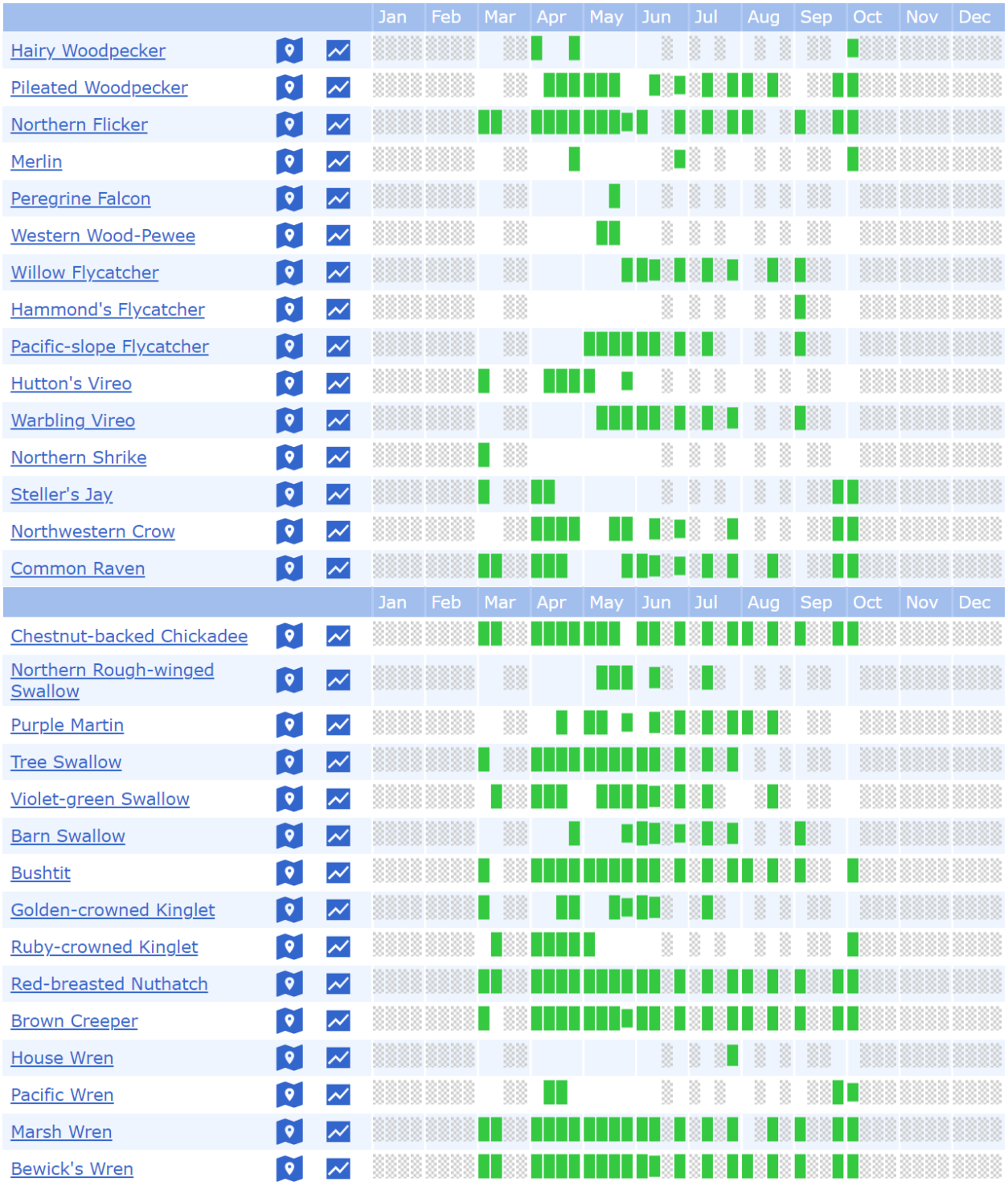

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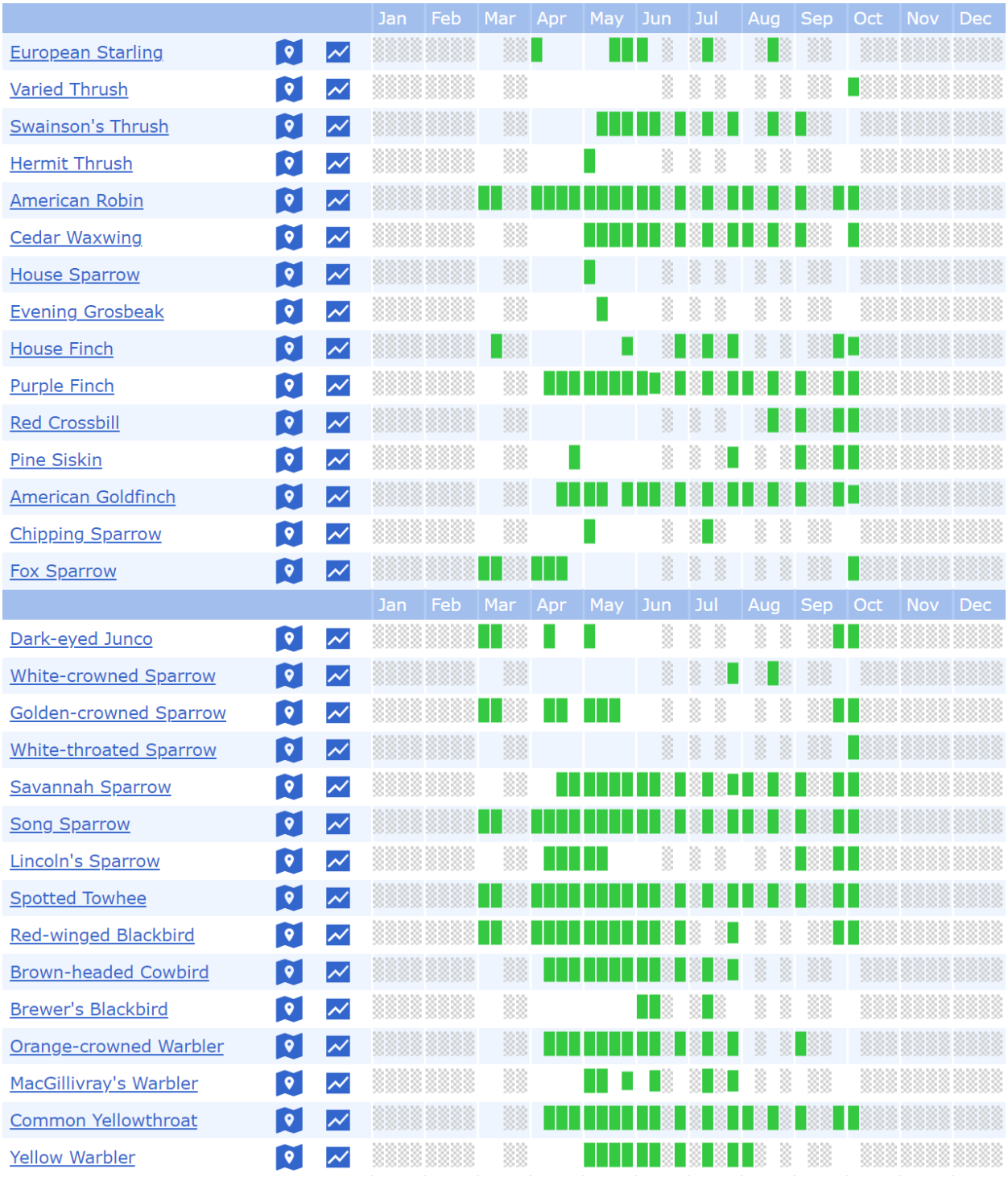

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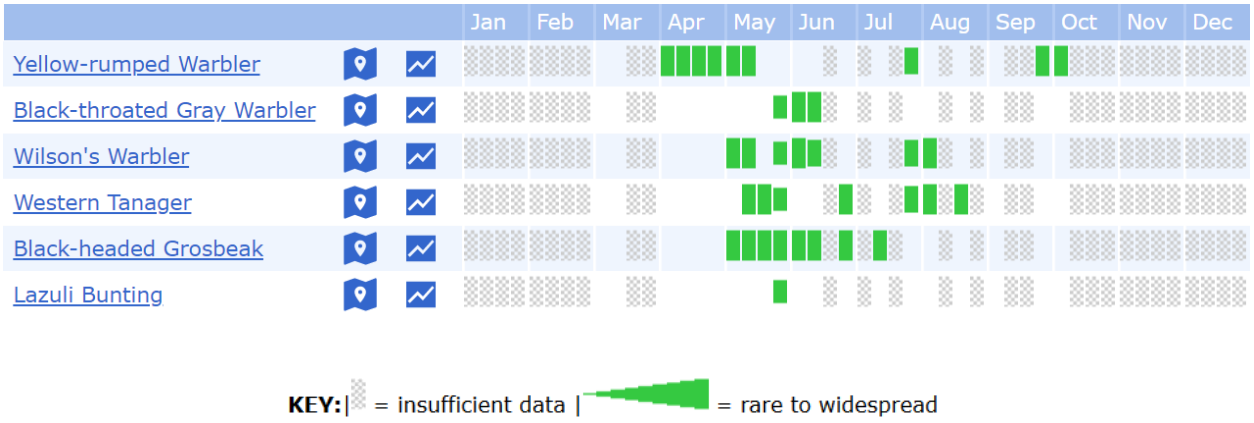

Photos A.1. Sample photographs for the VIU Bird Monitoring and Banding Project at Buttertubs West Marsh during 2020. Photos courtesy of S. Simard-Provençal.

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Photos A.1. (continued)


Lazuli Bunting


Lazuli Bunting


Black-headed Grosbeak


Brown-headed Cowbird


Chipping Sparrow


House Finch

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Photos A.1. (continued)


Marsh Wren


Purple Martin


Bewick's Wren


White-throated Sparrow


Hairy Woodpecker


Golden-crowned Sparrow

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Photos A.1. (continued)