DATA REPORT

Bird Monitoring and Banding Project

at Buttertubs West Marsh, Nanaimo, BC

2021



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1. Introduction

In the summer of 2012, the City of Nanaimo and Ducks Unlimited Canada jointly acquired the 27hectare 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 2021. 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 2021, 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, common hawthorn (*Crataegus monogyna*), and Himalayan blackberry.



Figure 2. Locations of mist nets and banding shelter used for songbird banding at Buttertubs West Marsh during 2021.

Bird banding activities were conducted 1-2 days most weeks between 11 March and 2 October 2021. 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.

In 2021, the VIU Bird Banding participated in the Bird Genoscape Project (BGP), launched by researchers at Colorado State University in an effort to map the population-specific migratory routes of 100 species of migratory songbirds by utilizing genomics. To help contribute to this project, feathers from up to 10 individuals were collected from the following 22 target species: American Goldfinch, American Robin, Black-headed Grosbeak, Chipping Sparrow, Common Yellowthroat, Fox Sparrow, Hermit Thrush, Lincoln's Sparrow, MacGillivray's Warbler, Orange-crowned Warbler, Oregon Junco, Pine Siskin, Ruby-crowned Kinglet, Song Sparrow, Spotted

Towhee, Swainson's Thrush, Warbling Vireo, White-crowned Sparrow, Willow Flycatcher, Wilson's Warbler, Yellow Warbler, and Yellow-rumped Warbler. For each individual, two rectrices (tail feathers) were be sampled: one central (r1) and one outer (r6) rectrix. Feathers from each bird were placed in BGP-provided pre-printed envelope and filled out with the species name, band number, date, location, age, sex, breeding condition (as determined by brood patch or cloacal protuberance), and whether the bird was a recapture. Feather samples were shipped to the BGP at the end of the year.

Due to the continued concerns about the COVID-19 pandemic, bird banding activities were conducted with a limited number of volunteers in 2021.

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. <u>Results</u>

2.2.1. Songbird banding

Songbird banding activities were conducted during 40 days between 11 March and 2 October 2021, with a total mist netting effort of 3,776 hours (average: 94.4 net hours / day) (**Table 1**). A total of 1,608 birds were caught from 50 species. Of these, 1,120 birds were banded and 488 birds (30.3%) were recaptures of previously banded birds. An additional 113 birds were captured and released unbanded (primarily hummingbirds). The average capture rate in 2021 was 42.6 birds / 100 nethours.

Devementer			Value		
Parameter	2017	2018	2019	2020	2021
Capture effort (net-hours)	5,874	3,340	3,263	2,981	3,776
Average daily effort (net-hours / day)	122.4	111.3	116.6	76.4	94.4
Number of birds banded	1,661	1,279	1,204	1,105	1,120
Number of recaptures	717	468	427	406	488
Total number of birds captured	2,378	1,747	1,631	1,511	1,608
Recapture rate (%)	30.2	26.8	26.2	26.9	30.3
Number of species	55	49	48	53	50
Capture rate (birds per 100 net-hours)	40.5	52.3	50.0	50.7	42.6

 Table 1. Mist net capture statistics at Buttertubs West Marsh during 2017-2021.

The total capture effort deployed in 2021 (3,776 net-hours) was the second highest in the last 5 years (**Table 1**). There was no change in layout or number of nets used between 2018 and 2021. Capture rate in 2021 (42.6 birds per 100 net-hours) was the second lowest observed since 2017. The lower capture rate in 2021 was partly due to 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 2021 (50 species) was average compared to the last few years (48-55 species in 2015-2020).

Compared to previous years, capture rates were high in April and early May, but average during other months (**Figure 3**). Capture rates were relatively high during spring migration (April / May), and but relatively low during fall migration (September).



Figure 3. Weekly moving average of capture rate in mist nets at Buttertubs West Marsh during 2013-2021.

The capture rate of mist nets varied across the project site (**Table 2**). Overall, capture rates were the highest for net nets R1-R4 located in the riparian habitat. This pattern was generally consistent with previous years.

Overall, Song Sparrow (*Melospiza melodica*) was the most captured species and represented 9.5% of all birds caught during 2021 (**Table 3**). Common Yellowthroat (*Geothlypis trichas*) was the second most common species and accounted for 9.1% 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 2021. Photos of some of the birds captured in 2021 are shown in **Photos B.1** in Appendix.

Net Number	Number Banded	Number Recaptured	Total Number Captured	Net Hours	Capture Rate (Birds / 100 Net hours)
1	33	39	72	201	35.9
2	35	20	55	202	27.3
3	29	24	53	200	26.5
4	34	21	55	189	29.2
5	12	12	24	157	15.3
6	32	11	43	199	21.7
7	49	25	74	172	43.1
8	116	36	152	205	74.3
9	59	23	82	205	40.1
10	44	22	66	205	32.3
11	19	23	42	179	23.5
12	24	33	57	179	31.8
13	21	17	38	171	22.3
14	40	22	62	171	36.3
15	24	30	54	171	31.6
R1	151	29	180	198	91.0
R2	179	34	213	198	107.8
R3	85	16	101	193	52.3
R4	75	25	100	193	51.8
R5	59	26	85	193	44.0
Totals	1,120	488	1,608	3,776	42.6

 Table 2. Capture statistics by net at Buttertubs West Marsh during 2021.

There were changes in the rankings for the top 10 species captured during 2021 (**Table 4**). For the first time since the project began in 2021, Common Yellowthroat was not the most commonly caught species. There was also an increase 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.

Only one new species was captured at Buttertubs West Marsh in 2021, a California Quail (*Callipepla californica*). This species cannot be banded, so it was released upon capture.

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Common Name	Number Banded	Number Recaptured	Total Number Captured
Song Sparrow	78	75	153
Common Yellowthroat	70	77	147
Lincoln's Sparrow	102	7	109
Orange-crowned Warbler	88	13	101
Purple Finch	81	14	95
American Robin	54	36	90
Yellow Warbler	64	24	88
Bewick's Wren	34	46	80
Chestnut-backed Chickadee	29	47	76
Spotted Towhee	30	35	65
Bushtit	45	18	63
Swainson's Thrush	30	23	53
Savannah Sparrow	50	1	51
Fox Sparrow	26	15	41
Oregon Junco	34	3	37

Table 3. Fifteen most common species captured in mist nets at Buttertubs West Marsh during 2021.

Table 4. Number captured and rank (in parentheses) of the ten species most captured in mist nets atButtertubs West Marsh during 2017-2021.

Common Name	2017	2018	2019	2020	2021
Song Sparrow	253 (2)	187 (2)	143 (3)	122 (2)	153 (1)
Common Yellowthroat	361 (1)	281 (1)	231 (1)	206 (1)	147 (2)
Lincoln's Sparrow	121 (7)	133 (3)	91 (5.5)	74 (9)	109 (3)
Orange-crowned Warbler	143 (5)	77 (8)	168 (2)	75 (8)	101 (4)
Purple Finch	90 (11)	78 (7)	62 (10)	79 (6)	95 (5)
American Robin	163 (3)	120 (4.5)	82 (7)	92 (4)	90 (6)
Yellow Warbler	126 (6)	53 (12)	55 (12)	98 (3)	88 (7)
Bewick's Wren	62 (12)	55 (11)	78 (8)	81 (5)	80 (8)
Chestnut-backed Chickadee	95 (10)	67 (9)	74 (9)	59 (11)	76 (9)
Spotted Towhee	144 (4)	102 (6)	108 (4)	76 (7)	65 (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 2020) were the dominant age group between March and May, while hatch-year birds (hatched in 2021) were the dominant age group between June and October. Overall, 36.3% of birds banded were birds hatched in 2021. 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.

Month	Hatch Year (HY)	Second Year (SY)	After Hatch Year (AHY)	After Second Year (ASY)	Other Ages	Total
March		39	13	3		55
April	1	218	26	85		330
May		136	17	51	2	206
June	51	27	17	8	1	104
July	99	13	7	3	1	123
August	101	1	5			107
September	127		24		3	154
October	28		10		3	41
TOTAL	407	434	119	150	10	1,120

 Table 5. Age structure of birds banded at Buttertubs West Marsh during 2021.

 Table 6. Fat score of birds banded at Buttertubs West Marsh during 2021.

Month	0	1-2	≥3	Total
March	39	9	3	51
April	179	63	81	323
May	125	24	52	201
June	94	8	1	103
July	112	9		121
August	73	30	4	107
September	127	20	4	151
October	32	6	1	39
TOTAL	781	169	146	1,096

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 (August-September) (**Table 6**). Overall, the majority of birds banded (71.3%) did not display any visible fat (fat score = 0).

Table 7. Number and percentage of individuals recaptured in 2021 which were originally banded in 2018 or before, 2019, 2020 or 2021 for the ten most commonly recaptured species.

Species	Bano 2018 o	ded in r before	Band 20	ded in)19	Banc 20	led in 20	Band 20	led in 21
	No.	%	No.	%	No.	%	No.	%
American Robin	5	0.7	2	2.8	5	5.9	6	11.3
Bewick's Wren	3	1.3	3	6.0	4	8.5	8	23.5
Bushtit	3	0.6	1	1.5	6	11.1	6	13.3
Chestnut-backed Chickadee	3	0.7	6	10.5	9	24.3	16	40.0
Common Yellowthroat	7	0.6	4	3.3	14	11.7	5	7.1
Fox Sparrow	2	0.9	1	5.0	1	3.8	4	10.8
Song Sparrow	8	1.0	3	3.9	11	15.9	20	25.0
Spotted Towhee	4	0.7	3	3.4	7	12.3	6	17.6
Swainson's Thrush	2	0.9	3	7.9	1	4.8	3	10.0
Yellow Warbler	3	0.8	0	0.0	5	6.6	7	10.9
All Species	50	0.4	40	2.8	89	6.4	121	8.8

Table 8. List of selected individuals recaptured in 2021, which were originally banded at Buttertubs West

 Marsh at least 5 years earlier.

Band Number	Species	Sex	Number of Times Recaptured Since Banded	Date Banded	Date of Last Recapture	Estimated Age
0942-98752	AMRO	Male	8	18 Jun. 2013	25 May 2021	9
2561-31836	BHGR	Male	8	6 Sep. 2016	30 Jun. 2021	6
2730-48514	CBCH	Unknown	6	27 Sep. 2015	16 Sep. 2021	6
2561-31727	FOSP	Unknown	2	1 Oct. 2015	6 Apr. 2021	7
2691-51530	SOSP	Male	8	29 Jun. 2016	23 Sep. 2021	5
2561-31709	SPTO	Male	8	17 Sep. 2015	29 Apr. 2021	6
2780-62215	YEWA	Male	3	1 Jun. 2016	5 Jul. 2021	6

The 488 recapture events recorded in 2021 involved 300 banded birds (**Table 7**), of which 50 individuals were banded in 2013-2018, and 40, 89, and 121 individuals were originally banded in 2019, 2020 and 2021, respectively. Overall, 0.4% of individuals banded in 2013-2018 were recaptured in 2021, 2.8% of individuals banded in 2019 were recaptured in 2021, 6.4% of

individuals banded in 2020 were recaptured in 2021, and 8.8% of individuals banded in 2021 were recaptured in 2021. 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 2021 but were not recaptured.

Most recapture events involved birds that were recaptured only once during 2021. However, 161 individuals were recaptured more than once since they were banded, and at least 39 individuals were recaptured 6 or more times since they were banded. Some of these frequently recaptured and older 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 9 years old in 2021.

2.2.2. Overall Species Presence / Absence

Banding totals (number of birds captured) and incidental observations were compiled in the online eBird database (<u>ebird.org</u>). 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 106 species were observed at Buttertubs West Marsh during 2021 (**Table A.3** in Appendix). Two new species were observed in 2021: Common Goldeneye (*Bucephala clangula*) and Mourning Dove (*Zenaida macroura*). A total of 144 species have been observed at Buttertubs West Marsh since the beginning of this project in 2013.

3. Swallow Nest Box Monitoring

3.1. <u>Methods</u>

Thirty-six 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 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 2021. 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 4. Locations of the 36 swallow nest boxes at Buttertubs West Marsh during 2021. Green and red squares indicate whether eggs were deposited in the nest box or not, respectively.

3.2. <u>Results</u>

Thirty of the 36 nest boxes were occupied by swallows and had signs of nest building activities (**Table 9**). Most boxes were occupied by Tree Swallows (*Tachycineta bicolor*) although four boxes were occupied by Violet-green Swallows (*Tachycineta thalassina*). The latter species did not successfully fledge any of the eggs laid in 2021.

Clutch sizes for Tree Swallows ranged from 3-7 eggs with an average of 5.1 eggs per clutch (**Table 10**), which was consistent with previous years. Ten 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. In two instances, neither clutch produced fledglings, and for the rest, it was evenly split whether the first or second clutch produced fledglings.

Table 9. Results of nest box monitoring at Buttertubs West Marsh during 2021. Nest boxes no. 10, 13, 14, 16, 28, 24, 27, 29, 30, and 33 received two or more clutches (see text). TRES = Tree Swallow, VGSW = Violet-green Swallow, 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	Yes	VGSW	4	29 May	DNH	0	F
2	No						
3	No						
4	Yes	TRES	5	26 May	9 Jun.	1	F, N
5	No						
6	Yes	TRES	5	13 May	27 May	2	F, N
7	Yes						
8	Yes						
9	No						
10	Yes	TRES	Clutch 1: 6 Clutch 2: 6	16 May 3 Jun.	DNH 17 Jun.	0 3	F F
11	Yes	TRES	5	16 May	30 May	4	F, N
12	Yes	TRES	6	15 May	29 May	0	F
13	Yes	TRES	Clutch 1: 6 Clutch 2: 4	13 May 20 Jun.	27 May 4 Jul.	0 3	F N
14	Yes	TRES	Clutch 1: 6 Clutch 2: 5	11 May 3 Jun.	DNH 17 Jun.	0 0	F F, N
15	Yes	TRES	6	14 May	28 May	0	F
16	Yes	TRES VGSW	Clutch 1: 6 Clutch 2: 3	11 May 1 Jul.	25 May 15 Jul.	1 0	F, N F, N
17	Yes	TRES	5	18 May	1 Jun.	5	F, M, N
18	Yes	TRES	Clutch 1: 5 Clutch 2: 4	6 May 24 Jun.	20 May DNH	1 0	F, N
19	Yes	TRES	5	9 May	23 May	0	F, N
20	Yes	VGSW	5	21 May	4 Jun.	0	F, N
21	Yes	TRES	6	9 May	23 May	3	F, N
22	Yes	TRES	7	10 May	24 May	0	F, N
23	Yes	TRES	4	30 May	13 Jun.	2	F, N
24	Yes	TRES	Clutch 1: 6 Clutch 2: 3 Clutch 3: 6	11 May 2 Jun. 26 Jun.	DNH DNH 10 Jul.	0 0 2	F F N
25	Yes	TRES	5	13 May	27 May	4	F, N
26	Yes	TRES	6	11 May	25 May	3	F, N
27	Yes	TRES	Clutch 1: 6 Clutch 2: 4	6 May 5 Jul.	20 May DNH	4 0	F, N F
28	Yes	TRES	7	8 May	22 May	0	F
29	Yes	TRES	Clutch 1: 6 Clutch 2: 4	10 May 28 Jun.	24 May DNH	3 0	F, N F
30	Yes	TRES	Clutch 1: 4 Clutch 2: 4	24 May 20 Jun.	DNH 4 Jul	0 3	F F, N
31	No						
32	No						
33	Yes	VGSW	Clutch 1: 5 Clutch 2: 3	22 May 9 Jun.	DNH DNH	0 0	F
34	Yes	TRES	5	8 May	22 May	1	F, N
35	No						
36	Yes	TRES	6	15 May	29 May	5	F, N
Total			194 (174 TRES; 20 VGSW)			50 (50 TRES; (0 VGSW))	

Parameter	2017	2018	2019	2020	2021
Number of boxes	37	30	30	36	36
Number of boxes with eggs (% of boxes with eggs)	22 (59%)	24 (80%)	21 (70%)	29 (81%)	27 (75%)
Number of eggs laid	138	135	141	193	194
Mean clutch size (range)	5.1 (1-7)	5.0 (1-7)	5.0 (2-7)	5.1 (2-7)	5.1 (3-7)
Number of eggs hatched (% eggs hatched)	82 (59%)	115 (85%)	106 (75%)	148 (77%)	119 (61%)
Number of nestlings banded (% nestlings banded)	69 (84%)	105 (91%)	97 (92%)	92 (62%)	88 (74%)
Number fledged (% nestlings fledged)	52 (63%)	62 (54%)	84 (79%)	76 (51%)	50 (42%)
Fledging rate (young per pair)	2.0	2.3	3.0	2.0	1.3

Table 10. Summary of Tree and Violet-green Swallow nesting productivity at Buttertubs West Marsh during 2017-2021.

Thirty individual adult females were captured. Only one male was captured in 2021 due to the significantly longer time required to capture males and reduced volunteer availability. Of the 30 adult female Tree Swallows captured, 14 individuals had nested at Buttertubs West Marsh during 2020, but none had nested previously between 2017-2019.

Out of 194 Tree Swallow eggs laid, 119 eggs hatched (hatching success: 61%), 88 nestlings were banded around day 12 (nestling survival to day 12: 74%), and 50 young birds fledged (nestling survival to fledging: 42%) (**Tables 9** and **10**). Fledging success was variable between nest boxes, and six boxes with hatched eggs did not fledge any young. The average fledging rate for the entire nest box colony was 1.3 young per nesting pair.

Overall, the fledging rate was the lowest since 2013. Hatching rate was low in 2021 (61%) compared to 2014-2020 (59-85%). Additionally, survival of young from hatching to day 12 (74%) and fledging (42%) were the lowest for the last 7 years. These results suggest that lower survival during the nestling phase resulted in the lower productivity in 2021, especially during the first 12 days after hatching. Field observations suggested that unfavourable precipitation during the month of June 2021 (total rainfall: 40.1 mm; number of days with precipitation: 10 days; data from The Weather Network) may have in part led to lower productivity. In previous years (2016-2020), 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 blow fly 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.

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 2021 due to the COVID-19 pandemic. A total of 13 volunteers dedicated 1,033 hours to this project during 2021 (**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.

Volunteer Grouping	Number of Volunteers	Hours on Project
VIU students	3	377
VIU graduates	5	333
VIU employees	2	276
Community volunteers	3	47
TOTAL	13	1,033

Table 11. Number of volunteers and hours volunteered for the bird monitoring and banding project atButtertubs West Marsh during 2021.

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**).

Bandar Cada	Numb	er of Birds Proce	essed
Bander Code	Banded	Recaptures	Total
ALBA	58	20	78
BRJU	19	11	30
DALA	384	169	553
ERDE	118	92	210
HEVA	79	49	128
JAKE	16	1	17
KAPA	3	0	3
KEDO	219	66	285
KIWE	1	0	1
LISI	78	28	106
MAWA	3	0	3
NIRI	20	0	20
SASP	220	73	293
TOTAL	1,218	509	1,727

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 2021. The numbers listed include birds processed as part of regular bird banding and swallow nest box monitoring.

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 2021:

- Online presentation for Nature Nanaimo (18 February).
- On-site demonstration for VIU recruiters (14 July).
- Off-site demonstration and training for 24 students: VIU RMOT 275 Wildlife Techniques (27 September; 4, 12, 18 October; VIU Nanaimo Campus).
- Off-site demonstration for Nanaimo District Secondary School grade 11 students as part of National Science and Engineering Research Council Ambassador (NSERC) grant outreach event hosted by Samuelle Simard-Provençal (23 September).

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 (<u>http://wordpress.viu.ca/viubirdbanding/</u>) and Facebook page (<u>https://www.facebook.com/VIUBandingStation</u>). 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.

6. Acknowledgements

This project would not be possible without a dedicated group of volunteers, contributors, and partners (any omission is unintended): A. Badger, E. Demers, K. Dodds, B. Judson, J. Kennerley, H. Kimura, D. Lacasse, K. Parr, N. Richardson, S. Simard-Provençal, L. Singh, H. van Vliet, M. Wagenaar, and K. Wetten.

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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 land birds.

7. References

- Demers, E. 2019. Bird Monitoring and Banding Manual, version 3. Vancouver Island University, Nanaimo, BC. 45 p.
- Demers, E. 2019. Swallow Nest Box Monitoring Manual. Vancouver Island University, Nanaimo, BC. 7 p.
- Institute for Bird Population (IBP). 2012. Monitoring Avian Productivity and Survivorship (MAPS) Manual. Institute for Bird Population, Point Reyes Station, California. 79 p.
- Lepczyk, C.A., and P.S. Warren. 2012. Urban Bird Ecology and Conservation. University of California Press, Los Angeles, CA. 344 p.
- North American Banding Council (NABC). 2001a. The North American Banders' Study Guide. North American Banding Council, Point Reyes Station, California. 66 p.
- North American Banding Council (NABC). 2001b. The North American Banders' Manual for Banding Passerines and Near Passerines (Excluding Hummingbirds and Owls). North American Banding Council, Point Reyes Station, California. 15 p.
- North American Bird Conservation Initiative Canada. 2019. The State of Canada's Birds, 2019. Environment and Climate Change Canada, Ottawa, Canada. 12 pages. <u>http://www.stateofcanadasbirds.org/</u>

8. Appendix

Table A.1. List of all species captured in mist nets at Buttertubs West Marsh during 2021. Subspecies areincluded in parentheses where applicable.

	Number	Number	Total number
Common Name	banded	recaptured	captured
Song Sparrow	78	75	153
Common Yellowthroat	70	77	147
Lincoln's Sparrow	102	7	109
Orange-crowned Warbler	88	13	100
Purple Finch	81	14	95
American Robin	54	36	90 90
Vollow Warblor	64	24	88
Bewick's Wren	24	46	80
Chartrait backed Chickedee	20	40	00 76
Spotted Towhoo	29	47	70
Spolled Townee Bushtit	30	30	60
Bushill Sweinsen's Thrush	45	18	03
	30	23	53
Savannan Sparrow	50	1	51
Fox Sparrow	26	15	41
Dark-eyed Junco Junco (Oregon)	34	3	37
Golden-crowned Sparrow	31		31
Pine Siskin	24	4	28
Ruby-crowned Kinglet	26	2	28
Brown Creeper	17	10	27
House Finch	25		25
Wilson's Warbler	24		24
Yellow-rumped Warbler (Myrtle)	21		21
Cedar Waxwing	16	1	17
American Goldfinch	14	3	17
Tree Swallow	8	6	14
Brown-headed Cowbird	10	3	13
Willow Flycatcher	10	3	13
Marsh Wren	4	7	11
Downy Woodpecker	5	6	11
Red-breasted Sapsucker	5	3	8
Chipping Sparrow	7		7
Black-headed Grosbeak	3	4	7
Warbling Vireo	6		6
Hermit Thrush	6		6
Steller's Jav	5		5
Pacific-slope Elycatcher	ů 4		4
White-crowned Sparrow (Gambel's)	4		4
Violet-green Swallow	4		4
Golden-crowned Kinglet	3	1	4
White-crowned Sparrow (Puget Sound)	5 Д	I	4
MacGillivray's Warbler	т 1		4
Yellow-rumped Warbler (Audubon)	т 2		
Pacific Wren	2		2
	2		2
Dalli Swallow Vollow rumpod Warbler (upknown con)	2		2
Vestern Teneger	2		2
vvestern Lanager	1		1
Rea-wingea Blackbira	1		1
vvnite-throated Sparrow	1		1
Hutton's Vireo		1	1
Hammond's Flycatcher	1		1
Red-breasted Nuthatch	1		1
Red-shafted Flicker	1		1
Northern Rough-winged Swallow	1		1
TOTAL	1,120	488	1,608

Date	Red-breasted Sapsucker	Downy Woodpecker	Northern Flicker	Willow Flycatcher	Pacific-slope Flycatcher	Hutton's Vireo	Warbling Vireo	Steller's Jav	Chestnut-backed Chickadee	Northern Rough-winded Swallow		Violet-green Swallow	Bushtit	Rubv-crowned Kinalet	Golden-crowned Kinglet	Red-breasted Nuthatch	Brown Creeper	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	Dark-eyed Junco	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	MacGillivray's Warbler	Common Yellowthroat	Yellow Warbler	Yellow-rumped Warbler	Wilson's Warbler	Western Tanager	Black-headed Grosbeak Total
Mar-11								1												1			3								4					1		1										11
Mar-22									1				2	2									1				1			1	2					3		2										15
Mar-25									4				6	2			3	1					2							3	3					2		2										28
Mar-27									9				4	1																3	1					3		4										25
Mar-31									4				3	2	1		1			1			3							4	4					4		1										28
Apr-02									3					3						1			2				1			3	2					2			1									18
Apr-05									1											1										2	1		1			2		1										9
Apr-06									1				1	7	1				1	4			8							2	1					6		1										33
Apr-08													1	4				1					2							3	2		1			2		1					1					18
Apr-14		1							3		1		2	2	1					0			3				~	0		2	1				1	5	0	3			1							26
Apr-16									1				3	3			1		1	2			3				3	3		0	1	1			4	3	2	3		4	2		4		4			44
Apr-20									2		2			1					I	1		1	3				2 5		1	1					1	2	5 15	3		1 1	2		2		3 1			24 45
Apr-20									2		2		1	'						י 3		1	с 3			2	2			1		2	1		י ג	5	17	1			- 13		٥ 4	2	י 5			45 68
Apr-26		1							4			1	'						1	4			7	2		- 1	2			1		- 1	1		0	8	11	1		1	5		7	2	1			60
Apr-27	1	2							2		1	•	1		1		1		•	1		1	3	-		1	2	2		•			2		2	5	8	2		·	6							44
Apr-29	1	_							1		1	2	-				-			1		1	3	2		-	5	_		1		1	11		6	1	22	1		1	19		9		3	4		96
May-04									3	1	1									1			2			4							5		2	1	4			3	12		6	3		3		51
May-07	2	1					1		1		2	1 1	4								2	1	4	1				3		1			4		9	1	3	2		2	15	2	8	1		3	1	76
May-13							1		1											1	3			1		1	2	1							1	2	1	1			3		8	3		4		34
May-14	1						1				4		1							1				1		7		1							3	1	1	1		1	2		5	12				43

VIU Bird Monitoring and Banding Project

(continued on next page)

Table A.2. (continued)

Date	Red-breasted Sapsucker	Downy Woodpecker	Northern Flicker	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	Barn Swallow	Bushtit Ruby-crowned Kinglet	Golden-crowned Kinglet	Red-breasted Nuthatch	Brown Creeper	Pacific Wren	Marsh Wren Bewick's Wren		Swainson' s Inrush Hermit Thrush					Pine Siskin	American Goldfinch	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	Red-winged Blackbird Rrown-headed Cowbird	Oranna-orownad Warhler	MacGillivray's Warbler	Common Yellowthroat	Yellow Warbler	Yellow-rumped Warbler	Wilson's Warbler	Western Tanager Black-headed Grosbeak	Total
May-18					2													1	4	1 1	2	2		1	1	1							6	2				4	1	4	13	}	6	1	50
May-20									1									З	3 4	1	1			4							2		3	3				1		4	10)	1	1	38
May-25	1	1								1						2		5	5 5	5	5	5 2	2	2	2									2		2				3	5				38
May-28				1	1													1 2	2 ^	1	2	2		1										1		1		1		5	3		3	1	24
Jun-19	1			1					1	1			6					1	∠	1		1		4		1			2					7		1		2		5	5	1		1	45
Jun-23	1			2					4						1			1 2	2 2	2	1	1	2	: 1		1							1	5			1	3		2	5	1			37
Jun-25																			Ę	5		2	2 2	8										3		1				3	1			1	26
Jun-30		1		1								1	10			2		1	∠	1		1		3			1							1		1	1	1		2	5			1	37
Jul-05				1									1			2		4	1 -	1		2	2	1			4						1	3		1		1		4	3				29
Jul-08																1		18	3		1			5		2	1							14						7	2				42
Jul-14		1					1		4				1			2		7	7 2	2	1	1		4					1				1	11		3		2		5		1			48
Jul-22		2							1							3		5	5 ^	1			8	2		1								6		2	1	1		3	1				37
Aug-12				2	1		1	;	3				2			1		3	3 -	1			9	5		1								2		1				8	5			1	46
Aug-19			1	3	1		1		1				1							1			4	7						3				2		1			1	10	1				38
Aug-26				2				:	2				1			1		2 1	13	3	1			4									7	3		1				6	1				35
Sep-09								1 4	4				2			4		6	5 4	1	З	3		12	2			1					1	5	9	5		1		5	1				64
Sep-16		1						;	3				4			2		1 1	5	5	8	3		3				1	1		1		1	13	6	3				10					64
Sep-23								1 :	2				2					1 4	1 -	1	8	3		8				2	6		2		1	5	1	7		3		1	4				59
Oct-02			_			1		2 (6				4			1		2	2		5	5		4				2	5			1		6	4	4		1			2	5			55
Total	8	11	1	13	1 4	1	6	5 7	76	1 14	4	2	63 28	4	1	27	2 1	1 8	05	3 6	9	0 1	7 2	5 95	5 28	3 17	7	41	37	8	31	1 :	51 1	53 ⁻	109	65	1 13	3 10'	1 4	147	7 88	325	24	1 7	1,608

Table A.3. List of all species observed at Buttertubs West Marsh during 2021 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.

106 species (+6 other taxa)			<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
Greater White-fronted Goose	0	\sim		8						8				
<u>Canada Goose</u>	0	\sim						8	8					
<u>Trumpeter Swan</u>	0	\sim						8		8		8		
Wood Duck	0	\sim		8				8	8			8		
American Wigeon	0	\sim		8				8				8		
<u>Mallard</u>	0	\sim						8						
<u>Northern Pintail</u>	0	\sim		8				8		8		8		
Green-winged Teal	0	\sim		8		-		8	8	8		8		
dabbling duck sp.	0	\sim		8		•		8		8		8		
<u>Canvasback</u>	0	\sim		8				8	8	8		8		
Ring-necked Duck	0	\sim								8		8		
<u>Lesser Scaup</u>	0	\sim		8				8	8	8		8		
<u>Bufflehead</u>	0	\sim				•		8		8		8		
<u>Common Goldeneye</u>	0	\sim		8				8	8	8		8		
Hooded Merganser	0	~					•	8		8		8		
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Common/Red-breasted Merganser	•	\sim		8				8	8			8		
duck sp.		\sim		8			•	8		8		8		
<u>California Quail</u>	0	\sim							8	8				
Pied-billed Grebe	0	\sim		8				8				8		
Rock Pigeon	0	\sim				•		8	8	8		8		
Band-tailed Pigeon	0	\sim		8				8						
Eurasian Collared-Dove	0	\sim				•		8	8	8		8		
Mourning Dove	0	\sim		8				8		8		8		
<u>Vaux's Swift</u>	0	\sim		8				8	8	8		8		
<u>Anna's Hummingbird</u>	0	\sim												
Rufous Hummingbird	0	\sim		8								8		
hummingbird sp.	0	\sim		8		•		8		8		8		
<u>Virginia Rail</u>	0	\sim							8	8				
Sora	0	\sim		8			•	8		8		8		
<u>American Coot</u>	0	~						8	8) (c	ontinu	led or	n next	page)

Table A.3. (continued)

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov Dec
<u>Killdeer</u>	0	\sim		8						8			
<u>Wilson's Snipe</u>	9	\sim		8									
Glaucous-winged Gull	0	\sim					•	8		8			
gull sp.	9	\sim		8				8				8	
Great Blue Heron	9	\sim		8								8	
Turkey Vulture	9	\sim		8									
<u>Osprey</u>	0	\sim		8				8	8	8		8	
Northern Harrier	0	\sim						8	8	*			
Sharp-shinned Hawk	0	~		8				8		8		8	
<u>Cooper's Hawk</u>	0	\sim										8	
Bald Eagle	0	\sim								8		8	
Red-tailed Hawk	0	\sim						8					
Barred Owl	9	\sim						8		8			
Belted Kingfisher	0	\sim										8	
Red-breasted Sapsucker	0	\sim		8								8	
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov Dec
Downy Woodpecker	2	\sim											
Hairy Woodpecker	9	\sim						8					
Pileated Woodpecker	0	\sim		8				8		8		8	
Northern Flicker	2	\sim											
<u>Merlin</u>	9	\sim		8				8		8		8	
Peregrine Falcon	0	\sim		8				8		8		8	
Olive-sided Flycatcher	0	\sim		8				8	8	8		8	
Western Wood-Pewee	0	\sim		8						8		8	
Willow Flycatcher	0	\sim		8								8	
Hammond's Flycatcher	0	\sim		8				8				8	
Pacific-slope Flycatcher	9	\sim		8								8	
Hutton's Vireo	9	\sim		8						8			
Warbling Vireo	9	\sim		8				8				8	
Northern Shrike	0	~		8				8		8		8	
Steller's Jay	9	\sim						8	8	8			

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Table A.3. (continued)

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
American Crow	9	\sim								8				
<u>Common Raven</u>	0	\sim												
Chestnut-backed Chickadee	0	\sim												
<u>Northern Rough-winged</u> Swallow	0	\sim		8					8	8		8		
Purple Martin	9	\sim		8								8		
Tree Swallow	9	\sim		8								8		
Violet-green Swallow	9	\sim		8								8		
Barn Swallow	9	\sim		8				8	8			8		
<u>Bushtit</u>	0	\sim												
Ruby-crowned Kinglet	9	\sim						8		8				
Golden-crowned Kinglet	9	\sim						8		8				
Red-breasted Nuthatch	9	\sim		8										
Brown Creeper	9	\sim												
Pacific Wren	9	\sim						8	8	8		8		
<u>Marsh Wren</u>	9	\sim										8		
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bewick's Wren	P	~	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bewick's Wren European Starling	0	~	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bewick's Wren European Starling Varied Thrush	0	~	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bewick's Wren European Starling Varied Thrush Swainson's Thrush		× ×	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Dec
Bewick's Wren European Starling Varied Thrush Swainson's Thrush Hermit Thrush			Jan	Feb	Mar	Apr		Jun		Aug	Sep	Oct	Nov 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Dec
Bewick's Wren European Starling Varied Thrush Swainson's Thrush Hermit Thrush American Robin			Jan	Feb	Mar	Apr		Jun		Aug	Sep	Oct	Nov	Dec
Bewick's Wren European Starling Varied Thrush Swainson's Thrush Hermit Thrush American Robin Cedar Waxwing			Jan	Feb	Mar	Apr		Jun 		Aug	Sep	Oct	Nov 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Dec
Bewick's Wren European Starling Varied Thrush Swainson's Thrush Hermit Thrush American Robin Cedar Waxwing House Sparrow			Jan Jan Jan Jan Jan Jan Jan Jan Jan Jan	Feb	Mar	Apr Apr		Jun 3 1 1 3 1 1 1 1 3 1 1 1 1 3 1 1 1 1 3 1 1 1 1 1 3 1 1 1 1 1 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			Sep	Oct	Nov	Dec
Bewick's Wren European Starling Varied Thrush Swainson's Thrush Hermit Thrush American Robin Cedar Waxwing House Sparrow House Finch			Jan Jan Jan Jan Jan Jan Jan Jan Jan Jan	Feb	Mar	Apr Apr A A A A A A A A A A A A A A A A		Jun 			Sep		Nov Image: State St	Dec
Bewick's WrenEuropean StarlingVaried ThrushSwainson's ThrushHermit ThrushAmerican RobinCedar WaxwingHouse SparrowHouse FinchPurple Finch			Jan	Feb	Mar	Apr Apr A A A A A A A A A A A A A A A A					Sep		Nov Control	Dec
Bewick's WrenEuropean StarlingVaried ThrushSwainson's ThrushHermit ThrushAmerican RobinCedar WaxwingHouse SparrowHouse FinchPurple FinchRed Crossbill			Jan Jan Jan Jan Jan Jan Jan Jan Jan Jan	Feb	Mar Mar	Apr Apr A A A A A A A A A A A A A A A A		Jun 3 1 1 3 1 1 1 3 1 1 1 1 3 1 1 1 3 1 1 1 1 3 1 1 1 1 3 1 1 1 1 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			Sep		Nov Image: State St	Dec 2000 2000 2000 2000 2000 2000 2000 20
Bewick's WrenEuropean StarlingVaried ThrushSwainson's ThrushHermit ThrushAmerican RobinCedar WaxwingHouse SparrowHouse FinchPurple FinchRed CrossbillPine Siskin			Jan Jan Jan Jan Jan Jan Jan Jan Jan Jan	Feb	Mar	Apr Apr A A A A A A A A A A A A A A A A					Sep		Nov Image: State St	Dec 2 2 2 2 2 2 2 2 2 2 2 2 2
Bewick's WrenEuropean StarlingVaried ThrushSwainson's ThrushHermit ThrushAmerican RobinCedar WaxwingHouse SparrowHouse FinchPurple FinchRed CrossbillPine SiskinAmerican Goldfinch			Jan 1991 1991 1991 1991 1991 1991 1991	Feb	Mar	Apr Apr A A A A A A A A A A A A A A A A					Sep		Nov Image: State St	Dec
Bewick's WrenEuropean StarlingVaried ThrushSwainson's ThrushHermit ThrushAmerican RobinCedar WaxwingHouse SparrowHouse FinchPurple FinchRed CrossbillPine SiskinAmerican GoldfinchChipping Sparrow			Jan	Feb	Mar						Sep		Nov	Dec

(continued on next page)

Table A.3. (continued)

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov Dec
Dark-eyed Junco	9	\sim								8			
White-crowned Sparrow	9	\sim										8	
Golden-crowned Sparrow	0	\sim		8				8		8		8	
White-throated Sparrow	0	\sim				-		8		8			
Savannah Sparrow	0	\sim		8									
Song Sparrow	0	\sim											
Lincoln's Sparrow	0	~		8				8		8			
Spotted Towhee	0	\sim											
Red-winged Blackbird	0	\sim											
Brown-headed Cowbird	9	\sim		8								8	
Brewer's Blackbird	9	\sim		8		•				8		8	
Orange-crowned Warbler	9	\sim		*									
<u>MacGillivray's Warbler</u>	0	\sim		8				8		8		8	
Common Yellowthroat	0	\sim										8	
Yellow Warbler	0	\sim		8									
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov Dec
Yellow-rumped Warbler	9	\sim		8						8			
Black-throated Gray Warbler	9	\sim		8			•			8		8	
Townsend's Warbler	0	\sim										8	
Black-throated Gray/Townsend's Warbler	0	~		8				8	8	8		8	
<u>Wilson's Warbler</u>	9	\sim						8	8	8		8	
<u>Western Tanager</u>	0	\sim		8								8	
<u>Black-headed Grosbeak</u>	0	~											

KEY: = insufficient data = rare to widespread

Photos B.1. Sample photographs for the VIU Bird Monitoring and Banding Project at Buttertubs West Marsh during 2021. Photos courtesy of S. Simard-Provençal.



(continued on next page)

Photos B.1. (continued)













(continued on next page)

Photos B.1. (continued)











