

Avian Point Count Report for Indreland Audubon Wetland Preserve 2025

4th Annual Progress Report

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January 2026

Introduction

Avian point count surveys were established in spring 2022 to provide baseline information on avian species richness, species abundance, and species diversity at the Indreland Audubon Wetland Preserve (IAWP) managed/owned by Sacajawea Audubon Society (SAS) in Bozeman, Montana. Point count data are being collected to provide a standardized and repeatable method for evaluating changes in avian metrics related to proposed wetland restoration activities and the potential designation of a wetland mitigation bank. The IAWP is being considered by the U.S. Army Corps of Engineers (COE) for the establishment of the Sacajawea Wetland Bank (Bank). Bird point count monitoring for at least a 5-year period is one requirement by the COE for designation of the wetland mitigation bank. The Bank will be used to mitigate for unavoidable wetland impacts approved through the COE (administered by Section 404 of the Clean Water Act). The Bank will provide a local wetland mitigation option to help offset wetland impacts occurring specifically in Bozeman and the surrounding watershed. Monitoring may be extended if success of performance standards (increases in species richness, abundance, and diversity) is not achieved within the five-year period. The performance standards for birds as defined by Confluence Consulting (2022) include the following:

- a. Avian species richness (i.e., number of species identified) within vegetated wetland and open water areas will exhibit a 10% increase over baseline conditions (63 species) by the final monitoring year.
- b. Avian species abundance will increase by 10% over baseline conditions by the final monitoring year.
- c. Avian species diversity, using the Shannon-Wiener Diversity Index will increase by the final monitoring year.

Study Area

The IAWP is located on the east side of Bozeman, Montana in Gallatin County (Latitude 45.681688°, Longitude -111.013765°) north of the I-90/Main St. interchange (Figure 1). The site consists of two parcels, located north and south of the railroad tracks, comprising 6.8 acres and 31.2 acres, respectively. Burlington Northern Santa Fe (BNSF) is the sole operator of the rail line, which bisects the project area northwest to southeast and separates the two parcels. A 30-ft tall historic railroad berm divides the 31.2-acre south parcel into two areas, located northwest and southeast of the berm, respectively. The Montana Department of Transportation's (MDT) I-90 East Bozeman Wetland Mitigation Reserve is located immediately southeast of the project's southern parcel.

Methods

During the 2025 field season, we conducted point count surveys at 9 established point count locations within the IAWP (Figure 2). We were able to collect data at all point count stations even with open and high-water levels.

Point counts are located a minimum of 150 meters apart to maintain independence of counts between locations. All birds seen or heard were recorded during a 5-min point count survey within a 75-m radius of each point count location. Data were recorded in eBird (primarily using smart phones) (<https://science.ebird.org/en/use-ebird-data/citation>; Sullivan et al. 2009).

A total of 11 surveys were conducted approximately every two weeks from mid-April through mid-October, except June, to collect data during spring migration, the breeding season and fall migration. All surveys were recorded by one person, not by pairs or groups, to maintain consistency and comparability of the data among years. Data were not collected during inclement weather, including strong winds and rain. Unfortunately, data were not collected in June 2025 due to unforeseen circumstances.

Six observers (same observers as past years) conducted point count surveys during 2025 (Table 1). Each person conducted 1-3 surveys. We did not correct for imperfect species detectability among observers (MacKenzie et al. 2009).

We recorded avian species richness (total number of species), species abundance (total number of individuals counted per species) and species diversity. We derived the Shannon-Weiner Species Diversity Index (H'), which is calculated by taking the number of each species, the proportion each species is of the total number of individuals, and then sum the proportion times the natural log of the proportion for each species (Nolan and Callahan 2006).

Results/Discussion

Seventy-one bird species (species richness) and 1,948 individuals (species abundance) were recorded during 11 point-count surveys in 2025 at 9 stations from mid-April through mid-October, excluding June (Table 2 and Appendix 1). Unexpectedly, data were not collected in June due to a mistaken schedule.

During years 2022 and 2023, we conducted 15 point-count surveys, whereas we completed 14 and 11 surveys, respectively, in 2024 and 2025 (Appendix 2). In 2023 we did not have access to survey point count station number 6 due to high water levels, although we recorded the highest species richness and abundance over the 4-year period in that year (Appendix 2). Species richness (71) in 2025 was similar to past years (67, 75, 65, in years 2022 – 2024, respectively) but species diversity was the lowest ($H' = 3.029$) among all years (3.176, 3.158, 3.258 in years 2022 – 2024, respectively) (Appendix 2).

Average abundance per survey was highest in 2025, at 177 individuals per survey, a better measure to compare abundance by effort among years. The greatest annual abundances of mallards and starlings were recorded in 2025, which strongly influenced the higher average abundance compared to the previous years (Appendix 2).

The most notable changes in 2025 compared to 2022-2024 were the additions of two shorebird species recorded for the first time during point count surveys (Spotted Sandpiper and Greater Yellowlegs) (Appendix 2). Perhaps the timing of more open mudflats in 2025 attracted these species. Also notable in 2025 is the large number of species that were recorded only once across the survey period (18 species;

Appendix 1). This is a unique result compared to past years when we recorded very few species only once throughout the survey period (2, 9, 8 in years 2022 – 2024, respectively; Appendix 2). The diversity index for 2025 was strongly influenced by the large number of species recorded only once, resulting in a reduced diversity compared with past years (Appendix 2).

Mallards and Red-winged Blackbirds continue to be the most abundant species across all years. Abundance for Mallards totaled 432 individuals, while Red-winged Blackbirds totaled 272 individuals. The abundance of Mallards in 2025 substantially increased by more than 100 individuals compared to past years.

Since the project began in April of 2022, we have recorded 101 species (eliminating Sharp-shinned/Cooper's Hawk and Black-capped/Mountain Chickadee) during point count surveys, with 21 species recorded in only 1 of 4 years (Appendix 2). Overall species richness continues to increase from the baseline number of 63 species. The pattern of increased abundance is noteworthy for Mallard while a pattern of decreased abundance is notable for Marsh Wren.

Performance Standards and Future

Prior to the wetland restoration, data collected during the past 4 years indicate more than a 10% increase for species richness (63 to 75) and abundance (128 to 177 per survey) over baseline conditions. Species diversity has not increased over the same monitoring period. Comparing the years when data were collected during the same months (2022-2024), we detected a pattern of increasing species diversity. These same measures will be calculated after wetland restoration to evaluate the influence of the restoration on birds using the IAWP during migration and the nesting season.

Four years is typically adequate for pre-treatment data to incorporate annual variation and start detecting patterns. Consequently, monitoring will cease during the proposed year of restoration (2026). Point count surveys are conducted April through the end of October, which would overlap with the restoration activities planned for September and October 2026. Point count surveys will resume in 2027, one year after the planned restoration. At least 2 years post-restoration data will be collected to meet the minimum monitoring obligations needed for the IAWP to be considered for designation as a wetland mitigation bank by the COE.

Acknowledgments

We are grateful to all observers (see Table 1) that conducted point count surveys and entered data into eBird, which allowed for more efficient data entry and data management to complete this report.

Literature Cited

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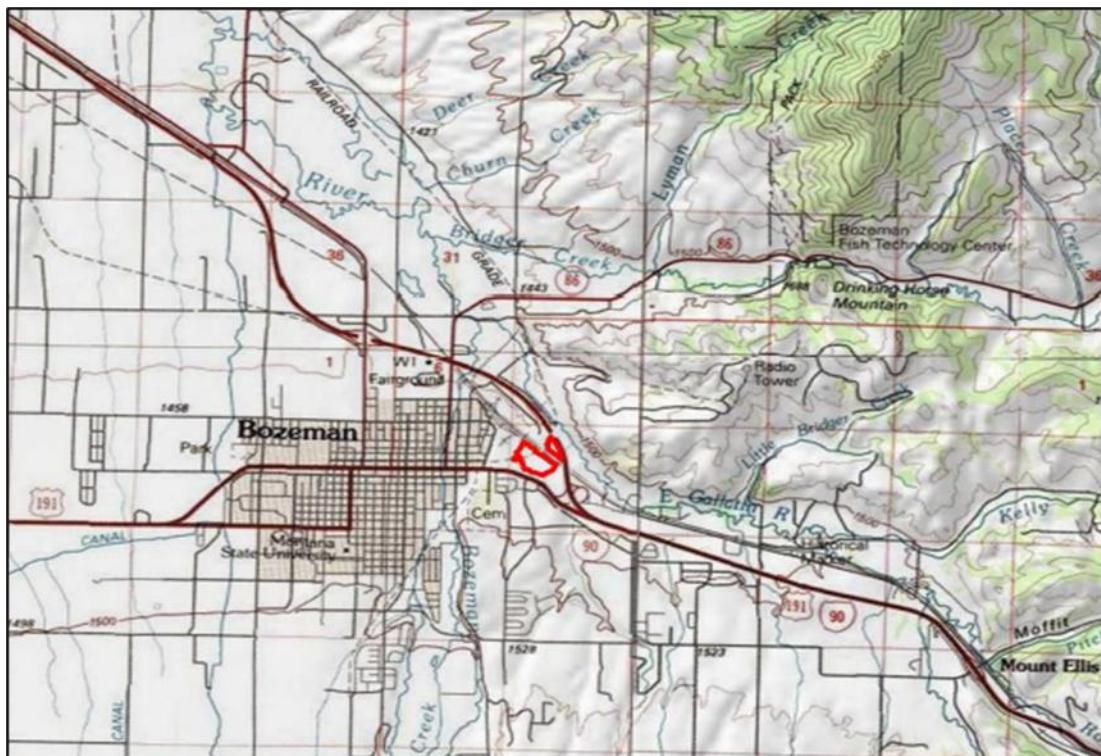


Figure 1. Location of Indreland Audubon Wetland Preserve outlined in red -----.

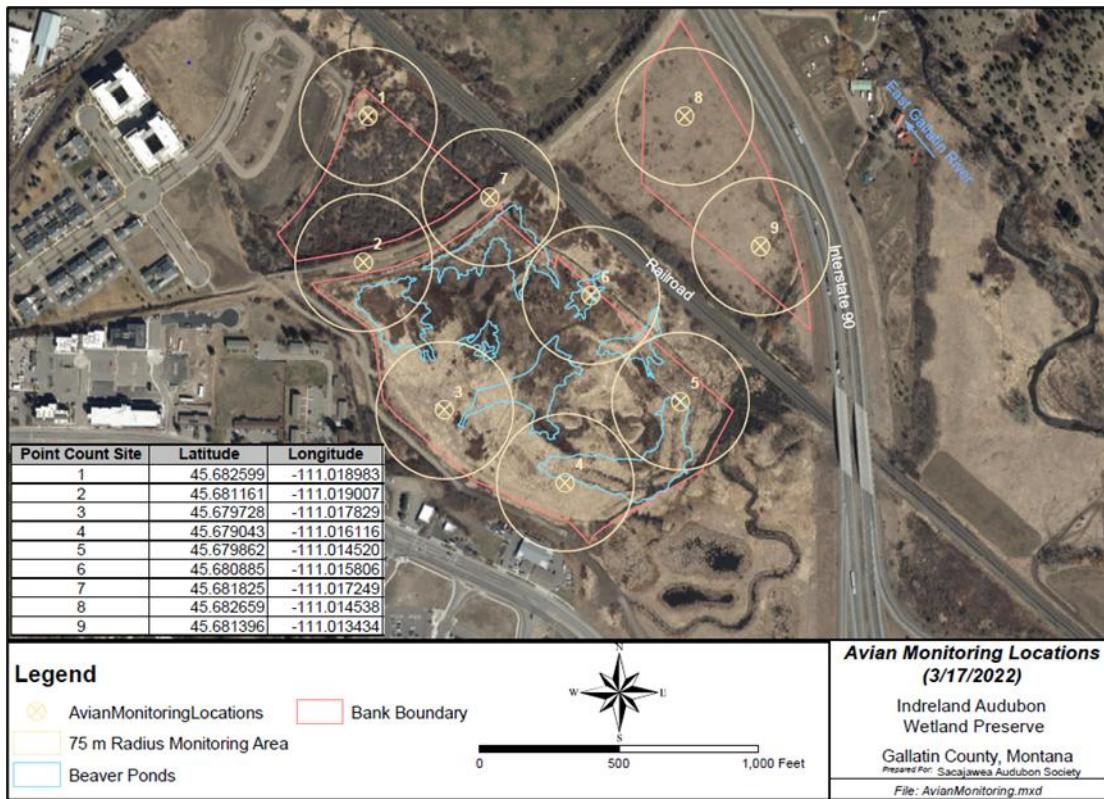


Figure 2. Point Count (Avian Monitoring) locations  at IAWP.

Table 1. Avian point count surveyors by date during 2025, with a total of 11 survey days.

Surveyor	16 April	1 May	15 May	29 May	11 July	26 July	8 Aug	21 Aug	3 Sept	8 Oct	20 Oct
Bontadelli, Kristen			KB						KB	KB	
Goodheart, Ben							BG				BG
Kocielek, Angie				AK							
Koenen, Sam					SK	SK					
McSpadden, Doug		DM									
Saab, Victoria	VS							VS			

Table 2. Species richness (total number of species = 71) and species abundance (total count of individuals = 1948 recorded during eleven, 5-minute point count surveys conducted from mid-April through mid-October 2025 on the Indreland Audubon Wetland Preserve.

	Common Name	16 April	1, 15, 29 May	11, 26 July	8, 21 Aug	3 Sept	8, 20 Oct	Total
1	Canada Goose	5	27	17			4	53
2	Blue-winged Teal			2		2		4
3	Cinnamon Teal			5				5
4	Northern Shoveler			2				2
5	Gadwall			2				2
6	Mallard	14	41	100	44	6	227	432
7	Green-winged Teal						3	3
8	Ring-necked Pheasant	1	1				2	4
9	Rock Pigeon (Feral Pigeon)			4	5		7	16
10	Virginia Rail						1	1
11	Sora		3		1			4
12	American Coot	12	15	16	4	8	8	63
13	Sandhill Crane			2				2
14	Killdeer	1	2		1			4
15	Wilson's Snipe	1	12				1	14
16	Eared Grebe				1			1
17	Turkey Vulture	1						1
18	Northern Harrier	2						2
19	Belted Kingfisher			3		6	2	3
20	Downy Woodpecker	1		2				3
21	Northern Flicker			3				3
22	Black-billed Magpie	3	19	6	8	1	15	52
23	American Crow	1	7				1	9
24	Common Raven			1		1		2
25	Black-capped Chickadee	6	24	12	4	18	27	91
26	Mountain Chickadee				1			1
27	Tree Swallow	2	12	12	13			39
28	Marsh Wren		3	14			2	19
29	European Starling			4	38		120	162
30	American Robin	8	38	6	4	1	11	68
31	House Sparrow			3		1		4
32	House Finch			7	2	4	3	12
33	Pine Siskin				3	12	3	20
34	American Goldfinch			7	17	19		45
35	Song Sparrow	9	11	20	6	1	10	57
36	Yellow-headed Blackbird	2	21	14				37

	Table 2 Continued							
37	Red-winged Blackbird	22	126	75	41	3	5	272
38	Spotted Sandpiper		3					3
39	Pied-billed Grebe		1				1	2
40	Great Blue Heron			1				1
41	Willow Flycatcher		2	7	2			11
42	Least Flycatcher			6				6
43	Eastern Kingbird		1	12	13			26
44	Horned Lark		1					1
45	Bank Swallow			14				14
46	Northern Rough-winged Swallow			10	16			26
47	Barn Swallow			1				1
48	Northern House Wren		1	4	1			6
49	Gray Catbird		1	10	4	6		21
50	Savannah Sparrow		8	2	2			12
51	Bullock's Oriole				1			1
52	Brown-headed Cowbird		4	4				8
53	Common Grackle		1	8	9		2	20
54	Northern Waterthrush		3		1			4
55	Common Yellowthroat		16	23	6	14		59
56	American Redstart			1				1
57	Northern Yellow Warbler		30	29	15	6		80
58	Wilson's Warbler		1					1
59	Cedar Waxwing			41	27	9	12	89
60	Lincoln's Sparrow					1		1
61	Lazuli Bunting					1		1
62	Wood Duck			1				1
63	Solitary Sandpiper				1			1
64	Greater Yellowlegs				2			2
65	Evening Grosbeak				2			2
66	Cooper's Hawk					1		1
67	Sharp-shinned/Cooper's Hawk					1		1
68	Swainson's Thrush					1		1
69	MacGillivray's Warbler					1		1
70	Yellow-rumped Warbler		2				1	3
71	American Tree Sparrow						1	1
	Total Abundance (no. of individuals)							1948

Appendix 1. Data summary for calculating the Shannon-Weiner Diversity Index 2025.

PhyloOrder	Correct_Name	April	May	July	Aug	Sept	Oct	Total	proportion	In p	p ln p
1	Canada Goose	5	27	17			4	53	0.027	-3.604	-0.098
2	Blue-winged Teal			2		2		4	0.002	-6.188	-0.013
3	Cinnamon Teal		5					5	0.003	-5.965	-0.015
4	Northern Shoveler		2					2	0.001	-6.881	-0.007
5	Gadwall		2					2	0.001	-6.881	-0.007
6	Mallard	14	41	100	44	6	227	432	0.222	-1.506	-0.334
7	Green-winged Teal						3	3	0.002	-6.476	-0.010
10	Ring-necked Pheasant	1	1				2	4	0.002	-6.188	-0.013
11	Rock Pigeon (Feral Pigeon)			4	5		7	16	0.008	-4.802	-0.039
13	Virginia Rail						1	1	0.001	-7.575	-0.004
14	Sora		3		1			4	0.002	-6.188	-0.013
15	American Coot	12	15	16	4	8	8	63	0.032	-3.431	-0.111
16	Sandhill Crane		2					2	0.001	-6.881	-0.007
17	Killdeer	1	2		1			4	0.002	-6.188	-0.013
18	Wilson's Snipe	1	12				1	14	0.007	-4.936	-0.035
19	Eared Grebe				1			1	0.001	-7.575	-0.004
20	Turkey Vulture	1						1	0.001	-7.575	-0.004
21	Northern Harrier	2						2	0.001	-6.881	-0.007
23	Belted Kingfisher		3		6	2	3	14	0.007	-4.936	-0.035
24	Downy Woodpecker	1		2				3	0.002	-6.476	-0.010
25	Northern Flicker			3				3	0.002	-6.476	-0.010
26	Black-billed Magpie	3	19	6	8	1	15	52	0.027	-3.623	-0.097
27	American Crow	1	7				1	9	0.005	-5.377	-0.025
28	Common Raven		1			1		2	0.001	-6.881	-0.007
29	Black-capped Chickadee	6	24	12	4	18	27	91	0.047	-3.064	-0.143
30	Mountain Chickadee				1			1	0.001	-7.575	-0.004
31	Tree Swallow	2	12	12	13			39	0.020	-3.911	-0.078
32	Marsh Wren		3	14			2	19	0.010	-4.630	-0.045
33	European Starling			4	38		120	162	0.083	-2.487	-0.207
34	American Robin	8	38	6	4	1	11	68	0.035	-3.355	-0.117
35	House Sparrow		3			1		4	0.002	-6.188	-0.013
36	House Finch		7	2	4	3	12	28	0.014	-4.242	-0.061
37	Pine Siskin		3	12	3	2	20	30	0.010	-4.579	-0.047
38	American Goldfinch		7	17	19		2	45	0.023	-3.768	-0.087
40	Song Sparrow	9	11	20	6	1	10	57	0.029	-3.532	-0.103
41	Yellow-headed Blackbird	2	21	14				37	0.019	-3.964	-0.075
42	Red-winged Blackbird	22	126	75	41	3	5	272	0.140	-1.969	-0.275
48	Spotted Sandpiper		3					3	0.002	-6.476	-0.010
49	Pied-billed Grebe		1				1	2	0.001	-6.881	-0.007
50	Great Blue Heron			1				1	0.001	-7.575	-0.004
52	Willow Flycatcher		2	7	2			11	0.006	-5.177	-0.029
53	Least Flycatcher			6				6	0.003	-5.783	-0.018
54	Eastern Kingbird	1	12	13				26	0.013	-4.316	-0.058
55	Horned Lark		1					1	0.001	-7.575	-0.004
56	Bank Swallow			14				14	0.007	-4.936	-0.035
57	Northern Rough-winged Swallow		10	16				26	0.013	-4.316	-0.058
58	Barn Swallow			1				1	0.001	-7.575	-0.004
60	Northern House Wren		1	4	1			6	0.003	-5.783	-0.018
61	Gray Catbird		1	10	4	6		21	0.011	-4.530	-0.049
62	Savannah Sparrow		8	2	2			12	0.006	-5.090	-0.031
63	Bullock's Oriole			1				1	0.001	-7.575	-0.004
64	Brown-headed Cowbird		4	4				8	0.004	-5.495	-0.023
66	Common Grackle		1	8	9		2	20	0.010	-4.579	-0.047
67	Northern Waterthrush		3		1			4	0.002	-6.188	-0.013
68	Common Yellowthroat		16	23	6	14		59	0.030	-3.497	-0.106
69	American Redstart		1					1	0.001	-7.575	-0.004
70	Northern Yellow Warbler	30	29	15	6		80	0.041	-3.193	-0.131	
71	Wilson's Warbler		1					1	0.001	-7.575	-0.004
75	Cedar Waxwing			41	27	9	12	89	0.046	-3.086	-0.141
76	Lincoln's Sparrow				1			1	0.001	-7.575	-0.004
79	Lazuli Bunting					1		1	0.001	-7.575	-0.004
81	Wood Duck			1				1	0.001	-7.575	-0.004
86	Solitary Sandpiper				1			1	0.001	-7.575	-0.004
87	Greater Yellowlegs			2				2	0.001	-6.881	-0.007
88	Evening Grosbeak			2				2	0.001	-6.881	-0.007
91	Cooper's Hawk					1		1	0.001	-7.575	-0.004
92	Sharp-shinned/Cooper's Hawk					1		1	0.001	-7.575	-0.004
94	Swainson's Thrush					1		1	0.001	-7.575	-0.004
98	MacGillivray's Warbler					1		1	0.001	-7.575	-0.004
99	Yellow-rumped Warbler	2				1		3	0.002	-6.476	-0.010
102	American Tree Sparrow						1	1	0.001	-7.575	-0.004
		91	466	506	314	91	480	1948			-3.029
									Shannon Weiner Index		3.029

Appendix 2. Species and their abundance by year recorded during point count surveys at IAWP 2022 – 2025, yellow unique to that year.

	Common Name	2022	2023	2024	2025
1	Canada Goose	22	42	97	53
2	Blue-winged Teal			6	4
3	Cinnamon Teal	4		9	5
4	Northern Shoveler		2		2
5	Gadwall	5	2	13	2
6	Mallard	217	220	249	432
7	Green-winged Teal	9		2	3
8	Hooded Merganser		1	3	
9	Ruddy Duck	3	3		
10	Ring-necked Pheasant	4	7	13	4
11	Rock Pigeon (Feral Pigeon)		33	7	16
12	Eurasian Collared-Dove	3	1	2	
13	Virginia Rail		1	2	1
14	Sora	3	4	7	4
15	American Coot	63	63	56	63
16	Sandhill Crane	6	10	6	2
17	Killdeer	7	5	27	4
18	Wilson's Snipe	21	23	14	14
19	Eared Grebe		2		1
20	Turkey Vulture				1
21	Northern Harrier	2	8		2
22	Red-tailed Hawk	6	1		
23	Belted Kingfisher	3	17	17	14
24	Downy Woodpecker	4	1	6	3
25	Northern Flicker	7	5	1	3
26	Black-billed Magpie	64	55	63	52
27	American Crow	13	5	10	9
28	Common Raven	3	5	7	2
29	Black-capped Chickadee	101	94	83	91
30	Mountain Chickadee		2	1	1
31	Tree Swallow	31	93	35	39
32	Marsh Wren	31	33	9	19
33	European Starling	151	94	67	162
34	American Robin	138	79	100	68
35	House Sparrow	10	5	3	4
36	House Finch	50	28	49	28
37	Pine Siskin	41	30	26	20
38	American Goldfinch	65	81	84	45

	Appendix 2 Continued.				
39	White-crowned Sparrow	16	17	3	
40	Song Sparrow	51	71	59	57
41	Yellow-headed Blackbird	52	108	71	37
42	Red-winged Blackbird	357	573	328	272
43	Great-tailed Grackle		2	3	
44	American Wigeon	2			
45	Canvasback			1	
46	Lesser Scaup			3	
47	Black-necked Stilt	9		2	
48	Spotted Sandpiper				3
49	Pied-billed Grebe		6	2	2
50	Great Blue Heron	1	1	5	1
51	Sharp-shinned Hawk		1		
52	Willow Flycatcher	7	8	14	11
53	Least Flycatcher	3		3	6
54	Eastern Kingbird	11	31	83	26
55	Horned Lark				1
56	Bank Swallow		58		14
57	Northern Rough-winged Swallow	4	19	18	26
58	Barn Swallow		18	11	1
59	Cliff Swallow		6	4	
60	Northern House Wren	8	13	16	6
61	Gray Catbird	28	26	19	21
62	Savannah Sparrow	13	25	13	12
63	Bullock's Oriole		2		1
64	Brown-headed Cowbird	12	15	23	8
65	Brewer's Blackbird	12	3		
66	Common Grackle	2	14	12	20
67	Northern Waterthrush	3	5	2	4
68	Common Yellowthroat	31	63	62	59
69	American Redstart	2	1		1
70	Northern Yellow Warbler	75	89	76	80
71	Wilson's Warbler	2			1
72	Calliope Hummingbird	1			
73	Western Warbling Vireo	3		1	
74	Veery		1	1	
75	Cedar Waxwing	82	85	128	89
76	Lincoln's Sparrow	8	4	1	1
77	Western Meadowlark	5			
78	Black-headed Grosbeak	7	2	3	

	Appendix 2 Continued.				
79	Lazuli Bunting	2	1		1
80	Trumpeter Swan	1			
81	Wood Duck	2	2		1
82	Osprey		1		
83	Western Wood-Pewee		1		
84	Sage Thrasher		1		
85	Mourning Dove	1			
86	Solitary Sandpiper		1		1
87	Greater Yellowlegs				2
88	Evening Grosbeak		8	21	2
89	Chipping Sparrow		10	2	
90	Nashville Warbler			1	
91	Cooper's Hawk				1
92	Sharp-shinned/Cooper's Hawk				1
93	Olive-sided Flycatcher	2			
94	Swainson's Thrush			6	1
95	Clay-colored Sparrow	2			
96	White-throated Sparrow		1	1	
97	Orange-crowned Warbler		1		
98	MacGillivray's Warbler				1
99	Yellow-rumped Warbler	5	7	4	3
100	Western Tanager		2		
101	Black-capped/Mountain Chickadee			9	
102	American Tree Sparrow	10			1
103	Dark-eyed Junco	3			
	Total Abundance	1922	2358	2085	1948
	Species Richness	67	75	65	71
	Species Diversity (H')	3.176	3.158	3.258	3.029
	Number of surveys by year	15	15	14	11
	Avg abundance per survey	128	157	149	177