

Avian community monitoring and public engagement at Rock Creek PCC Floodplain greenspace – 2019-21

2021 Report to Clean Water Services



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Executive Summary

In 2019 Portland Audubon and Clean Water Services expanded our partnership initiating a new project focused on the PCC Rock Creek Floodplain greenspace where Clean Water Services is currently conducting habitat enhancement and restoration. The goals of this 5-year project are to 1) Assess the avian use of the site employing “professional” surveys as well as a team of community scientists and 2) Work with local communities and partners, including underserved communities and communities of color, to provide engagement opportunities at the site focused on natural history, STEM, and community science. It has been a busy and successful season! Over the past 3 years of the project (2019-21) our highlights include:

Avian monitoring (professional and community science):

- We developed three survey protocols for assessing bird use at the site: spring point count, winter waterbird, and community science eBird surveys (see appendices).
- We recruited and trained a team of over 25 volunteer community scientists from Washington County and beyond, as well as new birders, PCC Students and faculty, and a Portland Audubon TALON intern that performed more than 120 eBird surveys from April 2019 through March 2020. However, after this, COVID pandemic has prevented community science effort since the site has been closed to the public since then.
- One hundred of the community science eBird surveys were conducted by 17 experienced birders which we included in the data analysis. Portland Audubon staff collected a wealth of data from 3 seasons of winter waterfowl surveys and spring point counts.
- Together, professional and community science surveys documented 111 bird species using the site from January 2019 to October 2021. This includes a diversity of species from Neotropical migratory songbirds (26 species), waterfowl (12 species), shorebirds (5 species) and raptors/owls (7).
- Most common species documented at the site include Song Sparrow, Common Yellowthroat, Red-winged Blackbird, American Robin, Cedar Waxing, and Spotted Towhee. We even documented a few surprises including a Yellow-headed Blackbird and California Quail!
- Spring species diversity was similar from 2019-21 with an Effective Number of Species of 26 in 2019, 28 in 2020, and 27 in 2021. In all years, species diversity peaked in May reflecting peak songbird migration. In all years shrub-scrub habitat had the highest detections of birds while the emergent wetland had the lowest abundance and species diversity (spring comparison only).
- We documented 18 waterbird species in the winter surveys with Mallards and Green-winged Teal making up most of the detections the first 2 seasons. Cackling Geese were the second most detected species behind Mallards in 2020-21. Data from all years indicates a peak in waterbird use of the site in January. Overall waterbird abundances were higher in 2019-20 and 2020-21 which could be related to the wetter winter in those years compared to the first monitoring season previous year (2018-19).

- Avian species richness between the “early habitat enhancement (2013 & 2017)” vs. “later habitat enhancement (2019-20)” periods were similar with a total of 52 species detected in the early period and 47 detected in the later period. Overall species richness has remained very similar between the early and late periods (33 ± 2.8 SD vs. 32 ± 1.0 SD, respectively). Small sample sizes and other factors may be hindering a viable comparison between the early and late enhancement periods. Creation of oak habitat may not necessarily increase overall bird use but will hopefully benefit oak-obligate species. We document some evidence of this in that there was a slightly higher increase in White-breasted Nuthatch detections in the late period compared to the early period.
- A total of 104 species were documented during community science eBird surveys at the site including 21 species that were only detected during the eBird surveys. The eBird data provides the ability to examine temporal bird trends though the annual cycle. At the guild level, we found songbird detections to be fairly consistent across seasons and months. Waterfowl detections were much higher in the winter months which makes sense since the emergent marsh appears to support flocks of waterfowl. Waterbird detections were noticeably lower in the summer months compared to all other seasons. Shorebird detections were highest in the winter and spring. Raptors were detected most commonly in the fall and winter months.

Outreach and partner engagement:

- Via seven guest-instructor appearances, we oriented over 55 PCC environmental science students and 3 faculty to the history of site enhancement, the importance of community science and the basics of bird identification and behavior at the site. Student were provided a combination of classroom and field instruction, and in May 2020 we successfully pivoted to an extended, online lecture format.
- We conducted three STEM outings with our partners at Adelante Mujeres, introducing the Chicas program to the ecology of the Rock Creek floodplain and the importance and accessibility of community science for all.
- We provided one-on-one mentorship opportunities at the site for PCC students working on independent study as well as TALON intern involvement.
- We recruited over 25 community scientists through two on-site field trainings in 2019, and conducted one virtual training in May 2020, reaching an additional 12 interested volunteer surveyors.
- We adapted to a new COVID-19 challenged world for the past 1.5+ years of this project. We successfully adapted our classroom lectures and community science trainings to online formats, and while our summer and fall STEM outings and community partner programs were suspended while the campus is closed, we have continued to build and develop these relationships and projects for planned launch in 2022.

Introduction and Background

Since 2019, Portland Audubon has worked with Clean Water Services to assess the avian bird community at the PCC-owned PCC Rock Creek Floodplain site in a collaborative effort that engages local communities and partners. This effort includes both avian monitoring and outreach goals outlined here:

- 1. Science & Monitoring:** Multi-year avian monitoring at PCC Rock Creek Floodplain using “professional-level” surveys and community science eBird surveys to assess spring migration/breeding season bird communities for the site as well as a winter waterbird use of inundated the wetland emergent habitat. Findings will be compared with previous avian point count surveys conducted in 2013 and 2017. Surveys help to understand bird response to the habitat enhancement/restoration efforts currently underway by CWS.
- 2. Outreach & Partner Engagement:** Offer local communities (focus on Washington County) community science trainings and monitoring, events with Adelantes Mujeres Chicas in after-school and STEM programming, partnership with PCC-Rock Creek faculty and students, and through Portland Audubon’s Education Program, provide youth of color one-on-one mentoring to build science, outreach, and naturalist skills.

This work is helping inform and meet goals of the PCC Rock Creek Floodplain Enhancement Project – Ecological Enhancement Plan (CWS 2018).

A note on COVID-19

With the emergence of the coronavirus pandemic and subsequent shelter-in-place executive order by Governor Brown, since March 2020 we have had to adjust the PCC Rock Creek project work accordingly. Professional surveys were not hindered but community science surveys at the site were curtailed and educational events have been postponed indefinitely.

Study area

The PCC Rock Creek Floodplain Enhancement site is ~114 acres in size and includes 77 acres that are being actively enhanced/restored comprising five different habitat types (Fig. 1). Stage of enhancement/restoration varies across the site. Community science bird monitoring and educational and community science training events are held along the PCC Nature Trail (Fig. 1).



Figure 1. PCC Rock Creek Floodplain Enhancement site and habitat areas. Habitat areas are in different phases of enhancement /restoration. This map also includes location of spring avian survey point count stations. See appendices at the end of this document for study site maps for the winter waterbird and eBird Community Science surveys.

SCIENCE & MONITORING REPORT:

BIRD SURVEY METHODOLOGY

Field methods

We developed both winter waterbird and spring point count avian monitoring protocols prior to conducting surveys. Protocols are based on standard bird survey monitoring protocols used widely in the Pacific Northwest. Study design emphasized baseline data collection for comparison to previously collected data as well as comparing among habitat types that are currently in different stages of enhancement/restoration. We also developed an eBird community science protocol modeled after the protocol we developed for the Fernhill Wetlands site in 2015. For details on survey methods all three protocols are included as appendices to this report.

Analysis - Species richness assessment

Species richness is simply an inventory of all species detected at the site accrued from all point count, waterfowl survey, and eBird community science data. We report on all species detected from the following data sets: 1) winter waterfowl surveys in January 2019 through February 2021, spring points counts for 2019 and 2020, and eBird surveys analyzed from 1 April 2019 to 31 March 2020. Regular eBird surveys have not resumed since the initial COVID shutdown because the PCC Rock Creek has not opened access to the greenspace. We are in contact with PCC staff and will be sure to mobilize community scientists again once the site is open to the public. As of this writing (Nov. 2021) it appears the site will open up in the spring of 2022. Despite the COVID closure to the public, a small number of eBird surveys were performed at this site between 1 April 2020 and 31 October 2021. We provide a summary of this effort in the results. Other than adding any new species detected during these “COVID surveys” to the species richness list (Table 1), we did not incorporate these data in an updated analysis since the additional data is minimal and would not have appreciably changed our results reported for 1 April 2019 to 31 March 2020.

Analysis – Spring Point Count Survey

We report individual bird species abundance as the average number of detections per survey (summed all detections per species divided by the number of survey replicates). We used typical detections (both within and outside 50m) and associated flyover data for this analysis. To estimate relative average bird abundance per habitat type we summed bird detections for all species for the relevant point count stations within each habitat type and divided by the number of survey replicates. We only used typical detections within 50m and associated flyover detections for the comparison of bird usage per habitat type. We collapsed CWS habitat types (Fig. 1) into four groupings with two point count stations for each one: Lowland/Upland Forest (PC stations 1&2), Oak/future oak (PC stations 3&4), Shrub-scrub/future shrub-scrub/Ash (PC stations 5&6), Emergent wetland (PC stations 7&8) (see Fig. 1 & Appendix A).

We used the Shannon Diversity Index to estimate spring avian species diversity. Species diversity is a measure of both species richness and species evenness¹. The Shannon Diversity index² is a widely accepted and utilized technique for assessing species diversity that allows comparison within and among sites. We used point count data to assess overall spring species diversity since eBird data is not standardized in the same way or as rigorously. We estimated winter waterbird species diversity using the Shannon Diversity index as well (see below) but this estimate focuses on a subset of the bird community. To make the Shannon Diversity index estimate more biologically intuitive, we convert it to the “Effective Number of Species” (ENS) which represents the number of species that would be present if they were all equally-common (100% evenness) based on a given Shannon Diversity Index estimate (H'). ENS is calculated as $\exp(H')$.

1 Species evenness refers to how close in number each species in an environment is.

2 <http://www.tiem.utk.edu/~gross/bioed/bealsmodules/shannonDI.html>

Analysis – Winter Waterbird Survey

We report individual waterbird³ species abundance as the average number of detections per survey (summed all detection per species divided by the number of survey replicates). To estimate relative bird abundance temporally we plotted the total number of waterbirds detected per survey date. For all analyses we only used typical detections and associated flyover detections. Waterbird species diversity was estimated using the Shannon Diversity Index as described above.

Analysis – Bird community comparison between “early habitat enhancement (2013-17)” and the “later habitat enhancement (2019-21)” periods

In 2013 and 2017 Pacific Habitat Services, Inc. (PHSI) performed spring point counts at PCC Rock Creek. The point count methodology used was the same as what we used in 2019-21 with the following exceptions:

- PHSI conducted 3 point counts per spring between mid-late May and late June. Portland Audubon completed 5 points per spring between mid-April and late June.
- PHSI conducted counts at 5 point count stations. Portland Audubon conducted counts at 8 point count stations. We established point count stations #1-3 in approximately the same location as PHSI stations #1-3. PHSI point count station #4 (centered in Emergent/Scrub-Shrub Wetland habitat) corresponds best with Portland Audubon station #5.
- PHSI conducted counts in 2 time periods: 0-3min and 3-5min. Audubon also counted during a third time period (5-8 min).

CWS expressed interested in comparing the 2013-17 “early” avian point count data with that of the 2019-21 “current” data set because habitat enhancement efforts at the

site have progressed since 2013 with the following actions:

- **2013:** the site was dominated by reed canarygrass and other non-native/invasive species
- **2017:** large wood installed adding floodplain structure, more water stored in winter/spring
- **2019:** oak release project. Snagged cherry and ash trees to give oaks space. All trees left down or snagged.
- **2017-current:** native trees, shrubs, grass and forbs added to multiple habitats.

In order to compare our point count data with that of PHSI, we used the subset of Portland Audubon data only including point count stations 1-3 and 5 to compare with PHSI stations 1-4⁴.



Community scientist conducting a survey at PCC Rock Creek (Photo: C. Larson)

³ We defined “waterbirds” to include: ducks, geese and swans, herons and egrets, cormorants, shorebirds, gulls, terns and rallids.

⁴ Audubon & PHSI stations #1-2 = upland/lowland forest habitat; station 3 = Oak (current/future) habitat for both; Audubon station 5 & PHSI Station 4 = Emergent/Scrub-Shrub Wetland habitat (only the 1st replicate at point count station #4 was conducted in 2017. Station was inaccessible during replicate 2 and 3 due to beaver activity causing flooding).

We only included the 3 counts performed mid-late May to late June. We only used time periods covering the first 5 minutes of the Portland counts. For both data sets, we only included typical and associated flyovers. For study site species composition comparison we used data for detection both within and outside 50m of each point count station. For habitat comparisons we only use detections within 50m.

To compare bird species richness and abundance between habitat types between the early and later periods we used PHSI point count stations 1-4 and Portland Audubon stations 1-4 to compare habitat types: Lowland/Upland Forest (PC stations 1 & 2), Oak/future oak (PC station 3 & 4). To compare Emergent Wetland we used PC station 5 (PHSI) and PC station 8 (Portland Audubon). Unlike the other stations these were not close to each other but they were both centered in Emergent Wetland habitat. We were unable to compare Shrub-scrub/future shrub-scrub/Ash for this analysis since PHSI did not include any point count stations in this habitat type.

We compared overall abundance and abundance per habitat type for the early and late periods using the same methods described above in the “Spring Point Count Survey” section. For this analysis we compared species richness but did not examine species diversity for brevity but that analysis can be provided in subsequent reports if desired by CWS.

Analysis – eBird community Science

Data were obtained from eBird for the period 1 April 2019 to 31 March 2020 for the PCC Rock Creek hotspot. Due to the COVID-19 pandemic, the site has been closed to public access since this time. Not enough community science eBird data has been collected since April 2020 to include in further analysis. Only data from trained volunteers who were evaluated to have “intermediate to high” skill level in both visual and auditory bird identification were used for analysis. If there was more than one survey in a day reported we retained the survey of the longest duration. We also removed data reported more than once in situations where volunteers working as a team submitted the same checklists separately. In this situation, we retained the checklist from the most experienced birder in the group. We only included morning surveys in the analysis.

We examined overall bird relative abundances of the site per month and per season for five species guilds (songbirds⁵, waterfowl, waterbirds, shorebirds, raptors) and for 17 selected species that represented either the most common species detected or species that are of conservation concern (Neotropical migrants including Swainson’s Thrush, Common Yellowthroat, and Tree Swallow) and/or are a species that enhancement activities are targeting (e.g. White-breasted Nuthatch for oak restoration and waterfowl/waterbird species for the emergent habitat enhancement). For all analyses we estimated relative abundance as bird detections per hour (dividing total birds observed per category by the total hours of survey effort by experienced observers on unique surveys). In this way the relative abundance estimates are controlled for effort. As mentioned previously, we added species detected during eBird counts to the species richness inventory which contains the comprehensive summary of species richness at the site (Table 1).

⁵ Songbirds include all passerines and near-passerines



Oak habitat and deer at PCC Rock Creek floodplain (Photo: C. Larson)

RESULTS

Results: Overall bird species richness

Among all survey types we documented 111 species using the site from the period January 2019 to October 2021 (Table 1). We also observed one domestic duck hybrid not included as part of the overall species richness list.

Results: Spring Point Count survey

Five point count surveys were performed during spring 2019, 2020, and 2021 spaced approximately every 2 weeks between April 16 and June 24. All eight point count stations were surveyed by one observer for each survey replicate (Candace Larson). All surveys were performed in low wind conditions with no precipitation. Temperatures ranged from 3.9° to 22.2°C. Extraneous noise was minimal.

A total of 82 bird species were detected using the site during these surveys (Table 1). The 15 most common species made up ~63% of all detections and were all songbird species (except for 1 species - Mallard) and included four Neotropical migrant passerine species (Common Yellowthroat, Western Wood-Pewee, Barn and Tree Swallow) (Table 1). Most species detected were in the passerine/near-passerine guild (64 of 81 species; 78%) followed by 5 shorebird, and 5 raptor, 4 waterfowl, and 4 waterbird species (Table 1).



Tree Swallow at nesting cavity at PCC Rock Creek (Photo: C. Larson)

Table 1. Detection rate (relative abundance) of individual bird species (\pm SD) and habitat types used during spring point count surveys and overall species richness from all survey types (point count, winter waterbird, and eBird surveys) from January 2019 through October 2021 at PCC Rock Creek PCC Floodplain. Species listed in order of abundance for those detected during spring point count surveys after which birds are listed alphabetically.

Species	Spring relative abundance (Avg. # of detections per survey \pm SD)	Habitat types detected in ²	Survey type detected in ³
Song Sparrow	16.1 \pm 2.4	F, O, S, W	PC, E
Common Yellowthroat	12.9 \pm 2.8	F, O, S, W	PC, E
Red-winged Blackbird	11.2 \pm 4.1	O, S, W	PC, E
American Robin	8.7 \pm 2.7	F, O, S, W	PC, E
Cedar Waxwing	7.1 \pm 10.9	F, O, S, W	PC, E
Spotted Towhee	6.3 \pm 2.9	F, O, S, W	PC, E
Marsh Wren	4.5 \pm 2.2	F, S, W	PC, E
Tree Swallow	4.5 \pm 3.2	O, S, W	PC, E
Bewick's Wren	4.5 \pm 2.4	F, O, S, W	PC, E
Mallard*	4.5 \pm 3.4	O, S, W	PC, W, E
Purple Finch	3.9 \pm 1.9	F, O, S	PC, E
Barn Swallow	3.7 \pm 3.1	O, S, W	PC, E
Black-capped Chickadee	3.3 \pm 2.1	F, O, S	PC, E
Western Wood-Pewee	3.3 \pm 3.3	F, O, S, W	PC, E

Species (Table 1 continued)	Spring relative abundance (Avg. # of detections per survey \pm SD)	Habitat types detected in ²	Survey type detected in ³
American Goldfinch	2.9 \pm 2.9	O, S	PC, E
Savannah Sparrow	2.8 \pm 1.4	O, W	PC, E
Swainson's Thrush	2.8 \pm 3.1	F, O, S, W	PC, E
Brown-headed Cowbird	2.3 \pm 2.1	F, O, S, W	PC, E
Yellow-rumped Warbler	2.2 \pm 3.5	O, W	PC, E
Wilson's Warbler	2.1 \pm 2.1	F, O, S, W	PC, E
Orange-crowned Warbler	2 \pm 1.2	F, O, S, W	PC, E
Black-headed Grosbeak	1.7 \pm 1.4	F, O, S, W	PC, E
Killdeer*	1.7 \pm 1.8	O, S, W	PC, W, E
Northern Flicker	1.7 \pm 1.4	F, O	PC, E
Lesser Goldfinch	1.6 \pm 1.7	F, O, S, W	PC, E
White-breasted Nuthatch	1.6 \pm 1	O	PC, E
Anna's Hummingbird	1.5 \pm 0.7	F, O, S, W	PC, E
Red-breasted Nuthatch	1.5 \pm 1	F	PC, E
Steller's Jay	1.5 \pm 1.5	F, O	PC, E
Virginia Rail*	1.5 \pm 0.9	F, S	PC, W, E
Brown Creeper	1.5 \pm 0.7	F, O	PC, E
Warbling Vireo	1.5 \pm 1.4	F, O, S, W	PC, E
House Finch	1.4 \pm 2.2	F, O, S	PC, E
Pacific-slope Flycatcher	1.3 \pm 0.9	F, O	PC, E
Wood Duck	1.3 \pm 1.8	S, W	PC, E
Pacific Wren	1.2 \pm 1.4	F	PC, E
Red Crossbill	1.2 \pm 4.6	Not determined	PC
Black-throated Gray Warbler	1.1 \pm 1.8	F, W	PC, E
Least Sandpiper	1.1 \pm 3.4	S, W	PC
Red-tailed Hawk	1.1 \pm 0.5	O, W	PC, E
Dark-eyed Junco	0.9 \pm 1.1	F, O, W	PC, E
European Starling	0.9 \pm 1.2	O, S	PC, E
Willow Flycatcher	0.9 \pm 1.5	S	PC, E
Pine Siskin	0.9 \pm 1.9	Not determined	PC, E
Mourning Dove	0.7 \pm 0.8	S	PC, E
Red-breasted Sapsucker	0.7 \pm 1	O	PC, E
Bushtit	0.7 \pm 0.9	F, S, W	PC, E
Downy Woodpecker	0.7 \pm 0.9	F, O	PC, E
Green-winged Teal*	0.7 \pm 1.2	S	PC, W, E
Violet-green Swallow	0.7 \pm 1	O, S, W	PC, E
Sora	0.6 \pm 0.6	Not determined	PC, E
Lazuli Bunting	0.5 \pm 1	E	PC, E
Western Tanager	0.5 \pm 0.7	F	PC, E
White-crowned Sparrow	0.5 \pm 0.5	Not determined	PC, E
Great Egret	0.5 \pm 1.6	S	PC, E
Wilson's Snipe	0.5 \pm 1.1	S	PC
Chestnut-backed Chickadee	0.4 \pm 0.8	F	PC, E
Evening Grosbeak	0.4 \pm 1.1	Not determined	PC, E
Great Blue Heron*	0.4 \pm 0.5	S	PC, W, E

Species (Table 1 continued)	Spring relative abundance (Avg. # of detections per survey \pm SD)	Habitat types detected in ²	Survey type detected in ³
Yellow Warbler	0.4 \pm 0.7	O, S	PC, E
Canada Goose*	0.3 \pm 0.7	Not determined	PC, W, E
Spotted Sandpiper	0.3 \pm 0.7	S	PC, E
American Crow	0.3 \pm 0.6	F	PC, E
California Scrub-Jay	0.3 \pm 0.6	S	PC, E
Common Raven	0.3 \pm 0.6	Not determined	PC, E
Greater Yellowlegs	0.3 \pm 0.6	F, S	PC, E
Vaux's Swift	0.3 \pm 0.7	Not determined	PC, E
Golden-crowned Kinglet	0.2 \pm 0.6	F	PC, E
Belted Kingfisher	0.1 \pm 0.4	Not determined	PC, E
Golden-crowned Sparrow	0.1 \pm 0.4	Not determined	PC, E
Hairy Woodpecker	0.1 \pm 0.4	Not determined	PC, E
Lincoln's Sparrow	0.1 \pm 0.4	W	PC, E
Ruby-crowned Kinglet	0.1 \pm 0.4	O	PC, E
Yellow-breasted Chat	0.1 \pm 0.4	E	PC
American Kestrel	0.1 \pm 0.3	Not determined	PC, E
Cliff Swallow	0.1 \pm 0.3	Not determined	PC, E
Cooper's Hawk	0.1 \pm 0.3	F	PC, E
Hutton's Vireo	0.1 \pm 0.3	Not determined	PC, E
Rufous Hummingbird	0.1 \pm 0.3	Not determined	PC, E
Sharp-shinned Hawk	0.1 \pm 0.3	Not determined	PC, E
Turkey Vulture	0.1 \pm 0.3	W	PC, E
Yellow-headed Blackbird	0.1 \pm 0.3	S	PC
American Wigeon	See Fig. 5 for winter abundance	W	W, E
Bald Eagle	Not determined	Not determined	E
Brewer's Blackbird	Not determined	Not determined	E
Cackling Goose	See Fig. 5 for winter abundance	W	W, E
California Quail	Not determined	Not determined	E
Cassin's Vireo	Not determined	Not determined	E
Cinnamon Teal	See Fig. 5 for winter abundance	W	W, E
Common Merganser	Not determined	Not determined	E
Domestic duck hybrid	See Fig. 5 for winter abundance	W	W
Double-crested Cormorant	See Fig. 5 for winter abundance	W	W, E
Eurasian Collared-Dove**	Not determined	Not determined	PC, E
Fox Sparrow	Not determined	Not determined	E
Gadwall	See Fig. 5 for winter abundance	W	W
Glaucous-winged Gull	Not determined	Not determined	E
Great Horned Owl	Not determined	Not determined	E
Green Heron**	Not determined	Not determined	PC
Hermit Thrush	Not determined	Not determined	E
Hooded Merganser	Not determined	Not determined	E
House Wren	Not determined	Not determined	E
MacGillivray's Warbler	Not determined	Not determined	E
Northern Pintail	See Fig. 5 for winter abundance	W	W, E
Northern Rough-winged Swallow	Not determined	Not determined	E

Species (Table 1 continued)	Spring relative abundance (Avg. # of detections per survey \pm SD)	Habitat types detected in ²	Survey type detected in ³
Northern Shoveler	See Fig. 5 for winter abundance	W	W
Olive-sided Flycatcher	Not determined	Not determined	E
Osprey	Not determined	Not determined	E
Pied-billed Grebe	Not determined	Not determined	E
Pileated Woodpecker	Not determined	Not determined	E
Rock Pigeon	Not determined	Not determined	E
Sandhill Crane	Not determined	Not determined	E
Townsend's Warbler	Not determined	Not determined	E
Varied Thrush	Not determined	Not determined	E

¹ S=Shrub-scrub/Ash; O=Oak; F=Lowland/upland forest; W=Emergent Wetland. Only determined for species detected w/in 50m during point count surveys. Not estimated for eBird surveys.

² PC=Point count, W=Waterfowl survey; E=eBird

* See Fig. 4 for winter waterbird abundance estimate

The overall Shannon Species Diversity Index estimate (H') for the entire site during the spring (mid-April to late June) was similar in each year (2019: = 3.27; 2020 = 3.33; 2021 = 3.30) which is equivalent to an “effective number of species” estimate of ~26 in 2019, ~28 in 2020, and ~27 in 2021. A 2-order polynomial trendline based on the 3-year average of effective species number indicates peak species diversity occurred in May (Fig. 2) which is what might be expected given that timeframe is also peak migration for many songbird species (which make up the bulk of detected birds on point counts).

In all three years, the relative average bird abundance among habitat types followed the same pattern with the highest bird abundance in Shrub-Scrub habitat type, followed by Oak (current/future), Upland/Lowland forest, and lowest in Emergent Wetland (Fig. 3). Each year the number of bird detections in all habitat types has declined (Fig. 3). At this point we don't know why we are seeing this declining trend during spring surveys. Despite the apparently declining abundances since 2019, species diversity appears similar across years with the exception of a noticeably lower diversity in the Shrub-Scrub/Ash habitat in 2021 compared to previous years (Fig. 4). Oak (current/future) and Upland/Lowland Forest habitat types have the highest diversity in all years (Both Oak and Upland/Lowland Forest habitats average effective # of species across all years ~23.0) compared to other habitats. Emergent Wetland had the lowest diversity overall (~14 average across years; Fig. 4).

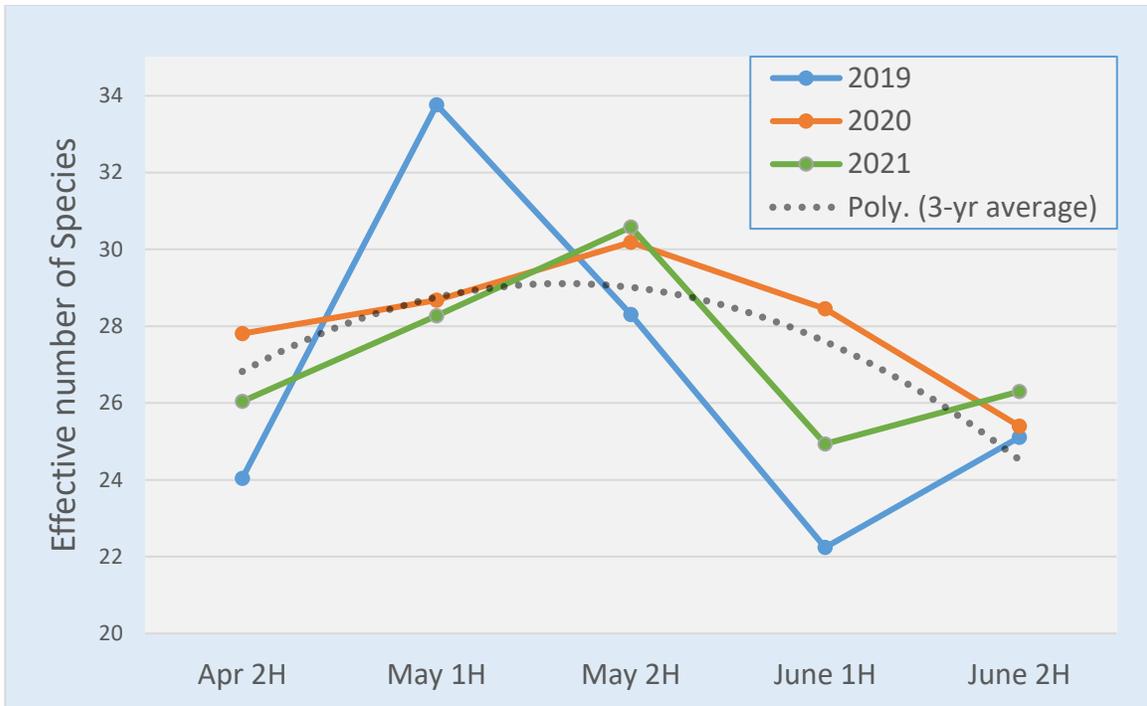


Figure 2. Effective Number of Species (ENS, based on Shannon Species Diversity Index) per spring point count survey replicate spring 2019, 2020, and 2021 PCC Rock Creek PCC Floodplain site. Dotted line represents an Order 2 polynomial trendline based on the 3-year average of ENS per survey.

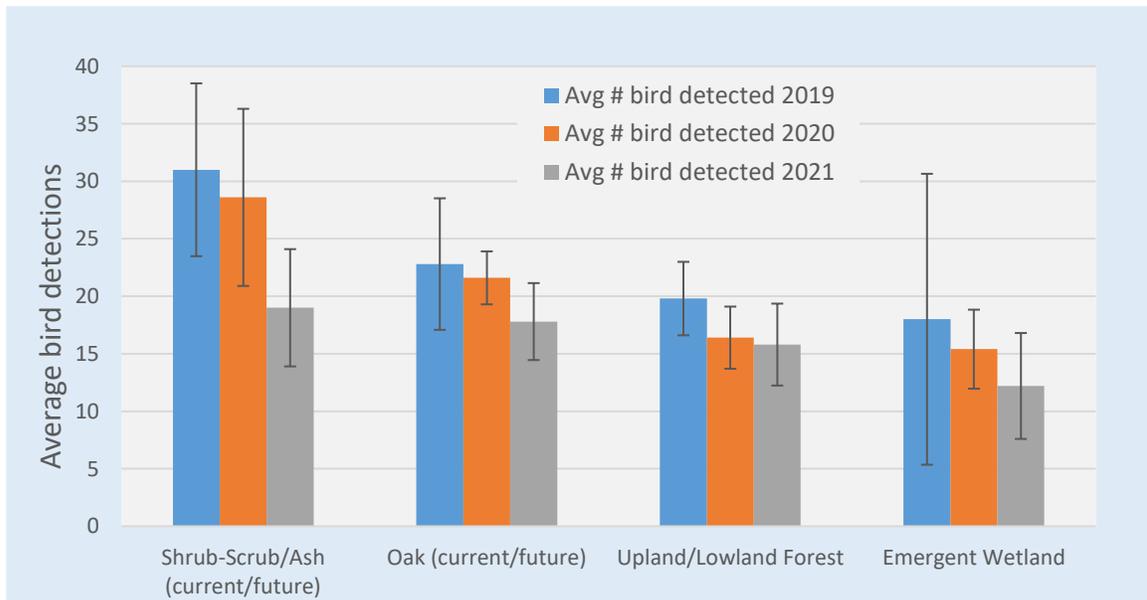


Figure 3. Relative abundance (average bird detections per spring point count survey) per habitat type \pm 1 SD, spring 2019, 2020, and 2021 PCC Rock Creek PCC Floodplain site.



Figure 4. Effective number of species (species diversity) per habitat type, spring 2019, 2020, and 2021 PCC Rock Creek PCC Floodplain site.

RESULTS – Winter Waterbird Survey

Four waterbird surveys were performed during the initial 2018/19 season in January and February. In the two subsequent season (2019/20 and 2020/21) six surveys were performed per season spanning early December to the end of February. The late start to surveys the first year was due to timing of the contract with CWS. All surveys were conducted by either one of two observers (Candace Larson, Joe Liebezeit). There was light precipitation on one survey in 2018/19 (drizzle) and no precipitation on the remaining surveys in all three years and low wind conditions in all years. Thus, weather conditions likely were not a factor in impacting survey detectability.

A total of 18 bird species were detected using the site during these surveys with the top seven most detected species (all waterfowl) making up >98% of all detections across all three years (Fig. 6). The remaining 11 species are listed in Table 1. In all three seasons we had the highest detections in January (Fig. 6) indicating this is the month the site supports the most waterbirds. Detections were highest in January 2020 and 2021 compared to other years and months. This may be due to greater availability of standing water in these time periods as January precipitation was noticeably higher in these two periods (7.58" and 7.03") compared to January 2019 (2.79") and other monthly periods (National Weather Service, <https://www.weather.gov/pqr/cliplot>). Variation in bird detections between species was high during each survey in both seasons (Fig. 6).

Winter waterbird species diversity (as measured by ENS) ranged from 2.7 to 4.7 species across the survey period remaining relatively consistent across the time frame for surveys (Fig. 7). Similarly, species richness was consistent across surveys and years with an average of ~9 species detected (Fig. 7). In general, the data collected so far indicates species richness/diversity remains consistent in the winter while abundances appear to be highest in January.

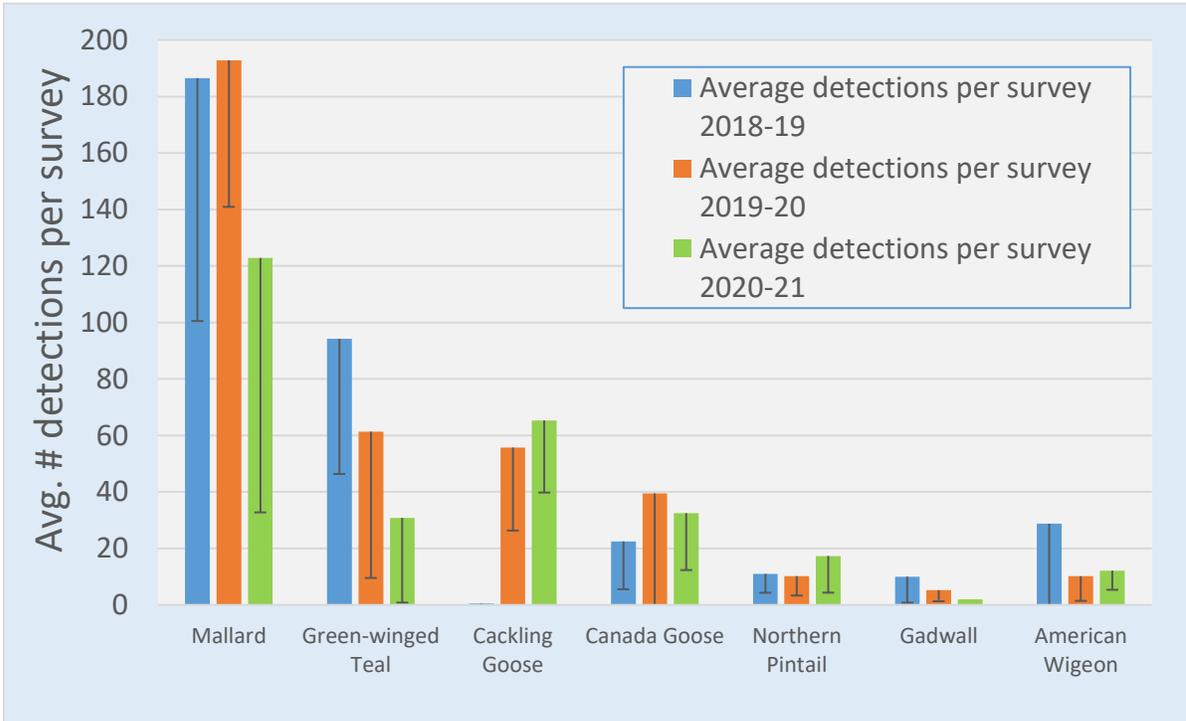


Figure 5. The average number of the top 7 most commonly detected waterbird species at the PCC Rock Creek Floodplain site from during the 2018-19, 2019-20, and 2020-21 seasons.

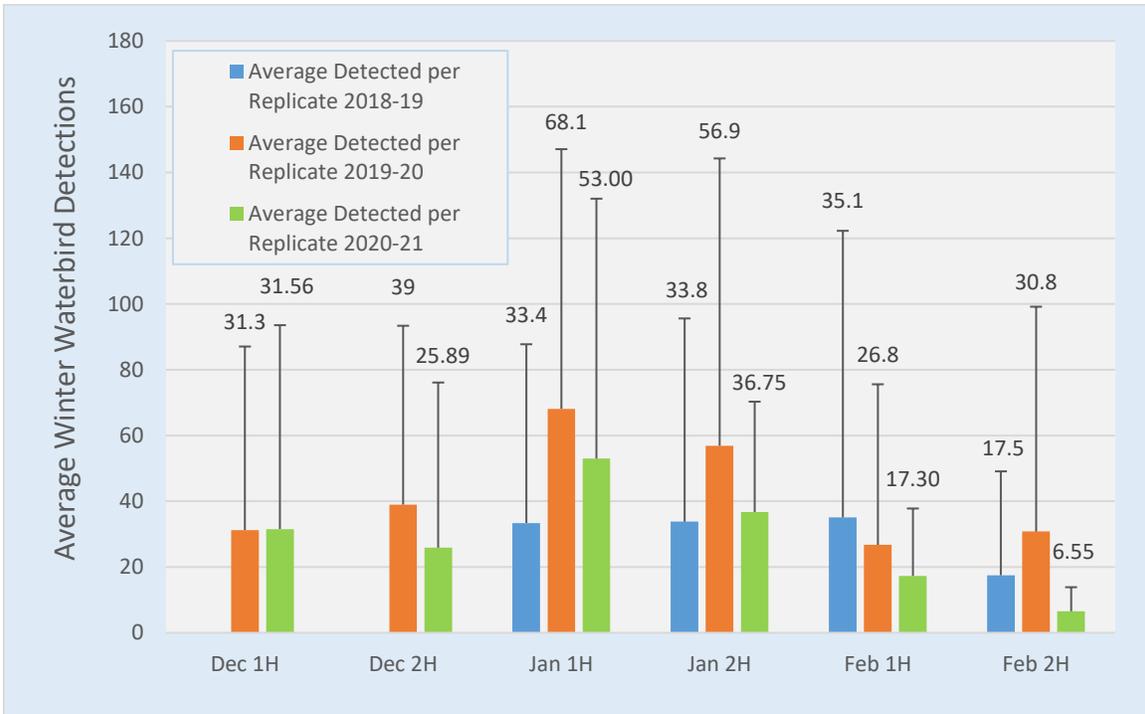


Figure 6. Average number of waterbird detections per survey replicate at the PCC Rock Creek Floodplain site from in three consecutive winters (2018-19, 2019-20, 2020-21). No surveys conducted in December 2018; 1H=1st half, 2H=2nd half

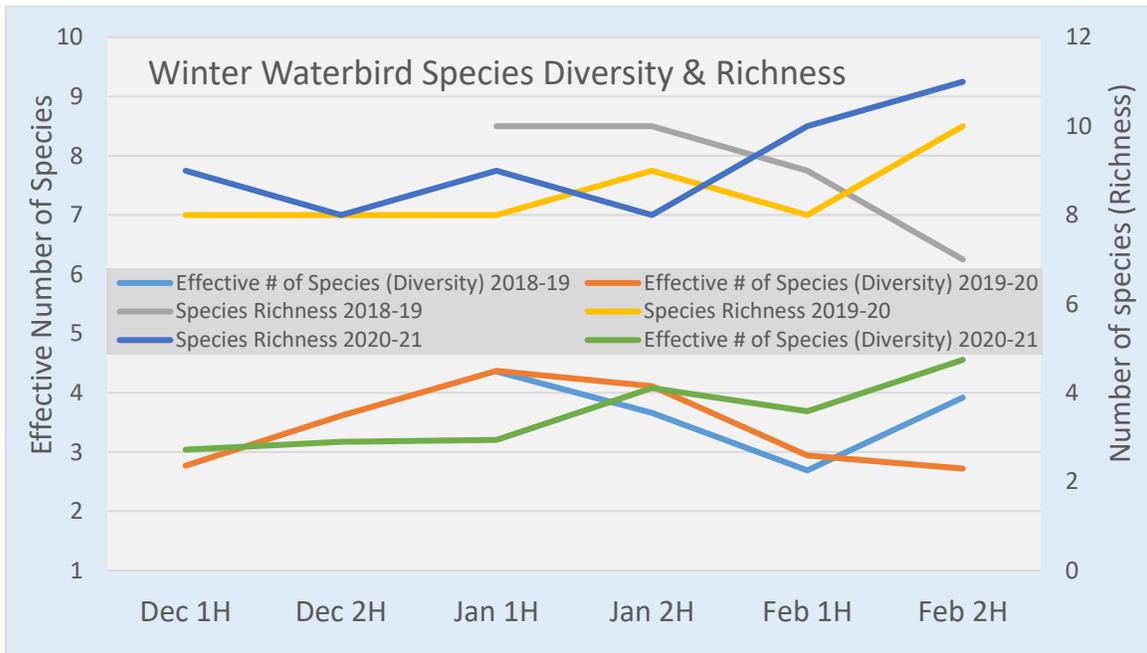


Figure 7. Winter waterbird species diversity (depicted as ENS) and species richness at the PCC Rock Creek Floodplain site in three consecutive winters (2018-19, 2019-20, and 2020-21).

Results: Bird community comparison between “early habitat enhancement (2013-17)” and “later habitat enhancement (2019-2021)” periods

Avian species richness for the entire study area between the “early habitat enhancement” vs. “later habitat enhancement” period were similar with a total of 52 species detected in the early period and 47 detected in the later period⁶. There were 13 species detected in the early period that were not detected in the later period and, vice versa, eight species detected in the later period not detected in the early period (Table 2). Most species detected were in the passerine/near-passerine guild (44 species in the early period and 43 in the late period) (Table 2). Relative abundance (total bird detections/year) was higher in the later period compared to the early period (375 ± 3.4 SD vs. 291 ± 4.2 SD, respectively). All species detected except one (European Starlings) were native species and starling abundance was low (<1% of all bird detections in both periods).

Bird abundance (as measured by total bird detections per minute) among habitat types between the early and later period years indicates a high peak in bird detections in 2013 in the wetland habitat and in 2017 in the oak habitat (Fig. 8). Otherwise, bird detections seem similar across years per habitat type. The reason for the fluctuations observed is likely attributable to high volatility from the very small sample sizes we have. We are only able to use data from either 1 or 2 point count stations per habitat type to make comparison across years. Because of this, a flock of birds detected on one count can have a dramatic effect on the trend. We see this in the 2017 wetland comparison with the spike in detections driven by the observation of a

⁶ This overall species richness estimate for the entire site also includes species detections both within and >50m from 5 selected point count stations unlike the results reported below for specific habitats which only includes species within 50m of the same 5 point count stations.

single flock of 12 Mallard. Likewise, the peak in oak habitat detections in 2017 can be explained by a flock of red-winged blackbirds and mallards detected during one of the counts. Moving forward, this will make comparison to the 2013/17 data difficult to get meaningful information.

Creation of oak habitat may not necessarily increase overall bird use but would hopefully benefit oak-obligate species. We see some possible evidence of this in that there were only two White-breasted Nuthatch detection in 2013-17 (1.0 detections/year) compared to 4 detections in 2019-21 (1.3 detections/year) after oak management started to occur.

Overall species richness has remained very similar between the early and late periods (33 ± 2.8 SD vs. 32 ± 1.0 SD, respectively; Fig. 9). When comparing species richness per habitat type across years, it appears that species richness is consistently highest in the forest habitat, then oak, and lowest in wetland. There is a dip in species richness in 2017. Other than that, no strong pattern emerges with considerable variation between years per habitat type (Fig. 9).

We would expect that habitat enhancement, over time, would provide more suitable habitat for native species. Based on this assumption we would predict higher abundance and diversity in years post enhancement. There are several reasons why we might not be observing this response including: 1) As mentioned previously, small sample size and/or study design not robust enough to detect a response; 2) Enhanced vegetation still needs time to mature to create an increase in avian habitat, 3) Enhancement magnitude is not robust enough to document an avian response, 4) Other biotic and/or environmental factors are more important in influencing bird community and are confounding detection of a response due to enhancement.



Candace Larson conducting a spring point count survey in emergent wetland habitat (Photo: J. Liebezeit)

Table 2. Detection rate (relative abundance) of individual bird species (\pm SD) during spring point count surveys from comparable point count surveys conducted during the “early” period (2013/2017) of habitat enhancement and the “later” period (2019-21) at PCC Rock Creek PCC Floodplain. Species listed in order of abundance for each time period.

Species	2013 & 2017 Spring rel. abund. (Avg. # of detections / survey \pm SD)	Species	2019 & 2021 Spring rel. abund. (Avg. # of detections / survey \pm SD)
Mallard	5.2 \pm 7	Song Sparrow	5.4 \pm 1.5
American Robin	4.7 \pm 2.7	American Robin	3.2 \pm 2
Red-winged Blackbird	4.2 \pm 4	Spotted Towhee	2.8 \pm 1.4
Song Sparrow	3.8 \pm 4.2	Western Wood-Pewee	2.7 \pm 1.5
Common Yellowthroat	2.5 \pm 2.6	Swainson's Thrush	2.3 \pm 1.7
Purple Finch	2.3 \pm 1.4	Bewick's Wren	2.2 \pm 1.4
European Starling	1.8 \pm 3.1	American Goldfinch	2 \pm 2.2
Spotted Towhee	1.8 \pm 1.3	Purple Finch	1.7 \pm 1.2
Western Wood-Pewee	1.7 \pm 1.2	Black-capped Chickadee	1.2 \pm 1.7
Black-headed Grosbeak	1.5 \pm 1	Common Yellowthroat	1.2 \pm 1.6
Barn Swallow	1.3 \pm 1.6	Steller's Jay	1.2 \pm 1.1
Spotted Sandpiper	1.2 \pm 1.9	Pacific-slope Flycatcher	1.2 \pm 0.8
Warbling Vireo	1.2 \pm 1.3	Warbling Vireo	1.2 \pm 0.8
Red-breasted Sapsucker	1 \pm 1.3	Brown Creeper	1.2 \pm 0.7
Swainson's Thrush	1 \pm 1.1	Wilson's Warbler	1 \pm 1.2
Lazuli Bunting	0.8 \pm 1.3	Black-headed Grosbeak	1 \pm 0.9
Cedar Waxwing	0.8 \pm 1	Cedar Waxwing	0.8 \pm 1.1
Killdeer	0.7 \pm 1	White-breasted Nuthatch	0.7 \pm 0.7
Bewick's Wren	0.7 \pm 0.8	Lesser Goldfinch	0.6 \pm 0.9
Marsh Wren	0.7 \pm 0.8	Brown-headed Cowbird	0.6 \pm 0.7
White-breasted Nuthatch	0.7 \pm 0.8	Downy Woodpecker	0.6 \pm 0.7
Brown Creeper	0.7 \pm 0.5	Red-breasted Nuthatch	0.6 \pm 0.7
American Goldfinch	0.5 \pm 0.8	Chestnut-backed Chickadee	0.4 \pm 0.7
Black-throated Gray Warbler	0.5 \pm 0.8	Northern Flicker	0.4 \pm 0.7
Cliff Swallow	0.5 \pm 0.8	Pacific Wren	0.4 \pm 0.7
Savannah Sparrow	0.5 \pm 0.8	Dark-eyed Junco	0.4 \pm 0.5
Tree Swallow	0.5 \pm 0.8	Bushtit	0.3 \pm 0.7
Gadwall	0.3 \pm 0.8	European Starling	0.3 \pm 0.7
House Finch	0.3 \pm 0.8	Red-breasted Sapsucker	0.3 \pm 0.7
Wilson's Warbler	0.3 \pm 0.8	Tree Swallow	0.3 \pm 0.7
Anna's Hummingbird	0.3 \pm 0.5	Marsh Wren	0.3 \pm 0.5
Black-capped Chickadee	0.3 \pm 0.5	Western Tanager	0.3 \pm 0.5
Brown-headed Cowbird	0.3 \pm 0.5	Willow Flycatcher	0.3 \pm 0.5
Chestnut-backed Chickadee	0.3 \pm 0.5	American Crow	0.2 \pm 0.7
Mourning Dove	0.3 \pm 0.5	Golden-crowned Kinglet	0.2 \pm 0.7
Pacific-slope Flycatcher	0.3 \pm 0.5	Mourning Dove	0.2 \pm 0.7

Species	2013 & 2017 Spring rel. abund. (Avg. # of detections / survey ± SD)	Species	2019 & 2021 Spring rel. abund. (Avg. # of detections / survey ± SD)
Western Tanager	0.3 ± 0.5	Anna's Hummingbird	0.2 ± 0.4
American Crow	0.2 ± 0.4	Lazuli Bunting	0.2 ± 0.4
California Scrub-Jay	0.2 ± 0.4	Orange-crowned Warbler	0.2 ± 0.4
Dark-eyed Junco	0.2 ± 0.4	Black-throated Gray Warbler	0.1 ± 0.3
Downy Woodpecker	0.2 ± 0.4	Killdeer	0.1 ± 0.3
Great Blue Heron	0.2 ± 0.4	Red-tailed Hawk	0.1 ± 0.3
Green Heron	0.2 ± 0.4	Red-winged Blackbird	0.1 ± 0.3
Northern Flicker	0.2 ± 0.4	Savannah Sparrow	0.1 ± 0.3
Orange-crowned Warbler	0.2 ± 0.4	Sora	0.1 ± 0.3
Pileated Woodpecker	0.2 ± 0.4	Virginia Rail	0.1 ± 0.3
Red-tailed Hawk	0.2 ± 0.4	White-crowned Sparrow	0.1 ± 0.3
Rufous Hummingbird	0.2 ± 0.4	Barn Swallow	0
Steller's Jay	0.2 ± 0.4	California Scrub-Jay	0
Violet-green Swallow	0.2 ± 0.4	Cliff Swallow	0
Virginia Rail	0.2 ± 0.4	Gadwall	0
Yellow-breasted Chat	0.2 ± 0.4	Great Blue Heron	0
Bushtit	0	Green Heron	0
Golden-crowned Kinglet	0	House Finch	0
Lesser Goldfinch	0	Mallard	0
Pacific Wren	0	Pileated Woodpecker	0
Red-breasted Nuthatch	0	Rufous Hummingbird	0
Sora	0	Spotted Sandpiper	0
White-crowned Sparrow	0	Violet-green Swallow	0
Willow Flycatcher	0	Yellow-breasted Chat	0

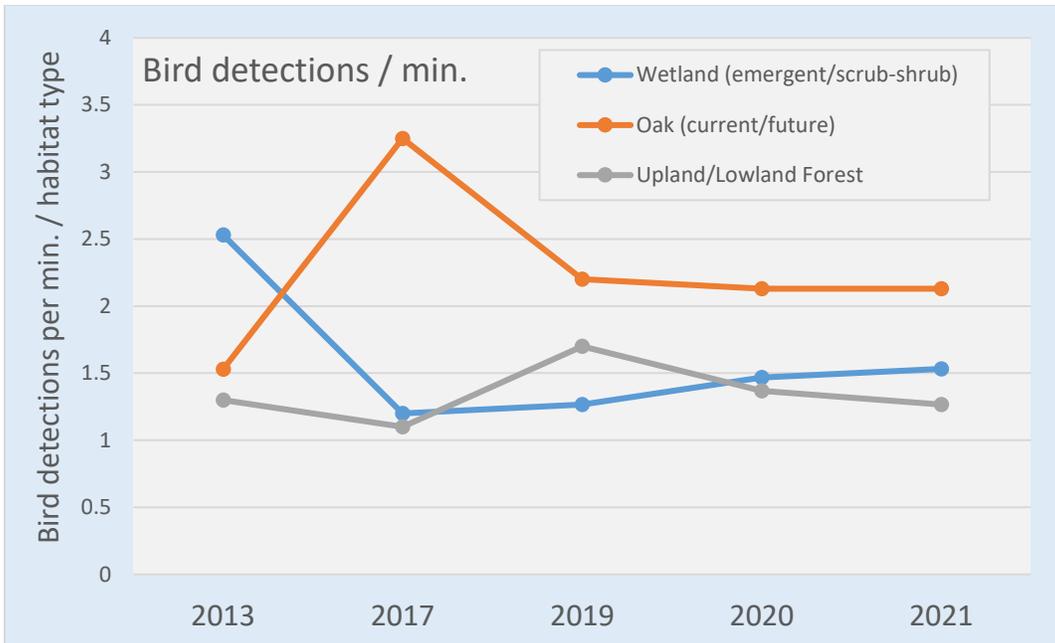


Figure 8. Relative abundance (total bird detections per minute) per habitat type, from comparable point count surveys conducted during the “early” period (2013 & 2017) of habitat enhancement and the “later” period (2019-21) at PCC Rock Creek PCC Floodplain.

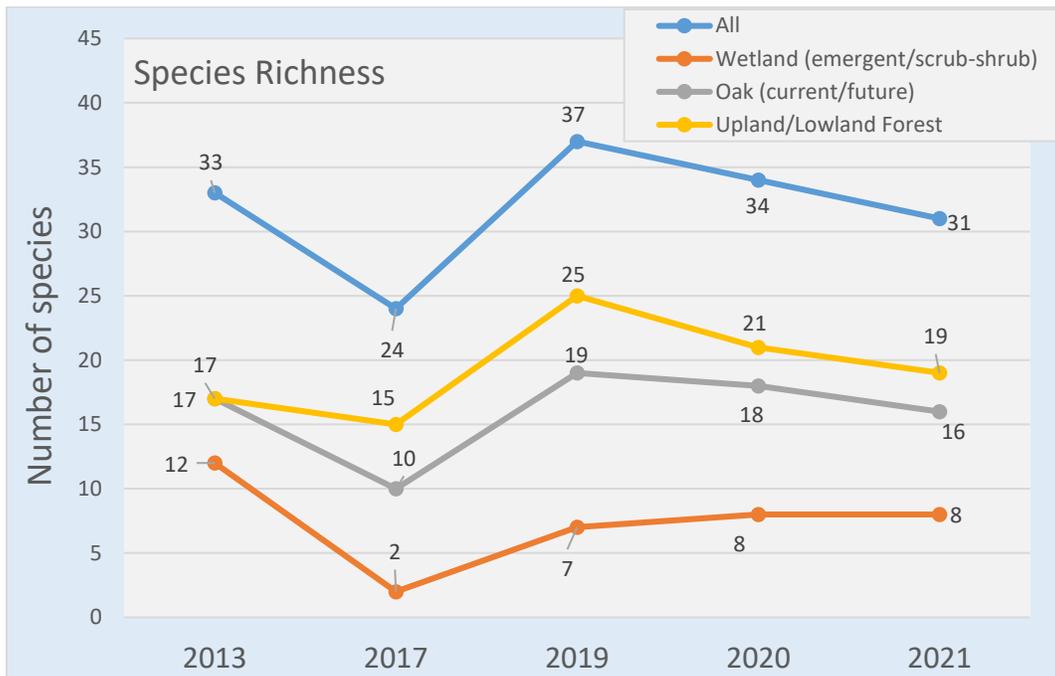


Figure 9. Species richness (total number of species detected per annual survey effort) per habitat type, from comparable point count surveys conducted during the “early” period (2013 & 2017) of habitat enhancement and the “later” period (2019-21) at PCC Rock Creek PCC Floodplain.



Red-breasted Sapsucker at PCC Rock Creek Floodplain (Photo: C. Larson)

Results: Community Science eBird surveys

Results reported here only includes data for the annual period: 1 April 2019 to 31 March 2020.⁷ The results include information from 17 community scientists that were evaluated as “intermediate to high competency” in identifying birds by sight and sound. A total of 88 unique surveys were conducted by experienced eBird surveyors during the timeframe. The average time conducting a given survey was 100 minutes and average distance traveled along the transect was 2.4 kilometers (1.5 miles). Coverage in the winter was low (only 1 survey each in December and January) because PCC Rock Creek closes a large section of the trail for safety reasons during that time and only PCC Rock Creek and Audubon staff can conduct surveys during that time.

⁷ Since March 2020 access to the site has been closed due to the COVID-19 pandemic. During this timeframe (between 1 April 2020 to the writing of this report - 31 October 2021) Candace Larson and two Rock Creek PCC staff conducted 12 eBird surveys. No new bird species were detected to include in the species richness estimate (Table 1). Because so few surveys were conducted we are unable to provide a new analysis so what is reported in this section is the same as in our previous annual report.

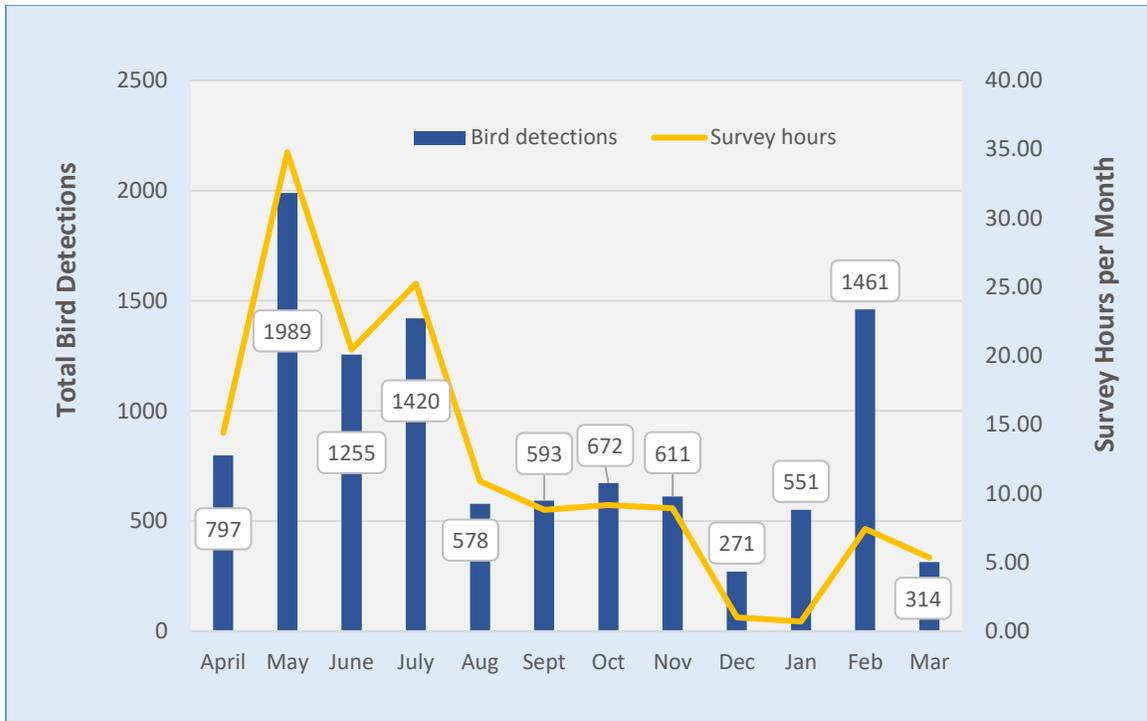


Figure 10. Total bird detections versus experienced eBird community scientist effort by month for the period 1 April 2019 to 31 March 2020.

A total of 104 species were documented during community science surveys at the site including 21 species that were only detected during the eBird surveys (Table 1).

The eBird data provides the ability to examine temporal bird trends through the annual cycle. At the guild level, we found songbird detections per hour to be fairly consistent across seasons. Waterfowl detections per hour were much higher in the winter which makes sense since the emergent marsh appears to support flocks of waterfowl (see winter waterfowl survey results above; Fig. 5). It's important to remember that eBird survey effort in the winter was minimal (Fig. 10) so the estimates are based on few surveys. Waterbird detections per hour were consistent in all seasons except the summer when detections were much lower. Like waterfowl, shorebird detections were highest in the winter. Shorebirds were also detected frequently in the spring but hardly any detections in the summer and fall (Fig. 11). Raptor hourly detection rates were highest in the fall and winter (Fig. 11).

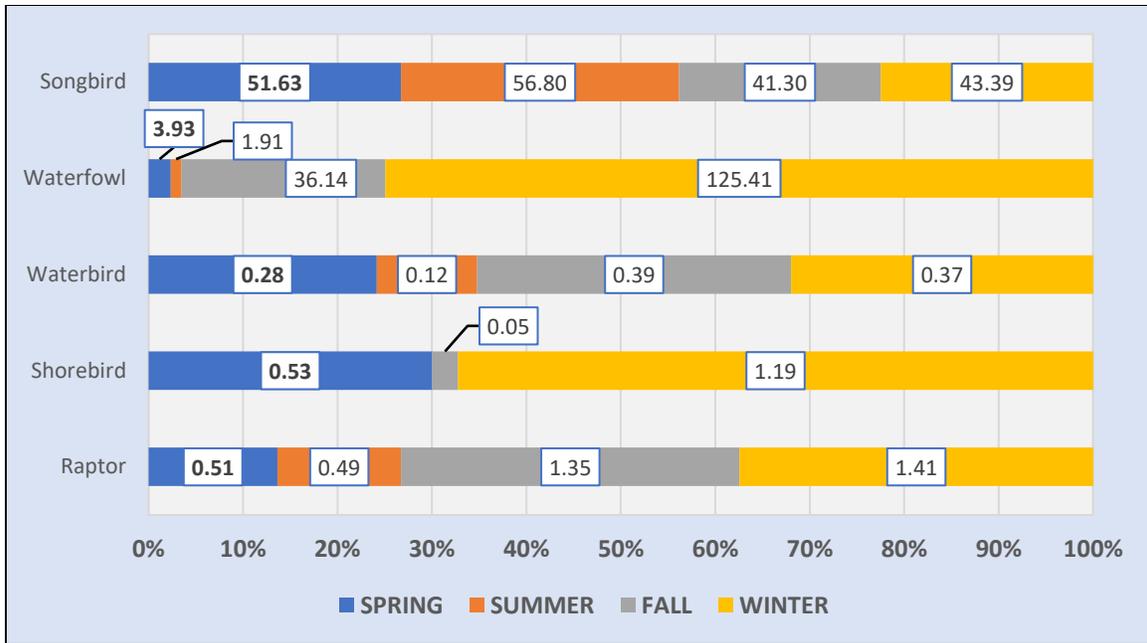


Figure 11. Detections per hour per season for five bird guilds from eBird surveys by experienced community scientists from 1 April 2019 to 31 March 2020 at PCC Rock Creek.

When examining the five bird guilds per month we see, by far, waterfowl have the highest hourly detection rates (over 700 detections per hour in January) but only for the months of December through February. After that detections are very low (Fig. 11). Again, it's important to point out that there were minimal winter surveys and only 1 survey performed in January so this must be taken into account when interpreting these findings. Songbird hourly detections were relatively consistent per month ranging between 35 and 66 detections per hour (Fig. 11). For raptors and waterbirds, which were detected much less frequently than waterfowl or songbirds, hourly detection rates were markedly higher in December and January reaching up to 3 detections per hour (Fig. 11). Shorebird detections were low throughout the year except in March when the rate was over 2 detections per hour (Fig. 11). Overall, the winter and early spring months indicated the highest relative abundances for all guilds except for songbirds which were detected at a consistent rate across the year.

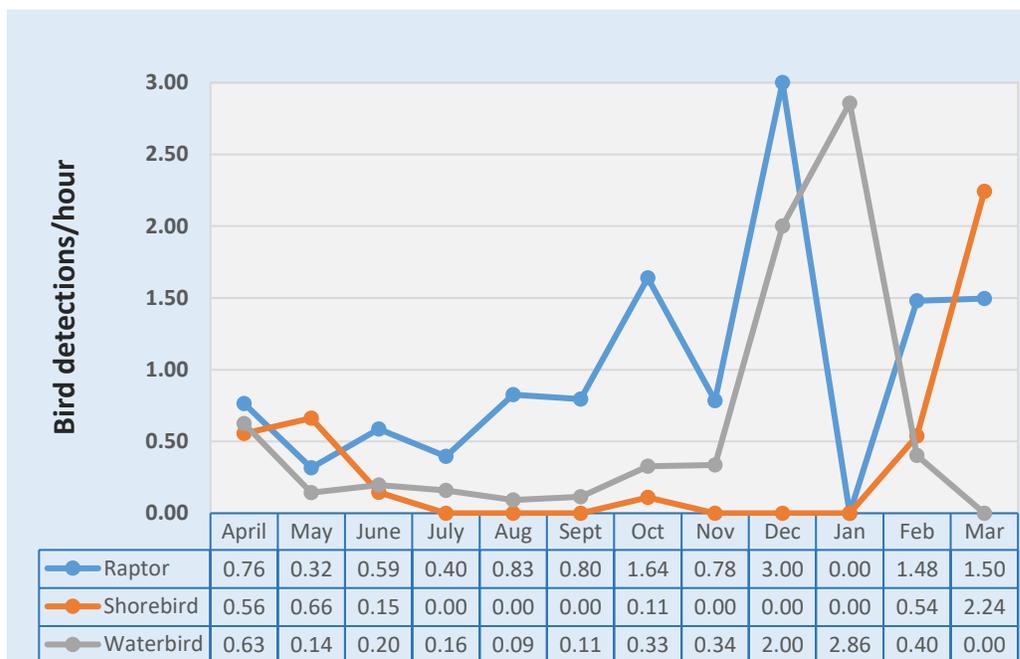
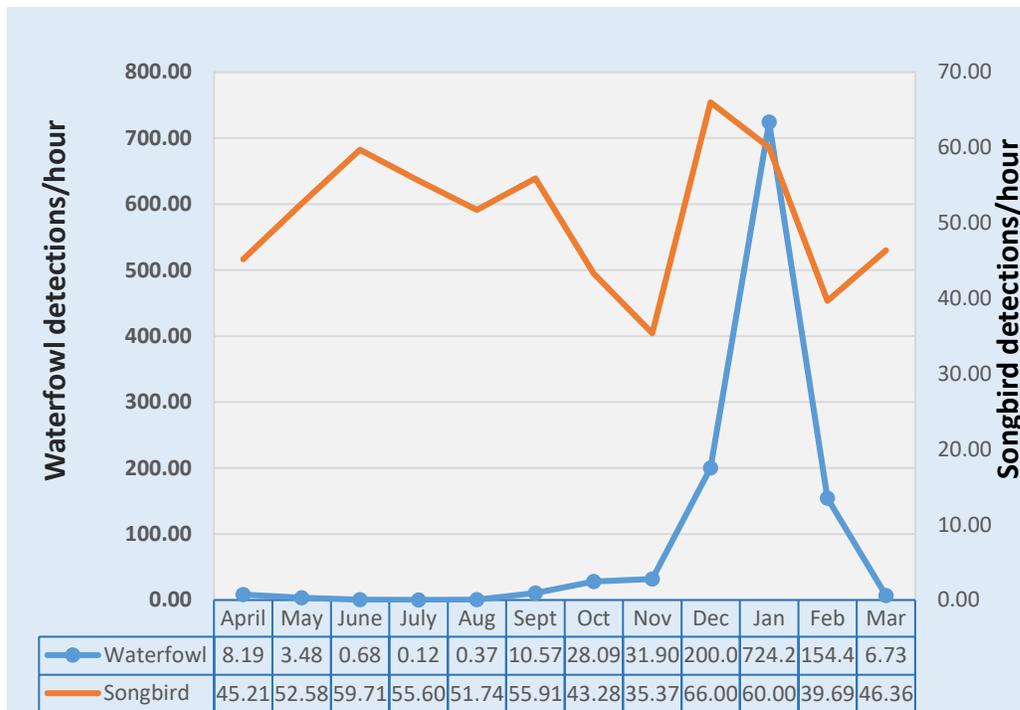


Figure 11. Detections per hour per month for five bird guilds from eBird surveys by experienced community scientists from 1 April 2019 to 31 March 2020 at PCC Rock Creek. Top chart includes bird guilds with high hourly detection rates <3 detections/hr (Raptor, Shorebird, and Waterbird). Bottom chart includes bird guilds with low hourly detection rates >35 detections/hr (Waterfowl and Songbird).

At the individual species level for the 17 selected species we observe trends which match the guild level results as is expected but offers a detailed look at inter-species differences in abundance by season and by month (Tables 3 & 4).

Table 3. Bird detections per hour per month for 17 select species detected during eBird surveys at PCC Rock Creek by experienced community scientists between 1 April 2019 and 31 March 2020. Orange shading = “higher detection months”, Yellow shading = “lower detection months”. No shading indicates species were not detected.

Species	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	AVG
AMERICAN GOLDFINCH	0.07	2.41	3.57	2.30	4.13	0.68	0.22	0.00	0.00	0.00	0.00	0.19	1.13
AMERICAN KESTREL	0.00	0.00	0.00	0.00	0.46	0.23	0.44	0.22	1.00	0.00	0.40	0.37	0.26
AMERICAN ROBIN	5.00	6.09	4.59	5.71	2.84	2.50	3.72	2.69	6.00	10.00	8.48	7.10	5.39
COMMON YELLOWTHROAT	1.53	1.35	3.32	4.56	1.28	0.57	0.00	0.00	0.00	0.00	0.00	0.00	1.05
COOPER'S HAWK	0.21	0.00	0.00	0.00	0.09	0.00	0.44	0.22	0.00	0.00	0.00	0.19	0.10
DARK-EYED JUNCO	2.92	3.08	6.60	4.00	1.38	3.75	3.61	1.79	0.00	7.14	4.57	4.11	3.58
GREAT BLUE HERON	0.07	0.11	0.10	0.16	0.09	0.00	0.33	0.22	2.00	1.43	0.27	0.00	0.40
GREAT EGRET	0.56	0.03	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.13	0.00	0.07
GREEN-WINGED TEAL	0.49	0.06	0.00	0.00	0.00	0.00	0.22	0.00	0.00	114.29	12.51	0.37	10.66
KILLDEER	0.56	0.66	0.15	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.54	2.06	0.34
MALLARD	4.79	1.18	0.54	0.12	0.37	8.07	3.93	21.38	150.00	382.86	131.17	4.67	59.09
RED-TAILED HAWK	0.49	0.14	0.34	0.24	0.28	0.34	0.66	0.22	2.00	0.00	0.94	0.93	0.55
SONG SPARROW	3.26	4.69	5.42	6.46	5.69	5.68	5.03	5.93	10.00	8.57	7.26	6.36	6.20
SPOTTED TOWHEE	1.39	3.62	3.66	4.24	1.56	3.98	2.40	1.46	0.00	4.29	1.35	1.31	2.44
SWAINSON'S THRUSH	0.00	0.78	1.37	1.94	0.18	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.40
TREE SWALLOW	3.26	2.36	3.22	2.77	1.93	0.23	0.00	0.00	0.00	0.00	0.00	0.75	1.21
WHITE-BREASTED NUTHATCH	0.21	0.29	0.15	0.40	0.46	0.23	0.33	0.11	1.00	0.00	0.27	0.19	0.30

No detections (no shading)

0.01 to 0.99 detections/hr

1.0 to 5.00 detections/hr

5.01 to 10 detections/hr

10.01 to 20.00 detection/hr

> 20.00 detections/hr

Table 4. Bird detections per hour per season for 17 select species detected during eBird surveys at PCC Rock Creek by experienced community scientists between 1 April 2019 and 31 March 2020.

Species	SPRING	SUMMER	FALL	WINTER	Average
AMERICAN GOLDFINCH	2.10	2.71	0.10	0.07	1.25
AMERICAN KESTREL	0.00	0.14	0.34	0.37	0.21
AMERICAN ROBIN	5.41	4.58	3.33	8.01	5.33
COMMON YELLOWTHROAT	1.95	3.00	0.00	0.00	1.24
COOPER'S HAWK	0.05	0.02	0.29	0.07	0.11
DARK-EYED JUNCO	3.52	4.21	2.46	4.52	3.68
GREAT BLUE HERON	0.11	0.10	0.34	0.22	0.19
GREAT EGRET	0.14	0.00	0.05	0.07	0.07
GREEN-WINGED TEAL	0.14	0.00	0.10	12.98	3.30
KILLDEER	0.53	0.00	0.05	1.11	0.42
MALLARD	1.87	1.60	18.22	94.04	28.93
RED-TAILED HAWK	0.28	0.25	0.53	0.89	0.49
SONG SPARROW	4.41	6.18	5.83	6.97	5.85
SPOTTED TOWHEE	3.10	3.59	1.98	1.48	2.54
SWAINSON'S THRUSH	0.69	1.35	0.05	0.00	0.52
TREE SWALLOW	2.82	2.20	0.00	0.30	1.33
WHITE-BREASTED NUTHATCH	0.25	0.35	0.24	0.22	0.27

No detections (no shading)

0.02 to 0.99 detections/hr

1.0 to 5.00 detections/hr

5.01 to 10 detections/hr

10.01 to 20.00 detection/hr

> 20.00 detections/hr

OUTREACH & PARTNER ENGAGEMENT

Due to the ongoing COVID-19 pandemic, Portland Community College closed their campus in March, 2020 and has only recently allowed for limited student and faculty activity on the campus. The nature trail remains closed to the public as of December 2021, with tentative plans to re-open in spring 2022.

Outdoor education events

In partnership with Adelantes Mujeres and CWS, Portland Audubon Education and Conservation Departments planned and executed three events in 2019 that included an introduction to bird identification and community science bird monitoring at CWS sites. Below is a brief summary:

- March 23rd: event with Adelantes Mujeres Chicas at PCC Rock Creek. Youth were introduced to the ecology and diversity of the Rock Creek Floodplain and the basics of bird survey protocols, then conducted a sample community science survey along the nature trail, learning fun facts about bird behavior and identification along the way.
- July 30th: STEM day event with Adelantes Mujeres – originally scheduled for PCC Rock Creek but for logistical reasons switched to holding the event at Pacific College in Forest Grove. Although not on-site, still included programming on introduction to community science bird monitoring.
- December 7th: STEM event with Adelantes Mujeres modeled after the March 23 program, introducing youth to bird identification and community science and the value of wetland ecosystems.

On-site community partner events for 2020 and 2021 were cancelled due to Covid-19 and the closure of the campus. We conducted multiple planning sessions for STEM and ecology programming with Adelantes Mujeres, Bienestar, the Girls Inc. Eureka! Program, and Portland Audubon's community science-focused summer camps, effort which was not entirely lost as it has helped strengthen relationships and build the framework for re-launching these programs in 2022.

Partnership with PCC classes

From 2019-2021, Portland Audubon staff member Candace Larson served as a guest instructor for seven PCC environmental science classes, introducing students to the history and importance of floodplain enhancement and the value of the nature trail, basic bird identification and ecology, and the importance of community science. Four of these guest lectures occurred pre-Covid and included a field session that oriented students to the nature trail and the community science eBird protocol. Additional, one-on-one mentorship was provided to interested students. In May, 2020, we successfully pivoted to an extended, online lecture format which included a deeper dive into the ecology of the Rock Creek floodplain habitat and its bird associations.

- Classes engaged included both 100 and 200 level Environmental Science and Wildlife Biology classes, and involved over 60 students and 4 PCC faculty.
- 4 students and 3 faculty have submitted eBird checklists for the project to date. One of the students became a key contributor to the project, and also incorporated the community science monitoring into his independent study work in a subsequent term.

- Additional guest-instructor appearances are currently being planned for 2022, beginning in the spring.

TALON

Portland Audubon's TALON internship program provided paid training and employment for young adults ages 16-20 focused on diverse cultural and ethnic communities living in the Portland Metro region. In 2019, our Community Science Intern (Biniam Egu) experienced one-on-one mentoring at PCC Rock Creek and Fernhill Wetlands from Portland Audubon mentors (Candace Larson and Greg Smith). Activities included: bird species ID, learning fundamentals of bird monitoring, conducting practice and eventually complete eBird community science surveys. Biniam assisted on both Adelantes Mujeres events described above, as did two additional TALON apprentices interning as environmental educators. In 2020, Portland Audubon began the work of strengthening this program to authentically center the experiences of youth of color and provide real, career-track employment opportunities through our Green Leaders Program. We look forward to opportunities to engage the Green Leaders Program in future work on this contract.

Community Science Recruitment

In 2019, we initiated our community scientist recruitment efforts at PCC Rock Creek, targeting both experienced e-Birders and newer birders, with a focus on Washington County residents and PCC environmental faculty and students. We conducted outreach through our website, social media, targeted Washington County mailing lists, and through PCC environmental science faculty, and completed two on-site field trainings, tailored to volunteers' experience levels. Trainings included site history, information about ongoing restoration work, and practice using the community science eBird protocol. Additional community science orientations were provided as part of field days with PCC environmental science classes. Ongoing survey orientation has also been provided both by Audubon staff and by experienced volunteers tutoring new, vetted volunteers in the field. In 2020, we successfully adapted our on-site field training to a digital format, and introduced 12 new, enthusiastic community science volunteers to the project. We look forward to resuming on-site community science trainings in 2022, whenever campus reopens.

Acknowledgements

Special thanks to our team of community scientists – we couldn't do this without them! Thanks for volunteer Janet McCurdy who spent a lot of time helping with data entry and eBird analysis. Also thanks to volunteer Cherie Mosher for entering the raw 2013 and 2017 PHSI data into MS Excel. Front Cover photo and back page photos of Adelantes Mujeres Chicas by Ali Berman. Front Cover Rock Creek PCC habitat photo by Candace Larson.



Audubon educator, Abby VanLeuven, with Adelantes Mujeres Chicas at the March 2019 event at PCC Rock Creek.



Barred Owl in upland forest habitat, PCC Rock Creek, 2021 (Photo: C. Larson)

APPENDIX A. PCC ROCK CREEK SPRING POINT COUNT SURVEY

Project goals & objectives: The goal of this point count survey is to assess avian response to ongoing habitat restoration in the Floodplain Enhancement Area at PCC Rock Creek. Our data will document spring season species richness and general abundances (within and between years) at the site during peak songbird use. Results will lend insight into which species are benefiting most from the habitat enhancement efforts. An additional objective is to provide baseline /early enhancement stage bird community data which will be available for comparison in future years at various stages of habitat enhancement.

Survey Design: This protocol is designed to overlap with previous point count survey efforts on the site in 2013 and 2017 to allow comparison with these past results. The protocol includes additional survey points and an expanded monitoring window for analysis of future trends taking into consideration eventual plant community (“habitat type”) goals outlined in the PCC Rock Creek Floodplain EEP.

Eight point count stations were established within multiple existing and planned habitat types at the site including emergent wetland, shrub-scrub wetland, forest, and oak woodland. Points were spaced a minimum of 150m apart, and centered within habitat types (2 point count stations per habitat type).

Point Count Station Locations – SEE MAP BELOW

1. 45.57007 -122.86575 (prior point re-centered in lowland forest habitat)
2. 45.56834 -122.86372 (prior point centered in upland forest habitat)
3. 45.56975 -122.86215 (prior point centered in oak habitat)
4. 45.57104 -122.85858 (prior point re-centered in future oak habitat)
5. 45.57274 -122.85840 (new point added, centered in future shrub-scrub habitat)
6. 45.56857 -122.86662 (new point added, centered in shrub-scrub habitat/ash forest)
7. 45.57264 -122.86070 (new point added, centered in emergent habitat)
8. 45.57180 -122.86295 (new point added, centered in emergent habitat)

Study season and frequency:

- The field work will be conducted between April 15 and June 30 beginning with the 2019 field season and continuing for at least an additional season (2020).
- Experienced field biologists or trained community scientists will conduct a minimum of 2 survey replicates per month during the survey period, spaced a minimum of 10 days apart, for a total of 5 replicates during the survey season.
- Surveys will be canceled if wind speeds exceed 10 mph, or if it is raining. Surveys may be conducted during light drizzle if birds are active. If weather conditions prevent a survey from being performed, an attempt will be made to reschedule the survey within a few days, maintaining at least 10 days between surveys.
- Each survey replicate will be completed in one day. Surveys will begin within 15 minutes of sunrise and be completed by 10am.
- Survey methods are based on existing point count protocols (e.g. Huff et al. 2000¹.)

Personnel Requirements and Training:

Observers must be able to identify all PNW bird species by sight and sound and should not have hearing impediments. Observers must be able to navigate to sample points using GPS devices, maps and other navigational aids.

Equipment list:

Appropriate clothing and footwear	Map of site
Binoculars	Data forms/clipboard + writing utensil
Digital timer	Range finder

Field Procedure:

- Complete all header fields on datasheet (*Appendix A*), including weather information and noise scale as included in data form key (*Appendix B*).
- To reduce temporal bias, the order of each day’s survey will be alternated (i.e. north to south, or south to north) so that stations are counted at different times of day on each visit.
 - Visit 1: 2,3,4,5,7,8,1,6
 - Visit 2: 6,1,8,7,5,4,3,2
 - Visit 3: 2,3,4,5,7,8,1,6
 - Visit 4: 6,1,8,7,5,4,3,2
 - Visit 5: 2,3,4,5,7,8,1,6
- At first point count station, record point number on point count data form. Wait 1 minute for birds to “settle down,” then record start time and start stopwatch. Record all birds detected by sight or sound during an 8-minute count window, separating detections into three time intervals: 0-3 minutes, 3-5 minutes and 5-8 minutes. Record species code, detection type, distance band, according to data form key.
- Record bird detections as either “typical,” “associated fly-over,” or “flush” detections. A typical detection is recorded the first time a bird is seen or heard from ground or water level to the top of the highest level of vegetation. An associated fly-over detection is defined as a bird which is only detected above the highest vegetation, where the bird appears actively involved in the site (An independent fly-over is not using the site. Do not record independent fly-overs.) A flush detection is a bird that is not detected during the count but is detected before or after the count within 50m of the point.
- Estimate the distance (in meters) to each bird detected (typical detections only) and record the appropriate distance band for the detection (inside 50m, outside 50m). Data inside 50m will be used for abundance estimates and for examining avian habitat relationships. All data (inside and outside) will be used for species richness estimates.
- While traveling between observation points (and between distance bands), record any additional species as “additional detections” on the data form. These detections will not be included in abundance/diversity estimates but will contribute to overall species richness estimates.
- Use care to avoid double-counting.

Other variables:

Vegetation: Clean Water Services’ Quantitative Vegetation Monitoring includes: Native tree and shrub counts (stems per acre), percent aerial cover of native species, invasive species, non-native species and bare ground, plant diversity metric and Prevalence Index. Data collection and analysis is consistent with Oregon Department of State Lands’ *Routine Monitoring Guidance for Vegetation* (Draft Sept 23,

2009). Circular plots covering 1/100th acre (11.7 foot radius) are placed randomly within each plant community type. Project sites that support multiple plant communities require either three plots per plant community type or one plot per acre (i.e., 1%), whichever is greater.

Water level: Changes in floodplain hydrology are being monitored using piezometer-well monitoring, beaver activity and inundation mapping using unmanned aerial system (UAD). Precipitation and stream gage data are also available.

Data Analysis:

Data will be summarized to document overall species richness both within and across years. We will estimate species diversity using Shannon-Weiner Index which takes into account both species richness and evenness. Species abundance will be estimated as a total count per season as well as an average abundance (across the 6 replicates) per season. Standard error will be calculated for the average abundance estimate. We may also examine bird species richness and abundance per habitat type (using the 50m distance band data) if we determine those comparisons are biologically relevant based on review of the data set.

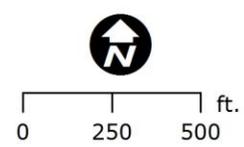
If CWS provides relevant vegetation and water level data we will conduct simple correlation analyses (e.g. linear regression) to examine for any relationships between these variables and species richness and abundance.

PCC ROCK CREEK SPRING AVIAN POINT COUNT SURVEY MAP



- Avian Count Station
- Avian Count Station, 50m buffer
- LWD
- PCC Nature Trail
- Other Trails

- Project Boundary
- Planting Communities**
- Riparian Forest (5 Acres)
- Oak Prairie/ Woodland (21 Acres)
- Emergent Wetland (25 Acres)
- Scrub Shrub Wetland (15 Acres)
- Ash Forest (11 Acres)



APPENDIX A

Point count data sheet – PCC Rock Creek

Page ____ of ____

Observer:	Date:	Replicate Number:
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Field Notes (<i>nests found, etc.</i>):	Weather (<i>circle % cloud cover</i>): Drizzle >90 50-90 10-50 <10 Wind (<i>check one</i>): ___ Low (0-5 mph) ___ Moderate (5-10 mph) Temperature: ____°F Noise Scale (<i>circle one</i>): 0 1 2 3 4
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STN #	Start Time	Species	Typical (0 to 50m)			Typical (>50m)			Associated Flyover			Flush Detection	Additional Detections
			0-3 min	3-5 min	5-8 min	0-3 min	3-5 min	5-8 min	0-3 min	3-5 min	5-8 min		

Data Entered (Init. + Date): _____

Data Proofed (Init. + Date): _____

APPENDIX B

Data Sheet Key:

Header

Observer: record full name

Date: day/month/year

Replicate #: 1st, 2nd, 3rd, etc.

Weather: Circle cloud cover / Wind. Note that rain, beyond a light drizzle, will cancel a survey.

Temperature: record approximate air temperature at start of survey.

Record **noise scale** using the following rankingsⁱ:

0 = no noise

1 = gentle babbling brook noise or faint urban noise, probably not missing any birds

2 = babbling creek or other urban noise, might miss some of the higher pitched songs and calls or some distant birds

3 = rushing creek noise or other loud background sound(s), probably detecting only those birds within 50 m and might be missing the high-pitched songs and calls of some species close to the center of the station

4 = roaring creek or traffic, probably detecting only the very loudest calls and songs within 50 m

Field Notes: record any unusual or noteworthy field observations

Data Fields

STN #: record point count station number. Remember to alternate direction of survey on each visit.

Start time: record 24-time at start of 8-minute count window (after settle-down period.)

Species: record 4-letter AOU code for each detection.

Detection type: record detection type for *first detection* as follows:

Typical detections: Tally individuals of each species detected in the appropriate time column (first three minutes, next two minutes, final three minutes of count) and distance column (within 50 meters of point or greater than 50 meters from point.)

Associated Flyover: Tally individuals for each species detected above the highest level of vegetation who are actively involved in the habitat. Do not record independent flyovers.

Flush detections: Tally individuals of any species detected before or after the 8-minute count window and within 50 meters of the point.

Additional detections: Tally individuals of any species detected while walking between stations, but outside the 50 meter radius of either station.

ⁱ Average the noise over the whole count – don't list a separate noise estimate for each point count

APPENDIX B. PCC ROCK CREEK WINTER WATERBIRD SURVEY - Protocol

Project goals & objectives: The goal of the winter waterbird survey is to assess ongoing waterbird response to recent habitat restoration in the Floodplain Enhancement Area at PCC Rock Creek. Our data will document winter waterbird species richness and general abundances at the site. Monitoring will also document changes in species richness and abundance between years. Results will lend insight into which species are benefiting most from the habitat enhancement efforts.

Fixed Observation Points

1. 45.574722°N 122.857500°W
2. 45.568333°N 122.861667°W
3. 45.568611°N 122.865278°W
4. 45.570556°N 122.857778°W

See Study Site Map below

Study season and frequency

- The field work will be conducted between December and February over a two-year period beginning January 2019.
- Experienced field biologists or trained community scientists will conduct a minimum of 2 survey replicates per month during the survey period, spaced a minimum of 10 days apart.
- Surveys will be canceled if wind speeds exceed 10 mph, or if it is raining. Surveys may be conducted during light drizzle if birds are active. If weather conditions prevent a survey from being performed, an attempt will be made to reschedule the survey within a few days, maintaining at least 10 days between surveys.

Personnel Requirements and Training:

Observers must be able to identify all PNW waterbird species by sight and sound and should not have hearing impediments. Observers must be able to navigate to sample points using GPS devices, maps and other navigational aids.

Survey Methodologies:

- Complete entire survey route in one day.
- Surveys should be conducted between sunrise and 3 hours after sunrise.
- The objective of the Winter Waterbird Survey is to record all detectable waterfowl in the survey area, including open water, emergent wetland and shoreline of the wetland. Waterbirds are defined as ducks, geese and swans, herons and egrets, cormorants, shorebirds, gulls, terns and rallids.

Field Procedure

- Complete all header fields on datasheet, including weather information and noise scale as included in data form key. Record start time of survey.
- Beginning at Observation Point 1 (OP1) travel to each of the four observation points in order.
- Spend 15 full minutes at each observation point. Using binoculars and spotting scope, count all waterbirds seen and heard within the viewshed assigned to that observation point, according to data form key included with data form (See Appendix A).
- Separate detections into “typical detections” and “associated flyover detections” (do not count independent flyovers).

- Record the highest number of individuals per species observed in a single scan. For instance, if on first pass of the scope, observer detects a total of 10 Mallards in viewshed, and on second pass observer detects 20 Mallards, use 20 as the number of detections.
- While traveling between observation points, record any additional species as “additional detections” on the data form. These detections will not be included in abundance/diversity estimates but will contribute to overall species richness estimates.
- Special care must be taken to avoid double-counting. Include detailed field notes if flocks moved during survey or if there are questions about multiple detections of same individuals.

Other variables:

- CWS may provide vegetation and water level data for the site.

Equipment list

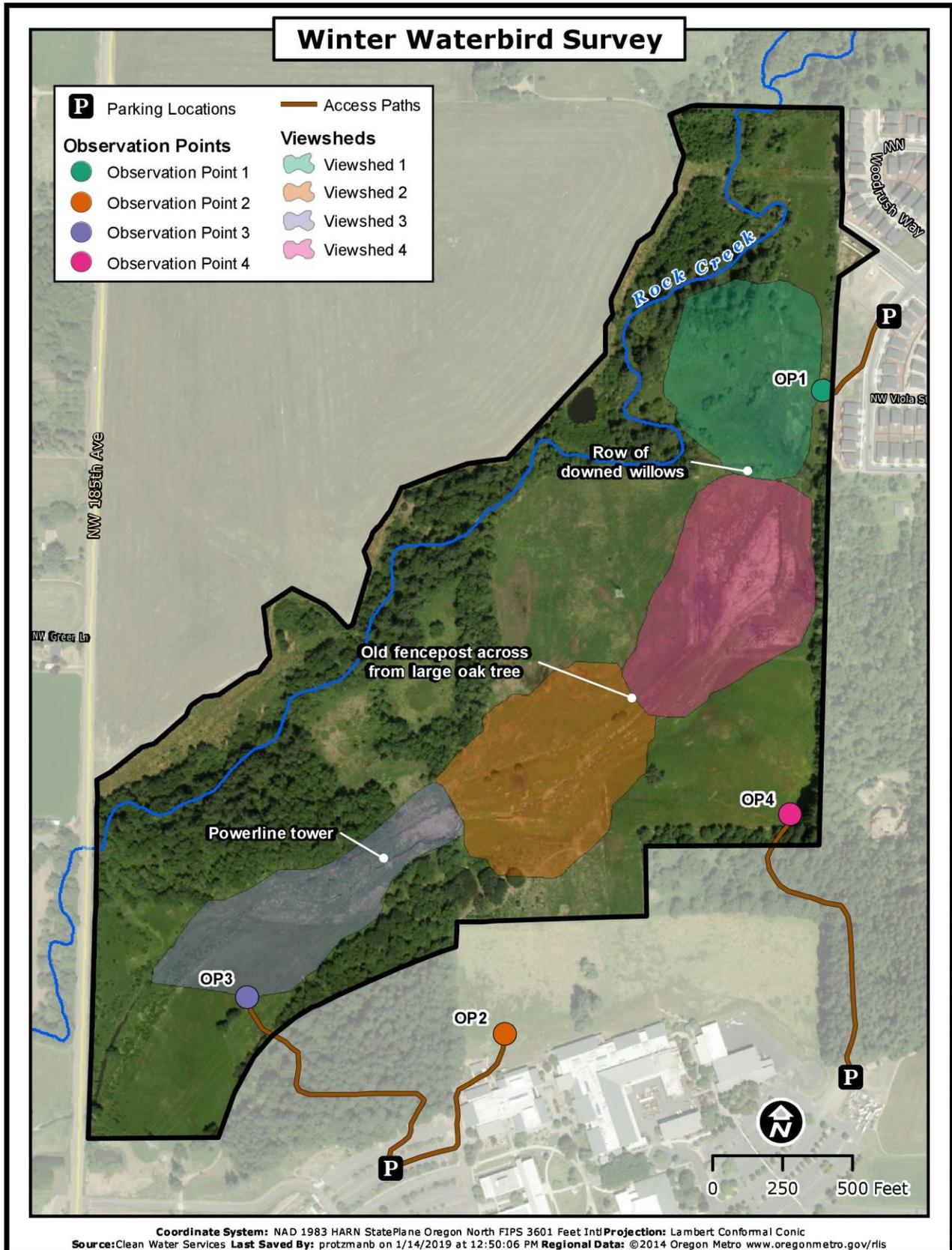
Appropriate clothing and footwear	Map of site
Binoculars and spotting scope	Data forms/clipboard + writing utensil
Digital timer	

Data Analysis

Data will be summarized to document overall species richness both within and across years. We will estimate species diversity using Shannon-Weiner Index which takes into account both species richness and evenness. Species abundance will be estimated as a total count per season as well as an average abundance (across the 6 replicates) per season. Standard error will be calculated for the average abundance estimate.

If CWS provides vegetation and water level data we will conduct simple correlation analyses (e.g. linear regression) to examine for any relationships between these variables and species richness and abundance.

Study site map



Data Sheet Key:

Header

Observer: record full name

Date: day/month/year

Replicate #: 1st, 2nd, 3rd, etc.

Weather: Circle cloud cover. Note that rain, beyond a light drizzle, will cancel a survey.

Temperature: record approximate air temperature at start of survey.

Record **noise scale** using the following rankings¹:

0 = no noise

1 = gentle babbling brook noise or faint urban noise, probably not missing any birds

2 = babbling creek or other urban noise, might miss some of the higher pitched songs and calls or some distant birds

3 = rushing creek noise or other loud background sound(s), probably detecting only those birds within 50 m and might be missing the high-pitched songs and calls of some species close to the center of the station

4 = roaring creek or traffic, probably detecting only the very loudest calls and songs within 50 m

Data Fields

OP# : record Observation Point number per protocol.

Start time: 24-hour time when survey begins at OP. End time: 24-hour time when survey ends at OP.

Spp Code: record 4-letter AOU code for each detection entry.

Typical Detection:

Tally number of individuals of each species detected. Do not include flyover detections.

Flyover Detection:

Tally number of individuals of each species of flyover birds who are actively using the habitat.

Additional Detection:

Record 4-letter AOU code for any new species detected while walking between OP's.

Field Notes: Any notable events (weather, noise, distractions). This is also the place to record any notable movement of waterbirds during the survey, in order to reduce the risk of double-counting.

¹

Average the noise over the whole count – don't list a separate noise estimate for each point count station.

Protocol for COMMUNITY SCIENCE eBIRD MONITORING AT PCC ROCK CREEK

Background:

PCC and Clean Water Services have developed an Ecological Enhancement Plan (EEP) for the PCC Rock Creek Floodplain site to guide enhancement and stewardship efforts at the site. Ongoing floodplain restoration on this site will connect high quality riparian, aquatic and upland habitats for improved ecological function. This protocol was developed to meet the EEP Goal of engaging community partners and volunteers in data collection to measure the effects of restoration activities.

Project goals & objectives:

- 1) Document bird use of the PCC Rock Creek Floodplain in order to monitor changes in bird composition and abundance as ecological enhancement activities progress as the site matures.
- 2) Connect community partners, PCC students and local birders to the site by providing community science skill-building and encouraging participation of new birders and constituencies.

Study Season and Frequency:

Our goal is to encourage robust use of the protocol throughout all days and seasons when the nature trail is open to the public. Surveys may be conducted on any date that is convenient for the observer when the PCC campus is open (Monday through Saturday) and the gates to the nature trail are unlocked (Spring through Fall). Surveys may be conducted any time during daylight hours although we encourage conducting them when most birds are at peak activity (early morning).

Observer Requirements:

Observers should attend an orientation and brief training at the site (to be provided at least once per year), have binoculars and/or a spotting scope, and have access to eBird, either through a mobile app to use on-site or through computer access after the survey is complete. eBird is free – you just need to set up a username and password (<https://ebird.org/home>).

Field Procedures:

Our aim with this protocol is to achieve reasonable standardization of effort among observers, while keeping the methods simple and as close to normal recreational birding as possible and allowing for personal freedom/flexibility.

1. Walk the survey route along the nature trail as shown on **Map A**. You may walk in either direction — your choice — and you may wish to alternate directions with each visit. The route traverses an array of habitat types including coniferous forest, deciduous woodland, oak savannah and grassland, and includes four dead-end spurs which offer views into the heart of the floodplain. When returning back along a dead-end spur to the main trail, **do not** count birds previously recorded in this area; new species only should be recorded.
2. Record all birds seen and heard and enter all data into eBird using the hotspot named [Portland Community College Rock Creek campus](#).
 - **Do not** record birds seen in the developed areas (buildings / parking areas on campus).
 - **Do** record fly-over birds that you suspect are actively using the site; **do not** record fly-over birds you believe are bypassing the site entirely.

3. You may enter data any way you prefer — directly from the field with a phone app or afterwards from written notes made in the field. Please record time and distance spent on the survey as accurately as possible, and please enter data as soon as possible during or after your visit so as to ensure accuracy. Remember to double check your entries before clicking “submit”. The length of the marked transect is approximately 1.0 miles.

4. **IMPORTANT:** Please make a note in the comments section of your checklist prior to submitting as follows: “**PA Community Science survey.**” You can also enter a brief description of weather conditions during your survey here, especially if you feel the weather had an adverse impact on the presence or detectability of birds.

Data Analysis: Descriptive analyses will be used to summarize avian abundance and diversity at the site across years and seasons. Species diversity will be assessed using Shannon Diversity index. Species abundance will be a measure of relative abundance per unit effort. This data will complement intensive point count surveys that will be performed at the site beginning in the summer of 2019 and continuing for up to five years.

For questions about this project or entering data via eBird contact Joe Liebezeit (jliebezeit@audubonportland.org) or Candace Larson (clarson@audubonportland.org).

Map A

