

Frick Park – Clayton Hill Restoration: Bird Monitoring

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We established four eBird Hotspots for collecting bird abundance and diversity data within each of the four restoration areas at Frick Park's Clayton Hill: Clayton East, Clayton North, Nature Trail East, and Clayton West. Bird data collection was promoted to birders throughout the local communities and the birding community at-large in Pittsburgh and Allegheny County. A focus was placed on collecting bird data during the breeding season (June and July) and fall migration (September) in 2020 and 2021. Across all seasons and years, we had 106 volunteers submit eBird checklists for this monitoring effort.

Effort was not distributed evenly across both years, likely a result of year differences in recruitment of birders for monitoring. Nor was effort distributed evenly across restoration areas. Figure 1 shows effort data across years for fall migration (September) for each of the four monitoring areas. In terms of both number of eBird checklists submitted and hours of bird monitoring effort, Clayton North received the most effort while Nature Trail East had the lowest effort in both 2020 and 2021. In total, there were three times the checklists submitted in Sept 2020 versus 2021 and five times as many hours monitoring in Sept 2020 versus 2021.

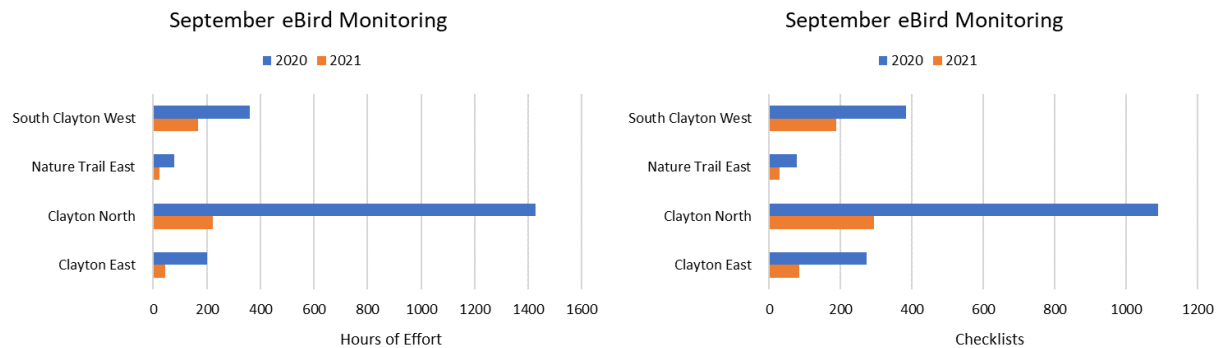


Figure 1. September eBird monitoring effort by volunteers during 2020 and 2021 broken out by hours of effort (L) and number of eBird checklists (R) for each of the four Clayton Hill restoration areas.

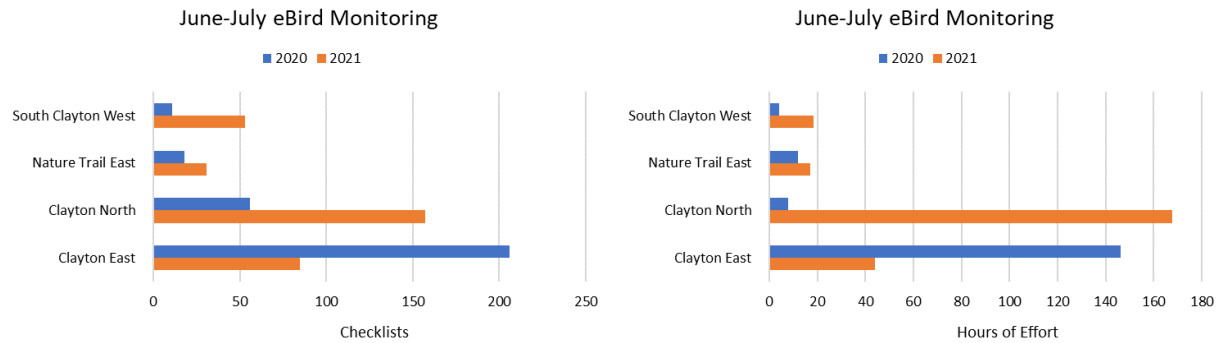


Figure 2. June and July eBird monitoring effort by volunteers during 2020 and 2021 broken out by hours of effort (L) and number of eBird checklists (R) for each of the four Clayton Hill restoration areas.

Monitoring effort was distributed differently across years and monitoring areas during the avian breeding season (June-July). In 2020, Clayton East had the highest number of eBird checklists submitted across sites and years, but more checklists were submitted in 2021 for Clayton North than Clayton East (Figure 2). Hours of effort showed nearly the same pattern for Clayton North and Clayton East (Figure 2), however, in 2020 there were only eight hours of effort in Clayton North versus 168 hours in 2021. Given this variation in monitoring effort across both years and monitoring areas, all bird abundance numbers will be reported as mean birds per checklists.

Bird Diversity

Across all months and both years, there were 116 bird species observed across the four monitoring areas (Table 1). Clayton North ranked first with 113 species followed by South Clayton West (103), Clayton East (99), and Nature Trail East (72). However, because species richness can be affected by effort, we also calculated an effort-corrected richness index – number of bird species per checklist. Effort-corrected richness was highest in Nature Trail East at 0.19 species per checklist followed by South Clayton West (0.06), Clayton East (0.05), and Clayton North (0.04).

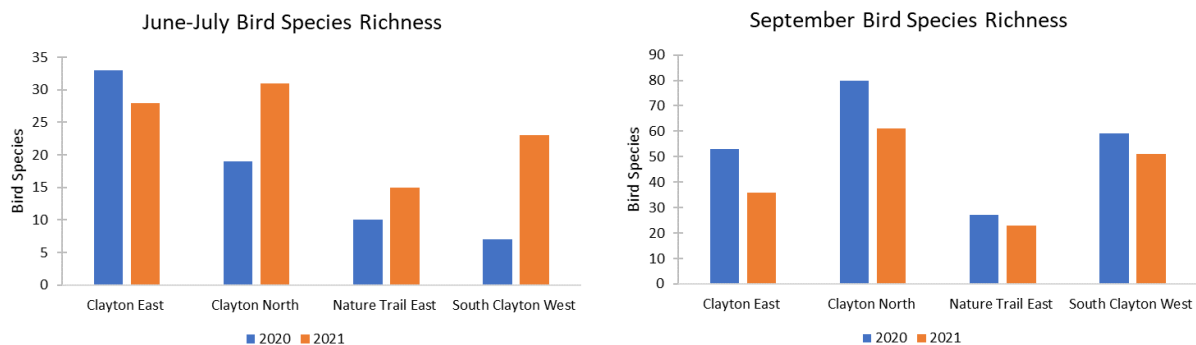


Figure 3. Bird species diversity as species richness across the four monitoring areas at Clayton Hill during the breeding season (June-July, L) and fall migration (September, R) in 2020 and 2021.

We take a closer look at bird species diversity in Figure 3 with richness by season and across restoration areas. In 2020 during the breeding season (June-July), Clayton East had the highest bird species richness across all four areas. In 2021 during the breeding season, Clayton East had five fewer species while Clayton North had the highest bird species richness and added 12 additional species. Nature Trail East and South Clayton West also had increases in breeding season bird species diversity.

During fall migration (September), Clayton North had the highest bird species richness across all sites and both years (Figure 3). We found a decrease in richness across all four monitoring areas from 2020 to 2021; however, there was a substantial decrease in fall migration bird species richness in both Clayton North with 19 fewer species and Clayton East with 17 fewer species (Figure 3). These data should be examined further to determine if these decreases in fall migrant diversity are correlated with changes in habitat through restoration efforts on Clayton Hill. Or are these decreases a result of annual variation in fall migration?

Table 1. All bird species observed at Frick Park's Clayton Hill restoration site during June 2020 through December 2021. Bird species detections are presented by monitoring area by count, number of checklists, and mean number of bird detections per checklist.

Bird Species	Clayton East			Clayton North			Nature Trail East			South Clayton West		
	Count	Checklists	Mean	Count	Checklists	Mean	Count	Checklists	Mean	Count	Checklists	Mean
Acadian Flycatcher	6.0	4.0	1.5	6.0	4.0	1.5	1.0	1.0	1.0	1.0	1.0	1.0
American Crow	61.0	11.0	5.5	48.0	19.0	2.5	550.0	1.0	550.0	32.0	13.0	2.5
American Goldfinch	79.0	51.0	1.5	98.0	55.0	1.8	18.0	7.0	2.6	72.0	34.0	2.1
American Redstart	14.0	10.0	1.4	48.0	27.0	1.8	5.0	4.0	1.3	12.0	9.0	1.3
American Robin	797.0	104.0	7.7	1131.0	171.0	6.6	209.0	28.0	7.5	690.0	104.0	6.6
Baltimore Oriole	28.0	16.0	1.8	16.0	15.0	1.1	2.0	1.0	2.0	23.0	14.0	1.6
Barred Owl	2.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bay-breasted Warbler	14.0	13.0	1.1	81.0	37.0	2.2	1.0	1.0	1.0	24.0	17.0	1.4
Black-and-white Warbler	13.0	7.0	1.9	25.0	13.0	1.9	1.0	1.0	1.0	15.0	11.0	1.4
Black-billed Cuckoo	4.0	3.0	1.3	1.0	1.0	1.0	0.0	0.0	0.0	2.0	2.0	1.0
Blackburnian Warbler	15.0	14.0	1.1	57.0	36.0	1.6	3.0	2.0	1.5	50.0	30.0	1.7
Black-capped Chickadee	23.0	13.0	1.8	16.0	6.0	2.7	5.0	3.0	1.7	39.0	8.0	4.9
Blackpoll Warbler	11.0	8.0	1.4	24.0	14.0	1.7	2.0	2.0	1.0	18.0	11.0	1.6
Black-throated Blue Warbler	9.0	8.0	1.1	16.0	10.0	1.6	2.0	1.0	2.0	7.0	6.0	1.2
Black-throated Green Warbler	48.0	26.0	1.8	100.0	50.0	2.0	3.0	2.0	1.5	60.0	28.0	2.1
Blue Jay	235.0	92.0	2.6	413.0	160.0	2.6	49.0	22.0	2.2	260.0	98.0	2.7
Blue-gray Gnatcatcher	17.0	14.0	1.2	10.0	7.0	1.4	0.0	0.0	0.0	9.0	7.0	1.3
Blue-headed Vireo	19.0	12.0	1.6	25.0	19.0	1.3	4.0	4.0	1.0	18.0	10.0	1.8
Blue-winged Warbler	0.0	0.0	0.0	2.0	2.0	1.0	0.0	0.0	0.0	4.0	4.0	1.0
Brown Creeper	5.0	3.0	1.7	27.0	20.0	1.4	4.0	1.0	4.0	8.0	4.0	2.0
Brown-headed Cowbird	37.0	20.0	1.9	32.0	20.0	1.6	3.0	2.0	1.5	25.0	16.0	1.6
Buteo sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0
Canada Goose	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Canada Warbler	1.0	1.0	1.0	4.0	3.0	1.3	0.0	0.0	0.0	1.0	1.0	1.0
Cape May Warbler	3.0	3.0	1.0	20.0	12.0	1.7	0.0	0.0	0.0	8.0	7.0	1.1
Carolina Chickadee	83.0	27.0	3.1	116.0	36.0	3.2	28.0	8.0	3.5	52.0	19.0	2.7
Carolina Wren	249.0	86.0	2.9	335.0	130.0	2.6	39.0	20.0	2.0	170.0	74.0	2.3
Carolina x Black-capped Chickadee (hybrid)	0.0	0.0	0.0	2.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Carolina/Black-capped Chickadee	205.0	73.0	2.8	325.0	96.0	3.4	37.0	10.0	3.7	151.0	52.0	2.9
Catharus sp.	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cedar Waxwing	195.0	41.0	4.8	508.0	70.0	7.3	57.0	6.0	9.5	248.0	27.0	9.2
Cerulean Warbler	0.0	0.0	0.0	2.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Chestnut-sided Warbler	14.0	10.0	1.4	47.0	26.0	1.8	1.0	1.0	1.0	29.0	19.0	1.5
Chimney Swift	47.0	15.0	3.1	98.0	44.0	2.2	9.0	3.0	3.0	91.0	22.0	4.1
Chipping Sparrow	6.0	1.0	6.0	1.0	1.0	1.0	0.0	0.0	0.0	3.0	3.0	1.0
Common Grackle	76.0	30.0	2.5	126.0	30.0	4.2	32.0	8.0	4.0	286.0	22.0	13.0
Common Nighthawk	0.0	0.0	0.0	2.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Common Raven	3.0	2.0	1.5	2.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Common Yellowthroat	1.0	1.0	1.0	27.0	19.0	1.4	1.0	1.0	1.0	3.0	3.0	1.0
Connecticut Warbler	0.0	0.0	0.0	5.0	5.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Cooper's Hawk	3.0	3.0	1.0	7.0	6.0	1.2	0.0	0.0	0.0	2.0	2.0	1.0
crow sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	3.0	1.0
Dark-eyed Junco	5.0	4.0	1.3	49.0	15.0	3.3	5.0	2.0	2.5	22.0	8.0	2.8
diurnal raptor sp.	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0
Double-crested Cormorant	0.0	0.0	0.0	4.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Downy Woodpecker	164.0	89.0	1.8	256.0	153.0	1.7	42.0	23.0	1.8	131.0	73.0	1.8
Downy/Hairy Woodpecker	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Eastern Bluebird	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Eastern Phoebe	12.0	11.0	1.1	17.0	15.0	1.1	2.0	2.0	1.0	11.0	10.0	1.1
Eastern Towhee	5.0	4.0	1.3	8.0	8.0	1.0	0.0	0.0	0.0	8.0	7.0	1.1
Eastern Wood-Pewee	40.0	27.0	1.5	59.0	41.0	1.4	3.0	3.0	1.0	46.0	23.0	2.0
Empidonax sp.	1.0	1.0	1.0	10.0	6.0	1.7	0.0	0.0	0.0	9.0	3.0	3.0
European Starling	40.0	3.0	13.3	60.0	6.0	10.0	7.0	2.0	3.5	4.0	1.0	4.0
Field Sparrow	0.0	0.0	0.0	2.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Fish Crow	2.0	2.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	4.0	3.0	1.3
Golden-crowned Kinglet	11.0	6.0	1.8	30.0	14.0	2.1	3.0	2.0	1.5	21.0	8.0	2.6
Gray Catbird	2.0	1.0	2.0	16.0	16.0	1.0	2.0	2.0	1.0	11.0	10.0	1.1
Gray-cheeked Thrush	1.0	1.0	1.0	7.0	7.0	1.0	0.0	0.0	0.0	1.0	1.0	1.0
Great Blue Heron	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Great Crested Flycatcher	2.0	2.0	1.0	8.0	7.0	1.1	0.0	0.0	0.0	5.0	4.0	1.3
Great Horned Owl	6.0	6.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	2.0	2.0	1.0
gull sp.	0.0	0.0	0.0	0.0	0.0	0.0	4.0	2.0	2.0	0.0	0.0	0.0
Hairy Woodpecker	70.0	48.0	1.5	76.0	61.0	1.2	16.0	13.0	1.2	44.0	33.0	1.3
Hermit Thrush	4.0	3.0	1.3	7.0	4.0	1.8	2.0	2.0	1.0	9.0	8.0	1.1
Hooded Warbler	7.0	6.0	1.2	9.0	8.0	1.1	0.0	0.0	0.0	5.0	5.0	1.0
House Finch	24.0	14.0	1.7	39.0	14.0	2.8	6.0	4.0	1.5	36.0	13.0	2.8
House Sparrow	2.0	1.0	2.0	20.0	7.0	2.9	11.0	2.0	5.5	1.0	1.0	1.0
House Wren	4.0	4.0	1.0	4.0	4.0	1.0	1.0	1.0	1.0	5.0	5.0	1.0

Bird Abundance

Bird abundance for each species across all months (June 2020 through December 2021) is presented in Table 1 as mean bird detections per checklist. We summed this measure for each area and determined that total bird abundance across the four monitoring areas did not differ substantially after American Crow was removed to account for a one-time observation of 550 individuals flying to a roost site. In rank order of total bird abundance: Clayton North (211), South Clayton West (200), Clayton East (186), and Nature Trail East (161). Most notable here is total abundance in Nature Trail East versus Clayton North.

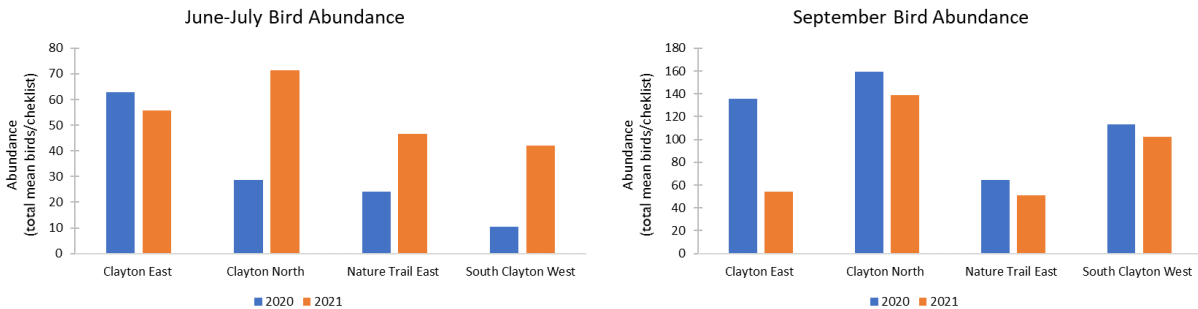


Figure 4. Bird abundance as total (summed across all species) mean birds per checklist for both breeding season (June-July) and fall migration (September) in each of the four restoration areas at Clayton Hill and for both years of monitoring. American Crow counts were removed to adjust for the bias of a one-time observation of a large flyover flock.

We also calculated overall bird abundance within each season across the four monitoring areas and both years (Figure 4). During the breeding season (June-July) in 2020, Clayton East had the highest bird abundance, more than double the abundance in each of the other monitoring areas. However, in 2021 we found an increase in breeding season bird abundance across all monitoring areas except Clayton East, which actually decreased. In 2021, Clayton North had the highest bird abundance as it more than doubled its 2020 abundance. These drastic changes could be correlated with an increased 2021 effort in Clayton North during June-July and a decreased effort during the same period in Clayton East (Figure 2). Similarly, this abundance is likely linked to parallel changes in bird species richness in these monitoring areas (Figure 3). That being said, the sharp increase in breeding season bird abundance in Clayton North should be examined together with changes in habitat structure and composition. A similar trend was seen for fall migration (September) bird abundance from 2020 to 2021 in Clayton East, but with an even greater decrease of about 60% (Figure 4). Fall migration abundance decreased across all monitoring areas from 2020 to 2021. Again, monitoring effort was lower during fall migration during 2021 across all areas and may be a factor in these trends as well.

We present individual bird species mean abundance (detections per checklist) for each year within each restoration area below. Table 1 shows the breeding season (June-July) and Table 2 shows fall migration (September). *Note: that not all species observed during June and July were necessarily breeders (i.e. Olive-sided Flycatcher was a migrant).* It is difficult to draw correlations with habitat restoration activities for individual species abundance changes just based on two seasons of data. We evaluate species abundance change results for each monitoring area across both years below:

Breeding Season (June-July 2020-2021)

Clayton East

- 15 species had higher abundance in 2021, including four of the highest abundance species: Mourning Dove, Northern Flicker, Tufted Titmouse, and Blue Jay
- 17 species had lower abundance in 2021, including American Robin which had the largest decrease of any species (-5.6 birds per checklist)
- 5 species had no change in abundance, including Wood Thrush – a forest interior Species of Greatest Conservation Need

Clayton North

- 28 species had higher abundance in 2021, including the five most abundant species: Common Grackle, House Finch, Red-winged Blackbird, American Robin, and Northern Cardinal
- 5 species had lower abundance in 2021, including Common Nighthawk – a Species of Greatest Conservation Need
- One species had no change in abundance: Scarlet Tanager – a forest interior Species of Greatest Conservation Need

Nature Trail East

- 11 species had higher abundance in 2021, including the three of the most abundant species: House Sparrow, American Robin, and Chimney Swift
- 6 species had lower abundance in 2021, including Wood Thrush – a forest interior Species of Greatest Conservation Need
- One species had no change in abundance: Red-eyed Vireo – a forest interior species

South Clayton West

- 20 species had higher abundance in 2021, including the three of the most abundant species: House Sparrow, American Robin, and Chimney Swift
- 2 species had lower abundance in 2021, including Red-eyed Vireo – a forest interior species
- 2 species had no change in abundance: Song Sparrow and Hairy Woodpecker

Fall Migration (September 2020-2021)

Clayton East

- 14 species had higher abundance in 2021, including the three of the most abundant species: House Sparrow, American Robin, and Chimney Swift
- 39 species had lower abundance in 2021, including four of the five most abundant species: European Starling, American Robin, Swainson's Thrush, and Wild Turkey
- 7 species had no change in abundance

Clayton North

- Connecticut Warbler, locally rare and an uncommon boreal breeding migrant statewide, was found here in 2020
- 19 species had higher abundance in 2021, including the two of the five most abundant species: American Robin and European Starling
- 57 species had lower abundance in 2021, including two of the five most abundant species: Swainson's Thrush and Cedar Waxwing
- 10 species had no change in abundance

Nature Trail East

- 12 species had higher abundance in 2021, including the most abundant species American Robin
- 23 species had lower abundance in 2021, including three of the five most abundant species: Carolina Chickadee, Common Grackle, and Cedar Waxwing
- 2 species had no change in abundance

South Clayton West

- 27 species had higher abundance in 2021, including two of the five most abundant species American Robin and Chimney Swift
- 37 species had lower abundance in 2021, including 19 species from 2020 that were not even detected here in 2021 (Table 3)
- 3 species had no change in abundance

As habitat restoration and monitoring of both birds and vegetation changes continues at Clayton Hill, we should begin to see what impacts the activities are having on the birds that occur there. Pittsburgh Parks Conservancy could consider selecting several focal species as indicators of change and utilize their education opportunities to track particular bird species nesting success through the breeding season and/or the use of particular habitat strata and plant species by stopover migrants during fall migration.

Table 2. Breeding season (June-July) mean abundance (detections per checklist) for 44 bird species observed through eBird monitoring across the four Clayton Hill restoration areas for both 2020 and 2021.

June-July Species	Clayton East		Clayton North		Nature Trail East		South Clayton West	
	2020	2021	2020	2021	2020	2021	2020	2021
American Crow	1	0	0	0	0	0	0	2
American Goldfinch	2	1	1	2.33	0	2	1.5	2
American Redstart	0	1	0	0	0	0	0	0
American Robin	8.18	2.6	3.5	6.15	3.5	9	2	3
Baltimore Oriole	0	0	0	0	0	0	0	2
Black capped Chickadee	0	2	0	2	0	0	0	0
Blue gray Gnatcatcher	1	1.5	0	0	0	0	0	0
Blue Jay	2.75	4	2	3.5	1.5	2.25	0	3.33
Brown headed Cowbird	2	1	0	0	0	0	0	1
Carolina Black capped Chickadee	3.5	2.83	2.5	2	4.5	0	0	1.67
Carolina Chickadee	2	0	0	2.25	0	0	0	0
Carolina Wren	3.54	1	1	1.5	0	1	1	0
Cedar Waxwing	2.25	3	2	1.5	0	0	0	2
Chimney Swift	1.67	0	0	1.4	0	5	0	0
Common Grackle	1	1	0	5.8	0	4.33	0	2
Common Nighthawk	0	0	1	0	0	0	0	0
Downy Woodpecker	2.11	2.33	1	1.88	1.5	1	0	3
Eastern Phoebe	1	0	0	0	0	0	0	0
Eastern Towhee	1	0	0	0	0	0	0	0
Eastern Wood Pewee	1	1	0	1	0	1	0	1
Gray Catbird	0	0	0	1	0	0	0	0
Hairy Woodpecker	1.25	1.33	0	1	0	1	1	1
Hooded Warbler	1	0	0	0	0	0	0	0
House Finch	0	0	0	4.67	0	0	0	0
House Sparrow	0	2	0	1.67	0	10	0	0
Indigo Bunting	1.36	1.17	1	1.83	0	0	0	0
Mourning Dove	1.75	4.33	0	2.67	0	0	0	2
Northern Cardinal	2.38	2.33	2	3.58	4.5	3	1	3
Northern Flicker	1.83	4	1	2.6	0	1.5	0	0.67
Olive sided Flycatcher	0	1	0	2	0	0	0	0
Orchard Oriole	0	0	1	0	0	0	0	0
Pileated Woodpecker	1.14	0	0	1	0	0	0	0
Red bellied Woodpecker	1.67	1.6	1	1.88	0	0	0	1.25
Red eyed Vireo	2.46	3	1.5	2.13	2	2	3	2
Red tailed Hawk	1	1	0	1	0	0	0	1
Red winged Blackbird	0	0	0	4.33	0	0	0	0
Rose breasted Grosbeak	1	0	0	0	0	0	0	0
Scarlet Tanager	1.14	1.4	1.5	1.5	0	0	0	1.5
Song Sparrow	0	0	1.5	2.14	0	0	1	1
Tufted Titmouse	2.9	4.2	2.2	2.6	1.5	2	0	2
White breasted Nuthatch	1.91	2	1	1.57	1	0	0	1
Wild Turkey	2	0	0	0	0	0	0	0
Wood Thrush	1	1	0	1	3	1.67	0	1
Yellow billed Cuckoo	1	1	1	0	1	0	0	0

Table 3. Fall migration (September) mean abundance (detections per checklist) for 94 bird species observed through eBird monitoring across the four Clayton Hill restoration areas for both 2020 and 2021.

September Species	Clayton East		Clayton North		Nature Trail East		South Clayton West	
	2020	2021	2020	2021	2020	2021	2020	2021
Acadian Flycatcher	2	0	1.5	0	1	0	0	1
American Crow	0	0	1.6	2	0	0	0	1
American Goldfinch	1.29	0	1.72	1.13	1	0	1.9	1
American Redstart	0	2	1.79	2	1	1	1	1.5
American Robin	9.47	2.75	5.74	12.93	1.67	20	6.06	7.33
Baltimore Oriole	0	0	1	0	0	0	0	0
Bay breasted Warbler	1	1	2.42	2.2	0	1	1.44	1
Black and white Warbler	1	0	1.33	0	0	1	1.5	0
Black capped Chickadee	2	0	3	0	2	0	8.33	3.5
Black throated Blue Warbler	1	1	1.67	0	0	0	1	1
Black throated Green Warbler	1	1.67	2	1.5	0	1	1.5	2.33
Blackburnian Warbler	1	1	1.5	1.4	0	0	2	1
Blackpoll Warbler	2	1	1.2	4.5	1	1	1.5	1.5
Blue gray Gnatcatcher	0	0	0	0	0	0	1	0
Blue headed Vireo	2	0	1.13	1.5	0	1	1.5	2.5
Blue Jay	2.67	2.17	3.06	3.16	3.2	3	3.04	2.77
Blue winged Warbler	0	0	1	0	0	0	0	0
Brown Creeper	0	0	0	1.5	0	0	0	3
Canada Goose	0	0	1	0	0	0	0	0
Canada Warbler	0	0	0	0	0	0	1	0
Cape May Warbler	1	1	1.67	1.5	0	0	1.25	1
Carolina Black capped Chickadee	3.43	2.33	3.89	3.5	3.5	0	3.23	1.75
Carolina Chickadee	3.78	3	4.42	2.5	4.67	2	2.5	4
Carolina Wren	2.7	1	3.29	1.9	1.5	1	2.62	1.44
Carolina x Black capped Chickadee hybrid	0	0	2	0	0	0	0	0
Cedar Waxwing	3.6	2	10.07	5.14	9	0	7.73	6
Chestnut sided Warbler	1.33	1.5	1.93	1.75	0	1	1.6	2
Chimney Swift	3.5	0	3.13	1	0	0	2.5	7.33
Common Grackle	1	0	1.5	1.8	4	3	0	1.5
Common Raven	0	0	0	1	0	0	0	0
Common Yellowthroat	0	0	1.47	1	0	0	1	0
Connecticut Warbler	0	0	1	0	0	0	0	0
Cooper s Hawk	0	1	1	2	0	0	0	0
Dark eyed Junco	0	0	0	2.67	0	0	0	0
Downy Woodpecker	1.58	1.8	1.52	2.06	2.5	1	1.59	1.73
Eastern Phoebe	1	0	0	1.5	0	0	2	0
Eastern Towhee	0	0	1	1	0	0	0	0
Eastern Wood Pewee	1.4	1	1.47	1.25	0	1	1.6	1.67
European Starling	30	0	3	30	0	0	0	0
Fish Crow	0	0	0	0	0	0	0	1.5
Golden crowned Kinglet	0	0	0	2	0	0	0	3
Gray Catbird	2	0	1	1	1	0	1	0
Gray cheeked Thrush	1	0	1	0	0	0	0	0
Great Crested Flycatcher	0	0	1	0	0	0	1	0
Great Horned Owl	1	0	1	0	0	0	1	0
Hairy Woodpecker	2	1	1.33	1.25	1.33	1	1.33	1.33
Hermit Thrush	0	0	0	0	0	0	1	0
Hooded Warbler	0	2	1.2	0	0	0	1	0
House Finch	1.75	1	4	2	0	0	1	0
House Sparrow	0	0	2	0	0	0	1	0
House Wren	0	1	1	0	0	0	0	0

Table 4. Continued. Fall migration (September) mean abundance (detections per checklist) for 94 bird species observed through eBird monitoring across the four Clayton Hill restoration areas for both 2020 and 2021.

September Species	Clayton East		Clayton North		Nature Trail East		South Clayton West	
	2020	2021	2020	2021	2020	2021	2020	2021
Indigo Bunting	3	0	2	0	0	0	1	0
Least Flycatcher	0	0	5	1.5	0	0	1	2
Lincoln s Sparrow	0	0	1	0	0	0	0	0
Magnolia Warbler	1	1	1.41	1	0	1	2	1.5
Marsh Wren	0	0	2	0	0	0	0	0
Mourning Dove	1.67	0	2.86	1	0	0	1.29	2
Mourning Warbler	0	0	1	1	0	0	0	0
Nashville Warbler	1	1	1.53	1	0	1	1	2
Northern Cardinal	1.29	1.67	2.57	2.23	2.8	1	2.19	2
Northern Flicker	3.36	1	1.98	1.2	2	0	1.79	1.4
Northern Parula	1	1	1	0	0	1	1	1
Ovenbird	1	0	1.38	1	0	0	1	0
Philadelphia Vireo	0	1	1.09	1	3	0	1	0
Pileated Woodpecker	1.9	1	1.41	1.8	3	0	1	1
Pine Warbler	0	0	0	0	0	0	0	1
Purple Finch	0	0	1	0	0	0	0	0
Red bellied Woodpecker	2.41	1	2.15	1.71	1.63	2	2.26	1.91
Red breasted Nuthatch	1	0	1	0	1	0	1	1
Red eyed Vireo	2.88	2	3.79	1.57	1	0	4.33	2.5
Red shouldered Hawk	0	0	0	0	0	0	1	0
Red tailed Hawk	1	0	1	1	1	0	2	1
Rose breasted Grosbeak	1	0	1	1	0	0	0	1
Ruby crowned Kinglet	0	0	0	1	0	0	0	1
Ruby throated Hummingbird	1	0	1	1	0	0	1	0
Scarlet Tanager	1	0	1.71	1	2	0	1.67	1
Song Sparrow	0	0	1.53	1	0	0	1	2.4
Swainson s Thrush	5.7	1	5.53	1.67	2	0	3.56	1.5
Tennessee Warbler	1	2.5	2.07	1.2	0	3	1.33	2
Tree Swallow	0	0	0	0	0	0	1	0
Tufted Titmouse	2.58	3.33	3.85	3.14	2.33	1.5	4	2.91
Turkey Vulture	0	0	1	0	0	0	0	0
Veery	0	0	1	1	0	0	0	1
Warbling Vireo	1	0	0	0	0	0	0	0
White breasted Nuthatch	1.36	2.25	1.62	1.75	2.2	1.5	1.43	1.5
Wild Turkey	4	0	4	0	0	0	0	0
Wilson s Warbler	0	0	1	0	0	0	0	0
Winter Wren	0	1	1	1	0	0	0	0
Wood Thrush	1	0	1.33	1	0	0	1	0
Yellow bellied Flycatcher	0	0	1	1	0	0	0	0
Yellow bellied Sapsucker	2	0	1.29	1.5	0	0	1	2
Yellow billed Cuckoo	0	0	1	1	0	0	0	1
Yellow rumped Warbler	0	1	1.33	1	0	0	0	0
Yellow throated Vireo	0	0	1.33	0	0	0	0	0