

Braddock Bay Ecosystem Restoration Monitoring Report-Fall 2016

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Vegetation Sampling

All of the plant data were collected between 19 July 2016 and 15 August 2016. Once entered into a spreadsheet, each plant species was given a corresponding C-score based on the New York State preliminary C-score list with reference to the Michigan C-score list. These C-scores for each individual species were then averaged to determine mean C-scores for each quadrat, which were then compiled for each zone (see below) and were used to calculate the Floristic Quality Assessment Index (FQAI) for each zone. This FQAI statistic is used to evaluate the nativeness of an area based on the plant species present. A C-score of 0 indicates non-native taxa with a widened range of tolerance in terms of environmental limits, with a score of 10 being a very specialized, narrow range of limits that the specific plant species can handle. These scores were then averaged to yield a mean FQAI and mean C-score for each transect, which were then grouped into zones. All of these data were averaged to determine a mean FQAI and C-score for all of the channel transects and all of the pothole transects, respectively. The means for total species within each quadrat, zone, and transect were calculated similarly. The overall mean values are shown in Table 1.

The calculated mean values show a trend of pothole transects having the highest mean FQAI and mean C-score, followed by channel transects, then the control quadrats. Pothole and channel transects both had 6.0 species in each quadrat, on average, as opposed to 4.7 within the control quadrats. From this broader point of view, we can then look further into Braddock Bay by separating these transect data to look at each individual habitat type within a group, or zone, that contains transects based on location or pothole variation.

We grouped channel transects into three zones (Figure 1) based on their location and proximity to one another. Throughout the three separate zones, there is a general trend of the sedge-grass meadow (SGM) having the highest values for mean FQAI and mean C-score (Table 2). The higher mean FQAI in SGM was driven by both higher mean-C and species richness within the zone. The sedge-grass zone is expected to have some species, such as *Carex lacustris* (C-score of 6.5), *Fraxinus pennsylvanica* (C-score of 5.5), and *Calamagrostis Canadensis* (C-score of 5) with C-scores higher than other habitat types in these transects. These species were present in

the sedge-grass meadow, which is expected, and created high zone FQAI values of 9.8 in Zone 1 and 8.4 in Zone 3 (Table 2). These data also show that the mound (M) habitat has the most species, on average, across all zones.

We were able to separate the pothole transects into two different groupings: 1) individual zones based on location and proximity to each other (Figure 2) and 2) connected vs isolated potholes (Figure 3). The only zone that does not differ between pothole groups is the zone of isolated potholes (Table 3 – zone 3, Table 4 – zone 2).

In group 1, the mound (M) habitats seem to have the highest FQAI values and average number of species (Table 3), which may be correlated since a greater number of plant species with a high C-score could potentially increase the average and FQAI. The mounds are expected to have some species with higher C-scores than the bench and deep water habitat types, such as *Decodon verticillatus* (C-score of 7.5), *Cephalanthus occidentalis* (C-score of 6.5), and *Thelyptris palustris* (C-score of 6). The deep water zone has the highest mean C-score, which can be attributed to the significantly fewer average plant species found in each plot. Very few species with higher C-scores will drive the average up. These species were mainly *Utricularia vulgaris* (C-score of 6) and *Stuckenia pectinata* (C-score of 5.5).

In Group 2, when data are grouped by connected vs isolated potholes (Figure 3), the results are the same, with the mound (M) habitats having the highest mean FQAI value and average species per plot, and the deep water zone having the highest mean C-score values (Table 4). Similar to the previous pothole groupings, species presence and abundance of certain species can explain these observations. The same species are responsible for these trends as those in the grouping based on location and proximity.

Within the channel transects, few species were dominant (mean cover percentage > 10.00) within each habitat type (Table 5). In the sedge grass meadow (SGM), the dominant vegetation was *Carex lacustris*, *Typha x glauca*, *Acer saccharinum*, and *Salix fragilis*, with all species having a mean percent cover of at least 10.0. In the treatment area (TR), the dominant vegetation was *Typha x glauca*, despite the fact that vegetation surveys were performed after the initial round of cattail treatment, and had a mean percent cover of 22.3. On the mounds (M), the dominant

vegetation included *Persicaria hydropiper*, *Lythrum salicaria*, *Persicaria lapathifolia*, and *Typha x glauca*. On the shallow bench (SB), the dominant vegetation was *Typha x glauca*, which had a mean percent cover of 48.9. On the intermediate bench (IB), the dominant vegetation was *Hydrocharis morsus-ranae*, *Lemna minor*, *Elodea canadensis*, and *Utricularia vulgaris*. Within the channel (C), the dominant vegetation was *Utricularia vulgaris* and *Hydrocharis morsus-ranae*, with mean percent covers of 22.0 and 11.0, respectively.

Within the pothole transects, there were even fewer dominant plant species within each habitat type (Table 6). The deep water zone (D) was the zone with the least vegetative cover in the pothole transects, and only *Utricularia vulgaris* was dominant with a mean percent cover of 17.7. On the bench habitat (B), only *Hydrocharis morsus-ranae* was dominant, and had a mean percent cover of 25.2. The mounds (M) had the most vegetation on the pothole transects; *Lythrum salicaria* and *Typha x glauca* were the dominant vegetation, with mean percent cover of 38.8 and 16.7, respectively. Lastly, within the control quadrats, only *Typha x glauca* was dominant (Table 7).

Bird and Anuran

Although grant contract writing process was not complete at the time, The College at Brockport surveyed the bird and amphibian community in Braddock Bay during the spring of 2016 for another project, and these data were made available for the restoration project monitoring. Surveys were conducted at three locations throughout the bay (Figure 4), with three visits for the anuran community that followed traditional Marsh Monitoring Protocol (MMP) timing. Anuran surveys were 3 minutes long, with surveyors recording all species detected in the marsh using call codes that serve as an index of abundance. Call code descriptions are provided in Appendix 1. The bird community was surveyed with an intensified version of the MMP, using roughly weekly samples during the bird survey period for five surveys per point. Methods set forth in MMP were followed for survey weather limitations, survey timing and length, and data recording. Briefly, these include morning (half hour before to four hours after sunrise) and evening surveys (four hours before to one half hour after sunset); each survey was 15 minutes long and contained 5 minutes of passive listening, 5 minutes of

marsh bird song audio playback to entice calls, and a final 5 minutes of passive listening; all birds detected either aurally or visually were recorded.

A total of 28 and 25 bird species were detected in survey stations 1 and 2, the survey locations that cover the cattail treatment, channel, and pothole portions of the restoration (Table 8). Survey station 3, the station furthest away from the cattail treatment, channel, and potholes of the restoration had 27 species present. Red-Winged Blackbird (*Agelaius phoeniceus*) was the most commonly detected species across all points, with a total of 100 individuals detected, across the three locations and was generally more prevalent in survey stations 1 and 2. Barn Swallow (*Hirundo rustica*), Marsh Wren (*Cistothorus palustris*), Ring-Billed Gull (*Larus delawarensis*), and Tree Swallow (*Tachycineta bicolor*) were the next four most commonly detected species, each with greater than 50 detections across all surveys and locations. Two invasive bird species, Mute Swan (*Cygnus olor*) and Double-Crested Cormorant (*Phalacrocorax auritus*) were detected in the surveys and were mostly observed at survey station 3, the station with the best view of open water where these species are often detected. Few marsh-nesting obligate focal species were detected, with only two Least Bittern (*Ixobrychus exilis*), one American Bittern (*Botaurus lentiginosus*), and one American Coot (*Fulica americana*) detected across all surveys and locations. Both Least Bitterns were detected at station 3, away from the marsh restoration activities, while the single American Coot and American Bittern were detected at survey station 2, close to the restoration activities.

Six anuran species were detected during the three surveys in spring of 2016 (Table 9). We report anuran abundance data using only the maximum call code (Appendix 1) recorded by species as the maximum call code mitigates some of the issues encountered with estimating calling anuran abundance, including their sensitivity to slight weather changes affecting calling intensity and the difficulty in estimating the true abundance in the field based on calls. American bullfrog (*Lithobates catesbeianus*) and American toad (*Anaxyrus americanus*) were the species of the lowest calling intensity, call code 1. Green frog (*Lithobates clamitans*), grey tree frog (*Hyla versicolor*), and leopard frog (*Lithobates pipiens*) were detected in greater numbers, call code 2.

Finally, spring peeper (*Pseudacharis crucifer*) was the only species to be detected in Braddock Bay with a full chorus, call code 3.

Tables

Table 1. Overall FQAI, mean C, and mean species richness values based on the different sampling areas.

	<i>Control Quadrats</i>	<i>Channel Transects</i>	<i>Pothole Transects</i>
Mean FQAI	5.6	6.4	6.8
Mean C	2.4	2.6	3.0
Mean # of spp.	4.7	6.0	6.0

Table 2. FQAI, mean C, and mean species richness for all channel transects and individual zonation of these transects based on location, with zone groupings shown in Figure 1 (SGM = Sedge-grass meadow, TR = Treatment area, M = Mound habitat, SB = Shallow Bench habitat, IB = Intermediate Bench habitat, C = Channel habitat).

ALL CHANNEL ZONES							
<i>All Zones</i>		SGM	TR	M	SB	IB	C
	Mean FQAI	8.4	6.2	6.8	4.9	5.9	5.9
	Mean C	3.5	2.5	2.5	2.0	2.4	3.0
	Mean # of spp.	6.1	6.3	7.6	5.6	6.1	4.5
<i>Zone 1</i>		SGM	TR	M	SB	IB	C
	Mean FQAI	9.8	6.0	7.2	6.6	6.6	5.3
	Mean C	3.7	2.5	2.6	2.5	2.6	2.5
	Mean # of spp.	7.6	5.6	8.1	6.9	7.0	4.8
<i>Zone 2</i>		SGM	TR	M	SB	IB	C
	Mean FQAI	6.5	5.9	6.1	4.3	5.2	5.7
	Mean C	3.4	2.2	2.3	1.8	2.1	2.9
	Mean # of spp.	3.8	8.8	7.2	5.8	5.9	4.3
<i>Zone 3</i>		SGM	TR	M	SB	IB	C
	Mean FQAI	8.4	5.5	6.8	3.1	5.5	6.9
	Mean C	2.9	2.7	2.5	1.5	2.4	3.9
	Mean # of spp.	6.3	6.8	7.4	4.0	5.8	4.3

Table 3. FQAI, mean C, and mean species richness for all pothole transects and individual zonation of these transects based on their location, with transect and quadrat zone groupings shown in Figure 2 (D = Deep water habitat, B = Bench habitat, M = Mound habitat).

ALL POTHOLE ZONES				
All Zones		D	B	M
	Mean FQAI	5.2	7.1	8.0
	Mean C	3.6	2.7	2.8
	Mean # of spp.	2.4	7.3	8.4
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Zone 1		D	B	M
	Mean FQAI	5.3	6.4	9.7
	Mean C	3.0	2.2	3.1
	Mean # of spp.	3.3	8.0	9.7
Zone 2		D	B	M
	Mean FQAI	5.2	7.4	5.8
	Mean C	3.5	2.5	2.1
	Mean # of spp.	2.4	8.5	8.2
Zone 3		D	B	M
	Mean FQAI	4.6	5.5	8.1
	Mean C	4.8	3.4	3.0
	Mean # of spp.	0.7	3.0	8.4
Zone 4		D	B	M
	Mean FQAI	5.7	7.9	10.1
	Mean C	3.9	2.6	3.2
	Mean # of spp.	2.2	8.8	9.1
Zone 5		D	B	M
	Mean FQAI	5.3	7.6	7.7
	Mean C	3.1	2.6	2.8
	Mean # of spp.	3.3	8.0	7.3

Table 4. FQAI, mean C, and mean species richness for the connected and isolated potholes, with quadrat and transect groupings shown in Figure 3 (D = Deep water habitat, B = Bench habitat, M = Mount habitat).

<i>Connected potholes</i>				
<i>Zone 1</i>		D	B	M
	Mean FQAI	5.3	7.4	7.9
	Mean C	3.4	2.5	2.7
	Mean # of spp.	2.8	8.3	8.4
<i>Isolated potholes</i>				
<i>Zone 2</i>		D	B	M
	Mean FQAI	4.6	5.5	8.1
	Mean C	4.8	3.4	3.0
	Mean # of spp.	0.7	3.0	8.4

Table 5. Mean percent cover by species found in channel transects (SGM = Sedge-grass meadow, TR = Treatment area, M = Mound habitat, SB = Shallow Bench habitat, IB = Intermediate Bench habitat, C = Channel habitat).

<i>Channel Transects</i>						
SPECIES	SGM	TR	M	SB	IB	C
Acer saccharinum	10.0	1.8	0.0	0.0	0.0	0.0
Acer spp.	0.0	0.5	0.1	0.1	0.0	0.0
Alisma triviale	0.0	0.2	0.0	0.0	0.0	0.0
Apios americana	0.5	0.1	0.0	0.0	0.0	0.0
Asclepias incarnata	0.0	0.0	0.1	0.0	0.0	0.0
Azolla caroliniana	0.0	0.0	0.0	0.0	0.1	0.1
Bidens cernua	0.0	1.3	1.4	0.2	0.2	0.2
Bidens frondosa	0.2	2.1	2.8	5.8	0.3	0.2
Butomus umbellatus	0.0	0.0	0.0	0.0	0.1	0.5
Calamagrostis canadensis	8.9	0.7	1.5	0.0	0.0	0.0
Calystegia sepium	1.4	0.4	0.3	0.2	0.0	0.0
Carex comosa	0.0	0.0	0.1	0.0	0.0	0.0
Carex lacustris	22.1	1.9	3.3	1.8	0.2	0.3
Carex stricta	0.0	0.0	1.1	0.2	0.0	0.0
Ceratophyllum demersum	0.0	0.0	0.0	0.0	1.4	8.0
Chamerion angustifolium	0.0	0.0	0.0	0.2	0.0	0.0
Chara vulgaris	0.0	0.0	0.0	0.0	1.5	0.7
Cicuta bulbifera	0.0	0.5	0.4	3.6	1.0	0.1
Cirsium arvense	0.2	0.2	0.9	0.9	0.0	0.0
Cornus spp.	0.7	0.0	0.0	0.0	0.0	0.0
Cuscuta spp.	0.0	0.0	0.0	0.2	0.0	0.0
Cyperus esculentus	0.0	0.9	2.6	0.4	0.5	0.1
Cyperus fuscus	0.0	0.0	0.1	0.0	0.0	0.0
Cyperus odoratus	0.0	0.4	0.2	0.0	0.0	0.0
Decodon verticillatus	0.0	0.0	1.1	0.0	0.0	0.0
Dichanthelium clandestinum	0.2	0.0	0.0	0.0	0.0	0.0
Eleocharis obtusa	0.0	0.2	0.1	0.0	0.0	0.0
Elodea canadensis	0.0	0.0	0.0	0.0	10.5	9.4
Elymus virginicus	1.3	0.0	0.3	0.0	0.0	0.0
Equisetum arvense	0.8	0.0	0.0	0.0	0.0	0.0
Eupatorium spp.	0.0	0.0	0.1	1.8	0.0	0.0
Fraxinus pennsylvanica	5.5	0.0	0.0	0.0	0.0	0.0
Galium trifidum	1.3	4.2	9.3	8.7	0.3	0.1
Hibiscus moscheutos	0.0	1.4	0.0	0.2	0.0	0.0
Hydrocharis morsus-ranae	0.0	0.9	0.1	6.6	37.1	11.0

<i>Impatiens capensis</i>	1.3	1.3	0.2	1.9	0.0	0.0
<i>Iris</i> spp.	1.7	0.8	0.6	0.4	0.0	0.0
<i>Juncus effusus</i>	0.3	0.4	0.0	0.0	0.0	0.0
<i>Juncus</i> spp.	0.0	0.1	0.3	0.0	0.0	0.0
<i>Lathyrus palustris</i>	0.5	0.0	0.0	0.0	0.0	0.0
<i>Lemna minor</i>	0.0	0.1	0.0	0.2	13.8	5.6
<i>Lemna trisulca</i>	0.0	0.0	0.0	0.0	0.5	0.0
<i>Lycopus americanus</i>	0.3	0.4	0.4	0.4	0.0	0.0
<i>Lycopus</i> spp.	0.0	0.0	0.0	0.1	0.0	0.0
<i>Lycopus virginicus</i>	0.7	0.3	0.1	0.0	0.0	0.0
<i>Lythrum salicaria</i>	1.6	4.1	12.5	4.1	0.2	0.0
<i>Mentha arvensis</i>	4.5	1.3	0.7	1.0	0.1	0.0
<i>Myosotis scorpioides</i>	0.0	0.1	0.5	0.2	0.0	0.0
<i>Myriophyllum spicatum</i>	0.0	0.0	0.0	0.0	5.2	5.6
<i>Najas flexilis</i>	0.0	0.0	0.0	0.0	0.2	0.0
<i>Najas minor</i>	0.0	0.0	0.0	0.0	2.1	4.2
<i>Nymphaea odorata</i>	0.0	0.0	0.0	0.0	0.2	0.9
<i>Onoclea sensibilis</i>	1.3	0.0	0.0	0.0	0.0	0.0
<i>Oxybasis glauca</i>	0.0	0.0	0.0	0.0	0.0	0.0
<i>Persicaria amphibia</i>	0.0	0.3	0.1	0.1	0.2	0.1
<i>Persicaria hydropiper</i>	1.7	1.7	19.8	1.6	0.0	0.0
<i>Persicaria hydropiperoides</i>	7.8	1.5	5.4	1.0	0.0	0.0
<i>Persicaria lapathifolia</i>	0.9	0.5	11.4	0.0	0.0	0.0
<i>Persicaria maculosa</i>	0.3	0.0	0.2	0.0	0.0	0.0
<i>Persicaria sagittata</i>	1.8	0.9	3.2	0.6	0.0	0.0
<i>Persicaria</i> spp.	0.5	0.0	0.0	0.0	0.0	0.0
<i>Populus tremuloides</i>	4.2	0.0	0.0	0.0	0.0	0.0
<i>Potamogeton crispus</i>	0.0	0.0	0.0	0.0	0.1	0.6
<i>Potamogeton folioses</i>	0.0	0.0	0.0	0.0	0.7	0.2
<i>Ranunculus aquatilis</i>	0.0	0.2	0.1	0.0	0.0	0.0
<i>Ranunculus</i> spp.	0.2	0.0	0.1	0.0	0.0	0.0
<i>Rhus typhina</i>	0.0	0.0	0.1	0.0	0.0	0.0
<i>Rorippa palustris</i>	0.0	0.0	0.5	0.0	0.0	0.0
<i>Rumex orbiculatus</i>	0.0	0.0	2.5	0.0	0.0	0.0
<i>Sagittaria latifolia</i>	0.0	0.2	0.6	2.9	0.2	0.1
<i>Salix fragilis</i>	10.0	0.0	0.0	0.0	0.0	0.0
<i>Schoenoplectus tabernaemontani</i>	0.0	0.1	0.0	0.0	0.0	0.0
<i>Scirpus fluviatilis</i>	0.2	0.5	0.2	0.0	0.0	0.0
<i>Scutellaria galericulata</i>	0.9	0.2	0.8	0.4	0.0	0.0
<i>Solanum dulcamara</i>	0.0	0.2	0.2	0.2	0.0	0.0
<i>Sparganium</i> spp.	0.2	2.2	0.6	0.3	2.0	0.5

<i>Spiraea latifolia</i>	0.2	0.0	0.0	0.0	0.0	0.0
<i>Stuckenia pectinata</i>	0.0	0.0	0.0	0.0	8.7	2.8
<i>Thelyptris palustris</i>	1.0	0.4	0.0	0.0	0.0	0.0
<i>Typha x glauca</i>	10.0	22.3	11.6	48.9	1.2	0.3
Unknown fungus	0.0	0.0	0.0	0.0	0.0	0.0
Unknown moss	0.2	0.0	0.0	0.0	0.0	0.0
<i>Utricularia vulgaris</i>	0.0	0.0	0.0	0.0	10.2	22.0
<i>Verbena hastata</i>	1.0	0.8	4.0	1.8	0.0	0.0
<i>Vitis riparia</i>	1.7	0.0	0.0	0.0	0.0	0.0

Table 6. Mean percent cover by species found in pothole transects (D = Deep water habitat, B = Bench habitat, M = Mount habitat).

<i>Pothole Transects</i>			
SPECIES	D	B	M
Alisma triviale	0.0	0.9	0.0
Azolla caroliniana	0.0	0.1	0.0
Bidens cernua	0.0	2.5	0.7
Bidens frondosa	0.1	1.3	0.8
Calystegia sepium	0.0	0.0	0.1
Carex lacustris	0.0	0.2	0.1
Carex spp.	0.0	0.0	0.1
Cephalanthus occidentalis	0.0	0.0	1.9
Ceratophyllum demersum	0.3	0.2	0.0
Chamerion angustifolium	0.0	0.0	0.1
Chara spp.	1.9	0.0	0.0
Cicuta bulbifera	0.0	0.9	0.4
Cirsium arvense	0.0	0.0	0.8
Comarum palustre	0.0	0.0	0.1
Cuscuta spp.	0.0	0.3	2.0
Cyperus esculentus	0.1	3.0	1.4
Decodon verticillatus	0.2	2.6	7.3
Eleocharis obtusa	0.1	2.0	0.3
Elodea canadensis	1.0	0.0	0.0
Elymus virginicus	0.0	0.0	0.2
Gallium trifidum	0.0	3.4	9.6
Hydrocharis morsus-ranae	1.8	25.1	0.1
Impatiens capensis	0.0	0.2	9.4
Juncus canadensis	0.0	0.1	0.0
Juncus effusus	0.3	0.2	0.0
Juncus spp.	0.0	0.1	0.2
Lemna minor	1.2	4.3	0.1
Lemna trisulca	0.0	0.6	0.0
Lycopus americanus	0.0	0.0	0.1
Lycopus virginicus	0.0	0.2	0.8
Lythrum salicaria	0.1	9.0	38.8
Myriophyllum spicatum	1.8	0.5	0.0
Najas minor	0.2	0.1	0.0
Persicaria amphibia	0.1	0.3	0.2

Persicaria hydropiper	0.0	0.8	8.1
Persicaria hydropiperoides	0.0	0.0	2.1
Persicaria lapathifolia	0.0	0.0	1.8
Persicaria maculosa	0.0	0.0	0.5
Persicaria sagittata	0.0	0.0	1.7
Pontederia cordata	0.0	0.1	0.0
Potamogeton folioses	0.1	0.0	0.0
Ranunculus aquatilis	0.0	0.1	0.0
Rhus typhina	0.0	0.0	0.6
Rorippa palustris	0.0	0.0	1.3
Sagittaria latifolia	0.4	1.6	0.2
Schoenoplectus tabernaemontani	0.0	0.0	0.1
Scutellaria galericulata	0.0	0.0	1.5
Solanum dulcamara	0.0	0.0	0.5
Sparganium spp.	0.5	3.0	0.2
Stuckenia pectinata	2.5	0.0	0.0
Thelyptris palustris	0.0	2.7	6.1
Typha x glauca	0.5	7.4	16.7
Unknown algae (1)	0.6	0.0	0.0
Unknown fern (1)	0.0	0.0	0.2
Unknown forb (1)	0.0	0.0	0.1
Unknown forb (2)	0.0	0.0	0.2
Unknown moss (1)	0.0	0.0	0.2
Unknown SAV (1)	0.2	0.0	0.0
Utricularia vulgaris	17.7	4.2	0.0
Verbena hastata	0.0	0.7	4.4
Vitis spp.	0.0	0.0	0.1

Table 7. Mean percent cover by species found in control quadrats in the unrestored cattail zone (CAT = cattail mat).

<i>Control Quadrats</i>	
SPECIES	CAT
Bidens frondosa	1.2
Calystegia sepium	2.8
Cicuta bulbifera	0.5
Decadon verticillatus	2.8
Galium trifidum	1.3
Hibiscus moscheutos	5.0
Hydrocharis morsus-ranae	0.2
Impatiens capensis	9.7
Juncus canadensis	2.2
Lathyrus palustris	0.8
Lemna minor	1.3
Lycopus virginicus	0.2
Lythrum salicaria	2.3
Mentha arvensis	0.5
Onoclea sensibilis	0.7
Persicaria amphibia	0.3
Persicaria hydropiper	0.8
Persicaria hydropiperoides	3.0
Phragmites australis	2.5
Sagittaria latifolia	1.3
Scirpus fluviatilis	0.2
Scutellaria galericulata	2.5
Solanum dulcamara	1.8
Sphagnum spp.	6.2
Thelyptris palustris	6.8
Triadenum fraseri	0.5
Typha x glauca	51.7
Unknown fern (1)	2.3
Verbena hastata	3.3

Table 8: Bird species ranked by total abundance across the three survey stations in Braddock Bay during the spring 2016 surveys. Abundance data show the total number of detections across five surveys for each location.

Species	Braddock 1	Braddock 2	Braddock 3	Total Abundance
Red-Winged Blackbird	39	39	22	100
Barn Swallow	29	13	12	54
Marsh Wren	30	7	17	54
Ring-Billed Gull	19	29	5	53
Tree Swallow	23	11	18	52
Swamp Sparrow	13	21	2	36
Yellow Warbler	6	8	11	25
Canada Goose	19	5		24
Common Yellowthroat	10	7	3	20
Song Sparrow	6	10	4	20
Mute Swan	2		16	18
Wilson's Flycatcher	7	6	1	14
Common Grackle	2	3	7	12
Mallard	9		3	12
European Starling	6		4	10
Caspian Tern	3		6	9
American Robin	4	2	2	8
American Goldfinch		6	1	7
Warbling Vireo	2		5	7
Gray Catbird	1	1	4	6
Purple Martin		3	3	6
Cedar Waxwing		1	4	5
Northern Cardinal	3		2	5
Bank Swallow	3			3
Double-Crested Cormorant	1		2	3
Eastern Kingbird	3			3
Osprey		3		3
Bald Eagle	1	1		2
Great Blue Heron		1	1	2
Killdeer		2		2
Least Bittern			2	2
American Bittern		1		1
American Coot		1		1
American Kestrel		1		1
Baltimore Oriole			1	1
Bobolink	1			1
Great-crested Flycatcher		1		1
Great Egret			1	1
Mourning Dove	1			1

Northern Rough-Winged Swallow	1			1
Red-Bellied Woodpecker	1			1
Grand Total	245	183	159	587

Table 9: Anuran species detected in Braddock Bay in spring 2016, ranked by the maximum call code. Call code descriptions are provided in Appendix 1.

Common Name	Scientific Name	Maximum Call Code
American bullfrog	<i>Lithobates catesbeianus</i>	1
American toad	<i>Anaxyrus americanus</i>	1
Green frog	<i>Lithobates clamitans</i>	2
Grey tree frog	<i>Hyla versicolor</i>	2
Northern leopard frog	<i>Lithobates sylvaticus</i>	2
Spring peeper	<i>Pseudacris crucifer</i>	3
Species Richness		6

Figures

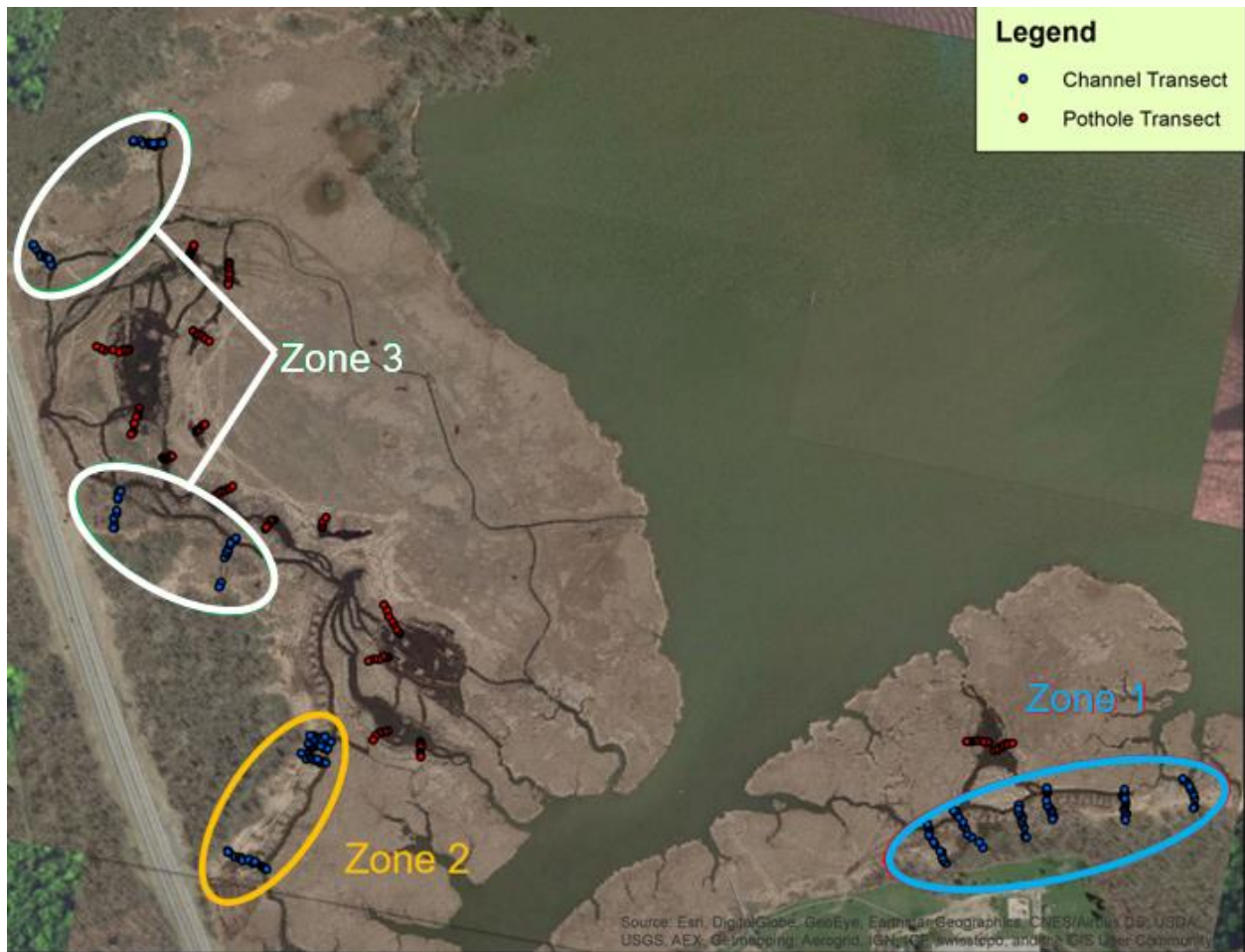


Figure 1. Transect grouping for channel transects, with data presented in Table 2.

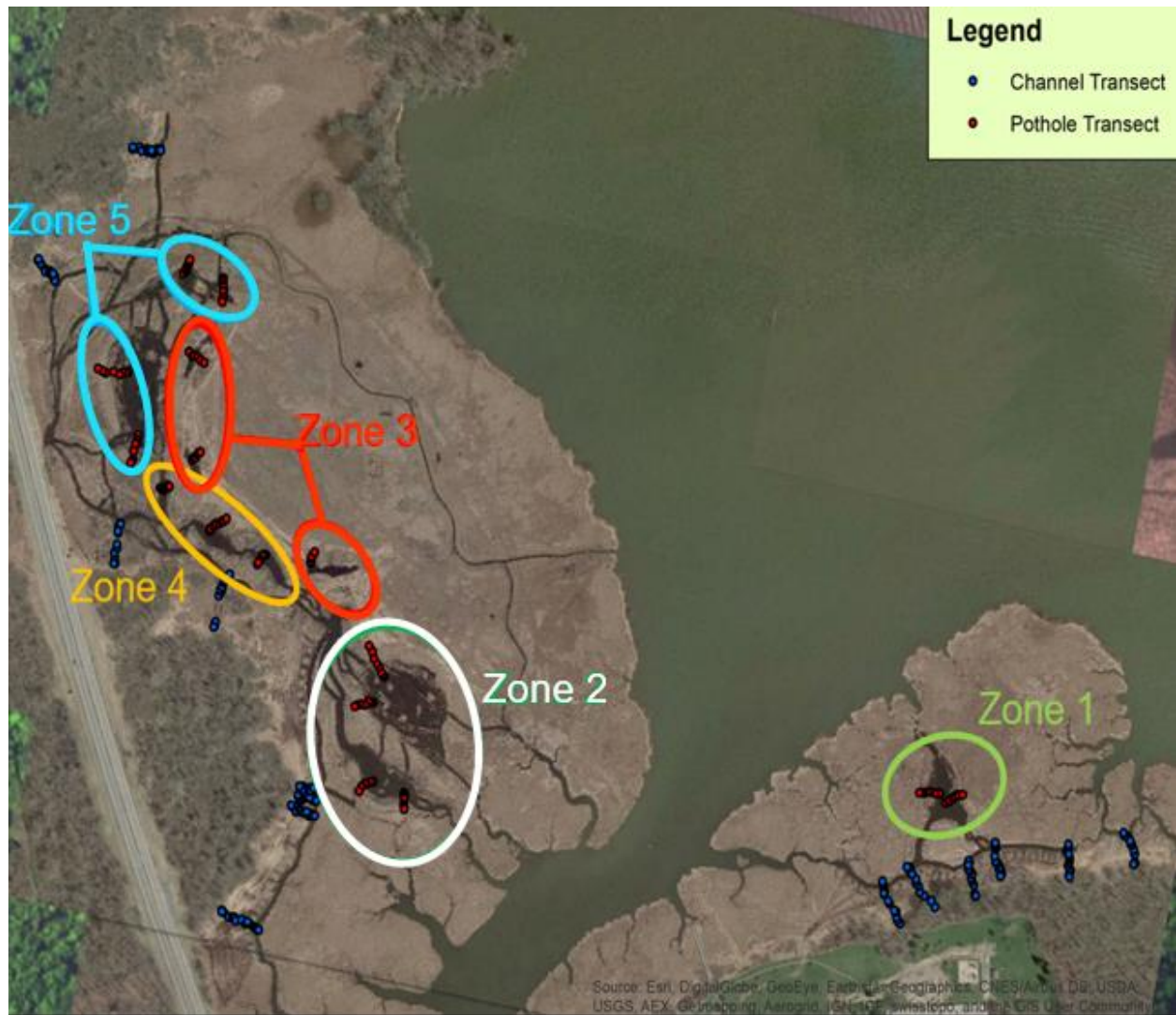


Figure 2. Quadrat and transect grouping to calculate FQAI for the pothole and channel transect breakout, with data shown in Table 3.



Figure 3. Transect and quadrat grouping used to calculate FQAI for connected and isolated potholes, with data shown in Table 4.

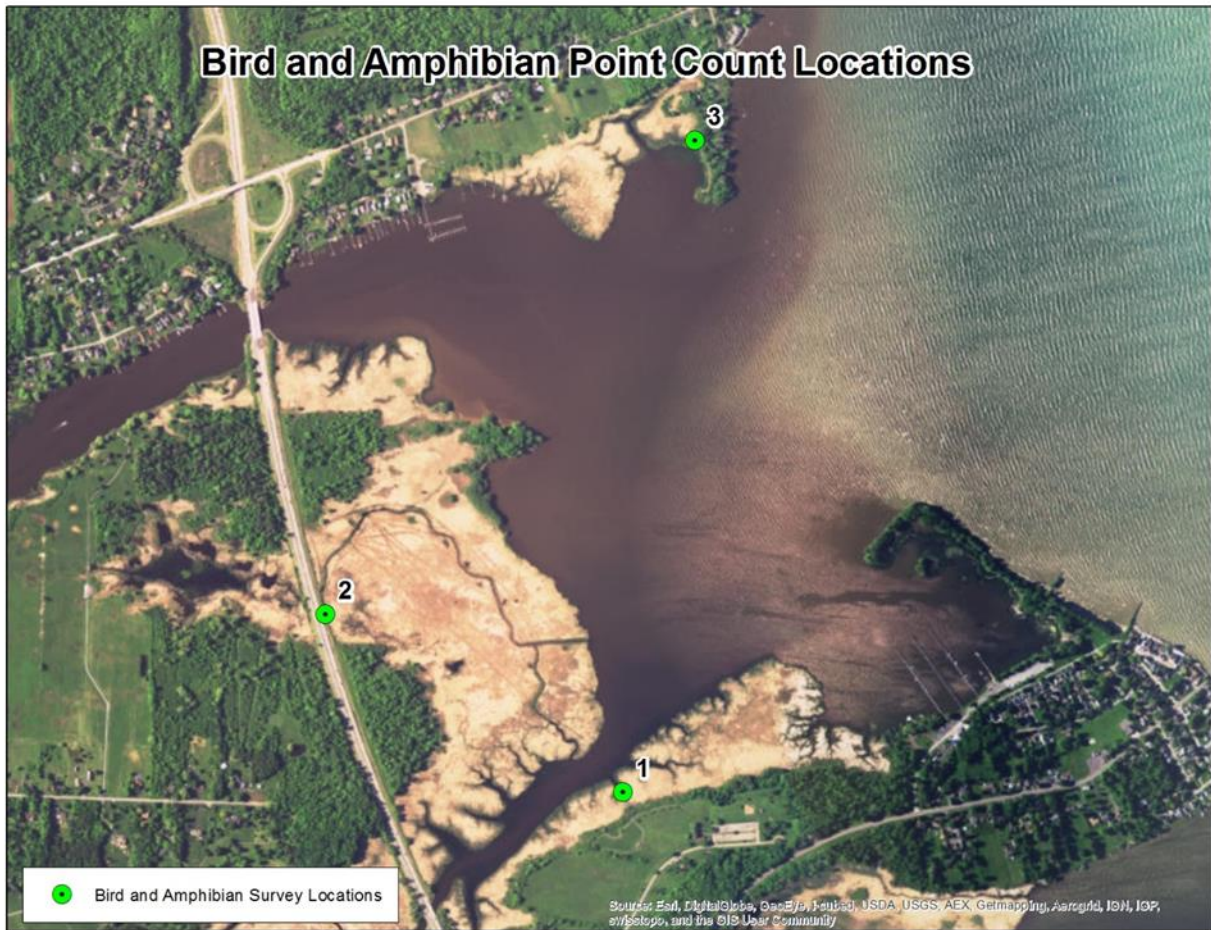


Figure 4: Spring 2016 bird and anuran survey locations in Braddock Bay.

Appendices

Appendix 1: Description of the anuran call codes.

Call Code	
1	Calls not simultaneous, number of individuals can be accurately counted.
2	Some calls simultaneous, number of individuals can be reliably estimated.
3	Full chorus, calls continuous and overlapping, number of individuals cannot be estimated.
