Beneficial Use Impairment Removal Project

Niagara River Area of Concern
Marsh Anuran and Avian Population Monitoring
Year 3 (2016) Survey Report

December 7, 2016

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1.0 INTRODUCTION

1.1 BACKGROUND

In 1987 the governments of the United States (U.S.) and Canada identified several areas within the Great Lakes region where environmental degradation had occurred due to historic pollution and habitat degradation. The areas were identified and designated for remediation and restoration and referred to as Areas of Concern (AOC). Remedial Action Plans (RAPs) were developed for each AOC and each RAP identified beneficial use impairments (BUI) (i.e., negatively affected chemical, physical, and/or biological properties associated with the AOC) that required restoration or remediation to remove the impairment from the list of BUIs associated with AOCs. The 37-mile long Niagara River waterway, which flows from Lake Erie to Lake Ontario, was identified as one of the forty-three AOCs for the Great Lakes region. The Niagara River AOC (NR AOC) is divided into two portions, the New York portion located on the U.S. side of the river; and the Ontario portion located on the Canadian side of the river; each are managed separately. On the U.S. side, the NR AOC extends from Smokes Creek at Buffalo Harbor north to the Niagara River's mouth at Lake Ontario (Figure 1).

The New York State Department of Environmental Conservation (NYSDEC) is currently funded by the U.S. Environmental Protection Agency (USEPA) to coordinate the Niagara River RAP. Because the Niagara River AOC is a binational AOC, the NYSDEC is coordinating technical assessments and regulatory efforts with the Canadian Niagara River RAP managers. A RAP was developed for the New York portion of the NR AOC (NYSDEC 1994), which identifies and provides the rationale and subsequent remediation plans for several BUIs. A 2012 addendum to the RAP (NR AOC Stage 2 Addendum) describes updated BUI-specific delisting criteria. Included in the delisting criteria for the "Degradation of Fish and Wildlife Populations" BUI, are assessments of 5-year trends in populations of sentinel native species representing the range of trophic levels within aquatic ecosystems (Filipski 2012). In February, 2012, the U.S. Fish and Wildlife Service (USFWS) New York Field Office (NYFO) was contacted by the U.S. Environmental Protection Agency (USEPA) Great Lakes National Program Office (GLNPO) to conduct population trend assessments for the Northern Leopard Frog (*Lithobates pipiens*), American Toad (*Anaxyrus americanus*), Bullfrog (*Lithobates catesbeianus*), and several species of marsh birds (e.g. rails, bitterns, snipe, and grebes) within the NR AOC to support a determination of the status of the "Degradation of Fish and Wildlife Populations" BUI. The species of interest are sentinel native species that represent the mid-level food chain within the Niagara River aquatic ecosystem.

In February 2014, the NYFO and NYSDEC issued a Scope of Work for performance of NR AOC marsh anuran and avian population monitoring surveys (USFWS 2014). Following the criteria outlined in the Scope of Work, in April 2014 a Work Plan was developed, which identified the survey protocols to be used over a 5-year period (2014-2018) for assessing the "Degradation of Fish and Wildlife Populations" BUI within the NR AOC and is hereafter referred to as the "Work Plan" (NewEarth 2014). The Work Plan specifically identified methods used for conducting surveys to facilitate population trend assessments for sentinel native anuran species and focal marsh bird species known to occur in the NR AOC. Anuran species targeted for population trend assessments include the northern leopard frog, American toad and the bullfrog. Targeted focal marsh bird species include Least Bittern (*Ixobrychus exilis*), Sora

(*Porzana carolina*), Virginia Rail (*Rallus limicola*), King Rail (*Rallus elegans*), American Bittern (*Botarus lentiginosus*), Common Gallinule (*Gallinula galeata*), American Coot (*Fulica americana*), and Pied-billed Grebe (*Podilymbus podiceps*).

This report provides a summary of the 2016 survey effort, which marks the third year of the sampling conducted in support of the 2014-2018 NR AOC Marsh Anuran and Marsh Bird Population Monitoring Project (Project). A summary of the methods used during the marsh anuran and avian monitoring effort are provided in Section 2.0 of this report. Results from the Year 3 monitoring effort are provided in Section 3.0, and a discussion of results is provided in Section 4.0. Appendices include photographs (Appendix A), the coordinate locations for survey points (Appendix B), completed 2016 survey data forms and raw data for anurans (Appendix C) and marsh birds (Appendix D); and. Marsh habitat data forms (Appendix E).

1.2 STUDY AREA

This study focused on the New York portion of the NR AOC located on the U.S. side of the Niagara River and extending from Tifft Nature Preserve near Buffalo Harbor north to the mouth of the Niagara River at Lake Ontario (Figure 1).

2.0 METHODS

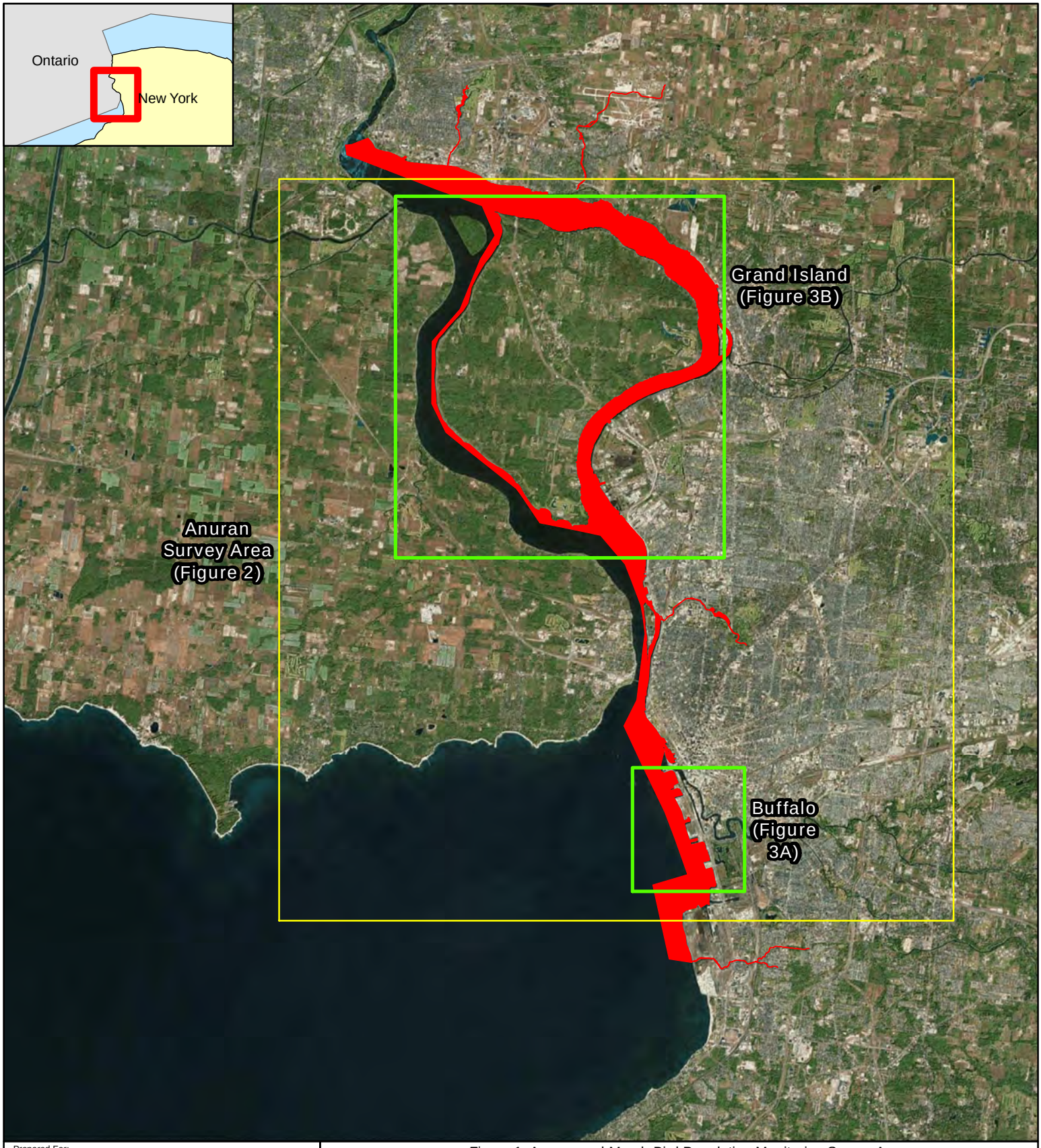
Anuran and marsh bird surveys were conducted in accordance with the approved Beneficial Use Impairment Removal Project, Niagara River Area of Concern Anuran and Avian Population Monitoring Work Plan (Work Plan), 2014-2018 (NewEarth 2014). The Work Plan was adapted from sources that are intensively involved in marsh monitoring efforts applicable to the Niagara River area, including the North American Amphibian Monitoring Program (NAAMP) Protocol Description by Weir and Mossman (2005); the Marsh Monitoring Program (MMP) Annual Report, 1995-2003 (Crewe et al. 2005); the MMP Annual Report, 1995-2007 (Archer and Jones 2009), and the New York State Marsh Bird Monitoring Program Pilot Study (Yard et al. 2012.

Survey routes, point locations, field methodologies and efforts were closely coordinated with, and based upon recommendations from, USFWS representative Amy Roe, and NYSDEC representatives Connie Adams, Jennifer Dunn, and Mark Filipski. The Work Plan should be referenced for additional details regarding the survey methodology used in this study.

2.1 MARSH ANURAN SURVEYS

2.1.1 Survey Routes and Points

Survey routes and points were originally established using Google Earth™ software and ground-truthed to determine suitability during broad reconnaissance level surveys in 2014. In 2015, some points were adjusted slightly for better access and several points were added to capture potential habitat that had previously not been identified (NewEarth 2016). No points were moved or added in 2016. As shown in Figure 2, the 2015 and 2016 efforts included 10 points on Route A1 and 13 points on Route A2. Six of the ten survey points on Route A1, and three of the thirteen survey points on survey Route A2, are located near previously surveyed points established by NYSDEC as part of the ongoing Niagara River Marsh Monitoring Program (NR MMP) and included survey points: A1-2; A1-3; A1-6; A1-7; A1-8; A1-9; A2-1; A2-2; and, A2-3 (Figure 2).



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Source: NewEarth Ecological Consulting, 2015; Esri, DigitalGlobe, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.

Date: 12/5/2016

Figure 1. Anuran and Marsh Bird Population Monitoring Survey Areas

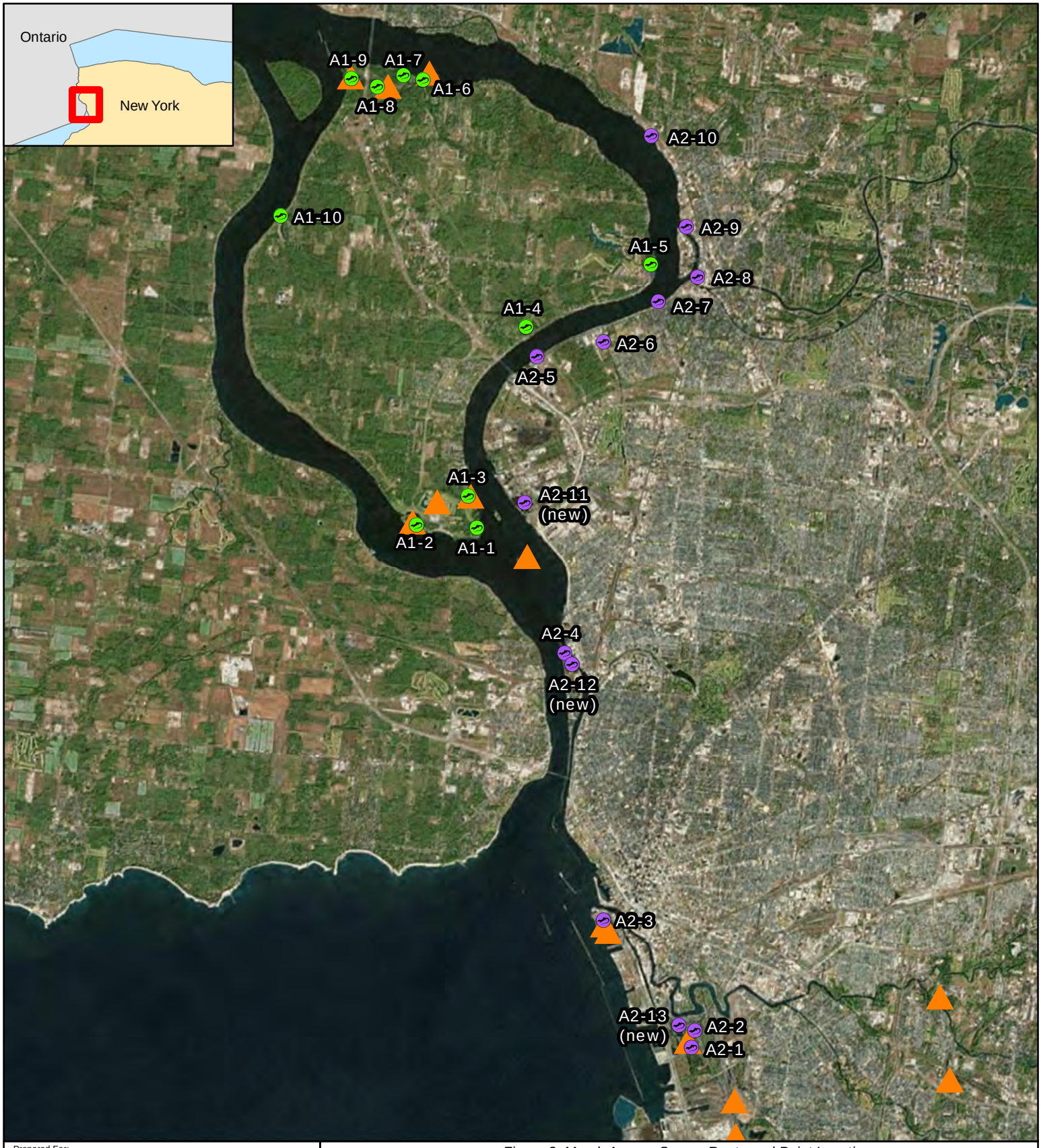
Niagara River Area of Concern
2014 - 2018
Marsh Anuran and Avian Population Monitoring
Niagara and Erie Counties, NY

Legend

- Upper Niagara River Area of Concern
- Marsh Bird Survey Locations
- Anuran Survey Locations

N

0 15 30 60 Miles



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Date: 12/5/2016

Figure 2. Marsh Anuran Survey Route and Point Locations

Niagara River Area of Concern
2014 - 2018
Marsh Anuran and Avian Population Monitoring
Niagara and Erie Counties, NY

Legend

- Route A1 Survey Point
- Route A2 Survey Point
- Marsh Monitoring Program Survey Point

(new) points were added after the 2014 survey event.

N

0 0.5 1 2 Miles

Survey points were located based on recommendations from NYSDEC, availability of potentially suitable habitat, and in most cases spaced at least 800 meters (m) apart unless site conditions justified placing them closer; for example, in areas where background noise was impairing detectability. Points were situated along the edges of marsh habitat dominated by emergent vegetation (e.g. *Typha latifolia*, *Typha angustifolia*, *Carex lacustris*, *Hibiscus moscheutos*), and were located along the Niagara River or abutting tributaries within 800 m of the Niagara River. Latitude and longitude were recorded for each survey point using a handheld GPS receiver and each point was assigned a unique identification number which included the route number followed by the point number (e.g., the first survey point on the first survey route received the unique identifier A1-1).

2.1.2 Sampling Periods and Conditions

Per the Work Plan, survey efforts in 2016 included sampling events that targeted expected peak vocalization periods for breeding amphibians based on precipitation and minimum night air temperatures above 41 °F for event 1, above 50 °F (events 2 and 3), and above 63 °F (event 4). Efforts focused on the early season portion of the recommended April-July survey period to capture the best conditions during what was an unusually dry breeding season in the Niagara region (Buffalo News 2016, NOAA 2016). Survey events were scheduled at least 15 days apart and were completed between mid-April and late-June as shown in Table 1. The initial 2014 survey effort included three sampling events held between May and June, but an additional event was added in 2015 and repeated in 2016 to target early season activities.

Table 1. 2015 Anuran Survey Dates and Temperature Ranges

Survey Event	Survey Dates	Temperature Range During Surveys
1	April 16-17	45-58 °F
2	May 11-12	57-60 °F
3	May 31-June 1	60-68 °F
4	June 24-25	67-73 °F

Surveys were conducted by biologists skilled in the identification of all common anuran vocalizations with the potential to occur within the NR AOC (Table 2). Observers were also trained to estimate distance to, and calling indexes of, calling anurans, and were familiar with wetland plants of Western New York. Surveys were conducted during evenings with little wind and temperatures above the identified thresholds, preferably in moist conditions. Surveys were not conducted in sustained wind speeds above 12 miles per hour (mph) (i.e., level 3 on the Beaufort scale), or during periods of heavy rain. All surveys were conducted between 30 minutes after sunset and 1:00 a.m.

2.1.3 Call Surveys

A calling survey technique was used, whereby an observer listened for anuran vocalizations along the previously determined survey route. Additional survey points were added in 2015 resulting in 23 survey points dispersed along two survey routes located within anuran breeding habitat (e.g., wetlands, ponds, shoreline) in the NR AOC. A survey route was completed by one observer (an assistant was used to fill out data forms but did not observe calling anurans) in a single night. At each survey point an observer recorded a two-minute settling period, at which

time no observations were recorded and anurans were given time to adjust to any disturbances caused by the arrival of the survey team. Following the settling period, the observer listened for 5 minutes (recording data in two time brackets: the first 3 minutes and the remaining 2 minutes), and then recorded the amphibian calling index for each species heard. Use of recordings of frog calls or other artificial measures to elicit frog responses were not used. When possible, efforts were made to avoid surveying during short-term temporary periods of noise or disturbance near the site.

Table 2. List of Target Marsh Anurans in the NR AOC

Common Name	Scientific Name
American Toad	*Anaxyrus americanus*
Gray Treefrog	*Hyla versicolor*
Spring Peeper	*Pseudacris crucifer*
Boreal/Western Chorus Frog Complex	*Pseudacris maculata/triseriata complex*
American Bullfrog	*Lithobates catesbeianus*
Green Frog	*Lithobates clamitans*
Mink Frog	*Lithobates septentrionalis*
Wood Frog	*Lithobates sylvaticus*
Northern Leopard Frog	*Lithobates pipiens*
Pickerel Frog	*Lithobates palustris*

2.1.4 Anuran Survey Data

Field data for species targeted within the NR AOC (Table 2) were recorded on data forms approved by the USFWS and NYSDEC prior to survey efforts. In addition to documenting occurrences of the target species, key elements of the data collection effort included an amphibian call index, and information on the weather conditions and background noise which are described in more detail below. A blank copy of the anuran data form and observer instructions for completing the form is included in Appendix C.

The amphibian calling index was developed to assist surveyors in identifying relative abundance of calls at any given survey point. The amphibian calling index is provided in the survey instructions portion of the data form (Appendix C). While recording the amphibian calling index, a level of “1” was assigned when calls did not overlap and calling individuals could be discretely counted; level “2” was assigned if calls of individuals overlapped, but the number of individuals could still be reasonably estimated; and, level “3” was assigned when an estimate of individuals could not be made because of significant overlap in calls making them seem continuous (i.e., a full chorus). Modifiers were used to describe if calls were occurring within (modifier - a), outside (modifier - b), or both inside and outside (modifier - c) the targeted habitat (within 50-meter radius of survey point). For example, a full chorus of Spring Peepers heard both inside and outside of the targeted habitat was recorded as 3c.

Background Noise

Background noise was documented by recording the number of cars that passed during the listening period and noting any other sources of noise. Car counting was conducted by the observer assistant. The observer indicated whether background noise impaired his/her ability to

hear by placing "yes" or "no" in the “Was Noise a Factor?” row. Noise levels were identified using the noise index (1-4 scale) provided in the instructions portions of the data form. If a significant noise disturbance lasted for longer than one minute, the observer could discontinue the listening period to avoid sampling during the excessive noise. If such a break was taken it was noted in the “Did you take a break?” row on the data form. After the major disturbance ends, the observer resumed listening for the time remaining. A survey break was only used for significant noise disturbance lasting longer than one minute, and was not be used for background noise.

Weather Conditions

The observer recorded the time, sky code, air temperature and wind code at each point along the survey route to verify that the sampling conditions were met on the evening of the survey (Weir and Mossman 2005). If at least 80 percent (%) of the stops did not meet temperature guidelines, surveys would be conducted on another night. Additionally, observed moon or moonlight was noted by placing a "yes" or "no" in the *“Moon or Moonlight Visible?”* row on the data form.

2.1.5 Anuran Habitat Data

Initial data collection of site habitat characteristics was conducted during the 2014 survey effort, or in 2015 for points A2-11, A2-12 and A2-13 which were added after the 2014 survey. Information is updated annually as needed to document obvious changes in habitat conditions since the original survey. The 2016 habitat assessment took place on June 26th. If no notable differences were observed at a given point when compared to 2014 or 2015 data, only water level data was recorded. If notable differenced were observed, a full Habitat Monitoring Data form was completed and included parameters such as percent cover of dominant plant species within a 50-m radius of each survey point, water level, and natural disturbances and management activities near the site. See Appendix E for habitat data forms.

2.1.6 Photographic Documentation of Survey Points

A photographic record of general habitat/site conditions at each survey point was collected in 2014, or 2105 for points A2-11, A2-12 and A2-13, and was updated if needed to document notable features or obvious changes in habitat conditions since the original survey. See Appendix A for photographic documentation of anuran survey points.

2.2 MARSH BIRD SURVEYS

2.2.1 Survey Routes and Points

Survey routes and points were originally established using Google Earth™ software and ground-truthed to determine suitability during broad reconnaissance level surveys in 2014. As with the anuran survey effort, several marsh bird points were added in 2015 to capture potential habitat that had previously not been identified (B1-8 and B1-9) and one point was eliminated (B1-1) due to continual excessive noise that prohibited survey (NewEarth 2016). No points were moved or added in 2016. The 2015 and 2016 efforts included two survey routes as shown on Figures 3 and 4; Route B1 comprised of eight points and Route B2 comprised of seven. Twelve of the fifteen survey points are located near previously surveyed areas established by NYSDEC as part of the

NR MMP and included all points on routes B1 and B2 except B2-1, B2-2, and B1-9 (Figures 3 and 4).

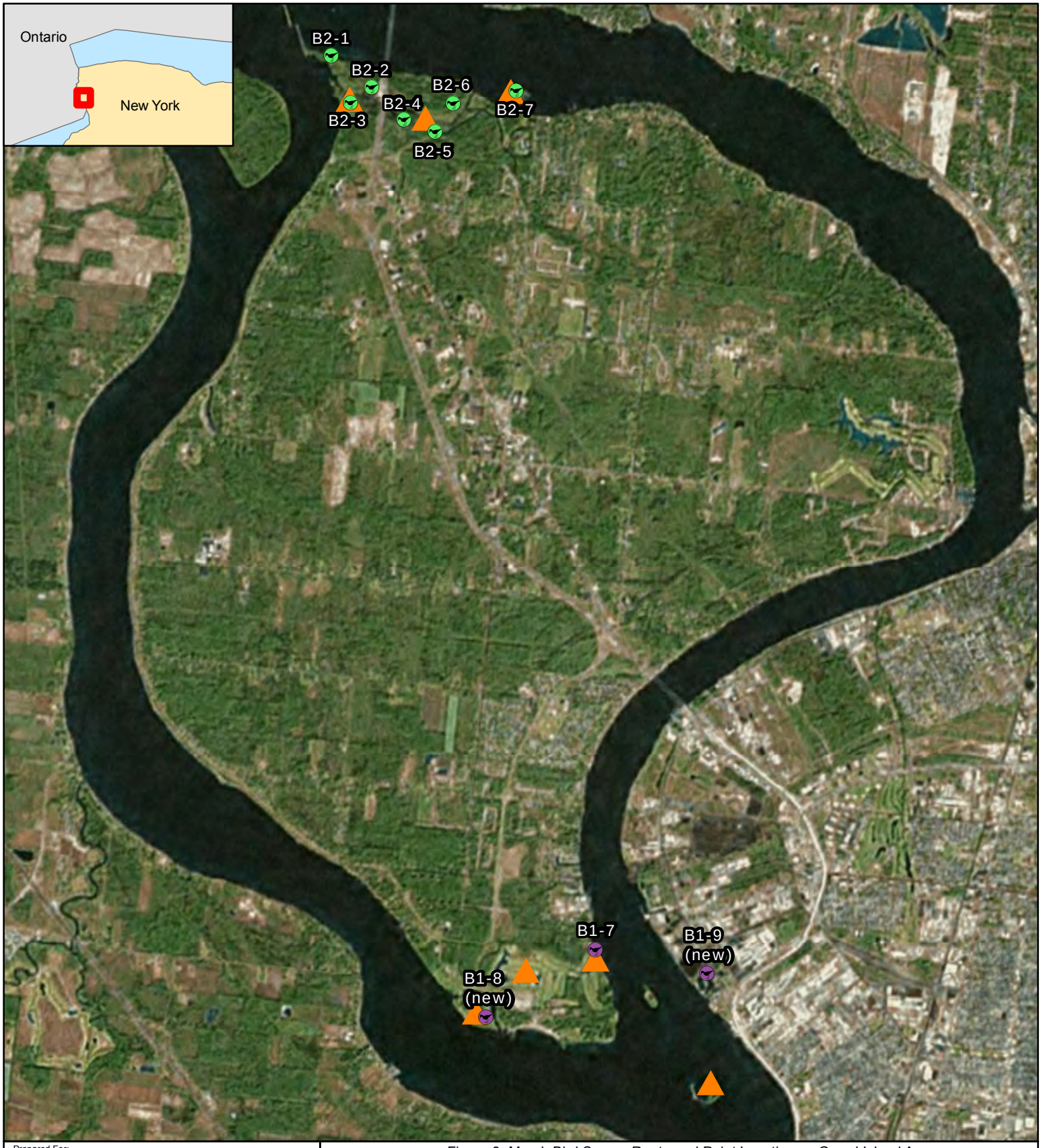
Points were located based on recommendations from NYSDEC and availability of potentially suitable habitat. Many the emergent marshes located within the NR AOC are relatively small [typically less than 16 hectares (ha)]. For this reason, all potential emergent marshes dominated by vegetation typically associated with wetland habitats and encompassing at least 0.5 ha were considered when establishing point placement. A single survey point was placed in marshes that were determined to have potential marsh bird habitat (emergent vegetation) totaling less than 16 ha in size (Figures 3 and 4). For larger marshes, points were placed at 400 m spacing, or approximately 1 point per 16 ha when appropriate. A unique identification number was assigned to each survey point and included the route number followed by the point number (e.g., the first survey point on the first survey route received the unique identifier B1-1).

2.2.2 Sampling Periods and Conditions

The primary goal of the marsh bird survey effort was to collect information on target primary and secondary marsh bird species to facilitate efforts to establish population estimates and to evaluate trends in the number of breeding adults for each species within the NR AOC. Per approved marsh bird survey guidelines (Conway 2011) and as identified in the approved NR AOC Marsh Anuran and Avian Work Plan (NewEarth 2014), three surveys were completed within the recommended survey windows. Survey dates were selected to capture the variation in breeding phenology among coexisting species, with a goal of increasing the probability of conducting at least one of the surveys during the seasonal peak in vocalization among all focal marsh bird species in the area. The timeline presented in Table 3 was followed for the 2016 survey effort to capture the best conditions during what was the driest spring on record since 1943 in the Niagara region (Buffalo News 2016).

Table 3. 2016 Survey Dates for Target Marsh Bird Species

Survey Event	Survey Dates
1	May 12-13
2	June 1-2
3	June 23-26



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Source: NewEarth Ecological Consulting, 2015; Esri, DigitalGlobe, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.

Date: 12/5/2016

Figure 3. Marsh Bird Survey Route and Point Locations – Grand Island Area

Niagara River Area of Concern
2014 - 2018
Marsh Anuran and Avian Population Monitoring
Niagara and Erie Counties, NY

Legend

- Route B1 Survey Point
- Route B2 Survey Point
- Marsh Monitoring Program Survey Point

(new) points were added after the 2014 survey event.

N

0 0.25 0.5 1 Miles

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US Fish and Wildlife Service
NY Department of Environmental Conservation

Prepared By:
NewEarth
ECOLOGICAL CONSULTING, LLC

Source: NewEarth Ecological Consulting, 2015; Esri, DigitalGlobe, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.

Date: 12/5/2016

Figure 4. Marsh Bird Survey Route and Point Locations – Buffalo Area

Niagara River Area of Concern
2014 - 2018
Marsh Anuran and Avian Population Monitoring
Niagara and Erie Counties, NY

Legend

Route B1 Survey Point

Marsh Monitoring Program Survey Point

N

0 0.075 0.15 0.3 Miles

Marsh bird surveys were conducted by biologists skilled in the identification of the common calls of primary and secondary focal species (Table 4) with the potential to occur within the NR AOC. Observers were also experienced in the identification of calls of secondary marsh bird species likely to occur in the Project area, estimating the distance to calling marsh birds, and were familiar with wetland plants of Western New York.

Table 4. List of Primary and Secondary Marsh Birds Targeted in the NR AOC

Common Name	Scientific Name
Primary Focal Birds	
American Bittern	*Botarus lentiginosus*
American Coot	*Fulica americana*
Common Gallinule	*Gallinula galeata*
King Rail	*Rallus elegans*
Least Bittern	*Ixobrychus exilis*
Pied-billed Grebe	*Podilymbus podiceps*
Sora	*Porzana carolina*
Virginia Rail	*Rallus limicola*
Secondary Focal Birds	
Black Tern	*Chlidonias niger*
Common Tern	*Sterna hirundo*
Forster's Tern	*Sterna forsteri*
Green Heron	*Butorides virescens*
Marsh Wren	*Cistotoruus palustris*
Sedge Wren	*Cistothorus platensis*
Swamp Sparrow	*Melospiza georgiana*
Willow Flycatcher	*Empidonax traillii*
Wilson's Snipe	*Gallinago delicata*

Based on information provided by NYSDEC related to known peak marsh bird vocalization periods in the region, surveys were completed during the morning survey period (i.e., 30 minutes before sunrise to 3 hours after sunrise) for all survey events. To reduce time of day bias, points were visited in numerically ascending order during the first set of surveys, descending order during the second set of surveys, and ascending order during the final set of surveys.

Since weather conditions can affect detection probability of marsh birds (Conway 2011), surveys were only conducted during appropriate conditions, when wind speeds were less than 20 km/hr (12 mph), and not during periods of heavy fog or sustained rain. A pocket wind meter (Kestrel 3000) was used to obtain an accurate measure of wind speed in the field. Surveys were postponed if the observer believed winds were affecting calling probability (even if winds were <20 km/hr).

2.2.2 Call Surveys

Due to the secretive nature of marsh birds, they are seldom observed and vocalizations are heard infrequently. For these reasons surveyors utilized broadcast calls to elicit vocalizations during surveys. Per recommended marsh bird survey guidelines (Conway 2011) survey efforts at each point included a 2-minute settling period after arrival on site; a 5-minute passive monitoring period in which surveyors recorded all primary and secondary focal species (Table 4) detected; then an 8-minute call-broadcast period, in which recorded primary focal marsh bird calls were broadcast into the marsh. The call-broadcast species sequence included only the primary focal species: Least Bittern, Sora, Virginia Rail, King Rail, American Bittern, Common Gallinule, American Coot, and Pied-billed Grebe, and included 30 seconds of calls for each species, with 30 seconds of silence between calls. The 30 seconds of calls consisted of a mix of the most common calls for the species, separated by 5 to 6 seconds of silence between each call type.

Broadcast equipment included use of an mp3 player with an externally connected speaker with a sound pressure of 80-90 dB at 1m in front of the speaker. The broadcast speaker was placed upright on the ground or on the bow of the boat (when conducting surveys from boat) and was aimed in the direction of the marsh at each survey point (Figures 3 and 4). Surveyors stood at a minimum 2 m to the side of the speaker while listening for vocal responses.

Because time spent seeking, observing, and recording non-focal species may detract from the quality of observations for primary and secondary focal species, surveyors did not record non-focal species during the survey period (see Johnson et al. 2009; Conway 2011 for discussion). When possible, efforts were made to avoid surveying during short-term temporary periods of noise or disturbance near the site.

2.2.3 Marsh Bird Survey Data

Field data for marsh bird species targeted within the NR AOC were recorded on data forms which were approved by the USFWS and NYSDEC prior to survey efforts. In addition to information regarding the survey event and weather conditions, key elements of the data collection included responses from the primary focal broadcast species, and secondary focal species, which are described in more detail below. A blank copy of the marsh bird data form and detailed observer instructions for completing the form are included in Appendix D.

Primary Focal, Broadcast Species

Observers recorded the unique identification number (e.g. B2-1) and time when they first arrived at each survey point. When a focal species was detected, the four-letter species code (located in the instructions portion of the marsh bird data form) was recorded in the "Species" column on the data form. In addition to the four-letter code, a check box was recorded in each detection column corresponding to the time interval(s) during which that individual was detected. The observer recorded an individual once per minute, regardless of if the individual called once or several times during that minute. If an individual continued to call into a second minute of passive listening an "H" was placed in the second column. If that individual continued to call during the 30-second broadcast for American Bittern or the 30-second silent period following the American Bittern broadcast, an "H" was placed in the column for "AMBI", and so forth. If an individual was heard and seen, both a "H" and "S" were recorded in the appropriate column(s).

When determining if an individual was a new observation or an individual that was already detected, surveyors used their best professional judgment. In general, observers were conservative and assumed that a call was from the same bird if heard from the same general location (i.e., similar direction and distance from the location of a previously recorded call) as a previously detected individual. If no species were observed during the survey period, the observer recorded "no birds" in the Species column of the data form. If the observer heard a marsh bird and was unable to identify the bird to the species level, the surveyor recorded "unknown" in the Species column and record all data for the individual as described above.

Secondary Focal, Non-Broadcast Species

Whenever possible, secondary focal species which specifically included Black Tern, Green Heron, Marsh Wren, Sedge Wren, Willow Flycatcher, Wilson's Snipe, Swamp Sparrow and Common Tern were recorded in the same manner as the primary focal species discussed above. Broadcast calls were not used to solicit responses from secondary focal species.

2.2.4 Marsh Bird Habitat Data

As with the anuran marsh survey effort, collection of site habitat data was conducted during the 2014 survey effort, or in 2015 for points B1-8 and B1-9 which were added after the 2014 effort, and is updated annually as needed to document obvious changed in habitat conditions since the original survey. The 2016 habitat assessment took place on June 26th. If no notable differences were observed at a given point when compared to 2014 or 2015 data, only water level data was recorded. If notable differenced were observed, a full Habitat Monitoring Data form was completed and included parameters such as percent cover of dominant plant species within a 50-m radius of each survey point, water level, and natural disturbances and management activities near the site. See Appendix E for habitat data forms.

2.2.5 Photographic Documentation of Survey Points

A photographic record of general habitat/site conditions at each survey point was collected in 2014, or 2015 for points B1-8 and B1-9, and was updated as needed in 2016 to document notable features or obvious changes in habitat conditions since the original survey. See Appendix A for photographic documentation of marsh bird survey locations.

3.0 RESULTS

3.1 ANURANS

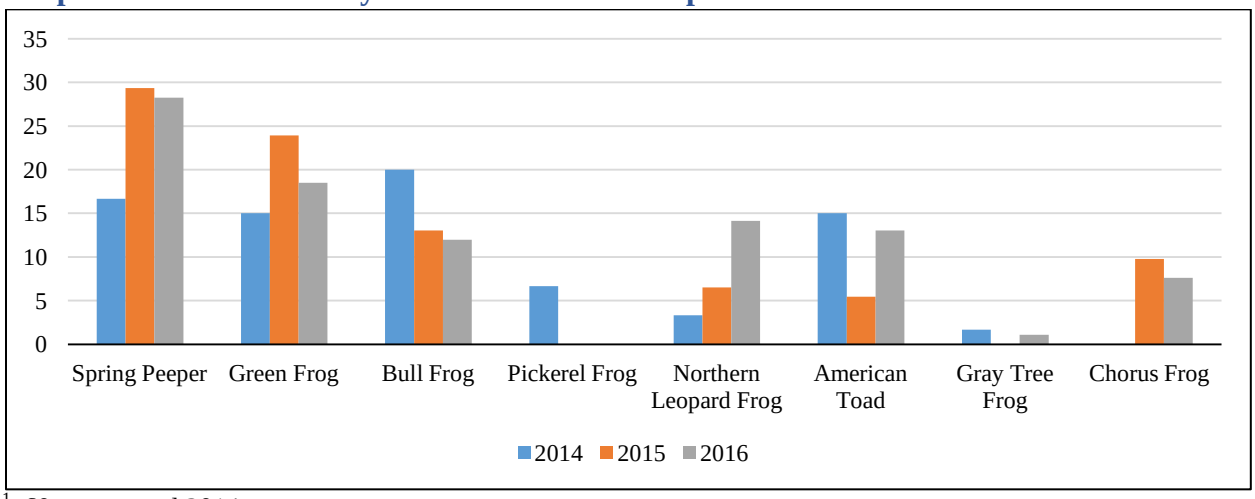
Anuran call monitoring surveys were performed on April 16-17; May 11-12; May 31-June 1; and, June 24-25 in 2016. These dates are similar to those performed in 2015, but an event anticipated for July was excluded and a second survey was performed in late May-early June in an effort to capture breeding activities in habitats that appeared to be rapidly desiccating due to extremely dry spring weather conditions. Figure 2 depicts the locations of each survey route and point. Points and the number of survey events did not change from the 2015 survey event, but the 2014 effort was comprised of three fewer points and did not include an April survey. Appendix B provides coordinates for the geographic location of all survey points, Appendix C provides the raw survey data and completed anuran survey data forms, and Appendix E includes habitat data forms.

3.1.1 Anuran Surveys

Survey Route A1 is located on Grand Island and is associated with various habitats along the Niagara River shoreline. Survey Route A2 is located on the east side of the Niagara River, from Tifft Nature Preserve at the southern extent to Gratwick Riverside Park at the northern extent of the survey route. A total of 10 points were surveyed for Route A1 and 13 were surveyed for Route A2 during the four survey periods; resulting in 92 survey events.

Seven of the 10 target anuran species were recorded within targeted marsh survey areas across the 92 survey events (Graph 1). Wood Frog and Mink Frog have yet to be detected in the study area; of these, only Wood Frogs have been detected within the general Niagara AOC based on MMP routes (Bird Studies Canada 2015). Northern Leopard Frog and Chorus Frog continued to be detected primarily only during the first survey event performed in April 2016, except for one lone Leopard Frog heard during the early May survey. Of the 92 total survey events, Spring Peepers were the most commonly detected species heard on 28% of survey events, followed by Green Frog (18% of events), then closely followed by Northern Leopard Frog (14%), American Toad (13%) and Bull Frog (12%) (Graph 1). In 2015 the most commonly detected species were similar, but notably fewer detections of Northern Leopard Frogs and American Toads were recorded (NewEarth 2016). In 2014 results were also similar, although Bull Frogs were the most commonly detected species (NewEarth 2015) and as with the 2015 survey, Northern Leopard Frogs were also less common in 2014 than in 2016 (Graph 1). Pickerel Frog have only been detected on 2014 surveys and have never been detected on MMP Routes in the Niagara AOC (Bird Studies Canada 2015). Chorus Frogs were first detected during 2015 surveys following a change in the survey protocol which added an April survey event to all subsequent survey efforts.

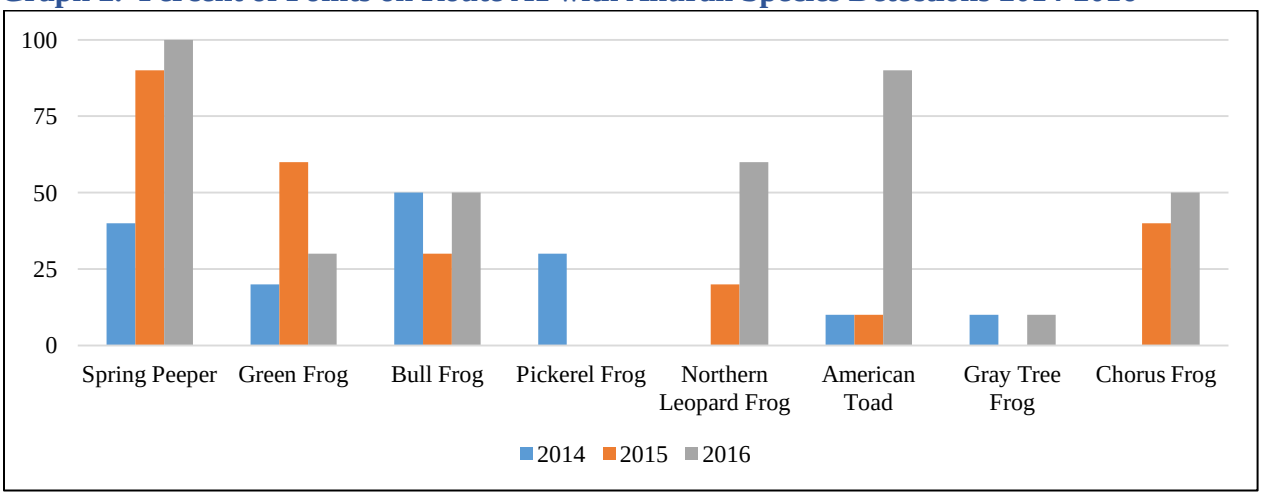
Graph 1. Percent of Survey Events with Anuran Species Detections 2014[1]-2016[2]



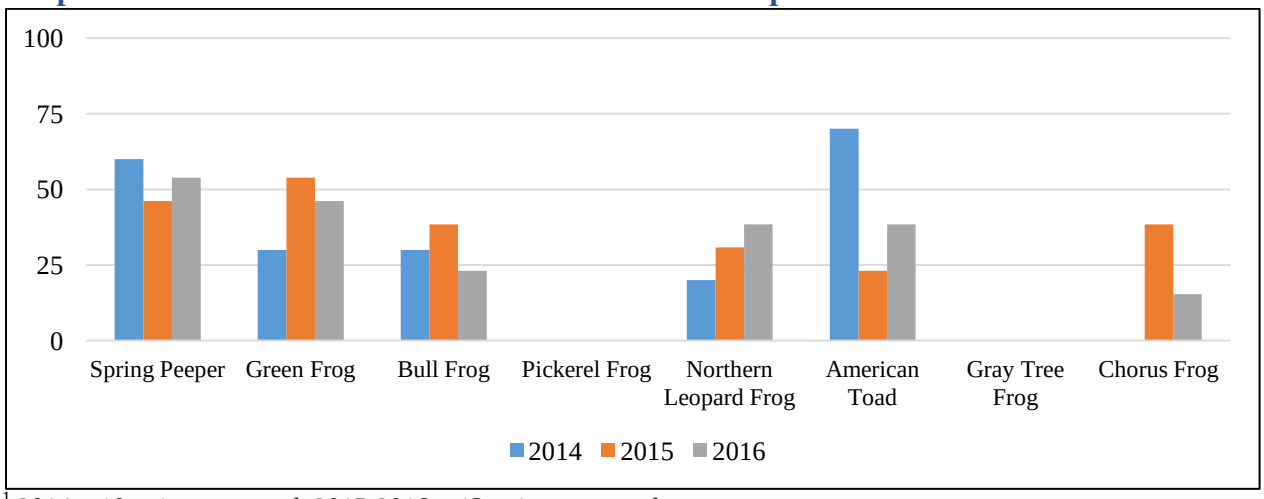
[1] 60 events total 2014.
[2] 92 events total 2015 and 2016.

Of the 23 points surveyed in 2016, four had no anuran species detections during the entire survey period: A2-7, A2-8, A2-9, and A2-10 (Graphs 2 and 3). Spring Peepers were heard at the highest number of survey stations on both routes (at ten points on A1 and seven on A2), followed by American Toad (at nine points on A1 and five on A2).

Graph 2. Percent of Points on Route A1 with Anuran Species Detections 2014-2016



Graph 3. Percent of Points on Route A2[1] with Anuran Species Detections 2014-2016



[1] 2014 = 10 points surveyed, 2015-2016 = 13 points surveyed.

Calls noted inside, outside, and both inside and outside of the targeted habitat at each survey point were recorded using calling code modifiers to assess if anurans were utilizing the target marsh areas. In 2014, 46 calls were documented (note fewer routes and points were surveyed in 2014); of these, 83% were detected from within or within and outside of the targeted habitat (NewEarth 2015). In 2015, 81 calls were documented; of these, 89% were detected from within or within and outside of the targeted habitat (NewEarth 2016). In 2016, a slightly higher number of calls were detected than in 2015 (85 calls), but fewer were within the target marsh areas. Sixty-six percent were detected within, or both within and outside, of the target marshes (Table 5).

Additionally, of the 85 call detections in 2016, 71% were of call index #1 (only individual calls could be distinguished), 22% were of call index #2 (some individuals could be distinguished, but there were some overlapping calls), and 7% were of call index #3 (large choruses, calls continuous and/or overlapping). In comparison, in 2015, 62% of calls were single calls, whereas 28% were call index #2 and 10% were index #3 (NewEarth 2015, 2016). In 2014, 89% of calls were single calls, whereas 11% were call index #2. Staff from Tifft Nature Preserve report that Green Frogs, a species typically found chorusing in large numbers within the Tifft marsh

systems, were only sporadically recorded in the preserve in 2016; consistent with the findings of this study (Spiering, personal communication 2016).

Table 5. Location of Anuran Species in Relation to Survey Points

Point	Total Species Detections	Cumulative Species Detections (within target habitat only)	Cumulative Species Detections (within and outside of target habitat)	Cumulative Species Detections (outside target habitat only)
Route A1				
A1-1	5	1	1	3
A1-2	7	0	2	5
A1-3	4	2	1	1
A1-4	4	4	0	0
A1-5	4	0	0	4
A1-6	3	0	0	3
A1-7	6	1	3	2
A1-8	7	3	4	0
A1-9	5	3	2	0
A1-10	1	0	0	1
TOTAL	**46**	**14**	**13**	**19**
Route A2				
A2-1	8	1	4	3
A2-2	9	1	6	2
A2-3	3	3	0	0
A2-4	2	2	0	0
A2-5	1	0	0	1
A2-6	2	1	0	1
A2-7	0	0	0	0
A2-8	0	0	0	0
A2-9	0	0	0	0
A2-10	0	0	0	0
A2-11	2	2	0	0
A2-12	5	5	0	0
A2-13	7	3	1	3
TOTAL	**39**	**18**	**11**	**10**

Table 6. Anuran Species Detected Using 3 Minute and 5 Minute Call Intervals

Species	Survey Route A1		Survey Route A2	
	3-Minute Period # of Points Recorded	5-Minute Period # of Points Recorded	3-Minute Period # of Points Recorded	5-Minute Period # of Points Recorded
Survey Event 1 (April 16-17, 2016)				
Spring Peeper	10	10	5	5
Green Frog	1	1	0	0
Bull Frog	0	0	0	0
Pickerel Frog	0	0	0	0
Northern Leopard Frog	7	7	5	5
American Toad	0	0	2	2
Gray Tree Frog	0	0	0	0
Chorus Frog	4	5	2	2
Survey Event 2 (May 11-12, 2016)				
Spring Peeper	7	7	3	3
Green Frog	0	0	1	1
Bull Frog	0	0	0	0
Pickerel Frog	0	0	0	0
Northern Leopard Frog	1	1	0	0
American Toad	6	7	3	3
Gray Tree Frog	1	1	0	0
Chorus Frog	0	0	0	0
Survey Event 3 (May 31-June 1, 2016)				
Spring Peeper	0	0	1	1
Green Frog	1	1	5	5
Bull Frog	2	2	3	3
Pickerel Frog	0	0	0	0
Northern Leopard Frog	0	0	0	0
American Toad	0	0	0	0
Gray Tree Frog	0	0	0	0
Chorus Frog	0	0	0	0
Survey Event 4 (June 24-25, 2016)				
Spring Peeper	0	0	0	0
Green Frog	3	3	6	6
Bull Frog	3	3	3	3
Pickerel Frog	0	0	0	0
Northern Leopard Frog	0	0	0	0
American Toad	0	0	0	0
Gray Tree Frog	0	0	0	0
Chorus Frog	0	0	0	0

Data were collected in a manner that also allowed for an evaluation of two widely used anuran monitoring protocols (i.e. MMP three minute intervals vs. the North American Amphibian Monitoring Program [NAAMP] five minute intervals) (Table 6). As with 2014 and 2015 results, extending the survey period an additional two minutes can increase the number of species detections, but no new species have been recorded during the additional time (NewEarth 2015, 2016). In 2016, extended surveys yielded two additional detections of previously recorded species. Seven additional detections were made in 2015, and 10 were documented in 2014.

3.1.2 Incidental Observations

Two Gray Tree Frogs were observed incidentally while traversing the Project Area; breeding calls of a lone individual were also documented during the May 12, 2016 survey event. Numerous feral/outdoor cats as well as an occasional Red Fox, Raccoon, Whitetail Deer, Muskrat, and Beaver were also noted.

3.1.3 Disturbances Noted During Survey Efforts

In highly developed areas, such as the Niagara River AOC, noise can be a significant factor in surveyor ability to detect calling amphibians. Despite surveyor efforts to avoid periods of high noise levels and activity at points, noise had a moderate (score = 2) to serious (score > 3) effect on two or more survey events at 14 (61%) of the point locations in 2016 (Table 7). These results are similar to prior survey efforts in which noise had a moderate to serious affect during 70% of surveys in 2015 and during 60% of surveys in 2014 (NewEarth 2015, 2016). The primary source of noise on anuran surveys was associated with vehicle traffic and boats. Other factors included sirens, airplanes, construction equipment, and noise from people recreating in the area. Additionally, ongoing restoration and monitoring efforts in Tifft and Times Beach nature preserves have affected vegetation and in some cases, has resulted in fluctuating water levels within the marsh system. Disturbance from these activities may have a short-term direct negative affect on amphibian breeding activities in the marsh, but efforts are likely to improve marsh conditions and suitability for breeding amphibians over time. Survey points that are most likely to be affected by these activities include A2-1, A2-2, and A2-3.

Table 7. Noise Levels During 2016 Anuran Survey Events

Point	Noise Event 1[1]	Noise Event 2[1]	Noise Event 3[1]	Noise Event 4[1]
Route A1				
A1-1	0	0	0	0
A1-2	0	1	0	0
A1-3	2	0	0	2
A1-4	1	1	0	3
A1-5	1	0	0	1
A1-6	0	0	0	0
A1-7	0	0	0	0
A1-8	2	0	0	4
A1-9	3	0	0	0
A1-10	1	0	0	0

Table 7. Noise Levels During 2016 Anuran Survey Events (continued)

Point	Noise Event 1[1]	Noise Event 2[1]	Noise Event 3[1]	Noise Event 4[1]
Route A2				
A2-1	0	2	0	0
A2-2	0	2	1	2
A2-3	2	3	2	2
A2-4	1	3	3	2
A2-5	1	2	2	2
A2-6	0	2	2	2
A2-7	0	2	2	3
A2-8	2	2	1	4
A2-9	3	2	1	2
A2-10	1	2	2	3
A2-11	2	2	4	3
A2-12	1	3	2	3
A2-13	2	2	1	2

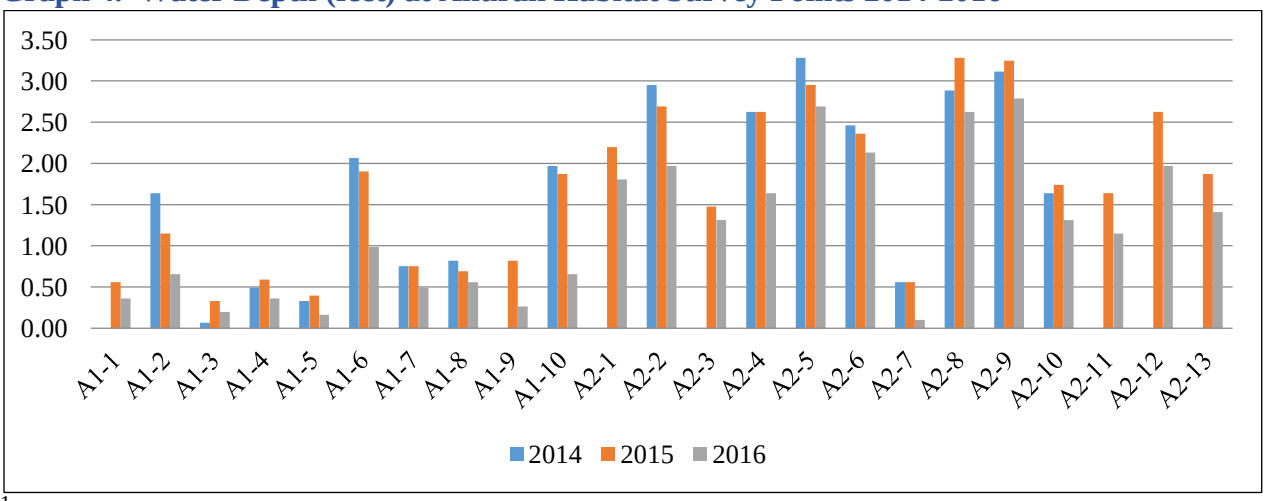
[1] Effect on Sampling: 0 = none; 1 = slight; 2 = moderate; 3 = serious; 4 = profound

3.1.4 Habitat

Some shoreline vegetation at point A2-8 was mowed following the May survey event, but this had a minor effect on the habitat at the point overall. Otherwise, vegetation conditions at survey points were similar to those previously documented and therefore, only water level data was collected at each point. The 2016 survey season proved to be much drier than previous surveys. Water levels were lower than 2014 and 2015 conditions (NewEarth 2015, 2016) at all survey points (Graph 4) and this reflects a continued decreasing trend in annual precipitation for the Niagara AOC since 2013 (NOAA 2016). No water is reported for some points from 2014 since most of the points originally surveyed in 2014 were on dry areas of the marsh and were moved slightly following 2014 surveys or the points were added after the 2014 event.

Under “normal” conditions water levels can fluctuate dramatically throughout the breeding season and drought weather conditions such as those experienced in 2016 can be even more dramatic in affect on marsh systems and habitat availability. Anecdotally, surveyors reported that many marsh areas had dried out during some periods of 2016 surveys, but many were somewhat replenished by subsequent rain events. It should be noted that conditions at the location of the water depth measurements are not necessarily representative of the overall marsh system and the locations that an individual may be breeding in and calling from throughout the season.

Graph 4. Water Depth (feet) at Anuran Habitat Survey Points 2014-2016[1]



[1] Points A1-1, A1-9, A2-1 and A2-3 moved slightly after 2014 survey; Points A2-11, A2-12 and A2-13 added after 2014 survey.

3.2 MARSH BIRDS

Similar to the 2014 and 2015 efforts, 2016 marsh bird monitoring surveys were conducted on May 12th and 13th, June 1st and 2nd, and June 23rd and 26th. Figures 3 and 4 show the locations of each survey route and point. Appendix B provides coordinates for the geographic location of all survey points, Appendices D and E provide the raw survey data and completed data forms from 2016 marsh bird and habitat surveys.

3.2.1 Marsh Bird Surveys

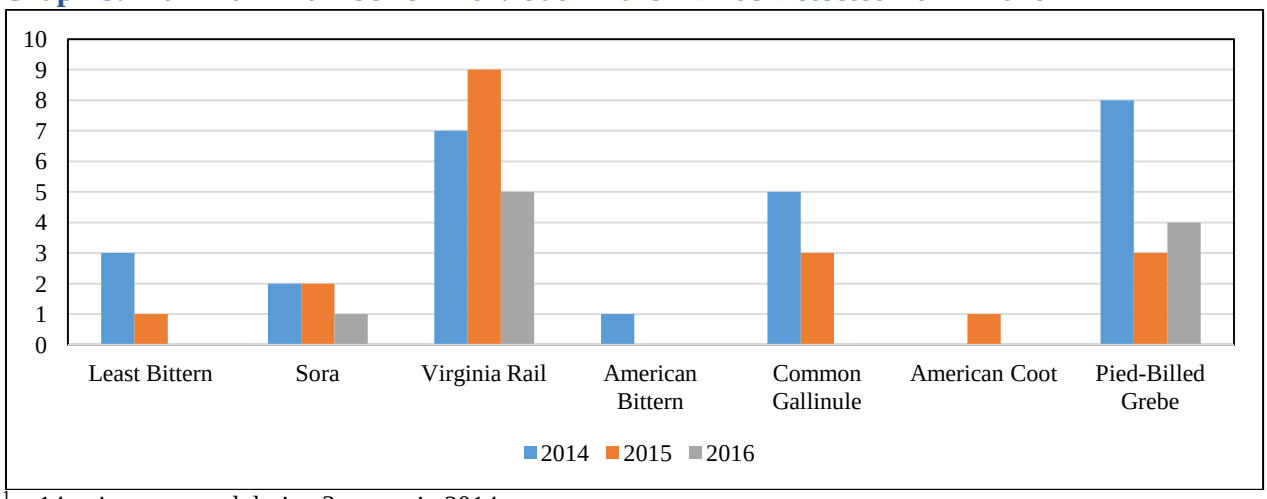
Surveys were conducted in the same locations as those in 2015 and included eight survey points for Route B1 within Tifft Nature Preserve, Times Beach Nature Preserve, and Beaver Island State Park and seven points on survey Route B2, established on Grand Island and Sunken Island (also referred to as Grass Island by various sources). In 2015 and 2016 a total of 15 points were surveyed during the three survey periods for a total of 45 survey events (NewEarth 2016). This differed from 2014 surveys where 14 points were surveyed during three events for a total of 42 survey events (NewEarth 2015).

Primary Focal Species

In 2016, only three of the eight target primary focal marsh bird species were recorded unlike 2014 and 2015 in which six were documented across the study area (Graph 5) (NewEarth 2015, 2016). This is consistent with findings at Tifft Nature Preserve where in 2016 staff reported only the Virginia Rail (Spiering, personal communication 2016). Species typically documented by staff within Tifft marshes include Pied-billed Grebe, Common Moorhen, American Coot and occasionally Sora and Least Bittern. Based on survey data from MMP routes in the Niagara AOC from 1995 through 2015, six of the eight species occur in the area, but annual detections are highly variable. Only Pied-billed Grebe and Virginia Rail have been documented consistently every year since 2010 (Bird Studies Canada 2015). Prior to this, Pied-billed Grebes were also highly variable and not consistently found in the area.

Higher numbers of individual Pied-billed Grebes were observed in 2014 than in 2015 and 2016, but higher numbers of Virginia Rail were reported in 2015 and 2016 than in 2014 (Graph 5). The King Rail has not been heard in the project area since NewEarth survey efforts began. This species and American Bittern have not been documented on MMP routes within the Niagara AOC to date (Bird Studies Canada 2015). Based on NewEarth surveys, the overall total numbers of individuals of the target bird species continues to decline. Collectively, 26 individuals were documented in the survey area in 2014, 19 were reported in 2015 and 10 were observed in 2016.

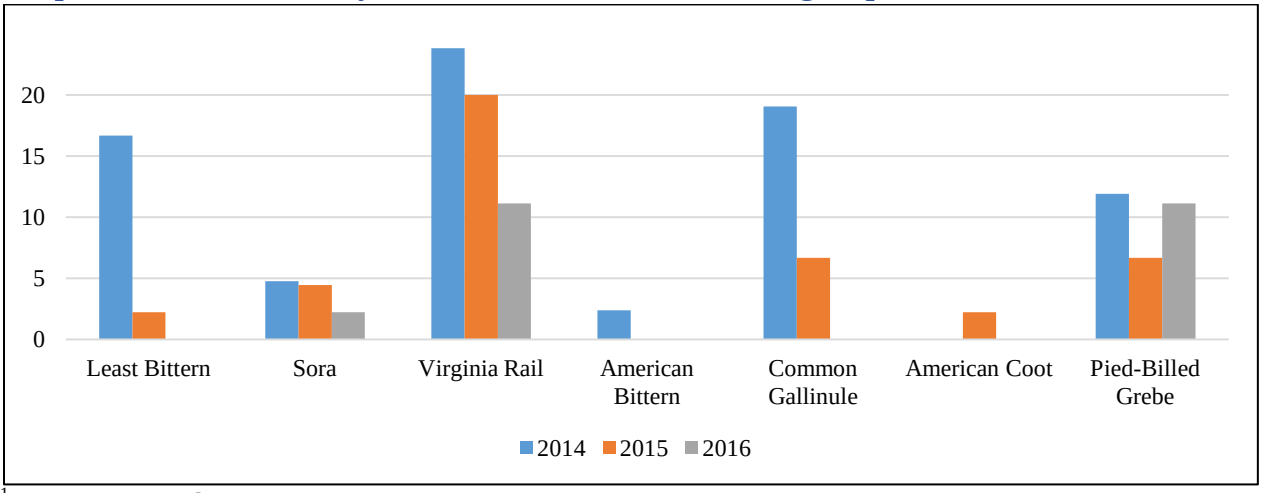
Graph 5. Maximum Number of Individual Marsh Birds Detected 2014[1]-2016[2]



[1] 14 points surveyed during 3 events in 2014
[2] 15 points surveyed during 3 events in 2015 and 2016

Marsh birds are notoriously secretive and difficult to detect. Of the 45 survey events performed in 2016, Virginia Rail and Pied-billed Grebe were the most consistently observed species; but each was detected during only 11% of the survey events (5 of 45) (Graph 6). In 2014 and 2015, Virgina Rail were again detected most often, but were more common than in 2016; at 20% of survey events in 2015 and at 24% in 2014 (NewEarth 2015, 2016).

Graph 6. Percent of Survey Events with a Detection of Target Species 2014[1]-2016[2]



[1] 42 events total in 2014
[2] 45 events total per year 2015and 2016

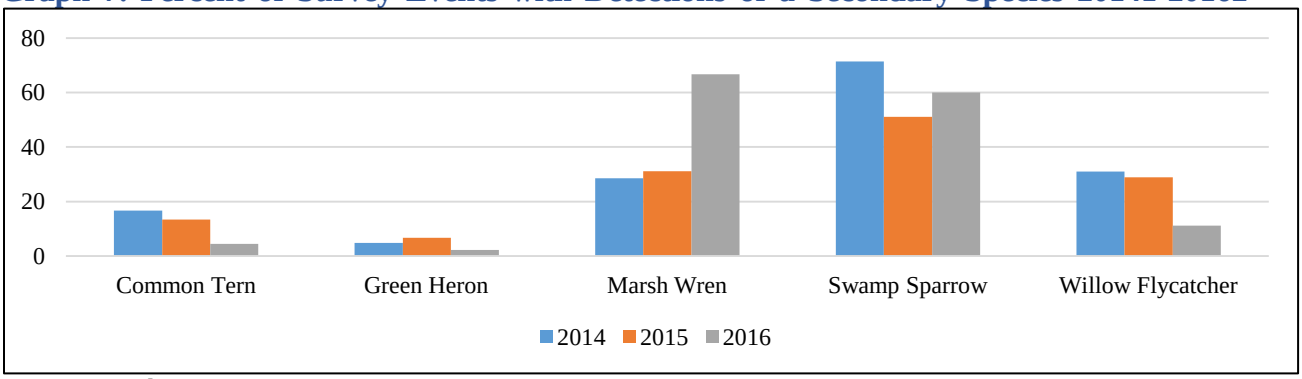
Surveys along Route B1 resulted in the recording of three species (i.e. Pied-billed Grebe, Sora, Virginia Rail), whereas surveys along Route B2 recorded two species (i.e. Pied-billed Grebe, Virginia Rail) (Graph 6). Of the 15 points surveyed in 2016, 11 had no marsh bird species detections: B1-2; B1-5; B1-6; B1-7; B1-8; B2-1; B2-2; B2-3; B2-4; B2-5; and B2-6. Point B1-3 had the highest number of different species detected (Pied-billed Grebe, Sora, Virginia Rail) and Point B2-7 had the most consistent detections with Pied-billed Grebes detected on all surveys. Pied-billed Grebe also had the highest numbers of individuals recorded at a given point (two grebes at B2-7 during all survey events). Although overall number of individuals and target species may be relatively low project-wide, throughout 2014 – 2016 surveys, only four survey points have never had a target marsh bird species present during a survey; B1-5, B1-7, B1-8 and B2-4.

Secondary Focal Species

Presence of secondary focal species was also documented during each of the three survey events. As with 2014 and 2015 surveys, five of the nine targeted secondary focal species were detected in 2016 (Graph 7). A sixth species, Black Tern, was detected in 2014, but not during a survey event. Species detected on Survey Route B1 included Swamp Sparrow, Willow Flycatcher, Marsh Wren and Green Heron; while Survey Route B2 secondary focal species included Swamp Sparrow, Marsh Wren, Willow Flycatcher, and Common Tern. The most commonly observed secondary species in 2016 was the Marsh Wren, replacing Swamp Sparrow as the most commonly observed species documented in 2014 and 2015 (NewEarth 2015, 2016). There was a notable decrease in Willow Flycatcher detections when compared to 2014 and 2015; dropping from detections on 13 survey events in both 2014 and 2015, to detections on five in 2016. Annual observations of this species in the study area are highly variable and the species is not documented in some years (Bird Studies Canada 2015). Forster's Tern, Sedge Wren, and Wilson's Snipe have not been detected in the survey area.

MMP routes from 1995 through 2015 have confirmed seven of the nine species in the Niagara AOC, but Black Tern were only documented in 1998 and Sedge Wren were only found in 2007 (Bird Studies Canada 2015). Of the remaining five species only Marsh Wren and Swamp Sparrow are consistently documented during each annual survey (Bird Studies Canada 2015). Wilsons Snipe and Foresters' Tern have never been detected on MMP routes in the study area.

Graph 7. Percent of Survey Events with Detections of a Secondary Species 20141-20162



42 events total in 2014
45 events total per year 2015and 2016

3.2.2 Incidental Observations

An adult bald eagle was observed flying along the Niagara River on numerous occasions.

3.2.3 Disturbances Noted During Survey Efforts

As with anuran survey efforts, noise (primarily from vehicle and boat traffic), had some effect on surveyor ability to detect calls during 2016 efforts. Noise was at moderate (score = 2) to serious (score = 3) levels during two or more survey events at nine (60%) of the 15 point locations and at several points the noise was extreme (Table 8). These results are similar to prior survey efforts in which noise had a moderate to serious affect during 47% of surveys in 2015 and during 67% of surveys in 2014 (NewEarth 2015, 2016). Although not necessarily documented during actual survey event windows, boats including excessively loud high-speed jet boats, were repeatedly observed near known nesting areas for marsh birds and herons such as point B2-7 (Grass Island) as well as the Motor Island heron rookery and adjacent restoration sites. Boating activity can cause disruption to breeding nesting pairs and excessive wakes can overtop nest sites, especially those in vulnerable low-lying areas such as Grass Island. Additionally, ongoing restoration efforts in Tifft and Times Beach nature preserves has affected vegetation and in some cases resulted in fluctuating water levels within the marsh system. Disturbance from these activities may have a short-term direct negative affect on marsh bird breeding activities in the marsh, but efforts are likely to improve conditions for marsh species over time.

Table 8. Noise Levels During Marsh Bird Survey Events.

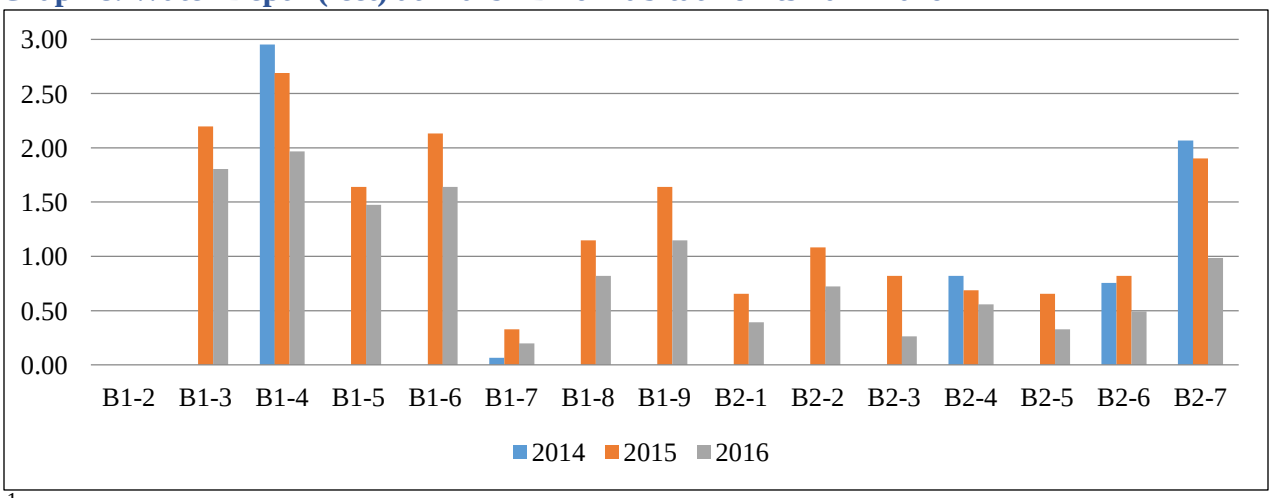
Point	Noise Level Event 1[1]	Noise Level Event 2[1]	Noise Level Event 3[1]
Route B1			
B1-2	2	3	1
B1-3	1	2	0
B1-4	0	0	0
B1-5	2	3	2
B1-6	2	3	2
B1-7	1	1	0
B1-8	2	0	0
B1-9	1	2	1
Route B2			
B2-1	1	2	3
B2-2	4	3	3
B2-3	3	2	3
B2-4	4	1	3
B2-5	3	0	2
B2-6	1	0	1
B2-7	2	3	3

[1] Effect on Sampling: 0 = none; 1 = slight; 2 = moderate; 3 = serious; 4 = profound

3.2.4 Habitat

Based on a visual assessment, vegetation conditions at marsh bird survey points were similar to those previously documented and therefore only water level data were collected in 2016 (Appendix E). Water levels were lower than in 2015 (NewEarth 2016) at all points except B1-2 where the point location has been consistently dry due to marsh restoration efforts within Tifft Preserve, and is representative of an overall decreasing trend in annual precipitation for the Niagara AOC since 2013 (NOAA 2013) (Graph 8). No water is reported for many points from 2014 since most of the points originally surveyed in 2014 were on dry areas of the marsh and were moved slightly following 2014 surveys. As noted, the conditions at the location of the measurements are not necessarily representative of the overall marsh system and the locations that an individual may be breeding in and calling from throughout the season.

Graph 8. Water Depth (feet) at Marsh Bird Habitat Points 2014-2016[1]



[1] Points B1-2, B1-3, B1-5, B1-6, B2-1, B2-2, B2-3 and B2-5 moved slightly after 2014 survey; Points B1-8 and B1-9 added after 2014 survey.

4.0 DISCUSSION

Overall 2016 proved to be a very dry spring and early summer (NOAA 2016), likely resulting in less suitable habitat for breeding anurans and marsh birds. Each of the most common frog species typically found in the project area were again recorded during survey efforts in 2016, however the numbers of individuals calling were lower and the number of individuals calling from within target marshes was also slightly lower. While marsh bird detections are consistently relatively low in the project area, the number of species detected in 2016 was down significantly. Notably absent were Least Bittern, Common Gallinule and American Coot.

Routes and Points

Consistent with 2015 efforts, two survey routes with 23 points total were sampled on four events for anurans and two routes with 15 points were sampled on three events for marsh birds in 2016 (NewEarth 2016). This is an increase in survey efforts from 2014 where two survey routes with 20 points total were sampled on three events for anurans and two routes with 14 points were sampled on three events for marsh birds (NewEarth 2015). This study represents nearly a full census of every location of potentially suitable habitat within the NR AOC that met the sample selection criteria (i.e., minimum size, location adjacent to the Niagara River, and direct

hydrologic connection to the river) for the target guilds. As discussed throughout NR AOC planning documents, nearly all former marshes in the region no longer exist, or are degraded to the extent that the vegetation, hydrologic regimes, food sources, and lack of adjacent undeveloped/undisturbed upland areas may make them unsuitable as habitat for breeding anurans and marsh birds. Wetland creation and restoration efforts such as those proposed in the NR AOC action plan (Filipski 2012), and those performed by others such as Tifft Nature Preserve, and the New York Power Authority as part of their Habitat Improvement Project (NYPA 2016) are the only foreseeable measures that would provide opportunities for significant expansion of anuran and marsh bird survey routes and points.

Anurans

Seven of the 10 target anuran species were documented during the 2016 anuran survey effort. Six species have been consistently documented during the NR AOC surveys to date and include American Toad, Spring Peeper, Chorus Frog, American Bullfrog, Green Frog, and Northern Leopard Frog. One species, Pickerel Frog, was documented in 2014 but not in 2015 or 2016 (NewEarth 2015, 2016). Two additional species were once again not detected during NewEarth surveys to date; Mink Frog and Wood Frog. Of these, neither Mink Frog nor Pickerel Frog has been detected on MMP points within the Niagara AOC (Bird Studies Canada 2015). While the vernal pool habitat that Wood Frogs depend on for successful breeding may occur in the general MMP survey area, such suitable habitat is not known to occur in the NR AOC study area. Mink Frogs typically occur in areas to the north of the NR AOC and extending into Canada and have never been documented in the general study area on MMP routes.

In 2014, 46 calls were documented (note fewer routes and points were surveyed in 2014) and of these 83% were detected from within or within and outside of the targeted habitat (NewEarth 2015). In 2015, 81 calls were documented, of these 89% were detected from within or within and outside of the targeted habitat (NewEarth 2016). In 2016, a slightly higher number of calls were detected than in 2015 (85 calls), but fewer were within the target marsh areas (66%) and most of the detections in 2016 were of only a small number of chorusing individuals at any given station. This reinforces the hypothesis that overall anuran population numbers throughout the NR AOC are quite low, and during the 2016 drought conditions these numbers were even lower than in previous years. Biologists from Tifft Nature Preserve (corresponding Niagara AOC points are A2-1, A2-2 and A2-13), reported the driest marsh conditions and lowest number of species in nine consecutive years (Spiering, personal communication 2016). In April and May, full choruses of spring peepers and several individual Northern Leopard Frogs were documented, but the Green Frogs, Bullfrogs and American toads that typically are found in Tifft marshes were not heard. The Niagara AOC 2016 study did document each of these species at Tifft, but in lower numbers than previously reported. MMP data was not available for 2016 at the time this report was prepared, but prior MMP data shows anuran population numbers can be quite variable, and Grey Tree Frog, Chorus Frog, and Wood Frog are often not detected during annual survey events in the Niagara AOC (Bird Studies Canada 2015).

Wildlife populations are by nature extremely variable year-to-year, long-term large multi-replicate data sets are typically needed to capture true trends. Cause and effect determinations in population trends are further complicated due to effects on species from a host of site variables that may/may not be measurable, variations in weather conditions, previous or on-going activities in the area, logistical problems, overall small population numbers of the target species

throughout the region, and the often secretive and allusive nature of the species. The relatively small sample size of this study may not be adequate to detect population trends with meaningful significance. However, future survey efforts, and data from other ongoing anuran data collection efforts in the region such as the MMP, will facilitate efforts to assess trends in anuran populations. Additionally, marsh creation and restoration measures (Filipski 2012, NYPA 2016), will eventually yield additional marsh locations and opportunities to increase the survey effort and sample sizes in the NR AOC.

Marsh Birds

Inconsistent with the 2014 and 2015 surveys in which six marsh bird species were recorded (NewEarth 2015, 2016), the 2016 effort detected only three of the eight target marsh bird species; Sora, Virginia Rail and Pied-billed Grebe. Even though marsh birds are secretive and often non-responsive to broadcast calls, this suggests that population numbers throughout the NR AOC are quite low and were notably lower during the dry 2016 conditions than previously documented. While additional survey efforts and longer time spent meandering through available habitat may yield higher numbers, these results are consistent with findings by staff at Tifft Nature Preserve, whom also report lower water levels throughout marshes and lower numbers of individuals and species of frogs and marsh birds in 2016 (Spiering, personal communication). Pied-billed Grebe, Common Moorhen, American Coot and occasionally Sora and Least Bittern can be found in marshes of Tifft in most years. However, in 2016 only Virgina Rail were documented by Tifft staff. This may be attributed to the driest spring on record since 1949. As with anuran populations, MMP bird data from 1995 through 2015 shows that bird populations in the Niagara AOC can be quite variable. Only Virginia Rail and more recently Pied-billed Grebe have been consistently observed during annual survey events (Bird Studies Canada 2015).

Marsh birds are notoriously secretive and difficult to detect. Of the 45 survey events performed in 2016, Virginia Rail and Pied-billed Grebe were the most consistently observed species; but each was detected during only 11% of the survey events (5 of 45). In 2014 and 2015, Virgina Rail were again detected most often, but were more common than in 2016; during 20% of survey events in 2015 and during 24% events in 2014 (NewEarth 2015, 2016). Overall numbers of individuals of the target bird species continues to decline. Collectively, 26 were documented in the survey area in 2014 (NewEarth 2015), 19 individuals were reported in 2015 (NewEarth 2016), and 10 individuals were observed in 2016. Most of the 2016 observations were also of a single individual, suggesting that while much of the available habitat is being used, population numbers of those species is low. Like the marsh anuran effort, marsh bird breeding activities and detectability are highly variable, particularly for secretive species such as marsh birds. Extensive survey efforts may yield additional detections of these secretive species, but again, these results are consistent with the general pattern of fewer sightings reported in 2016 by Tifft staff (Spiering, personal communication 2016).

Sunken Island (also referred to as Grass Island by various sources) (point B2-7) and portions of Tifft Preserve (points B1-2 through B1-4) offer the largest relatively high quality marshes in the NR AOC study area. Although overall numbers of marsh bird species encountered in 2016 are lower, the results are consistent with previous survey efforts which found the highest diversity of species in these areas. Tifft species composition included one detection of an individual Sora,

four detections of Virginia Rail (two individuals and one adult with a chick), and two detections of an individual Pied-billed Grebe. Detections at Sunken Island were consistently of two Pied-Billed Grebes which were detected during each of the three survey events. The remaining two detections were of individual Virginia Rails which were documented at B1-9 (same location as in 2015) and B2-5 (a site where they had previously not been observed).

The Sunken Island/Grass Island area was previously the only known breeding location on the Niagara River for Pied-billed Grebes and American Coots and is also a breeding site for Sora and Common Gallinule. Each of these species were observed near Sunken Island during 2015 and 2014 survey efforts, but Sora, American Coot, and Common Gallinule were not observed in 2016. Grebes were sighted in Tifft Preserve in 2016. This species was documented in the preserve in 2014 but was not observed in 2015 (NewEarth 2015, 2016). Noise, wake and general activity associated with high boating activity on the Niagara River continues to pose a threat to species that utilize vulnerable habitats in and directly adjacent to the river system such as Sunken Island.

Unfortunately, the small sample size in the NR AOC may not be sufficient to evaluate marsh bird population trends with any meaningful significance, and there are currently no obvious opportunities to expand the survey effort into additional marshes; this survey was essentially a full census of all accessible available habitat. By comparison, marsh bird population trend analysis conducted by NYSDEC in 2012 included data from nearly 1,500 call-broadcast surveys at 417 survey points (Yard et. al. 2012). However, future annual survey efforts and data from ongoing avian data collection efforts in the region, such as those associated with the MMP, will facilitate efforts to assess trends in anuran populations in the NR AOC. Additionally, proposed marsh creation and restoration measures in the NR AOC (Filipski 2012, NYPA 2016), will eventually yield additional marsh locations and opportunities to increase the survey effort and sample sizes.

5.0 CONCLUSIONS

This study is the third of five annual survey events that will be conducted at an intensive level within the NR AOC and represents nearly a full census of every location of habitat within the AOC that met the sample selection criteria (i.e., minimum size, location adjacent to the Niagara River, and direct hydrologic connection to the river) for the target anuran and marsh bird species. The study provides the baseline on which future survey events will be evaluated and offers a foundation for future comparisons with other studies locally and in the region.

It is well-known that nearly all former marshes in the region no longer exist, have been significantly reduced in size, and/or have had at least some of their primary wetland functions degraded. Despite this, seven of the ten targeted anuran species and three of the eight targeted marsh bird species were confirmed in the NR AOC during this study area. Future survey efforts will help to assess population sizes and species use of the marshes found in the NR AOC.

Weather and climate undoubtedly also affect habitat availability and reproductive success for marsh species. The 2016 survey season occurred within an abnormally dry year with annual reported precipitation 12 to 16 inches below normal for the general Niagara River AOC (NOAA 2016). This continues a reported decreasing trend in annual precipitation since 2013, with annual precipitation in 2015 at 6 to 8 inches below normal, 2014 precipitation at 2 to 4 inches

below normal, and 2013 from 2 inches below normal to 6 inches above depending on the exact location monitored within the AOC (NOAA 2016).

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APPENDIX A

PHOTOGRAPHIC DOCUMENTATION

Anuran Survey Point A1-1 Facing Northeast

Anuran Survey Point A1-2 Facing Southwest

Anuran Survey Point A1-3 Facing North

Anuran Survey Point A1-4 Facing North

Anuran Survey Point A1-5 Facing North

Anuran Survey Point A1-6 Facing Northeast

Anuran Survey Point A1-7 Facing East

Anuran Survey Point A1-8 Facing North

Anuran Survey Point A1-9 Facing West

Anuran Survey Point A1-10 Facing Southeast

Anuran Survey Point A2-1 Facing Southeast

Anuran Survey Point A2-2 Facing Southeast

Anuran Survey Point A2-3 Facing Northwest

Anuran Survey Point A2-4 Facing Northeast

Anuran Survey Point A2-5 Facing West

Anuran Survey Point A2-6 Facing North

Anuran Survey Point A2-7 Facing Northeast

Anuran Survey Point A2-8 Facing Southwest

Anuran Survey Point A2-9 Facing Southwest

Anuran Survey Point A2-10 Facing Northwest

Anuran Survey Point A2-11 Facing West

Anuran Survey Point A2-12 Facing Southeast

Avian Survey Point B1-1 – Deleted due to excessive noise

Avian Survey Point B1-2 Facing East

Avian Survey Point B1-3 Facing Northeast

Avian Survey Point B1-4 Facing Southwest

Avian Survey Point B1-5 Facing Northwest

Avian Survey Point B1-6 Facing South

Avian Survey Point B1-7 Facing Southeast

Avian Survey Point B1-8 Facing West

Avian Survey Point B1-9 Facing West

Avian Survey Point B2-1 Facing South

Avian Survey Point B2-2 Facing West

Avian Survey Point B2-3 Facing West

Avian Survey Point B2-4 Facing North

Avian Survey Point B2-5 Facing North

Avian Survey Point B2-6 Facing South

Avian Survey Point B2-7 Facing Northeast

APPENDIX B

COORDINATES FOR ANURAN AND MARSH BIRD SURVEY LOCATIONS

2016 Niagara AOC Anuran and Marsh Bird Survey Point Locations

Point ID	Route	X_Coordinate	Y_Coordinate
Anuran Survey Points			
A1-1	A1	-78.93921969	42.96050152
A1-2	A1	-78.95795973	42.95956784
A1-3	A1	-78.94299513	42.9675121
A1-4	A1	-78.93133144	43.00747002
A1-5	A1	-78.89498996	43.02501621
A1-6	A1	-78.9725269	43.06087169
A1-7	A1	-78.97866992	43.0613125
A1-8	A1	-78.98642021	43.05797605
A1-9	A1	-78.99476182	43.05918919
A1-10	A1	-79.01153746	43.0260928
A2-1	A2	-78.85370536	42.84815605
A2-2	A2	-78.8532601	42.85205124
A2-3	A2	-78.88556259	42.87472464
A2-4	A2	-78.90739393	42.93440447
A2-8	A2	-78.88005618	43.02351582
A2-5	A2	-78.92689204	43.00096179
A2-6	A2	-78.90674862	43.00618208
A2-9	A2	-78.88539973	43.03451121
A2-7	A2	-78.89135163	43.01685347
A2-10	A2	-78.8996137	43.05424911
A2-11 (new in 2015)	A2	-78.92524257	42.9674437
A2-12 (new in 2015)	A2	-78.90470658	42.93197804
A2-13 (new in 2015)	A2	-78.85845231	42.8528881
Marsh Bird Survey Points			
B1-1 (deleted in 2015)			
B1-2	B1	-78.85187044	42.84363383
B1-3	B1	-78.85361329	42.8484301
B1-4	B1	-78.85327745	42.85207409
B1-5	B1	-78.88355885	42.87245441
B1-6	B1	-78.88701785	42.87578334
B1-7	B1	-78.9424576	42.96855599
B1-8 (new in 2015)	B1	-78.95779895	42.95960999
B1-9 (new in 2015)	B1	-78.92517147	42.96737037
B2-1	B2	-78.99853893	43.06411645
B2-3	B2	-78.99478784	43.05914462
B2-2	B2	-78.99183671	43.06114591
B2-4	B2	-78.98637709	43.05798837
B2-5	B2	-78.98151314	43.05704682
B2-6	B2	-78.97927655	43.06044772
B2-7	B2	-78.96998062	43.06264311

APPENDIX C

2016 ANURAN SURVEY DATA FORMS

Niagara River Area Of Concern Marsh Anuran Survey Protocol

Anuran Calling Survey Data Form

Please complete information below		Data collected at start of each survey point	
Observer Name(s):		Additional notes:	
Route Number:			
Survey Date (mm/dd/yyyy):			
Window Number:		Days since last rainfall:	

Data collected at each point	Survey Point Number									
	1	2	3	4	5	6	7	8	9	10
Start Time (military):										
Air Temperature: Select Scale: °C °F										
Was noise a factor? (use index)										
Did you take a break? (check if yes)										
Wind (Use Wind Scale)										
Sky (Use Sky Codes)										
Moon or Moonlight Visible (Y or N)										
Number of cars that passed (within 50 m)										
Snow cover (Y or N)										
Species List	1	2	3	4	5	6	7	8	9	10
American toad										
Gray tree frog										
Spring peeper										
Western/Boreal chorus frog										
Mink frog										
Wood frog										
American bull frog										
Green frog										
Northern leopard frog										
Pickerel frog										

Comments:

Instructions:

Please be sure to complete the entire datasheet.

Each datasheet represents one person's frog call observations. If you have an assistant, he/she can assist with the environmental data (e.g. air temp, count cars, etc.) but not with what frogs are heard.

Visit stops in 1-10 order. If unforeseen circumstances require you to skip a stop, write that on the datasheet.

At the start of each survey point record the time, wind, and sky conditions (see codes to the right).

At each stop listen for 5 minutes, recording the amphibian calling index for each species heard during an initial 3 minute listening period in the first column of the survey point, followed by the findings of a subsequent 2 minute listening period in the second column of each survey point. Report only the species you are confident that you heard. If a species varies in calling intensity over the listening periods, report the highest calling index level you heard for each listening period.

At each stop, also report the environmental data requested: air temperature, noise conditions, moonlight, and number of cars that passed while listening.

There are two kinds of noise disturbance questions:

- Was noise a factor? The "Noise index" is a numerical ranking of the level of background noise disturbance encountered. See codes to the right.
- "Did you take a break?" If an unexpected noise disturbance happens (such as a train) that lasts a minute or more, you may interrupt the 5 minute listening period to ignore the sudden disturbance. Finish up the listening time after the disturbance has passed. Do not include this type of noise in the "was noise a factor" question.

Index and Code Definitions

Amphibian Calling Index	
1	Individuals can be counted; there is space between calls
2	Calls of individuals can be distinguished but there is some overlapping of calls
3	Full chorus, calls are constant, continuous and overlapping
Amphibian Calling Index Modifiers	
A	Amphibians Calling Within Target Area Only
B	Amphibians Calling Outside Target Area Only
C	Amphibians Calling Inside and Outside of Target Area
Sky codes	
0	Few clouds
1	Partly cloudy (scattered) or variable sky)
2	Cloudy or overcast
4	Fog or smoke
5	Drizzle or light rain (not affecting hearing ability)
7	Snow
8	Showers (is affecting hearing ability) do not conduct survey
Wind Codes	
0	Calm (<1mph) smoke rises vertically
1	Light Air (1-3 mph) smoke drifts, weather vane inactive
2	Light Breeze (4-7 mph) leaves rustle, can feel wind on face
3	Gentle Breeze (8-12 mph) leaves and twigs move around, small flag extends
4*	Moderate Breeze (13-18 mph) moves thin branches, raises loose papers * Do not conduct survey, unless in Great Plains states
5**	Fresh Breeze (19 mph or greater) small trees begin to sway **Do not conduct survey –ALL REGIONS
Noise Index	
0	No appreciable effect (e.g. owl calling)
1	Slightly affecting sampling (e.g. distant traffic, dog barking, 1 car passing)
2	Moderately affecting sampling (e.g. nearby traffic, 2-5 cars passing)
3	Seriously affecting sampling (e.g. continuous traffic nearby, 6-10 cars)
4	Profoundly affecting sampling (e.g. continuous traffic passing, construction noise)

Niagara River Area Of Concern Marsh Anuran Survey Protocol

Anuran Calling Survey Data Form

Please complete information below		Data collected at start of each survey point	
Observer Name(s):	S. GROVE	Additional notes:	RELATIVELY DRY WEEK PRIOR TO SURVEY BUT LATE SEASON SNOW EVENT 2.5" ON 4/10 PROVIDED SNOW PACK FOR POOLS. FORESTED AREAS W/ MANY POOLS DURING SURVEY
Route Number:	A1		
Survey Date (mm/dd/yyyy):	4/16/2016		
Window Number:	1	Days since last rainfall:	5 DAYS .39" ON 4/11

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2114	2152	2100	2448	2053	2359	2416	2334	2303	2215
Air Temperature: Select Scale: °C °F	53	50	54	45	55	45	45	46	47	48
Was noise a factor? (use index)	0	0	2	1	1	0	0	2	3	1
Did you take a break? (check if yes)	N	N	N	N	N	N	N	N	N	N
Wind (Use Wind Scale)	1	1	1	1	1	1	1	1	1	1
Sky (Use Sky Codes)	0	0	0	0	0	0	0	0	0	0
Moon or Moonlight Visible (Y or N)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Number of cars that passed (within 50 m)	0 0	0 0	0 0	1 1	0 0	0 0	0 0	0 0	0 0	0 1
Snow cover (Y or N)	N	N	N	N	N	N	N	N	N	N

Species List	1	2	3	4	5	6	7	8	9	10
American toad						1B 1B				
Gray tree frog										
Spring peeper CHORUS	1C 1C	3B 3B	1B 1B	2A 2A	2B 2B	2B 2B	1C 1C	3C 3C	3C 3C	1B 1B
Western/Boreal chorus frog MALE	1B 1B	0 1B				1B 1B	1B 1B	2C 2C		
Mink frog										
Wood frog										
American bull frog										
Green frog								2A 2A		
Northern leopard frog PEEPERS	1A 1A	2C 2C		1A 1A		1B 1B	1C 1C		1A 1A	
Pickerel frog										

Comments: A3 LEOPARD AFTER SURVEY - LIKELY CALLING DURING SURVEY BUT NOT CLOSE ENOUGH TO HEAR DUE TO CITY NOISE
A2 - LEOPARD ONLY 1 CALLING IN TARGET AREA WOODLAND POOLS ABUNDANT FROG ACTIVITY LEVEL 2
A1 - Peepers level 3 out of area
A6 ALL FROGS IN FOREST POOLS PBGR!!

A9 Peepers | HIGHWAY NOISE! CHORUS ON WALK IN

CHORUS FROGS IN FOREST ADJ TO MARSH
A4 ONLY IN MARSH TO N SIDE OF RD

Niagara River Area Of Concern Marsh Anuran Survey Protocol

Anuran Calling Survey Data Form

Please complete information below		Data collected at start of each survey point	
Observer Name(s):	S. GROVE	Additional notes:	EARLY SEASON WARM-UP > 60°F (LATE MARCH) SOME FROGS EMERGED, BUT THIS WAS FOLLOWED BY COLD SNAP / SNOW WEEKS OF 4/4-4/11
Route Number:	A2		
Survey Date (mm/dd/yyyy):	4/17/2016		
Window Number:	1	Days since last rainfall:	5 .39" ON 4/11 25" SNOW 4/10

Data collected at each point	Survey Point Number 1	2	3	~~4~~	~~5~~	~~6~~	~~7~~	~~8~~	~~9~~	~~10~~
Start Time (military):	2243	2321	2424							
Air Temperature: Select Scale: °C °F	53	52	51							
Was noise a factor? (use index)	2	1	2							
Did you take a break? (check if yes)	N	N	N							
Wind (Use Wind Scale)	1	1	1							
Sky (Use Sky Codes)	0	0	0							
Moon or Moonlight Visible (Y or N)	Y	Y	Y							
Number of cars that passed (within 50 m)	0 0	0 0	0 0							
Snow cover (Y or N)	N									
Species List	**1**	**2**	**3**	**~~4~~**	**~~5~~**	**~~6~~**	**~~7~~**	**~~8~~**	**~~9~~**	**~~10~~**
American toad										
Gray tree frog										
Spring peeper		A A 1 1	B B 1 1							
Western/Boreal chorus frog	A A 3 3									
Mink frog										
Wood frog										
American bull frog										
Green frog										
Northern leopard frog	2A 2A	0 1A								
Pickerel frog										

Comments:

Niagara River Area Of Concern Marsh Anuran Survey Protocol

Anuran Calling Survey Data Form

Please complete information below		Data collected at start of each survey point	
Observer Name(s):	S. GROVE	Additional notes:	LATE MARCH IN 60'S SOME FROGS EMERGED FOLLOWED BY SNOW WEEKS OF 4/4 – 4/11
Route Number:	A2		
Survey Date (mm/dd/yyyy):	4/17/2016		
Window Number:	1	Days since last rainfall:	6 .39" ON 4/11, 2.5" SNOW 4/10

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	0105	2407	2341	2304	2234	2220	2117	2211	2200	2141
Air Temperature: Select Scale: °C (°F)	49	51	51	52	55	55	58	56	57	57
Was noise a factor? (use index)	0	0	2	3	4	2	3	1	1	2
Did you take a break? (check if yes)	N	N								
Wind (Use Wind Scale)	1	1	1	1	1	1	1	1	1	1
Sky (Use Sky Codes)	0	0	0	0	0	0	0	0	0	0
Moon or Moonlight Visible (Y or N)	Y	Y							Y	Y
Number of cars that passed (within 50 m)	0 0	0 0	0 0	0 0	10 8	1 1	0 0	0 0	0 0	0 0
Snow cover (Y or N)	N	N								

Species List	1	2	3	4	5	6	7	8	9	10
American toad					B B 1 1	A A 2 2				
Gray tree frog										
Spring peeper	B B 1 1	C C 2 2	A A 1 1							
Western/Boreal chorus frog						B B 1 1				
Mink frog										
Wood frog										
American bull frog										
Green frog										
Northern leopard frog	A A 1 1	C C 1 1	A A 1 1							
Pickerel frog										

Comments: A2 1 2 PART OF BUFFER MOWED

A2-2 BEAVER

Niagara River Area Of Concern Marsh Anuran Survey Protocol

Anuran Calling Survey Data Form

Please complete information below		Data collected at start of each survey point
Observer Name(s):	S. GROVE	Additional notes:
Route Number:	A2	
Survey Date (mm/dd/yyyy):	5/31/2016	
Window Number:	3	Days since last rainfall:

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2430	2340	2321	2248	2214	2159	2147	2138	2129	2114
Air Temperature: Select Scale: °C (°F)	60	60	62	64	64	64	65	65	68	68
Was noise a factor? (use index)	0	1	2	3	2	2	2	1	1	2
Did you take a break? (check if yes)	N									
Wind (Use Wind Scale)	1	1	1	1	1	1	1	1	1	1
Sky (Use Sky Codes)	1	1	1	1	1	1	1	1	1	1
Moon or Moonlight Visible (Y or N)	N	N	N	N	N	N	N	N	N	N
Number of cars that passed (within 50 m)	0 0	0 0	0 0	0 0	0 0	2 3	0 0	0 0	0 0	0 0
Snow cover (Y or N)	N									

Species List	1	2	3	4	5	6	7	8	9	10
American toad										
Gray tree frog										
Spring peeper		C C 1 1								
Western/Boreal chorus frog										
Mink frog										
Wood frog										
American bull frog	C C 2 2	C C 2 2								
Green frog	C C 2 2	C C 2 2		A A 1 1						
Northern leopard frog										
Pickerel frog										

Comments:

Niagara River Area Of Concern Marsh Anuran Survey Protocol

Anuran Calling Survey Data Form

Please complete information below		Data collected at start of each survey point
Observer Name(s):	S. GROVE	Additional notes:
Route Number:	A2	
Survey Date (mm/dd/yyyy):	5/31/2016	
Window Number:	3	Days since last rainfall:

Data collected at each point	Survey Point Number									
	11	12	13	4	5	6	7	8	9	10
Start Time (military):	2227	2259	2400							
Air Temperature: Select Scale: °C °F	64	65	60							
Was noise a factor? (use index)	4	2	1							
Did you take a break? (check if yes)	N	N	N							
Wind (Use Wind Scale)	1	1	1							
Sky (Use Sky Codes)	1	1	1							
Moon or Moonlight Visible (Y or N)	N	N	N							
Number of cars that passed (within 50 m)	9 11	0 0	0 0							
Snow cover (Y or N)	N									

Species List	1	2	3	4	5	6	7	8	9	10
American toad										
Gray tree frog										
Spring peeper										
Western/Boreal chorus frog										
Mink frog										
Wood frog										
American bull frog			A A 1 1							
Green frog		A A 2 2	A A 1 1							
Northern leopard frog										
Pickerel frog										

Comments:

Niagara River Area Of Concern Marsh Anuran Survey Protocol

Anuran Calling Survey Data Form

Please complete information below		Data collected at start of each survey point
Observer Name(s):	S GROVE	Additional notes:
Route Number:	A1	
Survey Date (mm/dd/yyyy):	6/1/2016	
Window Number:	3	Days since last rainfall: Ø TRACE RAIN DURING SURVEY

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2410	2429	2442	2355	2348	2203	2232	2259	2325	2120
Air Temperature: Select Scale: °C °F	66	66	66	66	66	69	69	68	68	69
Was noise a factor? (use index)	0	0	0	0	0	0	0	0	0	0
Did you take a break? (check if yes)	N	N	N	N	N	N	N	N	N	N
Wind (Use Wind Scale)	1	1	1	1	1	1	1	1	1	1
Sky (Use Sky Codes)	5	5	5	5	5	2	2	2	2	2
Moon or Moonlight Visible (Y or N)	N	N	N	N	N	N	N	N	N	N
Number of cars that passed (within 50 m)	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Snow cover (Y or N)	N					N				

Species List	1	2	3	4	5	6	7	8	9	10
American toad										
Gray tree frog										
Spring peeper										
Western/Boreal chorus frog										
Mink frog										
Wood frog										
American bull frog								A 1	A 1	A 1	A 1
Green frog								C 1	C 1		
Northern leopard frog										
Pickerel frog										

Comments:

Niagara River Area Of Concern Marsh Anuran Survey Protocol

Anuran Calling Survey Data Form

Please complete information below		Data collected at start of each survey point
Observer Name(s):	S.GROVE / M. GROVE	Additional notes:
Route Number:	A2	
Survey Date (mm/dd/yyyy):	5/11/2016	
Window Number:	2	Days since last rainfall: 3 TRACE DAILY 5/6-5/8, 0.38 ON 5/2

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2136	2205	2234	2247	2328	2340	2352	2401	2411	2422
Air Temperature: Select Scale: °C °F	60	59	59	59	58	58	59	57	57	57
Was noise a factor? (use index)	2	2	3	3	2	2	2	2	2	2
Did you take a break? (check if yes)	N									
Wind (Use Wind Scale)	1	1	1	2	1	1	1	1	1	1
Sky (Use Sky Codes)	1	1	1	1	1	1	1	1	1	1
Moon or Moonlight Visible (Y or N)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Number of cars that passed (within 50 m)	0 0	0 0	0 0	0 0	0 0	2 2	0 0	0 0	0 0	0 0
Snow cover (Y or N)	N									

Species List	1	2	3	4	5	6	7	8	9	10
American toad	B 1 1	B 1 1								
Gray tree frog										
Spring peeper	B 1 1	B 1 1								
Western/Boreal chorus frog										
Mink frog										
Wood frog										
American bull frog										
Green frog										
Northern leopard frog										
Pickerel frog										

Comments: 1 - TIFFT PBGR, SORA

FROGS VERY QUIET!

TRAINS / AIRPLANE NOISE @ TIFFT

OTHERS - HIGHWAY NOISE, SIRENS MOTORCYCLES

VIRA IN SMALL # NEAR BYBLOS HOTEL

Niagara River Area Of Concern Marsh Anuran Survey Protocol

Anuran Calling Survey Data Form

Please complete information below		Data collected at start of each survey point
Observer Name(s):	S.GROVE / M.GROVE	Additional notes:
Route Number:	A2	
Survey Date (mm/dd/yyyy):	5/11/2016	
Window Number:	2	Days since last rainfall:

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2314	2258	2217							
Air Temperature: (Select Scale: °C °F)	58	58	59							
Was noise a factor? (use index)	2	3	2							
Did you take a break? (check if yes)	N									
Wind (Use Wind Scale)	1	2	1							
Sky (Use Sky Codes)	1	1	1							
Moon or Moonlight Visible (Y or N)	Y	Y	Y							
Number of cars that passed (within 50 m)	0 0	0 0	0 0							
Snow cover (Y or N)										

Species List	1	2	3	4	5	6	7	8	9	10
American toad			B 1 1							
Gray tree frog										
Spring peeper			B 1 1							
Western/Boreal chorus frog										
Mink frog										
Wood frog										
American bull frog										
Green frog		A 1	A 1							
Northern leopard frog										
Pickerel frog										

Comments: HIGHWAY NOISE / SIRENS! MOTORCYCLES

12 - ONLY A FEW BRIEF CALL NOTES 1 FROG

Niagara River Area Of Concern Marsh Anuran Survey Protocol

Anuran Calling Survey Data Form

Please complete information below		Data collected at start of each survey point	
Observer Name(s):	S.GROVE	Additional notes:	OCASSIONAL DRIZZLE
Route Number:	A1		
Survey Date (mm/dd/yyyy):	5/12/2015		
Window Number:	2	Days since last rainfall:	0 DRIZZLE DURING SURVEY

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2337	2321	2352	2409	0133	2201	2229	0104	2440	0117
Air Temperature: Select Scale: °C °F	64	65	64	64	63	65	65	63	64	63
Was noise a factor? (use index)	0	1	0	1	0	0	0	0	0	0
Did you take a break? (check if yes)	N	N	N	N	N	N	N	N	N	N
Wind (Use Wind Scale)	1	1	1	1	2	1	1	2	2	2
Sky (Use Sky Codes)	3	2	3	3	2	2	2	3	3	3
Moon or Moonlight Visible (Y or N)	N	N	N	N	N	N	N	N	N	N
Number of cars that passed (within 50 m)	0 0	0 0	0 0	1 2	0 0	0 0	0 0	0 0	0 0	0 0
Snow cover (Y or N)	N									

Species List	1	2	3	4	5	6	7	8	9	10
American toad	B 1 B 1	/ B 1	C 1 C 1	A 2 A 2	B 1 1		C 2 3	C 2 C 2		
Gray tree frog					B 1 1					
Spring peeper	B 2 B 2	B 1 B 2	A 1 A 1	A 1 A 1	B 1 1		B 1 B 1	C 2 C 2	C 3 C 3	
Western/Boreal chorus frog										
Mink frog										
Wood frog										
American bull frog										
Green frog										
Northern leopard frog										
Pickerel frog										

Comments: A1- IN POOLS W/IN FOREST

6- PBGR call

5- TOAD VISUAL, LONE TREE FROG PARTIAL SONG ALSO IN MARSH @ HOTEL W/ VIRA

BORDER TRUCK 96302

Niagara River Area Of Concern Marsh Anuran Survey Protocol

Anuran Calling Survey Data Form

Please complete information below		Data collected at start of each survey point
Observer Name(s):	S. GROVE	Additional notes:
Route Number:	A2	
Survey Date (mm/dd/yyyy):	6/24/2016	
Window Number:	4	Days since last rainfall:

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2340	2403	2456	2240	2219	2203	2149	2136	2118	2103
Air Temperature: Select Scale: °C (°F)	68	68	70	72	72	73	73	73	73	73
Was noise a factor? (use index)	0	2	2	2	2	2	3	4	2	3
Did you take a break? (check if yes)	N									
Wind (Use Wind Scale)	1	1	1	1	1	0	1	0	0	1
Sky (Use Sky Codes)	0	1	1	0	0	0	0	0	0	0
Moon or Moonlight Visible (Y or N)	N	Y	Y	N	N	N	N	N	N	N
Number of cars that passed (within 50 m)	0 0	0 0	0 0	0 0	0 0	0 1	0 0	0 1	0 0	0 0
Snow cover (Y or N)	N									

Species List	1	2	3	4	5	6	7	8	9	10
American toad										
Gray tree frog										
Spring peeper										
Western/Boreal chorus frog										
Mink frog										
Wood frog										
American bull frog	G C 1 1	A A 1 1								
Green frog	C C 1 1	C C 2 2	A A 1 1	A A 1 1						
Northern leopard frog										
Pickerel frog										

Comments: A2-8 ALL VEG MOWED, PARTY/MUSIC

Niagara River Area Of Concern Marsh Anuran Survey Protocol

Anuran Calling Survey Data Form

Please complete information below		Data collected at start of each survey point
Observer Name(s):	S. GROVE	Additional notes:
Route Number:	A2	
Survey Date (mm/dd/yyyy):	6/24/2016	
Window Number:	4	Days since last rainfall:

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2233	2302	2421							
Air Temperature: Select Scale: °C °F	68	72	67							
Was noise a factor? (use index)	3	3	2							
Did you take a break? (check if yes)	N	N	N							
Wind (Use Wind Scale)	1	1	1							
Sky (Use Sky Codes)	0	0	1							
Moon or Moonlight Visible (Y or N)	N	N	Y							
Number of cars that passed (within 50 m)	76	00	00							
Snow cover (Y or N)	N									
Species List	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
American toad										
Gray tree frog										
Spring peeper										
Western/Boreal chorus frog										
Mink frog										
Wood frog										
American bull frog			C1 C1							
Green frog		A1 A1	A1 A1							
Northern leopard frog										
Pickerel frog										

Comments: TRAFFIC

Niagara River Area Of Concern Marsh Anuran Survey Protocol

Anuran Calling Survey Data Form

Please complete information below		Data collected at start of each survey point
Observer Name(s):	S. GROVE	Additional notes:
Route Number:	A1	
Survey Date (mm/dd/yyyy):	6/23/2016	
Window Number:	4	Days since last rainfall:

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2417	2359	2438	2145	2157	2218	2245	2309	2325	2340
Air Temperature: Select Scale: °C (°F)	55	55	55	64	62	61	60	59	57	55
Was noise a factor? (use index)	0	0	2	3	1	0	0	4	0	0
Did you take a break? (check if yes)	N			N						
Wind (Use Wind Scale)	1	1	1	1	1	1	1	1	1	1
Sky (Use Sky Codes)	0	0	0	0	0	0	0	0	0	0
Moon or Moonlight Visible (Y or N)	Y	Y	Y	N	N	N	N	N	Y	Y
Number of cars that passed (within 50 m)	0 0	0 0	0 0	7 5	0 0	0 0	0 0	0 0	0 0	0 0
Snow cover (Y or N)	N									

Species List	1	2	3	4	5	6	7	8	9	10
American toad										
Gray tree frog										
Spring peeper										
Western/Boreal chorus frog										
Mink frog										
Wood frog										
American bull frog		C 2 C 2	A 1 A 1				A 1 A 1			
Green frog		0 1 B						A 1 A 1	A 1 0	
Northern leopard frog										
Pickerel frog										

Comments: POSS VIRA/OTHER @ PT 9 - 1 CALL UNUSUAL NO ID
OFFICER T. FRANZ NY PARK POLICE 716-278-1777

APPENDIX D

2016 MARSH BIRD SURVEY DATA FORMS

NIAGARA RIVER AREA OF CONCERN MARSH BIRD SURVEY DATA FORM

DATE (e.g. 15 May 2015): _____ **MULTIPLE OBSERVER SURVEY**: YES / NO **BOAT TYPE**: _____

MARSH NAME: _____ **OBSERVER NAMES (LIST ALL)**: _____

WATER DEPTH (by station #):_____

ADDITIONAL NOTES: _____

STATION NUMBER	START TIME (MILITARY)	TEMP. (F)	SKY	WIND (Beaufort))	BACKGROUND NOISE	SPECIES	OBSERVED DURING														CALL TYPE(S)	DIRECTION	IN TARGET AREA (Y/N)	DISTANCE (METERS)	DISTANCE AIDE	PREVIOUSLY DETECTED (Y/N)	COMMENTS
							PASS 0-1	PASS 1-2	PASS 2-3	PASS 3-4	PASS 4-5	LEBI	SORA	VIRA	KIRA	AMBI	COGA	AMCO	PBGR	OUTSIDE							
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					

NIAGARA RIVER MARSH BIRD SURVEY DATA FORM INSTRUCTIONS

The following instructions provide specific details for filling out the data form to provide consistency in recording survey data.

Header Information

Date: day/month/year (e.g., 15 May 2014). To be completed prior to beginning of survey.
Multiple Observer Survey (circle one**):** Yes or No
Observer Names (List All): List all observer and recorder names and identify what their role is.
Marsh Name: Identify what marsh is being surveyed when the marsh is named.
Boat Type: Describe the boat being used (i.e. manufacturer, length, motor size) or write N/A if a boat was not used.
Water Depth: Record the water depth at each station number. Depth should be recorded in centimeters or meters.

Observation Information

Station Number: Record station number (e.g. 2-1) prior to beginning passive monitoring at each station.
Start Time: Record the start time at the beginning of each survey. Record in military time (e.g., 0600 = 6 am, 1300 = 1 pm).
Temp.: Record as Fahrenheit.
Sky: Record sky codes as follows: 0=clear or a few clouds; 1=partly cloudy or variable sky; 2=cloudy or overcast; 3=sand or dust storm; 4=fog/smoke; 5=drizzle; 6=snow; 7=snow/sleet; 8=showers
Wind: Use the Beaufort Wind Scale below and record the average Force rating number.
Noise: Record noise codes as follows: 0=no noise; 1=faint noise; 2=moderate noise (probably can't hear some birds beyond 100m); 3=loud noise (probably can't hear some birds beyond 50m); 4=intense noise (probably can't hear some birds beyond 25m);
Species: Record each species observed using the 4-letter bird banding code system provided below (e.g. Least Bittern = LEBI). Secondary focal species should be recorded in the comments column.
Observed During: Record an H in the appropriate column when a species is heard, record an S in the column if the species was seen; and record an HS in the column if a species was heard and seen.
Call Type: Record the call type as described in Appendix D of the work plan.
Direction: Record the direction the bird was first observed from the surveyors position by marking on the circle provided (e.g. Q **=** behind the observer). The observer should be facing the direction of the speaker.
In Target Area: Record if the bird was within the targeted marsh or outside of the targeted marsh by recording Y or N, respectively.
Distance: Record distances in meters.
Distance Aide: Record the distance code used in estimating the distance to an observed bird. Distance codes are as follows**:** 0=none; 1=range finder; 2=distance bands on aerial photography; 3=flags tied to vegetation
Previously Detected (Y/N): Record a Y or N.
Comments: Use this space to record other relevant details not captured elsewhere on the data form. Other details may include behavioral notes, color band observations (recorded from top to bottom and from left to right), and documentation of any photos taken. Rare species observations can be described here as well. Use a blank sheet of paper if needed to add additional notes.
Field Book: Use your personal field log book to note/document all other noteworthy observations such as rare wildlife and logistical problems (copies will be requested).

Force	Beaufort Wind Scale			Name	Conditions on Land
	knots	km/h	mi/h		
0	< 1	< 2	< 1	Calm	Smoke rises vertically.
1	1-3	1-5	1-4	Light air	Smoke drifts and leaves rustle.
2	4-6	6-11	5-7	Light breeze	Wind felt on face.
3	7-10	12-19	8-11	Gentle breeze	Flags extended, leaves move.
4	11-16	20-29	12-18	Moderate breeze	Dust and small branches move.
5	17-21	30-39	19-24	Fresh breeze	Small trees begin to sway.
6	22-27	40-50	25-31	Strong breeze	Large branches move, wires whistle, umbrellas are difficult to control.
7	28-33	51-61	32-38	Near gale	Whole trees in motion, inconvenience in walking.
8	34-40	62-74	39-46	Gale	Difficult to walk against wind. Twigs and small branches blown off trees.
9	41-47	76-87	47-54	Strong gale	Minor structural damage may occur (shingles blown off roofs).
10	48-55	88-102	55-63	Storm	Trees uprooted, structural damage likely.
11	56-63	103-118	64-73	Violent storm	Widespread damage to structures.
12	64+	119+	74+	Hurricane	Severe structural damage to buildings, wide spread devastation.

IBP 4-LETTER SPECIES ACRONYMS FOR MARSH BIRDS IN THE NR AOC

CODE	Common Name	Scientific Name	Primary or Secondary Focal Species
AMBI	American Bittern	*Botarus lentiginosus*	Primary
AMCO	American Coot	*Fulica americana*	Primary
BLTE	Black Tern	*Chlidonias niger*	Secondary
COGA	Common Gallinule	*Gallinula galeata*	Primary
COTE	Common Tern	*Sterna hirundo*	Secondary
FOTE	Forster's Tern	*Sterna forsteri*	Secondary
GRHE	Green Heron	*Butorides virescens*	Secondary
KIRA	King Rail	*Rallus elegans*	Primary
LEBI	Least Bittern	*Ixobrychus exilis*	Primary
MAWR	Marsh Wren	*Cistotoruus palustris*	Secondary
PBGR	Pied-billed Grebe	*Podilymbus podiceps*	Primary
SEWR	Sedge Wren	*Cistothorus platensis*	Secondary
SORA	Sora	*Porzana carolina*	Primary
SWSP	Swamp Sparrow	*Melospiza georgiana*	Secondary
VIRA	Virginia Rail	*Rallus limicola*	Primary
WIFL	Willow Flycatcher	*Empidonax traillii*	Secondary
WISN	Wilson's Snipe	*Gallinago delicata*	Secondary

Niagara River Area Of Concern Marsh Bird Survey Data Form

DATE (e.g. 15 May 2015): 12 MAY 2016 **MULTIPLE OBSERVER SURVEY**: YES / NO **BOAT TYPE:** NA

MARSH NAME: NA **OBSERVER NAMES (LIST ALL):** S. GROVE

WATER DEPTH (by station #): NA

ADDITIONAL NOTES: SWSP / RWBL PRESENT AT NEARLY ALL PTS

STATION NUMBER	START TIME (MILITARY)	TEMP. (F)	SKY	WIND (Beaufort)	BACKGROUND NOISE	SPECIES	OBSERVED DURING														CALL TYPE(S)	DIRECTION	IN TARGET AREA (Y/N)	DISTANCE (METERS)	DISTANCE AIDE	PREVIOUSLY DETECTED (Y/N)	COMMENTS
							PASS 0-1	PASS 1-2	PASS 2-3	PASS 3-4	PASS 4-5	LEBI	SORA	VIRA	KIRA	AMBI	COGA	AMCO	PBGR	OUTSIDE							
B2-2	0531	54	1	0	4	/																O					SIGNIFICANT NOISE
B2-3	0558	54	1	0	3	/																O					
B2-4	0626	56	0	0	4	/																O					TRAFFIC
B2-5	0700	58	0	0	3	/																O					
B1-8	0727	60	0	1	2	/																O					SWSP
B1-7	0741	64	1	1	1	/																O					
B1-2	0827	67	1	1	2	/																O					SWSP, MAWR BTGN / BEKI
B1-3	0851	69	1	2	1	PBGR	V	V	V	/	/										NONE	O	Y	100	N	N	HEARD DURING FROG SURVEY 5/11
|					1	SORA	—	—	—	—	—	—	H								PIK	O	Y	10	N	N	SWSP MAWR
|					1	VIRA	—	—	—	—	—	—	—	—	—	—	—	—	H		PIK-GRUNT	O	Y	20	N	N	| MAWR
B1-4	0918	71	1	2	0	PBGR	—	—	—	—	—	—	—	—	—	—	—	—	H		BRAY	O	Y	15	N	Y	POSSIBLY SAME BIRD
																						O					FROM B1-3
																						O					
																						O					

B1-1 Deleted post 2014 - NOISE

Niagara River Area Of Concern Marsh Bird Survey Data Form

DATE (e.g. 15 May 2015): 13 MAY 2016 **MULTIPLE OBSERVER SURVEY:** YES / NO **BOAT TYPE:** NA

MARSH NAME: NA **OBSERVER NAMES (LIST ALL):** S. GROVE

WATER DEPTH (by station #): NA

ADDITIONAL NOTES:

STATION NUMBER	START TIME (MILITARY)	TEMP. (F)	SKY	WIND (Beaufort))	BACKGROUND NOISE	SPECIES	OBSERVED DURING														CALL TYPE(S)	DIRECTION	IN TARGET AREA (Y/N)	DISTANCE (METERS)	DISTANCE AIDE	PREVIOUSLY DETECTED (Y/N)	COMMENTS
							PASS 0-1	PASS 1-2	PASS 2-3	PASS 3-4	PASS 4-5	LEBI	SORA	VIRA	KIRA	AMBI	COGA	AMCO	PBGR	OUTSIDE							
B1-5	0550	58	2	3	2	—																O					
B1-6	0615	58	2	3	2	—																O					
B2-7	0701	56	2	3	2	PBGR													X		BRAY	O	Y	15	N	N	HEARD ON AMPHIB SURVEYS
					1	PBGR													X		BRAY	O	Y	20	N	N	
B1-9	0637	57	2	3	1	—																O					
B2-6	0743	56	2	3	1	—																O					
B2-1	0905	56	2	3	1	—																O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					

Niagara River Area Of Concern Marsh Bird Survey Data Form

DATE (e.g. 15 May 2015): 6/1/2016 **MULTIPLE OBSERVER SURVEY:** YES / NO **BOAT TYPE:** NA

MARSH NAME: NA **OBSERVER NAMES (LIST ALL):** S. GROVE

WATER DEPTH (by station #): NA

ADDITIONAL NOTES:

STATION NUMBER	START TIME (MILITARY)	TEMP. (F)	SKY	WIND (Beaufort)	BACKGROUND NOISE	SPECIES	OBSERVED DURING														CALL TYPE(S)	DIRECTION	IN TARGET AREA (Y/N)	DISTANCE (METERS)	DISTANCE AIDE	PREVIOUSLY DETECTED (Y/N)	COMMENTS
							PASS 0-1	PASS 1-2	PASS 2-3	PASS 3-4	PASS 4-5	LEBI	SORA	VIRA	KIRA	AMBI	COGA	AMCO	PBGR	OUTSIDE							
B1-2	0500	55	1	3	3	—																O					GRHE/MAWR
B1-3	0521	57	1	3	2	—																O					MAWR/SWSP
B1-4	0618	55	1	3	0	VIRA									H		H				KIDIK	O	Y	8	N	N	MAWR/SWSP WIFL
B1-5	0701	57	1	3	3	—																O					MAWR
B1-6	0639	57	1	3	3	—																O					MAWR
B1-9	0734	58	1	2	2	VIRA									H				H		KIDIK	O	Y	5	N	N	MAWR
B1-7	0824	59	1	2	1	—																O					MAWR
B1-8	0802	59	1	2	0	—																O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					

RWBL @ all PTS B1-5/6 RWBL / TRAFFIC HINDERING DETECTABILITY

B1-1 DELETED

Niagara River Area Of Concern Marsh Bird Survey Data Form

DATE (e.g. 15 May 2015): 6/2/2016 **MULTIPLE OBSERVER SURVEY:** YES / NO **BOAT TYPE:** CANOE

MARSH NAME: NA **OBSERVER NAMES (LIST ALL):** S. GROVE

WATER DEPTH (by station #): NA

ADDITIONAL NOTES: LIGHT RAIN PREVIOUS EVENING, PERIODIC RAIN THROUGHOUT SURVEY 1 RAIN Delay

STATION NUMBER	START TIME (MILITARY)	TEMP. (F)	SKY	WIND (Beaufort)	BACKGROUND NOISE	SPECIES	OBSERVED DURING														CALL TYPE(S)	DIRECTION	IN TARGET AREA (Y/N)	DISTANCE (METERS)	DISTANCE AIDE	PREVIOUSLY DETECTED (Y/N)	COMMENTS
							PASS 0-1	PASS 1-2	PASS 2-3	PASS 3-4	PASS 4-5	LEBI	SORA	VIRA	KIRA	AMBI	COGA	AMCO	PBGR	OUTSIDE							
B2-6	0500	68	2	1	0	—																O					OSPR (2), PERC WIFL, MAWR
B2-7	0527	68	2	1	3	PBGR											X					O	Y	15	N	N	
						PBGR											X					O	Y	5	N	N	
B2-5	0553	68	2	1	0	VIRA									X						GRUNT	O	Y	3	N	N	MAWR SWSP WIFL
B2-4	0631	69	2	1	1	—																O					(OSPR PERCHED) MAWR, SWSP
B2-3	0730	65	5	1	2	—																O					COTE, MAWR
B2-2	0820	67	2	1	3	—																O					
B2-1	0846	67	5	1	2	—																O					COTE, MAWR SWSP
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					

RAIN DELAY 0650- 0730

Niagara River Area Of Concern Marsh Bird Survey Data Form

DATE (e.g. 15 May 2015): 6/23 – 26/2016 **MULTIPLE OBSERVER SURVEY:** YES / NO **BOAT TYPE:** none

MARSH NAME: NA **OBSERVER NAMES (LIST ALL):** S. GROVE

WATER DEPTH (by station #): SEE HABITAT FORMS

ADDITIONAL NOTES: MANY SONGBIRDS CARRYING FOOD

	STATION NUMBER	START TIME (MILITARY)	TEMP. (F)	SKY	WIND (Beaufort)	BACKGROUND NOISE	SPECIES	OBSERVED DURING: PASS 0-1	PASS 1-2	PASS 2-3	PASS 3-4	PASS 4-5	LEBI	SORA	VIRA	KIRA	AMBI	COGA	AMCO	PBGR	OUTSIDE	CALL TYPE(S)	DIRECTION	IN TARGET AREA (Y/N)	DISTANCE (METERS)	DISTANCE AIDE	PREVIOUSLY DETECTED (Y/N)	COMMENTS
23	B2-3	0549	52	0	0	3	—																O					SWSP MAWR
	B2-4	0612	52	0	0	3	—																O					"
	B2-5	0706	60	1	1	2	—																O					
	B2-7	0731	62	1	1	3	PBGR													X		WHIPE-OUT	O	Y	10	N	N	SWSP
	[illegible]			1	1	1	PBGR													X		WHIPE-OUT	O	Y	20	N	N	-
	B2-6	0810	64	1	1	1	—																O					SWSP MAWR WIPL
																							O					
26	B2-2	0805	78	0	1	3	—																O					
	B2-1	0830	79	0	1	3	—																O					
																							O					
																							O					
																							O					
																							O					
																							O					

RWBL @ ALL PTS. HERON PERCHED ON OSPR POLE #

Niagara River Area Of Concern Marsh Bird Survey Data Form

DATE (e.g. 15 May 2015): 6/26/2016

MULTIPLE OBSERVER SURVEY: YES / NO (✓)

BOAT TYPE: NA

MARSH NAME: NA

OBSERVER NAMES (LIST ALL): S. GROVE

WATER DEPTH (by station #): SEE HABITAT FORMS

ADDITIONAL NOTES:

STATION NUMBER	START TIME (MILITARY)	TEMP. (F)	SKY	WIND (Beaufort))	BACKGROUND NOISE	SPECIES	OBSERVED DURING														CALL TYPE(S)	DIRECTION	IN TARGET AREA (Y/N)	DISTANCE (METERS)	DISTANCE AIDE	PREVIOUSLY DETECTED (Y/N)	COMMENTS
							PASS 0-1	PASS 1-2	PASS 2-3	PASS 3-4	PASS 4-5	LEBI	SORA	VIRA	KIRA	AMBI	COGA	AMCO	PBGR	OUTSIDE							
B1-2	0512	66	1	1	1	—																O					MAWR, SWSP GRHE, BCNH
B1-3	0550	67	1	1	0	VIRA	V								X						KIK	O	Y	5	N	N	CHICK
B1-1	0627	67	1	1	0	VIRA									H						KIK	O	Y	15	N	N	ADULT CALLING
B1-6	0659	73	1	1	2																	O					MAWR, SWSP RWBL
B1-5	0738	71	1	1	2																	O					
B1-4	0627	69	1	1	0																	O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					

B1-3 VISUAL OF CHICK - D-1 THEN CALL OF ADULT AFTER KIRA

RWBL @ ALL PTS MAWR, SWSP @ B1-3

Niagara River Area Of Concern Marsh Bird Survey Data Form

DATE (e.g. 15 May 2015): 6/23 **MULTIPLE OBSERVER SURVEY:** YES / NO **BOAT TYPE:** NONE

MARSH NAME: NA **OBSERVER NAMES (LIST ALL):** S.GROVE

WATER DEPTH (by station #): SEE HABITAT FORMS

ADDITIONAL NOTES:

STATION NUMBER	START TIME (MILITARY)	TEMP. (F)	SKY	WIND (Beaufort)	BACKGROUND NOISE	SPECIES	OBSERVED DURING														CALL TYPE(S)	DIRECTION	IN TARGET AREA (Y/N)	DISTANCE (METERS)	DISTANCE AIDE	PREVIOUSLY DETECTED (Y/N)	COMMENTS
							PASS 0-1	PASS 1-2	PASS 2-3	PASS 3-4	PASS 4-5	LEBI	SORA	VIRA	KIRA	AMBI	COGA	AMCO	PBGR	OUTSIDE							
23 B1-8	0507	50	0	0	0	—																O					HAWK SOSP BULLFROG
B1-7	0532	51	0	0	0	—																O					HAWK SOSP BULLFROG
B1-9	0546	52	0	0	1	—																O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					

RWBL PRESENT @ ALL

APPENDIX E

2016 MARSH HABITAT DATA FORMS

Niagara River Area of Concern Annual Habitat Evaluation Data Form

IF there are notable differences in the habitat/characteristics at a given point when compared to 2014 or 2015 data, a **full** Habitat Monitoring Data Form must be completed

Assessment Date: 6/24-25/2016 Observer(s): S. GROVE / K. BLOOMER

Survey Point	Water Depth (m)	Comments
A1-1	.11	
A1-2, B1-8	.20	IMPOUNOMENT EDGE MOST OF RESTORED ½ DRY
A1-3, B1-7	.06	HIGHLY VARIABLE - MUCH EXPOSED MUD FLAT
A1-4	.11	MARSH TO E/S SIMILAR BUT NO FROGS
A1-5	.05	
A1-6, B2-7	.30	
A1-7, B2-6	.15	
A1-8, B2-4	.17	
A1-9, B2-3	.08	
A1-10	.20	
A2-1, B1-3	.55	
A2-2, B1-4	.60	
A2-3	.40	
A2-4	.50	IMPOUNOMENT EDGE
A2-5	.82	RIVER EDGE - NO HABITAT
A2-6	.65	
A2-7	.03	RIVER EDGE - NO HABITAT
A2-8	.80	SOME VEG ALONG EDGE MOWED - MINOR IMPACT (RIVER TRIB)
A2-9	.85	RIVER EDGE
A2-10	.40	RIVER EDGE - NO HABITAT
A2-11, B1-9	.35	
A2-12	.60	POND EDGE
A2-13	.43	
B1-1	DELETED IN 2014	
B1-2	.00	
B1-5	.45	
B1-6	.50	
B2-1	.12	
B2-2	.22	
B2-5	.10	

Additional Notes:

EARLY SPRING WARM UP - ICE OFF RIVER IN MARCH NOT UNTIL MAY IN 14/15

MARSHES DESSICATING IN SPRING BUT SOME REPLENISHED PRIOR TO JUNE HABITAT SURVEY

Niagara River Area of Concern Annual Habitat Evaluation Data Form

IF there are notable differences in the habitat/characteristics at a given point when compared to 2014 or 2015 data, a **full** Habitat Monitoring Data Form must be completed

Assessment Date:_____ Observer(s):_____

Survey Point	Water Depth (m)	Comments
A1-1		
A1-2, B1-8		
A1-3, B1-7		
A1-4		
A1-5		
A1-6, B2-7		
A1-7, B2-6		
A1-8, B2-4		
A1-9, B2-3		
A1-10		
A2-1, B1-3		
A2-2, B1-4		
A2-3		
A2-4		
A2-5		
A2-6		
A2-7		
A2-8		
A2-9		
A2-10		
A2-11, B1-9		
A2-12		
A2-13		
B1-1		
B1-2		
B1-5		
B1-6		
B2-1		
B2-2		
B2-5		

Additional Notes: