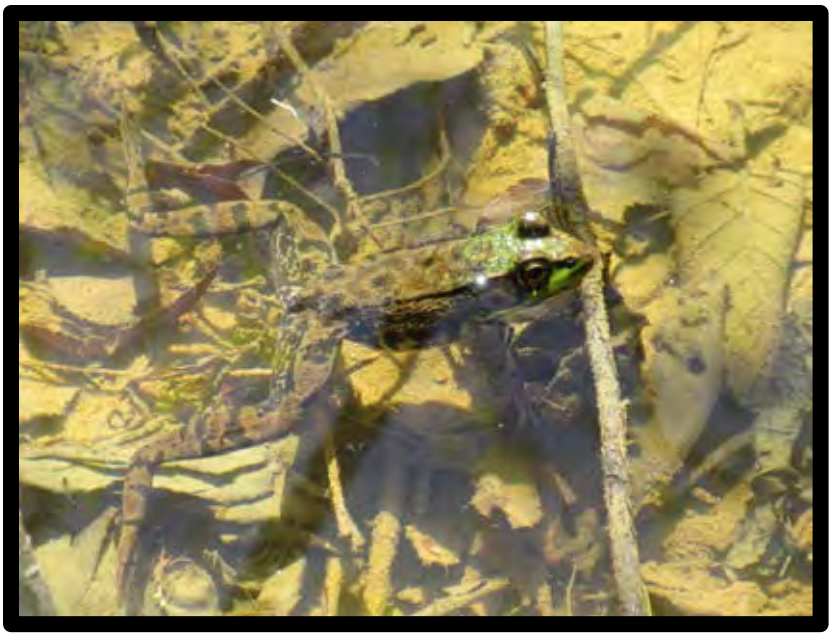
Beneficial Use Impairment Removal Project

Niagara River Area of Concern
Marsh Anuran and Avian Population Monitoring
Year 4 (2017) Survey Report



December 19, 2017

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Niagara River Area of Concern
Marsh Anuran and Avian Population Monitoring

Year 4 (2017) Survey Report
Final – December 19, 2017

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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 2017 survey effort, which marks the fourth 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 4 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 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 (Tifft) 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 2016a). No points have been moved or added since 2015. As shown in Figure 2, beginning in 2015 surveys have 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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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 1. Anuran and Marsh Bird Population Monitoring Survey Areas

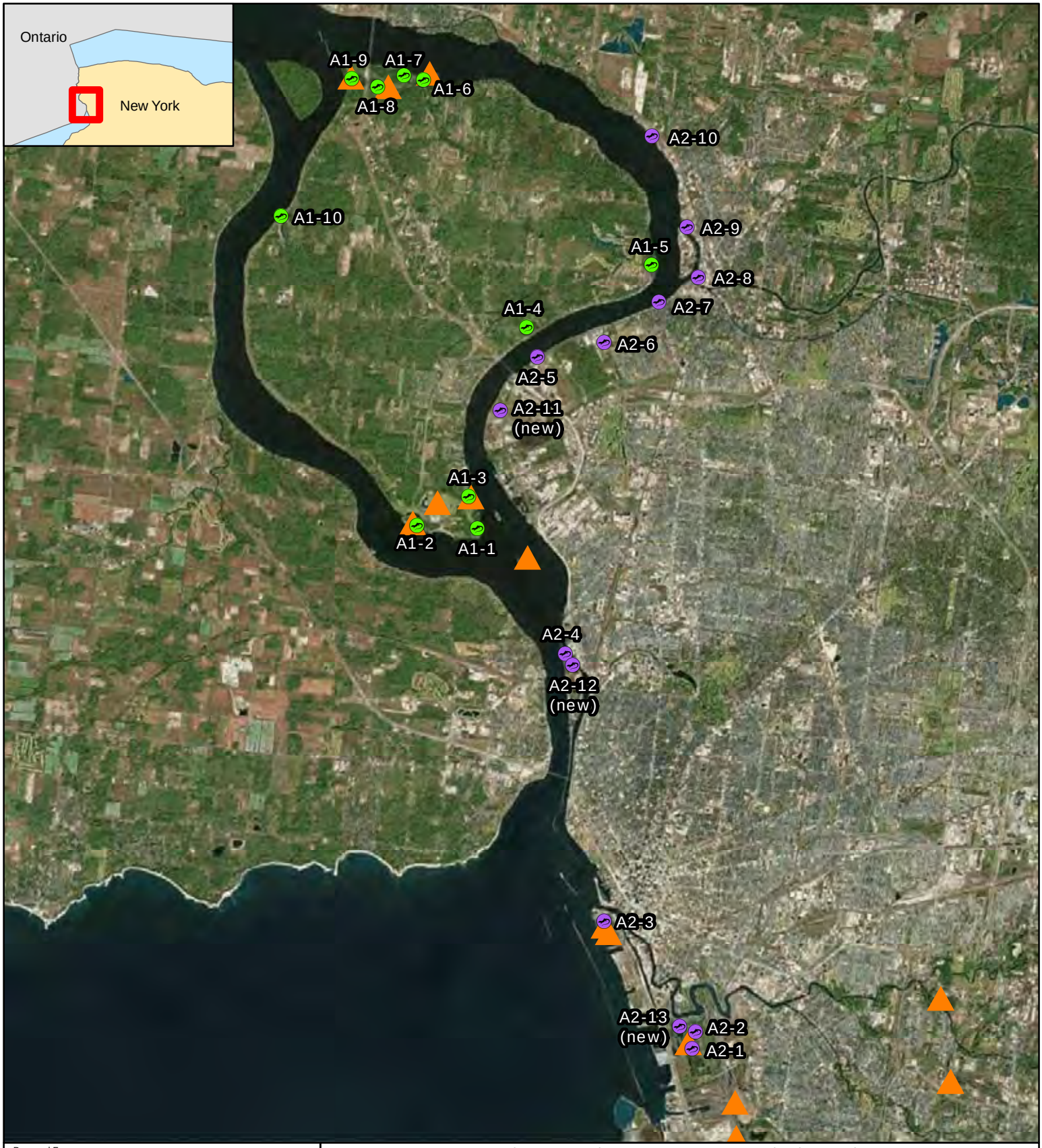
Niagara River Area of Concern
2014 - 2018
Marsh Anuran and Avian Population Monitoring
Niagara and Erie Counties, NY

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: 9/20/2017

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 2017 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 cool/wet spring season in the Niagara region; this following one of the driest on record (Buffalo News 2016, NOAA 2017). 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 since then an additional event was added to target early season activities and has been repeated annually.

Table 1. 2017 Anuran Survey Dates and Temperature Ranges

Survey Event	Survey Dates	Temperature Range During Surveys
1	April 17-18	42-55 °F
2	May 11-13	52-54 °F
3	May 30-May 31	55-65 °F
4	June 19-20	64-68 °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 if there are obvious changes in habitat conditions since the original survey. 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 differences 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. Habitat data was collected between June 20th through the 22nd.

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. Photographs are updated during subsequent annual surveys if new notable features or obvious changes in habitat conditions are observed. Conditions at anuran points were similar to 2015, therefore no additional photographs were collected in 2017.

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 2016a). No points were moved or added since 2015. Survey efforts since 2015 have 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 of 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).

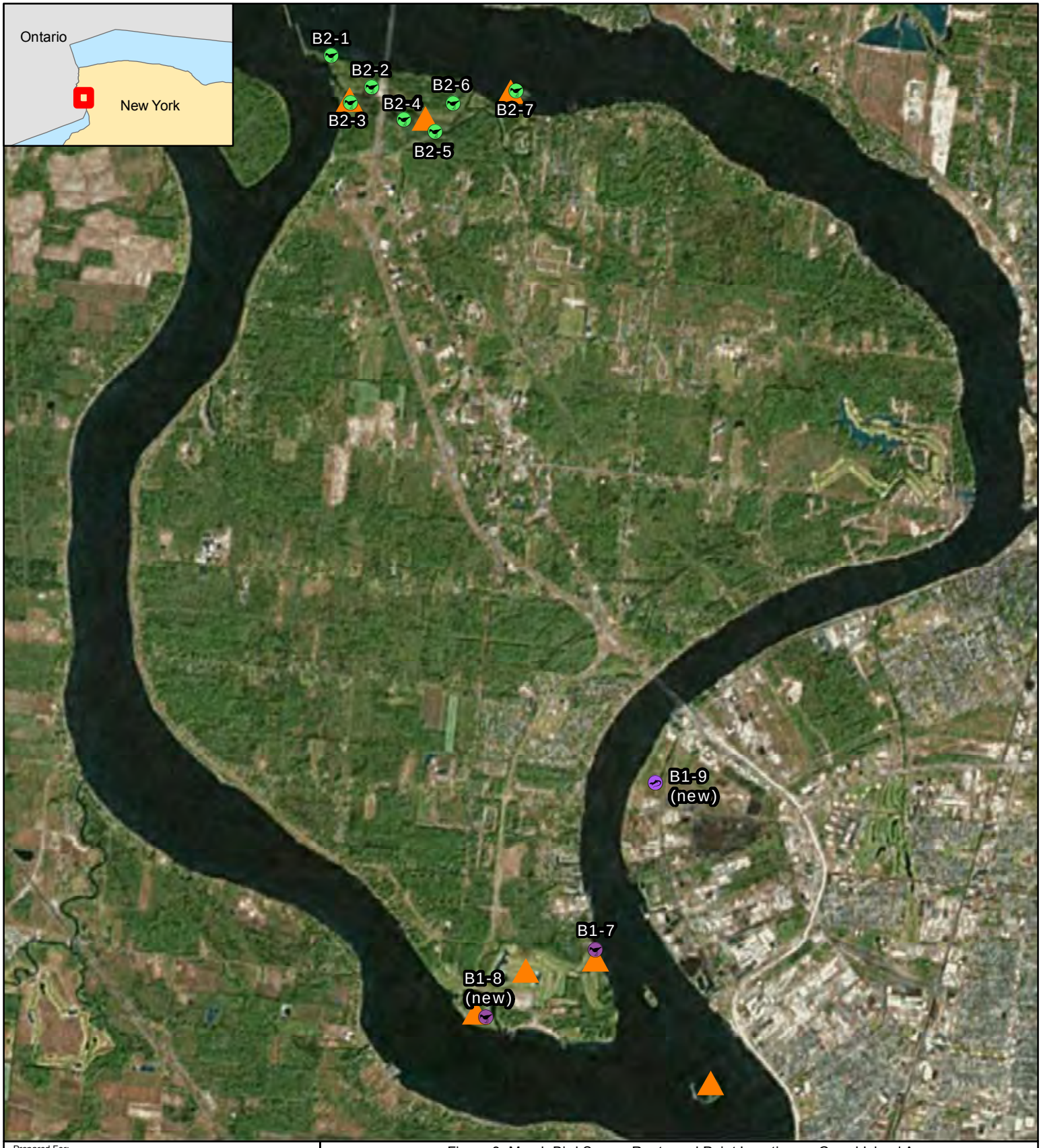
2.2.2 Sampling Periods and Conditions

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 2017 survey effort to capture the best conditions during what was one of the coolest and wettest spring seasons in the Niagara region; this following one of the driest on record since 1943 (Buffalo News 2016, NOAA 2017).

Table 3. 2017 Survey Dates for Target Marsh Bird Species

Survey Event	Survey Dates
1	May 12-14
2	May 31-June 2
3	June 20-22

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.



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Date: 9/20/2017

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: 9/20/2017

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

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.

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. Data is updated annually if there are obvious changes in habitat conditions since the original survey. 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 differences are 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. Habitat data was collected between June 20th through the 22nd 2017.

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. Photographs are updated during subsequent annual surveys if new notable features or obvious changes in habitat conditions are observed. Conditions at marsh bird points were similar to 2015, therefore no additional photographs were collected in 2017.

3.0 RESULTS AND DISCUSSION

3.1 ANURANS

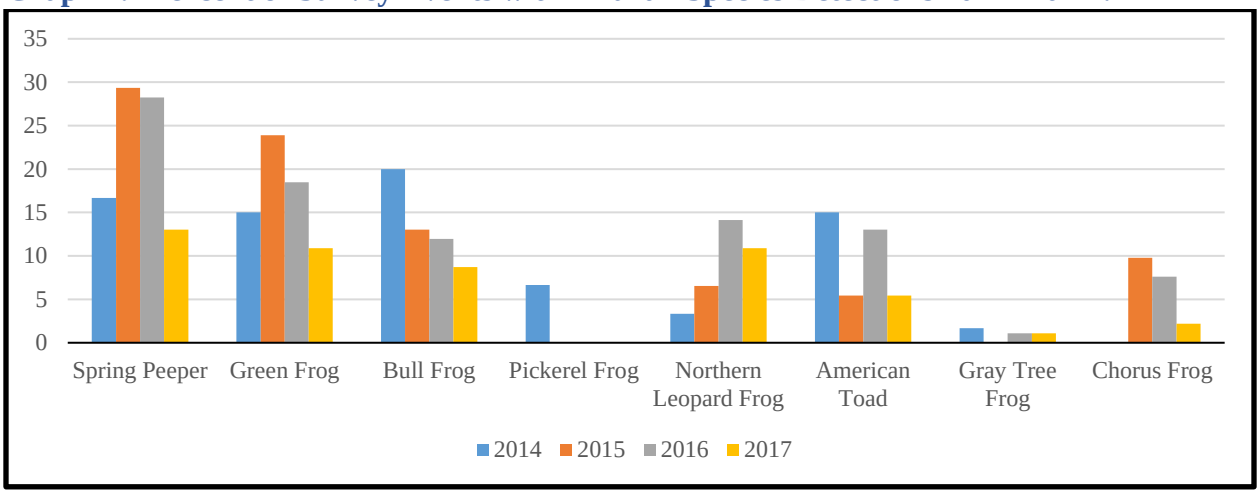
Anuran call monitoring surveys were performed on April 17th and 18th; May 11th, 12th and 13th; May 30th and 31st; and, June 19th and 20th in 2017. Figure 2 depicts the locations of each survey route and point. Points and the number of survey events have remained the same since the 2015 survey event (NewEarth 2016a, 2016b). 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 as well as relatively large wetland complexes within Buckhorn and Beaver Island state parks. Survey Route A2 is located on the east side of the Niagara River, from Tifft Preserve at the southern extent to Gratwick Riverside Park at the northern extent of the survey route and includes locations within restored marshes of Tifft and Times Beach Nature Preserve as well as smaller marsh complexes and shoreline of the Niagara River. 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 (Graph 1). Despite a wetter early spring season than previous years, Anuran detections were lower for all species in 2017 when compared to nearly all prior annual survey events, although the most commonly detected species were similar (NewEarth 2015, 2016a, 2016b). From 2015 through 2017, Spring Peepers (heard on 13% of 2017 survey events) and Green Frogs (heard on 11% of 2017 survey events), are consistently the most commonly detected species (Graph 1). The third most common species varies from year-year between Bullfrog and Northern Leopard Frog (Graph 1). Chorus Frogs were first detected during 2015 surveys following a change in the survey protocol which added an April survey event. This change also resulted in increased early-season detections for Northern Leopard Frog.

Graph 1. Percent of Survey Events with Anuran Species Detections 2014[1]-2017[2].



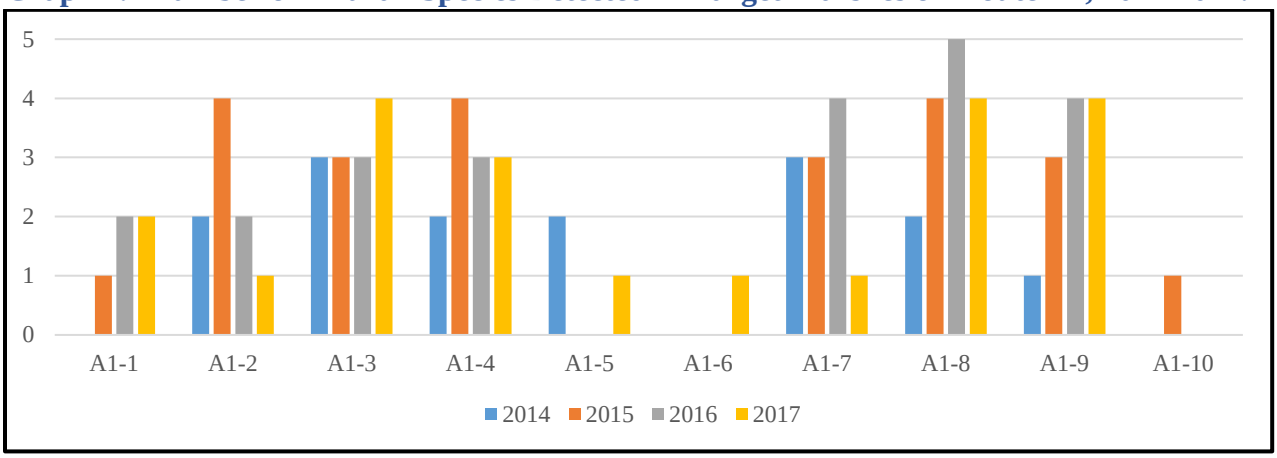
[1] 60 events 2014 (20 points, surveyed three times).
[2] 92 events annually 2015, 2016 and 2017 (23 points, surveyed four times).

Pickerel Frog have only been detected during NR AOC surveys in 2014 and incidentally in 2015, and Wood Frog and Mink Frog have yet to be detected (NewEarth 2015, 2016a, 2016b). Of these species, none have been detected within Tifft (Goodrich 2017), or on MMP routes within the survey area (Bird Studies Canada 2016). Wood frogs have been detected on occasion at MMP points in the late 1990's, all were at least 20 miles northeast/east of the Niagara River AOC (Bird Studies Canada 2016). The lack of detections of these species is most likely related to several factors. The predator-free vernal pool habitat that Wood Frogs depend on for successful breeding occurs in the general MMP survey area, but suitable habitat is not known to occur within the target marshes included in the NR AOC surveys. The reported home range of the Mink Frog begins to the north of the NR AOC and extends into Canada. Finally, Pickerel Frog calls are quieter than the calls of other anurans in the project area. It is possible that human-related noise sources and choruses of other louder species may be a factor in the lack of detections.

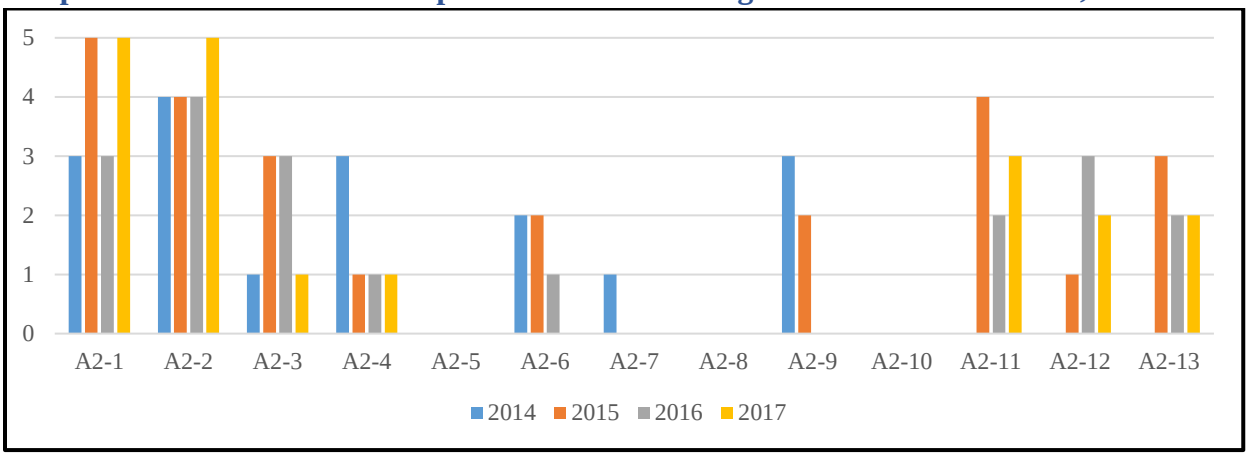
Although the number of frog species has been highly variable since survey efforts began in 2014, many target marshes consistently have had at least one frog species present for several consecutive years (Graphs 2 and 3). In 2017, seven locations (A1-10, A2-5, A2-6, A2-7, A2-8, A2-9 and A2-10) had no anuran species detections. Most of these points occur in small somewhat degraded marshes in urbanized areas along the shoreline of the Niagara River, and since 2014 consistently

lack, or have had very few, calling anurans during annual surveys. However, as seen in Graphs 2 and 3, species occurrences are highly variable year to year. As recent examples, frogs were detected at A1-5 and A1-6 in 2017, but these marshes have not had any anurans present since 2014. On the other hand, anurans were absent at two marshes in 2017 (A2-6 and A2-9) where they were previously detected during two or more surveys. In contrast, out of 28 MMP survey points that fall within the general area surveyed by NewEarth, only one MMP point (within Tifft) has documented anurans between 2014 and 2016 (Bird Studies Canada 2016). Species documented include American Toad, Bullfrog, Green Frog, Leopard Frog, and the most common species reported, Spring Peeper (Bird Studies Canada 2016).

Graph 2. Number of Anuran Species Detected in Target Marshes on Route A1, 2014-2017.



Graph 3. Number of Anuran Species Detected in Target Marshes on Route A2, 2014-2017[1].

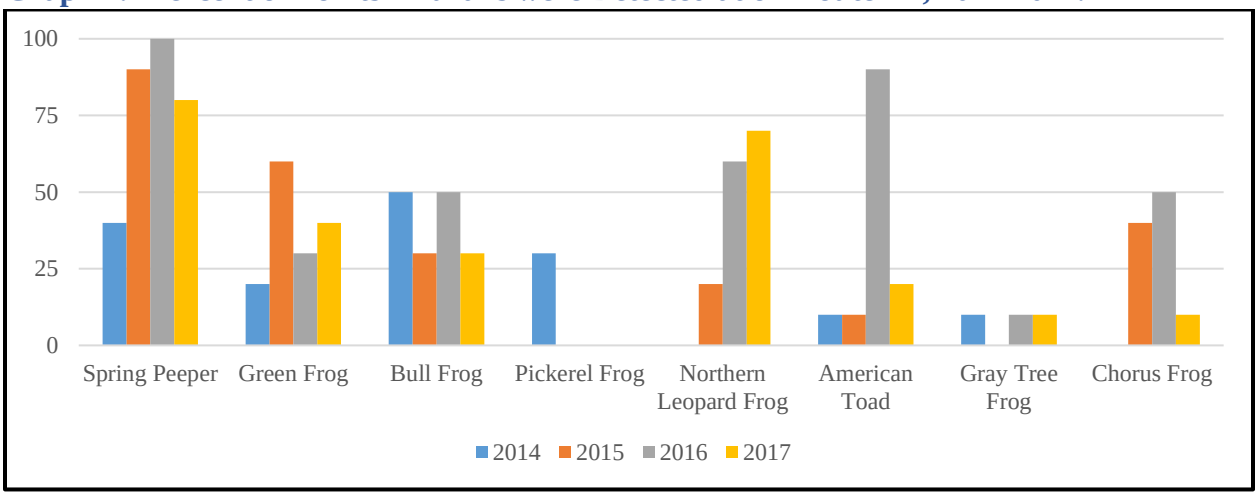


[1] 2014 points 1-10 surveyed, 2015-2017 points 1-13 surveyed.

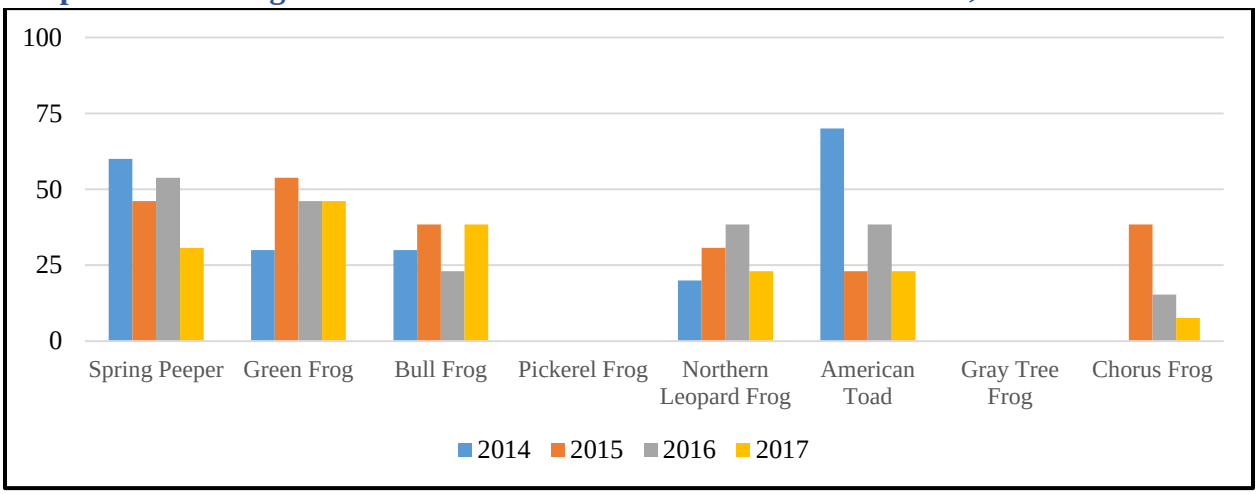
Spring Peepers are typically the most common species encountered in marshes along route A1, which primarily occur in Buckhorn and Beaver Island State Parks, and were again detected at the highest number of survey points (8) in 2017 (Graph 4). Route A2 includes a high number of points in highly developed areas along the Niagara River, but also includes point within relatively large restored marsh complexes of Tifft and Times Beach preserves. Since 2015, Green Frogs have

been the most common species detected on Route A2, and were again the most common (6 points) in 2017 (Graph 5).

Graph 4. Percent of Points Anurans were Detected at on Route A1, 2014-2017.



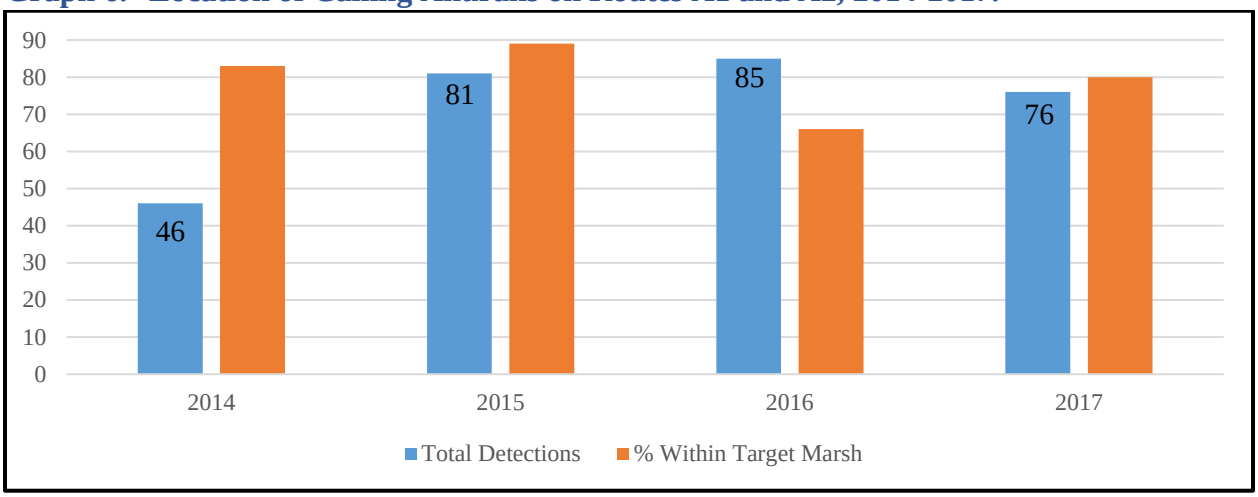
Graph 5. Percentage of Points Anurans were Detected at on Route A2, 2014-2017.



[1] 2014 = 10 points surveyed, 2015-2017 = 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 2017, 76 calls were documented, fewer than in 2015 (81) and 2016 (85). Although fewer calls were detected, 80% were located within the target marshes, which during early season surveys had higher water levels than noted anecdotally during several previous events (Graph 6) (NewEarth 2015, 2016a, 2016b). However, the results capture only frogs calling within or near target marshes during survey periods. Species encountered while navigating from point to point in the study area were not included. In 2017, significant early-season (April through mid-May) flooding was noted in low-lying areas such as within forests and roadside drainages located outside of the target marsh areas. Anecdotally, higher numbers of American Toad, Leopard Frog and Chorus Frog were noted within these areas than during previous annual survey events.

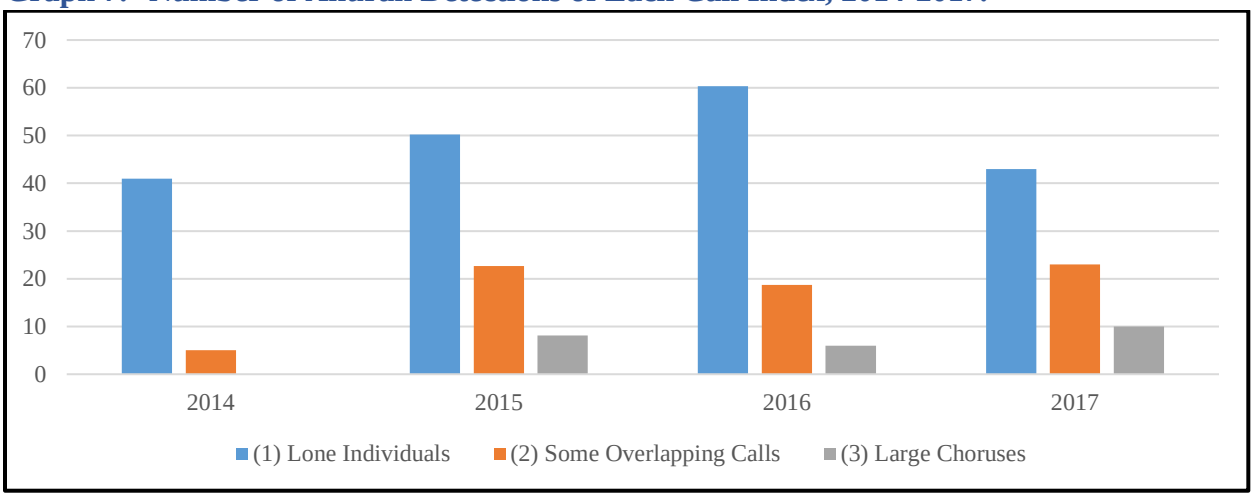
Graph 6. Location of Calling Anurans on Routes A1 and A2, 2014-2017.



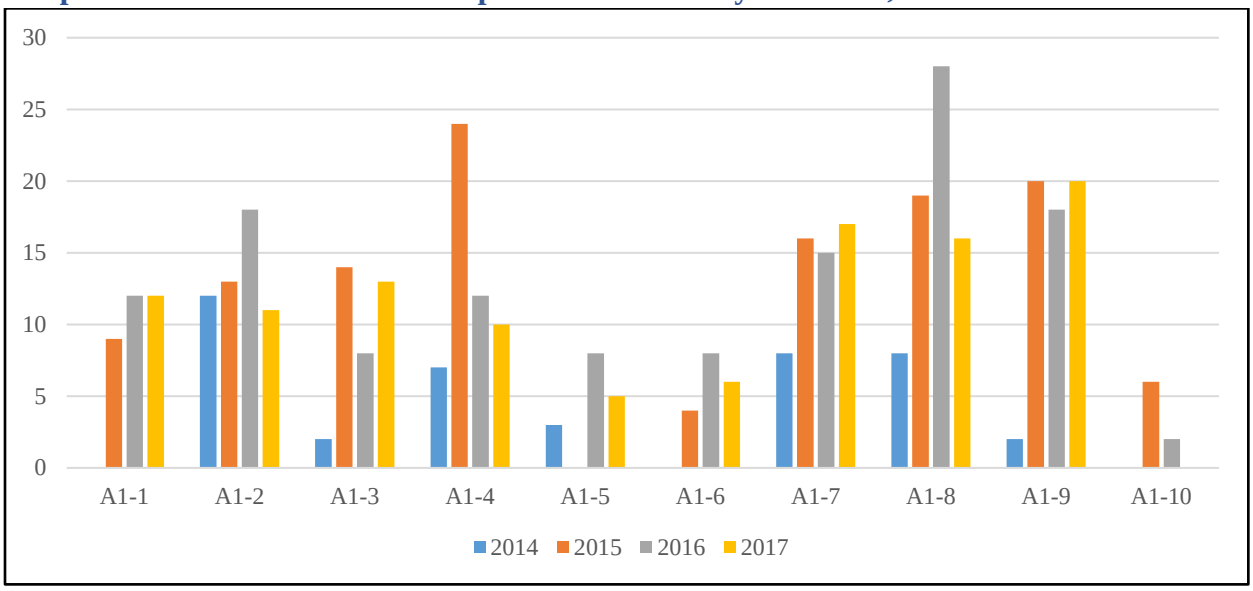
Call detection indices are an indicator of the number of each species in the area and range from lone individuals to large concentrations of chorusing frogs. As noted, fewer call detections were made in 2017 than during most prior years, but detections were comprised of slightly higher numbers of large choruses and overlapping calls than in previous years (NewEarth 2015, 2016a, 2016b). This may be an indicator of higher densities of breeding males in the target marshes, however, lone individuals are still predominant (Graphs 7). Of the 76 call detections on routes A1 and A2 combined, 43 (55%) were of call index #1 (only individual calls could be distinguished), 23 (32%) were of call index #2 (some individuals could be distinguished, but there were some overlapping calls), and 10 (13%) were of call index #3 (large choruses, calls continuous and/or overlapping).

Total call indices per point (all species detected in or near each survey point and all survey events per year combined), may be an indicator of overall breeding activity. When comparing annual total call indices, minor differences are noted year to year, but there are few consistent increasing or decreasing trends over the four years of surveys to date (Graphs 8 and 9). On Route A1, there appears to be a slight increase in the total call index reported year to year since 2015 at point A1-1, and a slight decrease noted over time at points 4 and 10 (Graph 8). All other points are inconsistent; with no observable trend. On Route A2, there appears to be a slight increase in the total call index reported year to year since 2015 at points 1 and 11, and a slight decrease noted over time at points 3, 5 and 9 (Graph 9). It should be noted that in 2014 there were three survey events, while 2015-2017 surveys included four events. Three additional survey points were included on Route A2 in 2015-2017.

Graph 7. Number of Anuran Detections of Each Call Index, 2014-2017.



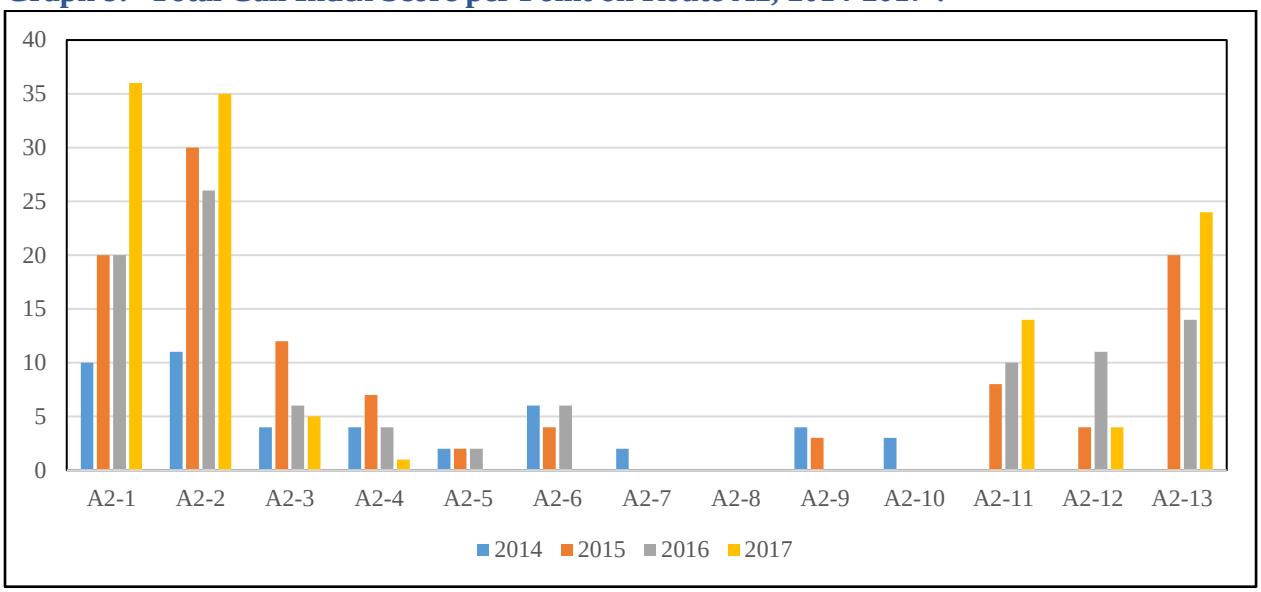
Graph 8. Total Call Index Scores per Point on Survey Route A1, 2014-2017[1].



[1] Based on 3 survey events in 2014; 4 survey events, 2015-2017.

Data were collected in a manner that also allowed for an evaluation of two widely used anuran monitoring protocols (i.e. MMP 3-minute intervals vs. the North American Amphibian Monitoring Program [NAAMP] 5-minute intervals). Between 2014 and 2016, extending the survey period an additional two minutes increased the number of species detections, but no new species were recorded during the additional time (NewEarth 2015, 2016a, 2016b). In 2017, one species (Gray Treefrog) was documented during the additional 2-minute window and would not have been detected using the 3-minute approach. Four additional detections of previously recorded species were heard in 2017, and there were two additional detections in 2016, seven in 2015, and 10 in 2014.

Graph 9. Total Call Index Score per Point on Route A2, 2014-2017[1].



[1] Based on 3 survey events, 10 points in 2014; 4 survey events, 13 points 2015-2017.

3.1.2 Incidental Observations

As noted, unlike previous drier spring seasons, many low-lying forested areas surrounding the study site were inundated during early season surveys in April and mid-May. Chorus Frog and Leopard Frog calls were predominant in these areas in April, and American Toad calls were the most common species heard in mid-May. Consistent with prior years, numerous feral/outdoor cats as well as an occasional Red Fox, Raccoon, Whitetail Deer, Muskrat and Beaver were noted.

3.1.3 Disturbances Noted During Survey Efforts

Noise continues to be a significant factor in surveyor ability to detect calling amphibians. Despite surveyor efforts to avoid periods of high noise levels, noise is unavoidable in highly developed areas of the Niagara River AOC. Noise had a moderate (score = 2) to serious (score > 3) effect during two or more survey events at 16 (70%) of the 23 survey points. These results are similar to prior survey efforts in which noise had a moderate to serious affect at 61% of survey points in 2016, 70% in 2015, and 60% in 2014 (NewEarth 2015, 2016a, 2016b). Not surprising 81% of points affected by noise are in proximity to the City of Buffalo and major highways into and out of the city. The primary source of noise was associated with vehicle traffic, emergency vehicle sirens, railroad activities and boats. Other factors included airplanes, construction equipment, and noise from people recreating in the area.

Additionally, ongoing restoration and monitoring efforts in Tifft and Times Beach preserves have affected vegetation density and have resulted in fluctuating water levels within the marsh complexes. Notable in 2017, were higher water levels and an increase in coverage of vegetation (primarily cattails) in Times Beach marsh and the primary marsh at Tifft. Disturbance from what appears to be ongoing restoration and/or monitoring activities within the marsh may have a short-term direct negative affect on amphibian breeding activities in the marsh, but efforts are likely to

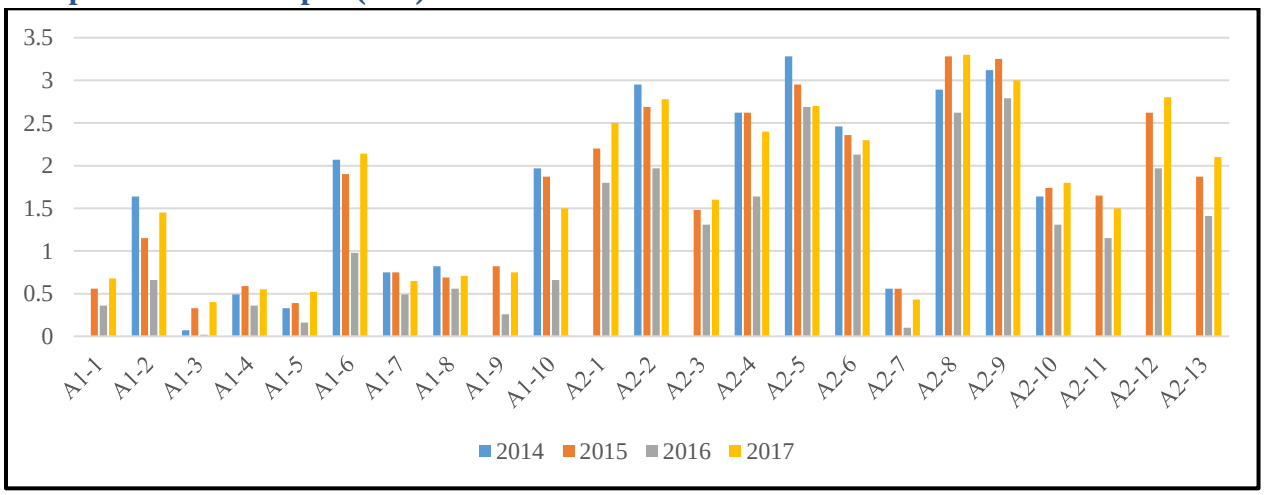
improve marsh conditions and suitability for breeding amphibians over time. Survey points that are most likely to be affected by these activities include A2-1, A2-2, and A2-3.

3.1.4 Habitat

Notable habitat changes since 2015 include mowing of some shoreline vegetation at points A2-8, and A2-12 following the April survey event, and an increase in coverage of cattails in some areas of the marshes at Tifft and Times Beach preserves. However, the changes at these, and other, survey points have thus far had an overall minor visible effect on the habitat at the survey point locations when compared to 2014-2015 conditions. Therefore, only water level data was collected at each point.

Under "normal" conditions water levels can fluctuate dramatically throughout the breeding season and even year to year. Anecdotally, surveyors reported that many marsh areas were excessively flooded during April and mid-May survey events, but had returned to more typical conditions in late May and June. Despite spring precipitation levels that were higher than average (NOAA 2017), June water levels were similar to conditions prior to the notably drier 2016 event (NewEarth 2015, 2016a, 2016b) at most survey points (Graph 12). More broadly, the reported annual precipitation for the Niagara region has been two to six inches below normal since 2014 (NOAA 2017). It should be noted that conditions at the specific location where water depth measurements are collected are not necessarily representative of the overall marsh system or the locations that an individual may be breeding in and calling from throughout the season.

Graph 10. Water Depth (feet) at Anuran Habitat Points 2014-2017[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 previous efforts, 2017 marsh bird monitoring surveys were conducted on May 12th through 14th, May 31st through June 2nd, and June 20th through 22nd. 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 marsh bird and habitat surveys.

3.2.1 Marsh Bird Surveys

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

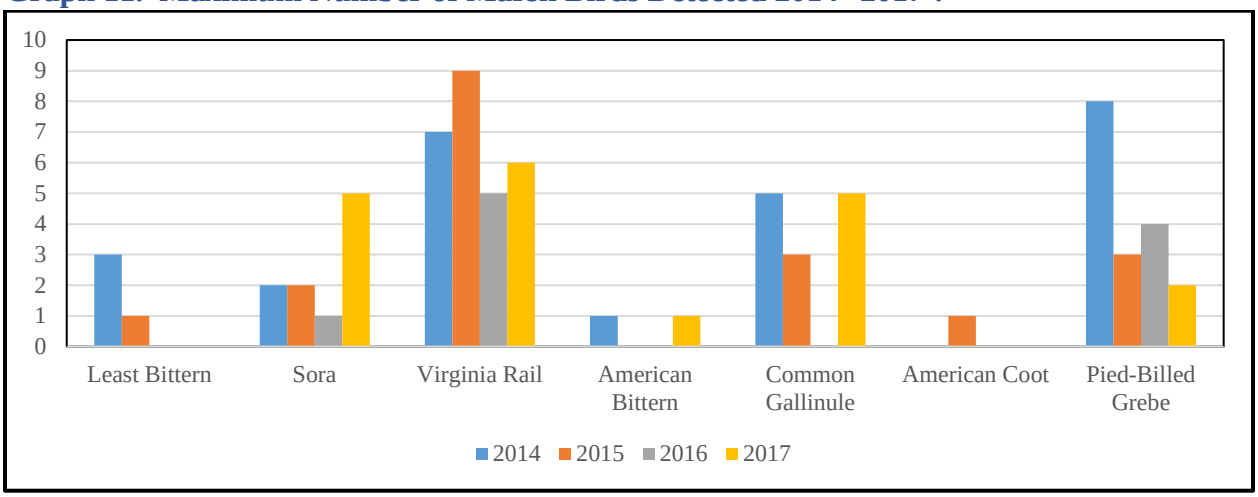
Primary Focal Species

Five of the eight target primary focal marsh bird species were recorded in 2017, unlike 2016 where only 3 were detected, but similar to 2014 and 2015 in which six species were documented (Graph 11) (NewEarth 2015, 2016a, 2016b). Least Bittern and American Coot, while present in the AOC during previous surveys, were not detected in 2017. Staff at Tifft Preserve, where points B2-2, B2-3 and B2-4 are located, reported detections of both species in 2017; highlighting the highly variable detectability of marsh bird species (Goodrich 2017).

Collectively, 19 breeding/calling individuals were detected in target marshes based on 2017 results, compared to 10 in 2016, 19 in 2015, and 26 in 2014. Four of the five species documented in 2017 were found at points within Tifft. Annual surveys conducted by staff at Tifft have reported seven of the eight target species over the past several years, but also not consistently year-to-year (Goodrich 2017). In comparison, MMP routes in the NR AOC from 1995 through 2016 have also reported seven species in the area, but annual detections of each are also highly variable (Bird Studies Canada 2016); only Pied-billed Grebe and Virginia Rail have been documented consistently on MMP routes since 2010 and prior to 2010, Pied-billed Grebes were not consistently found in the area.

The King Rail has not been detected in the NR AOC during annual NewEarth surveys since 2014. This is consistent with findings from Tifft (Goodrich 2017); the location of marshes with the highest diversity of marsh bird species detected by this study to date in the NR AOC (Graph 11). King Rail and American Bittern have not been documented on MMP routes within the NR AOC to date (Bird Studies Canada 2016).

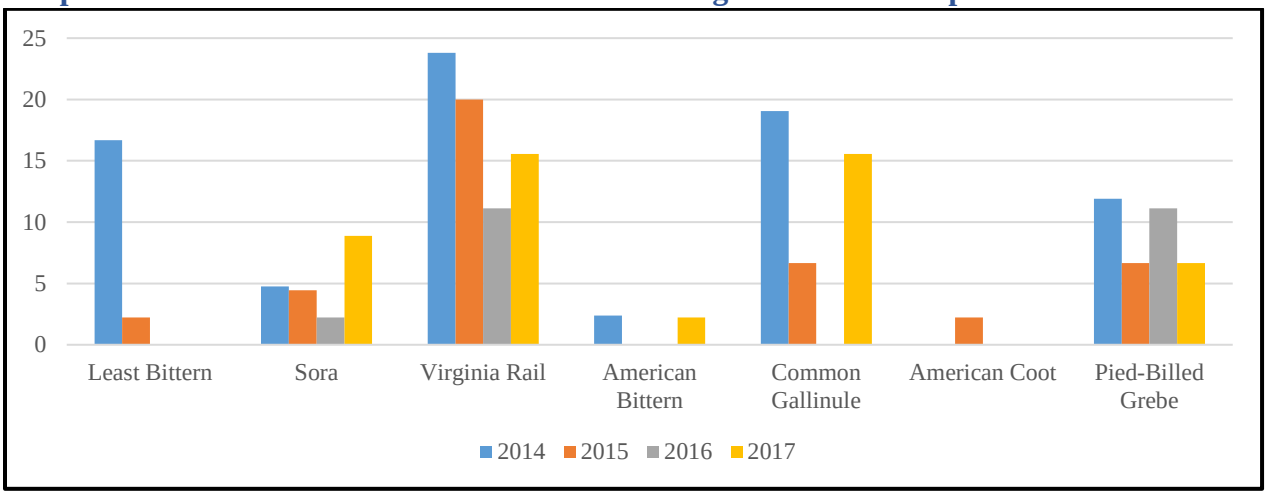
Graph 11. Maximum Number of Marsh Birds Detected 2014[1]-2017[2].



[1] 14 points surveyed during 3 events in 2014
[2] 15 points surveyed during 3 events from 2015 through 2017

Of the 45 survey events performed in 2017, Virginia Rail and Common Gallinule were the most consistently observed species; but each was detected on only seven of 45 survey events (16%) (Graph 12). In three out of the four surveys performed to date, Virginia Rails were detected most often. Detections dropped from 20 to 11 in 2016, but rose again to 16 in 2017 (NewEarth 2015, 2016a, 2016b).

Graph 12. Percent of Events with Detections of Target Marsh Bird Species 2014[1]-2017[2].

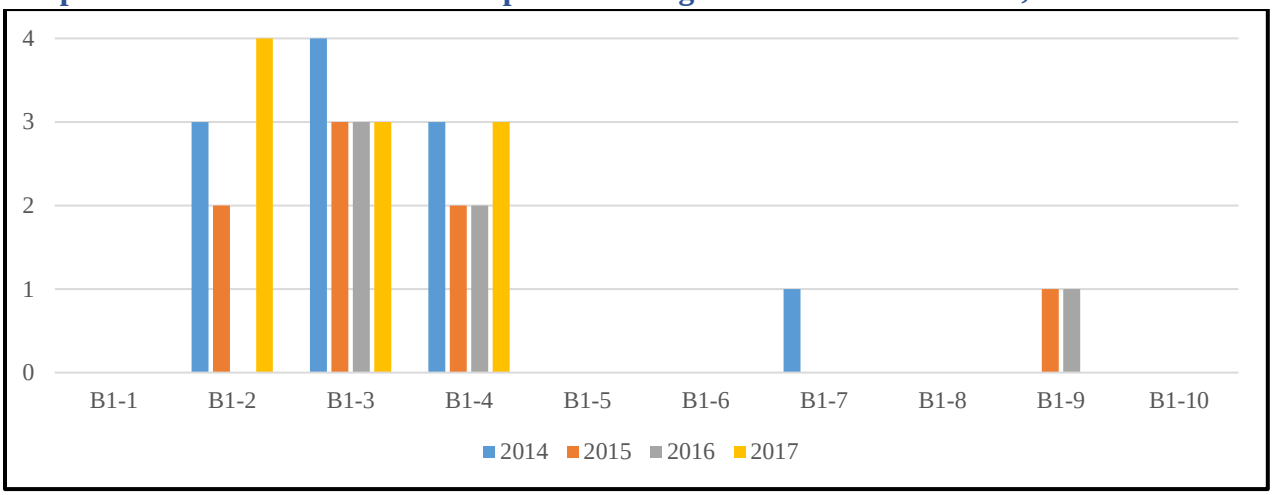


[1] 42 events total in 2014
[2] 45 events total per year 2015 through 2017

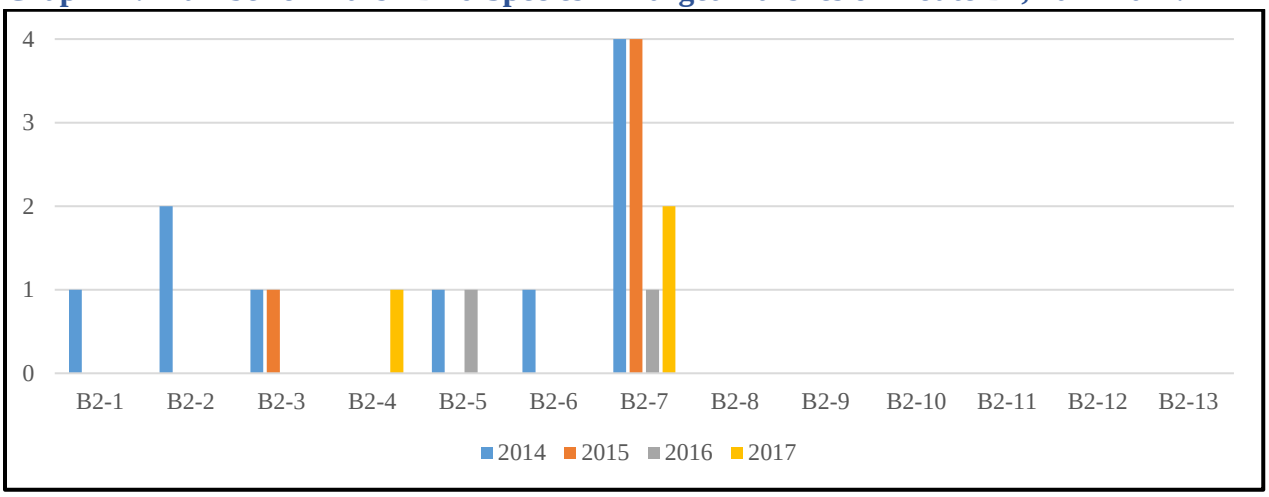
Four species (American Bittern, Common Gallinule, Sora, Virginia Rail) were detected on Route B1 (Graph 13), and three species (Common Gallinule, Pied-billed Grebe, Virginia Rail) were detected on Route B2 (Graph 14). Consistent with all prior annual surveys, the majority of all marsh bird detections on Route B1 are from within the marshes at Tifft and on B2 are from within Grass Island, off the shoreline of Buckhorn Island State Park (Graphs 13 and 14). Since 2014

several of the target marshes yield few, to no, marsh bird detections, including: B1-5; B1-6; B1-7; B1-8; B1-9; B2-1; B2-2; B2-3; B2-4; B2-5; and B2-6. Anecdotally, while Tifft and Grass Island do appear to be some of the largest areas of the highest-quality habitat available; other marshes that are seemingly of adequate size and vegetative condition, such as those within Buckhorn Island State Park (B2-1; B2-2; B2-3; B2-4; B2-5; and B2-6), have yielded few species detections. Significant noise and an abundance of the invasive species common reed (*Phragmites australis*) at Buckhorn marshes may be factors.

Graph 13. Number of Marsh Bird Species in Target Marshes on Route B1, 2014-2017.



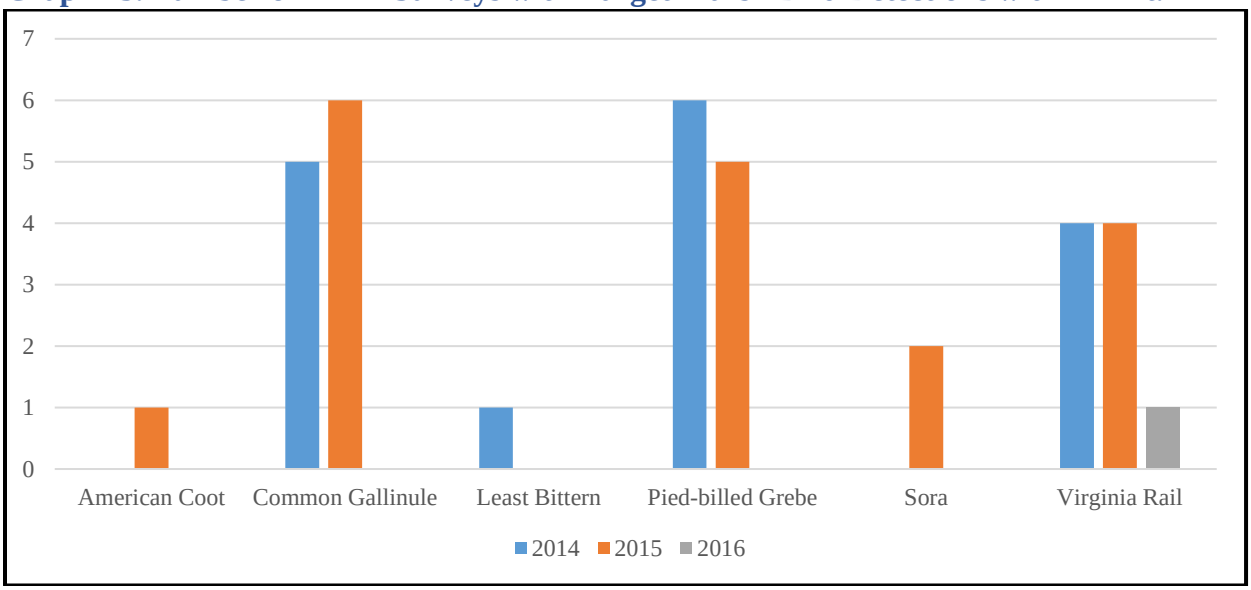
Graph 14. Number of Marsh Bird Species in Target Marshes on Route B2, 2014-2017.



Similar to anuran species, marsh bird detections can be highly variable. As shown on Graphs 13 and 14, eight marsh areas surveyed have had at least one target specie present within the past four survey events, but not consistently. Many of these detections may be attempts by breeding males to establish, unsuccessfully, new breeding territories. Notable examples of variability within specific species include: American Bittern, which had not been detected within Tifft since 2014; Least Bittern which were present at Tifft and several other locations in 2014 and 2015, but not since; and, Pied-billed Grebe, which have been found sporadically within Tifft marshes, but were

notably absent in 2017. Staff of the preserve reported detections of the same species as this study in 2107 as well as American Coot and Least Bittern, but note similar variability in detections of marsh birds from year to year (Goodrich 2017). In comparison, out of 28 MMP points within the area covered by NewEarth survey efforts, marsh birds were detected at only one point (within Tifft) between 2014 and 2016 and detections are highly variable year-year (Graph 15).

Graph 15. Number of MMP Surveys with Target Marsh Bird Detections within Tifft.

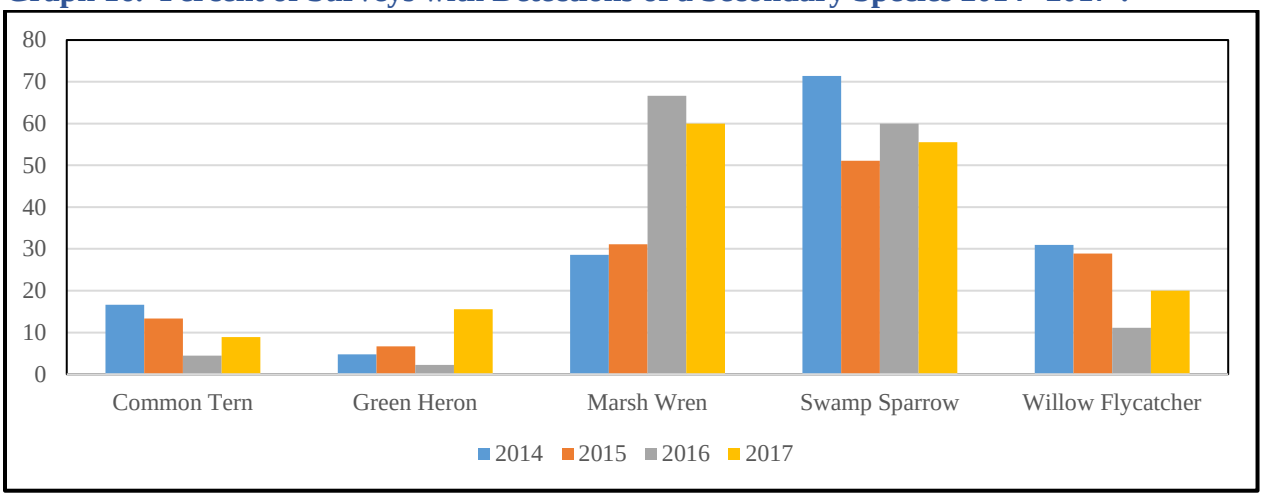


Secondary Focal Species

Presence of secondary focal species was also documented during each of the three survey events. As with all surveys since 2014, five of the nine targeted secondary focal species were detected in 2017 (Graph 16). 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 2017 and 2016 was the Marsh Wren, replacing Swamp Sparrow as the most commonly observed species documented in 2014 and 2015 (NewEarth 2015, 2016a, 2016b). Green Heron were observed in higher densities than in all previous years; all observations were made on Route B1, where they were detected at all points except B1-7, B1-8 and B1-9. Forster's Tern, Sedge Wren, and Wilson's Snipe have never been detected in the survey area during this monitoring effort. Black Tern were observed incidentally in 2015.

MMP routes from 1995 through 2016 have confirmed seven of the nine species in the NR AOC, but Black Tern were only documented in 1998 and Sedge Wren were only found in 2007 (Bird Studies Canada 2016). Of the remaining five species, only Marsh Wren and Swamp Sparrow are consistently documented during each annual survey (Bird Studies Canada 2016). Wilsons Snipe and Foresters' Tern have never been detected on MMP routes in the study area.

Graph 16. Percent of Surveys with Detections of a Secondary Species 2014[1]-2017[2].



[1] 42 events total in 2014
[2] 45 events total per year, 2015 through 2017

3.2.2 Incidental Observations

Two adult bald eagles were observed flying along the Niagara River on numerous occasions. One was believed to be tied to an active nest on Strawberry Island located approximately 4,500 feet to the southeast of the Motor Island heron rookery. The other eagle is likely tied to an active nest on Navy Island in Canada, located approximately 2,100 feet southwest of Buckhorn Weir. Three live non-native goldfish, approximately five inches in length, were observed near marsh bird survey point B1-6 in Times Beach marsh. A Virginia Rail was heard calling from the marsh complex to the west of point A2-2 in Tifft. The marsh is not one of the target marshes surveyed, but is new location for a detection of this species.

3.2.3 Disturbances Noted During Survey Efforts

As with anuran survey efforts, noise (primarily from vehicle and boat traffic), had an effect on surveyor ability to detect calls during 2017 efforts. Noise had a moderate (score = 2) to serious (score > 3) effect during two or more survey events at 16 (70%) of the 23 survey points. These results are similar to prior survey efforts in which noise had a moderate to serious affect at 61% of survey points in 2016, 70% in 2015, and 60% in 2014 (NewEarth 2015, 2016a, 2016b). Not surprisingly 81% of points affected by noise are in proximity to the City of Buffalo and major highways into and out of the city. The primary source of noise was associated with vehicle traffic, emergency vehicle sirens, railroad activities and boats. Other factors included airplanes, construction equipment, and noise from people recreating in the area. Boats, including excessively loud high-speed jet boats, continue to operate 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 and/or monitoring 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

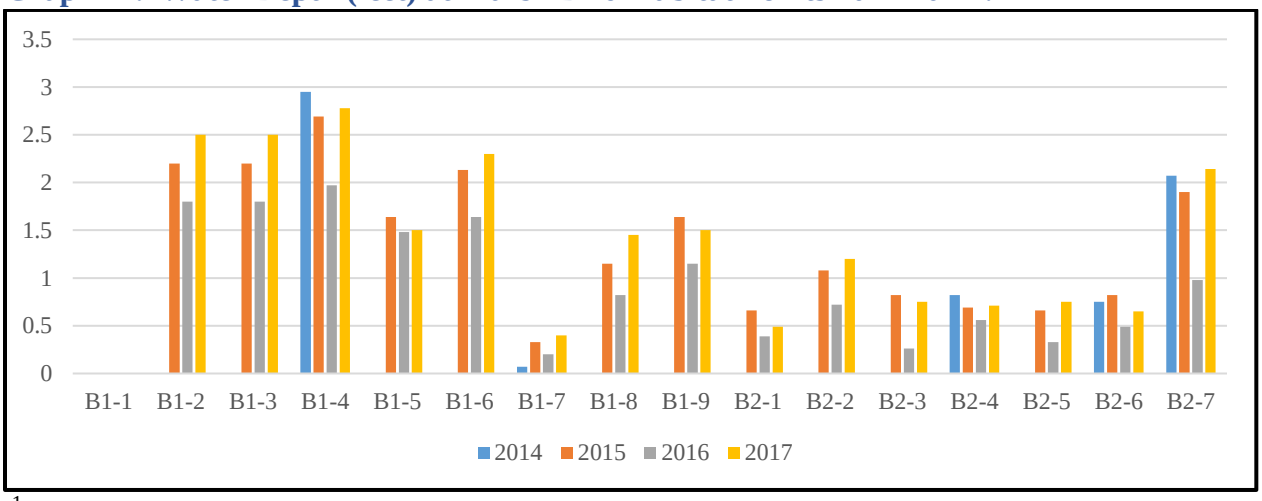
marsh bird breeding activities in the marsh, but efforts are likely to improve conditions for marsh species over time.

3.2.4 Habitat

Notable habitat changes since 2016 include an increase in coverage of cattails in some areas of the marshes at Tifft and Times Beach preserves. However, vegetation conditions at the survey points were similar to those previously documented and therefore only water level data were collected in 2017 (Appendix E).

Water levels can be highly variable throughout any given breeding season, but as shown in Graph 17, overall changes year to year documented in this study are not extreme (i.e., complete marsh desiccation or excessive flooding). Many marsh areas within the NR AOC were excessively flooded during April and mid-May survey events, but had returned to more typical conditions by June; with slightly higher than water levels documented during the dry 2016 survey effort (NewEarth 2016b). As noted, the habitat and water level conditions at the specific location where water depth measurements are collected are not necessarily representative of the overall marsh system or the locations that an individual may be breeding in and calling from throughout the season.

Graph 17. Water Depth (feet) at Marsh Bird Habitat Points 2014-2017[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 SUMMARY

This study is the fourth of five annual survey events that will be conducted within the NR AOC and represents nearly a full census of every location of marsh 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 that was available at the time of survey planning. This study provides the baseline on which future survey events can be evaluated and offers a unique opportunity for comparisons with other studies locally and in the region, such as efforts by Archer et. al., Bird Studies Canada, and Yard et. al.. Evaluations among various data sources will facilitate efforts to assess trends in anuran and marsh bird populations,

particularly as work on various ongoing restoration efforts in the region are completed. Marsh creation, enhancement and restoration measures (Filipski 2012, NYPA 2016), also will likely eventually yield additional marsh habitat locations suitable for anurans and would result in opportunities to increase future survey effort and sample sizes in the NR AOC.

Anurans

Overall, 2017 proved to be a wetter spring than normal (NOAA 2017). This may have provided more suitable early-season habitat for frogs, but any corresponding increases in species diversity and density as a result were not dramatic. The same seven species have been documented annually over the four survey events to date, and Pickerel frog, Mink Frog and Wood Frog have been notably absent; consistent with MMP results in the region since 1995. Spring Peepers followed by Northern Leopard Frog, generally are the most common species in marshes along Route A1 (which include Buckhorn and Beaver Island state parks), whereas Green Frogs followed by Spring Peepers are most common along Route A2 (which includes Tifft and Times Beach preserves); although again, the most common species can vary year-year. Seven points along Route A1 have consistently yielded anuran detections on three or more annual surveys, whereas points A1-5, A1-6 and A1-10 have yielded few to none. Points in marshes of Times Beach, Tifft, and Unity Island are most productive along Route A2, whereas the small, degraded, and highly urbanized marshes near the Niagara River at points A2-5, A2-7, A2-8, A2-9 and A2-10 have very low detections. In comparison, of 28 MMP points surveyed in the Niagara AOC area between 2014 and 2016, only one location (within Tifft) yielded detections, with Spring Peepers being the most commonly detected species. There were larger choruses of frogs detected in 2017, but the number of detections was lower than in the dryer spring 2016 season and calls were still predominately of lone individuals; which has been the case since 2014 surveys and is consistent with MMP results.

As with prior anuran survey results, 2017 surveys again indicate that overall anuran populations are relatively low in the highly urbanized NR AOC region when compared to non-urbanized areas, and populations are dynamic and highly variable year-to-year. However, although variable, the same target species are encountered year to year, and although a species may have low detections one year, they appear to show recovery during subsequent annual events. Cause and effect determinations in anuran population trends are difficult to establish, particularly without substantial data, due to effects from a wide host of site variables that may/may not be measurable, variations in weather conditions, previous or on-going activities that may be altering habitat, complications with detectability due to noise, overall small population numbers of the target species throughout the region, and the often secretive and allusive nature of the species.

Marsh Birds

Seven of the eight target marsh bird species have been documented in the NR AOC since 2014. King Rail have never been detected, and this is consistent with MMP results. Consistently, marsh bird detections are relatively low year to year; with generally fewer than 5 individuals of each species detected annually, and the maximum number of individuals ever detected were nine Virginia Rails in 2015. Sora, Virginia Rail and Pied-billed Grebe have been detected annually since surveys began, but Least Bittern, American Bittern, American Coot, and Common Gallinule are detected far more sporadically. In comparison to MMP data, out of 28 points surveyed between 2014 and 2016, the target marsh birds have only been detected at one point (within Tifft Preserve), and included six of the eight target species. Highlighting the variability in detections of these

species, typically Pied-billed Grebe and Virginia Rail are the most commonly encountered marsh birds during annual MMP events, but in 2016 the only species documented on any MMP survey point/event was Virginia Rail and the species was reported only during one event.

Common Gallinule and Pied-Billed Grebe are typically the most common marsh birds detected in marshes along Route B1 (which include Buckhorn Island and Beaver Island state parks). Sora and Virginia Rail are generally the most common species in marshes along Route B2 (which includes Tifft and Times Beach preserves). Notably absent during NewEarth annual marsh bird surveys since 2015 are Least Bittern and American Coot. On Route B1, only Grass Island, off the shoreline of Buckhorn Island State Park, has yielded marsh bird detections consistently since 2014. All remaining 12 points on B1 have had very low detections and/or very inconsistent sightings from year to year. The three survey locations within Tifft have consistently yielded marsh bird detections on three or more annual surveys, whereas all the remaining seven points of Route B2 have yielded few to none.

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, significant efforts have recently been completed to enhance, restore, and create habitat for marsh species. Notable, are efforts at Tifft and Times Beach preserves, Beaver Island State Park, and efforts near Strawberry and Motor islands. Notable planned efforts include New York State Office of Parks, Recreation and Historic Preservation (OPRHP) projects to extend Beaver Island State Park's East River Marsh to the south, and to protect and enhance Grass Island. NYSDEC and OPRHP will also be implementing projects similar to those at the East River Marsh at the Spicer Creek Wildlife Management Area and along the north side of Buckhorn Island State Park.

Seven of the ten targeted anuran species and five of the eight targeted marsh bird species have been confirmed in the NR AOC since 2014. Although detections are lower than what generally would be found in less urbanized areas, the highest diversity and densities of both marsh birds and frogs are consistently detected within marshes of Tifft; itself a former industrial waste site, that in the early 1970's was devoid of nearly all wildlife species. Additional restored marsh locations are included in this study and although not as productive as Tifft to date, are likely to support higher diversity and densities of marsh birds and anurans over time so long as marshes continue to develop characteristics of a natural functioning system following restoration efforts.

Noise, wake and general activity associated with high boating activity on the Niagara River continue to pose a threat to species that utilize vulnerable habitats in and directly adjacent to the river system such as Grass Island. However, despite the ongoing disturbances, Grass Island continues to host the highest diversity and density of marsh birds on route B2 in the NR AOC. It should be noted though, that as a part of the 2014-2018 survey efforts, American Coot were observed at Grass Island in 2015, but have not been detected there, or elsewhere in the NR AOC, since. However, staff at Tifft Preserve reported detections of American Coot in 2017.

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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 South

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

2017 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	-78.93642075	42.98781535
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	-78.84838211	42.84440854
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	-78.93642075	42.98781535
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

2017 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:	ADJ FORESTS FLOODED IN AREAS WHERE LITTLE H2O OBSERVED ON PRIOR APRIL EVENTS
Route Number:	A1		
Survey Date (mm/dd/yyyy):	4/17/2017		
Window Number:	1	Days since last rainfall:	2 DAYS 0.1 INCH

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2312	2241	2329	2347	2406	2131	2112	2147	2210	2228
Air Temperature: Select Scale: °C °F	43	42	42	42	42	44	44	44	43	43
Was noise a factor? (use index)	N	N	N	N	N	N	N	2	3	4
Did you take a break? (check if yes)	N	N	N	N	N	N	N	N	N	N
Wind (Use Wind Scale)	1	3	2	1	1	2	2	2	2	2
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	0 0	0 0	0 0	0 0	1 2 8
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	—	—	—	—	—	—	2C 2C	—	—	—
Gray tree frog	—	—	—	—	—	—	— —	—	—	—
Spring peeper	2C 2C	—	1A 1A	1A 1A	—	2C 2C	3B 3B	2C 2C	3C 3C	—
Western/Boreal chorus frog	—	—	—	—	—	—	1A 1A	—	—	—
Mink frog	—	—	—	—	—	—	—	—	—	—
Wood frog	—	—	—	—	—	—	—	—	—	—
American bull frog	—	—	—	—	—	—	—	—	—	—
Green frog	—	—	—	—	—	—	—	—	—	—
Northern leopard frog	1A 1A	1A 1A	—	2A 2A	1A 1A	—	—	1A 1A	2A 2A	—
Pickerel frog	—	—	—	—	—	—	—	—	—	—

Comments: A9 CHORUS FROG (INDEX 2) IN FOREST ON WALK IN
A1 - MANY LEOPARD FROG IN FLOODED FOREST AREAS NEARBY
A4 - NO FROGS IN MARSH TO SOUTH

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: OCCASIONAL DRIZZLE THROUGHOUT
Route Number:	A1	
Survey Date (mm/dd/yyyy):	5/12/2017	
Window Number:	2	Days since last rainfall: ϕ 5/12

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2158	2134	2212	2227	2257					
Air Temperature: Select Scale: °C °F	52	52	52	52	52					
Was noise a factor? (use index)	1	1	1	2	1					
Did you take a break? (check if yes)	N	N	N	N	N					
Wind (Use Wind Scale)	0	0	0	0	0					
Sky (Use Sky Codes)	2	2	2	2	2					
Moon or Moonlight Visible (Y or N)	N	N	N	N	N					
Number of cars that passed (within 50 m)	- | -	- | -	- | -	1 | 4	- | -					
Snow cover (Y or N)	N	N	N	N	N					
Species List	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
American toad	—	2B 2B	—	—	—					
Gray tree frog	—	—	—	—	—					
Spring peeper	B B 2 2	—	C C 1 1	—	—					
Western/Boreal chorus frog	—	—	—	—	—					
Mink frog	—	—	—	—	—					
Wood frog	—	—	—	—	—					
American bull frog	—	—	—	—	—					
Green frog	—	—	—	—	—					
Northern leopard frog	—	B B 1 1	A A 1 1	—	A A 1 1					
Pickerel frog	—	—	—	—	—					

Comments: PARKING LOTS, FOREST AREAS STANDING H_2O – TOADS, LEOPARD FROGS

A1-1, A1-2 CALLS FROM "OTHER" FLOODED AREAS NOT TARGET MARSH

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:	A1		
Survey Date (mm/dd/yyyy):	5/13/2017		
Window Number:	2	Days since last rainfall:	PREVIOUS NIGHT

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):						2355	2315	2244	2227	2436
Air Temperature: Select Scale: °C °F						53	53	54	53	52
Was noise a factor? (use index)						2	1	3	3	1
Did you take a break? (check if yes)						N	N	N	N	N
Wind (Use Wind Scale)						2	2	2	2	2
Sky (Use Sky Codes)						3	2	1	1	2
Moon or Moonlight Visible (Y or N)						Y	Y	N	N	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						C 1	C 1	A 3	A 2	C 2	C 2	C 2	C 2	—
Western/Boreal chorus frog						—	—	—	—	—
Mink frog						—	—	—	—	—
Wood frog						—	—	—	—	—
American bull frog						—	—	—	—	—
Green frog						—	—	—	—	—
Northern leopard frog						—	—	—	—	—
Pickerel frog						—	—	—	—	—

Comments: SLIGHT DRIZZLE A1-6

TOAD ON PATH NEAR A1-7

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:	1.6" RAIN ON 5/25 many forested areas flooded .15 ON 5/29
Route Number:	A1		
Survey Date (mm/dd/yyyy):	5/31/2017		
Window Number:	3	Days since last rainfall:	1 0.1 in on 5/30

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2442	2421	2403	2341	2317	2227	2258	2210	2148	2106
Air Temperature: Select Scale: °C °F	55	57	59	61	63	64	64	64	64	65
Was noise a factor? (use index)	0	0	2	2	0	1	1	3	2	1
Did you take a break? (check if yes)	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)	2	2	2	2	2	2	2	2	2	2
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)	—	—	—	5	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	—	—	—	—	1 B	—	—	—	—	—
Spring peeper	—	1 B	—	—	—	—	—	—	—	—
Western/Boreal chorus frog	—	—	—	—	—	—	—	—	—	—
Mink frog	—	—	—	—	—	—	—	—	—	—
Wood frog	—	—	—	—	—	—	—	—	—	—
American bull frog	—	—	— 1 A	—	—	—	—	—	—	—
Green frog	—	—	1 A 1 A	2 A 2 A	—	—	—	1 A 1 A	1 A 1 A	—
Northern leopard frog	—	—	—	—	—	—	—	—	—	—
Pickerel frog	—	—	—	—	—	—	—	—	—	—

Comments: MAYFLY HATCH EXTREME, TICKS!
TREE FROG SAME LOCATION ON DOCKS IN MARINA (2016)
#1 - NO FROGS TO S. OF ROAD ON ANY SURVEY SINCE 2014
VERY QUIET THROUGHOUT SURVEY AREA

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:	OCCASIONAL DRIZZLE BETWEEN SURVEY POINTS RAIN 6/15 .13" 6/18 .14"
Route Number:	A1		
Survey Date (mm/dd/yyyy):	06/19/2017		
Window Number:	4	Days since last rainfall:	Ø RAIN 6/19 & DURING SURVEY TRACE

Data collected at each point	Survey Point Number									
	1	2	3	4	5	6	7	8	9	10
Start Time (military):	2448	2422	2401	2344	2330	2317	2249	2220	2155	2119
Air Temperature: Select Scale: °C / °F	68	68	68	68	68	68	68	68	68	68
Was noise a factor? (use index)	1	1	1	1	1	1	2	3	2	1
Did you take a break? (check if yes)	N	—	—	—	—	—	—	—	N	—
Wind (Use Wind Scale)	2	2	3	3	3	2	2	1	1	1
Sky (Use Sky Codes)	2	2	2	2	2	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)	—	—	—	1 1	—	—	—	—	—	3 2
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 1 A 1	C 1 C 1	A 1 A 1	—	—	—	—	—	—	—
Green frog	—	—	A 1 A 1	A 2 A 2	—	—	—	C 2 C 2	C 2 C 2	—
Northern leopard frog	—	—	—	—	—	—	—	—	—	—
Pickerel frog	—	—	—	—	—	—	—	—	—	—
				—						

Comments: A1-4 NO FROGS IN ⊕ TO SOUTH 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:	LIGHT SNOW 1.3 INCHES ON 4/6 SEV RAIN EVENTS SINCE 4/7=.43, 4/10=.1 4/11 .04 4/15=.1
Route Number:	A2		
Survey Date (mm/dd/yyyy):	4/18/2017		
Window Number:	1	Days since last rainfall:	3 DAYS 0.1 INCH

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2115	2238	2253	2358	2440	2451	0100	0117	0132	0149
Air Temperature: Select Scale: °C (°F)	55	53	54	53	49	48	48	48	47	46
Was noise a factor? (use index)	3	2	3	3	2	1	2	1	2	2
Did you take a break? (check if yes)	N									
Wind (Use Wind Scale)	2	1	1	2	3	2	3	2	2	3
Sky (Use Sky Codes)	2	2	2	2	2	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 1	0 1	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	C 3 C 3	C 3 C 3	—	—	—	—	—	—	—	—
Gray tree frog	—	—	—	—	—	—	—	—	—	—
Spring peeper	C 1 C 1	C 2 C 2	—	—	—	—	—	—	—	—
Western/Boreal chorus frog	—	B 1 B 1	—	—	—	—	—	—	—	—
Mink frog	—	—	—	—	—	—	—	—	—	—
Wood frog	—	—	—	—	—	—	—	—	—	—
American bull frog	—	—	—	—	—	—	—	—	—	—
Green frog	—	—	—	—	—	—	—	—	—	—
Northern leopard frog	A 1 A 1	A 1 A 1	—	—	—	—	—	—	—	—
Pickerel frog	—	—	—	—	—	—	—	—	—	—

Comments: A1- JETS, POLICE, MOTORCYCLES
A2 - VIRA IN ↓ TO NORTH
A5 DENSE PHRAG NO OBV OPEN H_2O

LEOPARD FROGS THROUGHOUT BUT HARD TO HEAR BEYOND TARGET AREA

A - IN B - OUT C BOTH

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):	4/18/2017		
Window Number:	1	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):	2428	2410	2311							
Air Temperature: Select Scale: °C °F	48	52	54							
Was noise a factor? (use index)	3	3	2							
Did you take a break? (check if yes)	N	N	N							
Wind (Use Wind Scale)	2	2	2							
Sky (Use Sky Codes)	2	2	2							
Moon or Moonlight Visible (Y or N)	N	N	N							
Number of cars that passed (within 50 m)	3 | 2	0 | 0	0 | 0							
Snow cover (Y or N)	–	–	–							
Species List	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
American toad	—	—	3B 3B							
Gray tree frog	—	—	—							
Spring peeper	—	—	2B 2B							
Western/Boreal chorus frog	—	—	—							
Mink frog	—	—	—							
Wood frog	—	—	—							
American bull frog	—	—	—							
Green frog	—	—	—							
Northern leopard frog	2A 2A	—	—							
Pickerel frog	—	—	—							

Comments:

A12 — ~~PART~~ MOST OF VEG CUT ALONG SHORE LINE

NOISE @ ALL CARS, PLANT SIRENS & RELEASES

A2-13 FROGS IN FLOODED AREAS OUTSIDE TARGET

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:	RAIN EVENTS 5/4 = .47", 5/5 = 1.43", 5/6 = .33"
Route Number:	A-2		
Survey Date (mm/dd/yyyy):	5/11/2017		
Window Number:	2	Days since last rainfall:	4 .11 INCH ON 5/7

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2230	2255	2324	2345	2428	2443	2454	0004	0015	0031
Air Temperature: Select Scale: °C °F	54	52	52	52	52	52	52	52	52	52
Was noise a factor? (use index)	2	2	3	3	1	2	2	2	2	2
Did you take a break? (check if yes)	N									
Wind (Use Wind Scale)	3	2	2	2	2	1	1	1	1	1
Sky (Use Sky Codes)	2	2	2	2	2	2	2	2	2	2
Moon or Moonlight Visible (Y or N)	Y	Y	Y	Y	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 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 3 B 3	B 3 B 3	—	—	—	—	—	—	—	—
Gray tree frog	—	—	—	—	—	—	—	—	—	—
Spring peeper	B 1 B 1	C 1 C 1	—	—	—	—	—	—	—	—
Western/Boreal chorus frog	—	—	—	—	—	—	—	—	—	—
Mink frog	—	—	—	—	—	—	—	—	—	—
Wood frog	—	—	—	—	—	—	—	—	—	—
American bull frog	—	—	—	—	—	—	—	—	—	—
Green frog	—	—	—	—	—	—	—	—	—	—
Northern leopard frog	—	- 1 A	—	—	—	—	—	—	—	—
Pickerel frog	—	—	—	—	—	—	—	—	—	—

Comments: A2-1/2-TRAIN NOISE, PLANES
A2-2 - VIRA / TOADS (3) IN ⊥ TO EAST

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:	Many forest areas, road edges Standing H20
Route Number:	A2		
Survey Date (mm/dd/yyyy):	5/11/2017		
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):	2415	2355	2310							
Air Temperature: Select Scale: °C (°F)	52	52	52							
Was noise a factor? (use index)	1	3	0							
Did you take a break? (check if yes)	N	N	N							
Wind (Use Wind Scale)	2	2	2							
Sky (Use Sky Codes)	2	2	2							
Moon or Moonlight Visible (Y or N)	N	Y	Y							
Number of cars that passed (within 50 m)	– | –	– | –	– | –							
Snow cover (Y or N)	N	N	N							

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

Comments: TOADS IN FLOODED AREAS ALONG ROADS AND SHRUB OPEN AREAS NEAR TARGET MARSHES
A2-11 BIRD NEST BOX ACTIVE NEAR ENTRANCE – STARLINGS!

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:	RAIN 5/25 = 1.6", 5/26 = .1", 5/29 = .15 5/30 = .1" MANY AREAS STANDING H2O .1" EARLIER IN DAY
Route Number:	A2		
Survey Date (mm/dd/yyyy):	5/30/2017		
Window Number:	3	Days since last rainfall:	0

Data collected at each point	Survey Point Number									
	1	2	3	4	5	6	7	8	9	10
Start Time (military):	2235	2210	2150	2318	2401	2420	2436	2417	0115	0127
Air Temperature: Select Scale: °C (°F)	65	64	64	65	64	65	65	65	65	64
Was noise a factor? (use index)	0	0	2	1	1	0	2	0	0	1
Did you take a break? (check if yes)	N	N	N	N	N	N	N	N	N	N
Wind (Use Wind Scale)	2	3	4	3	3	3	3	3	3	3
Sky (Use Sky Codes)	2	2	2	2	2	2	2	2	2	2
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)	-	-	-	-	-	-	-	-	-	-
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	—	—	—	—	—	—	—	—	—	—
Gray tree frog	—	—	—	—	—	—	—	—	—	—
Spring peeper	—	—	—	—	—	—	—	—	—	—
Western/Boreal chorus frog	—	—	—	—	—	—	—	—	—	—
Mink frog	—	—	—	—	—	—	—	—	—	—
Wood frog	—	—	—	—	—	—	—	—	—	—
American bull frog	C 3 C 3	A 2 A 2	—	—	—	—	—	—	—	—
Green frog	A 2 A 2	A 1 A 1	0 A 1	—	—	—	—	—	—	—
Northern leopard frog	—	—	—	—	—	—	—	—	—	—
Pickerel frog	—	—	—	—	—	—	—	—	—	—

Comments: TOADS ON DRIVE INTO 2,13
NO HABITAT LEFT @ B

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):	5/30/2017	
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):	2347	2329	2130							
Air Temperature: Select Scale: °C °F	64	64	64							
Was noise a factor? (use index)	2	2	3							
Did you take a break? (check if yes)	N	N	N							
Wind (Use Wind Scale)	3	3	3							
Sky (Use Sky Codes)	2	2	2							
Moon or Moonlight Visible (Y or N)	Y	Y	Y							
Number of cars that passed (within 50 m)	—	—	—							
Snow cover (Y or N)	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	A 1 A 1							
Green frog	—	—	—							
Northern leopard frog	A 2 A 2	—	—							
Pickerel frog			—							

Comments: PEEPER (1) NEAR PT 12
PT 12 MOWED ALONG PART

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:	RAIN 6/15 = .13", 6/18 = .14", 6/20 = .34"
Route Number:	A2		
Survey Date (mm/dd/yyyy):	6/20/2017		
Window Number:	4	Days since last rainfall:	0 RAIN 6/20 DURING SURVEY

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2407	2338	2327	2252	2228	2121	2133	2147	2159	2216
Air Temperature: Select Scale: °C °F	63	64	65	64	65	64	64	64	64	64
Was noise a factor? (use index)	1	3	1	3	3	2	3	2	1	3
Did you take a break? (check if yes)	N									
Wind (Use Wind Scale)	1	2	2	3	4	3	4	3	3	4
Sky (Use Sky Codes)	2	2	5	2	2	5	2	2	2	2
Moon or Moonlight Visible (Y or N)	N									
Number of cars that passed (within 50 m)	—	—	— —	— —		1 3	— —	— —	— —	— —
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	C 2 C 2	—	—	—	—	—	—	—	—
Green frog	C 2 C 2	C 1 C 1	C 2 C 2	0 1 A	—	—	—	—	—	—
Northern leopard frog	—	—	—	—	—	—	—	—	—	—
Pickerel frog	—	—	—	—	—	—	—	—	—	—

Comments: WIND AFFECTING PTS 5, 7, 10 ALONG RIVER BUT NO HABITAT PRESENT ANYWAY

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):	6/20/2017		
Window Number:	4	Days since last rainfall:	0, RAIN 6/20 & DURING EVENT

Data collected at each point	Survey Point Number 1	2	3	4	5	6	7	8	9	10
Start Time (military):	2239	2302	2349							
Air Temperature: Select Scale: °C (°F)	65	65	64							
Was noise a factor? (use index)	1	2	2							
Did you take a break? (check if yes)	N	N	N							
Wind (Use Wind Scale)	3	2	2							
Sky (Use Sky Codes)	2	5	2							
Moon or Moonlight Visible (Y or N)	N	N	N							
Number of cars that passed (within 50 m)	– –	– –	+							
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 1 –	A 1 A 1							
Green frog	—	– 1 A	A 1 A 1							
Northern leopard frog	—	—	—							
Pickerel frog	—	—	—							

Comments: SEVERAL OF EACH SPP @ A2-13 MOST TO DATE
PERIM VEG INCREASING

APPENDIX D

2017 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					
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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): 5/12/2017 **MULTIPLE OBSERVER SURVEY:** YES / NO **BOAT TYPE:** NONE

MARSH NAME: B1 **OBSERVER NAMES (LIST ALL):** S. GROVE

WATER DEPTH (by station #):

ADDITIONAL NOTES: CANG CAUSING MUCH OF BACKGROUND NOISE A1-2-6

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							
1																						O					DELETED
2	0550	46	2	1	2	SORA				X	X										WHINNEY	O	Y	30	N	N	BRIEF CALLS
						SORA							X								↓WHINNEY	O	Y	30	N	Y	SWSP, MAWR
						SORA							X								"	O	Y	50	N	N	RWBL
						SORA							X								"	O	Y	35	N	N	
						VIRA								X							KIDIK/GRWT	O	Y	35	N	N	
						COGA											X				WPE OUT	O	Y	25	N	N	
						AMBI													X		VISUAL	O	Y	35	N	N	FLEW INTO MARSH
3	0642	47	2	2	2	SORA							X								WHINNEY	O	Y	35	N	N	TRES GRHE SWSP, MAWR, RWBL
4	0718	48	2	2	1	COGA				X							X				WHINNEY	O	Y	75		N	SWSP, MAWR
						SORA							X	X							WHINNEY	O	Y	15		N	RWBL
						VIRA								X							KIDIK	O	Y	10		N	
						COGA								X	X						CALL/VISUAL	O	Y	10		Y	SAME BIRD
																						O					

Version 12/18/2014

NIAGARA RIVER AREA OF CONCERN MARSH BIRD SURVEY DATA FORM

DATE (e.g. 15 May 2015): 5/12/2017 **MULTIPLE OBSERVER SURVEY:** YES / NO **BOAT TYPE:** NONE

MARSH NAME: B1 **OBSERVER NAMES (LIST ALL):** S. GROVE

WATER DEPTH (by station #):

ADDITIONAL NOTES: GOLDFISH UNDER MARSH WALKWAY TIMES BEACH B2-5

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							
5	0734	50	2	3	1	NONE															—	O					GOLDFISH!
																					—	O					RWBL, GRHE MAWR
6	0758	51	2	3	2	NONE															—	O					RWBL
																					—	O					
9	0840	53	2	2	3	NONE															—	O					RWBL LEOPARD FROGS
																						O					TRAFFIC NOISE
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					

Version 12/18/2014

NIAGARA RIVER AREA OF CONCERN MARSH BIRD SURVEY DATA FORM

DATE (e.g. 15 May 2015): 5/12-13/2017 **MULTIPLE OBSERVER SURVEY:** YES / NO **BOAT TYPE:** CANOE

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

WATER DEPTH (by station #): _____

ADDITIONAL NOTES: COOL, WET SPRING - MANY TREES ONLY IN BUD

	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
5/12	B2-7	1950	57	2	1	1	COGA		X									X				KEK	O	Y	15	N	N	RWBL
							COGA				PAIR							X				VISUAL	O	Y	15	N	N	PAIR
							PBGR											X		X		WHINNY	O	Y	20	N	N	
							PBGR												X			WHINNY	O	Y	25	N	N	
5/13	B1-8	0640	52	2	0	0	NONE															—	O					RWBL
	B1-7	0722	54	2	0	0	NONE															—	O					RWBL MINK
	B2-5	0810	54	3	0	1	NONE															—	O					MAWR
	B2-4	0832	54	2	0	1	VIRA													X		GRUNT	O					SWSP RUBL
	B2-3	0905	55	2	0	2	NONE																O					SWSP RWBL
																							O					MAWR, SWSP,
																							O					
																							O					
																							O					
																							O					
																							O					

B1-8 FRINGE TYPHA ONLY

COOL, RAINY
HIGHWAY WORK - UNUSUALLY QUIET
@ B2-4, 5, 3

51 B2-3 SPRING PEEPER

PAGE __ OF __

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NIAGARA RIVER AREA OF CONCERN MARSH BIRD SURVEY DATA FORM

DATE (e.g. 15 May 2015): 5/14/2017 **MULTIPLE OBSERVER SURVEY:** YES / NO **BOAT TYPE:** NONE

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

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							
B2-2	0632	51	1	1	2	NONE																O					RWBL MAWR, SWSP
B2-1	0705	52	1	1	0	NONE																O					RWBL SWSP
																						O					MAWR WIFL
																						O					
B2-6	0742	54	1	1	0	NONE																O					~~MAWR~~ RWBL, SWSP
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					

PBGR CALLING FROM B2-7 MARSH

Version 12/18/2014

Niagara River Area Of Concern Marsh Bird Survey Data Form

DATE (e.g. 15 May 2015): 5/31/2017 **MULTIPLE OBSERVER SURVEY:** YES / NO **BOAT TYPE:** NA

MARSH NAME: _____ **OBSERVER NAMES (LIST ALL):** S. GROVE / M. GROVE

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							
B1-2	0510	55	2	1	1	SORA	—	—	—	—			X								WHINNY	O	Y	35	N	N	MAWR SWSP RWBL
						VIRA							X	Y			X				GRUNT	O	Y	20	N	N	"
						VIRA								X							WHINNY	O	Y	35	N	N	"
						VIRA										X	X	X	X		WHINNY-GRUNT	O	Y	50	N	N	"
B1-3	0542	56	2	1	3	COGA											X				WIPE OUT	O	Y	20	N	N	MAWR SWSP RWBL
						VIRA							X								GRUNT	O	Y	40	N	N	
B1-4	0638	57	2	1	2	COGA											X				WIPE OUT	O	Y	10	N	N	WIRL, GRHE SWSP, MAWR, RWBL RWBL GRHE, COTE
B1-6	0710	58	2	2	2	—															—	O	—	—			
B1-5	0743	60	2	2	3	—															—	O	—	—			RWBL MAWR
B1-9	0831	62	2	2	3	—															—	O	—	—			RWBL
																						O					
																						O					
																						O					
																						O					

Beaver @ B1-2 WILF NEAR B1-2 B1-6 BUFO, GRN FROG

EXTREME MAYFLY SWARMS

Niagara River Area Of Concern Marsh Bird Survey Data Form

DATE (e.g. 15 May 2015): 6/1-2/2017 **MULTIPLE OBSERVER SURVEY:** YES / (NO) **BOAT TYPE:** NONE

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

WATER DEPTH (by station #): _____

ADDITIONAL NOTES: FISHING BOAT @ B2-7

	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
6/	B2-2	0425	55	2	1	3	—																O					WIFL, SWSP MAWR
	B2-3	0510	55	2	1	2	—																O					RWBL SWSP MAWR
	B2-4	0541	55	2	1	2	—																O					"
	B2-5	0629	56	2	1	1	—																O					RWBL SWSP
	B2-6	0708	57	2	2	1	—																O					ALFL, WIFL RWBL, SWSP
	B2-7	0737	57	2	2	1	PBGR											X				WHINNY	O	Y	10	N	N	—
				2	2	1	PBGR											X				WHINNY	O	Y	25	N	N	—
	B1-7	0801	58	2	2	0	—																O					RWBL! MANY COTE
																							O					CATE GBHE FORAGING
	B1-8	0834	58	2	2	0	—																O					RWBL
																							O					
6/	B2-1	0780	56	2	1	0	—																O					RWBL SWSP COTE
																							O					
																							O					

BUFO @ B2-2

Niagara River Area Of Concern Marsh Bird Survey Data Form

DATE (e.g. 15 May 2015): 6/22/2017 **MULTIPLE OBSERVER SURVEY:** YES / NO **BOAT TYPE:** NA

MARSH NAME: _____ **OBSERVER NAMES (LIST ALL):** S. GROVE / M. GROVE

WATER DEPTH (by station #): _____

ADDITIONAL NOTES: TIFFT H2O LEVELS LOW, TYPHA DOMINATING SOME NEWLY RESTORED AREAS
TIFFT MARSH LOSING OPEN WATER AREAS DUE TO TYPHA EXPANSION

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
B1-2	0502	59	2	1	2	VIRA								X							GRUNT	O	Y	30	N	N	WIRL (NEAR) RWBL, MAWR SWSP, GRHE
B1-3	0529	59	1	1	2	NONE																O					RWBL SWSP MAWR
B1-6	0558	61	1	2	3	NONE																O					RWBL SWSP
B1-5	0624	63	1	2	3	NONE																O					PAIR? (2) GRHE RWBL SWSP MAWR
B1-4	0652	65	1	2	2	VIRA						X									VISUAL	O	Y	20	N	N (2)	GRHE RWBL SWSP MAWR
						COGA											X				CALL	O	Y	25	N	N	
B1-9	0734	67	1	2	3	NONE																O					
B1-8	0820	68	1	2	1	NONE																O					
B1-7	0847	68	1	2	1	NONE																O					
																						O					
																						O					
																						O					
																						O					
																						O					
																						O					

B1-5 Very little open H2O areas remain due to typha

NIAGARA RIVER AREA OF CONCERN MARSH BIRD SURVEY DATA FORM

DATE (e.g. 15 May 2015): 6/20/2017 **MULTIPLE OBSERVER SURVEY:** YES / NO **BOAT TYPE:** NA

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

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						
B2-2	0537	63	1	3	2	NONE																O				WIFL, RWBL MAWR
B2-1	0611	63	1	3	1	NONE																O				WIFL, RWBL MAWR SWSP
B2-3	0648	63	1	2	1	NONE																O				"
B2-4	0707	64	1	2	1	NONE																O				MAWR RWBL SWSP
B2-5	0750	64	1	2	1	NONE																O				"
B2-7	0813	64	1	2	1	COGA	X														VISUAL	O	Y	25	N	N	—
						COGA													X		VISUAL	O	Y	30	N	N	—
						PBGR													X		WHINNY	O	Y	35	N	N	—
B2-6	0841	64	1	3	1	NONE																O				MAWR, SWSP WIFL, RWBL
																						O				
																						O				
																						O				
																						O				
																						O				

APPENDIX E

2017 MARSH HABITAT DATA FORMS

General Information

Survey Date (DD/MM/YYYY)**:**_____

Observer(s) Name(s): _____

Survey Point (complete for each point):_____

How was the point accessed? (Circle one): canoe, motor boat, walk, wade?

Edge Type (Circle one): roadside/marsh, parking lot/marsh, ditch or berm/marsh, upland/marsh, open water/marsh, interior/marsh, open water/upland, PSS or PFO wetland/Marsh, other (describe)__

Classification & Disturbance

NWI code (Record an NWI Code for the target wetland):_____

NVCS Alliance (Record an NVCS Alliance code or codes for the target wetland)[1]**:**_____

Most dominant plant species (Record % Cover for 3-5 dominant species):

Plant Scientific Name (e.g., *Typha latifolia*)	% Cover (Absolute cover)

Natural Disturbance (circle all that apply): Fire, ice damage, animal/insect damage, other:_____

_____

Month/year (if known) of natural disturbance event:_____

Management Actions (circle all that apply): Trail/road construction, dredging, invasive species control (mechanical and chemical), wetland restoration, wildlife management, other:_____

Month/year (if known) of last management action:_____

_____

[1] For NVCS Alliance codes, see http://www.natureserve.org/explorer/servlet/NatureServe?init=Ecol

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:

Habitat characteristics (for 50-m radius area)

Select (by placing an "X" under each % category) the % of wetland perimeter covered by the following characteristics:

Perimeter Characteristic:	<5%	6-25%	26-50%	51-75%	>75%
Shrubs					
Trees					
Bare soil					
Water					
Upland					
Mudflat					
Floating veg.					

Distance to vegetation patch edge (m):_____

Type of patch (Circle one): none, tree, shrub, herbaceous

Wetland Interspersion (%open water and %vegetation cover)**:**_____

Density of marsh vegetation[2] (Circle one): None, sparse, moderate, dense

Estimated average marsh vegetation height (m): 0-1, 1-3, 3-6,>6.

Litter depth (cm):_____ **Water depth** (m): _____

Method used for measuring water depth (Circle one)**:** staff gauge, meter stick, other: _____

Distance to Physical Characteristics

Water edge (m):_____

Ditch (m): _____

Mudflat (m): _____

Road or dike (m):_____

Upland area (m):_____

Large open-water area (m):_____

Small open-water area (m):_____

[2] Estimate density of vegetation within 50 m around survey point using the following categories: 1-Dense = water not visible through base of stems at water level and you cannot easily push hand through the stems; 2-Moderate = anything that falls between dense and sparse; 3-Sparse = water easily visible through base of widely scattered stems

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: 6/20-22/2017 Observer(s): S. GROVE / M. GROVE

Survey Point	Water Depth (~~m~~) FT.	Comments
A1-1	.68	
A1-2, B1-8	1.45	
A1-3, B1-7	.40	
A1-4	.55	NO FROGS IN MARSH TO E/S
A1-5	.52	
A1-6, B2-7	2.14	
A1-7, B2-6	.65	
A1-8, B2-4	.71	
A1-9, B2-3	.75	
A1-10	1.5	
A2-1, B1-3	2.5	
A2-2, B1-4	2.78	VIRA IN MARSH TO E/NE (OUTSIDE AOC)
A2-3	1.6	
A2-4	2.4	IMPOUNDMENT
A2-5	2.7	
A2-6	2.3	
A2-7	.43	RIVER EDGE
A2-8	.33	PART OF SHORE VEG MOWED
A2-9	3.0	RIVER EDGE
A2-10	1.8	RIVER EDGE
A2-11, B1-9	1.5	
A2-12	2.8	PART OF ADJ FIELD & POND EDGE MOWED
A2-13	2.1	
B1-1	—	DELETED AFTER 2014
B1-2	2.5	
B1-5	1.5	
B1-6	2.3	
B2-1	.49	
B2-2	~~.75~~ 1.2	
B2-5	.75	

Additional Notes:

MARSHES EXCESSIVELY FLOODED, H_2O IN MANY FOREST AREAS AND ALONG ROADS, PARKING LOTS BUT H_2O RETURNED TO "NORMAL" BY JUNE SURVEY