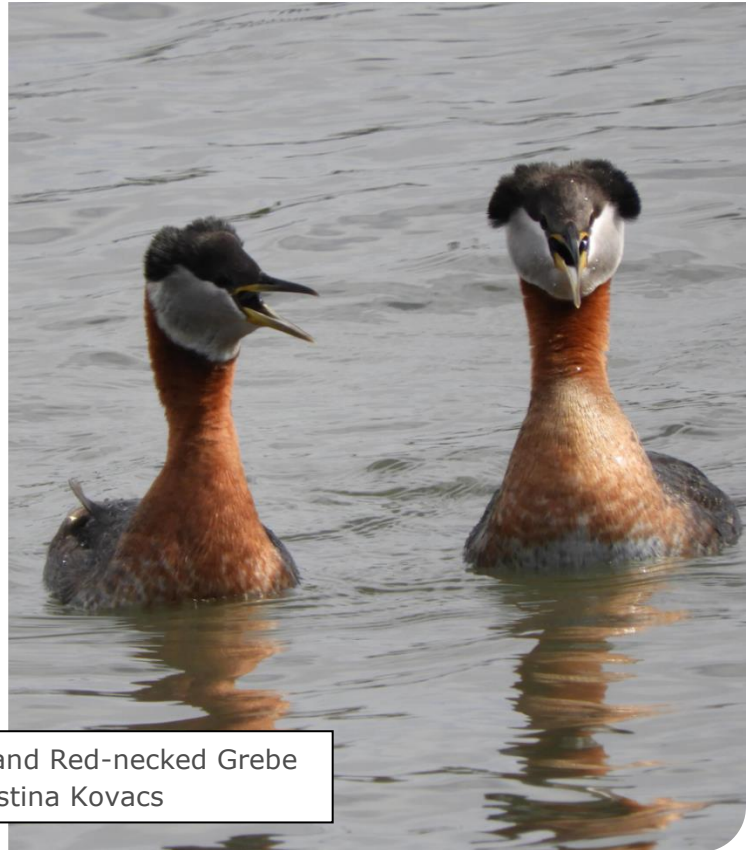




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Semipalmated Plover and Red-necked Grebe
Photos: Christina Kovacs

Migratory Waterfowl and Shorebird Stopover Habitat Survey Protocol

Prepared by Credit Valley Conservation
Prepared for surveyors conducting migratory waterfowl and
shorebird stopover habitat surveys

FINAL
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1.0 Introduction

This document describes a protocol to conduct migratory shorebird and waterfowl surveys, in aquatic habitats, to identify Significant Wildlife Habitat (SWH). This protocol is intended for use in the Credit River watershed in Southern Ontario. It is based on methods and recommendations from various migratory waterfowl and shorebird protocols and SWH guides. This protocol provides methods for how to choose survey sites, how to set the sites up before surveying, and how to conduct the surveys, including timelines. Anyone can use it who intends to conduct migratory waterfowl and shorebird surveys to identify SWH.

Shorebirds and waterfowl can migrate long distances between their northern breeding habitats and their southern wintering habitats. During their vast spring and fall migrations, they must occasionally stop to rest and refuel. Migratory stopover and staging areas are sites where waterfowl and shorebirds stop and gather in large groups. These stops allow the birds to feed and rebuild their energy reserves and seek cover from predators and poor weather. Migratory waterfowl may also moult their feathers during these stops (Ontario Ministry of Natural Resources (OMNR) 2000).

Waterfowl and shorebirds face several threats during migration. First, human disturbance at migratory stopover sites can startle birds, which prevents them from feeding and resting. Second, the degradation of migratory stopover habitat – for example, by pollution, pesticide run-off, and oil spills – leads to fewer birds using an area (Canadian Wildlife Services (CWS) 2016). Last, and most significantly, is the loss of stopover and staging areas. Conversion of these habitats to urban development and agriculture, for example, results in fewer sites that waterfowl and shorebirds can depend on during their migration (North-South Environmental et al. 2009).

Migratory stopover sites are listed under the *Seasonal Concentration Areas* category of SWH, as defined in the *Significant Wildlife Habitat Technical Guide* (OMNR 2000). Seasonal concentration areas are places where wildlife gather in large numbers during specific times of the year. The Significant Wildlife Habitat guides define three types of habitats for migratory shorebirds and waterfowl: shorebird migratory stopover areas, waterfowl stopover and staging areas (aquatic habitats), and waterfowl stopover and staging areas (terrestrial habitats). These sites are often reused each year and are critical wildlife habitats that should be identified, monitored, and protected.

This document presents a protocol to conduct migratory waterfowl and shorebird surveys to identify SWH; however, it only applies to aquatic habitats for waterfowl. Migratory waterfowl surveys in terrestrial habitats require a different protocol that Credit Valley Conservation does not have experience with conducting. Surveys like these provide information on the status of wildlife populations, identify reasons for population changes, and inform the development of proper management strategies. This information can prevent future decline and help to maintain steady wildlife population levels (OMNR 2000).

This protocol is designed for use in the Credit River watershed and is specific to three geographic areas in Southern Ontario contained within the watershed. This includes Ecoregion 6E, Ecoregion 7E, and the Region of Peel. For surveys outside these regions,

surveyors will need to refer to the applicable SWH guides for their geographic area for the relevant species and habitat types.

2.0 Protocol

2.1 Overview of source material

This document outlines methods to conduct migratory shorebird and waterfowl surveys for use in migratory stopover and staging habitat assessments, including Significant Wildlife Habitat assessments. This protocol is based on methods and recommendations from the following documents: *Ontario Shorebird Survey Training Manual and Protocol* (CWS 2016); *Significant Wildlife Habitat Technical Guide* (OMNR 2000); *Peel-Caledon Significant Woodlands and Significant Wildlife Habitat Study* (North-South Environmental et al. 2009); *Significant Wildlife Habitat Ecoregion 6E Criteria Schedule* (Ministry of Natural Resources and Forestry (MNRF) 2015a); *Significant Wildlife Habitat Ecoregion 7E Criteria Schedule* (MNRF 2015b); and *Bird and Bird Habitats: Guidelines for Wind Power Projects* (Ministry of Natural Resources (MNR) 2011).

2.2 Site selection

Surveyors should choose sites that have the potential to provide, or a known history of providing suitable stopover habitat for migratory waterfowl and shorebirds. There are a few steps that should be taken to identify these sites.

First, consider the habitat types and Ecological Land Classification (ELC) ecosites most likely to attract migratory waterfowl and shorebirds ([Sections 2.2.1](#) and [2.2.2](#)). For waterfowl, this includes rivers and marshes. For shorebirds, this includes wetlands with exposed mudflats and beaches (MNRF 2015a and 2015b). An ELC Ecosite is an area of land that has the same combination of soils and vegetation (Lee et al. 1998).

Second, assess potential areas of habitat using aerial photographs, topographical maps, and ELC mapping. The quality and context of each site should be considered. Ideal sites include diverse ELC ecosites that contain the resources that birds need during their stopover, including food and shelter.

Third, review existing data to find areas with records of target migratory waterfowl and shorebird species ([Section 2.2.3](#)). This may come from internal sources (e.g., CVC's Natural Heritage Database), external agencies (e.g., Ducks Unlimited Canada, Canadian Wildlife Service, Ontario Ministry of Natural Resources and Forestry), and citizen science platforms (e.g., eBird, iNaturalist). Other knowledgeable groups include private consultants, local birders, and naturalist clubs (OMNR 2000).

2.2.1 Waterfowl stopover habitat

The ELC ecosites listed in [Table 1](#) are those that have the greatest potential to contain migratory waterfowl stopover and staging areas.

Migratory waterfowl in aquatic habitats use a variety of habitat types, including ponds, lakes, bays, coastal inlets, managed reservoirs, and watercourses. Waterfowl will use these areas if they have a steady supply of food, such as aquatic invertebrates and vegetation.

Waterfowl may also use sewage treatment ponds and stormwater ponds. However, these man-made habitats are not considered SWH (MNR 2015a and 2015b).

Stopover and staging sites that support the greatest number of species are larger wetlands or water bodies with diverse ELC ecosites interspersed with open water. Marshes along the Great Lakes shorelines are important since they offer both deep open water and shallow marsh habitat (OMNR 2000).

Table 1 ELC ecosites with the potential to support significant aquatic waterfowl stopover and staging areas.

ELC Ecosite Code ¹	Description ²
MAS1	Graminoid Bedrock Shallow Marsh Ecosite
MAS2	Mineral Shallow Marsh Ecosite
MAS3	Organic Shallow Marsh Ecosite
SAF1	Floating-leaved Shallow Aquatic Ecosite
SAM1	Mixed Shallow Aquatic Ecosite
SAS1	Submerged Shallow Aquatic Ecosite
SWD1	Oak Mineral Deciduous Swamp Ecosite
SWD2	Ash Mineral Deciduous Swamp Ecosite
SWD3	Maple Mineral Deciduous Swamp Ecosite
SWD4	Mineral Deciduous Swamp Ecosite
SWD5	Ash Organic Deciduous Swamp Ecosite
SWD6	Maple Organic Deciduous Swamp Ecosite
SWD7	Birch - Poplar Organic Deciduous Swamp Ecosite

¹ MNR 2015a and 2015b

² Lee et al. 1998

2.2.2 Shorebird stopover habitat

The ELC ecosites listed in [Table 2](#) are those that have the highest potential to contain migratory shorebird stopover and staging areas.

Table 2 ELC ecosites with the potential to support significant shorebird migratory stopover habitat.

ELC Ecosite Codes ¹	Description ²
BBO1	Mineral Open Beach / Bar Ecosite
BBO2	Bedrock Open Beach / Bar Ecosite
BBS1	Mineral Shrub Beach / Bar Ecosite
BBS2	Bedrock Shrub Beach / Bar Ecosite
BBT1	Mineral Treed Beach / Bar Ecosite
BBT2	Bedrock Treed Beach / Bar Ecosite
MAM1	Bedrock Meadow Marsh Ecosite
MAM2	Mineral Meadow Marsh Ecosite
MAM3	Organic Meadow Marsh Ecosite
MAM4	Great Lakes Coastal Fen Meadow Marsh Ecosite

ELC Ecosite Codes ¹	Description ²
MAM5	Mineral Fen Meadow Marsh Ecosite
SDO1	Open Sand Dune Ecosite
SDS1	Sand Shrub Dune Ecosite
SDT1	Treed Sand Dune Ecosite

¹ MNRF 2015a and 2015b

² Lee et al. 1998

Shorebirds often follow shorelines of the Great Lakes during migration, congregating in wetland areas that provide ideal habitat for foraging and resting. The best stopover sites are permanent and natural sites (OMNR 2000). They will also use shorelines with groynes and other armour rock (MNRF 2015a and 2015b). Shorebirds also like sites that have an accumulation of invertebrate prey (OMNR 2000).

Shorebirds can also use several other habitat types for stopover areas. These include seasonally flooded mudflats, unvegetated shoreline habitats, and shorelines of lakes and rivers. Shorebirds may also use sewage treatment ponds and stormwater ponds. However, these man-made habitats are not considered SWH (MNRF 2015a and 2015b).

2.2.3 Migratory waterfowl and shorebirds listed as SWH species

The waterfowl and shorebird species that are listed in the SWH guides are indicators of significant stopover and staging habitats (Table 3 and Table 4). Existing data should be examined to find records of these species at potential stopover sites during the migration season. Also, surveyors should familiarize themselves with this list as they may encounter many waterfowl and shorebird species while conducting stopover habitat surveys.

Table 3 Migratory waterfowl species listed in three Significant Wildlife Habitat guides for aquatic stopover and staging habitat.

Species	Latin Name	4-letter Bird Code ¹	Peel-Caledon ²	Ecoregion 6E ³	Ecoregion 7E ⁴
American Black Duck	<i>Anas rubripes</i>	ABDU	✓	✓	✓
American Wigeon	<i>Anas americana</i>	AMWI	✓	✓	✓
Black Scoter	<i>Melanitta americana</i>	BLSC	✓	✓	✓
Blue-winged Teal	<i>Anas discors</i>	BWTE	✓	✓	✓
Brant	<i>Branta bernicla</i>	BRAN	✓	✓	✓
Bufflehead	<i>Bucephala albeola</i>	BUFF	✓	✓	✓
Cackling Goose	<i>Branta hutchinsii</i>	CACG		✓	✓
Canada Goose	<i>Branta canadensis</i>	CANG		✓	✓
Canvasback	<i>Aythya valisineria</i>	CANV	✓	✓	✓
Common Eider	<i>Somateria mollissima</i>	COEI	✓		
Common Goldeneye	<i>Bucephala clangula</i>	COGO	✓	✓	✓
Common Merganser	<i>Mergus merganser</i>	COME	✓	✓	✓
Gadwall	<i>Anas strepera</i>	GADW	✓	✓	✓
Greater Scaup	<i>Aythya marila</i>	GRSC	✓	✓	✓

Species	Latin Name	4-letter Bird Code ¹	Peel-Caledon ²	Ecoregion 6E ³	Ecoregion 7E ⁴
Green-winged Teal	<i>Anas crecca</i>	GWTE	✓	✓	✓
Harlequin Duck	<i>Histrionicus histrionicus</i>	HADU	✓		
Hooded Merganser	<i>Lophodytes cucullatus</i>	HOME	✓	✓	✓
Horned Grebe	<i>Podiceps auritus</i>	HOGR	✓		
King Eider	<i>Somateria spectabilis</i>	KIEI	✓		
Lesser Scaup	<i>Aythya affinis</i>	LESC	✓	✓	✓
Long-tailed Duck	<i>Clangula hyemalis</i>	LTDU	✓	✓	✓
Northern Pintail	<i>Anas acuta</i>	NOPI	✓	✓	✓
Northern Shoveler	<i>Anas clypeata</i>	NSHO	✓	✓	✓
Red-breasted Merganser	<i>Mergus serrator</i>	RBME	✓	✓	✓
Redhead	<i>Aythya americana</i>	REDH	✓	✓	✓
Red-necked Grebe	<i>Podiceps grisegena</i>	RNGR	✓		
Ring-necked Duck	<i>Aythya collaris</i>	RNDU	✓	✓	✓
Ruddy Duck	<i>Oxyura jamaicensis</i>	RUDU	✓	✓	✓
Snow Goose	<i>Chen caerulescens</i>	SNGO		✓	✓
Surf Scoter	<i>Melanitta perspicillata</i>	SUSC	✓	✓	✓
White-winged Scoter	<i>Melanitta deglandi</i>	WWSC	✓	✓	✓
Wood Duck	<i>Aix sponsa</i>	WODU	✓		

¹ Pyle and DeSante 2021

² North-South Environmental et al. 2009

³ MNRF 2015a

⁴ MNRF 2015b

Table 4 Migratory shorebird species listed in three Significant Wildlife Habitat guides for shorebird migratory stopover habitat

Species	Latin Name	4-letter Bird Code ¹	Peel-Caledon ²	Ecoregion 6E ³	Ecoregion 7E ⁴
American Avocet	<i>Recurvirostra americana</i>	AMAV	✓		
American Golden-Plover	<i>Pluvialis dominica</i>	AMGP	✓	✓	✓
American Woodcock	<i>Scolopax minor</i>	AMWO	✓		
Baird's Sandpiper	<i>Calidris bairdii</i>	BASA	✓	✓	✓
Black-bellied Plover	<i>Pluvialis squatarola</i>	BBPL	✓	✓	✓
Buff-breasted Sandpiper	<i>Calidris subruficollis</i>	BBSA	✓		
Dunlin	<i>Calidris alpina</i>	DUNL	✓	✓	✓
Greater Yellowlegs	<i>Tringa melanoleuca</i>	GRYE	✓	✓	✓
Hudsonian Godwit	<i>Limosa haemastica</i>	HUGO	✓	✓	✓
Killdeer	<i>Charadrius vociferus</i>	KILL	✓		
Least Sandpiper	<i>Calidris minutilla</i>	LESA	✓	✓	✓
Lesser Yellowlegs	<i>Tringa flavipes</i>	LEYE	✓	✓	✓
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	LBDO	✓		
Marbled Godwit	<i>Limosa fedoa</i>	MAGO	✓	✓	✓

Species	Latin Name	4-letter Bird Code ¹	Peel-Caledon ²	Ecoregion 6E ³	Ecoregion 7E ⁴
Pectoral Sandpiper	<i>Calidris melanotos</i>	PESA	✓	✓	✓
Piping Plover	<i>Charadrius melodus</i>	PIPL	✓		
Purple Sandpiper	<i>Calidris maritima</i>	PUSA	✓	✓	✓
Red Knot	<i>Calidris canutus</i>	REKN	✓		
Red Phalarope	<i>Phalaropus fulicarius</i>	REPH	✓		
Red-necked Phalarope	<i>Phalaropus lobatus</i>	RNPH	✓	✓	✓
Ruddy Turnstone	<i>Arenaria interpres</i>	RUTU	✓	✓	✓
Ruff	<i>Calidris pugnax</i>	RUFF	✓		
Sanderling	<i>Calidris alba</i>	SAND	✓	✓	✓
Semipalmated Plover	<i>Charadrius semipalmatus</i>	SEPL	✓	✓	✓
Semipalmated Sandpiper	<i>Calidris pusilla</i>	SESA	✓	✓	✓
Short-billed Dowitcher	<i>Limnodromus griseus</i>	SBDO	✓	✓	✓
Solitary Sandpiper	<i>Tringa solitaria</i>	SOSA	✓	✓	✓
Spotted Sandpiper	<i>Actitis macularius</i>	SPSA	✓	✓	✓
Stilt Sandpiper	<i>Calidris himantopus</i>	STSA	✓	✓	✓
Upland Sandpiper	<i>Bartramia longicauda</i>	UPSA	✓		
Western Sandpiper	<i>Calidris mauri</i>	WESA	✓		
Whimbrel	<i>Numenius phaeopus</i>	WHIM	✓	✓	✓
White-rumped Sandpiper	<i>Calidris fuscicollis</i>	WRSA	✓	✓	✓
Willet	<i>Tringa semipalmata</i>	WILL	✓		
Wilson's Phalarope	<i>Phalaropus tricolor</i>	WIPH	✓		
Wilson's Snipe	<i>Gallinago delicata</i>	WISN	✓		

¹ Pyle and DeSante 2021

² North-South Environmental et al. 2009

³ MNRF 2015a

⁴ MNRF 2015b

2.2.4 Prioritization

Once a set of candidate survey sites have been selected based on habitat type and/or existing data, surveyors may need to decide which sites to visit. If time and resources allow, surveying all candidate sites will provide the most information regarding available migratory stopover and staging habitat in the area. If only a subset of candidate sites may be visited, surveyors will need to develop criteria for prioritizing and selecting the sites.

These criteria may include:

- Sites with the greatest potential to meet the criteria for confirmed SWH, based on existing species data and general site characteristics (e.g., coastal wetlands, sites with diverse vegetation communities)
- Sites with management plans in development, or existing management plans that may be reviewed soon (e.g., Island Lake Conservation Area)
- Sites of organizational significance (e.g., CVC's Centres for Biodiversity)
- Sites triggered by development applications

2.3 Pre-survey: site setup

2.3.1 Establishing vantage points and survey route

A vantage point is a fixed standing position where the surveyors can view the habitat for waterfowl and shorebirds. Predetermined vantage points for each site should be set up around the survey area using a desktop mapping exercise.

Several guidelines apply when setting up vantage points. First, there is no predetermined distance between vantage points. They should be set up so the surveyors can view the entire habitat under study without obstruction (MNR 2011). These habitats include open water for waterfowl and mudflats for shorebirds. Second, vantage points should be set up in areas that are easy for surveyors to access. Third, vantage points should not be placed too close to the water's edge, including inlets. Surveyors that are too close may stress the birds, causing them to stop using the habitat (CWS 2016). Fourth, surveyors should set up vantage points so there is minimal overlap of the viewable area between them. This will help prevent the double counting of birds. Finally, larger sites will need more than one vantage point (CWS 2016; MNR 2011).

At larger sites with more than one vantage point, a survey route should be set up to help surveyors navigate between vantage points. A survey route is an established path that surveyors follow when going between vantage points. There is no standard way to determine a survey route for an area, but surveyors should follow the same route each time they survey a site. This will ensure the data is free of bias (CWS 2016).

Site setup requires the use of mapping software. ESRI GIS software such as ArcMap and ArcView can help with this. This software allows one to view orthophotos of the habitat to help create vantage points and survey routes. An orthophoto is an aerial photograph of the landscape that has been geometrically corrected, so the scale is uniform and can be used as a map. [Figure 1](#) is an example of an orthophoto marked with vegetation communities, vantage points, and a survey route.

Once the vantage points have been chosen, surveyors may need to test the placement of the vantage points and survey route in a pre-survey visit. This will help identify issues they can fix before starting surveys. For instance, surveyors may find that a vantage point is not well-positioned to view a mudflat for shorebirds.

2.3.2 Creating field maps

In the next step, surveyors should create a field map of the vantage points and survey route for each site. The vantage points and survey route should be placed on an orthophoto of the survey area that includes delineation of the ELC ecosites that are present. The orthophoto allows surveyors to get an accurate representation of where they are in relation to the surrounding habitat. The scale of the orthophoto may vary depending on the size of the site. Generally, a 1:2000 to 1:5000 scale should be enough to see individual features on the orthophoto, including trails, small inlets, etc.

The field maps should also include several other pieces of information to help surveyors navigate in the field. First, each field map should contain Universal Transverse Mercator

(UTM) grid lines to help surveyors estimate the distance the bird is from the vantage point. Second, a direction symbol (e.g., north) should be included to help surveyors orient themselves in the field. Third, labelling major roads can assist surveyors if they need to drive as part of their survey route. Finally, property boundaries should be included to prevent surveyors from trespassing while moving between vantage points (Figure 1).

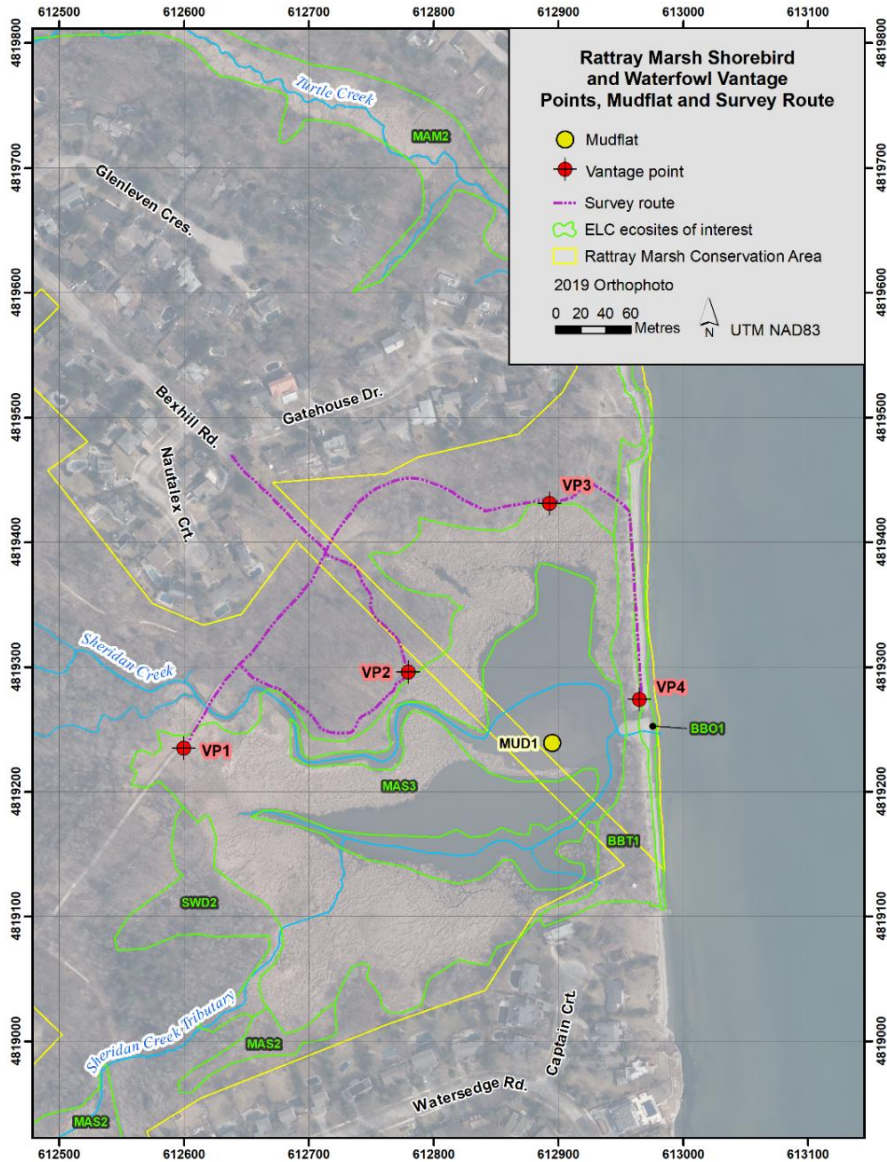


Figure 1 Example of vantage point locations at Rattray Marsh Conservation Area for surveying waterfowl in open water areas and shorebirds on an exposed mudflat area.

2.4 Crew size and equipment

Two people are required to conduct the surveys: a primary and secondary surveyor. The primary surveyor leads the crew and handles most of the species identification. They should have strong identification skills for waterfowl and shorebirds. The secondary surveyor assists with the data recording, as described in Section 2.6.

The following equipment is required to conduct the surveys:

1. Spotting scope with strong magnification power (e.g., $\geq 60\times$ magnification) supported by a tripod to view birds out on the water
2. Binoculars ($\geq 8\times$ magnification, preferably $10\times$) to view birds that are close to the vantage points
3. Bird identification field guides to assist with species identification when needed
4. Global Positioning System (GPS) unit to navigate to vantage points
5. Clipboard and writing utensils
6. Field map for recording bird locations
7. A datasheet for recording bird species
8. Other standard field equipment, including health and safety materials

2.5 Survey timelines and weather

2.5.1 Time of year

Surveyors should be familiar with the general waterfowl and shorebird migration periods for their area. Spring arrival and fall departure dates can vary across species. In fact, some species may leave a stopover site just as other species arrive. In the fall, most juvenile shorebirds migrate a month after adults (Pittway 2010). Surveyors should consult migration timing windows ([Appendix A: Figure A-1](#), and [Figure A-2](#)) and field guides and websites, ([Appendix B: Table B-1](#), and [Table B-2](#)) to determine when different waterfowl and shorebird species may pass through their area.

2.5.1.1 Migratory waterfowl

Surveys should be completed during **both the spring and fall migration seasons** (Mark Heaton, MNR, personal communication 2016). For spring, this should occur between **mid-March to early May**. For fall, this should occur between **early September to early December**.

For fall surveys, surveyors should also be familiar with waterfowl moulting and fall plumage to help with identification. Waterfowl moulting is a period when waterfowl replace their feathers and can appear “naked” or featherless in some areas of their body. This occurs as the birds lose their breeding plumage and transition into their fall, non-breeding plumage. Even individual birds in the same species may look different during this transition period. Surveyors can consult various field guides and websites for more information ([Appendix B: Table B-1](#), and [Table B-2](#)).

2.5.1.2 Migratory shorebirds

The ecoregion schedules state that surveys should be completed in **either the spring or fall** (MNR 2015a, 2015b). Spring migration surveys can take place between **late April to early June**. For fall migration surveys, they can be completed between **late July to late October** (CWS 2016).

We **recommend conducting the surveys in the fall** for two reasons. First, in Ontario, shorebirds are more likely to be observed in the fall. This is because in the spring many shorebirds migrate northward through the centre of the continent, but during the fall they

migrate southward towards the Atlantic coast, passing through Ontario (CWS 2016). Second, water levels tend to be lower in the fall, which exposes mudflats in areas of normally open water. The mudflats provide feeding habitat for shorebirds, making it more likely they will use an area as a stopover site. However, the fall plumage of shorebird species can make identification more difficult. As with waterfowl, surveyors can consult field guides and websites to help identify shorebirds in the fall ([Appendix B](#); [Table B-1](#), and [Table B-2](#)).

2.5.2 Time of day

Surveys should be conducted during **daylight hours** (MNR 2011). Both migratory waterfowl and shorebirds are active and visible throughout the day, and surveys are not generally affected by the time of day.

Depending on the site, two factors relating to the time of day may negatively affect waterfowl and shorebird activity. First, large groups of people and motorboats cause a lot of disturbance to them. Where this is an issue, surveyors should work when human activity is lower. Second, raptors, like hawks and eagles, prey on these birds and cause them to be more skittish (CWS 2016). As humans and raptors tend to be more active later in the day, surveyors may wish to survey earlier in the day.

2.5.3 Duration of survey

Surveys are **not time-sensitive** and should last as long as it takes the primary surveyor to record all the identifiable species using a site (CWS 2016). Surveyors may spend more time at larger sites with more vantage points. Here, surveyors should start earlier in the day to ensure they can complete the survey in one day. One survey round at a site should never be completed over more than one day.

2.5.4 Frequency of surveys

Sites should be surveyed for waterfowl and shorebirds **once every 10 days** throughout the migration period. For shorebird surveys, surveyors should follow the schedule guidelines in [Table 5](#) (CWS 2016). Surveyors can also use these guidelines if they are completing waterfowl surveys at the same time on a site ([Section 2.6.4](#)). However, they also need to ensure they are surveying within the waterfowl migration period as outlined in [Section 2.5.1.1](#). For example, in the fall, surveys should go until early December.

Table 5 Spring and fall survey dates that surveyors should follow when completing a round of shorebird surveys.

Spring Survey Dates ¹	Fall Survey Dates ¹
April 21 to 30	July 22 to 31
May 1 to 10	August 1 to 10
May 11 to 20	August 11 to 20
May 21 to 30	August 21 to 30
May 31 to June 9	August 31 to September 9
	September 10 to 19
	September 22 to 29
	September 30 to October 9

Spring Survey Dates ¹	Fall Survey Dates ¹
	October 10 to 19
	October 20 to 31

¹ CWS 2016

2.5.5 Weather conditions

Surveyors should conduct surveys with **little to no rain**, **little to no wind** (three or less on the Beaufort scale), and **no fog** (MNR 2011). These factors can impair a surveyor's ability to detect birds. Rain and fog can make it difficult for surveyors to see birds. Strong winds create waves on the water, which can force waterfowl to move further offshore or into sheltered areas.

2.6 Field data collection

During a stopover count, the aim is to estimate the total number of birds using a site as migratory stopover habitat. The methods outlined below were adapted from *Bird and Bird Habitats: Guidelines for Wind Power Projects* (MNR 2011) and the *Ontario Shorebird Survey Training Manual and Protocol* (CWS 2016).

2.6.1 Following the survey route and navigating to vantage points

Two surveyors should follow the survey route established during the pre-survey site setup. This predetermined survey route and vantage points will allow surveyors to estimate all the birds using a site during a single visit. Surveyors can follow the survey route using a boat, vehicle, and/or by walking, depending on the site (CWS 2016; MNR 2011). Their field map will also help to navigate around the study site. Surveyors should make every attempt to follow the same survey route each time they perform the survey (CWS 2016).

To navigate to each vantage point, surveyors should use a combination of their field map and GPS to guide them. Once at the vantage point, surveyors should position themselves to view the entire habitat under study. Surveyors should be able to see the habitat as completely as possible, with minimal obstruction. Surveyors should move if vegetation or other objects are blocking their view.

2.6.2 Performing the stopover count survey

A primary and secondary surveyor is required to perform the survey, each with different responsibilities. It is the primary surveyor's responsibility to do most of the species identifications. The secondary surveyor is responsible for notetaking, recording species counts, and mapping the species' locations, as the primary surveyor calls them out.

Once at a vantage point, the surveyors should perform a general scan of the viewable area using binoculars before setting up the spotting scope. Birds present at the site will sometimes flush upon the arrival of the surveyors. If this occurs, surveyors should attempt to identify and count all the birds and record them as pre-survey observations.

Once the spotting scope is set up, the primary surveyor should start counting birds as follows. They should start at one end of the viewable area and count while scanning the area from left to right, or vice versa. To minimize the double-counting of individual birds,

scan the area slowly in one direction and avoid going back to an area that has already been scanned. Depending on flock size and diversity, all species can be counted during a single scan, or the flock can be scanned a few times to count abundance for each species. For example, scan once completely to count American Black Duck, then again to count Canada Goose.

When the primary surveyor encounters a bird, they should call it out to the secondary surveyor. The secondary surveyor should record the species on the datasheet and note its location on the field map ([Appendix C](#); [Figure C-1](#), and [Figure C-2](#)) using the species four-letter bird code (e.g., Common Goldeneye = COGO) (Pyle and DeSante 2021). The secondary surveyor should also record the abundance, any relevant species notes, and an evidence code for each observation. The primary surveyor may encounter multiple individuals or flocks of birds of the same species within the same viewable area of the vantage point. When this occurs, the secondary surveyor should record the observations in sequential order on the map and datasheet (e.g., COGO.1, COGO.2, etc.).

The secondary surveyor should also complete other tasks while the primary surveyor is counting birds. This includes recording the surveyor names, the start and end time, the weather, and the conditions of the site (e.g., noise from local traffic) on the datasheet. The secondary surveyor can also monitor flock movements and assist with species identification using their binoculars, where needed.

After completing a tally at one vantage point, the surveyors can move onto the next vantage point until they are finished with the site.

2.6.3 Dealing with overlapping migratory, breeding, and overwintering birds

Stopover sites may also support birds that are not migrating at certain times during the migration period. For example, breeding species may be present in the spring and overwintering species may be present in the fall. This can pose a challenge for surveyors, as they will need to pick out the species that are using the site as breeding or overwintering habitat and exclude them from the final migratory bird tally. This is necessary to prevent overinflating the abundance of the species that are migrating.

2.6.3.1 Dealing with overlapping migratory and breeding birds

There are several ways to distinguish between migratory and breeding species. First, surveyors should be familiar with the breeding range of all the waterfowl and shorebird species in their study area. Certain species do not breed in Southern Ontario, so surveyors should presume they are migrants. For waterfowl, some examples include Long-tailed Duck and Surf Scoter (Sandilands 2005). For shorebirds, all species breed further north except for Killdeer, Spotted Sandpiper, American Woodcock, Upland Sandpiper, and Wilson's Snipe. These are the only shorebirds that breed in the Region of Peel within the Credit River watershed (North-South Environmental et al. 2009). Surveyors can consult breeding range maps from reputable sources like field guides or online websites ([Appendix B](#); [Table B-1](#), and [Table B-2](#)).

Second, surveyors should be familiar with the breeding window for species that breed within the study area. This information is available in field guides, in online bird nesting queries

like the one from Birds Canada (2021), and nesting dates provided by the Ontario Breeding Bird Atlas (OBBA) (2021b). For example, species like Wood Duck may already be nesting during late April in Southern Ontario (OBBA 2021b).

Finally, surveyors should be familiar with breeding behaviour to recognize birds that may be nesting. For example, a bird is no longer migrating if you see it building a nest or incubating a nest. Surveyors can consult a list of breeding behaviours they are likely to encounter (OBBA 2021a).

Using these guidelines, surveyors should be able to distinguish between most migratory and breeding species. For breeding species, surveyors can either exclude the record entirely or record it but include the breeding evidence code (OBBA 2021a). This way, when surveyors tally the number of migratory birds, they can pick out the breeding species by looking at the evidence codes. Alternately, surveyors can include a separate column on the datasheet to check off species that are still migrating.

2.6.3.2 Dealing with overlapping migratory and overwintering birds

There are several ways to distinguish between migratory and overwintering species. First, surveyors should be familiar with the overwintering range of all the waterfowl and shorebird species they find. Certain species rarely overwinter in Southern Ontario and should be presumed to be migrants. For waterfowl, examples include Green-winged Teal and Blue-winged Teal (Sandilands 2005). No shorebirds overwinter in Southern Ontario, although occasionally some species, like Killdeer, may stay later depending on the conditions (Sandilands 2010). This is generally rare, so surveyors should assume they are migrants.

Second, surveyors should be familiar with the migratory window for all the species they may find in a study area. This will help them know when they are most likely to encounter a species, especially in high numbers. They can get this information from online data sources such as eBird ([Appendix A](#), [Figure A-1](#), and [Figure A-2](#)).

There may be times when a single waterfowl species may have a mixture of both migratory and overwintering individuals at a site. This can make it difficult for surveyors to differentiate between those individuals. One clue may come on the **next visit** to the site to see if the same individuals are still present. For example, if the surveyors found 25 Red-breasted Merganser on one visit, then found two Red-breasted Mergansers on the next visit, they can likely assume most of the birds they found on the first visit were migrants. If it is not possible to use follow-up visits to make these assessments or if the abundances do not make a discernable difference, surveyors can record the birds with evidence of “observed”.

Using these guidelines, surveyors should be able to distinguish between most migratory and overwintering birds. Like [Section 2.6.3.1](#), surveyors can exclude the overwintering records completely from the datasheet or make a note about which species are overwintering.

It is important to note that the complication of observing both migratory and overwintering birds is more likely to be an issue in waterbodies that remain ice-free in the late fall and winter. This includes Lake Ontario and other waterbodies that have large wave action that

prevents ice build-up. Smaller waterbodies will eventually freeze up, forcing waterfowl to move.

2.6.4 Joint migratory shorebird and waterfowl stopover surveys

Surveyors can carry out joint surveys for waterfowl and shorebirds during the same field visit to increase efficiency. This can occur during periods when the migration windows for both groups of birds overlap. If combined surveys will be conducted, surveyors should establish vantage points that provide adequate coverage of suitable habitats for both shorebirds and waterfowl (e.g., mudflats and open water).

The stopover count protocol outlined in [Section 2.6](#) should be used to survey both groups of birds in the same way as when surveying each group independently. Surveyors can record data for both groups of birds on the same datasheet and should show the survey was targeted at both groups of birds.

2.6.5 Surveying large or distant flocks

Surveyors may encounter large or distant flocks of waterfowl and shorebirds that can be difficult to identify. Several guidelines can help with identification in this case.

First, surveyors can gather clues based on how a species mixes, either with other species or with other individuals of the same species. For waterfowl, some species easily mix with other species. For example, some dabbling ducks like Mallards and American Black Duck mix, and diving ducks like various *Aythya* species will mix (Behrens and Cox 2013). For shorebirds, some species tend to be solitary such as Solitary Sandpiper and Spotted Sandpiper. However, species like Western Sandpiper will form huge flocks (Sibley 2001). Surveyors can consult reference guides and websites to find out what species mix and do not mix and those that form large flocks or are more solitary ([Appendix B](#); [Table B-1](#), and [Table B-2](#)).

Second, surveyors can look for a distinct body shape or feature to help with identification. This is useful when a bird is far away or shaded by the sun. For example, Long-tailed Duck and Northern Pintail both have a long, pointy tail that no other ducks have in this area. In addition, shorebirds like Whimbrel have a long, downcurved bill that is distinct for the species (Sibley 2003). Surveyors should consult field guides and websites for more information ([Appendix B](#); [Table B-1](#), and [Table B-2](#)).

Third, for waterfowl, surveyors can look for dark or light colouring on the body or both. When flocks are close, surveyors can typically identify the bird based on the colour(s) and patterns on the bird. However, when a bird is far away or shaded by the sun, surveyors can lose the ability to see these colours. To help with this, surveyors can look for areas on the body and wings that are dark, light, or both. For example, the Green-winged Teal has a white stripe pointing towards its shoulder, which is unique (Behrens and Cox 2013; Devokaitis 2015; Sibley 2013).

It should be noted that surveyors should not rely solely on these guidelines to identify birds. Surveyors should use a combination of guidelines to help with this process.

Lastly, with large groups of birds, it may be difficult to get an exact tally of birds by counting individuals. Here, surveyors can use a block method to extrapolate the total number of birds. First, they need to count the number of birds in a block or subset of the flock, such as 10 or 20 birds. Second, they need to estimate how many subsets of that size make up the flock. Finally, they should multiply the number of birds within a subset by the number of subsets in the flock (eBird 2012a and 2012b). For example, if surveyors count 10 birds in a subset, then estimate there are about six subsets in the flock, they will get about 60 birds. Note, this method is only useful if the flock contains one species. Surveyors can refer to additional guidance on counting large groups of birds through eBird (2012a and 2012b).

3.0 References

Behrens, K., and Cox, C. (2013). Peterson Reference Guide to Seawatching: Eastern Waterbirds in Flight. Houghton Mifflin Harcourt Publishing Company, New York, xi + 602 pp + App

Birds Canada. (2021). Nesting Calendar Query Tool. Available online: <https://www.birdscanada.org/apps/rnest/index.jsp>

Canadian Wildlife Service (CWS). (2016). Ontario Shorebird Survey Training Manual and Protocol. 2016-01. Environment Canada, Canadian Wildlife Service.

Devokaitis, M. (2015). Where's the White? A Simple Question Can Be The Key In Waterfowl ID. The Cornell Lab of Ornithology. Available online: <https://www.allaboutbirds.org/news/wheres-the-white-a-simple-question-can-be-the-key-in-waterfowl-id/>

eBird. (2012a). Bird Counting 101. Available online: <https://ebird.org/news/counting-101/>

eBird. (2012b). Bird Counting 201. Available online: <https://ebird.org/news/counting-201/>

eBird. (2021). Bird Bar Chart. Available online: <https://ebird.org/GuideMe?cmd=changeLocation>

Lee, H. T., Bakowsky, W. D., Riley, J., Bowles, J., Puddister, M., Uhlig, P., and McMurray, S. (1998). Ecological Land Classification for Southern Ontario: First Approximation and its Application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science and Development and Transfer Branch. SCSS Field Guide FG-02. 225 pp.

Ministry of Natural Resources (MNR). (2011). Bird and Bird Habitats: Guidelines for Wind Power Projects. 32 pp. Available online: <https://www.ontario.ca/page/birds-and-bird-habitats-guidelines-windpower-projects>

Ministry of Natural Resources and Forestry (MNR). (2015a). Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E, 38 pp. Available online: <https://dr6j45jk9xcmk.cloudfront.net/documents/4775/schedule-6e-jan-2015-access-ver-final-s.pdf>

Ministry of Natural Resources and Forestry (MNR). (2015b). Significant Wildlife Criteria Schedules for Ecoregion 7E, 40 pp. Available online: <https://dr6j45jk9xcmk.cloudfront.net/documents/4776/schedule-7e-jan-2015-access-vers-final-s.pdf>

North-South Environmental Inc., Dougan & Associates and Sorensen Gravely Lowes. (2009). Peel-Caledon Significant Woodlands and Significant Wildlife Habitat Study. Report Prepared for the Region of Peel and the Town of Caledon, Ontario. xi + 187 pp + App.

Ontario Breeding Bird Atlas (OBBA). (2021a). Breeding Bird Evidence Codes. Available online: <https://www.birdsontario.org/breeding-codes/>

Ontario Breeding Bird Atlas (OBBA). (2021b). Ontario Breeding Bird Atlas-3 safe dates/breeding dates by ecoregion. Available online: <https://www.birdsontario.org/wp-content/uploads/Atlas-3-Safe-Dates-English-taxonomic-2021-04-03.pdf>

Ontario Ministry of Natural Resources (OMNR). (2000). Significant Wildlife Habitat Technical Guide. Queen's Printer of Ontario, 151p + app.

Pittway, R. (2010). Southbound Shorebirds. Ontario Field Ornithologists. Available online: <http://www.ofo.ca/site/page/view/articles.southboundshorebirds>

Pyle, P. and DeSante, D. F. (2021). Four-letter (English Name) and Six-letter (Scientific Name) Alpha Codes for 2168 Bird Species (and 113 Non-Species Taxa) in accordance with the 62nd AOU Supplement (2021), sorted alphabetically by English name. The Institute for Bird Populations. Available online: https://www.birdpop.org/docs/misc/Alpha_codes_eng.pdf

Sandilands, A. P. (2005). Birds of Ontario: Habitat Requirements, Limiting Factors, and Status for Nonpasserines: Waterfowl Through Cranes. Vancouver, UBC Press. 365 pp.

Sandilands, A. P. (2010). Birds of Ontario: Habitat Requirements, Limiting Factors and Status for Nonpasserines: Shorebirds Through Woodpeckers. Vancouver, UBC Press. 387 pp.

Sibley, D. A. (2001). The Sibley Guide to Bird Life & Behavior. New York, Andrew Stewart Publishing, Inc. 587 pp.

Sibley, D. A. (2003). The Sibley Field Guide to Birds of Eastern North America. New York, Andrew Stewart Publishing, Inc. 431 pp.

Appendix A: Migration windows for the listed Significant Wildlife Habitat waterfowl and shorebirds species

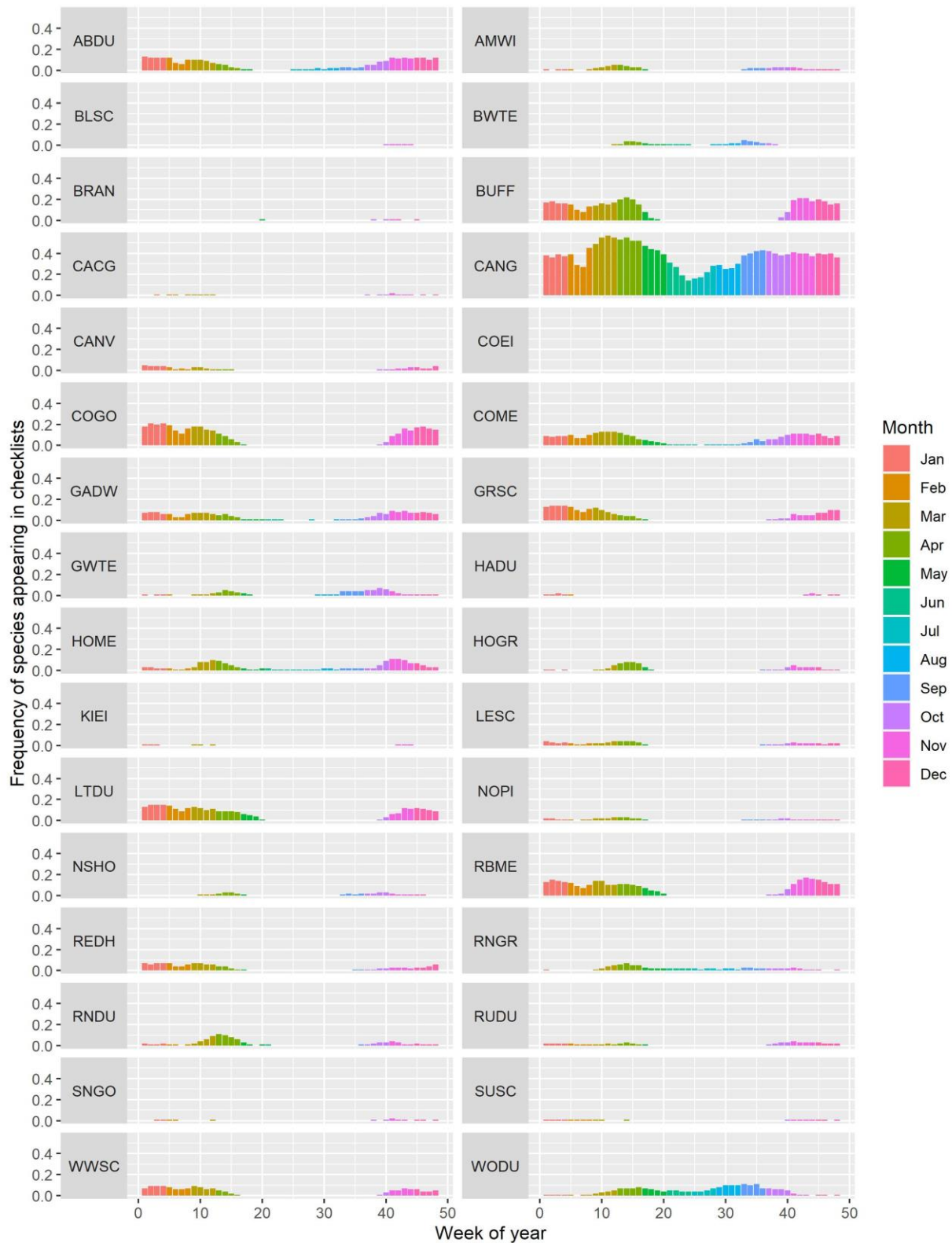


Figure A-1 Bar chart showing the frequency of waterfowl species occurrences throughout the year in the Regions of Peel, Halton, Dufferin, and Wellington based on data from eBird checklists (eBird 2021)

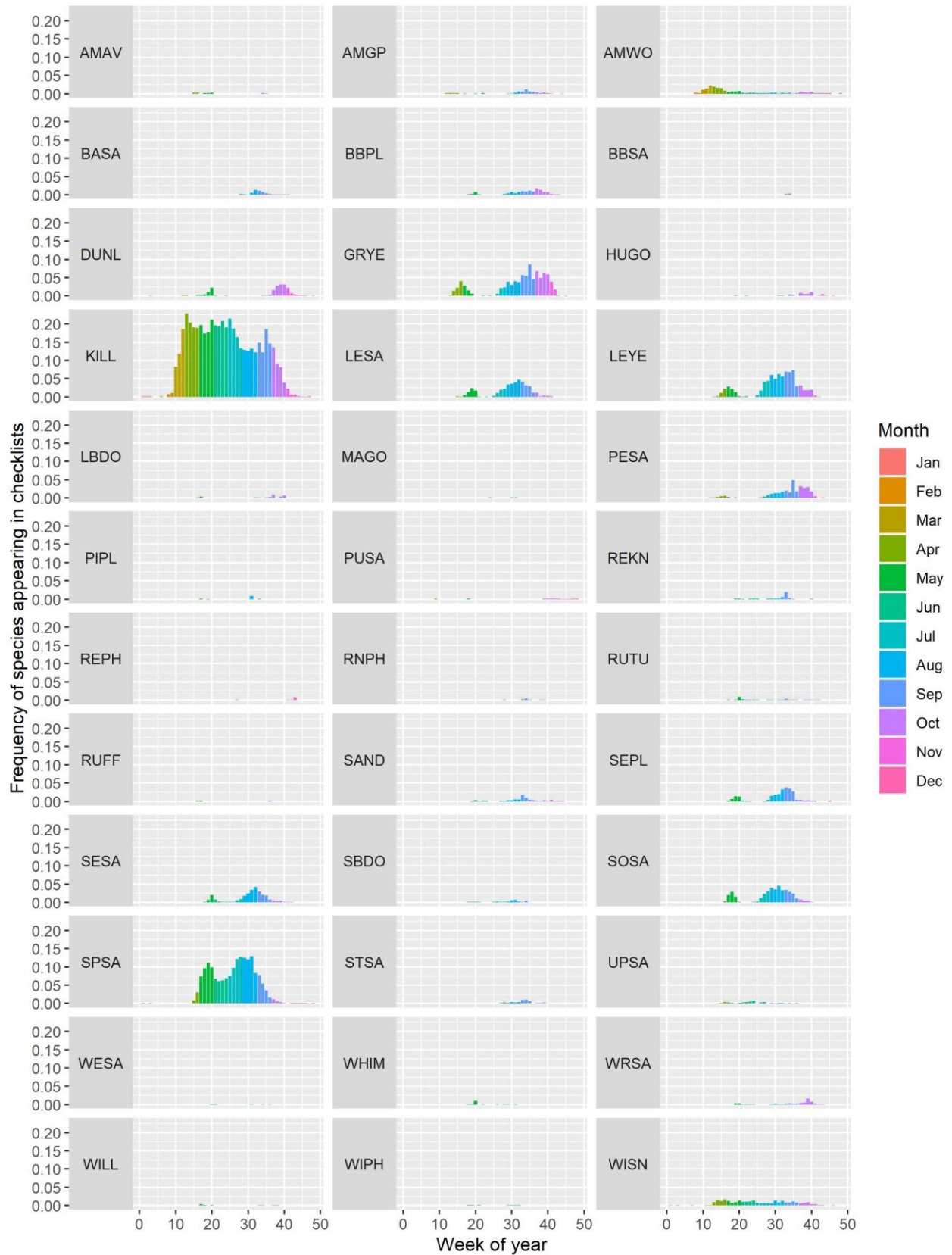


Figure A-2: Bar chart showing the frequency of shorebird species occurrences throughout the year in the Regions of Peel, Halton, Dufferin, and Wellington based on data from eBird checklists (eBird 2021)

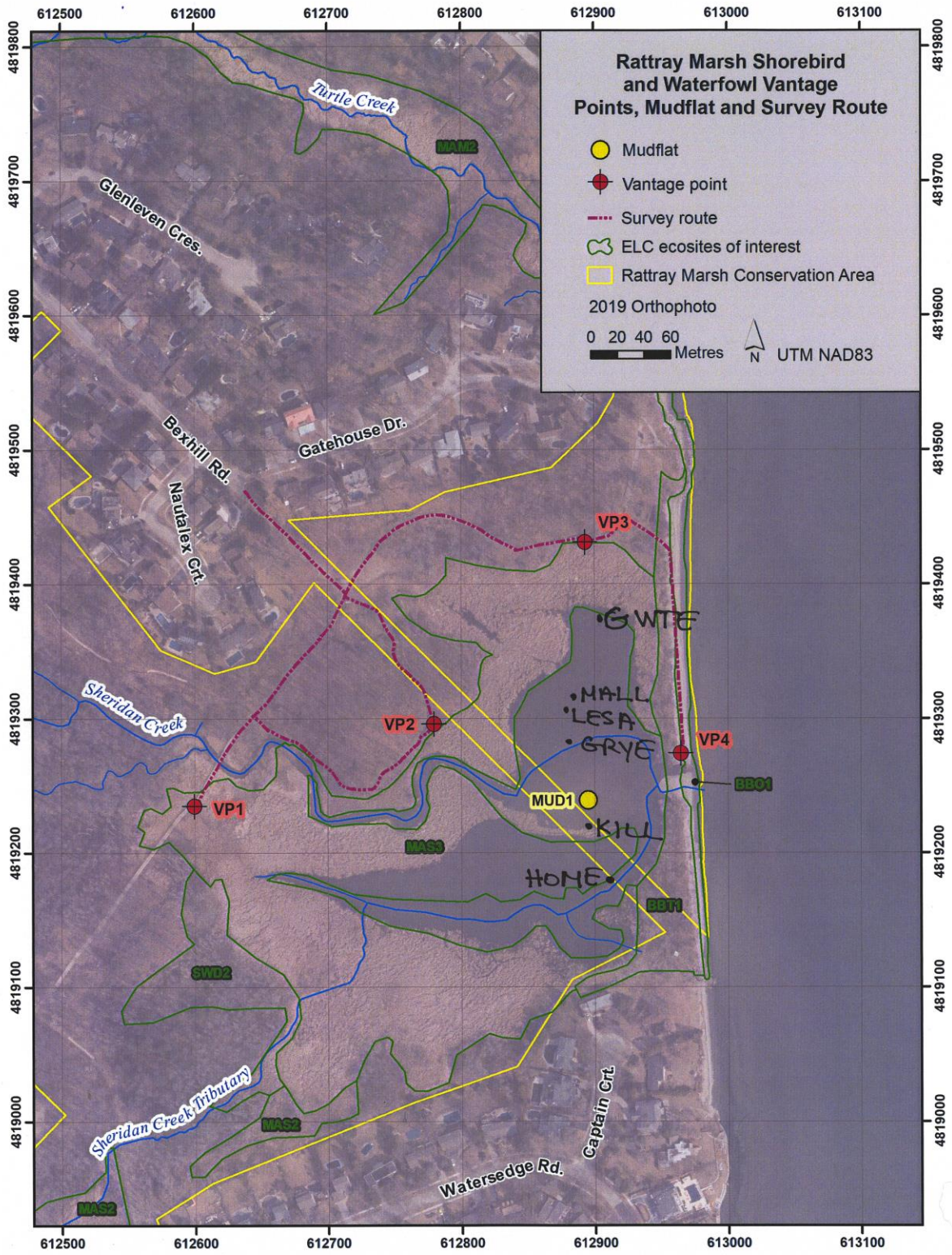
Appendix B: Useful reference books, field guides and websites

Table B-1: References books and field guides to assist with species identification and life-history traits.

Reference Books and Field Guide	Author(s)	Year of Publication
Birds of Ontario: Habitat Requirements, Limiting Factors and Status: Volume 1	Al Sandilands	2005
Birds of Ontario: Habitat Requirements, Limiting Factors and Status: Volume 2	Al Sandilands	2010
Peterson Reference Guide to Seawatching: Eastern Waterbirds in Flight	Ken Behrens and Cameron Cox	2013
The Sibley Field Guide to Birds of Eastern North America, Second Edition	David Sibley	2016
The Shorebird Guide	Michael O'Brien, Richard Crossley and Kevin Karlson	2006

Table B-2: Websites to assist with species identification and life-history traits

Website Names	Websites
The Cornell Lab of Ornithology	https://www.birds.cornell.edu/home/
eBird	https://ebird.org/home
Ontario Field Ornithologists	http://www.ofo.ca/
The Birds of the World	https://birdsoftheworld.org/bow/home



Oct. 3, 2019

Figure C-2: Example of a completed field map with species locations which is used for data recording during migratory waterfowl and shorebird surveys.