ENVIRONMENT AND CLIMATE CHANGE CANADA'S CANADIAN WILDLIFE SERVICE, ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY, BIRD STUDIES CANADA, MOOSE CREE FIRST NATION AND TRENT UNIVERSITY.

James Bay Shorebird Project

2018 Report

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Winter 2018

Photo: Longridge Point

Report summarizing 2018 shorebird survey results from three camps on the western James Bay coast.

Contents

Land Acknowledgment

We would like to begin by acknowledging that the work carried out and reported upon here was in Treaty 9 territory and the land on which the study sites are located is the traditional territory of Mushkegowuk (Cree), Ojibwe/Chippewa, Oji-Cree, Algonquin, and Métis Peoples.

Introduction

The Hudson Bay Lowlands are the third largest wetland complex on earth and the coastal ecosystems of southwestern Hudson Bay and James Bay are a global hotspot for breeding and staging waterbirds, waterfowl, shorebirds and other migratory birds (Manning 1952, Ross *et al.* 2003, Abraham and Keddy 2005, Abraham and McKinnon 2011). For shorebirds, the Lowlands are known or believed to harbour significant proportions of the provincial breeding populations of Hudsonian Godwit (*Limosa haemastica*) and Whimbrel (*Numenius phaeopus hudsonicus*) (Manning 1952, Morrison 1987, Skeel and Mallory 1996, Peck and James 1983, Peck 2007, Peck and Sutherland 2007, Prevett 1987, Walker *et al.* 2011). Several Arctic and sub-Arctic breeding shorebird species stage along the Hudson Bay and James Bay coasts to add fat reserves and undertake partial moults (e.g., White-rumped Sandpiper (*Calidris fuscicollis*), Semipalmated Sandpiper (*C. pusilla*)) or complete moults (e.g., Dunlin (*C. alpina*)) in preparation for their migrations (Harrington *et al.* 1991, Parmelee 1992, Warnock and Gill 1996, Hicklin and Gratto-Trevor 2010, Abraham and McKinnon 2011).

Research on shorebirds throughout the Americas in the 1970s led to the establishment of the Western Hemisphere Shorebird Reserve Network (WHSRN) program in 1985 (Morrison 1983, 1984, Myers *et al.* 1987a, b). A site must meet two criteria to be considered for WHSRN designation: demonstrated importance to shorebirds and expressed landowner agreement. Three categories of WHSRN sites are recognised based on peak counts or use by a percentage of a population of a species:

- Sites of Hemispheric Importance hosting at least 500,000 shorebirds annually, or at least 30% of the biogeographic population for a species;
- Sites of International Importance hosting at least 100,000 shorebirds annually, or at least 10% of the biogeographic population for a species; and
- Sites of Regional Importance hosting at least 20,000 shorebirds annually, or at least 1% of the biogeographic population for a species (WHSRN 2009).

Landowners must agree to three conditions: to make shorebird conservation a priority at the site; to protect and manage the site for shorebirds; and to update WHSRN annually about the status of the site (WHSRN 2009).

During the 1990s, Environment and Climate Change Canada's Canadian Wildlife Service (CWS) compiled an inventory of potential WHSRN sites along the coasts of both Hudson Bay and James Bay (Morrison *et al.* 1991, 1995, Ross *et al.* 2003). In 2016, the Moose Cree First Nation nominated a portion of the James Bay coast as a WHSRN Site of Hemispheric Importance.

The James Bay shorebird project (hereafter: the project) began when the Royal Ontario Museum (ROM) and the Ontario Ministry of Natural Resources and Forestry (OMNRF) partnered to survey birds at sites along the James Bay coast in 2009. Since then, CWS, ECCC's Wildlife and Landscape Science, Bird Studies Canada (BSC), Nature Canada, Moose Cree First Nation, and Trent University have joined this partnership to continue surveys of southbound staging shorebirds. This work initially included surveys at sites known to support staging shorebirds, with an emphasis on Red Knot (*C. canutus rufa*) to enable identification of critical habitat, as well as surveys for two federal Species at Risk, the Yellow Rail (*Coturnicops noveboracensis*) and Short-eared Owl (*Asio flammeus*). Additional work to collect natural heritage information by staff at the Natural Heritage Information Centre of the OMNR has been

conducted in concert with more recent surveys. Currently, the project involves annual surveys of shorebirds staging at established survey sites along the southwestern coast of James Bay.

The overall intention of the project is to contribute to shorebird population assessments and conservation, site designations and protection (e.g. Important Bird Area and WHSRN), and species recovery and protection (e.g. Endangered *rufa* Red Knot[1]). The goals of the project are to:

- produce reliable estimates of shorebird species staging along the south-western James Bay coast;
- understand local and flyway scale movement patterns of shorebirds staging in James Bay; and
- identify sites and habitats needed to sustain staging shorebirds.

The objectives to meet these goals are to estimate the:

- variability in shorebird migration phenology (both annually and among species);
- length of stay of staging shorebirds;
- annual variation in the abundance of staging shorebirds;
- habitat and food resource availability for staging shorebirds; and
- minimum proportion of the global population of Red Knot, subspecies *rufa*, that uses the southwestern James Bay coast.

Three field camps operated on the southwestern coast of James Bay in 2018; Little Piskwamish Point, Longridge Point, and Northbluff Point between 15 July and 11 September (see Figure 1). From these field camps, dedicated volunteers and paid staff counted shorebirds during their southbound migration. The timing of these counts was driven by the tide cycle, in that birds are more easily counted when they concentrate because of the flooding (incoming) and ebbing (outgoing) tides. Shorebirds were captured at Longridge Point with the objective of affixing Lotek PinPoint GPS tags to individuals of the target species Lesser Yellowlegs. Information gained from these tagged birds will contribute to a range-wide study led by the USFWS and Alaska Game and Fish. See below for details. Other shorebird species were banded and flagged with unique alphanumeric codes.

Motus Wildlife Tracking System

The Motus Wildlife Tracking System (Motus; http://motus.org) is a network of automated radio telemetry towers that track the movements of tagged organisms in terrestrial environments. The purpose of Motus is to facilitate landscape-scale research and education on the ecology and conservation of migratory animals. It is a program of Bird Studies Canada (BSC) in partnership with Acadia University, Western University, the University of Guelph and collaborating researchers and organizations.

As of February 2017, the network contained over 350 automated VHF radio-receiving stations, positioned throughout the Western Hemisphere (https://motus.org/data/receiversMap). A digital "nano-tag" tracking device is secured to an animal and they can be detected in real-time up to 15 km away from any station. This array can often track tagged animals across a diversity of landscapes covering thousands of kilometres. The James Bay shorebird project operates a number of Motus towers that contribute data to the network.

The resulting data, which often include tens of thousands of individual records per tag, are stored locally and transmitted back to a centralized data management system at BSC's National Data Centre where data are filtered, archived, visualized, and disseminated. Researchers, non-government

[1] The Red Knot was listed as Endangered in Ontario in 2008 under the provincial Endangered Species Act *2007*; in 2007 COSEWIC designated the Red Knot as Endangered; and in 2012 the *rufa* subspecies was listed as Endangered, *roselaari* subspecies was listed as Threatened, and the islandica subspecies was listed as Special Concern under Schedule 1 of the federal *Species at Risk Act* (SARA).

organizations, and the public can then query those data and examine the movements and behaviours of any species being tracked. This state-of-the-art system is the first of its kind in the world and is open to all researchers and organizations.

Study Areas

The Longridge Point camp (51.798942°N, 080.69204°W) has been surveyed annually since 2009. It is located approximately 60 km northwest of Moosonee (Figure 1). The site is characterised by a prominent point that juts out into James Bay. Sheltered areas have formed on either side of the point, where fresh water tributaries flow out into the bay. These areas provide excellent roosting and feeding opportunities for migrant shorebirds. The gradient of the shoreline is very flat. The spruce forest is close to the high tide line, generally within 1 km, and opens to willow thickets and meadow marsh, eventually grading into brackish and saline tidal marshes. Based upon aerial surveys and this project's surveys, the area hosts large concentrations of shorebirds (e.g., Semipalmated Sandpiper, Red Knot, and Pectoral Sandpiper) during autumn migration.

The Little Piskwamish Point camp (51.683427°N, 080.565783°W) has operated each year since 2011. It is located approximately 45 km northwest of Moosonee, and about 20 km southeast of Longridge Point (Figure 1). The habitat is similar to Longridge, except that there is no prominent point. Based upon aerial surveys, and supported by ground surveys of this project, the area is known to host large concentrations of shorebirds (e.g., Red Knots, Dunlin and White-rumped Sandpiper) during southern migration.

The Northbluff Point camp (51.4879571°N, 080.4398775°W) is the most southerly of the project's field camps surveyed in 2018 and has been surveyed in 2009, 2011, and 2014-2017. Like the other two sites, the shoreline gradient is very flat. From the spruce tree line, willow thickets and meadow marsh eventually grade to brackish ad saline tidal marshes. The area is known to host large concentrations of shorebirds (e.g., Semipalmated Sandpiper and White-rumped Sandpiper) during southern migration.

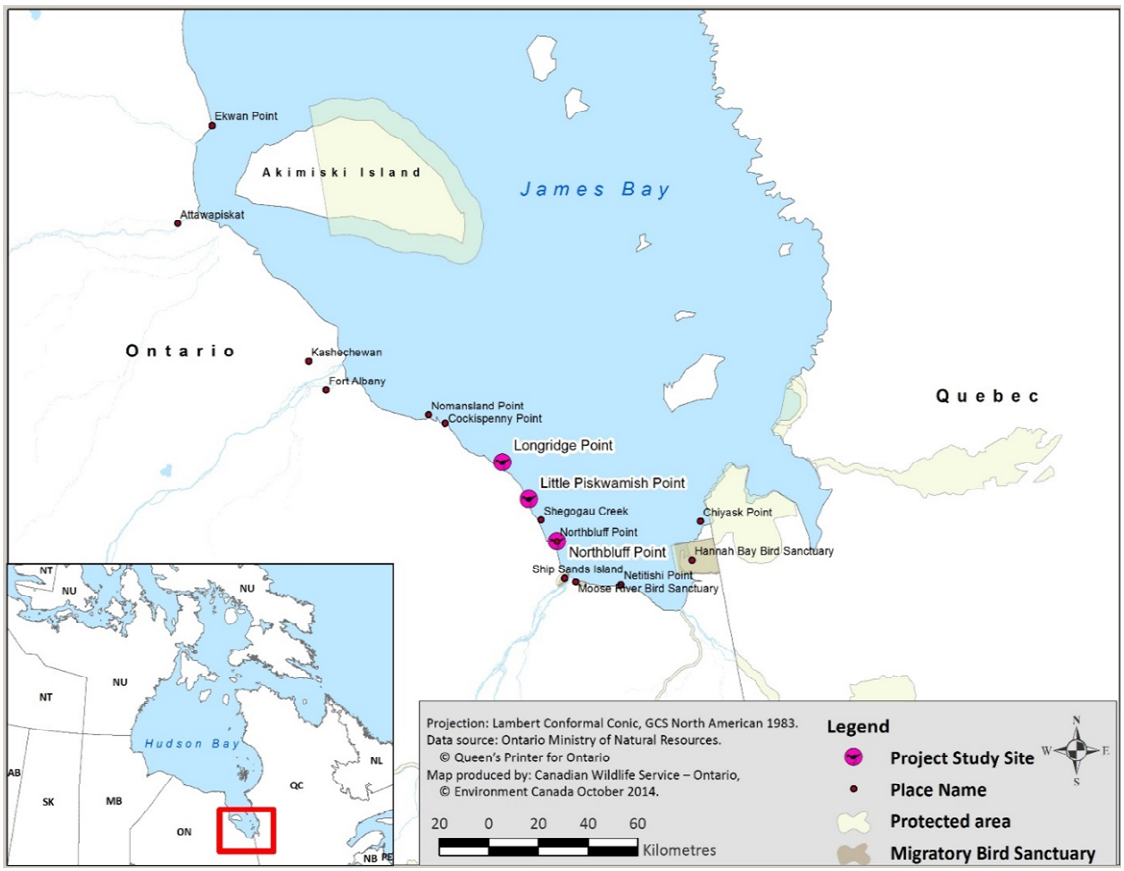


Figure 1. Field camp sites of the James Bay Shorebird Project, 2018.

Images of the most commons species encountered at study sites along James Bay

Semipalmated Plover

Hudsonian Godwit

Greater Yellowlegs

Marbled Godwit

Lesser Yellowlegs

Ruddy Turnstone

All Photos © Mark Peck

Red Knot – with individual colour marked flag banded in Argentina

Least Sandpiper

Sanderling

White-rumped Sandpiper

Semipalmated Sandpiper

Pectoral Sandpiper

Dunlin

Results and Discussion

Longridge Point

A maximum of 13 people were stationed at Longridge Point during the season. The camp was active from 13 July to 10 September 2018. The work in this period was focused on daily surveys to generate estimated totals for the area, passive banding, and banding target species and affixing tags to these birds.

During this season at Longridge Point a total of 684 hours was spent in the field, which the highest raw measure of effort at the site, and above the average of 425 field hours since 2014 (when seasonal coverage of ~60 days). There were 175 bird species recorded in 2018, which is above the average of 125 across all sites and years, and the Longridge average since 2014 of 160 species. After scaling to effort, however, Longridge Point 2018 results were the lowest to date (25.58 species/100 field hours; Figure 2), likely a result of the combined effect of high field hours and maximum number of available species at the site. Tables 1 and 2 show the top ten estimated high counts of bird species and shorebird species, respectively, encountered each month during the survey period, not corrected for effort. A total of 947 birds was banded and seven Lesser Yellowlegs were equipped with PinPoint tags during the period (see Motus towers, banding, and tagging section below).

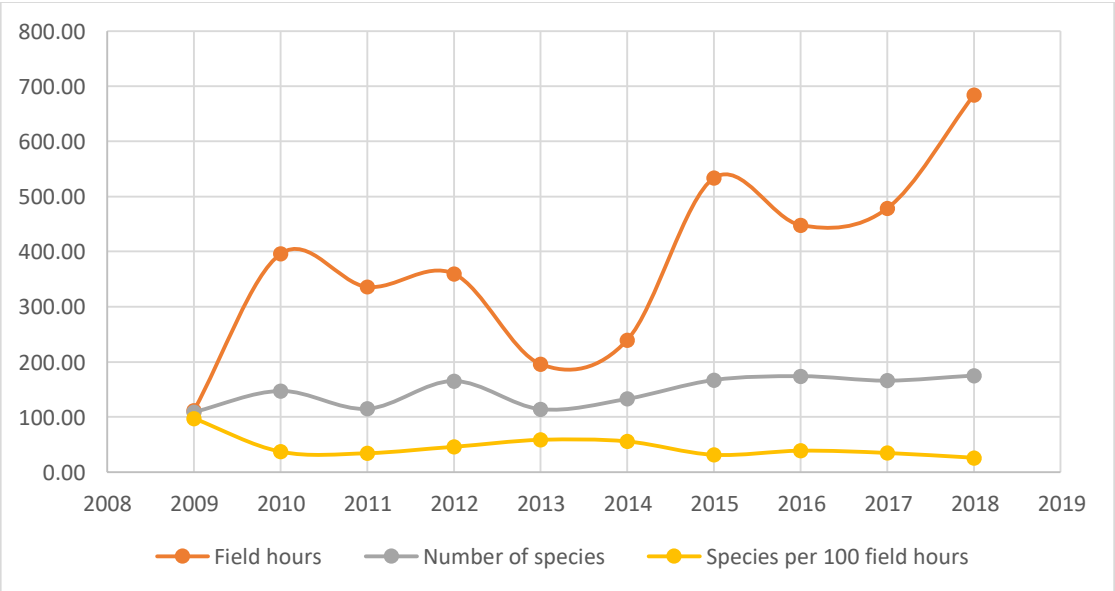


Figure 2. Field hours, total number of species, and species per 100 field hours at Longridge Point over the years 2009-2018.

The following summarizes the avian highlights at Longridge Point in 2018; counts are not corrected for effort.

Northern Shoveler, 62. High for the project in September.
American Wigeon, 50. High at Longridge in July.
Northern Pintail, 130. Lowest September count for the project.
Surf Scoter, 6. Highest (and third) July record.
Long-tailed Duck, 1 (August). Third records for the project.
Horned Grebe, 2. High for the project and 10th record.
Black-billed Cuckoo, 1. First record at Longridge in July. The bird continued into August and is the fourth record for the project.
Black-bellied Plover, 41. High for the project in July. Note that the counts in August and September (430 and 269, respectively) are the second highest recorded by the project in those months.

Ruddy Turnstone, 956. High count for the project. Note that the count in July is the second highest recorded by the project.
Sanderling, 381. High for the project in July and the second all-time high for the project. Note that the count in August (340) is the second highest recorded by the project in August.
Dunlin, 195. Lowest count recorded by the project in September. Note that the August count (87) is among the project low counts for the species in that month.
Parasitic Jaeger, 4 (August). High for the project.
Sabine's Gull, 1 (August). Third record; previous records also in August in 2012 and 2015.
Bonaparte's Gull, 920. High for the project in July.
Herring Gull, 45. High for the project in July, and second highest all-time.
Caspian Tern, 18. High for Longridge in August.
Common Tern, 204. High for Longridge in August.
Common Loon, 13. High for the project in July.
Rough-legged Hawk, 4 (September). Second highest for the project.
Snowy Owl, 1 (July). Second record for the project (same bird seen in 2018 at Northbluff)
Northern Flicker, 7 (August). High for the project.
Merlin, 7. High for the project in September.
Canada Jay, 9. High for the project in August.
American Crow, 85 (September). Highest counts recorded by the project throughout the season, peaking in September.
Boreal Chickadee, 18. High for the project in August.
Red-breasted Nuthatch, 27 (July). High for the project RBNU.
Ruby-crowned Kinglet, 15 & 31. High for the project in July and August.
Pine Siskin, 36. High for the project in August.
White-crowned Sparrow, 1 (July). The only record for 2018.
Tennessee Warbler, 20. High for the project in July.
Nashville Warbler, 4. High for the project in September.
Magnolia Warbler, 8 (August). High for the project.
Blackburnian Warbler, 2. Second record.
Yellow-rumped Warbler, 45. High for the project in September.

Table 1. Top 10 estimated single-day high counts of bird species encountered at Longridge Point, 13 July to 10 September 2018, not corrected for effort.

Common Name	July High Count
Semipalmated Sandpiper	2,826
peep sp.	1,770
Red Knot	1,536
Black Scoter	1,262
Bonaparte's Gull	920
White-rumped Sandpiper	645
Pectoral Sandpiper	538
Ruddy Turnstone	421
Sanderling	381
Canada Goose	352

Common Name	August High Count
White-rumped Sandpiper	8,654
Semipalmated Sandpiper	3,382
peep sp.	2,503
Bonaparte's Gull	1,852
Black Scoter	1,650
Red Knot	1,013
large shorebird sp.	1,000
Ruddy Turnstone	956
Canada Goose	922
Hudsonian Godwit	636

Common Name	September High Count
White-rumped Sandpiper	3,523
Bonaparte's Gull	1,505
Semipalmated Sandpiper	779
Canada Goose	433
Black Scoter	312
Common Goldeneye	273
Black-bellied Plover	269
Dunlin	195
Savannah Sparrow	169
Snow Goose	164

Table 2. Top 10 estimated single-day high counts of shorebird species encountered at Longridge Point, 13 July to 10 September 2018, not corrected for effort.

Common Name	July High Count
Semipalmated Sandpiper	2,826
peep sp.	1,770
Red Knot	1,536
White-rumped Sandpiper	645
Pectoral Sandpiper	538
Ruddy Turnstone	421
Sanderling	381
Lesser Yellowlegs	338
Hudsonian Godwit	242
Greater Yellowlegs	133

Common Name	August High Count
White-rumped Sandpiper	8,654
Semipalmated Sandpiper	3,382
peep sp.	2,503
Red Knot	1,013
large shorebird sp.	1,000
Ruddy Turnstone	956
Hudsonian Godwit	636
Black-bellied Plover	430
Sanderling	340
Pectoral Sandpiper	303

Common Name	September High Count
White-rumped Sandpiper	3,523
Semipalmated Sandpiper	779
Black-bellied Plover	269
Dunlin	195
Sanderling	163
Hudsonian Godwit	143
Ruddy Turnstone	130
Greater Yellowlegs	130
Least Sandpiper	121
Pectoral Sandpiper	113

Little Piskwamish Point

A maximum of five people were stationed at Little Piskwamish Point. The camp was active from 13 July to 10 September 2018. During this period a total of 510 hours were spent in the field recording a total of 164 bird species. This is the highest measure of raw effort at the site and nine more species than the previous high set in 2017. This is highest measure of raw effort and is the highest species total recorded by the project at the site, despite being among the lowest when scaled for effort (32.15 species/100 field hours; Figure 3). Piskwamish represents the most important of our study sites for Red Knots.

Tables 3 and 4 show the top ten estimated high counts of bird species and shorebird species, respectively, encountered each month during the survey period, not corrected for effort. The following summarizes the avian highlights at Little Piskwamish Point, 2018.

Ross's Goose, 1 (September). First record for the project
Northern Shoveler, 102. High for the project in August.
Mallard, 800. High for the project in July.
American Black Duck, 413. High for Piskwamish (second highest for the project) in September.

Northern Pintail, 120. High for the project in July. Note the second highest all-time count (8,057) was made in September.
Black-billed Cuckoo, 1 (July). First record for Piskwamish and fourth for the project.
Sora, 11. High for the project in July (second all-time high).
Sandhill Crane, 137. High for the project in September.
American Golden-Plover, 119 (September). High for the project.
Red Knot, 2,981. Second highest all-time July. Note also the highest all-time September count (1,078).
Least Sandpiper, 205. Second highest for the project in September.
White-rumped Sandpiper, 40,787. High for the project. Note also the high for the project in September (31,008).
Buff-breasted Sandpiper, 15. High for the project in September and second highest for the project.
Semipalmated Sandpiper, 1,953. Second highest for the project in September.
Solitary Sandpiper, 12 (July). Tied the highest for the project SOSA. Other record is also from Piskwamish, but in August.
Lesser Yellowlegs, 90. High for the project in September.
Black Guillemot, 1. First record for Piskwamish, seen each month.
Caspian Tern, 15. High for the project in September and third highest for the project.
Common Tern, 157. High for Piskwamish in September.
Arctic Tern, 5. High for Piskwamish in August.
Double-crested Cormorant, 5 (August). High for Piskwamish.
Bald Eagle, 8 (September). High for the project.
Rough-legged Hawk, 5 (August). High for the project RLHA.
Peregrine Falcon, 10 (September). High for the project.
Canada Jay, 9. High for the project in September.
Common Raven, 24. High for the project in September.
Tree Swallow, 6. High for the project in September.
Barn Swallow, 12. High for the project in August.
Gray Catbird, 1 (September). The seventh record for the project; first record since 2015.
Pine Grosbeak, 1. The third and fourth record for the project (1 in August & 1 in September).
Pine Siskin, 23. High for Piskwamish in August.
Nelson's Sparrow, 9. High for the project in September.
Savannah Sparrow, 246. High for the project in September.
Red-winged Blackbird, 41. High for the project in September.
Rusty Blackbird, 77 (September). High for the project.

Northern Parula, 1 (August). The fourth record for the project.

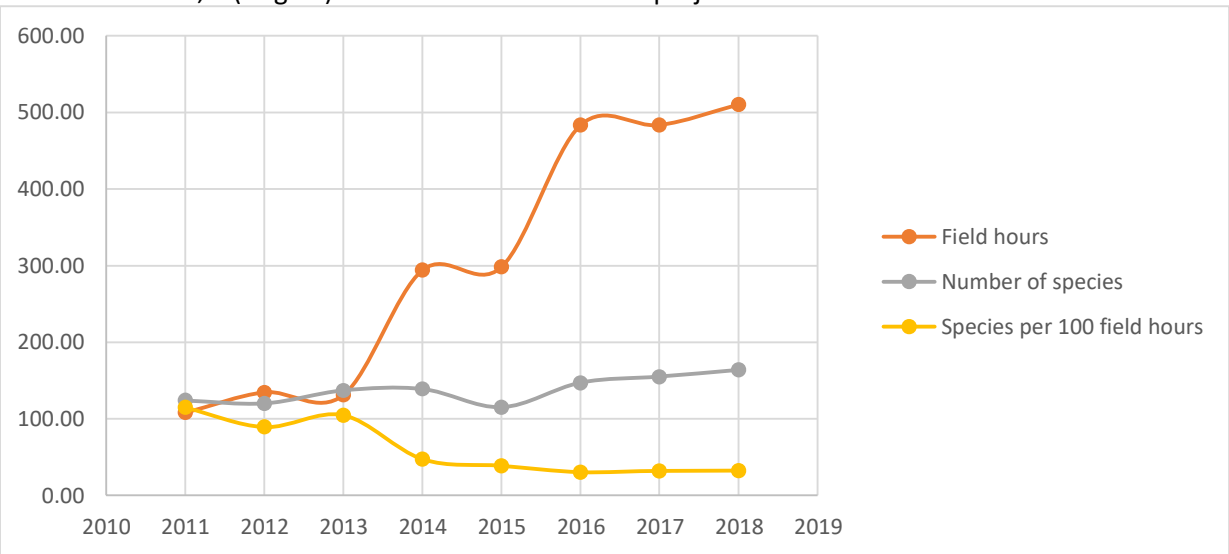


Figure 3. Field hours, total number of species, and species per 100 field hours at Little Piskwamish Point over the years 2011-2018.

Table 3. Top 10 estimated single-day high counts of bird species encountered at Little Piskwamish Point, 13 July to 10 September 2018, not corrected for effort.

Common Name	July High Count
Semipalmated Sandpiper	14,867
White-rumped Sandpiper	4,836
Red Knot	2,981
Mallard	800
Canada Goose	585
Dunlin	511
Hudsonian Godwit	399
Lesser Yellowlegs	249
Sanderling	212
Pectoral Sandpiper	202

Common Name	August High Count
White-rumped Sandpiper	40,787
Semipalmated Sandpiper	8,672
Calidris sp.	6,000
Red Knot	3,593
Northern Pintail	2,037
Dunlin	1,550
Hudsonian Godwit	1,324
peep sp.	1,000
Canada Goose	495
Bonaparte's Gull	420

Common Name	September High Count
White-rumped Sandpiper	31,008
Northern Pintail	8,057
Dunlin	5,107
Semipalmated Sandpiper	1,953
Canada Goose	1,325
Red Knot	1,078
duck sp.	954
Calidris sp.	437
American Black Duck	413
Green-winged Teal	393

Table 4. Top 10 estimated single-day high counts of shorebird species encountered at Little Piskwamish Point, 13 July to 10 September 2018, not corrected for effort.

Common Name	July High Count
Semipalmated Sandpiper	14,867
White-rumped Sandpiper	4,836
Red Knot	2,981
Dunlin	511
Hudsonian Godwit	399
Lesser Yellowlegs	249
Sanderling	212
Pectoral Sandpiper	202
Greater Yellowlegs	188
peep sp.	130

Common Name	August High Count
White-rumped Sandpiper	40,787
Semipalmated Sandpiper	8,672
Calidris sp.	6,000
Red Knot	3,593
Dunlin	1,550
Hudsonian Godwit	1,324
peep sp.	1,000
Sanderling	297
Greater Yellowlegs	286
Semipalmated Plover	284

Common Name	September High Count
White-rumped Sandpiper	31,008
Dunlin	5,107
Semipalmated Sandpiper	1,953
Red Knot	1,078
Calidris sp.	437
Greater Yellowlegs	268
peep sp.	250
Hudsonian Godwit	231
Pectoral Sandpiper	214
Least Sandpiper	205

Northbluff Point

A maximum of six people were stationed at Northbluff Point. The camp was active from 13 July to 10 September 2018. During this period, a total of 429 hours was spent in the field. The work in this period was focused on daily surveys to generate estimated totals for the area, banding target species and affixing radio tags to these birds. There were 174 bird species observed during this time, the highest recorded at Northbluff. When scaled for effort, the results were among the lowest recorded at the site (40.54 species/100 field hours; Figure 4).

Tables 5 and 6 show the top ten estimated high counts of bird species and shorebird species, respectively, encountered each month during the survey period, not corrected for effort. The following summarizes the avian highlights at Northbluff Point in 2018.

Canada Goose, 341. Low for the project in August. Note the September count (940) is the low for Northbluff in that month.

Northern Shoveler, 9. High for Northbluff in July and second all-time high.

Gadwall, 95. High for the project in September and only site where the species was recorded in September 2018.

American Wigeon, 121. High for Northbluff in July. Note the September count is the high for the project in that month.
American Black Duck, 418. High for the project in September.
Black-billed Cuckoo, 1 (July). First record for Northbluff and second record for the project.
Sora, 8. High for Northbluff in July.
Black-bellied Plover, 40. Second highest count for the project in July.
American Golden-Plover, 87 (September). Second highest all-time count.
Ruff, 1 (July). First record for the project.
Least Sandpiper, 256. High for the project in September.
Buff-breasted Sandpiper, 10. High for the project in July.
Short-billed Dowitcher, 14. High for the project in September.
Wilson's Snipe, 35. Tied the high for the project in July.
Red-necked Phalarope, 5. High for the project in July.
Greater Yellowlegs, 375. High for the project in September.
Parasitic Jaeger, 3. High for Northbluff in August.
Bonaparte's Gull, 3. Low for the project in September.
Great Black-backed Gull, 1 (August). Only record in 2018.
Common Tern, 275 (August). High for the project. Note also the high for the project in September.
Double-crested Cormorant, 10. High for Northbluff in July.
Snowy Owl, 1 (July). Second record for the project (same bird seen in 2018 at Longridge)
American Three-toed Woodpecker, 1 (August). First record for the project.
Cedar Waxwing, 90 (August). High for the project.
Pine Siskin, 32. High for Northbluff in August.
Cape May Warbler, 7 (August). High for the project.

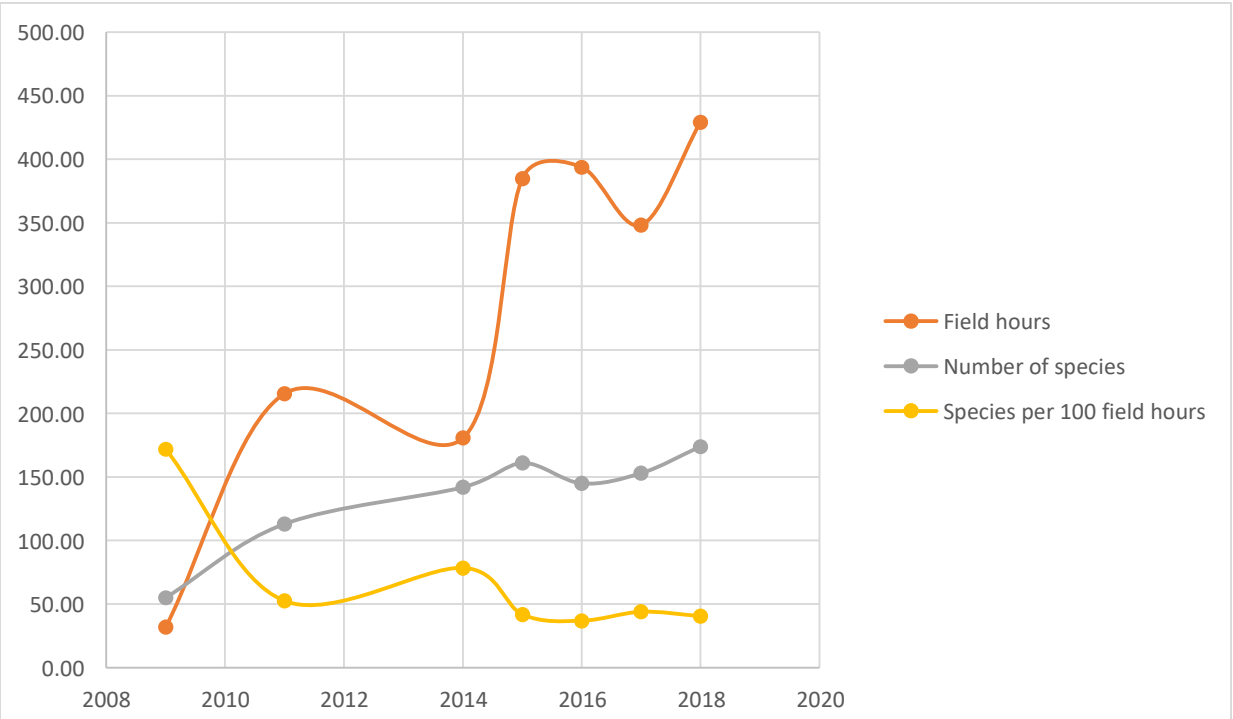


Figure 4. Field hours, total number of species, and species per 100 field hours at Northbluff Point over the years 2009-2018. Note there was no coverage at the site in 2012 or 2013.

Table 5. Top 10 estimated single-day high counts of bird species encountered at Northbluff Point, 13 July to 10 September 2018, not corrected for effort.

Common Name	July High Count
Semipalmated Sandpiper	10,009
White-rumped Sandpiper	1,428
Hudsonian Godwit	643
Lesser Yellowlegs	503
Red Knot	463
Black Scoter	450
peep sp.	440
Red-winged Blackbird	370
Greater Yellowlegs	264
Dunlin	240

Common Name	August High Count
White-rumped Sandpiper	5,653
peep sp.	5,000
Semipalmated Sandpiper	4,856
Red Knot	1,183
Hudsonian Godwit	819
Northern Pintail	550
Dunlin	387
duck sp.	365
Canada Goose	341
Greater/Lesser Yellowlegs	288

Common Name	September High Count
Dunlin	3,277
White-rumped Sandpiper	2,790
Northern Pintail	1,094
Semipalmated Sandpiper	1,034
peep sp.	1,017
Canada Goose	940
Red Knot	702
Calidris sp.	500
American Black Duck	418
Mallard	404

Table 6. Top 10 estimated single-day high counts of shorebird species encountered at Northbluff Point, 13 July to 10 September 2018, not corrected for effort.

Common Name	July High Count
Semipalmated Sandpiper	10,009
White-rumped Sandpiper	1,428
Hudsonian Godwit	643
Lesser Yellowlegs	503
Red Knot	463
peep sp.	440
Greater Yellowlegs	264
Dunlin	240
Pectoral Sandpiper	169
Ruddy Turnstone	163

Common Name	August High Count
White-rumped Sandpiper	5,653
peep sp.	5,000
Semipalmated Sandpiper	4,856
Red Knot	1,183
Hudsonian Godwit	819
Dunlin	387
Greater/Lesser Yellowlegs	288
godwit sp.	250
Greater Yellowlegs	221
Least Sandpiper	205

Common Name	September High Count
Dunlin	3,277
White-rumped Sandpiper	2,790
Semipalmated Sandpiper	1,034
peep sp.	1,017
Red Knot	702
Calidris sp.	500
Greater Yellowlegs	375
Hudsonian Godwit	370
Least Sandpiper	256
Black-bellied Plover	170

All-site summary

Across all sites in 2018, there are a number of interesting and notable records. Counts noted below are cumulative, same-day counts across all sites, uncorrected for effort.

Ross's Goose, 1 (September). First project record.

Canada Goose. Among the lowest counts recorded by the project throughout the season. Counts peaked at 2,540 in September, which typically peak closer to 8,000 at that time.

Northern Shoveler. High for the project in August (111) and September (63).

Gadwall, 95. First records in September.

American Wigeon, 54. High for the project in September.

Mallard. High for July (1,026), followed by the second lowest August (247).

American Black Duck, 831. High for September.

Northern Pintail. High for the project in July and numbers continued to build to among the highest on record for the project, peaking in September at over 8,280.

Lesser Scaup, 99 (July). High for the project.

Surf Scoter, 6. Second July record.

Long-tailed Duck, 1 (August). Third project record.

Common Goldeneye, 281. High for the project in September.

Pied-billed Grebe. Has been annual since 2015.
Black-billed Cuckoo. Second record. It is difficult to know if the same individual was detected among sites, or if multiple individuals were present.
Sora, 14. High for the project in July.
Yellow Rail. Average counts that were not higher than 10 (July).
Black-bellied Plover. High for the project in July and second highest in August and September (Table 7).
American Golden-Plover, 226 (September). High for the project (Table 7).
Semipalmated Plover, 207. High for the project in July (Table 7).
Ruddy Turnstone, 1,015 (August). High for the project (Table 7).
Red Knot. High for the project in July and September, with an average August (Table 7).
Ruff, 1 (July). First record for the project.
Stilt Sandpiper, 4. High for the project in September STSA. Note this is the first year where none was recorded in July (Table 7).
Sanderling, 561 (July). High for the project (Table 7).
Dunlin. Above average numbers throughout season (Table 7).
Baird's Sandpiper, 43 (August). High for the project (Table 7).
Least Sandpiper, 350. High for the project in September (Table 7).
White-rumped Sandpiper. High for the project in August and September (Table 7).
Buff-breasted Sandpiper. High for the project in July and September (Table 7).
Pectoral Sandpiper. Low for the project in August and September (Table 7).
Semipalmated Sandpiper, 3,689. High for the project in September (Table 7).
Wilson's Snipe, 49. High for the project in July (Table 7).
Wilson's Phalarope, 1. First September record.
Red-necked Phalarope. High counts all season (Table 7).
Solitary Sandpiper, 23 (July). High for the project (Table 7).
Greater Yellowlegs, 588. High for the project in September (Table 7).
Lesser Yellowlegs. Low for the project in August (Table 7).
Parasitic Jaeger, 5 (August). High for the project.
Black Guillemot, 1. Second record for the project in September; the first was in 2012.
Sabine's Gull, 1 (August). Third record for the project.
Bonaparte's Gull, 956. High for the project in July.
Herring Gull, 65. High for the project in September.
Caspian Tern, 48 (August). High for the project.
Common Tern 355 (September). High for the project. Note also the high count for the project in August (333).
Arctic Tern, 4. High for the project in September.
Common Loon, 18. High for the project in July.
American White Pelican. Lowest counts recorded throughout the season (39 in July, 6 in August, 1 September).
American Bittern, 13 (August). High for the project.
Northern Harrier 49 (September). High for the project. Note also a high for August (33).
Bald Eagle, 14 (September). High for the project in September.
Rough-legged Hawk, 5 (August). High for the project.
American Three-toed Woodpecker, 1 (August). First for the project.
Northern Flicker, 7 (August). High for the project.
American Kestrel, 2 (August). First record since 2015 and a high for the project. Note also the first record for the project in September (1).
Merlin, 11. High for the project in September.

Peregrine Falcon, 17 (September). High for the project. Note also the high for the project in August (8).
Canada Jay, 16 (September). High for the project. Note also a high for the project in August.
American Crow. High counts throughout the season with a peak at 90 in September.
Common Raven, 37. High for the project in September.
Horned Lark. Lowest counts on record, never more than 50, which was the highest (September).
Barn Swallow, 12 (August). High for the project.
Boreal Chickadee, 65 (September). High for the project. Note also a high for the project in August (23).
Red-breasted Nuthatch, 33 (July). High for the project. Note also a high for the project in August (28).
Ruby-crowned Kinglet, 15. High for the project in July.
American Pipit Lowest counts on record all season; highest count in September (52), when counts are typically >300.
Cedar Waxwing, 93 (August). High for the project.
Pine Grosbeak. Only the third year with a record (2010 and 2012).
Red Crossbill. No records; though not common, the species has been annual since 2014.
Pine Siskin, 39. High for the project in August.
American Goldfinch, 6. High for the project in September.
Lapland Longspur, 1. First August record.
Dark-eyed Junco. Low numbers throughout the season; none in July and less than seven. Last missed in July in 2013.
White-crowned Sparrow, 1 (July). The only record in 2018 (Longridge).
Savannah Sparrow, 496 (September). High for the project.
Red-winged Blackbird. High for the project in July and September (578 and 41, respectively).
Brown-headed Cowbird, 1. Second record for the project.
Rusty Blackbird, 77 (September). High for the project.
Tennessee Warbler, 20 (July). Tied the high for the project (August 2015).
Cape May Warbler, 10 (August). High for the project.
Northern Parula, 1 (August). Third record for the project.
Magnolia Warbler, 8 (August). High for the project.
Bay-breasted Warbler, 6. High for the project.
Blackburnian Warbler, 2 (August). Second record for the project.
Palm Warbler, 163 (September). High for the project.

Table 7. Cumulative, one-day maximum counts of shorebird species recorded in 2018, across all sites and mean cumulative counts for those species within the same area (i.e., Northbluff Point to Longridge Point) over the period 2009-2018, not corrected for effort. Mean maximum counts were calculated using the sum total count of each species across each site of each year.

Species	Month	Maximum 2018 count	Mean maximum count
Black-bellied Plover	July	95	31
	August	543	318
	September	478	473
American Golden-Plover	July	2	2
	August	8	14
	September	226	81
Semipalmated Plover	July	207	144
	August	401	359
	September	298	209
Killdeer	July	16	22
	August	17	25
	September	28	9
Whimbrel	July	135	101
	August	65	99
	September	5	15
Hudsonian Godwit	July	960	754
	August	1,831	2,125
	September	573	1,134
Marbled Godwit	July	24	137
	August	20	44
	September	7	6
Ruddy Turnstone	July	499	319
	August	1,015	670
	September	262	200
Red Knot	July	3,928	2,028
	August	4,010	3,993
	September	1,204	680
Ruff	July	1	1
Stilt Sandpiper	July	0	2
	August	5	5
	September	4	3
Sanderling	July	561	154
	August	415	277
	September	341	406
Dunlin	July	679	2,289
	August	1,939	3,183
	September	7,499	6,391
Baird's Sandpiper	July	2	4
	August	43	11
	September	26	13
Least Sandpiper	July	197	231
	August	350	617
	September	574	232
White-rumped Sandpiper	July	6,728	7,870
	August	48,880	30,292
	September	37,321	10,584
Buff-breasted Sandpiper	July	10	3
	August	2	8
	September	15	9
Pectoral Sandpiper	July	697	630
	August	312	976
	September	322	639
Semipalmated Sandpiper	July	24,003	19,874
	August	11,647	19,122
	September	3,689	2,350
Short-billed Dowitcher	July	9	10
	August	19	21
	September	19	6
Wilson's Snipe	July	49	23
	August	44	42
	September	23	18
Wilson's Phalarope	July	1	2
	August	8	9
	September	1	1
Red-necked Phalarope	July	6	2
	August	10	6
	September	9	6
Spotted Sandpiper	July	2	6
	August	5	10

Species	Month	Maximum 2018 count	Mean maximum count
	September	1	1
Solitary Sandpiper	July	23	7
	August	5	7
	September	2	2
Greater Yellowlegs	July	455	498
	August	551	678
	September	588	337
Lesser Yellowlegs	July	913	830
	August	266	723
	September	126	109

Motus towers, banding and tagging

In May 2018, six temporary Motus towers were set-up at sites on the southwestern coast of James Bay (Figure 5). These autonomous VHF receivers detect and store records of individual nanotagged birds. Individuals tagged at the study sites and elsewhere (either on northbound migration or on the breeding grounds), while near the tower, are recorded on a regular interval depending on the duty cycle of the nanotag (e.g., every nine seconds). These towers operated from 27 May to 14 November 2018.

Banding activities were focussed at Longridge Point. Shorebird trapping followed a non-standardized[2] approach using mist-nets; trapping was conducted both day and night and throughout the tidal cycle. Along with recording standard morphometrics (age, weight, exposed culmen, wing cord, flattened wing cord, fat score), each shorebird was marked with a uniquely coded alphanumeric leg flag and a uniquely coded USGS metal band. No nanotags were put on birds in 2018. Instead, we contributed to a range-wide Lesser Yellowlegs study (Appendix 1).

Non-standard mist-netting was also conducted in a variety of habitats within each study site. Non-shorebird species were banded with a uniquely coded USGS metal band and standard morphometrics were recorded. Other banding activities resulted in trapping and banding shorebirds and local breeding individuals and their young. Together with the shorebird trapping effort, 947 individuals of 37 species were banded. Close to 70% of the individuals banded were shorebird species, accounting for 43% of the species banded (Table 8).

[2] Non-standard banding means that although we followed standard banding procedures, we did not band at the same time or location each day, or with the same effort each trapping session. Standard banding is a term used by banding groups such as those in the Canadian Migration Monitoring network. This requires that banding stations keep nets in the same location year-to-year and operate them for specified periods each day the station is operational in a given season.

Figure 5. Locations of Motus towers, showing direction of antennas. Active May to November 2018. Note that towers at Akimiski Island, Moosonee, Fort Rupert, and Charlton Island are operated by other projects and contribute tag detections to the Motus network.

Table 8. Species, ages and numbers of birds banded, including shorebirds flagged at Longridge Point, 2018.

Species	Age	Number of Individuals Banded	Individuals Flagged
American Golden-Plover	AHY	1	0
Black-and-white Warbler	AHY	1	
Boreal Chickadee	HY	5	
Boreal Chickadee	U	1	
Clay-colored Sparrow	AHY	1	
Clay-colored Sparrow	HY	1	
Common Redpoll	AHY	1	
European Starling	HY	1	
Fox Sparrow	HY	2	
Canada Jay	AHY	2	
Canada Jay	HY	2	
Canada Jay	U	1	
Greater Yellowlegs	HY	5	0
Hudsonian Godwit	AHY	4	4
Killdeer	HY	3	0
Le Conte's Sparrow	AHY	1	
Le Conte's Sparrow	L	1	
Least Flycatcher	HY	2	
Least Sandpiper	AHY	18	11
Least Sandpiper	HY	45	2
Lesser Yellowlegs	AHY	14	14
Lesser Yellowlegs	HY	37	37
Lincoln's Sparrow	HY	5	
Yellow-rumped (Myrtle) Warbler	HY	1	
Yellow-rumped (Myrtle) Warbler	U	1	
Nelson's Sparrow	AHY	1	
Nelson's Sparrow	HY	1	
Northern Waterthrush	HY	2	
Pectoral Sandpiper	AHY	30	26
Pectoral Sandpiper	HY	2	2
Ruby-crowned Kinglet	AHY	1	
Ruby-crowned Kinglet	HY	4	
Ruddy Turnstone	AHY	2	0
Red-winged Blackbird	ASY	1	
Sanderling	AHY	1	0
Savannah Sparrow	AHY	8	
Savannah Sparrow	HY	213	
Savannah Sparrow	U	1	
Short-billed Dowitcher	HY	1	0
Semipalmated Plover	AHY	13	13
Semipalmated Plover	HY	26	26
Semipalmated Sandpiper	AHY	120	96
Semipalmated Sandpiper	HY	268	0
Solitary Sandpiper	HY	1	1
Swamp Sparrow	HY	3	
Tennessee Warbler	AHY	2	
Tennessee Warbler	HY	2	
Wilson's Phalarope	AHY	2	2
Wilson's Snipe	HY	5	0
(Western) Palm Warbler	HY	4	
(Western) Palm Warbler	U	1	
White-rumped Sandpiper	AHY	50	50
White-throated Sparrow	AHY	1	
White-throated Sparrow	HY	14	
White-throated Sparrow	U	1	
Yellow Warbler	AHY	1	
Yellow Warbler	HY	9	
Band Lost	*NA*	*2*	
Band Destroyed	*NA*	*1*	
Total		950	285

Lesser Yellowlegs migration, population structure and demography

The Lesser Yellowlegs is a shorebird species that breeds in the boreal forests of Alaska and Canada and winters in Central and South America. The species has experienced a population decline of -5.3% per year on average and has lost an estimated 90% of their population size since 1970, with an additional 50% projected loss within the next 15 years (Sauer et al. 2013). Our study aims to fill knowledge gaps and investigate the causes of declines, which includes unregulated hunting on wintering grounds. Listed below are the studies four primary objectives. The order of objectives listed is based on priority level, with number 1 being of highest priority. Methods described in this protocol follow the Arctic Shorebird Demographics Network Breeding Camp Protocol (Brown et al. 2014).

1. Deploy GPS Argos PinPoints and geolocator tags on breeding adults to identify migratory timing and routes, including key stopover sites and wintering locations utilized by individual Lesser Yellowlegs within sub-populations in Alaska and Canada.
2. Individually mark and resight individual Lesser Yellowlegs to estimate apparent annual survival rates.
3. Collect biological samples to examine potential genetic variation in sub-populations of Lesser Yellowlegs.
4. Collect information on reproductive rates of Lesser Yellowlegs to better understand nest and brood survival, and juvenile recruitment.

See Appendix 1 for the complete report.

Aerial Survey

Surveys were conducted by helicopter, led by Guy Morrison (Environment and Climate Change Canada, Emeritus Research Scientist) and Ken Ross (retired ECCC Canadian Wildlife Service biologist), along with Ontario Ministry of Natural Resources and Forestry pilot Rob Burns. The aerial survey covered the James Bay coast from the Quebec border in the east to Ekwan Point to the northwest, including Akimiski Island. The objective of the survey was to count shorebird species within smaller sectors generally delineated by tributaries or other landforms, allowing comparison with results from previous aerial surveys of the region (Figure 6). General identification to size category (small, medium, and large shorebird) were made. Where species are readily identified, such as Red Knot and Hudsonian Godwit, these individuals were recorded to species. Surveys are conducted by helicopter at high tide, when birds are concentrated into roost locations. At low tide, birds are spread out across kilometres of exposed sand and mud flats that are characteristic of the James Bay coast. The low profile of the coast generates vast expanses of exposed flats at low tide, making it virtually impossible to get a reliable count at this point in the tidal cycle. In addition to counting shorebirds, we had a VHF receiver hooked up to an antenna at the nose of the helicopter logging locations of nanotagged birds detected along the coast. Personnel stationed at the three field camps located at Northbluff Point, Little Piskwamish Point, and Longridge Point carried out a coordinated ground count. Ground counts can be used to estimate species composition of the aerial counts.

Over 240,000 individual shorebirds were recorded during the survey (Figure 7), doubling the totals from 2016 (about 110,000; Figure 9) and 2017 (about 105,600; Figure 10). The 2018 count for small shorebirds accounted for the greatest proportion of birds and totaled over 206,000 (Figures 6 and 8), which is significantly higher than the 2017 (92,500) and 2016 (77,000) counts. The count for medium shorebirds (over 19,000, <10% of total individual; Figures 6 and 8) was higher in 2018 than in 2017. The count for large shorebirds (over 18,000, <10% of total individuals; Figures 6 and 8) was higher in 2018 than in either 2016 or 2017. In 2017, 7,200 medium and 5,900 large shorebirds were counted, while in 2016, 20,400 medium and 11,800 large shorebirds were counted. The Red Knot count of over 13,000 was the highest of the 3 surveys in 2016, 2017 and 2018. Although, the birds were distributed differently, with a moderate (though still significant) number in the southern part of the bay

(approximately Longridge to North Point) (about 5,000 compared to a maximum of 10,000 in 2016) and a new and very significant concentration of some 8,000 on the northwest coast of Akimiski Island.

Reasons for the significantly higher number of birds in 2018 are currently unclear but may be connected to the widely reported very poor breeding conditions in the Arctic in 2018 (https://www.audubon.org/news/shorebirds-experience-dismal-breeding-season-due-quirk-climate-change). Late snow melt resulting in high snow cover early in the season may have significantly delayed breeding attempts for many species, with a subsequent delay in the southward migration. For instance, initial reports from Yves Aubry's (CWS biologist) studies on the Mingan Island Archipelago on the north shore of the St. Lawrence River suggest that migration of Red Knots was around 10-14 days later than normal. If similar considerations apply to other shorebird species, the large numbers observed in James Bay in 2018 may reflect a later migration, since by the August survey dates in 2018 (consistent over the three years) many birds would have already passed through the area in a more "normal" (previous) year. Alternatively, perhaps the birds were in poorer condition after the difficult summer in the Arctic and needed to stay longer in James Bay to build up stores for migration. Interestingly, in previous years where aerial surveys have been conducted in James Bay (1976 to 2009), the only year with a total autumn count over 200,000 individuals (292,000) was in 2001, which was noted as a seasonably late and relatively poor breeding year in the Arctic (see http://www.arcticbirds.net/). Further analysis of ground counts from James Bay in 2018 should indicate whether the difficult or delayed breeding conditions in the Arctic in 2018 resulted in poor breeding success for many species.

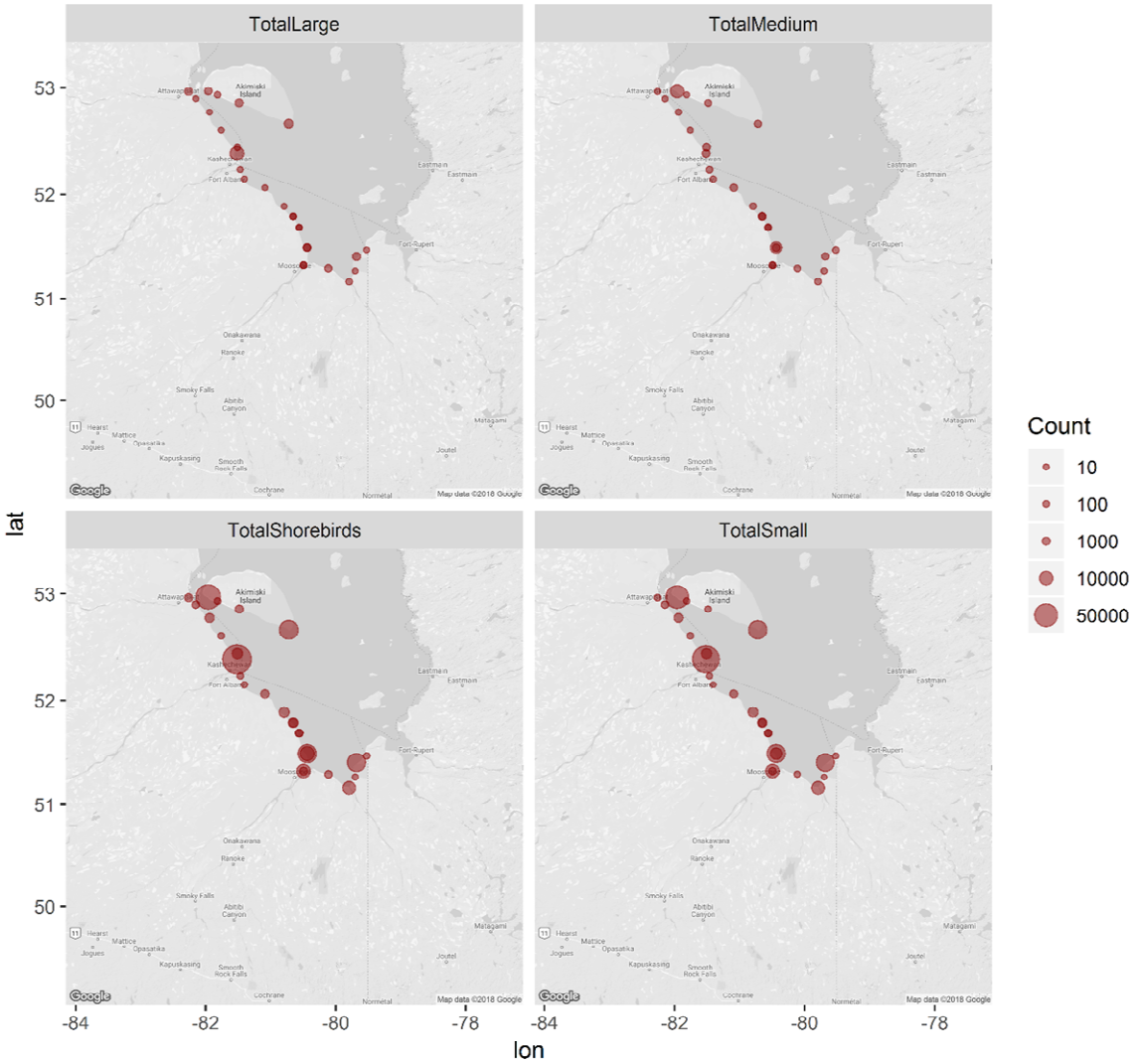


Figure 6. Counts and concentrations of size groupings of shorebird species, including sum total (TotalShorebirds) of all individual recorded during the aerial survey 10-12 August 2018.

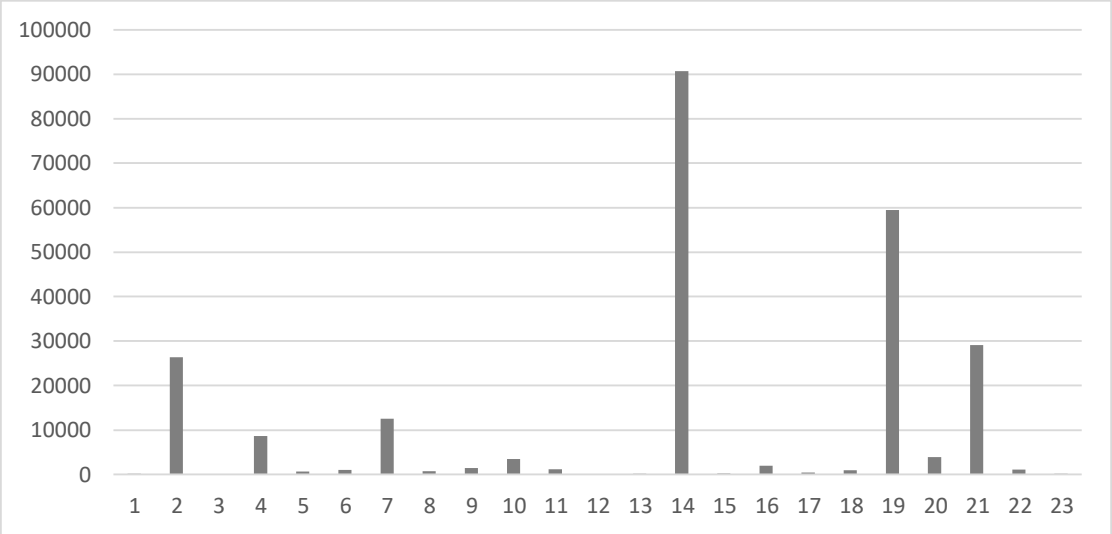
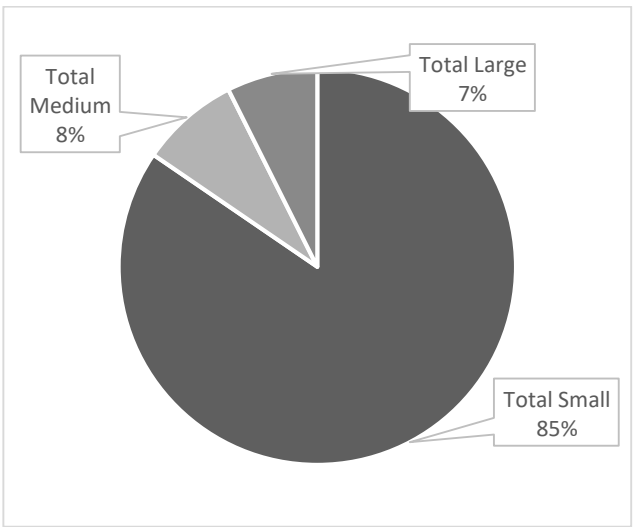


Figure 7. Total number of shorebirds recorded at each sector during the James Bay coastal aerial survey from the Quebec border in the east to Ekwan Point in the northwest, including Akimiski Island 10-12 August 2018. Note scale, as compared to 2016 and 2017.



Size category	Species
Small shorebird	Semipalmated Sandpiper
	Least Sandpiper
	White-rumped Sandpiper
Medium shorebird	Black-bellied Plover
	Greater Yellowlegs
	Lesser Yellowlegs
	Unidentified Yellowlegs
	Ruddy Turnstone
	Red Knot
Large shorebird	Whimbrel
	Hudsonian Godwit
	Marbled Godwit

Figure 8. Proportion of each shorebird size category recorded during the aerial survey, 2018. Accompanying table shows the species size-category assignments.

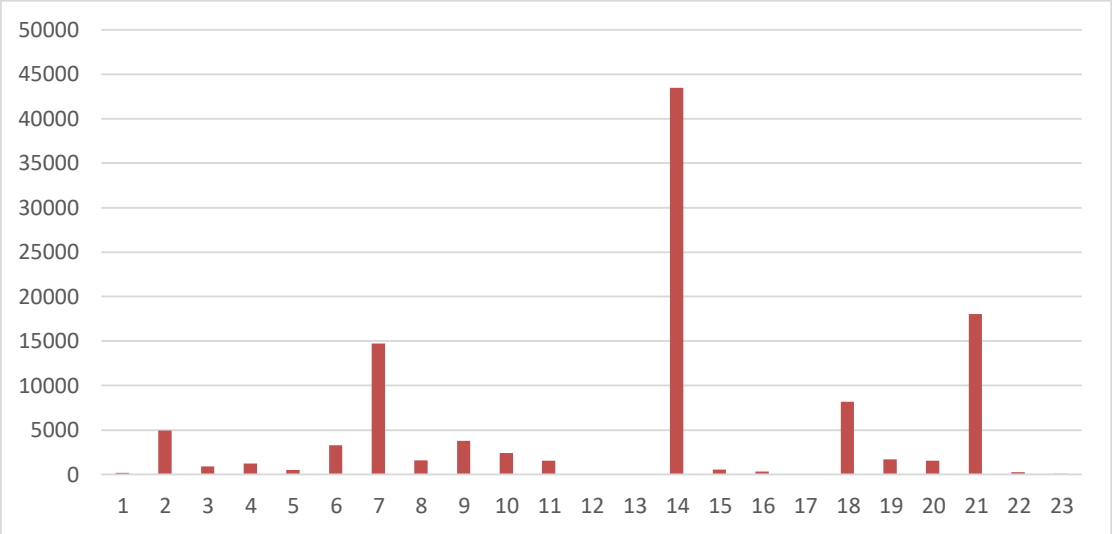


Figure 9. Total number of shorebirds recorded at each sector during the James Bay coastal aerial survey from the Quebec border in the east to Ekwan Point in the northwest, including Akimiski Island, 2016. Note scale, as compared to 2017 and 2018.

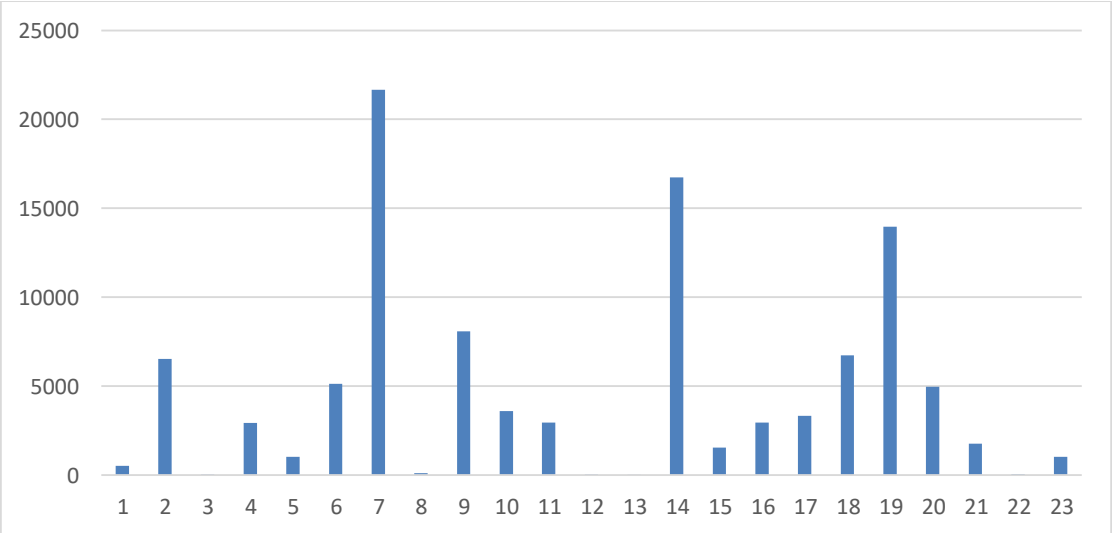


Figure 10. Total number of shorebirds recorded at each sector during the James Bay coastal aerial survey from the Quebec border in the east to Ekwan Point in the northwest, including Akimiski Island, 2017. Note scale, as compared to 2016 and 2018.

Advances in methodology

In 2018, we continued to implement the segment survey protocol. In addition, through the continued efforts of Amie MacDonald (Trent University MSc. candidate), we bolstered the flag resighting effort, with dedicated surveyors at each camp following standardized protocol. The results of the flag resighting work will be used to determine a super-population of Red Knot, following Lyons et al. (2016). Finally, our partnership with the Lesser Yellowlegs project allowed us to utilize new tag technology and contribute to a range-wide study of the species.

Future plans

Currently, the project is in and evaluation phase. Analyses are underway to understand the need for and design options for regular surveys of staging shorebirds at James Bay sites beyond the traditional southeastern James Bay focus of this project. A goal for defining and evaluating design options is winter 2019.Following results of the evaluation, the project will implement the best way forward. In the meantime, surveys either will continue in an effort to maintain annual coverage at core sites, such as Longridge Point, while gaining new or updated information from other survey locations that are new to the project or where surveyed historically.

With sufficient resources and pending the outcomes of various analyses, we plan to allocate effort to addressing each of the project's objectives over the coming years. To address the objectives of estimating variation in migration phenology and in the abundance of staging shorebirds, we plan to continue daily monitoring of shorebirds on the ground. In addition, we plan to conduct aerial surveys following standardized methodology used in previous aerial surveys of the James Bay coast. To address the objective of estimating the availability of staging habitat and food resources, we plan to use results of analyses conducted to date on recent sampling efforts. Continuation of invertebrate sampling effort and collecting tissue and fecal samples will be based on these results. To address the objectives of estimating the length of stay of staging and the value of southern James Bay to the global Red Knot, subspecies *rufa*, population, we plan to continue our daily effort for flag resighting at key locations. In addition, we plan to continue to deploy temporary Motus towers at various sites along the coast that will be used to detect nanotagged shorebirds. This project will continue to contribute to the larger Motus network. More information is available at motus.org.

Acknowledgements

The James Bay Shorebird Project is a cooperative effort spearheaded by Environment and Climate Change Canada's Canadian Wildlife Service, the Ontario Ministry of Natural Resources and Forestry, Bird Studies Canada, Trent University, and Moose Cree First Nation. The Royal Ontario Museum was a partner until 2016. Additional support received from the USFWS Neotropical Migratory Birds Conservation Act program. The OMNRF provided helicopter transport to and from field camps and accommodations in the staff house while crews were in Moosonee. Thanks to Rod Brook, Sarah Hagey, and Kim Bennett and to the OMNR pilots for providing logistical support. Ted Cheskey of Nature Canada and Bernie McLeod of Moose Cree First Nation coordinated logistics associated with the Moose Cree First Nation volunteers. Finally, without the many hours of dedicated volunteer support, this project would not have been possible. Many thanks to the volunteers who gave their time to the project this year.

Literature Cited

Abraham K.F. and **C.J. Keddy.** 2005. The Hudson Bay Lowland: a unique wetland legacy. Pp 118-148 *in* The World's Largest Wetlands: Their Ecology and Conservation. P. A. Kelly and L. H. Fraser (Eds.). Cambridge University Press, Cambridge.

Abraham, K.F. and **L.M. McKinnon.** 2011. Hudson Plains Ecozone^{+} evidence for key findings summary. Canadian Biodiversity: Ecosystem Status and Trends 2010, Evidence for Key Findings Summary Report No.2. Canadian Councils of Resource Ministers. Ottawa, ON. vi + 102p. http://www.biodivcanada.ca/default.asp?lang=En&n=137E1147-1

Bird Studies Canada and **Nature Canada.** 2012. Important Bird Areas of Canada Database. Port Rowan, Ontario: Bird Studies Canada. To access the Canadian IBA directory: http://www.ibacanada.com.

Accessed December 2012.

Friis, C., K. Abraham, M. Peck, and **S. Mackenzie.** 2012. Western James Bay Shorebird Surveys, 2012 Report: Report summarizing 2012 shorebird survey results from three camps on the western James Bay coast. Unpublished report. 15pp.

Harrington, B. A., F. J. Leeuwenberg, S. Lara Resende, R. McNeil, B. T. Thomas, J. S. Grear and **E. F. Martinez.** 1991. Migration and mass change of White-rumped Sandpipers in North and South America. Wilson Bulletin 103:621-636.

Hicklin, P. and **C.L. Gratto-Trevor**. 2010. Semipalmated Sandpiper (*Calidris pusilla*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/006doi:10.2173/bna.6

Manning, T.H. 1952. Birds of the west James Bay and Hudson Bay coasts. National Museum of Canada Bulletin 125. Ottawa.

Morrison, R. I. G. 1983. A hemispheric perspective on the distribution of some shorebirds in North and South America. Pp. 84-94 *in* First western hemisphere waterfowl and waterbird symposium, H. Boyd (Ed.). Canadian Wildlife Service, Ottawa.

Morrison, R. I. G. 1984. Migration systems of some New World shorebirds. Pp. 125-202 *in* Behavior of marine animals. Vol. 6 (Burger, J. and B. L. Olla, Eds.) Plenum Press, New York.

Morrison, R. I. G. 1987. Hudsonian Godwit, p. 527 in Cadman, M. D., P. F. J. Eagles and F. M. Helleiner, Eds. Atlas of the breeding birds of Ontario. Univ. of Waterloo Press, Waterloo, ON.

Morrison, R.I.G., R.W. Butler, H.L. Dickson, A. Bourget, P.W. Hicklin and **J.P. Goossen.** 1991. Potential Western Hemisphere Shorebird Reserve Network sites for migrant shorebirds in Canada. CWS Tech. Rep. Series No. 144, 98 pp. Canadian Wildlife Service, Headquarters, Ottawa.

Morrison, R.I.G., R.W. Butler, G.W. Beyersbergen, H.L. Dickson, A. Bourget, P.W. Hicklin, J.P. Goossen, R.K. Ross and **C.L. Gratto-Trevor**. 1995. Potential W. Hemisphere shorebird reserve network sites for shorebirds in Canada: 2nd Edition 1995. CWS Tech. Rep. Series No. 227, 104 pp. Canadian Wildlife Service, Headquarters, Ottawa.

Myers, J.P., P.D. McLain, R.I.G. Morrison, P.Z. Antas, P. Canevari, B.A. Harrington, T.E. Lovejoy, V. Plulido, M. Sallaberry and **S.E. Senner.** 1987a. The Western Hemisphere Shorebird Reserve Network. Wader Study Group Bulletin 49:122-124.

Myers, J.P., R.I.G. Morrison, P.Z. Antas, B.A. Harrington, T.E. Lovejoy, M. Sallaberry, S.E. Senner and **A. Tarak.** 1987b. Conservation strategy for migratory species. American Scientist 75: 12-26.

Parmelee, D.F. 1992. White-rumped Sandpiper (*Calidris fuscicollis*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/029

Peck, G.K. and **R.D. James.** 1983. Breeding birds of Ontario: nidiology and distribution, Vol.1. Non-passerines. Life Sciences Miscellaneous Publication, Royal Ontario Museum, Toronto, Ontario.

Peck, M.K. 2007. Hudsonian Godwit, pp. 232-233 in Cadman, M.D., D.A. Sutherland, G.G. Peck, D. Lepage and A.R. Couturier, Eds. Atlas of the Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto, xxii + 706pp.

Peck, M.K. and **D.A. Sutherland.** 2007. Whimbrel, pp. 230-231 in Cadman, M.D., D.A. Sutherland, G.G. Peck, D. Lepage, and A.R. Couturier, Eds. Atlas of the Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto, xxii + 706pp.

Prevett, J.P. 1987. Whimbrel, p. 526 in Cadman, M. D., P. F. J. Eagles and F. M. Helleiner, Eds. Atlas of the breeding birds of Ontario. University of Waterloo Press, Waterloo, Ontario.

Ross, K., K. Abraham, R. Clay, B. Collins, J. Iron, R. James, D. McLachlin and **R. Weeber.** 2003. Ontario Shorebird Conservation Plan. Environment Canada, Canadian Wildlife Service, Toronto 48pp.

Sinclair, P. 1986. The effects of weather in late fall coastal bird migration in James Bay. B.Sc. Thesis, Biol. Dept. Queen's University, Kingston, ON. 50pp.

Skeel, M. A. and **E.P. Mallory.** 1996. Whimbrel (*Numenius phaeopus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/219

Walker, B.M., N.R. Senner, C.S. Elphick and **J.Klima.** 2011. Hudsonian Godwit (Limosa haemastica), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/629

Warnock, N.D. and **R.E. Gill.** 1996. Dunlin (*Calidris alpina*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/203.

Western Hemisphere Reserve Network. 2009. http://www.whsrn.org/selection-criteria, accessed January 2013.

Appendix 1: Lesser Yellowlegs migration, population structure and demography

Summary of James Bay contributions to an international project

Background

The Lesser Yellowlegs is a shorebird species that breeds in the boreal forests of Alaska and Canada and winters in Central and South America. The species has experienced a population decline of -5.3% per year on average and has lost an estimated 90% of their population size since 1970, with an additional 50% projected loss within the next 15 years (Sauer et al. 2013). Our study aims to fill knowledge gaps and investigate the causes of declines, which includes unregulated hunting on wintering grounds. Listed below are the studies four primary objectives. The order of objectives listed is based on priority level, with number 1 being of highest priority. Methods described in this protocol follow the Arctic Shorebird Demographics Network Breeding Camp Protocol (Brown et al. 2014).

1. Deploy GPS Argos PinPoints and geolocator tags on breeding adults to identify migratory timing and routes, including key stopover sites and wintering locations utilized by individual Lesser Yellowlegs within sub-populations in Alaska and Canada.
2. Individually mark and resight individual Lesser Yellowlegs to estimate apparent annual survival rates.
3. Collect biological samples to examine potential genetic variation in sub-populations of Lesser Yellowlegs.
4. Collect information on reproductive rates of Lesser Yellowlegs to better understand nest and brood survival, and juvenile recruitment.

Project Study Sites

Geographic locations for this study cover the longitudinal extent of the Lesser Yellowlegs breeding range and include the following study sites: Anchorage and Matanuska Susitna Valley, AK; McClelland Lake, AB; Yellowknife, NT; Churchill, MB; and James Bay, ON. Sites that have the potential to be added in the future include Fairbanks, AK and Kanuti National Wildlife Refuge, AK. The expected duration of this project is May 2018 to April 2022.

Methods

Captures Objectives

- Capture and uniquely mark at least 20 individuals per study site per year and make a concerted effort to resight individuals in subsequent years.
- Deploy 10-15 GPS Argos PinPoint tags on breeding Lesser Yellowlegs to better understand their duration and extent of migratory movements.

All adults captured Lesser Yellowlegs were banded with a unique government-issued metal band, alphanumeric flag and darvic color band. Color bands were site-specific (green for James Bay). Standard morphometrics or each bird were taken, including wing length, exposed culmen, total head, nares to tip, tarsus length, and mass. All birds were examined for body and flight feather moult, and for subcutaneous fat score. Blood samples were collected from the brachial vein under the wing to determine sex of individuals using genetic sexing techniques in the lab. Determining sex using plumage characteristics or measurements is unreliable. Feather and claw samples were collected from all

captured adults. Claws (2-3 per individual) were cut at the quick and placed in a labeled coin envelope. The S1 secondary feather from the right wing was pulled at the base and placed in a labeled coin envelope. Photos were taken of each bird prior to release to document band combinations and the bird's condition.

Lotek PinPoint GPS tags were attached using leg-loop harnesses to adult Lesser Yellowlegs weighing over 80g; seven tags were provided to the James Bay crew. Each harness was made out of 1mm stretch magic jewelry chord and 3mm jewelry crimps). Tagged birds were placed in a holding cage for up to 30 minutes to monitor for potential adverse effects of the tag on gait and center of gravity. Birds were released once it was confirmed that no ill effects were observed.

Summary and discussion of 2018 results at James Bay

Fifty-one Lesser Yellowlegs were trapped and processed at Longridge Point in 2018. Seven of these were harnessed with PinPoint tags. Two of these tags were not detected outside of the James Bay Lowlands; two tags were not detected beyond the northeastern USA; and three tags were detected in South America.

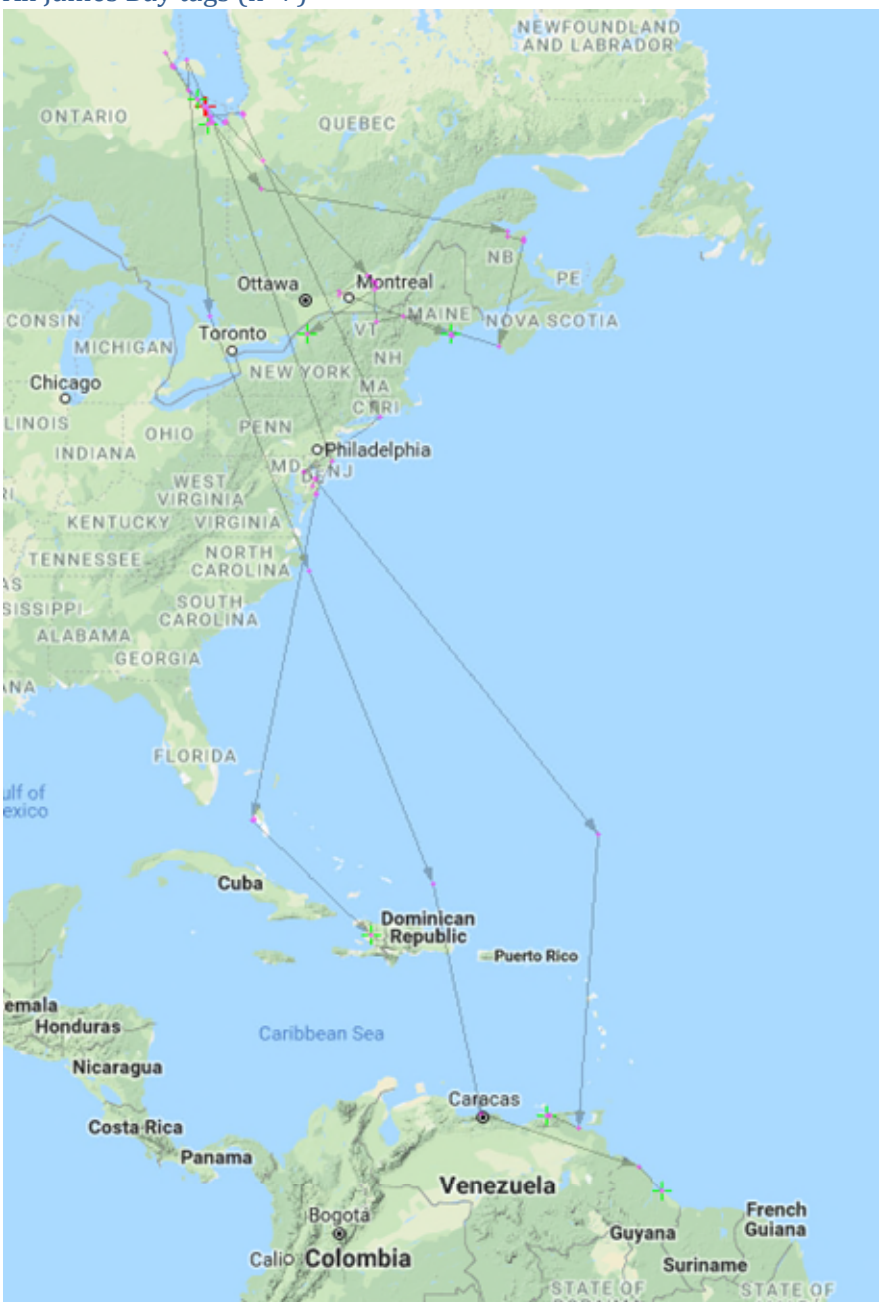
The tag on the bird with flag 8A5 may have failed at Longridge, and for flag 5A3 at the Moose River. The others show some neat movements. Flag 6A9 is a good example. The point in the ocean that was registered on 2018-09-21, after the bird staged in Prime Hook NWR in DE for about two weeks. A weather system may have pushed this bird out around the storm activity. A low with developing gale force winds on the 19th became gale force by the 20th while the system tracked southeast (see weather maps below by date [source: NOAA] and the video visualisation of the maps). Flag 5A1 was in the Bahamas by the 11th and flag 5A7 was in the Caribbean by the 15th.

Interestingly, some birds from the western population and all James Bay bird travelled through the Caribbean. This area is known to be a high risk of hunting take of Lesser Yellowlegs, and unregulated hunting pressure is identified as a source of population decline for this species. The movements show that while this pressure may affect the entire Lesser Yellowlegs population, this pressure may be disproportionately affecting the eastern segment of the population.

More to come as the principal investigator analyses data from across the study sites.

All tags for the project (n=24)

All James Bay tags (n=7)



FEW(5A0)

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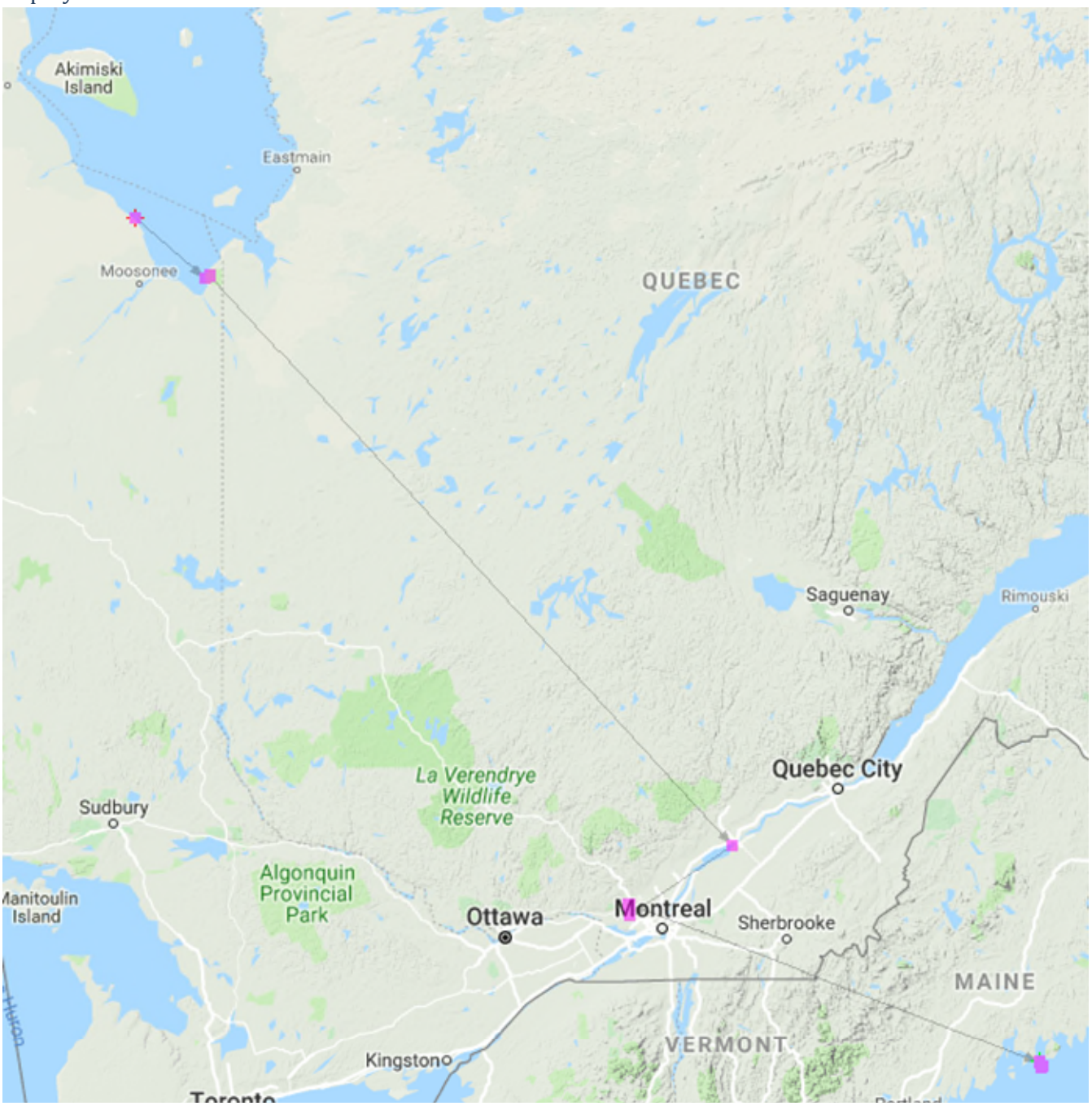

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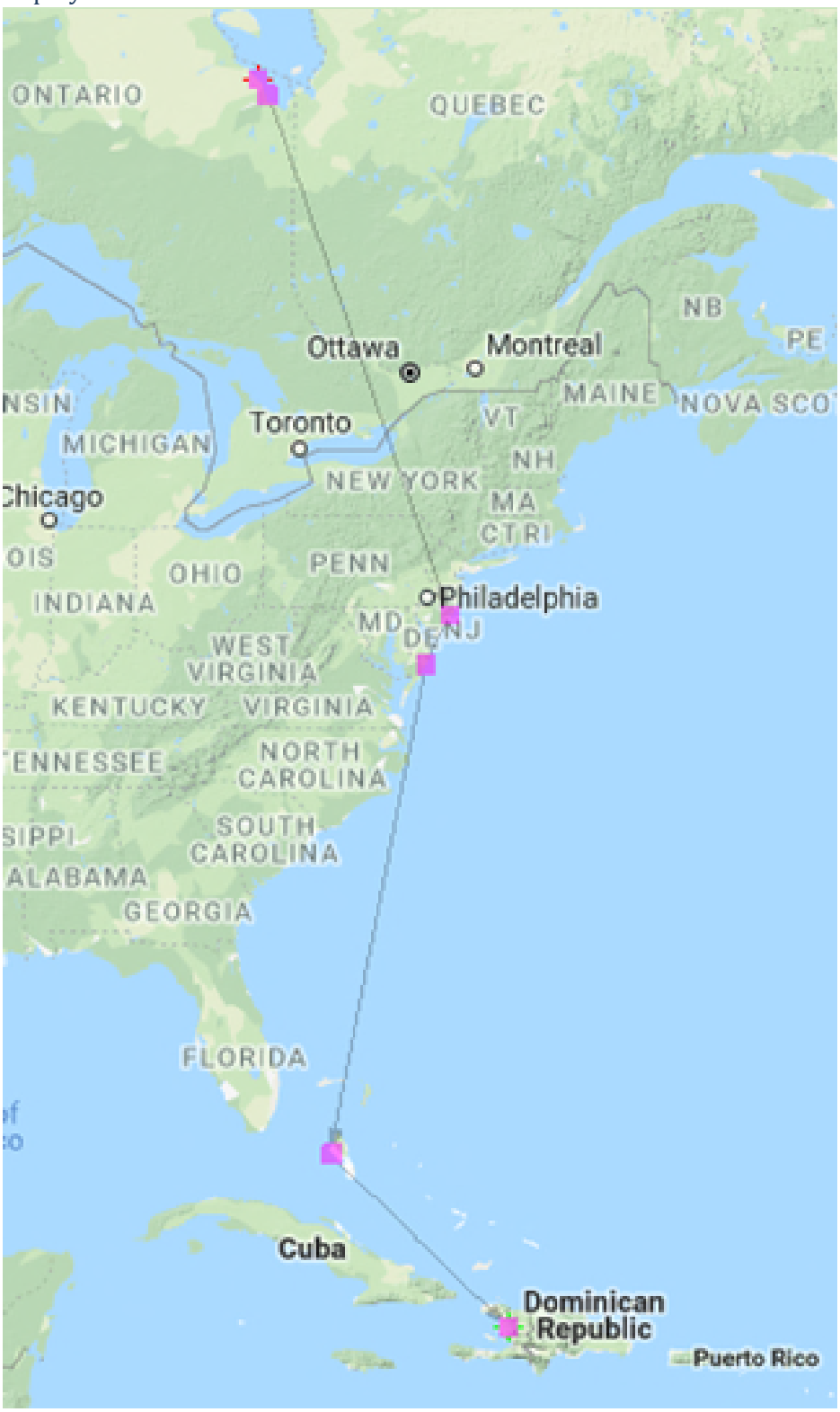

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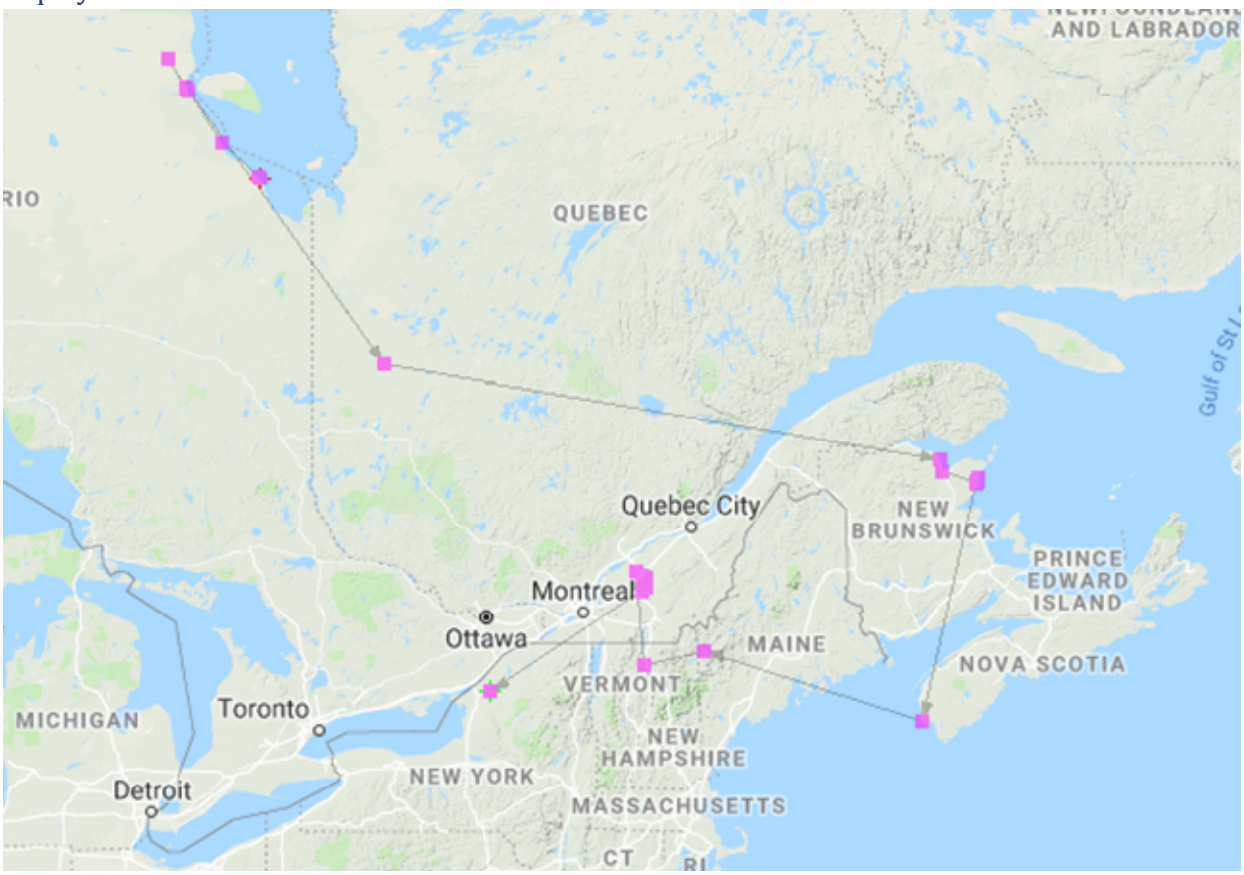
FEW(5A4)

Deployment interval: 2018-07-21 05:00:00 .. 2018-10-05 05:00:00



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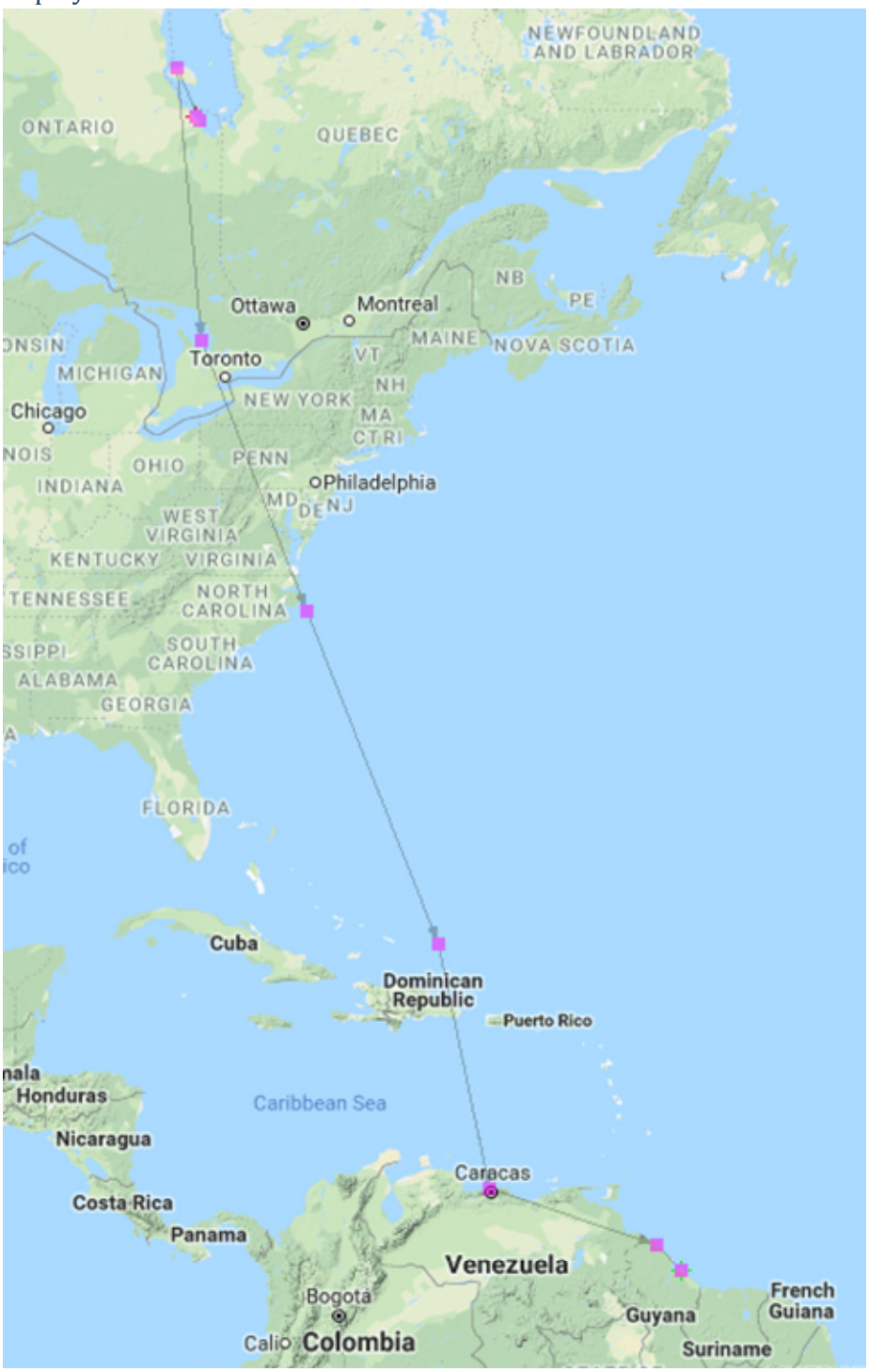

FEW(6A9)

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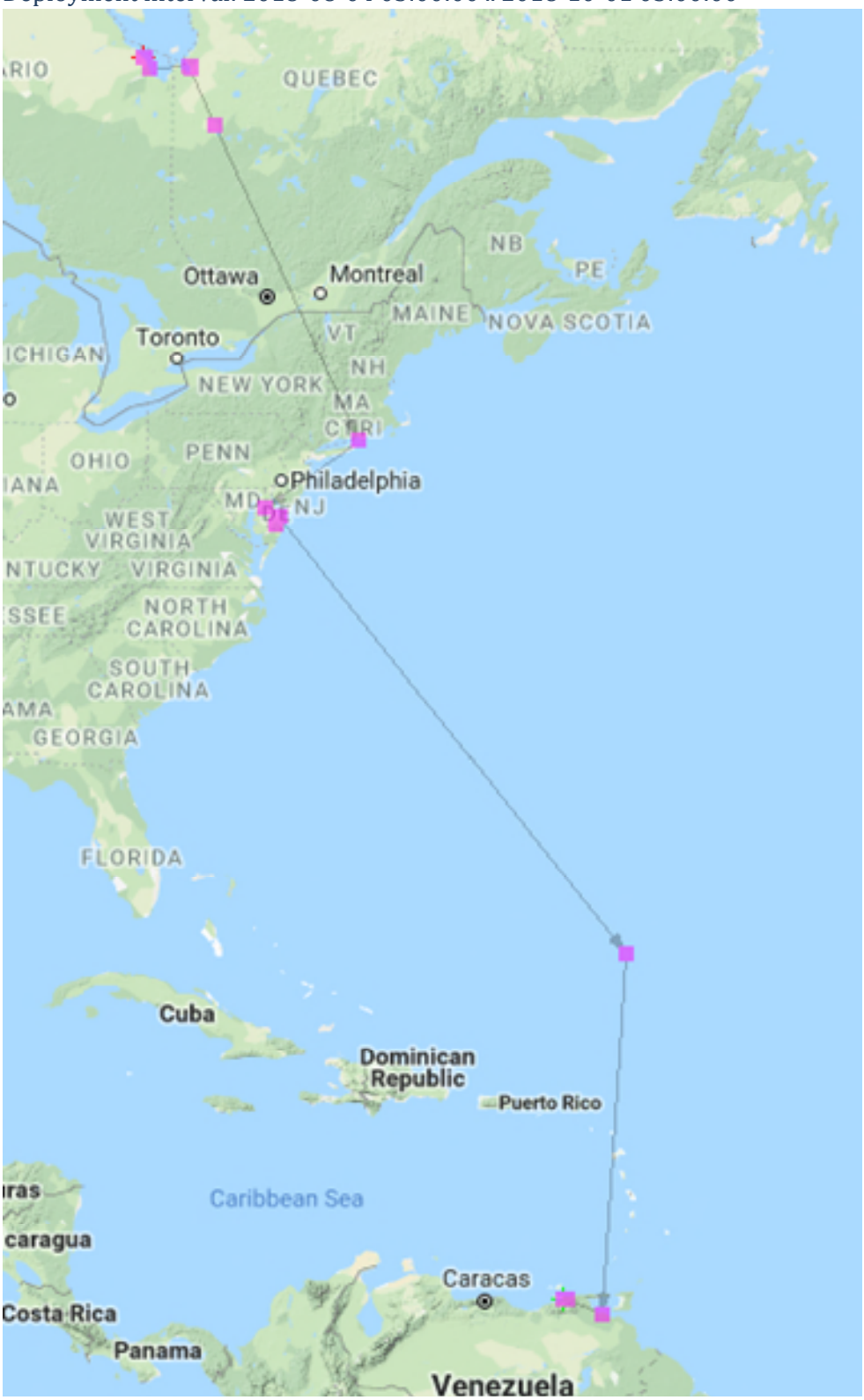

FEW(8A5)

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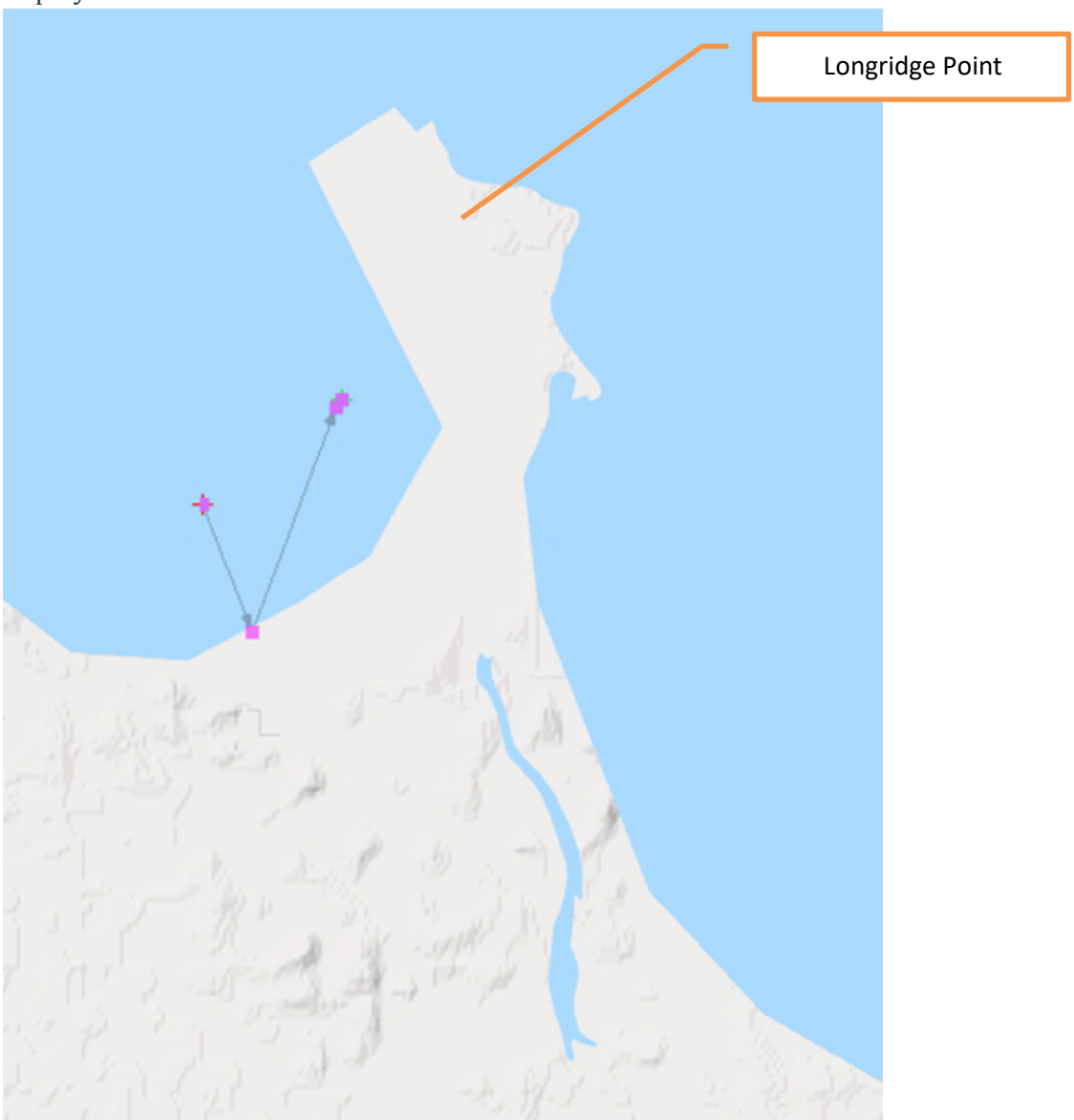
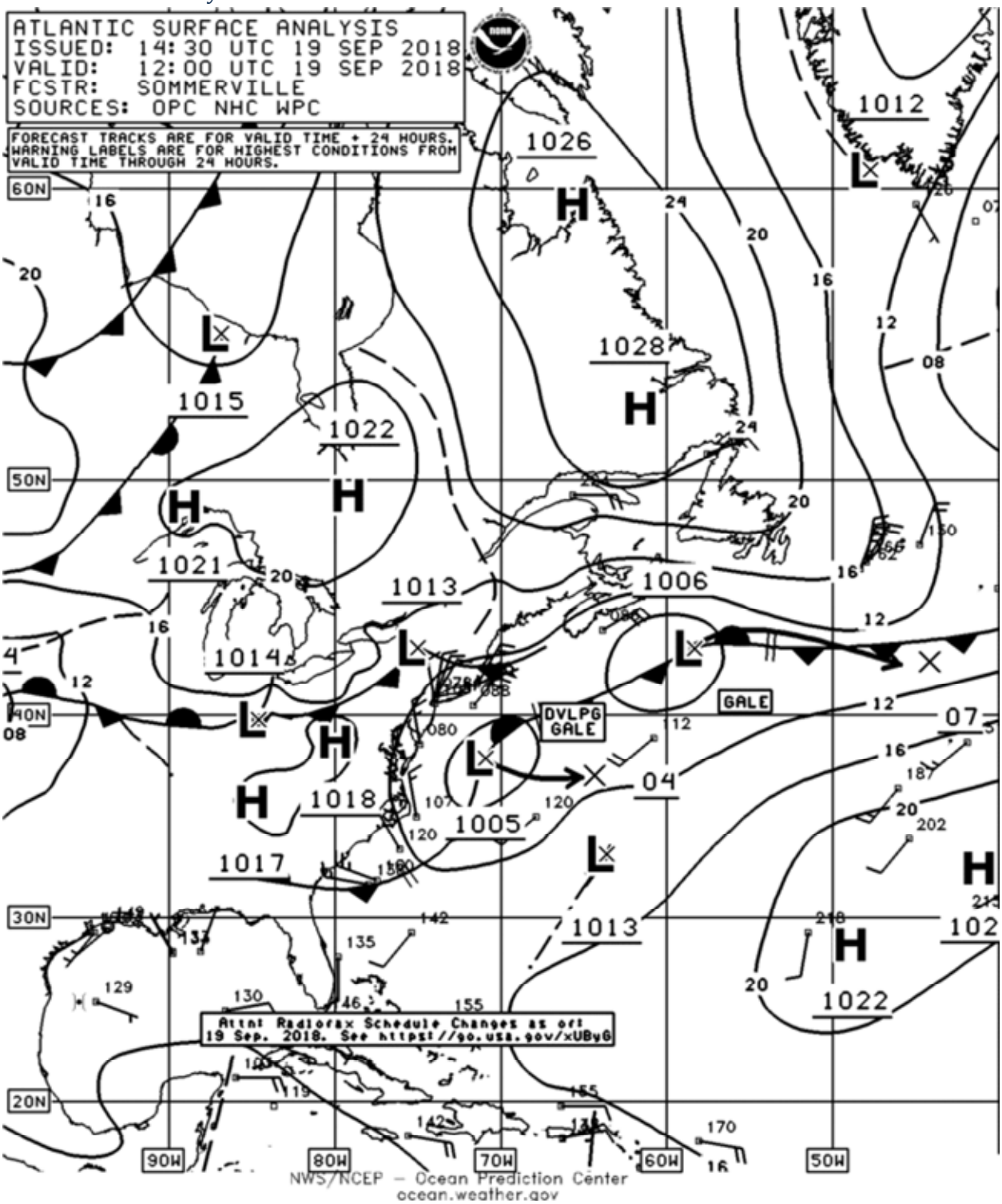
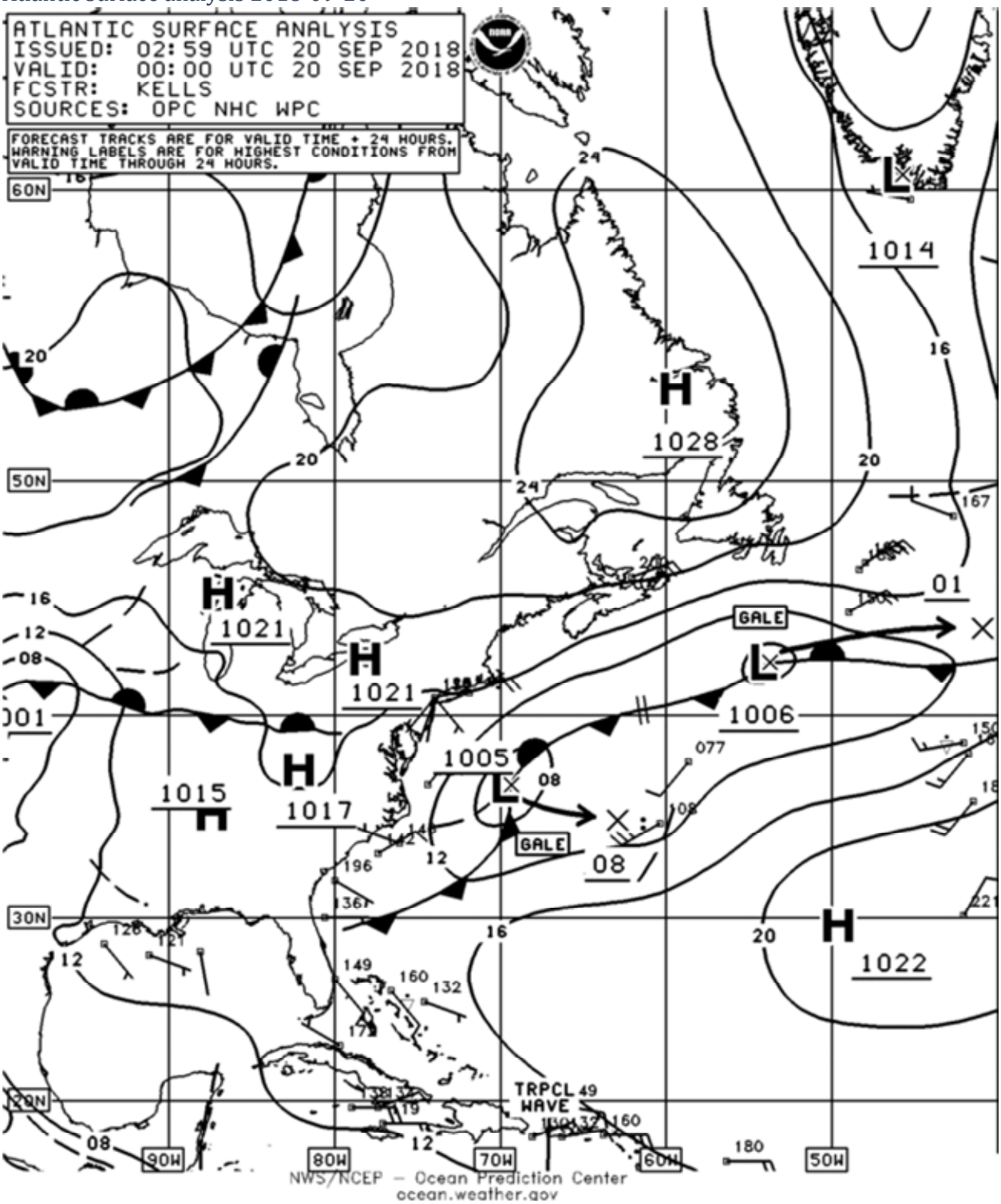


Weather Maps

Atlantic surface analysis 2018-09-19



Atlantic surface analysis 2018-09-20



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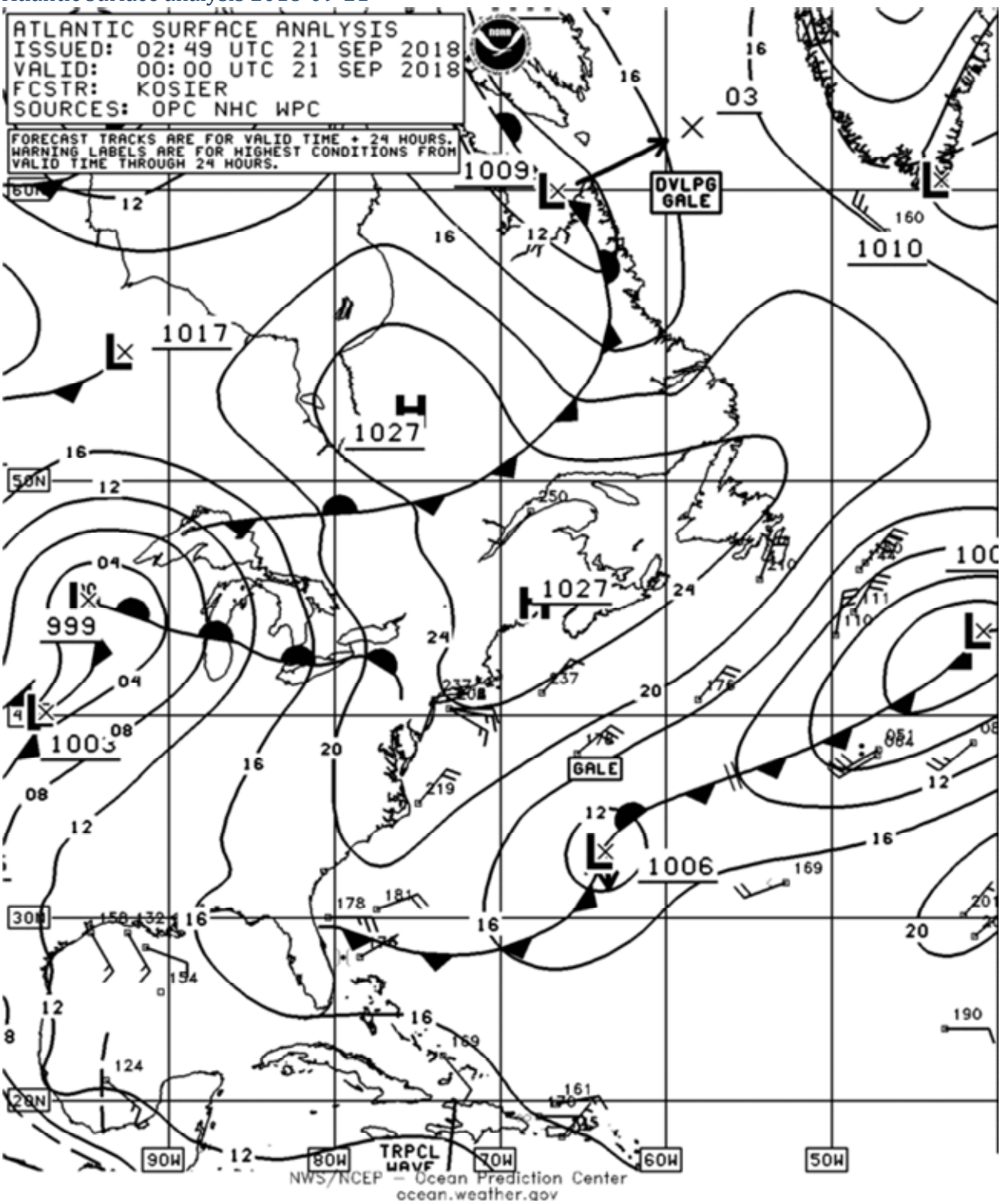
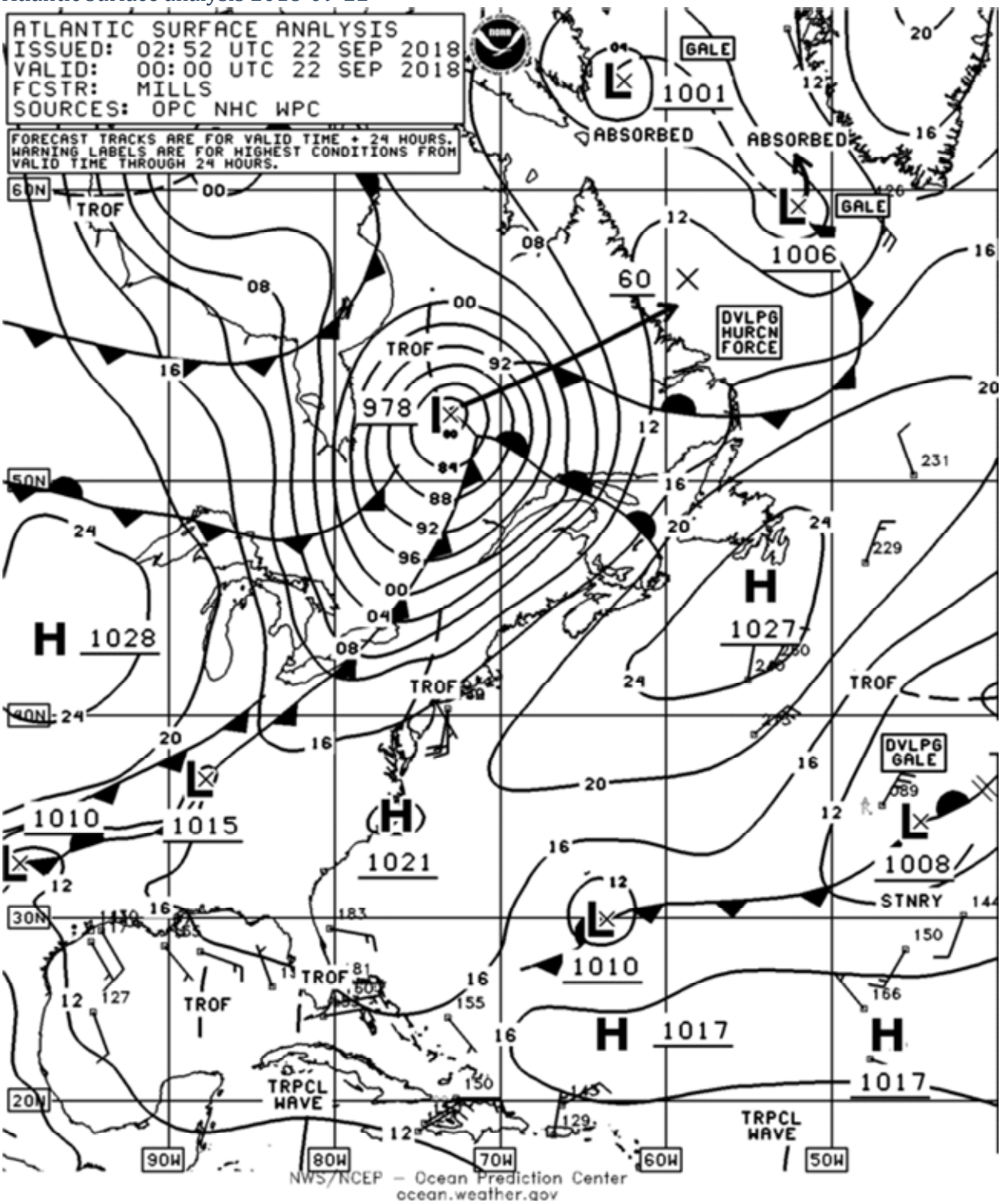


Atlantic surface analysis 2018-09-22



References

Brown, S. C. , H. R. Gates, J. R. Liebezeit, P. A. Smith, B. L. Hill, and R. B. Lanctot . 2014. Arctic Shorebird Demographics Network Breeding Camp Protocol, Version 5, April 2014. Unpubl. paper by U.S. Fish and Wildlife Service and Manomet Center for Conservation Sciences, 118 pp.

Sauer, J.R., W.A. Link, J.E. Fallon, K.L. Pardieck, and D.J. Ziolkowski Jr. 2013. The North American Breeding Bird Survey 1966-2011: Summary Analysis and Species Accounts. North American Fauna 79:1-32.