



2018 PROGRAM REPORT

FEBRUARY 2019

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BIRD STUDIES
ÉTUDES D'OISEAUX CANADA

Canadian co-partner of
un partenaire canadien de



Canadian Migration
Monitoring Network



Réseau canadien
de surveillance
des migrations



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INTRODUCTION

LONG POINT BIRD OBSERVATORY

In October 1959 six members of the [Ontario Bird Banding Association](#) made the first expedition to the Tip of Long Point in search of an ideal location to study bird migration. In the spring of 1960, the [Long Point Bird Observatory](#) (LPBO) and its Migration Monitoring Program was born. Subsequently, LPBO is the oldest bird observatory in the Western Hemisphere and houses one of the largest data sets on migratory birds in the world.

LPBO quickly grew beyond the borders of Long Point, implementing regional and provincial research and monitoring programs, and initiating North America's first sponsored bird count fundraiser, the Great Canadian Birdathon. Remarkable growth occurred in the following decades with the initiation and coordination of a wide range of national and international programs and initiatives. In 1998, in recognition of the organization's breadth and aspirations, LPBO membership voted to create Bird Studies Canada (BSC). LPBO was then reinvented as a program of BSC operating research, education, and training programs that focus on ornithology, conservation, and other aspects of natural history at Long Point. LPBO programs include the Migration Monitoring Program, the Doug Tarry Natural History Fund (Young Ornithologists' Workshop and Internship), the Tree Swallow Project, the Latin American Training Program, Long Point Breeding Bird Census, and an active and diverse program of public education, professional training, and collaborative research.

You can follow our weekly [sightings board](#) during the migration monitoring seasons, or find us on [Facebook](#), [Instagram](#), or [Twitter](#).

BIRD STUDIES CANADA

[Bird Studies Canada](#) is Canada's leading science-based bird conservation organization. BSC's mission is to conserve the wild birds of Canada through sound science, on-the-ground actions, innovative partnerships, public engagement, and science-based advocacy.

BSC is a national charity built on the contributions of thousands of supporters and citizen scientists. Using data from our volunteer monitoring programs and targeted research, our scientists identify significant population changes and direct conservation planning. We are a strong partner in BirdLife International, the world's largest conservation alliance for nature and people, active in more than 120 countries and territories.

ACKNOWLEDGEMENTS

LPBO programs are supported by BSC, the LPBO Endowment Fund, the Doug Tarry Natural History Fund, and the Great Canadian Birdathon, a variety of organizations, and the gracious support of many individual supporters. We are particularly grateful to the Ontario Ministry of Natural Resources and Forestry (Aylmer District Office) and Wildlife Assessment Program, and to Environment and Climate Change Canada for their support of the Latin American Training Program and migration monitoring as a contribution to the Canadian Migration Monitoring Network. LPBO is also grateful for the support of the Armstrong Bird Food, Bradstreet Family Foundation, ECO Canada, Ontario Trillium Foundation, TD Friends of the Environment Foundation, The Nature Conservancy of Canada, Norfolk Land Stewardship Council, James and Betty Runnings, and numerous anonymous donors. We wish to acknowledge the support and collaborative research carried out with numerous institutions (see collaborative research below). LPBO is also grateful for the permission it receives to operate its programs on properties owned by: Norfolk County, Fisheries and Oceans Canada, Transport Canada, Environment and Climate Change Canada, Long Point Company, Ontario Ministry of Natural Resources and Forestry, Ontario Ministry of the Environment, and Connie and Vernon Smith.



Environment
Canada

Environnement
Canada

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Canada

MIGRATION MONITORING PROGRAM

LPBO has been collecting standardized data on bird migration at Long Point since 1960. In 1986, LPBO coined the term *migration monitoring* to describe the use of standardized daily counts of migrating birds as a method of monitoring populations of selected migratory species. Each spring and fall, staff and volunteers perform daily censuses, banding, and observations at each of three research stations on Long Point: Old Cut, Breakwater, and the Tip. The migration count data assembled at LPBO are used to derive daily estimated totals for each species recorded throughout the year. Ultimately, estimated total data are used to generate [population trends](#) for over 200 species. Migration monitoring is a particularly valuable method as it enables the monitoring of species that breed in northern Canada, or other inaccessible areas, which can be difficult to assess with more conventional monitoring methods such as the North American Breeding Bird Survey. There are now about 30 migration monitoring stations across Canada which form the [Canadian Migration Monitoring Network](#).

In 2018, 23,573 birds of 146 species and forms were banded at LPBO. Additionally 4,635 recaptures of previously banded birds were processed. Long Point's first Virginia's Warbler was banded at the Tip June 1, and LPBO banded its first Kirtland's Warbler on September 7. Other notable banding records included the third ever Common Loon (Last banded in 2003), sixth ever Common Nighthawk, the fourth ever Great Blue Heron and record high banding totals for:

- Eastern Bluebird, 17 (record was 16 in 1966 and 1992)
- Second highest numbers of Purple Finch banded, 177 (record was 262 in 1985);

LPBO had a slightly below average number of birds banded. In 2018, LPBO banded 15.1% (4,239 individuals) fewer birds than the previous 10-year average. The number of species and forms was slightly better with 146 banded. This is 3.6% (5 species and forms) short of the previous 10 year average.

Twenty-seven birds that were previously banded at LPBO were reported as encountered elsewhere in 2018 (Table 1). The farthest encounter of an LPBO band was of a Sharp-shinned Hawk captured in Texas in April 2018, after being banded at Thunder Cape Bird Observatory in October 2015 - a journey of 1,815km! A Blue Jay, originally banded at Old Cut Field Station October 2014 was recaptured in La Tuque, Quebec in October 2018. A Bald Eagle banded as a nestling in southern Ontario in 2004, was recaptured in Ohio October, 2018.

LPBO had 13 foreign recaptures that have been confirmed to date (Table 2).

In addition to banded and recaptured birds, LPBO counted 1,078,698 birds during 7,838 person-hours of migration monitoring.

Table 1. Encounters of LPBO banded birds reported from elsewhere in 2018. AHY = after hatch year; ASY = after second year; HY = hatch year; SY = second year; U = unknown.

Species	Age at Banding	Banding Date	Encounter Date	Encounter Location
American Robin	SY	5/30/2015	7/29/2018	Ontario
Bald Eagle	HY	6/7/2004	10/17/2018	Ohio
Baltimore Oriole	HY	8/8/2015	5/20/2018	Michigan
Blue Jay	HY	10/5/2014	11/2/2018	Québec
Brown-headed Cowbird	SY	4/27/2015	4/14/2018	Ontario
Chipping Sparrow	SY	4/25/2016	5/20/2018	Ontario
Common Grackle	AHY	3/30/2015	5/26/2018	Ontario
Common Grackle	AHY	4/14/2016	3/18/2018	Ontario
Common Grackle	SY	4/29/2015	3/11/2018	Ontario
Common Grackle	AHY	4/27/2015	4/7/2018	Ontario
House Sparrow	U	11/8/2017	7/3/2018	Ontario
Lincoln's Sparrow	SY	5/28/2016	11/14/2018	Kentucky
Myrtle Warbler	HY	10/20/2017	5/9/2018	Minnesota
Northern Saw-whet Owl	HY	10/17/2017	10/25/2018	Ontario
Northern Saw-whet Owl	SY	10/20/2017	4/12/2018	Ontario
Northern Saw-whet Owl	SY	11/7/2017	11/17/2018	Ontario
Northern Saw-whet Owl	TY	11/2/2018	11/8/2018	West Virginia
Northern Saw-whet Owl	HY	11/2/2018	12/4/2018	Ohio
Northern Saw-whet Owl	SY	10/20/2017	11/12/2018	Ohio
Northern Saw-whet Owl	SY	11/3/2015	11/7/2018	Massachusetts
Northern Saw-whet Owl	SY	10/19/2016	3/29/2018	Ontario
Northern Saw-whet Owl	SY	11/4/2016	5/19/2018	Michigan
Red-winged Blackbird	SY	5/23/2017	3/11/2018	Ontario
Red-winged Blackbird	SY	4/19/2012	3/19/2018	Ontario
Tree Swallow	HY	6/16/2017	6/26/2018	Ontario
Tree Swallow	HY	6/19/2013	6/7/2018	Ontario
White-throated Sparrow	HY	10/1/2017	7/1/2018	Ontario

Table 2. Foreign recaptures at LPBO in 2018. ASY = after second year; HY = hatch year; SY = second year.

Species	Age at Banding	Encounter Date	Banding Date	Banding Location
Northern Cardinal	HY	4/22/2018	10/18/2017	Ontario
Northern Saw-whet Owl	HY	11/4/2018	10/31/2018	Ontario
Northern Saw-whet Owl	HY	11/2/2018	10/25/2018	Ontario
Northern Saw-whet Owl	ASY	11/2/2018	10/20/2018	Ontario
Northern Saw-whet Owl	HY	11/4/2018	10/13/2018	Ontario
Northern Saw-whet Owl	HY	11/10/2018	10/7/2018	Ontario
Northern Saw-whet Owl	SY	11/10/2018	10/24/2015	Ontario
Northern Saw-whet Owl	SY	11/11/2018	11/10/2018	Ontario
Northern Saw-whet Owl	ASY	11/12/2018	11/8/2018	Ontario
Red-Winged Blackbird	AHY	5/11/2018	4/22/2017	Ontario
Tree Swallow	HY	6/10/2018	6/22/2012	Pennsylvania
Tree Swallow	HY	6/10/2018	6/22/2012	Pennsylvania
Tree Swallow	HY	6/10/2018	6/11/2015	Ontario

SPRING MIGRATION MONITORING

LPBO's 58th spring migration monitoring season ran at Old Cut from April 1 to June 10 (74 days), at Breakwater from April 20 to June 8 (48 days), and at the Tip from April 10 to June 5 (57 days). The 24 volunteers who helped run operations during the spring season came from Australia, Canada, Germany, Sweden, the United Kingdom, and the United States. Staff and volunteers logged 4,200 person-hours collecting migration data on over 245 species and forms. Summary statistics of seasonal effort are summarized in Table 3. In total, 13,859 birds of 127 species and forms were banded (Table 4 and Appendix 1). LPBO had 179 station-days of coverage, yielding 9,476 net-hours and 1,382 trap-hours with a catch rate of 127 birds/100 hours (77% of captures were by nets). About 20 volunteer Friends of LPBO helped to welcome 1,784 visitors to the Old Cut Field Station and Visitor Centre.

Volunteers: Daniel Akin (United States of America), Isabelle Apkarian (Canada), Dan Branch (United Kingdom), Brendan Boyd (Canada), Paul Collins (United Kingdom), Emily Emptage (Canada), Will Feeney (Australia), Brett Fried (Canada), Andrea Gress (Canada), Erika Hentsch (Canada), Alex Israel (Canada), William Von Herff (Canada), Aranya Iyer (Canada), Reta Meng (Canada), Samreen Munim (Canada), Tobias Nordin (Sweden), Ben Oldfield (Canada), Eleanor Page (United Kingdom), Katie Petrie (Canada), Bill Read (Canada), Verena Rupprecht (Germany), Roger Short (United Kingdom), Sara Skidell (Sweden), Sue Suess (Canada), Antoine Turcotte-van De Rydt (Canada), Christophe Turcotte-van De Rydt (Canada), Helen Williams (United Kingdom), Amy Wilson (Canada), Scott Wilson (Canada).

Table 3. Effort summary statistics for spring migration monitoring.

Person-hours	4,200
Total species and forms observed	245
Individuals banded	13,859
Species and forms banded	127
Total station-days of migration monitoring	179
<i>Old Cut</i>	74
<i>Breakwater</i>	48
<i>Tip</i>	57
Total net-hours	9,476
<i>Mist net</i>	9,476
Total trap-hours	1,382
<i>J-trap</i>	626
<i>Ground trap</i>	757
Overall catch rate	127 birds/100 hours
% of catch in mist nets	77
% of catch in traps	23
Visitors to Old Cut	2,725

Table 4. Ten most abundant species banded at LPBO spring 2018.

Species	Number Banded
White-throated Sparrow	1,252
Red-winged Blackbird	845
Slate-colored Junco	758
Ruby-crowned Kinglet	552
Yellow Warbler	484
Blue Jay	483
Song Sparrow	454
American Goldfinch	449
Brown-headed Cowbird	445
Golden-crowned Kinglet	405

SPRING BIRD HIGHLIGHTS:

Eurasian Wigeon - A male was found where Big Creek crosses the East Quarter Line Road, just south of Concession Road 10. It was first observed April 25 (EG) and continued until April 27.

Ring-necked Pheasant – One was observed along the Causeway April 7 (TG,PG).

Eared Grebe - One was observed off the Tip of Long Point April 16 (KGC).

Eurasian-collard Dove - One bird was observed intermittently at the Tip May 16-25 (LPBO).

White-winged Dove - One was at the Tip Apr 28 (EJE); it remained until May 3 (LPBO).

Chuck-will`s-widow – One was in the 'New' Long Point Provincial Park 14 May (LPBO).

Piping Plover – A colour-banded bird was at the Tip Apr 29 (TLN, KGC). It was banded as a chick at Wasaga Beach in 2011. Two colour-banded birds were observed at the Tip May 12 and 16 (LPBO).

American White Pelican - Three were photographed flying over Port Rowan May 7 (JH).

Cattle Egret - One flew over the 'New' Long Point Provincial Park May 9 (JA). One was observed flying over Port Rowan Public School May 13. Likely the same individual was observed on Stark's golf course May 14 (M. Obs.).

Black-crowned Night Heron – Usually absent to rare in the Long Point area, two were observed daily at Old Cut April 7-16, 22 and at Breakwater on April 26 (LPBO).

White-faced Ibis - One was discovered west of Big Creek on Walsingham Concession 2 June 1 (PC, MEG, AT).

Mississippi Kite - One bird was observed flying over the Bird Studies Canada headquarters May 20 (JBF, AM).

Snowy Owl - One record late individual was observed along the Front Rd. fields June 13 (KW).

Vermillion Flycatcher - A first for the Long Point Area Checklist - number 401! This bird was observed at the Tip on April 27. The bird was found again three days later in Port Rowan but has not been observed since (SM et al.).

White-eyed Vireo – Great numbers of White-eyed Vireos this spring. The first migrant of the spring was at Old Cut April 24 (JA, SAM). Presumably the same bird was banded at Old Cut

April 26. More sightings at the 'New' Long Point Provincial Park May 2-5, Old Cut May 4-8, and the Tip May 7-8. These sightings continued throughout May.

Common Raven – Single birds reported at the St. Williams Forest, Turkey Point Conservation Reserve and near Port Rowan periodically throughout the winter. This species is now regularly reported in very low numbers in Norfolk County.

Sedge Wren – Birds were observed in the Hahn Marsh May 10 (JS) and 13 (EG et al.).

Yellow-breasted Chat – One was at Silver Lake in Port Dover May 2 (MT). One was banded at Old Cut May 3 (LPBO). One was at the 'New' Long Point Provincial Park May 5 (AZ, JS, RS). One male was observed singing in suitable habitat on the Timpf Farm along West Quarter Line May 14 (AT). One was observed around the Old Cut woodlot May 18 (LPBO).

Yellow-headed Blackbird – A male observed at the Tip feeders May 17 (WVH).

Worm-eating Warbler - One was observed in north section of Backus Woods May 14 (JA).

Golden-winged Warbler – Single birds were at the 'New' Long Point Provincial Park May 2 (AT, SAM, TM) and Old Cut May 6 (MAC). One was banded at Breakwater May 8 (LPBO). Yet another bird was at Old Cut May 9 (JBF, SM). One was heard May 17 (JBF).

Virginia's Warbler - A second-year female was caught and banded at the Tip June 1 (LPBO). This bird represents LPBO's first record of this species and number 402 on the area checklist. If accepted by the Ontario Rare Birds Record Committee this bird will represent Ontario's sixth record.

Kentucky Warbler - One bird was banded at Breakwater May 17 (LPBO).

Kirtland's Warbler - A female was found on Hasting Dr. early in the morning May 16 during a local Birdathon. Many birders came to see this rare bird offering amazing views throughout the day. This bird represented Long Point's 8th record. (AH, M.Obs.)

Yellow-throated Warbler - One was at the 'New' Long Point Provincial Park May 9-10 (SAM, JL et al.).

Prairie Warbler – One was at Old Cut (LPBO) and another was at the 'New' Long Point Provincial Park May 9-10 (SAM).

Summer Tanager – One was banded at Old Cut May 5 (LPBO). One was at Breakwater (MAC) and another at the Tip May 7-8 (LPBO). One was at 'New' Long Point Provincial Park May 9 (SAM, RR, AT). Two birds were observed at the Tip May 15; one was banded later that day. Another was observed May 17 (LPBO). A second-year male was observed in Westwood Acres Park May 23 (KG).

Western Tanager - A stunning after second-year male was found at the Tip May 27 (IJA et al.).

Eurasian Tree Sparrow - One bird was observed at Breakwater May 21 (LPBO), presumably the same bird was observed at the Tip's feeders May 23 - 28 (LPBO).

Observers: Jody Allair (JA), Isabelle Apkarian (IJA), Kyle Cameron (KGC), Peter Carson (PC), Mark Conboy (MAC), Emily Emptage (EJE), Brett Fried (JBF), Mary Gartshore (MEG), Paula Gent (PG), Ted Gent (TG), Kevin Giles (KG), Eric Giles (EG), Audrey Heagey (AH), William von Herff (WVH), Jeremy Hussel (JH), James Lees (JL), Anita Morales (AM), Samreen Munim (SM), Stu Mackenzie (SAM), Tobias Nordin (TLN), Ron Ridout (RR), Adam Timpf (AT), Matthew Timpf (MT), Robert Spaul (RS), Jeff Skevington (JS), Kerrie Wilcox (KW), Anthony Zammit (AZ), and Long Point Bird Observatory staff (LPBO).

FALL MIGRATION MONITORING

LPBO's 58th fall migration monitoring season ran at Old Cut from August 15 to November 15 (92 days), at Breakwater from August 23 to September 19 (28 days), and at the Tip from August 17 to November 8 (84 days). As with every year, Breakwater closed early due to land use restrictions associated with waterfowl hunting. The 26 volunteers who helped run operations during the fall season came from Canada, France, Mexico, and the United Kingdom. Staff and volunteers logged 7,838 person-hours collecting migration data on over 271 species and forms. About 20 volunteer Friends of LPBO helped to welcome 1,318 visitors to Old Cut. Summary statistics of seasonal effort are summarized in Table 5. In total, 9,760 birds of 121 species and forms were banded (Table 6 and Appendix 1). LPBO had 204 station-days of coverage, yielding 19,191 net-hours and 2,310 trap-hours with a low catch rate of 45 birds/100 hours (85% of captures were by nets).

Long Point is recognized as one of three International Monarch Butterfly Reserves in Canada due to its large concentrations of butterflies during fall migration. In 2018, daily afternoon Monarch censuses were conducted at Breakwater from August 5 to September 11, and at the Tip from August 15 to November 5. The total count of Monarchs was 4,571, with 2113 at Breakwater and 2458 at the Tip. The largest single-day count at Breakwater was 400 on both September 9 and 11, while the largest single-day count at the Tip was 226 on September 2.

Volunteers: Shane Abernethy (Canada), Michaela Berdougou (France), Brendan Boyd (Canada), Megan Buers (Canada), Ian Buxton (United Kingdom), Maddie Davies (Canada), Peter Denyer (United Kingdom), Stefany Desroches (Canada), Brett Fried (Canada), Andrea Gress (Canada), RuiLin Guo (Canada), Karl Heide (Canada), Erika Hentsch (Canada), Alex Israel (Canada), James Kennerley (United Kingdom), Jesse Lewis (Canada), Maya Longpre-Croteau (Canada), Yolanda Morbey (Canada), Alice Palmer (United Kingdom), Bill Read (Canada), Owen Rigden (Canada), Kaila Ritchie (Canada), Lakesha Smith (Canada), Sachi Snively (Canada), Antoine Turcotte (Canada), Stefanny Villagomez (Mexico).

Table 5. Effort summary statistics for fall migration monitoring.

Person-hours	7,838
Total species and forms observed	271
Individuals banded	9,760
Species and forms banded	121
Total station-days of migration monitoring	204
<i>Old Cut</i>	92
<i>Breakwater</i>	28
<i>Tip</i>	84
Total net-hours	19,191
Total trap-hours	2,310
<i>J-trap</i>	1140
<i>Ground trap</i>	1290
<i>Other traps</i>	6
Overall catch rate	45 birds/100 hours
% of catch in mist nets	85
% of catch in traps	15
Visitors to Old Cut	3,871

Table 6. Ten most abundant species banded at LPBO Fall 2018.

Species	Number Banded
American Goldfinch	933
Ruby-crowned Kinglet	783
Blackpoll Warbler	570
Golden-crowned Kinglet	508
Myrtle Warbler	446
White-throated Sparrow	395
Red-breasted Nuthatch	390
Northern Saw-whet Owl	335
Hermit Thrush	330
Magnolia Warbler	315

FALL BIRDING HIGHLIGHTS:

Snow Goose - One was at the Lee Brown WMA September 22 (RVT, AV). A flock of seven was observed at Long Pt. P.P. October 18 (KB). Seven (6 white, 1 blue) were observed at Long Point Provincial Park October 19 (eBird). One was observed flying west past Long Pt. P.P. November 8 (eBird). Eight flew over Old Cut November 11 and Big Creek NWA November 12 (LPBO).

Brant - Six record early birds were observed flying over the Inner Bay towards Turkey Point September 27 (SAM). Individuals were observed at Old Cut October 13 and at the Tip October 16 and 18 (LPBO). Twelve birds were observed flying off the Tip October 18 and three were observed October 19 (SDS, JBF).

King Eider - One young male was observed flying with mergansers at the Tip October 16 (JBF).

Stilt Sandpiper - One was at Silver Lake, Port Dover September 2 - 5 (JD, RR et al.)

Buff-breasted Sandpiper - One individual was observed along the south shore of Long Point August 11 (SAM).

Black-legged Kittiwake - One was observed at the Tip October 16 (JBF).

Pacific Loon - Two were observed off the Tip October 30 (SAM, SDS)

Cattle Egret - The seemingly annual November Cattle Egret was discovered at Dedrick Creek on the 1st Concession November 1-2 (SW).

Snowy Owl - One, possibly two, birds were present through July into early August providing Long Point's first summer records (M. Obs.). One was most frequently observed near the Sandboy Marina until August 7.

Olive-sided Flycatcher - One was observed at the Tip August 23 (JBF, EKH), one to a max of 3 were observed at Breakwater August 24-26, and another was observed at Old Cut August 26 (AW). One was observed at Breakwater August 29 (JBF). Another was at the Tip September 6 (ERB).

Western Kingbird - A very rare mainland individual was observed in the vicinity of Cove Rd September 26, and re-found further west at Clear Creek September 27. One was briefly observed flying over the Tip November 4 (ERB, PCD, SDS). One was observed on the Christmas Bird Count December 15 (JBF et al.)

Eastern Bluebird - 180 were observed on census October 16 (LEB, GEM). 105 were counted migrating past the Covers October 18 (RR).

Townsend's Solitaire - One was observed in Long Pt. P.P. October 14 (AT, MT, JC, TM). This represents Norfolk's eighth record.

Purple Finch - Significant numbers (10-100 /day) had been observed at the field stations throughout September signalling an irruption year for the species (M. Obs.).

White-winged Crossbill - Two were observed at Old Cut October 28, and 1-2 November. Two were observed on census at Old Cut November 1 with six birds there November 2 (JBF, JBL).

Nelson's Sparrow - One was observed at the Tip October 14 and 15 (SAM et al.).

Yellow-breasted Chat - One was banded at Old Cut August 29. A hatch-year female was banded at the Tip on September 28 (LPBO).

Yellow-headed Blackbird - A male was found on Marina Road east of Port Rowan August 15 (LS). A male was found in a large flock of mixed blackbirds along Concession 1 north of the Port Rowan subdivision November 4 (JCC).

Icterids - Approximately 3,175,000 birds, primarily grackles, were estimated flying to roost at Big Creek National Wildlife Area November 11 (SAM).

Golden-winged Warbler - A hatch-year male was banded at Breakwater August 25 (LPBO).

Kirtland's Warbler - A hatch-year female was banded at Old Cut September 6 (LPBO) representing the first of this species banded at Long Point. This is Long Point's second record this year, ninth overall and first fall record since 1941.

Pine Warbler - A high count of six were observed at Old Cut September 22 (LPBO).

Prairie Warbler - One was observed at the Tip during the Young Ornithologist Workshop August 8 (LPBO).

Hermit Warbler - Some very compelling photos were taken of a bird at Long Point Provincial Park October 18. (Anonymous ebird) (eBird - available here: <https://ebird.org/canada/view/checklist/S49281961>).

Observers: Jody Allair (JA), Isabelle Apkarian (IJA), Lucas Berrigan (LEB), Emma Buck (ERB), Ken Burrell (KB), Kyle Cameron (KGC), Janice Chard (JCC), Pete Davidson (PD), Peter Denyer (PCD), Brett Fried (JBF), Kevin Giles (KG), Eric Giles (EG), Jesse Lewis (JBL), Stu Mackenzie (SAM), Ted Matheson (GEM), Ron Ridout (RR), Linda Slade (LS), Sachi Snively (SDS), Adam Timpf (AT), Matthew Timpf (MT), Rohan van Twest (RVT), Anthony Vanderheyden (AV), and Long Point Bird Observatory staff (LPBO).

THE FRIENDS OF LONG POINT BIRD OBSERVATORY

The Friends of LPBO continued in 2016 as a group of 20+, mostly local, volunteers who greet and inform visitors to the Old Cut Research Station while running the LPBO Shop and helping with a myriad of other tasks around the station, including scribing, extracting and gathering observations. Revenue from the shop provides critical support to LPBO programs. The presence of the Friends has dramatically increased the quality of our visitor and education services at Old Cut and takes a great deal of pressure off of the Banders-In-Charge and our volunteers.

Friends: Hugh McArthur, Sandra Maxwell, Evelyn Stone, Ted & Paula Gent, Ruth Ann Logan, Barb Hourigan, Geoff Atkins, Betty Chanyi, Diane Salter, Julia Wever, Otto & Gail Larsen, Gabe Gabriel, Len Grincivicious, Ted Maddeford, Brenda Burville, Ricky Dunn and Tia McGraff.

Tree Swallow Project

This comprehensive long-term research program was initiated in 1963 at the eastern Tip of Long Point, under the direction of David Hussell and Geoff Holroyd. While the initial work at the Tip provided valuable detailed data on breeding biology, the need for a broader geographic scope prompted expansion of this project to include two mainland sites in the mid-1970s, presently at Mud Creek and the Port Rowan Sewage Lagoons. Across these sites, the current project consists of 206 nest boxes with differing geography, food abundance, and micro-climates. The objectives of this project are (1) to provide a long-term record of breeding performance of Tree Swallows in relation to their food supply and local climate; (2) to provide other opportunities for research on breeding swallows; and (3) to provide training in field ornithology for students and other volunteers.

Since its inception, the project has annually supported post-graduate, graduate and undergraduate students, has involved the training of more than 200 volunteer fieldworkers, and has resulted in over 20 peer-reviewed publications and numerous theses and presentations. The project completed its 48th year in 2018. In total 92 new adults were banded and 126 adults were recaptured with bands. An additional 632 nestlings were also banded (Table 7). In addition to collecting basic breeding parameters and maintaining the marked population, the project contributed to a long-term study examining accumulated toxins from the environment being conducted by Environment and Climate Change Canada.

Volunteers: Verena Rupprecht, Aranya Iyer, Reta Meng, Antoine Turcotte-van de Rydt, Christophe Turcotte-van de Rydt.

Table 7. Summary of Tree Swallow Project banding in 2018.

Location	Total Boxes	Active Nest Boxes	% Active Nest Boxes	New Adults Banded	Recaptured Adults	Nestlings Banded
Tip	64	30	47	24	15	52
Sewage Lagoon	62	61	98	16	52	309
Mud Creek	78	77	99	52	59	271
Total	204	168	82	92	126	632

BREEDING BIRD CENSUS

The Long Point Breeding Bird Census was established by LPBO in 1991. Fifteen 10 ha breeding bird census plots were installed across representative habitats on Long Point to monitor the response of vegetation and breeding bird communities after a deer cull. Following acquisition of Long Point in 1866, the Long Point Company reintroduced White-tailed Deer to the point. A lack of natural predators subsequently resulted in a deer population explosion that, by 1989, was demonstrating negative impacts on the fragile ecology of Long Point. In 1989/90 the Canadian Wildlife Service organized a cull of nearly 500 White-tailed Deer on Long Point to keep the herd at a sustainable level. Smaller culls have been carried out since then.

In 2018, 5 Breeding Bird Census plots were surveyed. Each plot was visited 8-10 times for 3-4 hours in the morning beginning 1 hour before sunrise, and 1-2 times in the evening between May 25 and July 5. During these visits the territories of all birds on each plot were mapped. In total, 49 species were detected during the territory mapping field work.

Field Crew: Kyle Cameron, Brett Fried, Antoine Turcotte-van de Rydt, Christophe Turcotte-van de Rydt.

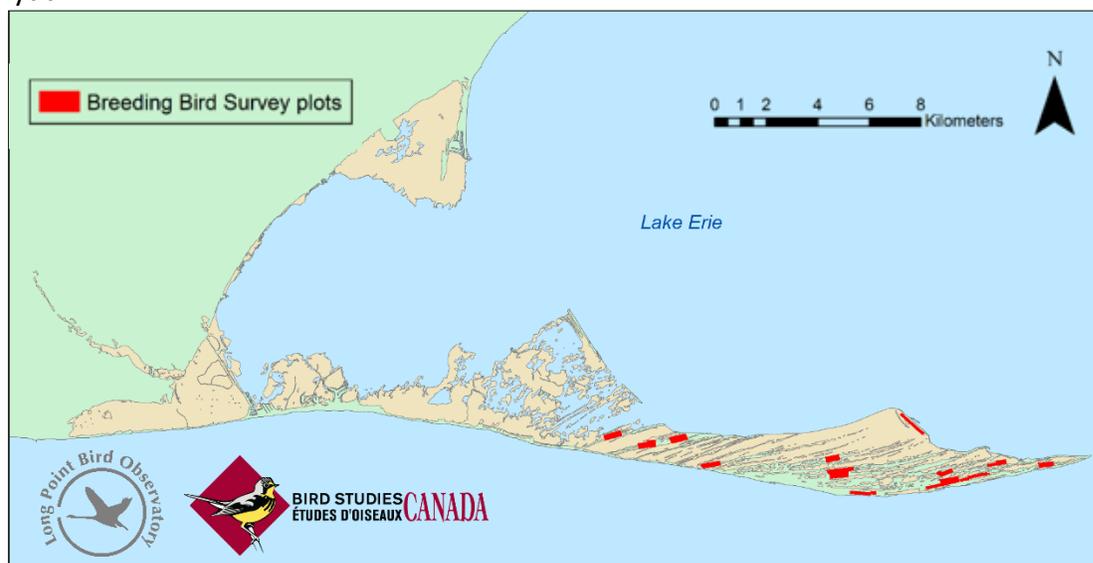


Figure 1. Map of Long Point Breeding Bird Census Plots.

NORTH AMERICAN BANDING COUNCIL - BANDER CERTIFICATION

The [North American Banding Council](#) promotes sound and ethical banding techniques and practices across the Americas. LPBO adheres to the standards, guidelines, and recommendations established by NABC, and is a steadfast contributor to their mission.

On November 4 to 5, LPBO held an NABC certification session in collaboration with the Ontario Bird Banding Association. Four new assistants and five new banders were certified.

Participants: Megan Buers - bander, Amy Wilson - assistant extractor, Kaila Ritchie - assistant bander, Jesse Lewis - assistant bander, Stefanny Villagomez - bander, Nicole Richardson - bander, Nigel Shaw - bander, Maya Longpré-Croteau - assistant bander, Alice Palmer - bander.

NABC trainers: Dayna LeClair, Matt Iles, Brett Fried, Willow English and Ross Wood.

GREAT LAKES MARSH MONITORING PROGRAM

In 2018 LPBO conducted Great Lakes Marsh Monitoring Program (GLMMP) surveys on Courtright and Squires ridges as well as Crown Marsh as part of a project to compare the diversity and abundance of wetland birds at sites that had ongoing *Phragmites australis* control to sites with no control in an effort to determine effects of those control measures. This was part of a larger effort to quantify the effects on wetland bird diversity and abundance at sites with varying degrees of *Phragmites* cover on Long Point and elsewhere in the Lake Erie ecosystem.

The historical and recent surveys on Courtright Ridge, Squires Ridge and Crown Marsh routes followed the GLMMP protocol of fixed-distance point counts (100 m semicircle) using playback to elicit responses from target species. Each route consisted of seven point count stations. In 2018, two point counts were conducted at each station during the month of June. A vegetation assessment was also conducted at each of the stations in accordance with the GLMMP protocol. Three amphibian surveys were also conducted along each route for the GLMMP. Five of the nine GLMMP target wetland species were detected on the 2018 surveys: Pied-billed Grebe, Least Bittern, American Bittern, Virginia Rail, and Common Gallinule.

Field Crew: Kyle Cameron, Mark Conboy and Ross Wood.

DOUG TARRY NATURAL HISTORY FUND

LPBO began the Young Ornithologists' Workshop in 1975, as the Bird Study Workshop. The project received major support in 1994 thanks to the generosity and foresight of the late Doug Tarry, who allowed for the establishment of the Doug Tarry Natural History Fund to support educational activities for young Canadians at LPBO. The fund supports the Young Ornithologists' Workshop and Student Internship.

Since 1991, the program has trained 163 teens, many of whom are now some of the best and brightest naturalists and scientists in the country. These programs are aimed at providing pre-university level students with an opportunity to experience nature and ornithology hands-on in a research oriented setting. Six teens from across Canada participated in the 2018 workshop in early August.

Young Ornithologists: Linden Imeson (Waterloo, ON), Erik Van Den Kieboom (Owen Sound, ON), Isaac Nelson (Kamloops, ON), Bridget Spencer (Vancouver, BC), Eva Visscher (St. Thomas, ON), Christopher Zayachkowski (Sault Ste. Marie, ON)

Young Ornithologist Interns: Maddie Davies (Cape Breton, NS) and Owen Ridgen (Cambridge, ON).

Project Assistants: James Cowan (Canadian Raptor Centre), Mary Gartshore, David Okines (Ontario Bird Banding Association), Megan Wilcox Hiebert and Amy Wilson.

LATIN AMERICAN TRAINING PROGRAM

LPBO has been operating a series of Latin American training initiatives since 1987. In 1995, LPBO began bringing trainees north to Long Point for a formal month-long (or longer) training stint immersing them in the Migration Monitoring Program. Participants receive the most up-to-date training in bird banding, migration monitoring, and data management. To date LPBO has trained over 100 individuals from 15 countries throughout Central and South America. LPBO also contributes to the development of protocols, training opportunities abroad, and certification through the North American Banding Council and the Western Hemisphere Bird Banding Network.

This year the program hosted Stefanny Villagomez from Mexico for the entire fall season. Through Bird Studies Canada additional support and training was provided for ongoing training work in Colombia associated with a project on Swainson's Thrushes and Canada Warblers.

COLLABORATIVE RESEARCH

The following is a brief summary of LPBO's collaborative research contributions in 2018. All projects are conducted with appropriate permits and have been approved by animal care committees. Project summaries were provided by the researchers.

Sex-related wing shape dimorphism and vertical take-off speed in migratory songbirds

Jessica Deakin

University of Western Ontario

The wings of migrating birds are under immense selective pressures that reflect their need to fly efficiently, exploit habitat effectively, and survive as predator or prey. Wing shape, measured by morphometric parameters, plays a vital role in determining the overall flight performance of birds. Low aspect ratio wings (short and blunt) increase take-off speed, which could result in increased predator avoidance. High aspect ratio wings (long and pointy) and low wing loading (large wings compared to body) reduce the energetic costs of flight, which could ultimately increase the overall rate of migration. Common among migratory songbirds during spring migration is protandry, meaning early male arrival. As a result, sex related differences in wing shape should represent ecological trade-offs between overall migratory flight speed and predator avoidance. As part of my PhD research, I am evaluating this relationship across various species of migratory songbirds. Birds were captured at Long Point Bird Observatory, Ontario, Canada during spring migration 2018. The birds were then released into a vertical flight chamber equipped with quad-level infrared detection sensors that measures take-off speed and acceleration. Pictures of the wings were used to determine various wing morphometrics such as wing span, wing area, and wing pointedness.

Breeding season carry-over effects of forest fragmentation on Wood Thrush (*Hylocichla mustelina*)

Brendan Boyd (PhD candidate)

York University

The Wood Thrush is an iconic North American long-distance migrant that has been steadily declining for decades. Habitat loss and fragmentation on the breeding grounds have been shown to cause short-term negative effects on immediate breeding success. However, long-term impacts on adults, or carry-over effects, have not been studied. The Motus Wildlife Tracking System, for the first time, has allowed me to examine the link between breeding fragment size and both fall migration and annual survival. Wood Thrushes occupying small fragments are expected to experience high rates of brood parasitism and nest predation. This could directly delay fall migration due to timing constraints from late re-nesting or indirectly delay migration if adults are in poorer condition. Wood Thrushes are large enough to carry radio tags with a one year battery life, allowing detection of adults who return to the study area in SW Ontario. I captured adult Wood Thrushes in large and small forest fragments in Norfolk County during the 2016-2018 breeding seasons and fitted them with radio tags in

order to track their movements. I am testing two main predictions: (1) the initiation of fall migration will occur later for birds breeding in small versus large fragments and (2) there will be a lower annual return rate for birds breeding in small versus large fragments.

Can nest concealment in Wood Thrushes predict reproductive success?

Alexandra Israel (MSc candidate)

York University

Predation is an extremely important force in nature, driving the amazing variety of defense strategies we see in prey species. The Wood Thrush (*Hylocichla mustelina*) is a long-distance migrant that has declined severely in the last 50 years and is currently listed as a threatened Species at Risk in Canada. In many species of birds, nest predation is a major source of nest failure, accounting for nearly 80% of unsuccessful nests on average. To understand how a threatened species might reduce nest failure, I investigated whether nest concealment increased the success of Wood Thrush nests. During the summer of 2017 and 2018, Wood Thrush nests were found within large and small forest fragments selected throughout Norfolk County, Ontario. I measured the amount of vegetation concealing each nest, in addition to a variety of other characteristics. With dozens of migratory songbirds in decline, and increasing numbers joining the Species at Risk list, it is critical to understand what management choices could increase nesting productivity. Predation is the leading cause of nest failure in Wood Thrushes, so finding whether nest concealment is an effective countermeasure is important for informing future conservation efforts for this declining species.

Introduction of Southern Ticks by Migratory Songbirds

John Scott

Lyme Ontario

The aim of our study is to identify ticks parasitizing migratory songbirds during northward spring migration. Specifically, we want to get 25 live ticks from several southern temperate and Neotropical passerines collected from April 15 to June 10, 2018 at the Tip of Long Point, Ontario. In order to help with identification, we will retain live, engorged ticks to molt to the next development life stage. Current taxonomic keys will be employed for *Ixodes* and *Amblyomma* species. PCR amplification and DNA sequencing may be employed for certain ticks. Novel ticks will be catalogued in a biological museum.

Save Our Swallows Project

Brodie Badcock-Parks

Nature Canada

In Ontario, swallow roosts initiate near the end of the breeding season during late July, peaking in early- to mid-August, and lasting through to mid-September within the wetlands of river deltas and along the Great Lakes shoreline, primarily. The roosts first identified using weather radar, and efforts are made to conduct passive field investigations in order to ground-truth and monitor the sites. Field investigations help to provide accurate estimates of

how many birds are using the roost, determine species assemblage, and learn more about the dynamics and vulnerability of each site. Weather radar imagery from 2016 and 2017 indicate that the extensive marshland of Long Point hosts a large roost site. We hope to monitor the roost at Long Point from the Breakwater station in hopes of gaining a better understanding of its specific location, magnitude and composition.

Determining bird diets using laser absorption spectrometry.

Keith Hobson

Western University and Environment and Climate Change Canada

Using a very non-invasive laser absorption spectrometer, breathe from migratory birds was passively sampled the bird for a few minutes before being released to determine the composition of their diet. They found a very nice breakdown of diets among the likely frugivorous candidates (thrushes, waxwings, some warblers, vireos) whereas others were purely insectivorous (most warblers). This year's work was experimental as future research plans are being established.

Understanding Bent-spike Rush (*Eleocharis geniculata*) and threats from *Phragmites australis*

Heather Polowyk

There were an estimated 531 *Eleocharis geniculata* individuals located on the edge of three wet areas on BSC property. These populations were only located once water levels dropped in early October. The populations all had low competition from other species, however, *Phragmites australis* was located close to almost all populations but in very low numbers. In addition to conducting population searches, we installed water depth data loggers to monitor changes in water levels. This information provides us with insight into the germination requirements of *E. geniculata*. To further study germination requirements, we collected 15 seed heads from random individuals throughout the population. To help characterize the threat from *P. australis*, we measured photosynthetic capacity and ambient light of *E. geniculata* to compare with *P. australis* measurements obtained previously. Lastly, three soil cores were collected for analysis of inorganic and organic carbon, macro and micro nutrients, and soil texture. No other habitat or individuals were harmed, collected or possessed.

Do birds flexibly change their metabolism in response to migratory flight?

Cory Elowe

Derrick Groom

Alexander R Gerson

University of Massachusetts Amherst

Migratory birds consume both fat and lean mass during their multi-hour flights. These reductions in mass may impact post-flight recovery, as large reductions in organ sizes like the digestive system could have functional consequences. However, little is known about the rate

of recovery from these flights, nor the metabolic strategies birds use to regain mass. Our study examines the rate of total, fat, and lean mass loss during simulated migratory flight, how rapidly birds regain these resources, and the metabolic strategies they employ during refueling. We flew myrtle warblers (*Setophaga coronata coronata*) in a climate-controlled wind tunnel for up to six hours and monitored their metabolic rate, food intake, and mass for three days before and after flight. We also scanned birds using quantitative magnetic resonance during flight and recovery, a technique that allows us to non-invasively measure dynamic changes in fat and lean mass. We predict that birds reduce their metabolic rates following flight, as this may accelerate recovery, and that the rate of recovery increases with time following flight as lean mass is replenished.

Fuel Selection Strategies of an Ultra-Long Distance Migrant

Derrick Groom

Cory Elowe

Alexander R Gerson

University of Massachusetts Amherst

Blackpoll warblers (*Setophaga striata*) are long-distance migrants flying for up to three days from the northeastern United States to the Caribbean across the Atlantic Ocean during Autumn migration. The fuel selection strategies (fat versus lean tissue) and rates of metabolic expenditure for these long flights are poorly understood. We flew blackpoll warblers for durations ranging from 1 to 28 hours in a climate-controlled wind tunnel and measured rates of metabolic expenditure using doubly-labeled water and quantitative magnetic resonance. We found that during longer flights the birds reduced their rate of lean mass consumption while fat was consumed at a continuous rate. Post-flight observations also indicated that birds flying for long durations ended their flights with visible fat stores but limited flight muscle. This suggests that lean mass may be a major determinant of migratory success and, ultimately, may impose greater limits on total possible flight duration than previously considered.

PUBLICATIONS FROM 2015-2018.

All LPBO and BSC publications are tracked via www.zotero.org (group name: Bird Studies Canada).

Adams, A.M., L.P. McGuire, L.A. Hooton, and M.B. Fenton. 2015. How high is high? Using percentile thresholds to identify peak bat activity. *Canadian Journal of Zoology* 93: 307-313.

Beauchamp, A. T. 2018. Differential Spring Migration in the White-throated Sparrow (*Zonotrichia albicollis*). Electronic Thesis and Dissertation Repository. 5654. <https://ir.lib.uwo.ca/etd/5654>

Boyd, R. J., T. R. Kelly, S. A. MacDougall-Shackleton, and E. A. MacDougall-Shackleton. 2018. Alternative reproductive strategies in white-throated sparrows are associated with differences in parasite load following experimental infection. *Biology Letters* 14: 20180194. <http://doi.org/10.1098/rsbl.2018.0194>

Bradstreet, M.S.W. 2015. Monitoring vegetation after a reduction in deer browsing at Long Point, Lake Erie: 2014. Unpublished report for Canadian Wildlife Service. 39 pp.

Brown, J.M., P.D. Taylor. 2015. Adult and hatch-year Blackpoll Warblers exhibit radically different regional-scale movements during post-fledging dispersal. *Biology Letters* 11: 20150593.

Burrell, K.G.D., J.H. Skevington, S. Kelso, M.V.A. Burrell, D.L. LeClair, and S.A. Mackenzie. 2016. A previously undocumented hybrid new world warbler (*Setophaga pensylvanica* × *S. magnolia*) captured at Long Point, Ontario. *Wilson Journal of Ornithology* (In press).

Clark, R.G., D.W. Winkler, R.D. Dawson, D. Shutler, D.J.T. Hussell, M.P. Lombardo, P.A. Thorpe, P.O. Dunn, L.A. Whittingham. 2018. Geographic variation and environmental correlates of apparent survival rates in adult tree swallows *Tachycineta bicolor*. *Journal of Avian Biology*. 49(6). <https://doi.org/10.1111/jav.01659>.

Crewe, T.L., D. Lepage, and P.D. Taylor. 2016. Effect of sampling effort on bias and precision of trends in migration counts. *The Condor: Ornithological Applications* 118: 117-138.

Crewe, T.L. and J.D. McCracken. 2015. Long-term trends in the number of Monarch Butterflies (Lepidoptera: Nymphalidae) counted on fall migration at Long Point, Ontario, Canada (1995-2014). *Annals of the Environmental Society of America* 108(5): 707-717.

Crewe, T.L., P.D. Taylor, D. Lepage, A.C. Smith, and C.M. Francis. 2016. Quantifying regional variation in population trends using migration counts. *The Journal of Wildlife Management* 80(2): 245-255.

- Crewe, T.L., P.D. Taylor, and D. Lepage. 2015. Modeling Systematic change in stopover duration does not improve bias in trends estimated from migration counts. *PLoS ONE* 10(6): e0130137.
- DeLuca, W.V., B.K. Woodworth, C.C. Rimmer, P.P. Marra, P.D. Taylor, K.P. McFarland, S.A. Mackenzie, and D.R. Norris. 2015. Transoceanic migration by a 12 g songbird. *Biology Letters* 11: 2-4.
- Dick, Morag F., 2017. The Long Haul: Migratory Flight Preparation and Performance in Songbirds. Electronic Thesis and Dissertation Repository. 4520.
<https://ir.lib.uwo.ca/etd/4520>
- Dick, Morag F., C.G. Guglielmo. 2019. Flight muscle protein damage during endurance flight is related to energy expenditure but not dietary polyunsaturated fatty acids in a migratory bird. *Journal of Experimental Biology* 2019 222: jeb187708 doi: 10.1242/jeb.187708
- Dossman, B.C., G.W. Mitchell, D.R. Norris, P.D. Taylor, C.G. Guglielmo, S.N. Matthews, and P.G. Rodewald. 2015. The effects of wind and fuel stores on stopover departure behaviour across a migratory barrier. *Behavioural Ecology* 27(2): 567-574.
- Dunn, E.H. 2016. Bird observatories: an underutilized resource for migration study. *Wilson Journal of Ornithology* 128(4): 691-984.
- Dunn, E.H. 2016. David John Trevis Hussell, 1934-2015. *The Auk* 133(3): 568-570.
- Falconer, C.M., G.W. Mitchell, P.D. Taylor, and D.C. Tozer. 2016. Prevalence of disjunct roosting in nesting Bank Swallows (*Riparia riparia*). *Wilson Journal of Ornithology* 128(2): 429-434.
- Gow, E.A., L. Burke, D.W. Winkler, S.M. Knight, D.W. Bradley, R.G. Clark, M. Belisle, et al. 2019. A Range-Wide Domino Effect and Resetting of the Annual Cycle in a Migratory Songbird. *Proceedings of the Royal Society B: Biological Sciences* 286, no. 20181916.
<https://doi.org/10.1098/rspb.2018.1916>.
- Guigueno MF, Sherry DF, MacDougall-Shackleton SA. 2016. Sex and seasonal differences in volume and neurogenesis of the song-control system are associated with song in brood-parasitic and non-brood-parasitic songbirds. *Developmental Neurobiology* 76: 1226-1240.
- Guigueno MF, MacDougall-Shackleton SA, Sherry DF. 2015. Sex differences in spatial memory in brown-headed cowbirds: Males outperform females on a touchscreen task. *PLoS ONE* 10: e0128302.

- Guigueno MF, MacDougall-Shackleton SA, Sherry DF. 2016. Sex and seasonal differences in hippocampal volume and neurogenesis in brood-parasitic brown-headed cowbirds (*Molothrus ater*). *Developmental Neurobiology* 76: 1275-1290.
- Guigueno, M.F., D.A. Snow, S.A. MacDougall-Shackleton, D.F. Sherry. 2014. Female cowbirds have more accurate spatial memory than males. *10. Biology Letters*
<http://doi.org/10.1098/rsbl.2014.0026>
- Guigueno, M.F., MacDougall-Shackleton, S.A., & Sherry, D.F. 2016. Sex and seasonal differences in hippocampal volume and neurogenesis in brood-parasitic brown-headed cowbirds (*Molothrus ater*). *Developmental neurobiology*, 76 11, 1275-1290 .
- Hao, H., M.L. Eng, F. Sun, and C.A. Morrissey. 2018. Part-per-Trillion LC-MS/MS Determination of Neonicotinoids in Small Volumes of Songbird Plasma. *Science of the Total Environment* 644: 1080–87. <https://doi.org/10.1016/j.scitotenv.2018.06.317>.
- Hobson, K. A., S.L. Van Wilgenburg, E.H. Dunn, D.J.T. Hussell, P.D. Taylor, and D.M. Collister. 2015. Predicting origins of passerines migrating through Canadian migration monitoring stations using stable-hydrogen isotope analyses of feathers: a new tool for bird conservation. *Avian Conservation and Ecology* 10(1): 3.
- Jonasson, K.A. and C.G. Guglielmo. 2016. Sex differences in spring migration timing and body composition of Silver-haired Bats *Lasionycteris noctivagans*. *Journal of Mammalogy* 97(6): 1535-1542.
- Kennedy, L.V., Y.E. Morbey, S.A. Mackenzie, P.D. Taylor, and C.G. Guglielmo. 2016. A field test of the effects of body composition analysis by quantitative magnetic resonance on songbird stopover behaviour. *Journal of Ornithology* DOI 10.1007/s10336-016-1399-2.
- Kishkinev, D., D. Heyers, B.K. Woodworth, G.W. Mitchell, K.A. Hobson, and D.R. Norris. 2016. Experienced migratory songbirds do not display goal-ward orientation after release following a cross-continental displacement: an automated telemetry study. *Scientific Reports* 6: 37326.
- Knight, S.M., D.W. Bradley, R.G. Clark, E.A. Gow, M. Bélisle, L.L. Berzins, T. Blake, et al. n.d. 2018. Constructing and Evaluating a Continent-Wide Migratory Songbird Network across the Annual Cycle. *Ecological Monographs* 0 (0).
<https://doi.org/10.1002/ecm.1298>.
- Ma, Y., B. A. Branfireun, K.A. Hobson, and C.G. Guglielmo. 2018. Evidence of negative seasonal carry-over effects of breeding ground mercury exposure on survival of migratory songbirds. *Journal of Avian Biology*. 49. 10.1111/jav.01656.

- Marshall, T.J., M.F. Dick, and C.G. Guglielmo. 2016. Seasonal dietary shifting in Yellow-rumped Warblers is unrelated to macronutrient targets. *Comparative Biochemistry and Physiology* 192: 57-63.
- McGuire, L.P., L.A. Kelly, D.E. Baloun, W.A. Boyle, T.L. Cheng, J. Clerc, N.W. Fuller, et al. 2018. Common Condition Indices Are No More Effective than Body Mass for Estimating Fat Stores in Insectivorous Bats. *Journal of Mammalogy*.
<https://doi.org/10.1093/jmammal/gyy103>.
- Mills, A.M. 2016. Banding data reveals bias in age-class sampling of songbirds during spring migration. *Journal of Field Ornithology* 87(3): 1-14.
- Milnes, E.L. 2018. Eco-Epidemiology and Treatment of Babesiosis in Cervids. Theses and dissertation. <http://hdl.handle.net/10214/14265>
- Morris, S.R., K.M. Covino, J.D. Jacobs, and P.D. Taylor. 2016. Fall migratory patterns of the Blackpoll Warbler at a continental scale. *The Auk* 133(1): 41-51.
- Müller, F., P.D. Taylor, S. Sjöberg, R. Muheim, A. Tsvey, S.A. Mackenzie, and H. Schmaljohann. 2016. Towards a conceptual framework for explaining variation in nocturnal departure time of songbird migrants. *Movement Ecology* 4:24.
- Parada, I.A. 2017. Stopover Movement Patterns by Blackpoll and Canada Warblers Across South-eastern Canada during Fall Migration: An Automated Radio-telemetry Study. Trent University.
- Scott, J.D. and L.A. Durden. 2015. New records of the Lyme disease bacterium in ticks collected from songbirds in central and eastern Canada. *International Journal of Acarology* 41(4): 241-249.
- Seewagen, C.L., Ma, Y., Morbey, Y.E. and C.G. Guglielmo. 2019. Stopover departure behavior and flight orientation of spring-migrant Yellow-rumped Warblers (*Setophaga coronata*) experimentally exposed to methylmercury. *Journal of Ornithology*
<https://doi.org/10.1007/s10336-019-01641-2>.
- Swan, D.C., L.Y. Zquette, and M. Clinchy. 2015. Brood parasites manipulate their hosts: experimental evidence for the farming hypothesis. *Animal Behaviour* 105: 29-35.

Appendix 1.

LPBO's 2018 banding totals for the Old Cut, Breakwater, and the Tip research stations, plus other special research projects.

Species & Forms	Fall				Spring				Other	Grand Total
	Old Cut	Break-water	Tip	Sub Total	Old Cut	Break-water	Tip	Sub Total		
Acadian Flycatcher	2	1	0	3	0	0	0	0		3
American Goldfinch	57	279	113	449	176	37	720	933		1382
American Kestrel	0	1	0	1	0	0	3	3		4
American Redstart	73	38	49	160	123	94	45	262		422
American Robin	38	59	29	126	29	0	8	37		163
American Woodcock	2	2	0	4	0	0	2	2		6
American Tree Sparrow	97	10	26	133	38	0	11	49		182
Baltimore Oriole	21	200	107	328	6	2	2	10		338
Barn Swallow	0	1	9	10	0	0	0	0		10
Black-and-white Warbler	38	8	12	58	11	11	5	27		85
Black-billed Cuckoo	1	1	1	3	0	2	1	3		6
Black-bellied Plover	0	0	0	0	0	0	1	1		1
Bay-breasted Warbler	7	2	4	13	17	24	21	62		75
Black-capped Chickadee	4	1	1	6	51	10	42	103		109
Belted Kingfisher	0	1	1	2	0	0	5	5		7
Brown-headed Cowbird	9	157	279	445	0	0	8	8		453
Blue-headed Vireo	57	14	13	84	36	1	22	59		143
Blackburnian Warbler	12	3	5	20	4	6	7	17		37
Blue Jay	52	98	333	483	9	2	20	31		514
Blackpoll Warbler	6	20	22	48	57	140	373	570		618
Bobolink	0	2	3	5	0	0	0	0		5

Species & Forms	Fall				Spring				Other	Grand Total
	Old Cut	Break-water	Tip	Sub Total	Old Cut	Break-water	Tip	Sub Total		
Bonaparte's Gull	0	0	0	0	0	0	2	2		2
Brown Creeper	148	89	71	308	95	3	98	196		504
Brown Thrasher	13	32	32	77	7	1	1	9		86
Black-throated Blue Warbler	35	9	13	57	46	7	13	66		123
Black-throated Green Warbler	12	3	10	25	11	12	12	35		60
Blue-winged Warbler	4	4	3	11	0	0	0	0		11
Carolina Wren	4	1	0	5	6	1	0	7		12
Canada Warbler	18	4	6	28	15	4	4	23		51
Clay-coloured Sparrow	0	1	0	1	0	0	0	0		1
Cedar Waxwing	9	12	13	34	30	4	36	70		104
Cerulean Warbler	0	1	0	1	0	0	0	0		1
Chipping Sparrow	14	223	84	321	3	0	41	44		365
Cape May Warbler	12	10	8	30	12	47	28	87		117
Common Grackle	178	40	101	319	31	1	10	42		361
Cooper's Hawk	0	0	0	0	0	0	1	1		1
Common Loon	0	0	0	0	1	0	0	1		1
Common Nighthawk	0	1	0	1	0	0	0	0		1
Connecticut Warbler	0	1	0	1	2	0	4	6		7
Common Redpoll	0	0	0	0	0	0	1	1		1
Common Tern	0	0	0	0	0	0	1	1		1
Common Yellowthroat	66	101	107	274	47	15	21	83		357
Chestnut-sided Warbler	31	19	25	75	10	13	8	31		106
Dickcissel	0	1	0	1	0	0	0	0		1

Species & Forms	Fall				Spring				Other	Grand Total
	Old Cut	Break-water	Tip	Sub Total	Old Cut	Break-water	Tip	Sub Total		
Downy Woodpecker	3	16	10	29	9	2	12	23		52
Eastern Bluebird	0	11	1	12	0	0	0	0	5	17
Eastern Kingbird	2	10	10	22	4	0	0	4		26
Eastern Phoebe	45	15	10	70	38	4	54	96		166
Eastern Screech-Owl	0	0	0	0	0	0	1	1		1
Eastern Towhee	7	6	13	26	6	0	2	8		34
Eastern Wood-Pewee	14	29	33	76	11	11	10	32		108
European Starling	9	10	11	30	6	0	0	6		36
Eastern White-crowned Sparrow	17	93	60	170	14	0	56	70		240
Eastern Whip-Poor-Will	0	1	1	2	1	0	0	1		3
Field Sparrow	5	59	29	93	11	5	15	31		124
Fox Sparrow	28	6	1	35	13	0	4	17		52
Great Blue Heron	0	0	0	0	0	0	1	1		1
Great Crested Flycatcher	7	6	2	15	4	0	2	6		21
Golden-crowned Kinglet	249	110	46	405	295	0	213	508		913
Grey-cheeked Thrush	21	10	6	37	45	9	28	82		119
Grey Catbird	157	187	55	399	61	16	7	84		483
Green Heron	0	0	1	1	0	0	0	0		1
Grasshopper Sparrow	0	1	0	1	0	0	0	0		1
Gamble's White-crowned Sparrow	1	1	0	2	0	0	0	0		2
Golden-winged Warbler	0	1	0	1	0	1	0	1		2
Hairy Woodpecker	0	2	1	3	0	0	0	0		3
Hermit Thrush	125	65	14	204	142	2	186	330		534

Species & Forms	Fall				Spring				Other	Grand Total
	Old Cut	Break-water	Tip	Sub Total	Old Cut	Break-water	Tip	Sub Total		
House Finch	4	0	0	4	17	0	7	24		28
House Sparrow	58	2	10	70	94	0	7	101		171
Hooded Warbler	3	0	1	4	1	0	0	1		5
House Wren	66	32	20	118	83	35	35	153		271
Indigo Bunting	1	41	19	61	1	2	6	9		70
Kentucky Warbler	0	1	0	1	0	0	0	0		1
Killdeer	0	1	3	4	0	0	0	0		4
Kirtland's Warbler	0	0	0	0	1	0	0	1		1
Least Flycatcher	51	56	87	194	64	23	67	154		348
Least Sandpiper	0	0	0	0	0	0	1	1		1
Lincoln's Sparrow	42	43	114	199	5	1	4	10		209
Louisiana Waterthrush	0	3	0	3	0	0	0	0		3
Magnolia Warbler	180	76	81	337	176	92	47	315		652
Marsh Wren	1	1	0	2	4	0	4	8		10
Mourning Dove	8	1	8	17	4	0	4	8		25
Mourning Warbler	7	8	9	24	11	1	2	14		38
Myrtle Warbler	65	94	71	230	319	26	101	446		676
Nashville Warbler	31	28	19	78	70	16	29	115		193
Northern Cardinal	21	16	9	46	32	0	0	32		78
Northern Mockingbird	0	0	0	0	0	0	1	1		1
Northern Parula	12	2	1	15	6	11	6	23		38
Northern Waterthrush	14	55	13	82	11	20	14	45		127
Northern Rough-winged Swallow	2	5	2	9	0	0	0	0		9
Northern Shrike	0	0	0	0	1	0	1	2		2

Species & Forms	Fall				Spring				Other	Grand Total
	Old Cut	Break-water	Tip	Sub Total	Old Cut	Break-water	Tip	Sub Total		
Northern Saw-whet Owl	0	0	0	0	40	0	295	335		335
Orange-crowned Warbler	1	1	1	3	6	0	6	12		15
Orchard Oriole	0	8	5	13	0	0	0	0		13
Olive-sided Flycatcher	0	1	0	1	0	0	0	0		1
Ovenbird	32	19	13	64	15	4	1	20		84
Philadelphia Vireo	19	7	21	47	14	6	13	33		80
Pine Siskin	3	1	1	5	16	0	243	259		264
Pine Warbler	1	2	1	4	1	0	0	1		5
Prothonotary Warbler	0	1	0	1	0	0	0	0		1
Purple Finch	0	2	2	4	27	19	127	173		177
Purple Martin	1	0	3	4	0	0	0	0	2	6
Rose-breasted Grosbeak	15	161	47	223	8	16	1	25		248
Red-breasted Nuthatch	2	0	0	2	57	20	313	390		392
Red-bellied Woodpecker	0	1	1	2	1	0	2	3		5
Ruby-crowned Kinglet	276	168	108	552	585	1	197	783		1335
Red-eyed Vireo	28	16	42	86	98	52	21	171		257
Red-headed Woodpecker	0	4	6	10	0	0	0	0		10
Red-tailed Hawk	0	0	0	0	1	0	0	1		1
Rusty Blackbird	0	7	2	9	0	0	4	4		13
Red-winged Blackbird	279	271	295	845	6	1	18	25		870
Savannah Sparrow	1	6	47	54	0	0	4	4		58
Semipalmated Plover	0	0	0	0	0	0	1	1		1
Semipalmated Sandpiper	0	0	0	0	0	0	1	1		1
Slate-coloured Junco	506	76	176	758	67	0	128	195		953

Species & Forms	Fall				Spring				Other	Grand Total
	Old Cut	Break-water	Tip	Sub Total	Old Cut	Break-water	Tip	Sub Total		
Scarlet Tanager	2	9	7	18	1	3	0	4		22
Song Sparrow	147	98	209	454	58	4	114	176		630
Spotted Sandpiper	0	1	0	1	0	0	1	1		2
Sharp-shinned Hawk	0	0	0	0	11	1	14	26		26
Summer Tanager	1	0	1	2	0	0	0	0		2
Swamp Sparrow	71	54	54	179	75	0	28	103		282
Swainson's Thrush	117	54	39	210	162	59	51	272		482
Tennessee Warbler	6	4	8	18	19	47	10	76		94
Tree Swallow	15	32	7	54	0	0	0	0	736	790
Trail's Flycatcher	24	24	61	109	31	13	24	68		177
Veery	26	11	10	47	43	7	9	59		106
Vesper Sparrow	0	0	1	1	0	0	2	2		3
Virginia's Warbler	0	0	1	1	0	0	0	0		1
Warbling Vireo	13	11	23	47	57	16	5	78		125
White-breasted Nuthatch	0	2	0	2	10	0	46	56		58
White-crowned Sparrow	3	0	1	4	6	0	32	38		42
White-eyed Vireo	6	2	1	9	0	0	1	1		10
Wilson's Warbler	35	46	44	125	19	14	10	43		168
Winter Wren	31	9	7	47	20	0	8	28		75
Wood Thrush	20	15	3	38	1	0	0	1		39
Western Palm Warbler	27	19	27	73	13	8	30	51		124
White-throated Sparrow	665	270	317	1252	229	0	166	395		1647
Yellow-breasted Chat	1	1	0	2	1	0	1	2		4
Yellow-billed Cuckoo	0	2	2	4	0	0	1	1		5

Species & Forms	Fall				Spring				Other	Grand Total
	Old Cut	Break-water	Tip	Sub Total	Old Cut	Break-water	Tip	Sub Total		
Yellow-bellied Flycatcher	50	13	37	100	34	24	20	78		178
Yellow-bellied Sapsucker	4	3	1	8	3	0	9	12		20
Yellow Warbler	80	175	229	484	33	15	13	61		545
Yellow Palm Warbler	0	0	0	0	2	0	0	2		2
Yellow-shafted Flicker	8	16	10	34	8	1	3	12		46
Totals	4,194	1,388	3,265	8,847	4,483	2,786	6,033	13,302	743	24,612

