Frontenac Breeding Birds

Report on the 2009 Field Season

Red-eyed Vireo banded in Frontenac Provincial Park (Seabrooke Leckie)

FRONTENAC BIRD STUDIES
AVIAN MONITORING & RESEARCH IN THE FRONTENAC ARCH

MIGRATION RESEARCH FOUNDATION

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Background

Migration Research Foundation

The Migration Research Foundation (MRF) was established in 2002 to support conservation and wildlife management efforts through the study of animal distributions and movements, and the dissemination of this knowledge within the scientific community and to the public at large. All MRF programs are overseen by a four-person volunteer board of directors.

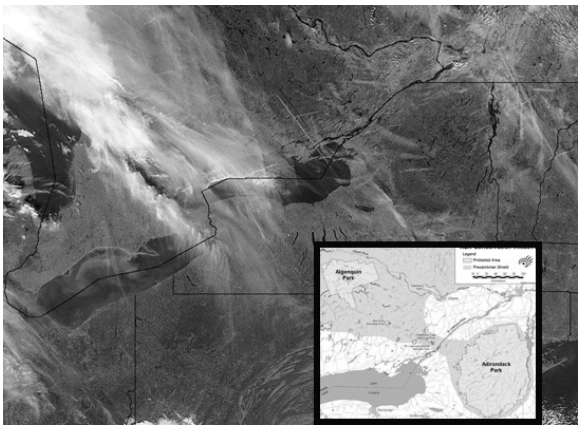
Frontenac Bird Studies

Frontenac Bird Studies (FBS) was created by the Migration Research Foundation (MRF) in 2009 with the understanding that proactive science and educational programming will be vital to the protection of the extraordinary socio-cultural and natural heritage of the Frontenac Arch. The primary goal of the FBS project is to strengthen the capacity for protection of bird populations and habitats in the region.

FBS Objectives

Objectives of FBS are to: a) increase knowledge of avian populations and ecology in the Frontenac Axis; b) establish long-term monitoring programs to track changes in avian communities; c) raise awareness through public outreach and community support; and d) cooperate with analogous agencies to increase capacity for protection of biodiversity.

The Frontenac Axis



The Frontenac Axis is an ancient span of Precambrian bedrock that connects the Canadian Shield of central and northern Ontario to the Adirondack and Appalachian regions to the south. Over a billion years old, the Frontenac Axis is considered the “backbone” of Eastern North America and one of the most biologically diverse regions in Canada. As a unique zone of bio-geographic overlap with convergent ecoregions, the Frontenac Axis has the highest number of federally and provincially listed species at risk than anywhere else in Canada. The landform is also an important corridor of habitats for the migration and dispersal of wildlife. The Frontenac Arch Biosphere Reserve was established in 2002, in recognition of the region’s significance to cultural and biological heritage.

Formerly a mountain range, the present-day Frontenac Axis was formed by glacial retreat and millenia of erosion, which has resulted in the distinctive shield topography of ridges and valleys with shallow soils. The rugged landscape of the region has hindered agricultural land use and commercial development. Roughly 40% of the Frontenac Axis consists of forest cover, 30% is wetland and 15% agricultural, with the remainder being human settlements. Despite that the majority of the region is in a “natural” state, just 7% of the Biosphere Reserve is protected from development. This percentage consists primarily of Provincial Parks (Frontenac, Charleston Lake, Murphy's Point) a national park (St. Lawrence Islands), as well as some scattered nature reserves and conservation areas.

Birds on the Axis

The North American Bird Conservation Initiative (NABCI) indicates that relative to other areas of Southern Ontario, the Frontenac Axis has a “high proportion of forest, shrubland and low intensity agricultural habitats” and that diversity of breeding birds is “exceptionally high” (Ontario Partners in Flight 2006). The NABCI plan for

region 13 (Lower Great Lakes/St. Lawrence Plain) lists 42 priority species, of which 35 occur on the Frontenac Axis. The plan for region 12 (Boreal Hardwood Transition) lists 51 priority species, of which 43 occur in this area.

A total of 15 bird species classified as Species At Risk (provincial and/or federal) occur or have occurred historically on the Frontenac Axis. Of these, Cerulean Warbler, Louisiana Waterthrush, Golden-winged Warbler, Common Nighthawk and Whip-poor-will occur in the region in nationally significant densities. Though not considered "at risk", Prairie Warbler and Red-shouldered Hawk are two of many examples of rare/sensitive species with high concentrations in the region.

Frontenac Breeding Birds

Program Overview

Frontenac Breeding Birds, the flagship program of our FBS project, was designed as an integrated approach to monitoring - an approach that concurrently derives both annual primary demographic statistics and basic population parameters of breeding landbirds. In 2009, the program utilized a point count regime throughout a defined study area to systematically assess relative abundance, species richness and distribution through the combined use of roadside and off-road point count surveys. We also began annual assessments of breeding bird demographics through the installation of the Monitoring Avian Productivity and Survivorship (MAPS) program and a nest monitoring scheme. At present, primary demographic data (e.g. productivity, adult survivorship, parasitism/predation rates) are absent for most if not all bird species in the region. The North American Bird Conservation Initiative has identified avian demographics as a primary monitoring objective for "species or study areas of high management concern/interest" in the Ontario region (Ontario Partners in Flight 2006). Data on vital rates such as productivity, survivorship, fidelity and recruitment are critical to the detection and reversal of causal factors in population trends. The first year of field studies alone has generated a previously non-existent database on breeding bird demography for this region - a vital platform for long-term monitoring and research.

The rich diversity of species on the Frontenac Axis, including fifteen Species At Risk, is cause for extensive monitoring and stewardship. As a third objective of the program, we carefully documented any rare species detected during all fieldwork operations within the breeding season and also performed additional inventory work in appropriate habitats for select species. This effort will greatly enhance current knowledge of density and distribution of rare species in the area.

Study Area

A study area of over 15,000 hectares, roughly located between the towns of Sydenham and Westport, ON, was selected as the best available context for the Frontenac Breeding Birds program (Appendix A). This area, in the northern section of the Frontenac Axis, is at the heart of the transition from the Mixedwood Plains and Boreal Shield. The study area includes Frontenac Provincial Park at its centre, a designated threshold-wilderness of over 5000 hectares. Frontenac Provincial Park is a model unit to measure breeding bird populations given its size, location, protected status and high diversity of habitats and species. The landscape surrounding Frontenac Provincial Park receives a higher degree of anthropogenic pressure, which will facilitate vital comparative analysis. The study area is mostly privately owned with the exception of the park, a few small crown land parcels and the Helen Quilliam Sanctuary, owned by the Kingston Field Naturalists. The sanctuary was not surveyed in any manner during 2009 field operations.

Historical and Contemporary Studies of Birds in the Frontenac Axis

Breeding Bird Survey (BBS)

The Breeding Bird Survey (BBS) is the continental standard for assessing temporal and spatial shifts in populations of breeding birds. Our study area contains part of one BBS route (312-Glendower), which follows the western boundary (Bedford Rd-Canoe Lake Road). This stretch of secondary road has been covered annually since 2004 by members of the Kingston Field Naturalists. The route carries on from the north end of Canoe Lake southwest to Highway 38 via Westport Road. A total of fifty roadside point counts (3 minute duration) are evenly distributed along the length of the route, of which less than half are located within the FBS study area.

Queen's University Biological Station

The Queen's University Biological Station (QUBS) has been actively studying Cerulean and Golden-winged Warblers, along with other species in the Frontenac Axis, specifically in an area near Opinicon Lake (approx.15 km east of study area). Inventories of Cerulean Warbler populations have extended beyond the QUBS property to include a larger portion of the Frontenac Axis.

Kingston Field Naturalists

The Kingston Field Naturalists (KFN) is an active group with a deep background of natural history inventory in the Kingston area. The club conducts a host of bird monitoring work for the region as a whole, including the Forest Bird Monitoring Program (FBMP), Red-shouldered Hawk and Spring Woodpecker Survey and the Great Lakes Marsh Monitoring Program. The KFN has participated in both editions of the Ontario Breeding Bird Atlas and has conducted inventory and documentation of Species at Risk within the region.

Ontario Breeding Bird Atlas

Published in 1987, the first edition of the Ontario Breeding Bird Atlas (OBBA) was based on five years of extensive field inventory of breeding birds across Ontario from 1981-1985. Published in 2007, the second edition of the OBBA facilitated a landmark comparative analysis of trends and shifts in distribution of Ontario's breeding bird populations. These province-wide five-year assessments are repeated every two decades and are, in combination with BBS results, the important groundwork for monitoring, conservation and research.

The sheer size of the province of Ontario (over one million km^2) necessitates that the OBBA coverage be an extensive rather than intensive sample. Six OBBA squares contain some portion of the FBS study area, with one square measuring approximately 100 km^2. Between 2001-2005, a total of 543 hours of effort were accumulated for these six squares, which represents an average of 90 hours per square or 18.8 hours/square/year. Using this calculation, an hour of effort was used to derive results depicting 531 hectares. The proposed *Frontenac Bird Studies* initiative would build on the foundational efforts of the OBBA to begin a more in-depth assessment of breeding birds within a core study area.

Other Studies

Dougan & Associates and Bill McLeish Consulting (2006)

A detailed assessment of Species at Risk in Frontenac Provincial Park was produced in 2006 by Dougan & Associates and Bill McLeish Consulting (Brinker, S. and B. McLeish 2006). An inventory of several bird species was conducted, which focused on Cerulean Warbler, Red-shouldered Hawk and Louisiana Waterthrush. A total of 71 point count surveys were completed, primarily along trail systems. This report will be referenced as Brinker and McLeish 2006 throughout this report.

Ecological Services (2004)

Ecological Services, a local environmental consulting firm, conducted a large-scale life science inventory of Frontenac Provincial Park in 2002 and 2003. Presence/absence information of all bird species found were included in the 2004 report along with more detailed documentation of Species at Risk encountered. This report will be referenced as Ecological Services (2004) throughout this report.

2009 Results

Point Count Surveys

Methods

An extensive system of roadside and offroad point count stations was employed to provide a base index of relative abundance and distribution of breeding avifauna within the study area. Due to the size of the study area and the overall scale of the project, it was decided that maximizing coverage would be of more value than conducting repeat visits to fewer stations. Therefore, all stations were visited only once between June 1-June 25, the period of peak activity for most breeding bird species of the region.

Each point count survey was conducted from a fixed location (termed station) identified by UTM (NAD83) and a written description in field notes. All birds were recorded by sight and sound during specified time intervals (0-3min, 3-5min and 5-10min) and distance from centre of station (0-50m, 5-100m and >100m). All stations were visited within four hours after sunrise and were reached on foot from appropriate access points (offroad stations) or by vehicle along roadways (roadside stations). This protocol was adopted to portray bird populations given both the landscape characteristics and project objectives while still complimenting other regional and continental standards (e.g. Ontario Breeding Bird Atlas, Breeding Bird Survey, Forest Bird Monitoring Program).

A total of 63 offroad stations were distributed throughout Frontenac Provincial Park. The limitations of time and available staff dictated that surveys within the park be organized into routes of 8-12 stations, spaced by 330m. This would allow a route to be completed on foot in under four hours, covering a distance of nearly 4 km. Ecological Services (2004) identified four major terrestrial habitat zones within the park (Mature Maple-Oak Forest, Young Maple-Ironwood Forest, Rock Barren and Mature Mixed Forest). An attempt was made to distribute stations by proportional representation of these zones, however the limited number of access points and remarkable heterogeneity of the park's habitats proved this easier to do on paper than in practice.

The methodology for the roadside point counts completed in 2009 was the same as for the offroad counts with the exception of spacing between stations along routes. Offroad stations were spaced at a minimum of 330m intervals while roadside stations were spaced at a minimum of 500m intervals. A total of 101 point count stations were surveyed along secondary and tertiary roads within the study area boundaries. Refer to Appendix B for a map of all point count station locations.

Results

A total of 164 point count stations were surveyed in the study area between June 1 and June 25, 2009, the period of peak breeding activity and vocalization for most species. Weather during this period was atypically cool and unsettled with frequent periods of high wind and precipitation. These weather anomalies severely limited detection probabilities on many mornings in June, which made scheduling point counts a challenge. Unfortunately, only four stations were completed in Rock Barrren habitat within Frontenac Provincial Park in 2009, which was due to both weather and access difficulties. This particular habitat zone, though extensive, is generally remote and difficult to traverse. An effort will be put forth in 2010 to properly evaluate breeding bird communities in this unique and important habitat.

The overall efforts of 2009 have produced a considerable database on breeding birds in the study area. To be as concise as possible, this report will focus on summarizing principal results while more in-depth analysis will follow at a later date when appropriate.

Of 63 offroad point count stations in Frontenac Provincial Park, 764 individual birds were recorded for an average of 12.12 individuals per survey. Roadside stations yielded 1269 birds for an average of 12.56 individuals per survey. Species richness was significantly higher at roadside stations as would be expected along major edges astride a matrix of secondary and primary habitats. At the habitat level, diversity and abundance was highest in the Young Maple Ironwood Forest zone. Refer to Table 1 for detailed summary of overall point count results.

Table 1. Summary of Point Count Results

Station Variable	Points	Total Birds	Total Species	Ave Birds/Point	Ave Species/Point
Offroad	63	764	68	12.12698	8.71
Roadside	101	1269	88	12.56436	9.1
Mature Maple-Oak	12	143	38	11.91667	8.08
Young Maple Ironwood	37	467	58	12.62162	9.02
Mature Mixed	10	114	33	11.4	8.5
Rock Scrub Barrens	4	40	19	10	8.25

At the species level, Red-eyed Vireo was the most abundant species detected overall – ranking in the top two in all habitats sampled. A total of 324 Red-eyed Vireos were recorded from all surveys combined, followed by Red-winged Blackbird (131), American Robin (89) and Ovenbird (81). A list of most abundant species recorded by habitat zone is provided in Table 2 below. In Mature Maple-Oak, Cerulean Warbler, a designated Species at Risk, is the second most abundant bird species present. Results for Mature Mixed Forest surveys indicate that Yellow-rumped 'Myrtle' Warbler, Pine Warbler, Black-and-white Warbler, Chipping Sparrow and Blue Jay were strongly associated. Field Sparrow, Common Yellowthroat, Northern Flicker, Eastern Kingbird and Wilson's Snipe are dominant in the Rock Scrub Barrens. In the Young Maple-Ironwood zone, American Robin, Red-winged Blackbird, American Redstart and Rose-breasted Grosbeak are common.

Table 2. Top Ten Species per habitat and type

Species	Mature Maple-Oak	Species	Mature Mixed	Species	Rock Scrub Barren	Species	Young Maple-Ironwood
Red-eyed Vireo	37	Red-eyed Vireo	13	Field Sparrow	8	Red-eyed Vireo	104
Cerulean Warbler	11	Yellow-rump. Warbler	10	Red-eyed Vireo	4	American Robin	27
Cedar Waxwing	10	Blue Jay	8	Common Yellowthroat	3	Red-winged Blackbird	25
Eastern Wood-Pewee	10	Song Sparrow	8	Rose-br.. Grosbeak	3	American Redstart	22
Red-winged Blackbird	8	American Robin	6	Wilson's Snipe	3	Scarlet Tanager	21
Ovenbird	6	Scarlet Tanager	6	Song Sparrow	2	Rose-br. Grosbeak	18
American Robin	5	Black-& white Warbler	6	Red-winged Blackbird	2	Eastern Wood-Pewee	14
Baltimore Oriole	5	Chipping Sparrow	5	Northern Flicker	2	Common Grackle	13
Great Cr. Flycatcher	5	Pine Warbler	5	Eastern Kingbird	2	Cerulean Warbler	13

In Table 3 the data have been corrected for effort and are presented as a rate of abundance by habitat zone (average number of individuals per station). Results show clear preferences of species to particular habitat zones. Of particular note is the strong association of Cerulean Warbler with Mature Maple-Oak, as would be expected, but also the high frequency of detection in younger stands as well. Field Sparrow is clearly a bird of the open ridge-tops and rock barrens. A more thorough coverage of the Rock Barrens in 2010 will be instructive as a guild of species is expected to be associated (e.g. Eastern Towhee), however the sample size in 2009 is probably too small to accurately reflect true patterns. Expectedly, the coniferous favouring Black-throated Green Warbler, Chipping Sparrow, Pine Warbler and Yellow-rumped Warbler were most commonly found in mixed forest stands, which are primarily found along shorelines of lakes, although some very interesting inland stands were also found during the surveys.

Table 3. Species abundance by habitat (individuals recorded per station) with correction for variable effort

Species	Mature Maple-Oak	Mature Mixed	Rock Scrub Barren	Young Maple-Ironwood	Grand Total	Total Birds
American Crow	0.17	0.10		0.11	0.11	7
American Goldfinch	0.08	0.40		0.08	0.13	8
American Redstart	0.25			0.59	0.40	25
American Robin	0.42	0.60	0.25	0.73	0.62	39
Baltimore Oriole	0.42	0.20		0.19	0.22	14
Barn Swallow		0.10			0.02	1
Black-and-white Warbler	0.17	0.60		0.27	0.29	18
Black-billed Cuckoo	0.08			0.11	0.08	5
Black-capped Chickadee	0.17	0.40		0.30	0.27	17
Blue Jay	0.08	0.80	0.25	0.30	0.33	21
Black-throated Gr. Warbler	0.17	0.30		0.11	0.14	9
Canada Goose				0.03	0.02	1
Cedar Waxwing	0.83			0.22	0.29	18
Cerulean Warbler	0.92			0.35	0.38	24
Chipping Sparrow	0.25	0.50		0.14	0.21	13
Common Grackle	0.08	0.30	0.25	0.35	0.29	18
Common Loon		0.20	0.25	0.05	0.08	5
Common Raven	0.17	0.10		0.11	0.11	7
Common Yellowthroat	0.08	0.20	0.75	0.19	0.21	13
Chestnut-sided Warbler				0.03	0.02	1
Downy Woodpecker				0.05	0.03	2
Eastern Kingbird		0.10	0.50	0.08	0.10	6
Eastern Phoebe	0.08			0.08	0.06	4
Eastern Towhee				0.08	0.05	3
Eastern Wood-Pewee	0.83			0.38	0.38	24
Field Sparrow			2.00	0.24	0.27	17
Great Blue Heron		0.10		0.03	0.03	2
Great Crested Flycatcher	0.42	0.30		0.27	0.29	18
Great Horned Owl		0.20			0.03	2
Hairy Woodpecker	0.08		0.25	0.11	0.10	6
Hermit Thrush	0.08			0.11	0.08	5
Indigo Bunting				0.05	0.03	2
Killdeer		0.10			0.02	1
Least Flycatcher				0.14	0.08	5
Louisiana Waterthrush	0.08				0.02	1
Mourning Dove			0.50		0.03	2
Yellow-rumped Warbler		1.00		0.11	0.22	14
Northern Flicker	0.08	0.20	0.50	0.22	0.21	13
Northern Waterthrush	0.08			0.05	0.05	3
Ovenbird	0.50			0.32	0.29	18
Pine Siskin		0.10			0.02	1
Pine Warbler	0.17	0.50		0.05	0.14	9
Pileated Woodpecker	0.08			0.08	0.06	4
Prairie Warbler		0.10	0.25		0.03	2
Purple Finch	0.08			0.03	0.03	2
Rose-breasted Grosbeak	0.08	0.20	0.75	0.49	0.38	24
Red-breasted Nuthatch		0.30			0.05	3
Red-eyed Vireo	3.08	1.30	1.00	2.81	2.51	158
Red-shouldered Hawk	0.25			0.05	0.08	5
Red-tailed Hawk				0.03	0.02	1
Ruby-throated Hummingbird	0.08			0.03	0.03	2
Red-winged Blackbird	0.67	0.30	0.50	0.68	0.60	38
Scarlet Tanager	0.42	0.60	0.25	0.57	0.52	33
Song Sparrow	0.08	0.80	0.50	0.19	0.29	18
Spotted Sandpiper				0.03	0.02	1
Swamp Sparrow				0.03	0.02	1
Tree Swallow				0.03	0.02	1
Unidentified Woodpecker				0.08	0.05	3
Veery				0.03	0.02	1
Warbling Vireo	0.08		0.25	0.08	0.08	5
White-breasted Nuthatch				0.24	0.14	9
Wilson's Snipe		0.20	0.75		0.08	5
Wood Thrush				0.11	0.06	4

White-throated Sparrow		0.10			0.02	1
Yellow-billed Cuckoo			0.25	0.24	0.16	10
Yellow-bellied Sapsucker	0.08	0.10		0.05	0.06	4
Yellow-throated Vireo	0.17			0.05	0.06	4
Yellow Warbler				0.08	0.05	3
Grand Total						

*Species with results showing marked habitat associations are highlighted

Surveys within Frontenac Provincial Park spanning approximately 24 kilometres of habitat indicated that forest cover was largely dry-mesic, predominantly deciduous and with a characteristically open understorey. These features explain the relatively low numbers of singing Catharus thrushes detected on point counts in the park (e.g. Veery). Forest cover surrounding Frontenac Provincial Park is more varied in age with a more recent and cyclic pattern of disturbance. This factor produces more forest and woodland with denser understoreys that are favoured by Veery, Wood Thrush and a few other species such as Black-throated Blue Warbler. Conversely, Hermit Thrush, a species that prefers forest interior sites, was more frequently encountered at stations within the park than at roadside stations.

A lack of shrubland habitat in Frontenac Provincial Park was also apparent and is a strong contributing factor to low numbers of shrub specialists such as Yellow Warbler, Gray Catbird, and Golden-winged Warbler. Shrubs generally occur here in narrow bands along perimeters of waterbodies and are often semi-permanently flooded. The near total absence of shrub thickets and dense undergrowth of the park's forests was also an influential factor in ground searches for suitable Monitoring Avian Productivity and Survivorship (MAPS) sites.

In Table 4, the point count data have been corrected for effort and are presented as a rate of abundance by count type (offroad vs. roadside). It must be stressed that this analysis is presented without calibration for vegetation type and structure or hydrology but is rather only considering presence/absence of a road. Furthermore, there is significant variation in degree of anthropogenic disturbance at roadside stations – ranging from low (gravel/dirt road through mature forest) to high (paved road through agricultural area). Despite this, the data provide some generalized insight into the preference of various species for either edge/early succession or interior/mature conditions. Cerulean Warbler, Hermit Thrush, Eastern Wood Pewee and Scarlet Tanager were substantially more abundant in offroad stations while Chipping Sparrow, Gray Catbird, Ovenbird and Wood Thrush, among others, were more frequently detected along roadsides.

Table 4. Species abundance by count type (offroad vs. roadside) with correction for variable effort (Individuals per station)

Species	Offroad	Road	Species	Offroad	Road	Species	Offroad	Road	Species	Offroad	Road
American Crow	0.11	0.39	Common Raven	0.11	0.11	Least Flycatcher	0.08	0.03	Red-winged Blackbird	0.6	0.92
American Goldfinch	0.13	0.32	Common Yellowthroat	0.21	0.36	Louisiana Waterthrush	0.02		Savannah Sparrow		0.05
American Redstart	0.4	0.14	Chestnut-sided Warbler	0.02	0.06	Mallard		0.01	Scarlet Tanager	0.52	0.39
American Robin	0.62	0.5	Downy Woodpecker	0.03	0.02	Mourning Dove	0.03	0.17	Song Sparrow	0.29	0.44
Baltimore Oriole	0.22	0.24	Eastern Kingbird	0.1	0.14	Mourning Warbler		0.01	Spotted Sandpiper	0.02	
Barn Swallow	0.02	0.05	Eastern Meadowlark		0.11	Yellow-rumped Warbler	0.22	0.03	Swamp Sparrow	0.02	0.08
Black-and-white Warbler	0.29	0.26	Eastern Phoebe	0.06	0.1	Nashville Warbler		0.02	Tree Swallow	0.02	0.05
Black-billed Cuckoo	0.08	0.02	Eastern Towhee	0.05	0.15	Northern Flicker	0.21	0.12	Unidentified Woodpecker	0.05	0.01
Black-capped Chickadee	0.27	0.39	Eastern Wood-Pewee	0.38	0.22	Northern Waterthrush	0.05	0.04	Veery	0.02	0.08
Belted Kingfisher		0.01	European Starling		0.05	Northern R.-wing.Swallow		0.01	Virginia Rail		0.01
Brown-headed Cowbird		0.02	Field Sparrow	0.27	0.05	Ovenbird	0.29	0.62	Warbling Vireo	0.08	0.15
Blue-headed Vireo		0.01	Great Blue Heron	0.03	0.03	Pine Siskin	0.02		White-breasted Nuthatch	0.14	0.21
Blackburnian Warbler		0.03	Great Crested Flycatcher	0.29	0.21	Pine Warbler	0.14	0.15	Wilson's Snipe	0.08	0.06
Blue Jay	0.33	0.44	Great Horned Owl	0.03		Pileated Woodpecker	0.06	0.04	Wood Duck		0.01
Bobolink		0.13	Gray Catbird		0.09	Prairie Warbler	0.03		Wood Thrush	0.06	0.16
Brown Creeper		0.01	Green Heron		0.01	Purple Finch	0.03	0.06	White-throated Sparrow	0.02	0.01
Brown Thrasher		0.03	Grasshopper Sparrow		0.01	Rose-breasted Grosbeak	0.38	0.22	Yellow-billed Cuckoo	0.16	0.06
Black-throated Blue Warbler		0.02	Golden-winged Warbler		0.01	Ring-billed Gull		0.01	Yellow-bellied Sapsucker	0.06	0.08
Black-throated Green Warbler	0.14	0.12	Hairy Woodpecker	0.1	0.12	Red-breasted Nuthatch	0.05	0.07	Yellow-throated Vireo	0.06	0.03
Canada Goose	0.02		Hermit Thrush	0.08		Red-eyed Vireo	2.51	1.64	Yellow Warbler	0.05	0.2
Cedar Waxwing	0.29	0.17	Hooded Merganser		0.01	Rock Pigeon		0.03			
Cerulean Warbler	0.38	0.06	House Sparrow		0.01	Red-shouldered Hawk	0.08	0.03			
Chipping Sparrow	0.21	0.44	House Wren		0.06	Red-tailed Hawk	0.02				
Common Grackle	0.29	0.22	Indigo Bunting	0.03	0.2	Ruby-throated Hummingbird	0.03	0.03			
Common Loon	0.08	0.1	Killdeer	0.02	0.02	Ruffed Grouse		0.03			

Discussion

Results presented here for point count surveys in 2009 represent the first dataset of what should be a long-term monitoring objective. This monitoring will track shifts in population size and distribution of breeding bird species within and surrounding Frontenac Provincial Park. Furthermore, the point count data, collected over the long-term, has the potential to assess changes in the environment and their impacts on biodiversity in the region.

It is recommended that habitat zones not adequately covered in 2009 be covered in 2010 (e.g. Rock Scrub Barren zone) and that all survey routes be sampled on a rotating basis at specific temporal intervals. This approach would have the advantage of streamlining annual operational efficiency and ensuring long-term duration of the surveys.

Demographics

Monitoring Avian Productivity and Survivorship (MAPS)

Background

The Breeding Bird Survey (BBS) and Christmas Bird Count (CBC) are two primary sources of data used to derive population trends for North American birds. These long-standing programs can be used to determine rates of population change for many species but fail to identify causal factors effecting detected trends. Only an integrated approach to monitoring that includes the systematic collection of demographic statistics will provide the necessary tools for tracking and reversing declining bird populations.

Modeled after the Constant Effort Ringing scheme in the United Kingdom, the Monitoring Avian Productivity and Survivorship (MAPS) program was initiated in 1989 to provide long-term demographic data for North American landbirds. After a four-year pilot study, the MAPS program was endorsed by Partners in Flight, U.S. Geological Survey and the U.S. Fish and Wildlife Service indicating that MAPS was “the most important project in the nongame bird monitoring arena since the creation of the Breeding Bird Survey”. Over 1000 MAPS stations have been activated since 1989 contributing heavily to research, land management and conservation strategies at local, regional and continental scales.

MAPS Objectives (Desante et.al. 2009)

MAPS **Monitoring** Objectives are to provide:

- annual indices of adult population size and post-fledging productivity;
- annual estimates of adult survival rate, adult population size, proportion of residents in the adult population, and recruitment into the adult population.

MAPS **Research** Objectives are to identify and describe:

- temporal and spatial patterns in the demographic indices and estimates provided by MAPS
- relationships between these temporal and spatial patterns and (1) ecological characteristics of the target species (e.g., migration strategy, nest location), (2) population trends of the target species (e.g., areas or locations with increasing or decreasing trends), (3) station specific and landscape-level habitat characteristics (e.g., total forest cover, mean forest patch size), and (4) spatially-explicit weather data (e.g., mean, min, and max temperature or precipitation, extreme events).

MAPS **Management** Objectives are to:

- determine the proximate demographic cause(s) of population decline, that is, whether the decline is caused by low productivity or low survivorship.
- to identify and formulate landscape-level management actions and conservation strategies to reverse population declines and maintain stable or increasing populations.

- evaluate, through the adaptive management process, the effectiveness of those management actions and conservation strategies that are actually implemented. In all cases, these management objectives are to be achieved for multiple target species at the appropriate spatial scale.

Methods

Each MAPS station is roughly square or circular in shape and encompasses an area of 20 hectares. Standardized mistnetting is conducted within a core area of about 8 hectares. The MAPS program divides the breeding season into ten 10-day periods: (1) May 1-10; (2) May 11-20; (3) May 21-30; (4) May 31-June 9; (5) June 10-19; (6) June 20-29; (7) June 30-July 9; (8) July 10-19; (9) July 20-29; and (10) July 30-August 8. As part of the Northeast region with a later start to the breeding season, MAPS stations in Ontario commence operations during period four and complete during period ten for a total of seven visits (1 visit=7 field hours for a total of 49 hours of fieldwork) from May 31-August 8.

For each visit, mistnets are erected precisely at local sunrise time, checked at regular intervals of 20 minutes and are closed after six hours of operation. Each net location is coded and will be reused in all subsequent MAPS seasons to ensure methodological consistency. Birds are safely captured, measured and released for the duration of each six-hour visit to the MAPS site. As a mark-recapture study, the MAPS program utilizes mistnetting to acquire detailed demographic information on species, capture location (net #), sex, age, moult and feather condition, fat, and breeding condition scores of all individuals captured and recaptured. This data is entered into provided field data sheets and then entered into MAPSPROG, a specially designed program for MAPS data. Effort data (start/finish times, capture data, net operation etc.) is also tabulated at the end of each field day and entered into MAPSPROG.

A Breeding Status List is carefully maintained throughout the MAPS season to provide a complete assessment of the summer residency status of all species present at each station each season. Nesting behavior, singing, and other indicators of presence of each species are recorded during each visit to facilitate identification of active breeders, transients and non-breeders within the study site.

A Habitat Structure Assessment (HSA) is conducted during the first year of each MAPS station to provide a classification for each station, permit detection of gross changes in habitat structure at the station that may explain changes in population demographics, and provide station-specific habitat data to complement remotely-sensed landscape data at a fine resolution.

MAPS Station Information

Three MAPS stations were installed on protected lands within the study area by staff and volunteers in May 2009. All three stations were registered with the Institute for Bird Populations (IBP), administrating organization of the MAPS program. Sites selected for the stations included Hemlock Lake (HELA), located on crown land east of Canoe Lake Road, Rock Ridge (RRID) near Big Clear Lake within Frontenac Provincial Park and Maplewood Bog (MABO) on crown land north of Devil Lake Road. The HELA station was closed after only two visits due to a combination of low capture volume and inhibiting terrain for fieldwork. Rock Ridge and Maplewood Bog proved to be productive sites and were operated for complete seasons. Below is a more detailed summary of each station operated in 2009.

Hemlock Lake (HELA)

The HELA station was installed on crown land astride the northern section of Canoe Lake Road. The site contains a large beaver pond bordered by mixed forest dominated by Eastern Hemlock. The mature hemlocks around the pond appeared to have sustained considerable damage from insect infestation, possibly Hemlock Borer or Hemlock Looper. The habitat was regenerating from this damage, creating an unusual amount of dense undergrowth for the area. This made the site particularly attractive for MAPS as both adults and young tend to concentrate in dense second-growth habitats during the latter half of the breeding season. Black-and-white Warbler, Brown Creeper, Yellow-bellied Sapsucker, Chestnut-sided Warbler and Ovenbird were common breeders at the site while male Blackburnian and Magnolia Warbler held territories

just outside the station boundaries. Unfortunately, after two visits it was decided that the uneven terrain, dense blowdown and thorny scrub made the site unfeasible as a long-term MAPS station. Our two visits indicated a fairly small population of adults, although the site had great potential for attracting large numbers of post-breeding dispersers later on in the summer.

Rock Ridge (RRID)

The RRID station was chosen primarily for its appropriate geographical situation, a long scrubby ridge bound by water on three sides – ideal for channeling late summer post-breeding dispersal. The site also had a diverse breeding bird community with large numbers of White-throated Sparrow, Field Sparrow, Eastern Towhee, Black-and-white Warbler and Nashville Warbler, among others. This site was burned over around 1930 and is very slowly regenerating due to the shallow till and expanses of exposed bedrock. Vegetation cover ranges from open mixed woodland to successional deciduous forest to rock scrub barrens.

Maplewood Bog (MABO)

The MABO station was installed on crown land on the north side of Devil Lake Road, north of Frontenac Provincial Park. Like HELA, the crown land parcel is relatively small and surrounded by largely undisturbed private lands. The name Maplewood Bog was chosen for the site because of the predominance of mid-succession Sugar Maple forest and the presence of multiple bogs. MABO also features smaller components of rock scrub barren habitat and mixed open woodlands. This site was particularly attractive for its lower lying Sugar Maple-Oak forest and preponderance of small/shrubby wetlands. Of all the stations, it was clear that MABO had the densest and most varied population of breeding avifauna. Dominant species included Veery, Ovenbird, Northern Waterthrush and American Redstart.

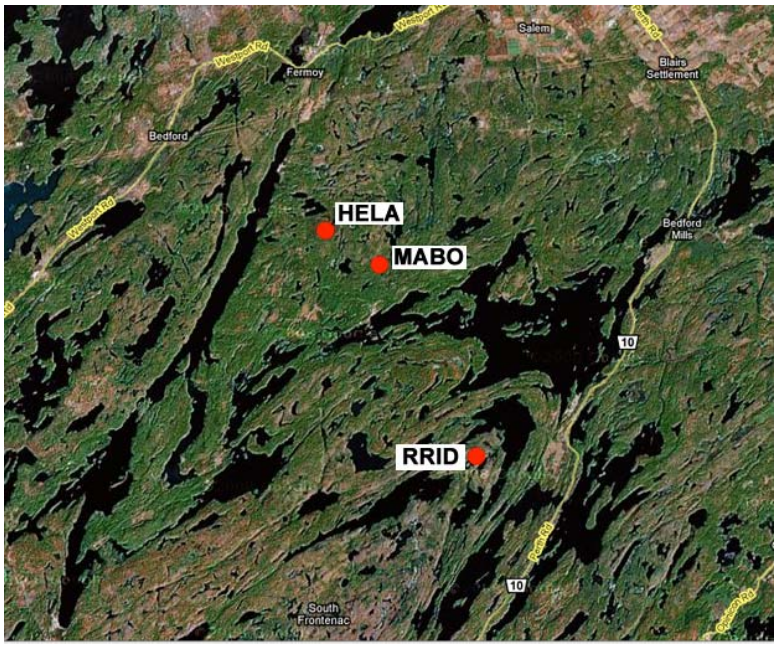


Figure 1. MAPS station locations

Banding Results

A total of 325 individual birds were captured during the MAPS season at MABO and RRID. An average of 19 birds were banded per visit with data from both stations combined. Each station employs ten mistnets for a period of six hours per visit. The overall rate of capture for both stations was .38 birds captured/net hour. This rate is consistent with what is expected for a banding operation during the breeding season and overall capture results are comparable to MAPS stations operated elsewhere in the United States and Canada.

Table 5. Summary of MAPS effort/banding totals by station

LOC	STATION	DATE	Period	Net Hours	START	END	Banded	Recap	Unb	Total Captures
AXIS	MABO	6/5/2009	4	60	530	1130	22	2	2	26
AXIS	RRID	6/6/2009	4	60	530	1130	23	2		25
AXIS	MABO	6/14/2009	5	60	530	1130	14	8		22
AXIS	RRID	6/16/2009	5	60	530	1130	9	1		10
AXIS	MABO	6/23/2009	6	60	520	1120	36	9		45
AXIS	RRID	6/27/2009	6	60	520	1120	23	5		28
AXIS	MABO	7/6/2009	7	60	520	1120	24	6		30
AXIS	RRID	7/8/2009	7	60	520	1120	8	1	1	10
AXIS	MABO	7/17/2009	8	60	530	1130	25	6		31
AXIS	RRID	7/20/2009	9	60	540	1140	15			15
AXIS	MABO	7/25/2009	9	60	540	1140	18	5	1	24
AXIS	RRID	7/28/2009	9	60	550	1150	13		1	14
AXIS	MABO	8/3/2009	10	60	600	1200	15	4		19
AXIS	RRID	8/7/2009	10	60	600	1200	24	2		26
			Totals	840			269	51	5	325

*Unb refers to birds captured and released unbanded

At Rock Ridge, 115 birds were banded, of which 11 were recaptured upon subsequent visits to the station. A total of 33 species were sampled during the summer, a diverse assemblage. In terms of abundance, American Robin, Black-and-white Warbler, Eastern Towhee and Red-eyed Vireo were most commonly captured. Mistnetting also sampled Yellow-rumped Warbler, White-throated Sparrow and Field Sparrow in moderate numbers. Other captures of note include a single adult Broad-winged Hawk and two records each of Yellow-billed and Black-billed Cuckoo.

Table 6. Rock Ridge (RRID) Banding Results

SPEC	Band	Rec	Unb	Total	SPEC	Band	Rec	Unb	Total
American Robin	19	1		20	Black-billed Cuckoo	2			2
Black-and-white Warbler	12	1		13	Blue Jay	2			2
Eastern Towhee	7	2		9	Cedar Waxwing	2			2
Red-eyed Vireo	7	2		9	Common Grackle	2			2
Black-cap. Chickadee	6	1		7	Yellow-billed Cuckoo	2			2
Yellow-rumped Warbler	7			7	Yellow-shafted Flicker	2			2
Song Sparrow	5	1	1	7	Brown-headed Cowbird	1			1
Chipping Sparrow	5	1		6	Broad-winged Hawk	1			1
White-throated Sparrow	4	2		6	Common Yellowthroat	1			1
Field Sparrow	5			5	Eastern Kingbird	1			1
Hermit Thrush	4			4	Eastern Phoebe	1			1
Hairy Woodpecker	3			3	Great Crest. Flycatcher	1			1
Nashville Warbler	3			3	Red-breasted Nuthatch	1			1
Rose-breast. Grosbeak	3			3	Ruby-thr. Hummingbird			1	1
American Redstart	2			2	Scarlet Tanager	1			1
Baltimore Oriole	2			2	Veery	1			1
Black-billed Cuckoo	2			2	Totals	115	11	2	128

*Unb refers to birds captured and released unbanded

At MABO, the busier of the two stations, a total of 154 birds of 33 species were banded, of which 40 were subsequently recaptured. Veery, Black-capped Chickadee and Red-eyed Vireo were the most abundant species at the station – accounting for 30% of all birds banded during the season. The spiraling songs of Veery were omnipresent during our visits and our data indicates that a dense population of adults was present but it is likely that some transient adults were also sampled. The maple-oak forest at MABO has a denser understorey than was typically found in Frontenac Provincial Park, thus providing the appropriate conditions for both Veery and Wood Thrush to breed here. Other notable results include moderate numbers of species associated with aquatic habitats such as Common Yellowthroat, Northern Waterthrush and Swamp Sparrow. Rock Barren specialists such as Eastern Towhee and Field Sparrow along with scrub species like Indigo Bunting, Gray Catbird and Chestnut-sided Warbler were also sampled at MABO.

Table 7. Maplewood Bog (MABO) Banding Results

SPEC	Band	Rec	Unb	Grand Total	SPEC	Banded	Recap	Unb	Grand Total
Veery	13	7		20	Eastern Towhee	2			2
Black-capped Chickadee	17	2		19	Field Sparrow	2			2
Red-eyed Vireo	16	2		18	Hairy Woodpecker	2			2
Common Yellowthroat	11	4		15	Nashville Warbler	2			2
American Robin	10	4		14	Ruby-thr. Hummingbird			2	2
Northern Waterthrush	8	6		14	Scarlet Tanager	2			2
Gray Catbird	9	3		12	Swamp Sparrow	2			2
Song Sparrow	10	2		12	American Goldfinch	1			1
American Redstart	6	2		8	Baltimore Oriole	1			1
Ovenbird	5	3		8	Blue Jay	1			1
Black-and-white Warbler	4	2		6	Chipping Sparrow	1			1
White-breasted Nuthatch	5	1		6	Downy Woodpecker	1			1
Wood Thrush	5	1		6	Hermit Thrush	1			1
Rose-breasted Grosbeak	4		1	5	Indigo Bunting	1			1
Chestnut-sided Warbler	3	1		4	Magnolia Warbler	1			1
Yellow-bellied Sapsucker	4			4	Red-breasted Nuthatch	1			1
Yellow-rumped Warbler	3			3	Total	154	40	3	197

Productivity

Mark-recapture techniques, such as those used in the MAPS program, are essential to calculating avian demography. Each bird captured was aged, sexed, and carefully measured for breeding evidence. A complete summary of productivity statistics per species is presented below in Table 8. Age ratios are one of a few tools available in the measurement of avian productivity for a site, region or continent. After a summer with high nest success, the proportion of young birds in the population reaches an annual high. Simply put, the degree to which this proportion varies is considered an index of productivity.

At Rock Ridge, a total of 75 adults and 42 young birds (termed hatch-year) were banded during the course of the season. Therefore, of the total, 35.9% were young birds, which is lower than would be expected for a viable breeding population. Young birds outnumbered adults for just nine species at Rock Ridge in 2009. As previously mentioned, June and July of 2009 were unusually cool with high winds and frequent precipitation in the Frontenac region. Weather may have been a factor contributing to low

nest success rates. MAPS is a monitoring program and it will be critical to collect data using the same protocol for a period of at least five years to generate accurate demographics statistics.

At MABO, productivity was even lower as just 32.5% of all birds banded were young birds. Young birds outnumbered adults for eight species in 2009. Perhaps the most telling of the species showing low productivity were Veery and Northern Waterthrush, which are two of the most abundant species present and yet just one young bird was encountered between them. Results were a little more positive for Common Yellowthroat, Black-capped Chickadee and Chestnut-sided Warbler.

Table 8. Age ratios of species captured at MABO

SPEC	AHY	SY	ASY	HY	Total Adults	Total HY	% HY	Total
American Goldfinch	1				1		0.0%	1
American Redstart	1	4		1	5	1	16.7%	6
American Robin	3	4		3	7	3	30.0%	10
Baltimore Oriole				1	0	1	100.0%	1
Black-and-white Warbler	1	1	1	1	3	1	25.0%	4
Black-capped Chickadee	6			11	6	11	64.7%	17
Blue Jay	1				1		0.0%	1
Chipping Sparrow	1				1		0.0%	1
Common Yellowthroat	1	3	1	6	5	6	54.5%	11
Chestnut-sided Warbler	1			2	1	2	66.7%	3
Downy Woodpecker				1	0	1	100.0%	1
Eastern Towhee		1		1	1	1	50.0%	2
Field Sparrow		1		1	1	1	50.0%	2
Gray Catbird	2	5		2	7	2	22.2%	9
Hairy Woodpecker			1	1	1	1	50.0%	2
Hermit Thrush				1	0	1	100.0%	1
Indigo Bunting	1				1		0.0%	1
Magnolia Warbler	1				1		0.0%	1
Yellow-rumped Warbler	1	1		1	2	1	33.3%	3
Nashville Warbler	1		1		2		0.0%	2
Northern Waterthrush	6	2			8		0.0%	8
Ovenbird		4		1	4	1	20.0%	5
Rose-breasted Grosbeak	1	3	1		5		0.0%	5
Red-breasted Nuthatch				1	0	1	100.0%	1
Red-eyed Vireo	13			3	13	3	18.8%	16
Ruby-thr. Hummingbird	1			1	1	1	50.0%	2
Scarlet Tanager		1		1	1	1	50.0%	2
Song Sparrow	6			4	6	4	40.0%	10
Swamp Sparrow		1		1	1	1	50.0%	2
Veery	5	4	3	1	12	1	7.7%	13
White-breasted Nuthatch		2		3	2	3	60.0%	5
Wood Thrush	1	1	2	1	4	1	20.0%	5
Yellow-bellied Sapsucker	1	1	1	1	3	1	25.0%	4
Grand Total	56	39	11	51	106	51	32.5%	157

*AHY=After Hatch-year SY=Second-year ASY=After Second-year HY=Hatch-year
*Highlighted species – hatch-year individuals outnumber adults captured


Common Nighthawk nest at Rock Ridge (Derbyshire)

Table 9. Age ratios of species captured at RRID

SPEC	AHY	SY	ASY	HY	Total Adults	Total HY	%HY	Total
American Redstart				2	0	2	100.0%	2
American Robin	1	4		14	5	14	73.7%	19
Baltimore Oriole		2			2		0.0%	2
Black-and-white Warbler	1	5	2	4	8	4	33.3%	12
Black-billed Cuckoo		1	1		2		0.0%	2
Black-capped Chickadee	2	3		1	5	1	16.7%	6
Brown-headed Cowbird	1				1		0.0%	1
Blue Jay			1	1	1	1	50.0%	2
Broad-winged Hawk	1				1		0.0%	1
Cedar Waxwing	1	1			2		0.0%	2
Chipping Sparrow	1	2		2	3	2	40.0%	5
Common Grackle		2			2		0.0%	2
Common Yellowthroat				1	0	1	100.0%	1
Eastern Kingbird		1			1		0.0%	1
Eastern Phoebe				1	0	1	100.0%	1
Eastern Towhee	3	2		2	5	2	28.6%	7
Field Sparrow	1	3		1	4	1	20.0%	5
Great Crested Flycatcher	1				1		0.0%	1
Hairy Woodpecker		2	1		3		0.0%	3
Hermit Thrush		1		3	1	3	75.0%	4
Yellow-rumped Warbler	3	2		2	5	2	28.6%	7
Nashville Warbler		1	1	1	2	1	33.3%	3
Rose-breasted Grosbeak	1	1	1		3		0.0%	3
Red-breasted Nuthatch				1	0	1	100.0%	1
Red-eyed Vireo	6		1		7		0.0%	7
Ruby-throated Hummingbird				1	0	1	100.0%	1
Scarlet Tanager				1	0	1	100.0%	1
Song Sparrow	2	2		2	4	2	33.3%	6
Veery				1	0	1	100.0%	1
White-throated Sparrow		3		1	3	1	25.0%	4
Yellow-billed Cuckoo			2		2		0.0%	2
Yellow-shafted Flicker		2			2		0.0%	2
Grand Total	25	40	10	42	75	42	35.9%	117

*Highlighted species - hatch-year individuals outnumber adults captured

Analysis of daily captures by age class at RRID indicate a small but steady increase of young birds appearing over the course of the summer. Hatch-year birds peaked during visit 5 at MABO, which is unusually early (post-fledge dispersal usually peaks in late July). These young birds represent a mix of both newly fledged young birds within the MAPS site and dispersing individuals from the surrounding landscape. This "young superperiod" is key in the calculation of annual productivity indices.

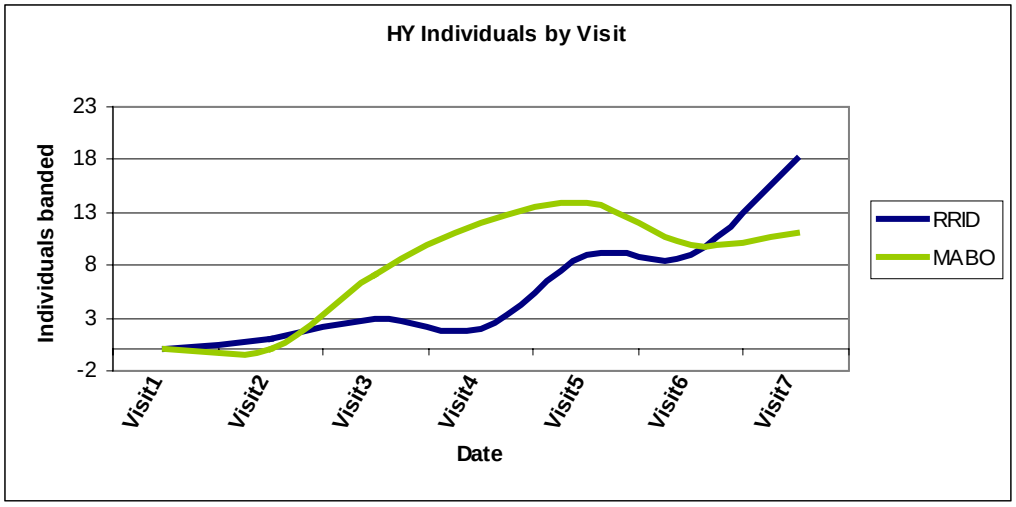


Figure 2. Hatch-year individuals banded by visit for MAPS stations

Breeding Status Results

In any defined study area, there is both an active breeding bird population and a non-breeding population. These non-breeding birds can be unmated males and/or transients, consisting of migrants, failed breeders, and post-breeding dispersers. For accurate analysis, it is critical to separate breeders from non-breeders. During each visit to RRID and MABO, birds were carefully observed to determine breeding status of each species encountered in the study area. Various criteria are used as evidence of breeding activity (e.g. distraction display, nest discovered).

At RRID, a total of 71 species were detected at the site. Of these, 42 were confirmed as breeders (B) and an additional 7 species were classed as likely breeders (L). The remaining species (22) were designated as either migrants (M) or non-breeding transients (T). This procedure will be executed each year to further weed out the breeders from non-breeders. Highlights of those confirmed as breeders in 2009 include Whip-poor-will (nest) and Common Nighthawk (nest). There was also an intriguing record of a male Northern Parula singing in late July. The bird was designated as a migrant as no suitable habitat is known to occur locally and no further data was gathered on the bird's status.

At MABO, 68 species were detected in 2009, 3 fewer than RRID. Of 68 species, 40 were confirmed as breeders and another 7 were listed as likely breeders. The remaining 19 species have been listed as non-breeding transient species. At least two male Cerulean Warblers seemed to be holding territory at the site in late May/early June but vacated the area by mid-June and were probable migrants. Highlights of confirmed breeders include Ruffed Grouse (fledged young), Wilson's Snipe, Yellow-throated Vireo, Veery (nest) and Ovenbird (nest).

Discussion

The 2009 MAPS season was a great success as a diverse avian community was sampled in sufficient quantity to validate the continuation and expansion of the MAPS program in the Frontenac Axis. Furthermore, no injuries or mortalities to captured birds occurred during the course of the season. The following is a breakdown of species that were captured in sufficient numbers to reliably monitor their vital rates on an annual basis (minimum of two adults/season). Adding more stations to the network will significantly improve database strength and also increase species/habitat coverage.

Table 10. Applicable species for annual demographic monitoring based on 2009 data from MABO/RRID

Species	Adults	Species	Adults
Red-eyed Vireo	20	Hairy Woodpecker	4
American Robin	12	Nashville Warbler	4
Veery	12	Ovenbird	4
Black-and-white Warbler	11	Wood Thrush	4
Black-capped Chickadee	11	White-throated Sparrow	3
Song Sparrow	10	Yellow-bellied Sapsucker	3
Northern Waterthrush	8	Baltimore Oriole	2
Rose-breasted Grosbeak	8	Black-billed Cuckoo	2
Gray Catbird	7	Blue Jay	2
Yellow-rumped Warbler	7	Cedar Waxwing	2
Eastern Towhee	6	Common Grackle	2
American Redstart	5	White-breasted Nuthatch	2
Common Yellowthroat	5	Yellow-billed Cuckoo	2
Field Sparrow	5	Yellow-shafted Flicker	2
Chipping Sparrow	4	Total Species	29

Nest Monitoring

Nest searching and monitoring can be labour intensive, however a well designed and executed study produces significant benefits, including an ability to discern patterns of nest-success, predation, parasitism and relationships of these patterns to specific habitat variables. In 2009, as an adjunct to our MAPS studies, we employed a nest search/monitoring component. The information collected is of considerable value to the

Frontenac Breeding Birds program as well as to the ongoing provincial/regional schemes (e.g. Ontario Nest Records Scheme (ONRS) and Project Nestwatch).

Results

A total of 54 nest records of 31 species were recorded on ONRS cards throughout the summer. Nests discovered near or within MAPS stations were monitored through nest outcome while some records encountered during surveys in Frontenac Provincial Park were not revisited. Only thirteen of fifty-four nests could be confidently assigned nest outcome codes. Of these, eight nests failed and five successfully reared young. This sample size is quite low and an effort should be made to increase the total number of nests monitored to "completion". There were no instances of brood parasitism by Brown-headed Cowbirds for any of the nest records in 2009. Brown-headed Cowbird is a difficult species to find in the densely forested study area, although they do occur.

There were some unusual and exciting finds during our first year of nest monitoring. There were two nest records of Winter Wren, one of which turned out to be a "dummy nest" built by a male at the now defunct HELA MAPS station. A Veery nest in a Common Juniper at MABO fledged young around mid-June. A Northern Waterthrush nest at HELA failed for unknown reasons shortly after egg laying. A Common Nighthawk nest with two eggs was discovered at RRID on June 2,2009. The female incubated the eggs until late June but no evidence was obtained to indicate that successful fledging had occurred. Perhaps the most exciting nest was that of a Whip-poor-will with two blind young close to Big Clear Lake in Frontenac Provincial Park. This record will likely qualify as the earliest known Whip-poor-will nest for the province of Ontario.

Table 11. 2009 Nest Records. (Nest outcome codes – OU=Unknown, F=Failed, S=Successful)

Nest Card #	Species	First Date	Final Date	Visits	Outcome
209296	Winter Wren	8/6/09	19/6/2009	3	OU
209304	Great Blue Heron	5/10/09	25/5/2009	2	OU
209329	Ovenbird	6/14/09	7/6/09	5	F
209295	Winter Wren	5/26/09	6/12/09	3	OU
209321	Yellow-bellied Sapsucker	5/8/09	5/10/09	4	OU
209319	Pileated Woodpecker	3/20/09	6/13/09	3	OU
209300	Veery	6/5/09	6/23/09	5	S
209324	Northern Waterthrush	5/18/09	6/5/09	3	F
209310	Hairy Woodpecker	6/1/09	6/5/09	2	OU
209311	Hairy Woodpecker	6/8/09	6/8/09	1	OU
209307	Hairy Woodpecker	6/8/09	6/8/09	1	OU
209314	Red-eyed Vireo	6/10/09	6/10/09	1	OU
209328	American Robin	5/12/09	6/6/09	3	OU
209326	Yellow-bellied Sapsucker	5/5/09	5/9/09	2	OU
209316	American Robin	6/10/09	6/10/09	1	OU
209308	American Robin	6/10/09	6/10/09	1	OU
209305	Common Nighthawk	6/2/09	6/27/09	4	OU
209298	Black-and-white Warbler	6/9/09	6/15/09	2	OU
209286	Red-eyed Vireo	6/20/09	6/20/09	1	OU
209286	Red-eyed Vireo	6/20/09	6/20/09	1	OU
209303	Great Blue Heron	5/18/09	5/26/09	2	OU
209318	Eastern Wood-Pewee	6/17/09	6/26/09	4	OU
209333	American Robin	6/11/09	6/23/09	4	OU
209284	American Robin	6/10/09	6/10/09	1	OU
209285	Eastern Phoebe	6/17/09	7/1/09	7	OU
209289	Red-eyed Vireo	6/27/09	7/1/09	5	OU
209291	Red-eyed Vireo	6/22/09	6/25/09	4	OU
209332	American Redstart	6/17/09	6/24/09	3	F

209294	Song Sparrow	7/25/09	8/4/09	2	OU
209331	American Redstart	6/14/09	6/18/09	2	F
209330	Wood Thrush	6/14/09	6/18/09	3	F
209320	Scarlet Tanager	5/24/09	6/23/09	6	OU
209299	Field Sparrow	6/5/09	6/14/09	2	F
209317	Baltimore Oriole	6/17/09	6/17/09	1	OU
209313	Northern Rough-winged Swallow	6/6/09	6/27/09	3	OU
209297	Rose-breasted Grosbeak	5/23/09	6/19/09	3	OU
209301	Chipping Sparrow	6/9/09	6/9/09	1	OU
209325	Brown Creeper	5/18/09	6/12/09	3	S
209327	Osprey	4/16/09	7/9/09	5	F
209302	Great Blue Heron	5/18/09	5/26/09	2	OU
209200	Red-shouldered Hawk	3/28/09	6/21/09	8	F
209315	Blue Jay	6/17/09	6/17/09	1	S
209288	American Robin	6/27/09	7/8/09	2	OU
209322	Yellow-shafted Flicker	5/18/09	6/13/09	3	OU
209287	Wood Thrush	6/25/09	6/25/09	1	OU
209312	Mourning Dove	6/4/09	6/20/09	4	OU
209306	Whip-poor-will	6/2/09	6/2/09	1	S
209293	Eastern Phoebe	7/20/09	7/20/09	1	OU
194175	Field Sparrow	7/25/09	8/2/09	2	OU
	Red-eyed Vireo	6/24/09	6/25/09	2	OU
	American Robin	6/24/09	6/24/09	1	OU
	Red-eyed Vireo	6/24/09	6/24/09	1	OU
	American Robin	6/24/09	6/24/09	1	S
	Gray Catbird	6/24/09	6/24/09	1	OU

Species at Risk

Whip-poor-will (COSEWIC-Threatened, SARO-Threatened)

The recently completed Ontario Breeding Bird Atlas found a pronounced decline amongst a guild of species called “aerial foragers”, those that feed on flying insects. Not just limited to Ontario, most aerial foragers (e.g. swallows, swifts, nightjars etc.) are rapidly disappearing across the continent and the causes remain largely unknown. The Whip-poor-will was once much more common across Southern and Central Ontario than it is today. In Ontario, this nocturnal insectivore remains most abundant along a narrow band of the Southern Shield, including the Frontenac Axis.

Because the Whip-poor-will is a nocturnal species, both the Breeding Bird Survey and state/provincial breeding bird atlas programs are incapable of monitoring them. It is therefore necessary to implement a specific program with a tailored protocol for tracking the Whip-poor-will and other nightjar species.

A growing list of northeastern and central states (9 total) have banded together to monitor and study the population trends and ecology of the Whip-poor-will. This effort is generating a new resource of population data that will contribute greatly to conservation. Ontario has no analogous program specifically directed to the monitoring and study of Whip-poor-wills and other nightjars. Recognizing this shortfall, we decided to initiate monitoring nightjars with currently accepted protocols within the proposed study area.

Methods

The protocol used for Project Whip-poor-will was adapted from the methodology used in various states by the Northeast Nightjar Survey. Lunar phase and weather are key factors for Whip-poor-will surveys as the birds vocalize most frequently when the face of the moon is >50% illuminated. Therefore, the position of a well

illuminated moon above the horizon on warm, clear nights with little or no wind, are needed to accurately detect abundance and distribution.

Surveys routes were distributed along secondary and tertiary roads in the northern section of the study area. This section of the study area contains a varied mix of habitats ranging from open agricultural fields with small forest fragments to mature contiguous deciduous forest. Forty stations were spaced by 1000m along four main routes covering 40 km of distance.

Each station was surveyed for ten minutes and any vocalizing nightjars were mapped spatially using a compass bearing and estimation of distance from observer (m). The ten-minute survey was broken down into 1-minute intervals and any encountered birds were allotted to the specific minute of first encounter. Start time, UTM, weather conditions and station notes were also taken during each survey.

Results

An impressive concentration of Whip-poor-wills was noted during four nights of surveys in early July. Due to other commitments of the project in May and June, the first available period of quarter-full moon was missed, which forced us to initiate surveys during the next available period in July. A total of 46 Whip-poor-wills were detected from forty surveys (refer to Appendix D for a map of results). Seventeen stations had zero encounters, meaning that 46 individuals were drawn from 29 stations for an average of 1.6 birds/station. Nine stations had one encounter, seven had two, five had three and two had four Whip-poor-wills. Numbers recorded at many stations were conservative judgments as instances of birds changing positions and overlapping singing often made determinations difficult. It is likely that at least some stations had more individuals than were recorded on field sheets.

Analyses of route level totals indicate some clear associations of Whip-poor-wills to specific areas of the landscape. The Westport route, consisting of six stations within a largely open agricultural area with small forest fragments had only a single Whip-poor-will. The Canoe Lake Road route, which consisted of nine stations through a heavily forested landscape, held 7 birds. Conversely, routes passing through forested areas with frequent small to medium sized clearings had high numbers of Whip-poor-will. This was particularly evident along stretches of Devil Lake Road and McAndrews Road where rock barrens and/or light agricultural fields bordered by mid-successional forest were prevalent.

Table 12. Summary of Whip-poor-will survey results

Route	Station	Date	Start Time	Temp	Sky	Wind	Moon	Cars	WPWI
McAndrews	McA1	1-Jul-09	22:11	26	20	0	75%	0	4
McAndrews	McA2	1-Jul-09	22:24					0	3
McAndrews	McA3	1-Jul-09	22:37					0	2
McAndrews	McA4	1-Jul-09	22:49		30	0	75%	0	1
McAndrews	McA5	1-Jul-09	23:01					0	1
McAndrews	McA6	1-Jul-09	23:14		20	0	75%	0	0
McAndrews	McA7	1-Jul-09	23:36	24	50	0	75%	0	2
McAndrews	McA8	1-Jul-09	23:49		20			0	4
McAndrews	McA10	2-Jul-09	0:12		30			0	1
McAndrews	McA9	2-Jul-09	0:00	24	20	0	75%	0	3
Westport	West1	4-Jul-09	22:25	19	10	<5k	100%	1	0
Westport	West2	4-Jul-09	22:34	18	0	8k	100%	0	0
Westport	West3	4-Jul-09	22:44	18	0	8k	100%	1	1
Westport	West4	4-Jul-09	22:56	18	0	8k	100%	0	0
Westport	West5	4-Jul-09	23:05	16	0	10k	100%	1	0
Westport	West6	4-Jul-09	23:15	16	0	10	100%	0	0
Canoe Devil	CANO01	9-Jul-09	23:45	20	0	0	90%	0	2
Canoe Devil	CANO02	9-Jul-09	23:56	19	0	0	90%	0	3
Canoe Devil	CANO03	10-Jul-09	0:08					0	2
Canoe Devil	CANO04	10-Jul-09	0:25	18	0	0	90%	0	2
Canoe Devil	CANO05	10-Jul-09	0:38	18	0	0	90%	0	1
Canoe Devil	CANO06	10-Jul-09	0:48	18	0	0	90%	0	0
Canoe Devil	CANO07	10-Jul-09	0:58	17	0	0	90%	0	1
Canoe Devil	CANO08	10-Jul-09	1:05	17	0	0	90%	0	0
Canoe Devil	CANO09	10-Jul-09	1:14	16	0	0	90%	0	0
Canoe Devil	CANO10	10-Jul-09	1:24	16	0	0	90%	0	0
Canoe Devil	CANO11	10-Jul-09	1:35	16	0	0	90%	0	0
Canoe Devil	CANO12	10-Jul-09	1:44	16	0	0	90%	0	0
Canoe Devil	CANO13	10-Jul-09	1:51	16	0	0	90%	0	3

Canoe Devil	CANO14	10-Jul-09	2:08	16	0	0	90%	0	2
Canoe Devil	CANO15	10-Jul-09	2:19	16	0	0	90%	0	1
Canoe Lake Road	CANO16	10-Jul-09	23:17	23	<10	0	85%	0	0
Canoe Lake Road	CANO17	10-Jul-09	23:27	22	<10	<5k	85%	0	3
Canoe Lake Road	CANO18	10-Jul-09	23:36	22	<10	0	85%	0	2
Canoe Lake Road	CANO19	10-Jul-09	23:45	21	10	<5k	85%	0	0
Canoe Lake Road	CANO20	10-Jul-09	23:53	21	40	0	85%	0	1
Canoe Lake Road	CANO21	11-Jul-09	0:01	21	50	<10	85%	0	1
Canoe Lake Road	CANO22	11-Jul-09	0:09	20	60	10k	85%	0	0
Canoe Lake Road	CANO23	11-Jul-09	0:16	20	80	<10k	85%	0	0
Canoe Lake Road	CANO24	11-Jul-09	0:26	20	80	<10k	85%	0	0

For the purpose of testing protocol efficiency, several stations were repeated to determine whether detection frequency was affected by weather variables. McA9 was revisited on July 4, two nights after it was first surveyed. Conditions during the first survey on July 2 were warm (24 ^{o}C) and calm with 75% lunar illumination, and three singing birds were recorded. On July 4, the weather had shifted to cooler (15 ^{o}C) with moderate wind speeds and no birds were detected on the repeat survey at this station. Two stations along the Westport route (West 1 and West 2) were resurveyed on July 9 to confirm absence of Whip-poor-wills noted on the first survey. No Whip-poor-wills were recorded on repeat visits to the Westport stations.

Table 13. Results of survey replicates

Route/Station Name	Date Surveyed	Start Time	Elevation	Temp	Sky	Wind	Moon	Cars	WPWI
McA9	4-Jul	23:30	178 m	15	0	15-20k	100%	0	0
West1	9-Jul	23:22	179 m	21	0	0	90%	2	0
West2	9-Jul	23:30	176 m	21	0	0	90%	3	0
CANO2	14-Jul	21:10	145 m	18	30	<5k	NA	0	4
CANO4	14-Jul	22:01	192 m	18	30	0	NA	0	1

A list of non-survey observations of Whip-poor-will is presented below in Table 14. Of note are the nest discussed earlier in this report and the observation of three birds resting on the shoulders of roadsides at about 4am on June 16, 2009.

Table 14. Non-survey observations of Whip-poor-will

Date	Species	#	Easting	Northing	Location (description)	Breeding Evidence	Source
6/4/2009	Whip-poor-will	1	380762	4939131	MABO	singing	Casual
6/6/2009	Whip-poor-will	1	383232	4935390	Clear Lake Road	singing	Casual
6/16/2009	Whip-poor-will	2			Perth Road	flushed from roadside	Casual
6/16/2009	Whip-poor-will	1			Canoe Lake Road	flushed from roadside	Casual
6/2/2009	Whip-poor-will	1	Available upon request			Nest	Casual

Cerulean Warbler (COSEWIC-Special Concern, SARO-Special Concern)

The Frontenac Axis region is considered a stronghold for Canada's population of Cerulean Warblers, with smaller numbers occurring in other areas of the southern shield, Quebec and Carolinian zone of southern Ontario. Studies by researchers at Queen's University Biological Station have identified a significant population in the area of Opinicon Lake, east of the FBS study area, estimated at about 70-100 pairs. Results of the second Ontario Breeding Bird Atlas show that this species also occurs northward into Central/North Frontenac townships and eastward along the Frontenac Axis to the Thousand Islands area. The Canadian Population is estimated at 500-1000 breeding pairs, of which all but 40 are in Ontario.

Previous studies within the FBS study area have been focused on Frontenac Provincial Park (Ecological Services 2004 and Brinker and McLeish 2006). These efforts have produced estimates of 80-90 pairs in Frontenac Park alone. No data were available to the author for estimates outside of Frontenac, but various studies by the Kingston Field Naturalists suggest an overall population of approximately 250 pairs for the Kingston region, which includes our study area and the Opinicon population (Weir 2008). Weir also notes an average of 12 males along Canoe Lake Road and 11 males along Perth Road during annual BBS routes. Lastly, an

observation of 25 males found singing along Canoe Lake Road from the Helen Quilliam Sanctuary to Canoe Lake on May 15, 1970 is remarkably similar to densities found by FBS in late May 2009, a very high population of singing males that by mid-late June had significantly reduced in number. It is likely that a large portion of these males were migrants.

Results for Cerulean Warbler and other Species at Risk from our fieldwork in 2009 is limited to abundance and distribution information derived from point count surveys. Also, any Species at Risk encountered casually or during travel to and between point count stations were also documented. A complete summary of data for Cerulean Warbler is presented below in Table 15 along with a map in Appendix E. A total of 57 singing males were recorded, of which 30 were found on actual point count surveys. From these surveys, only six were detected on roadside counts compared to 24 during offroad surveys. The highest concentration of this species is certainly within Frontenac Provincial Park, where they were the second most abundant species detected in Mature Maple-Oak forest habitat. Clusters of Ceruleans were also found in surprisingly young deciduous stands with uneven canopies and open understoreys. The greatest concentration of the species was found in the northeastern portion of the park near Hardwood Bay, Devil Lake, where 11 males were detected in a linear span of 500m.

Overall, all but 11 of 57 Cerulean Warblers were in Frontenac Park. Only a fraction of the suitable Cerulean habitat in the park was visited in 2009. By projecting the rate of detection per station from our samples of suitable habitat, we could reasonably estimate between 80-120 pairs for Frontenac Park. This figure is consistent with previous assessments.

The frequency of detection along roadsides surrounding Frontenac Park was much lower and may be a bias of the species toward forest interiors. There is a considerable quantity of mature forest on private lands in the area, which should be suitable for Cerulean Warblers. Securing permission to access these lands would be a considerable exercise but nonetheless highly valuable as abundance estimates have not been published for non-public lands in the area. An in-depth inventory of the species within and surrounding Frontenac Provincial Park is needed to reliably estimate the scale and characteristics of the population found in the area.

Table 15. Summary of Cerulean Warbler records in 2009

Date	Species	Total	Easting	Northing	Breeding Evidence	Source
6/8/2009	Cerulean Warbler	1	378226	4935349	singing	Casual
6/8/2009	Cerulean Warbler	1	378971	4936374	singing	Casual
06/08/09	Cerulean Warbler	1	377534	4934965	singing	PC
06/08/09	Cerulean Warbler	1	379884	4936726	singing	PC
06/08/09	Cerulean Warbler	2	380181	4936875	singing	PC
06/08/09	Cerulean Warbler	2	378105	4935316	singing	PC
06/08/09	Cerulean Warbler	1	378363	4935528	singing	PC
06/08/09	Cerulean Warbler	1	378648	4935697	singing	PC
06/08/09	Cerulean Warbler	2	379138	4936143	singing	PC
06/08/09	Cerulean Warbler	1	379589	4936565	singing	PC
6/9/2009	Cerulean Warbler	1	376984	4934726	singing	Casual
6/10/2009	Cerulean Warbler	1	378172	4932020	singing	Casual
6/10/2009	Cerulean Warbler	1	378162	4931898	singing	Casual
6/10/2009	Cerulean Warbler	1	377909	4931743	singing	Casual
6/10/2009	Cerulean Warbler	1	377898	4931668	singing	Casual
6/10/2009	Cerulean Warbler	1	377794	4931608	singing	Casual
6/10/2009	Cerulean Warbler	1	376670	4931786	singing	Casual
6/10/2009	Cerulean Warbler	1	377507	4932799	singing	Casual
6/10/2009	Cerulean Warbler	1	380319	4938454	singing	Casual
06/10/09	Cerulean Warbler	1	377745	4933124	singing	PC
06/10/09	Cerulean Warbler	3	377603	4932794	singing	PC
06/10/09	Cerulean Warbler	1	378242	4932147	singing	PC
06/10/09	Cerulean Warbler	2	378114	4931838	singing	PC
06/10/09	Cerulean Warbler	2	377871	4931594	singing	PC
6/11/2009	Cerulean Warbler	1	378529	4931477	singing	Casual
6/13/2009	Cerulean Warbler	1	377018	4935236	singing	Casual
6/15/2009	Cerulean Warbler	1	378999	4936611	singing	Casual
06/17/09	Cerulean Warbler	1	384958	4942651	singing	PC
6/18/2009	Cerulean Warbler	1	377132	4935172	singing	Casual
6/20/2009	Cerulean Warbler	1	379006	4931935	singing	Casual
06/21/09	Cerulean Warbler	1	377274	4923484	singing	PC
06/21/09	Cerulean Warbler	1	378453	4926271	singing	PC
06/24/09	Cerulean Warbler	1	377510	4937074	singing	PC
06/24/09	Cerulean Warbler	1	378166	4937976	singing	PC
06/24/09	Cerulean Warbler	1	378573	4940438	singing	PC

6/25/2009	Cerulean Warbler	1	382845	4935462	singing	Casual
6/25/2009	Cerulean Warbler	1	382161	4935721	singing	Casual
6/25/2009	Cerulean Warbler	4	382327	4935798	singing	Casual
6/25/2009	Cerulean Warbler	1	382487	4935905	singing	Casual
6/25/2009	Cerulean Warbler	1	382515	4935920	singing	Casual
6/25/2009	Cerulean Warbler	1	382608	4935990	singing	Casual
6/25/2009	Cerulean Warbler	1	382633	4935939	singing	Casual
06/25/09	Cerulean Warbler	1	381634	4935446	singing	PC
06/25/09	Cerulean Warbler	2	382222	4935747	singing	PC
06/25/09	Cerulean Warbler	1	381394	4934785	singing	PC
7/5/2009	Cerulean Warbler	1	375872	4936002	singing	Casual

Prairie Warbler (Not at Risk)

The Prairie Warbler was delisted as a federal species of concern in 1999. The Ontario population remains small and scattered, primarily found along the edge of the southern shield. A total of seven Prairie Warblers were encountered during summer 2009, which included a small colony along the sloped shoreline of Slide Lake in Frontenac Provincial Park's east side. The colony contained three singing males on June 24 but no other breeding evidence or observation of females was obtained at that time. Another territorial male was found on June 20 in rock-scrub barren habitat. The male sang frequently, moving from perch to perch and showed no evidence that it was mated. Lastly, three single males were encountered in various locations while traveling between point counts that seemed to be unmated transient males or migrants.

The previous study by Brinker and McLeish 2006 reported five Prairie Warblers within Frontenac Provincial Park in 2005. All of these involved males detected in rock scrub barren habitat along near the park's southeastern boundary. These findings, combined with observations of the species in 2009 suggest that Prairie Warbler may be a regular but uncommon summer resident in the park. A thorough exploration of rock-scrub barren habitat along with cliff faces at lake edges would likely reveal more individuals. An effort should also be put forth to determine breeding status/productivity of the population.

Table 16. Summary of Prairie Warbler records in 2009

Date	Species	Total	Easting	Northing	Breeding Evidence
6/8/09	Prairie Warbler	1	378759	4936019	singing
6/20/09	Prairie Warbler	1	380232	4930324	singing
6/24/09	Prairie Warbler	3	382196	4930861	singing
6/9/09	Prairie Warbler	1	374908	4933002	singing
5/31/09	Prairie Warbler	1	378172	4935389	singing

Lousiana Waterthrush (COSEWIC-Special Concern, SARO-Special Concern)

The Louisiana Waterthrush in Ontario, like Prairie Warbler, has a very small and scattered population. This species occurs in small numbers in the northern portion of the Frontenac Axis region. Louisiana Waterthrushes favour mature forest with clear, moving, gravel bottomed streams. Relative to other parts of southern Ontario, there is a large quantity of suitable habitat in this region. An early spring migrant, Louisianas return to Ontario in April and become almost silent by June, making them a difficult species to detect during summer point counts. Two males were encountered in 2009, one at the well known site on Canoe Lake Road and another near Crab Lake in Frontenac Provincial Park. No evidence of breeding beyond the presence of a male on territory was obtained. A few historical breeding locations were checked in June (e.g. Arab Lake) but no birds were observed. Similar results were found by previous studies, although breeding was confirmed by volunteers of the Ontario Breeding Bird Atlas (2001-2005). The migration timing, behaviour and habitat requirements of this species requires that a specific inventory be designed to properly evaluate annual abundance and productivity.

Table 17. Summary of Louisiana Waterthrush records in 2009

Date	Species	Total	Easting	Northing	Elevation	Location	Breeding Evidence	Source
06/08/09	Louisiana Waterthrush	1	380520	4936868		Crab Lake	Alarm Call	PC
05/25/09	Louisiana Waterthrush	1	378810	4940875		Canoe Lake Road	Singing	Casual

All suitable stream habitat encountered over the course of the summer was marked for future surveys and is provided below in Table 18.

Table 18. UTM locations of potential LOWA nesting sites marked in 2009

Date	Species	Total	Easting	Northing	Elevation	Source
6/10/2009	STREAM1		378209	4932352	168 m	Casual
6/10/2009	STREAM2		377044	4931713	169 m	Casual
6/11/2009	STREAM3		376878	4929673	146 m	Casual
6/17/2009	STREAM4		383547	4939662	193 m	Casual
6/10/2009	STREAM5		378209	4932352	168 m	Casual
6/25/2009	STREAM6		382821	4935377	188 m	Casual
6/10/2009	STREAM7		377044	4931713	169 m	Casual
6/25/2009	STREAM8		381405	4934778	162 m	Casual
6/25/2009	STREAM9		381556	4935284	153 m	Casual
6/25/2009	STREAM10		381901	4935526	159 m	Casual
6/24/2009	STREAM11		382349	4931033		Casual
6/24/2009	STREAM12		382323	4930650		Casual

Common Nighthawk (COSEWIC-Threatened, SARO-Special Concern)

The Common Nighthawk, much like Whip-poor-will, is a rapidly declining species with a largely unknown ecology. Sharp decreases in abundance have only recently been noted by provincial and state breeding bird atlas programs. Previous assessments of Species at Risk in Frontenac Park did not include Common Nighthawk or Whip-poor-will.

A crepuscular species, standard monitoring programs are not able to accurately assess population trends of the Common Nighthawk. They remain most abundant along the southern shield ecotone and in the Georgian Bay region where rock barren habitat and low-intensity agricultural habitat create suitable conditions for breeding.

Our Whip-poor-will surveys in 2009 did not detect any Common Nighthawks, however, our surveys were restricted to nighttime periods, therefore missing primary periods of activity for nighthawks (dawn, dusk). The significance of rock barren habitat for breeding avifauna was further supported by the finding of a nest with two eggs on June 2, 2009 within the boundaries of the RRID MAPS station in Frontenac Provincial Park. At RRID, Common Nighthawks were regularly observed foraging overhead in the early morning (detected on 5 of 7 visits).

Nests of this species are difficult to find, however a dedicated investigation into the abundance of Common Nighthawks within rock barren habitat in Frontenac Provincial Park would be highly valuable. The extremely slow rate of succession in this habitat creates significant quantities of viable habitat for many species in need of open

scrub habitat such as Prairie Warbler, Field Sparrow, Eastern Towhee and Common Nighthawk, all species in decline.

Table 19. Summary of Common Nighthawk records in 2009

Date	Species	#	Easting	Northing	Location (description)	Breeding Evidence	Source
6/2/2009	Common Nighthawk	1	Available upon request		RRID, Frontenac	Nest	Casual
6/15/2009	Common Nighthawk	2			Kingsford Lake	Flyover	Casual

Red-shouldered Hawk (Not at Risk)

The Red-shouldered Hawk was formerly listed as a species of Special Concern in Ontario. Historically the most abundant forest raptor in Southern Ontario (CrocolII 1994), this species has been reduced in abundance due to inter-specific competition with the Red-tailed Hawk and habitat loss. Red-shouldered Hawks are area-sensitive species, requiring large, contiguous tracts of mature deciduous forest. The southern shield and Frontenac Axis remain important strongholds for this as this zone contains the greatest percentage of mature deciduous forest cover in the province. The Red-shouldered Hawk and Spring Woodpecker Survey (1990-2006) run by Bird Studies Canada dramatically showed that the highest rates of abundance occur in the Frontenac Axis with the most productive route being Canoe Lake Road, which encompasses the western boundary of the FBS study area.

The summary presented below is for individuals recorded during point count surveys only. Red-shouldered Hawks were encountered on a daily basis beginning in March and there were vastly more detected on a casual basis than are included here. Also included is a nest record from late-March near Canoe Lake Road. The nest was carefully monitored but the nest appeared to have failed sometime in May from unknown causes. It is likely that the adults renested nearby as a pair were detected in the area several weeks past the date of failure for the first nest.

Table 20. Summary of Red-shouldered Hawk records in 2009

Date	Species	Total	Easting	Northing	Notes	Source
3/28/2009	Red-shouldered Hawk	1	377059	4935121	Nest	Casual
06/24/09	Red-shouldered Hawk	1	378750	4939439		PC
06/21/09	Red-shouldered Hawk	1	376106	4926319		PC
06/08/09	Red-shouldered Hawk	1	379884	4936726		PC
06/08/09	Red-shouldered Hawk	1	377827	4935091		PC
06/08/09	Red-shouldered Hawk	1	379268	4936484		PC
06/21/09	Red-shouldered Hawk	1	380081	4926712		PC
06/19/09	Red-shouldered Hawk	1	384927	4939209		PC
06/10/09	Red-shouldered Hawk	1	376503	4931802		PC
06/11/09	Red-shouldered Hawk	1	376639	4929504		PC

Golden-winged Warbler (COSEWIC-Threatened, SARO-Special Concern)

This Threatened species has one of the lowest population estimates of any warbler, at 210,000, of which Canada is home to an estimated 18% (Cadman et.al. 2007). The Golden-winged Warbler is a bird of successional scrub habitats bordered by forest. In Ontario, the highest concentration of this species is found in the southern shield and Frontenac Axis. Relatively free of large-scale intensive agricultural practices, these regions have heterogeneous landscapes where light agricultural disturbance and rock scrub barrens create opportunities for the Golden-winged Warbler and several other species.

Suitable habitat for Golden-wings was found to be fairly scarce in the study area. Very little wet shrubland habitat was found in Frontenac Park and on local crown lands. However, appropriate habitat on private lands adjacent to roadways was frequently observed. Due to time constraints of the project, a thorough investigation of these areas was not completed.

A total of four Golden-winged Warblers were detected in 2009. Only one of these birds occurred on a point count survey, although all were found within 50m of a roadside. Two males held territory on Canoe Lake Road in May

and remained into June. Both sites consisted of wet shrubby clearings at the road edge, bordered by forest. Another bird was located singing on multiple dates just off Devil Lake Road and the last was found in shrubby habitat at the edge of farmland on McAndrews Road.

Table 21. Summary of Golden-winged Warbler observations in 2009

Date	Species	Total	Easting	Northing	Breeding Evidence	Source
6/17/2009	Golden-winged Warbler	1	Available upon request		singing	Casual
6/19/2009	Golden-winged Warbler	1			singing	PC
6/22/2009	Golden-winged Warbler	1			singing	Casual
6/22/2009	Golden-winged Warbler	1			singing	Casual

Other Rare Species

A summary table of rare avian and non-avian species for the region is presented below in Table 22. The most significant of these observations includes a Five-lined Skink observed at the Hemlock Lake MAPS station in early June, 2009 as well as the first discovery of Pitch Pine for Frontenac Provincial Park. More details on these and any other sightings are available with appropriate permissions upon request.

Table 22. Summary of other rare species in 2009

Date	Species	Status	No.	Easting	Northing	Note
6/4/09	Five-lined Skink	Threatened	1			observed at HELA station
5/4/09	Blanding's Turtle	Threatened	1	Available upon request		near Big Clear Lake
6/20/09	Pitch Pine	-	>2			
7/28/09	River Otter	-	6	379110	4939949	
6/25.09	River Otter	-	4	381394	4934785	
6/5/09	Mink	-	1	379110	4939949	
7/28/09	Northern Parula	-	1	383613	4934234	singing
6/13/09	Black-throated Blue Warbler	-	1	378193	4937977	singing
6/17/09	Black-throated Blue Warbler	-	1	378560	4937629	singing
6/17/09	Black-throated Blue Warbler	-	1	379998	4937932	singing
6/20/09	Blue-headed Vireo	-	1	381624	4932224	territorial male singing
6/20/09	Blue-headed Vireo	-	1	379271	4932070	singing
6/22/09	Blue-headed Vireo	-	1	374600	4932830	singing
6/6/09	Eastern Rat Snake	Threatened	1	Available upon request		
6/12/09	Magnolia Warbler	-	1	379250	4940055	singing
6/19/09	Grasshopper Sparrow	-	1	388067	4943773	singing
6/21/09	Mourning Warbler	-	1	375303	4928095	singing
6/11/09	Pine Siskin	-	1	377299	4929624	calling

*List includes both SAR, regionally uncommon species (e.g. Blue-headed Vireo) and species found in very low numbers (e.g. Pine Siskin, Black-throated Blue Warbler).

Summary

The Frontenac Breeding Birds program was successful in generating the first year of data for an integrated approach to monitoring bird populations in the Frontenac Axis – a first for the region. The information gathered is of substantial value to the understanding of this area's rich avian communities. Our efforts in 2009 were intentionally wide-focused and comprehensive in nature, which was important to refine and entrench procedures and objectives for 2010 and beyond. Prior to the commencement of field operations in spring 2010, we will establish more specific priorities for monitoring and research, with the intention of making the most efficient and effective contribution to the monitoring, study and protection of avian populations in the Frontenac Axis.

Acknowledgements

The successful delivery of Frontenac Breeding Birds was the result of a generous effort put forth by a collective of individuals and organizations with an interest and commitment to science and conservation in the region.

A sincere thanks are due to the following for their collaborative support in the development and execution of the program in 2009.

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Bert Korporaal	Ontario Parks
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Corina Brdar	Ontario Parks
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Don Ross	Frontenac Arch Biosphere Reserve
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Lastly, we must recognize the remarkable contributions of Seabrooke Leckie, FBS volunteer, who has helped immensely at every step of the way!

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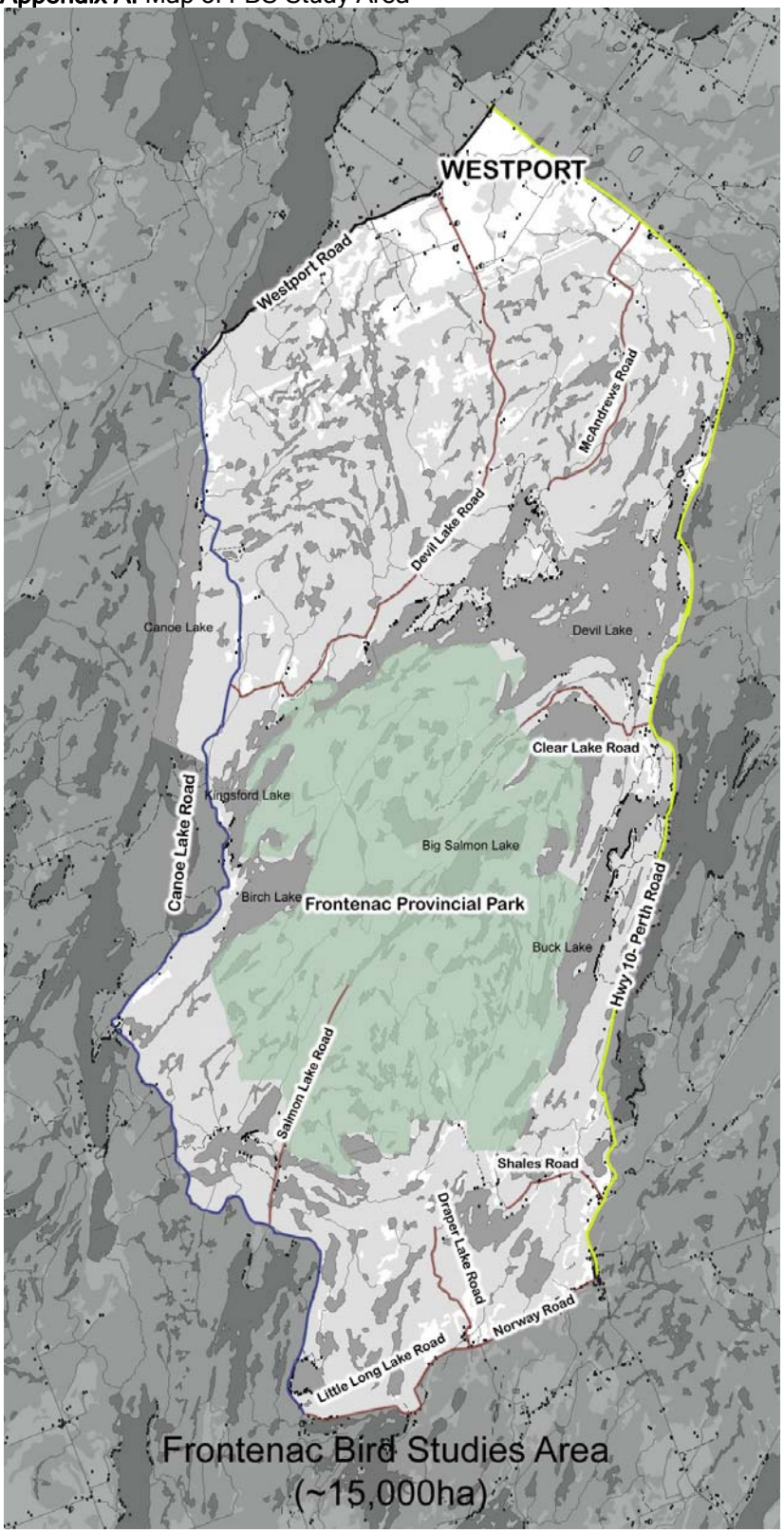
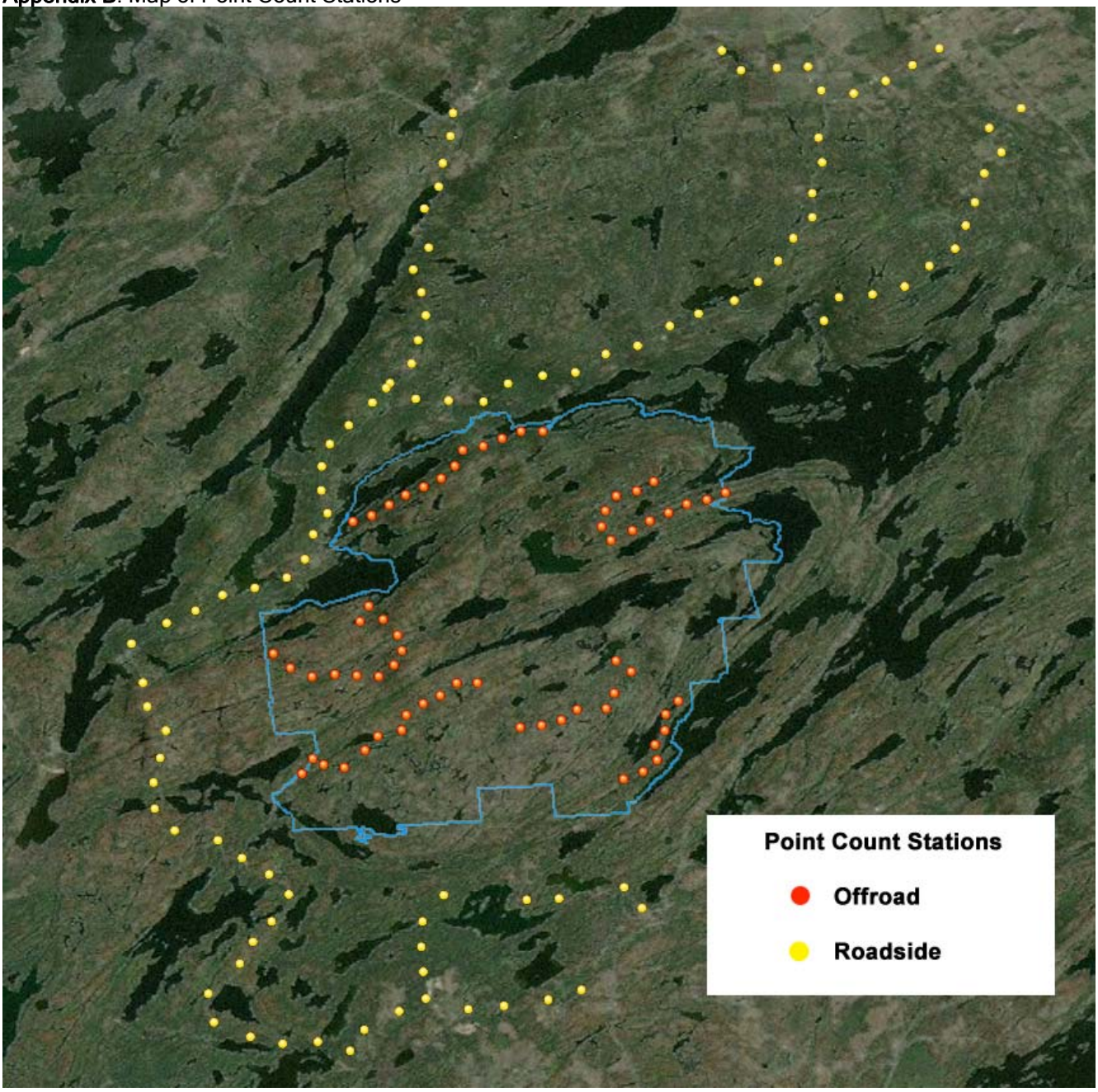
Appendices

Appendix A. Map of FBS Study Area



Appendix B. Map of Point Count Stations



Appendix C. Complete list of Year Status designations for MABO and RRID species.

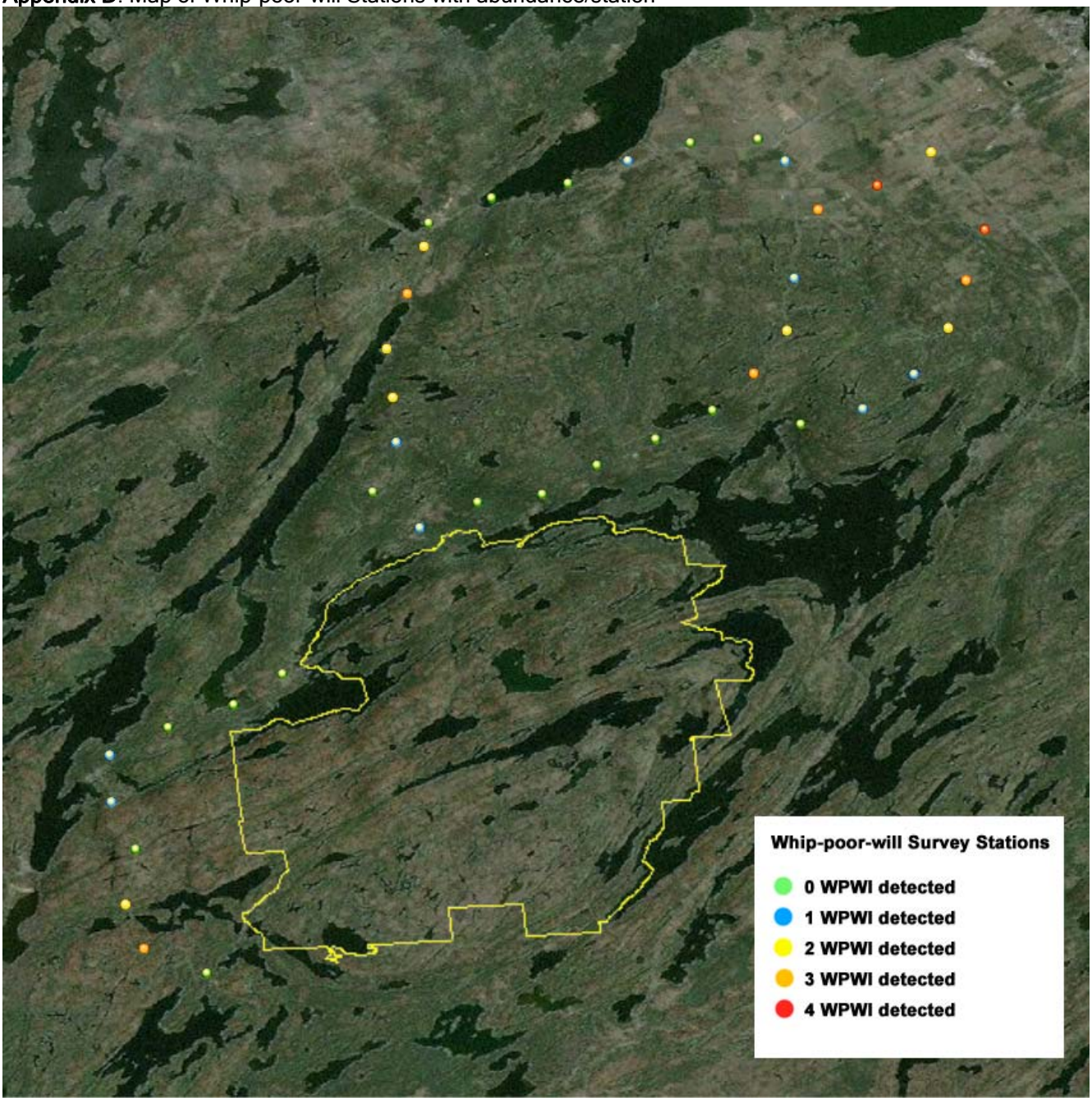
LOC	STA	SPEC	PS4	PS5	PS6	PS7	PS8	PS9	PS10	Year Status
AXIS	RRID	Common Loon	O	O	O	O	O	O	O	T
AXIS	RRID	Pied-billed Grebe	P	-	-	-	-	-	-	T
AXIS	RRID	Turkey Vulture	O	O	O	O	O	O	O	T
AXIS	RRID	Canada Goose	O	-	-	-	-	-	-	T
AXIS	RRID	Wood Duck	-	-	-	-	O	-	C	B
AXIS	RRID	Mallard	-	-	-	O	-	-	-	T
AXIS	RRID	Osprey	O	O	C	O	-	-	-	B
AXIS	RRID	Red-shouldered Hawk	O	-	-	-	-	-	-	T
AXIS	RRID	Broad-winged Hawk	-	-	O	-	-	-	-	L
AXIS	RRID	Ring-billed Gull	O	-	O	O	-	O	O	T
AXIS	RRID	Mourning Dove	C	P	P	P	O	O	O	B
AXIS	RRID	Black-billed Cuckoo	P	P	O	P	P	-	-	B
AXIS	RRID	Yellow-billed Cuckoo	-	-	-	-	O	O	-	L
AXIS	RRID	Common Nighthawk	C	C	C	O	O	-	-	B
AXIS	RRID	Whip-poor-will	C	-	-	-	P	-	-	B
AXIS	RRID	Ruby-throated Hummingbird	O	O	-	O	-	O	-	L
AXIS	RRID	Yellow-bellied Sapsucker	-	-	-	-	O	-	-	L
AXIS	RRID	Downy Woodpecker	-	-	-	P	O	-	-	L
AXIS	RRID	Hairy Woodpecker	P	O	O	P	P	P	O	B
AXIS	RRID	Yellow-shafted Flicker	O	O	O	O	O	O	O	B
AXIS	RRID	Pileated Woodpecker	O	-	-	-	-	-	-	T
AXIS	RRID	Eastern Wood-Pewee	P	P	P	P	P	-	-	B
AXIS	RRID	Least Flycatcher	-	-	-	-	-	P	P	T
AXIS	RRID	Eastern Phoebe	P	P	P	P	C	C	O	B
AXIS	RRID	Great Crested Flycatcher	P	P	P	P	P	-	-	B
AXIS	RRID	Eastern Kingbird	P	P	P	P	P	P	P	B
AXIS	RRID	Warbling Vireo	-	P	P	P	-	-	P	B
AXIS	RRID	Red-eyed Vireo	P	P	P	P	P	P	P	B
AXIS	RRID	Blue Jay	P	P	-	P	P	P	P	B
AXIS	RRID	American Crow	-	O	-	-	O	O	-	T
AXIS	RRID	Common Raven	O	O	O	O	O	O	O	L
AXIS	RRID	Horned Lark	-	-	-	-	-	O	-	T
AXIS	RRID	Purple Martin	O	O	O	-	-	-	O	T
AXIS	RRID	Tree Swallow	O	O	-	-	-	-	-	T
AXIS	RRID	Northern Rough-winged Swallow	C	O	O	O	-	-	-	B
AXIS	RRID	Bank Swallow	O	-	-	-	-	-	-	T
AXIS	RRID	Barn Swallow	-	-	-	-	O	-	-	T
AXIS	RRID	Black-capped Chickadee	P	C	O	P	O	O	O	B
AXIS	RRID	Red-breasted Nuthatch	P	P	O	P	P	O	O	B
AXIS	RRID	White-breasted Nuthatch	-	-	-	-	O	O	-	L
AXIS	RRID	Veery	-	-	-	-	-	-	O	T
AXIS	RRID	Hermit Thrush	P	P	P	-	C	O	-	B
AXIS	RRID	American Robin	P	C	C	P	C	P	P	B
AXIS	RRID	Brown Thrasher	P	P	-	O	O	O	P	B
AXIS	RRID	Cedar Waxwing	O	O	O	O	O	O	-	B
AXIS	RRID	Nashville Warbler	P	P	C	P	P	-	-	B
AXIS	RRID	Northern Parula	-	-	-	-	P	-	-	M
AXIS	RRID	Yellow Warbler	P	P	-	P	P	-	-	B
AXIS	RRID	Chestnut-sided Warbler	-	P	-	-	-	-	-	T
AXIS	RRID	Yellow-rumped 'myrtle' Warbler	P	P	P	P	C	P	O	B

LOC	STATION	SPEC	PS4	PS5	PS6	PS7	PS8	PS9	PS10	YS
AXIS	RRID	Pine Warbler	P	P	C	P	P	P	-	B
AXIS	RRID	Black-and-white Warbler	P	P	P	P	C	P	P	B
AXIS	RRID	American Redstart	P	-	-	-	O	O	-	T
AXIS	RRID	Northern Waterthrush	-	P	-	-	-	-	-	T
AXIS	RRID	Common Yellowthroat	P	P	P	P	P	P	P	B
AXIS	RRID	Scarlet Tanager	P	P	P	P	P	O	P	B
AXIS	RRID	Eastern Towhee	P	P	P	P	P	P	P	B
AXIS	RRID	Chipping Sparrow	C	P	P	P	P	P	O	B
AXIS	RRID	Field Sparrow	C	C	C	P	P	P	P	B
AXIS	RRID	Vesper Sparrow	-	-	-	-	O	-	-	T
AXIS	RRID	Song Sparrow	C	C	C	P	P	P	P	B
AXIS	RRID	Swamp Sparrow	P	P	P	P	P	P	P	B
AXIS	RRID	White-throated Sparrow	P	C	P	P	P	P	P	B
AXIS	RRID	Rose-breasted Grosbeak	P	P	P	P	O	O	O	B
AXIS	RRID	Indigo Bunting	P	-	-	-	O	-	-	T
AXIS	RRID	Red-winged Blackbird	P	P	P	O	O	-	O	B
AXIS	RRID	Common Grackle	-	O	O	O	O	O	O	B
AXIS	RRID	Brown-headed Cowbird	P	P	P	-	-	-	-	B
AXIS	RRID	Baltimore Oriole	P	P	P	P	P	P	P	B
AXIS	RRID	Purple Finch	P	P	P	P	O	-	-	B
AXIS	RRID	American Goldfinch	P	P	P	P	P	P	P	B
AXIS	MABO	Common Loon	O	O	O	P	P	O	O	T
AXIS	MABO	Turkey Vulture	-	-	-	O	-		O	T
AXIS	MABO	Mallard	O	O	O	O	-	-	-	T
AXIS	MABO	Red-shouldered Hawk	-	O	-	-	-	-	-	T
AXIS	MABO	Broad-winged Hawk	-	-	-	-	-	O	-	T
AXIS	MABO	Ruffed Grouse	O	-	-	O	O	O	O	B
AXIS	MABO	Wilson's Snipe	P	-	P	P	-	-	-	B
AXIS	MABO	Ring-billed Gull	-	-	-	-	-	O	O	T
AXIS	MABO	Mourning Dove	P	O	P	-	O	-	-	B
AXIS	MABO	Black-billed Cuckoo	P	-	-	-	-	P	P	B
AXIS	MABO	Yellow-billed Cuckoo	P	P	P	P	-	-	-	B
AXIS	MABO	Common Nighthawk	-	-	-	-	O	-	-	T
AXIS	MABO	Whip-poor-will	P	-	-	-	P	-	-	L
AXIS	MABO	Ruby-throated Hummingbird	O	O	-	O	-	O	-	B
AXIS	MABO	Belted Kingfisher	-	-	O	-	-	-	-	T
AXIS	MABO	Yellow-bellied Sapsucker	P	P	P	C	P	O	O	B
AXIS	MABO	Downy Woodpecker	-	P	-	-	O	-	-	L
AXIS	MABO	Hairy Woodpecker	C	P	P	P	-	O	O	B
AXIS	MABO	Northern Flicker	P	P	P	P	P	O	O	B
AXIS	MABO	Eastern Wood-Pewee	P	P	P	P	P	P	P	B
AXIS	MABO	Least Flycatcher	-	-	-	-	-	P	O	T
AXIS	MABO	Eastern Phoebe	P	P	P	-	C	C	P	B
AXIS	MABO	Great Crested Flycatcher	P	P	P	P	P	P	O	B
AXIS	MABO	Yellow-throated Vireo	P	P	P	-	-	-	O	B
AXIS	MABO	Warbling Vireo	-	-	-	P	-	-	-	T
AXIS	MABO	Red-eyed Vireo	C	P	P	P	C	P	P	B
AXIS	MABO	Blue Jay	O	O	O	O	-	O	O	B
AXIS	MABO	American Crow	O	-	-	-	-	-	-	T
AXIS	MABO	Common Raven	O	-	-	-	-	-	O	T
AXIS	MABO	Purple Martin	-	O	-	-	O	O	-	T

LOC	STATION	SPEC	PS4	PS5	PS6	PS7	PS8	PS9	PS10	YS
AXIS	MABO	Tree Swallow	-	O	-	-	-	-	O	L
AXIS	MABO	Barn Swallow	-	-	-	O	-	O	O	T
AXIS	MABO	Black-capped Chickadee	O	P	C	C	O	C	O	B
AXIS	MABO	Red-breasted Nuthatch	-	-	O	O	O	O	-	B
AXIS	MABO	White-breasted Nuthatch	O	P	P	O	O	O	O	B
AXIS	MABO	Veery	C	C	C	P	O	O	O	B
AXIS	MABO	Hermit Thrush	-	-	-	-	P	O	P	T
AXIS	MABO	Wood Thrush	P	C	P	P	P	P	O	B
AXIS	MABO	American Robin	P	C	C	C	P	P	P	B
AXIS	MABO	Gray Catbird	P	P	P	O	O	O	O	B
AXIS	MABO	Cedar Waxwing	O	O	O	-	-	O	O	L
AXIS	MABO	Nashville Warbler	P	P	-	-	-	-	O	L
AXIS	MABO	Yellow Warbler	P	P	P	P	P	-	P	B
AXIS	MABO	Chestnut-sided Warbler	-	P	P	-	-	-	O	L
AXIS	MABO	Magnolia Warbler	-	-	-	-	-	-	O	T
AXIS	MABO	Yellow-rumped Warbler	O	P	-	-	O	O	O	B
AXIS	MABO	Black-throated Green Warbler	-	-	-	-	-	O	-	T
AXIS	MABO	Cerulean Warbler	P	-	-	-	-	-	-	T
AXIS	MABO	Black-and-white Warbler	P	P	P	P	P	P	P	B
AXIS	MABO	American Redstart	P	C	P	P	-	O	O	B
AXIS	MABO	Ovenbird	P	C	C	P	P	-	O	B
AXIS	MABO	Northern Waterthrush	C	P	O	-	P	P	P	B
AXIS	MABO	Common Yellowthroat	P	P	P	C	P	P	P	B
AXIS	MABO	Scarlet Tanager	C	C	P	P	P	O	O	B
AXIS	MABO	Eastern Towhee	P	P	C	C	P	P	P	B
AXIS	MABO	Chipping Sparrow	P	P	-	C	P	-	O	B
AXIS	MABO	Field Sparrow	C	P	P	P	P	C	C	B
AXIS	MABO	Song Sparrow	P	P	C	P	P	C	P	B
AXIS	MABO	Swamp Sparrow	P	P	P	P	P	P	P	B
AXIS	MABO	Rose-breasted Grosbeak	P	C	P	C	P	O	O	B
AXIS	MABO	Indigo Bunting	-	-	-	-	-	O	-	T
AXIS	MABO	Red-winged Blackbird	P	P	-	O	O	-	-	L
AXIS	MABO	Common Grackle	O	C	O	O	-	O	O	B
AXIS	MABO	Brown-headed Cowbird	O	-	P	-	-	-	-	L
AXIS	MABO	Baltimore Oriole	P	P	P	-	P	-	O	B
AXIS	MABO	Purple Finch	-	P	P	P	-	-	-	B
AXIS	MABO	American Goldfinch	-	O	O	-	O	O	O	B

Period Breeding Status (C=Confirmed, P=Probable, O=Observed, "-" = absent
Year Breeding Status (C=Confirmed Breeder, L=Likely Breeder T=Transient M=Migrant)

Appendix D. Map of Whip-poor-will Stations with abundance/station



Appendix E. Map of Cerulean Warbler records in 2009 with abundance per record