2013 Annual Report
Research and Monitoring in the Greater Kejimkujik Ecosystem

Parks Canada Parcs Canada

Canada

Mersey Tobeatic Research Institute

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E. Le Bel

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2013 Annual Report
Research and Monitoring in the Greater Kejimkujik Ecosystem

TABLE OF CONTENTS

WETLANDS

HUMAN DIMENSIONS

APPENDIX

MTRI

E. Le Bel

INTRODUCTION

This is the ninth Annual Report of Research and Monitoring in the Greater Kejimkujik Ecosystem. As with previous editions, this one was inspired by a very similar series piloted by the Parks Canada Western Arctic Field Unit. This report serves as a compilation of the research and monitoring projects that were conducted in the Kejimkujik area. The summaries are all written by the researchers who are listed as contacts for each project but the report as a whole is a collaborative effort between Kejimkujik National Park and National Historic Site of Canada (Kejimkujik) and the Mersey Tobeatic Research Institute (MTRI). Many thanks to all the researchers who took the time to submit the research and monitoring project summaries this year.

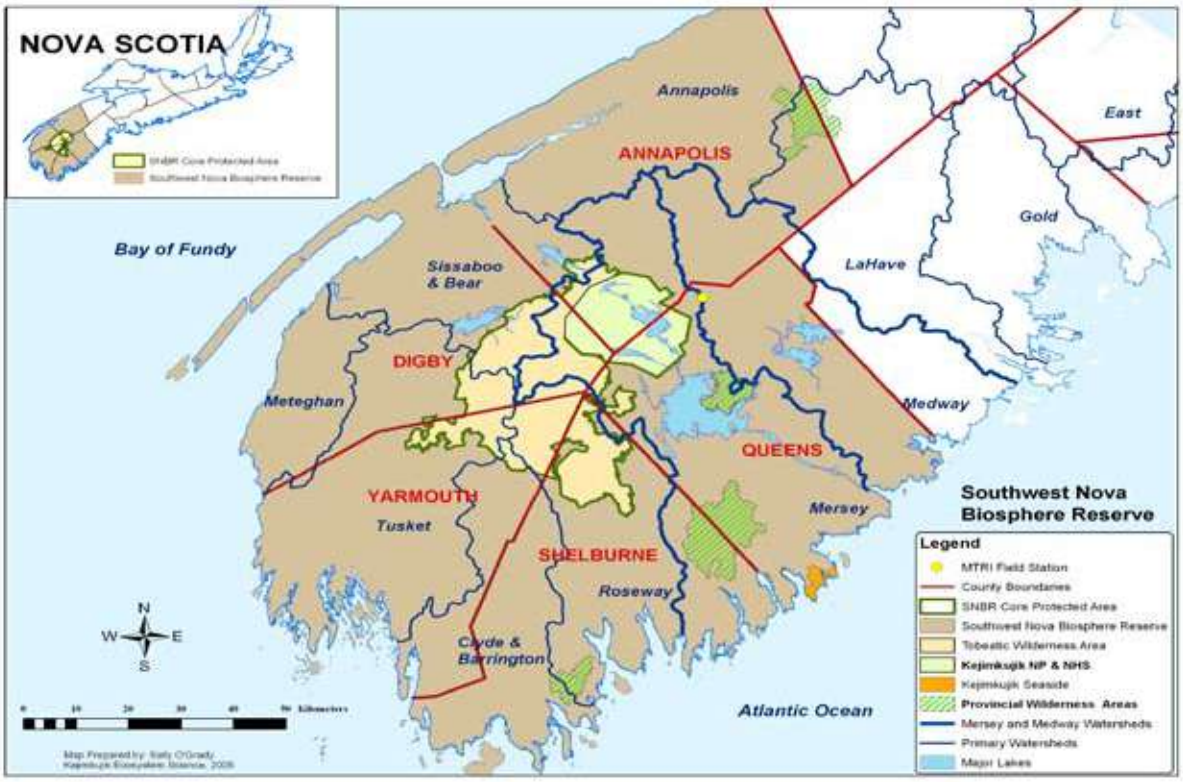
This report was produced in spring 2014 and is a compilation of the research and monitoring projects that were conducted in the Kejimkujik area in 2013 by Parks Canada, MTRI and their partners. The purpose of the report is to make information about these projects available to the public, government agencies, researchers and other stakeholders.

Research and monitoring projects provide the information necessary to make wise management and conservation decisions. The projects in this report are organized in four chapters corresponding to ecosystems: Coastal, Forest, Wetland and Freshwater, with an additional chapter highlighting research about the Human Dimensions of sustainable resource use. Projects are categorized as either monitoring or research projects.

The research and monitoring projects detailed in this report are important tools for attaining sustainable management of our natural resources and maintaining ecological integrity of our protected areas. The monitoring projects are conducted to keep track of how the ecological systems around us are changing over time and examine the effectiveness of management actions. The research projects provide a better understanding of the ecology of the area, how it is affected by natural and human-related influences and how to affect restoration. Overall, they indicate an impressive amount of work that is being undertaken in Kejimkujik and the surrounding area.

Kejimkujik represents the Atlantic Upland Natural Region in Parks Canada's network of protected areas. Kejimkujik consists of 381 km^2 inland and 22 km^2 on the coast and, in combination with the Tobeatic, is the core area of the Southwest Nova Biosphere Reserve. Since its establishment, Kejimkujik has been an important centre of science for southwest Nova Scotia. In collaboration with partners, research and monitoring in the park and surrounding landscape has informed decision-makers on a number of management issues at local, regional and national scales. Kejimkujik was declared the first Ecological Monitoring and Assessment Network site in Canada (1993) and was the first in Canada to install a Smithsonian Institution Monitoring and Assessment of Biodiversity plot (1994). Kejimkujik also serves as one of five core Canadian Acid Precipitation Monitoring Network sites that monitor the long-range transport of air pollutants and is a long-term climate monitoring station for Environment Canada. In 1995, Kejimkujik was designated a national historic site (the only national park in Canada with this dual designation) highlighting the cultural significance of the area and the importance of aboriginal peoples to understanding and presenting commemorative integrity. Kejimkujik is identified by the Parks Canada Agency as a species at risk priority site where stewardship and recovery are paramount. In 2010, Kejimkujik was designated "Dark Sky Preserve" by the Royal Astronomical Society of Canada. More information about Kejimkujik can be found at www.pc.gc.ca/pn-np/ns/kejimkujik or at the Friends of Keji Cooperative Association website (www.friendsofkeji.ns.ca).

The Mersey Tobeatic Research Institute (MTRI) is a non-profit co-operative with a mission to promote sustainable use of natural resources and biodiversity conservation in the Southwest Nova Biosphere Reserve and beyond through research, education and the operation of a field station. MTRI's field station is located between Kejimkujik and Caledonia in Kempt, Queens County where it provides office work space, accommodation for researchers, space for public presentations and a site for learning. MTRI provides expertise in the community and coordinates research and monitoring projects to address the goal of sustainable resource management. MTRI also provides an important link from research to the public through an active outreach and education program. More information about the charitable co-operative is available at www.merseytobeatic.ca.



S. O'Grady, Parks Canada

Kejimkujik and Tobeatic comprise the core area of the Southwest Nova Biosphere Reserve

The Southwest Nova Biosphere Reserve (SNBR) comprises a large portion of terrestrial and coastal southwestern Nova Scotia (see map above). The United Nations Educational, Scientific and Cultural Organization (UNESCO) internationally recognizes a biosphere reserve as an area in the world that is deemed to demonstrate a "balanced relationship between humans and the biosphere." Biosphere reserves around the world fulfill the following three functions: conservation, sustainable development and capacity building. Collaborative efforts among people in the designated area promote the sustainability of local economies and communities, as well as the conservation of the ecosystems.

A biosphere reserve is also a mechanism used for regional planning and multi-sector collaboration. It offers an opportunity for the community to envision sustainability for the region and to work towards achieving it. In 1999, a group of volunteers from Queens and Annapolis counties in Nova Scotia developed a proposal for the establishment of a UNESCO Biosphere Reserve incorporating Kejimkujik and the Tobeatic as the core protected area. This group of volunteers later became incorporated as the Southwest Nova Biosphere Reserve Association (SNBRA). In September 2001, the nomination document received approval and the region of southwest Nova Scotia was designated a biosphere reserve by UNESCO.

Photos on page 9, clockwise from top left:
- *New naturally seeded eelgrass bed,* by C. McCarthy, Parks Canada
- *European Green crab,* by O. Woods and M. Symington
- *Plover monitoring at Kejimkujik Seaside,* by M. Sheldon
- *Piping plover at Kejimkujik Seaside,* by W. Pitts
- *Little Port Joli Estuary,* by C. McCarthy, Parks Canada

COASTAL

Rationale

The Piping plover is a small shorebird that has been listed as an Endangered species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) since 1985. Piping plovers nest on white sandy beaches including St. Catherine's River Beach at Kejimkujik Seaside. In recent years, the number of nesting pairs of Piping plovers in the province has decreased significantly due to habitat disturbance, loss and fragmentation, predation and development of distant over-wintering grounds. The Piping plover is often referred to as a management dependent species, as sustained management actions are sometimes needed to maintain and increase population levels. Park staff have monitored plover adults and chicks within the park since 1985 to assess Piping plover population levels at Kejimkujik Seaside and to implement a suite of management strategies focused on protecting and sustaining plover numbers.

Piping plover

Monitoring

PEEP LO! PIPING PLOVER MONITORING PROGRAM

OBJECTIVES

- To monitor the number of breeding pairs of Piping plover and their productivity (number of chicks fledged per pair).
- To monitor the extent of suitable nesting habitat for Piping plovers in Kejimkujik Seaside and restore a portion of nesting habitat on St. Catherine's River Beach.
- To note predators or signs of predators on St. Catherine's River Beach.

METHODS

- Park staff and volunteers monitored St. Catherine's River Beach frequently during Piping plover nesting season. This was done at a distance with binoculars and spotting scopes. Other birds and animals, particularly predators, were also noted.
- Nest, chick and habitat observations were recorded. Nests were located by observing territorial birds and individuals exhibiting nesting behaviours.
- After a minimum of three eggs were laid (of four in a full clutch) nests were numbered and georeferenced.
- Plover habitat was restored on one section of St. Catherine's River Beach, through removal of dense Marram grass in the fall.

RESULTS

- In 2013 we continued to survey St. Catherine's River Beach at Kejimkujik Seaside three days per week from May-August.
- Five Piping plover pairs, seven nests (two re-nests), twelve chicks and nine fledglings were observed on St. Catherine's River beach, including one pair that nested outside the closed area before Harbour Rocks.
- Little Port Joli Beach was surveyed for Piping plovers three times, a pair was observed on June 19th, but not observed again.
- Kejimkujik is part of a broad volunteer program where park visitors and community members are encouraged to get involved with hands-on recovery actions. Throughout the season, 12 volunteers assisted with Piping plover monitoring surveys and 27 volunteers participated in habitat restoration events, contributing a total of 300 hours.

Plover monitoring at Kejimkujik Seaside

YEARS OF DATA

- Ongoing project since 1985

PARTNERS

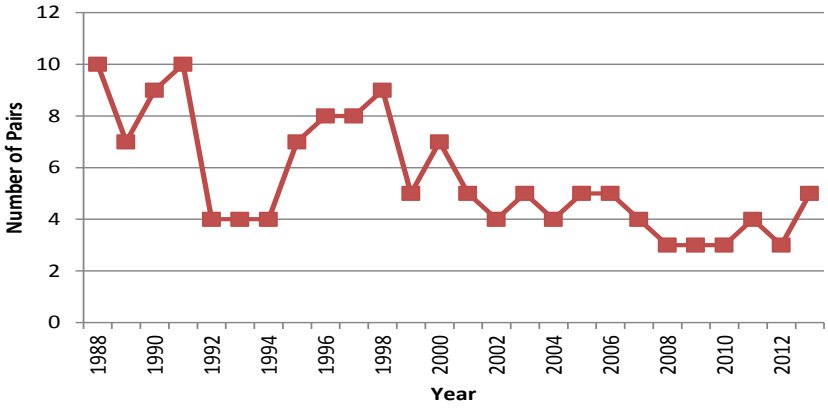
- Parks Canada
- Piping Plover Recovery Team (Eastern Canada)
- Bird Studies Canada
- Environment Canada
- Province of Nova Scotia

W. Pitts

Habitat restoration event

Parks Canada

Thank you sticker



M. Crowley, Parks Canada

Total breeding Piping plover pairs at Kejimkujik Seaside from 1988 to 2013

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Rationale

The Nova Scotia Piping Plover Conservation Program is coordinated by Bird Studies Canada (BSC), a non-profit organization. The program's goal is to recover Endangered Piping plovers and conserve beach habitat in Nova Scotia. Atlantic Coast beaches, including Lunenburg, Queens and Shelburne counties, support the southern Nova Scotia sub-population which is believed to be reproductively isolated from other plovers in Eastern Canada. Since 1991, southern Nova Scotian plovers declined by 34% and lost 25% of their beach breeding sites. Bird Studies Canada staff coordinate dozens of volunteers and partners in plover monitoring, breeding habitat protection and stewardship on beaches outside of Parks Canada's Kejimkujik Seaside.

W. Pitts

Piping plover at Kejimkujik Seaside

Monitoring

NOVA SCOTIA PIPING PLOVER CONSERVATION PROGRAM

OBJECTIVES

- To protect beach habitat for breeding Piping plovers.
- To reduce threats to breeding plovers on beaches.
- To increase understanding and awareness among beachgoers and coastal communities about plovers and the ecological value of beaches.
- To build community support and engagement for recovery and conservation efforts.
- To strengthen partnership and collaboration for conservation and recovery within Nova Scotia, regionally and internationally.

METHODS

- Staff, volunteers and partners conducted beach surveys April to August throughout the southern Nova Scotia region to establish presence of plovers, assess threats and protect breeding habitat.
- Beachgoer education, signs and rope fencing were used to reduce threats to plovers from human activities. Plover population, breeding success (*e.g.* nest and fledge success), recreational activities and potential predators were monitored. Using this information, threats were identified to breeding plovers, habitat protection and stewardship activities were coordinated and adapted and stewardship outcomes were tracked.

C. Curry

N. Poirier was inducted into Kejimkujik's Walk of Honour for over 250 volunteer Piping plover stewardship hours at Fox Bar, Shelburne County

E. Le Bel

RESULTS

- Including Kejimujik Seaside, a grand total of 52 plover pairs were found on 25 beaches across Nova Scotia in 2013.
- At 17 beaches in southern Nova Scotia, 35 pairs were found: four in Lunenburg County, nine in Queens County (including five in Kejimkujik Seaside), and 22 in Shelburne County.
- The 2013 results for southern Nova Scotia, excluding Kejimkujik Seaside (refer to page 10 for Kejimkujik Seaside results), are as follows:
- On 16 beaches, 30 pairs produced 31 fledged young, resulting in a 1.03 fledglings/pair which is less than the established 1.65 annual productivity target.

RESULTS
Continued

- Of 40 known nests, 50% hatched, which is slightly less than the past six-year annual mean for Nova Scotia of 54%.
- Chick survival was 43% and far lower than the Nova Scotia mean of 73%. Cold and wet weather in May through early July may have been a factor that depressed chick survival as well as recreational beach use.
- In comparison to 2012, 54% fewer beach users were observed during beach surveys. The vast majority of walkers complied with habitat protection signage: 89% of 245 walkers stayed outside of sensitive nesting areas marked with signs. However, as in 2012, one nest was lost due to human disturbance. Someone with a bicycle disturbed the area around a nest that was due to hatch several days later at Louis Head, Shelburne County. Of the 71 dogs observed in 2013, 62% were on-leash. Illegal motorized vehicle use on beaches increased compared to 2012, but remained low with tracks or vehicles detected on 6% of surveys (n=367).

M. Barnes

D. Barnes monitoring a pair of plovers at Beach Meadows

YEARS OF DATA

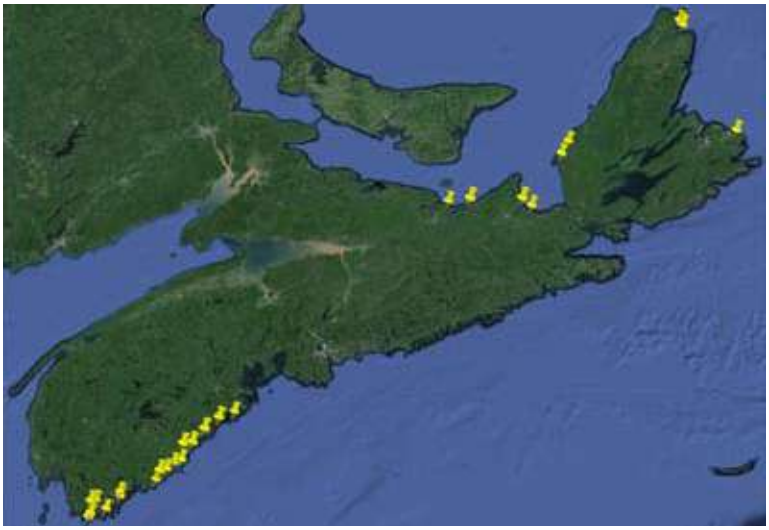
- Ongoing project since 2006
- Bird Studies Canada initiated a multi-year recovery effort for plovers in Nova Scotia in 2006. Before 2006, monitoring and recovery efforts were coordinated by various partners, including Nova Scotia Department of Natural Resources.

PARTNERS

- Parks Canada
- Environment Canada's Canadian Wildlife Service
- Nova Scotia Department of Natural Resources
- Friends of Keji Cooperating Association
- Cape Sable Important Bird Area
- Government of Canada's Habitat Stewardship Program for Species at Risk
- Municipality of the District of Shelburne
- Town of Shelburne
- White Point Beach Resort

A. Nagy-MacArthur

A big plover and volunteer at the 2013 Cherry Hill Fun Run



S. Abbott, BSC

Location of 2013 Piping plover breeding sites in Nova Scotia

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Rationale

Coastal marine systems world-wide are threatened by invasions of non-native species. The European Green crab, familiarly known as the cockroach of the sea, is a pan-global invasive species occuring in estuaries from New England to Newfoundland. Several studies have shown the Green crab to be an 'ecosystem engineer', having significant predation impacts on local species such as soft-shell clams and blue mussels, and causing the physical destruction of eelgrass beds. A more recent introduction of a clade from Iceland may be causing amplified impacts due to cold tolerance, its aggressive nature and its ability to adapt to new foraging opportunities. This project is investigating Green crab population dynamics, relative influences on native habitats and developing a reduction and monitoring program to help address management and restoration considerations.

O. Woods

European Green crab

Monitoring

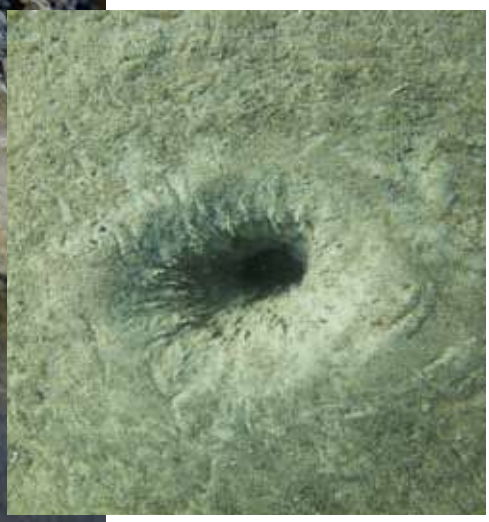
EUROPEAN GREEN CRAB COASTAL MONITORING

OBJECTIVES

- To determine whether physical removal can be effective and sustainable in Green crab control at Kejimkujik Seaside estuaries.
- To conduct Green crab removal operations to prescribed catch per unit effort rates to control impacts on native species.
- In combination with other research and monitoring projects, assess the ecological consequences of Green crab activities in Kejimkujik Seaside ecosystems.
- To work with local interests, industry and other government departments to develop a positive use for harvested Green crabs.
- To assess management effectiveness in restoring impaired coastal habitats such as eelgrass beds.
- To involve harvesters and the public in restoration activities.

METHODS

- Different sampling techniques and protocols were explored to assess monitoring and removal efficiencies. Trapping was determined to be the most effective method of control and to conduct ecological integrity monitoring. Two types of traps were used: modified eel traps to provide standardized monitoring and modified shrimp (Russell) traps developed by local fishing expertise to enhance larger scale Green crab removal.
- Morphological data were recorded for all individuals captured through monitoring. All by-catch and other pertinent data were recorded throughout all sampling investigations to determine population structure, distribution and relative density characteristics.
- All Green crabs captured during removals were counted and a daily sample of fifty randomly selected crabs per region were sampled for morphology and sex.



O. Woods

Green crab excavation in mud substrate

E. Le Bel

RESULTS

- Initial monitoring at St. Catherine's River and Little Port Joli indicate similar densities in both estuaries before removals began.
- Since 2010, 1.3 million green crabs have been removed from Little Port Joli Estuary and sold or composted. Size, sex ratios, distribution and trap location efficiencies have been

RESULTS
Continued

determined. The proportion of larger males declined in areas where the greatest number of removals occurred, followed by larger catches of females and smaller crabs.

- Numbers have been reduced to well below prescribed thresholds in the upper estuary and the numbers remain low. Average catch per unit effort in Basin Lake was decreased by over 600%, as was average biomass per trap. Very little effort (sentinel trapping) was required to maintain low catches over the last two years.
- General knowledge was gained on more effective fishing techniques including amounts of bait to use, fishing hotspots and how often to pull traps to gain maximum efficiencies.
- Options for positive use of culled invasive Green crabs were investigated including use as lobster bait, fertilizer and composting.
- Native species by-catch continues to increase with no trapping mortality noted.
- Results from this project have enabled ecosystem recovery projects (eelgrass transplanting) to enhance native species and habitats.

K. Durovich

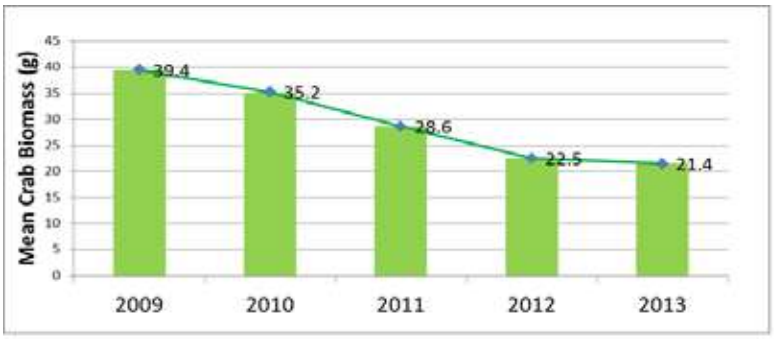
Volunteers fishing Green crabs with park staff

YEARS OF DATA

- Ongoing project since 2008

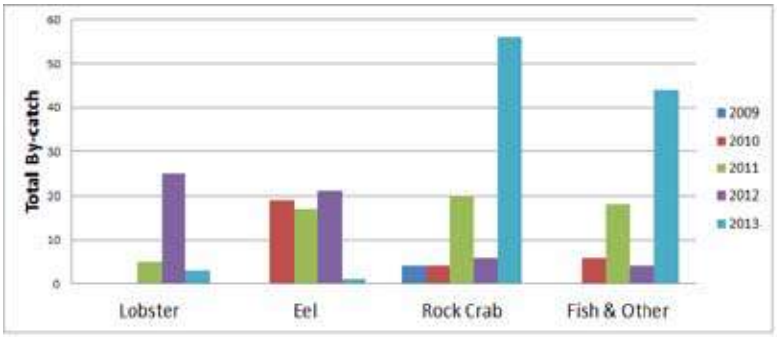
PARTNERS

- Parks Canada
- Dalhousie University
- Fisheries and Oceans Canada Gulf Region
- Fisheries and Oceans Canada Bedford Institute of Oceanography



Parks Canada

Reduction in Green crab biomass at Little Port Joli Estuary from 2009 to 2013



Parks Canada

By-catch totals found in Green crab traps over five years of fishing at Little Port Joli Estuary

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Rationale

Eelgrass is the dominant seagrass species of marine ecosystems in Atlantic Canada. Eelgrass habitats perform important ecological services in nearshore waters, often referred to as a 'keystone species' due to its ability to enhance biodiversity and productivity. Eelgrass beds provide nursery habitat for juvenile stages of fish and invertebrates and important feeding habitat for migrating waterfowl. The primary production of eelgrass beds and their associated epiphytic community exceeds that of many cultivated terrestrial systems, playing an important role as biological filters, sediment stabilizers, exporters of organic matter to subsidize productivity of other coastal ecosystems and as valuable carbon sinks. Declines in eelgrass can precipitate cascading ecosystem effects and a loss of valuable ecological services. By 2010, eelgrass at Kejimkujik Seaside had declined to less than 2% of its 1987 distribution.

O. Woods

Eelgrass at Kejimkujik Seaside

Monitoring

EELGRASS COASTAL MONITORING AND RECOVERY

OBJECTIVES

- To monitor temporal trends in eelgrass extents and condition.
- To provide insight into the causes and ecological consequences of these changes.
- To assess whether management response is effective in reversing eelgrass loss.

METHODS

- Suitable eelgrass habitats at St. Catherine's River and Little Port Joli estuaries are examined annually by canoe to determine the presence of eelgrass beds. The extents of each discrete bed are mapped by a swim survey using mask and snorkel. The surveyor carries a Global Positioning System (GPS) unit with a track function to record locations for later mapping and area determinations.
- The SeagrassNet monitoring protocol is used to measure conditions including morphology, grazing, epiphyte load, wasting disease and water quality variables.

RESULTS

- After reaching less than 2% of its 1987 distribution by 2010, eelgrass decline has been reversed coincident with effective control of Green crabs at Little Port Joli Estuary. For each of 2011, 2012 and 2013, a continuous restoration rate of 10% has been observed. Eelgrass continues to be absent from St. Catherine's River Estuary (where there are no Green crab control activities), 12 years after its effective disappearance.
- Volunteers continue to assist with eelgrass transplant trials, the first ones on this coast. Four methodologies were tested with encouraging results. Three of the four trial plots showed excellent results with a greater than 50% survivorship. The fourth trial plot was located near high densities of Green crab resulting in a 98% loss of eelgrass transplants within 2 months, showing the importance of green crab control before taking recovery actions. The 5/8" steel washer technique proved to be relatively cost effective and produced the best survivorship of the four methodologies to date. Next year we will use donor plugs from within the estuary to expand distribution nodes.
- Future monitoring will continue to assess the success of Green crab mitigations on eelgrass recovery.

C. McCarthy, Parks Canada

New naturally reseeded eelgrass bed

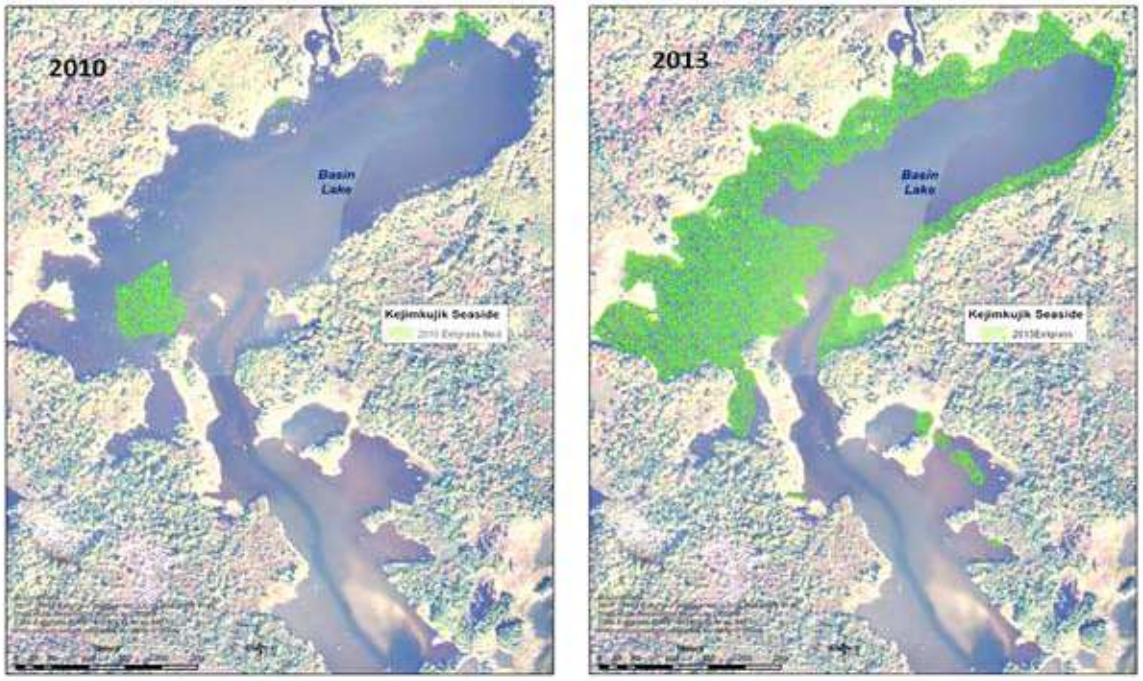
E. Le Bel

YEARS OF DATA

- Ongoing project since 1987

PARTNERS

- Parks Canada
- School for Resource and Environmental Studies, Dalhousie University
- Fisheries and Oceans Canada Gulf Region
- Fisheries and Oceans Canada Bedford Institute of Oceanography
- Harrison Lewis Marine Centre



S. O'Grady, Parks Canada

Change in Eelgrass distribution (in green) at Little Port Joli Estuary from 2010 to 2013

T. Ball

Eelgrass transplanting party

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Rationale

Nutrient enrichment of the coastal zone as a result of anthropogenic inputs of nitrogen and phosphorus is becoming a pressing issue in many regions of the world. In shallow waters, nutrient enrichment can cause blooms of fast growing algae which may eliminate slower growing submerged aquatic vegetation such as seagrasses, which provide important nursery habitat in coastal waters for many fish and invertebrate species. Harmful algal blooms and anoxia/hypoxia in bottom waters are also symptoms of nutrient enrichment and can precipitate the collapse of shellfish and fish stocks and changes in benthic species composition. Kejimkujik has identified high water quality as critical to the ecological integrity of its lagoon ecosystems including eelgrass beds, salt marsh, benthic invertebrate communities and the diverse wildlife that depend on these habitats.

S. O'Grady, Parks Canada

Little Port Joli Estuary

Monitoring

ESTUARINE WATER QUALITY MONITORING

OBJECTIVES

- To determine if the Estuarine Water Quality Index (EWQI) for Little Port Joli Estuary at Kejimkujik Seaside is in good condition (*i.e.* >0.66) and if it has changed over the last five years.
- To identify through visual surveys if common symptoms of eutrophication are present in Little Port Joli Estuary, such as nuisance macroalgae blooms and epiphyte abundance.

METHODS

- Monitoring was conducted annually in November.
- Visual surveys were conducted to identify any common symptoms of eutrophication.
- Four locations within the Little Port Joli Estuary were sampled for temperature, salinity, turbidity, dissolved oxygen (DO) and pH.
- Dissolved phosphorous (DP), dissolved inorganic phosphorous (DIP) and dissolved inorganic nitrogen (DIN) were determined by Environment Canada.
- Mean sample concentrations of DIN, DP, and DO were compared to the thresholds using a one sample t-test and assigned a sub-measure score (0 or 1) based on whether they exceed the threshold.
- Threshold scores were determined by averaging the 3 sub-measure scores.

A. Pelletier

Mats of mixed green algae observed in Basin Lake, Little Port Joli Estuary

RESULTS

- In 2013, the DIN was very high (0.130 to 0.595 mg/L), DP was also elevated (0.013 to 0.070 mg/L) resulting in negative EWQI scores of 0, whereas high DO levels (9.1 to 11.4 mg/L) resulted in a positive EWQI score of 1.
- Overall 2013 EWQI value was 0.33, resulting in a threshold status of 'fair'. Results from a combined effort in 2010/11 were the same (0.33), indicating the EWQI status at Little Port Joli Estuary has remained stable for the last two years.
- The sampling protocol was streamlined and timing standardized to allow for more comparable results from year to year, and to more accurately assess trends as the dataset continues to grow.

E. Le Bel

YEARS OF DATA

- Ongoing project since 2008

PARTNERS

- Parks Canada
- Environment Canada
- Dalhousie University

A. Pelletier

Lagoon at Little Port Joli Estuary, Kejimkujik Seaside

Sub Measures			
Measure	Question	0	1
Dissolved Inorganic Nitrogen (DIN)	Is the mean estuary DIN concentration ≥0.020mg/L?	Yes	No
Dissolved Phosphorous (DP)	Is the mean estuary DP concentration ≥0.015mg/L?	Yes	No
Dissolved Oxygen (DO)	Is the mean estuary DO concentration ≤7.8mg/L?	Yes	No

Thresholds			
Measure	Poor	Fair	Good
Estuarine Water Quality Index (EWQI)	<0.33	0.33-0.66	>0.66

Parks Canada

Estuarine Water Quality Index (EWQI) sub-measures and thresholds

C. McCarthy, Parks Canada

Ocean side of Little Port Joli Estuary, Kejimkujik Seaside

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Photos on page 21, clockwise from top left:
- *Olive-sided flycatcher,* by R. D'Entremont
- *Heading out to sample salamanders,* by E. Aulenback
- *Barred owl*, by E. Le Bel
- *Boreal felt lichen,* by B. Toms, MTRI
- *Decaying leaves,* by E. Le Bel

FOREST

Rationale

Reduction of suitable habitat is the greatest threat to forest landbirds in their breeding ranges. The Olive-sided flycatcher, Canada warbler and Rusty blackbird have experienced steep population declines of up to 90% over the past half-century. In order to conserve these federally listed species at risk, improvements to networks of protected areas and conservation activities on managed landscapes are needed. Areas for conservation can be targeted once available habitat has been identified. This project uses species distribution modeling techniques to quantify the spatial extent of available habitat for these species at risk, as individual species and groups of species. Habitat maps for each model type will be used to assess the contribution of protected and managed lands to available habitat, which can be used to target conservation efforts.

Olive-sided flycatchers often inhabit treed bogs dominated by black spruce

Monitoring

MODELING HABITAT FOR LANDBIRDS AT RISK

OBJECTIVES

- To conduct field surveys for landbird species at risk (SAR) and quantify vegetation at SAR-occupied sites in southwestern Nova Scotia.
- To compare habitat between sites occupied in managed and protected landscapes for each SAR species using fine-scale vegetation information.

METHODS

- From April-June 2013, 159 known and potential SAR locations were surveyed using playbacks of conspecific vocalisations. Playbacks were used because birds often respond by vocalising or flying towards the speaker, and are thus more likely to be detected.
- From July-August 2013, habitat surveys were conducted at 41 known SAR locations. Habitat was assessed for forest ecosystem classification, and quantified by amount of deciduous, coniferous, shrub and vegetation cover in different forest layers, abundance of snags and various ground features, including wetness.
- Species occurrence will be predicted at fine and coarse spatial scales across the landscape of southwestern Nova Scotia by creating species distribution models.
- Species distribution models will be used to quantify available suitable habitat in managed and protected landscapes and make management recommendations for these SAR.

Measuring tree canopy cover using a densiometer

RESULTS

- During the 2013 field seasons, 17 Rusty blackbirds (11 at new locations), 38 Olive-sided flycatchers (17 at new locations), and 17 Canada warblers (7 at new locations) were located within southwestern Nova Scotia.
- Despite high habitat heterogeneity of southwestern Nova Scotia, the three bird species tended to occupy ecologically similar ecosites, with moist, nutrient poor soils and a groundcover of Sphagnum moss.

RESULTS
Continued

- All three species tended to inhabit wet coniferous or deciduous forest with a broken canopy, but with different types of understorey development. Canada warbler habitat had high shrubs and cinnamon fern, Olive-sided flycatcher habitat had low heath shrubs, and Rusty blackbird habitat had less shrub cover and more grass.
- Creation of species distribution models for each species, separately and combined, is in progress.

YEARS OF DATA

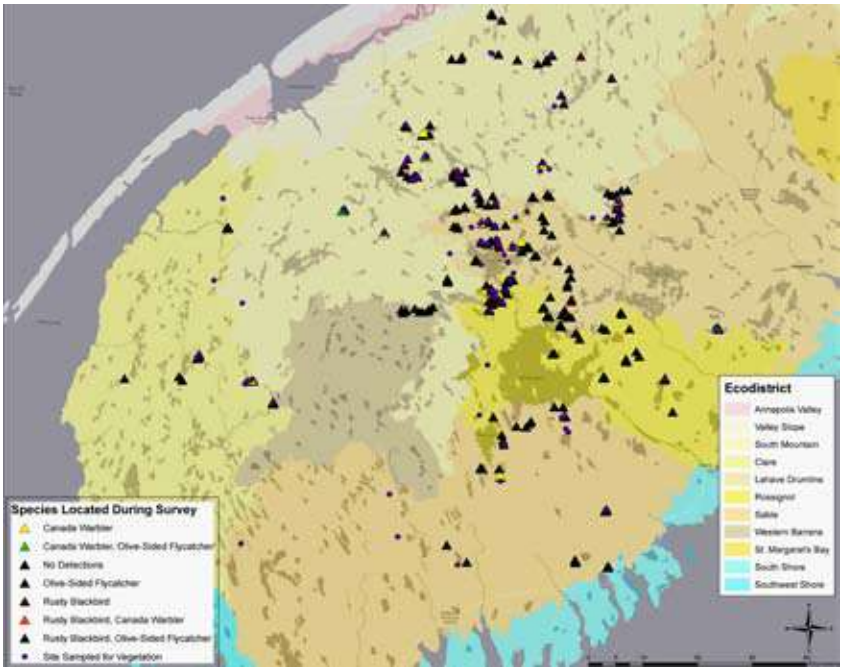
- Year 2 of a 4 year project

PARTNERS

- Mersey Tobeatic Research Institute
- Parks Canada
- Nova Scotia Habitat Conservation Fund
- Nova Scotia Strategic Cooperative Education Incentive
- Science Horizons Youth Internship Program
- Dalhousie University
- Natural Science and Engineering Research Council of Canada

A. Westwood

Field technician broadcasting calls of target SAR to assess site occupancy at a site along the Medway River



A. Westwood

Sites surveyed for the presence of landbird species at risk (2012-2013) and known locations of landbird species at risk selected for vegetation sampling in Southwest Nova Scotia

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J. Todd

Rationale

Christmas Bird Counts have been carried out annually for over a century. They have been conducted at several locations in Nova Scotia over the last 50 years. Currently, within Nova Scotia, approximately 35 Christmas Bird Counts are conducted every year. The counts occur on one day between mid-December and early January (hence the name Christmas Bird Count) within the same set area. The bird counts document early winter birds and can be compared from year-to-year and area-to-area. The Nova Scotia Bird Society and Audubon Society maintain a master record of all counts within the province and annually report the counts with notes on the unique results of that year.


M. Willison

Blue jay

Monitoring

CALEDONIA CHRISTMAS BIRD COUNT

OBJECTIVES

- To document early winter birds during an ongoing annual survey.
- To record sufficient data so that the results may be compared from year-to-year and count-to-count.
- To engage interested volunteer members of the public to complete the annual count.
- To publicize the results to inform and interest the local public in the bird communities of the Caledonia area.

METHODS

- Annually, a one day Christmas Bird Count has been held between specific dates determined by the Audubon Society between mid-December and early January.
- The Caledonia Bird Count was held on December 15 2013 from midnight to midnight.
- This count has consistently been held in the same area: a circle of 24 km diameter centered where a brook flows northward out of Donnellan Lake in West Caledonia.
- The coordinator organized volunteers to cover different areas so the maximum number of habitats could be searched and the most species located while preventing repeated counting of the same birds in the same areas.
- The bird species and their numbers were recorded.
- The time spent in the woods and at bird feeders, distances traveled, methods of travel and numbers of people involved were recorded to compare the effort by observers.


A. Lavers, MTRI

Volunteer J. Sheppard braving the elements the day of the 2013 count

RESULTS

- The 2013 Caledonia Bird Count occurred during a blizzard but noted 27 bird species and 809 individuals (down from 36 species, 1352 individuals last year). There were 65 hours spent at feeders which is higher than usual.
- There were 25 observers who participated this year.
- The total number of kilometres walked was 12.5 (compared to 81 last year) and only 15.5 driven.
- Rare birds sighted included the following: Red-tailed hawk, American robin, Barred owl, Fox sparrow and American kestrel.

RESULTS
Continued

- Species not observed that are usually counted in the Caledonia Bird Count, likely because of the stormy weather, included the following: Mallard and Ring-necked ducks, Hooded merganser, Pine grosbeak, Pine siskin, Sharp-shinned hawk and White-winged crossbill.

YEARS OF DATA

- Ongoing project since 1991

PARTNERS

- Nova Scotia Bird Society
- Mersey Tobeatic Research Institute

M. Willison

Hairy woodpecker feeding on suet

J. Sheppard

A. Lavers performing the 2013 Christmas Bird Count

M. Willison

Dark-eyed junco at a feeder

M. Willison

Black capped chickadee

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Rationale

Nocturnal owls are surveyed across Canada as indicators of forest ecosystem health. As top predators in the food chain, they are vulnerable to habitat disturbance. Barred owls require large hardwood trees which have cavities suitable for their nests. Additionally, they are sensitive to forest cover and composition changes associated with forest harvesting and human developments. Owls are not easy to monitor due to their secretive, nocturnal activities. Bird Studies Canada coordinates nocturnal surveys in all three Maritime provinces. Locally, two official routes have been conducted annually since 2002 while a third, unofficial route, was established in 2005. These surveys document relative owl counts and note changes over time.

Barred owl

Monitoring

NOCTURNAL OWL SURVEY

OBJECTIVES

- To carry out an annual survey of nocturnal owl populations on established routes.
- To compare local owl populations within Nova Scotia, within the Maritimes and within Canada.

METHODS

- At night, volunteer surveyors drove a designated route making ten stops each at least 1.6 km apart. At each stop recorded owl calls prepared by Bird Studies Canada were broadcasted and the number and species of owls heard or seen were recorded.
- Route 40 begins on highway Route 8, 8 km north of the Mersey River Bridge in Maitland Bridge and continues northward to South Milford.
- Route 41 begins at the entrance to Kejimkujik and ends near the Gold Mines trail.
- The Devonshire/Rossignol Route follows these roads towards the Mersey River.

Saw-whet owl

RESULTS

- Over the years, Barred, Saw-whet, Great horned and Long-eared owls have been detected.
- Route 40, surveyed by Peter and Lorraine Hope on April 21 2013, detected three Barred owls, one Northern saw-whet owl and one unidentified owl (seen but not heard).
- Route 41, surveyed by Chris McCarthy and local 4H contributors on May 03 2013, detected six Barred owls and one Great horned owl.
- The Devonshire/Rossignol Route, surveyed by Peter Hope and Brad Toms on April 29 2013, detected three Barred owls and one Northern saw-whet owl.

YEARS OF DATA

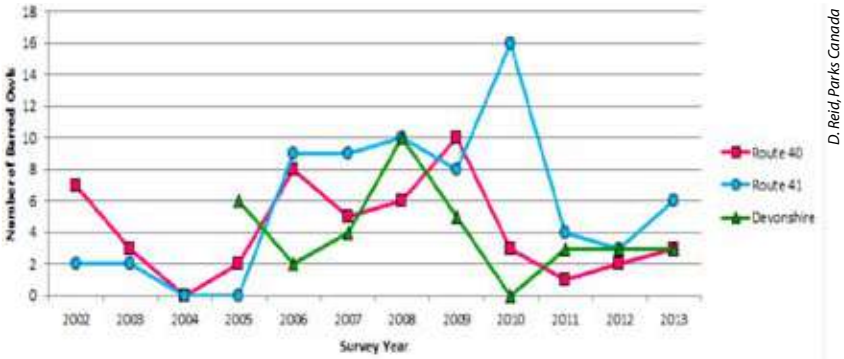
- Ongoing project since 2002

PARTNERS

- Parks Canada
- Bird Studies Canada
- Mersey Tobeatic Research Institute

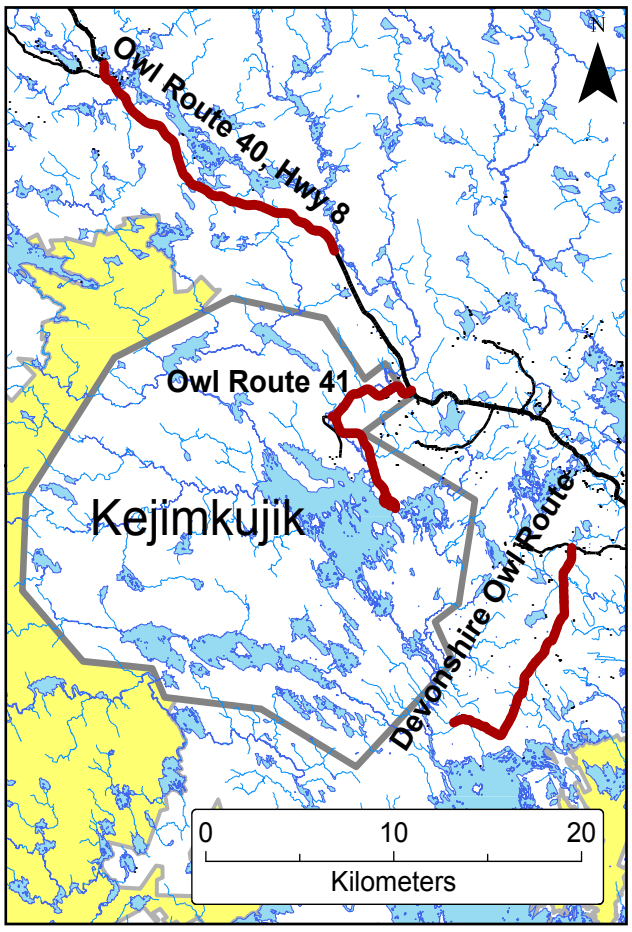
J.McNeil

Barred owl perched on a fence at night



D. Reid, Parks Canada

Number of Barred owls detected on three survey routes. The Highway 8 (Route 40) and Kejimkujik (Route 41) routes have been surveyed since 2002 and the Devonshire/Rossignol Route has been surveyed since 2005



A. Belliveau, MTRI

Owl survey routes are indicated in red

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Rationale

Aerial insectivorous bird populations have been in sharp decline for several decades in North America. The Chimney swift was listed as Threatened in 2007 by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and under the federal Species at Risk Act (SARA) in 2008. In Nova Scotia, several well known roost sites have been monitored for many years by a number of dedicated volunteers. In 2010, multiple stakeholders came together, along with experts from Quebec, Ontario and Manitoba, to identify gaps and needs for Chimney swift recovery in the Maritime Provinces and to bring current monitoring in line with other Canadian programs. The result was the Maritime Swiftwatch program initiated by Bird Studies Canada. This project aims to systematically monitor population levels at known roost sites, to learn more about nesting ecology of Chimney swifts and increase awareness of Chimney swifts.

S. Gosser

Chimney swifts in flight

Monitoring

MCGOWAN LAKE CHIMNEY SWIFT MONITORING

OBJECTIVES

- To conduct counts at the McGowan Lake roost site on standardized dates and other dates during migration and nesting seasons.
- To introduce new volunteers to Chimney swift monitoring to expand the base of available volunteers.
- To test an automated counter to get a better understanding of arrival and departure dates as well as seasonal fluctuations.

METHODS

- Chimney swifts were counted as they entered the roost site at dusk using visual and video counts. Weather conditions were also noted along with any other aerial insectivores.
- An automated counter was installed on the chimney at McGowan Lake and monitored regularly to ensure proper function, via Bluetooth™ connection.

RESULTS

- Fourteen counts took place from 6 May to 30 July including four counts on standardized dates. The highest count was 241 and the lowest was 4 birds. During the months of June and July greater than 100 birds were observed on 8 evenings.
- The automated counter and data logger were deployed on 13 June and retrieved 11 November. Analysis of results and effectiveness as a monitoring tool are still to be assessed.

Bird Studies Canada

Chimney swift

J. Todd

Year	Minimum Count	Maximum Count	Average (n)
2011	14	162	80 (12)
2012	9	98	56 (10)
2013	4	241	132 (14)

B.Toms, MTRI

Minimum count, maximum count and average number of Chimney swifts observed from 2011 to 2013 at McGowan Lake

YEARS OF DATA

- Ongoing project since 2011

PARTNERS

- Bird Studies Canada
- Blomidon Naturalist Society
- Ecology Action Center
- Mersey Tobeatic Research Institute
- Nova Scotia Power

B.Toms, MTRI

McGowan Lake roost site with data logger on chimney

B.Toms, MTRI

Close-up of the data logger at the McGowan Lake site

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J. Todd

Rationale

The Forest Health Group within the Forest Protection Division of the Department of Natural Resources monitors and assesses insect and disease populations and damage, and provides technical advice and management options to forest stakeholders. In 2004, an aerial damage survey detected defoliation and mortality caused by the Jack pine budworm, a native insect of Jack pine stands, in mature and old growth stands of White pine throughout the Southwest Nova Biosphere Reserve. Because this was the first record of this defoliating pest causing damage to the forests of Nova Scotia, it generated concern among forest managers. The reason for the concern is that in Nova Scotia the Jack pine budworm is feeding specifically on White pine rather than its usual host, Jack pine, which is its preferred host in other regions of Canada and the United States.


Forest Health NSDNR

L-2 larvae

Monitoring

JACK PINE BUDWORM POPULATION AND DAMAGE ASSESSMENTS

OBJECTIVES

Aerial Surveys:

- To observe and record locations of defoliation, determine the size (ha) of the outbreak and the severity of the damage.

Ground Surveys:

- To place pheromone traps baited with lures in mature and old growth stands of White pine to collect male moths to detect building populations.
- To collect branch samples to determine overwintering larval (L2 second instar larval stage) population levels.

METHODS

Aerial Surveys:

- Using one helicopter, two observers flew the entire province at an altitude of 600 m (approximate) along flight lines spaced 10 km apart.
- Locations of defoliation or mortality were delineated using a digitizing tablet and/or a personal computer using ArcPad software.
- Damage severity was also recorded for each polygon using a severity rating of light, moderate or severe defoliation or mortality.


Forest Health, NSDNR

L-2 extraction wash procedure

Ground Surveys:

- Using ArcGIS software, forest stands containing a major component of mature to old growth White pine were selected that provided the habitat required to support an outbreak population of Jack pine budworm.
- At each of these sites one Multi-Pher® pheromone trap containing a lure to attract the male moths were placed during late June or early July, just before the peak period of moth emergence and flight activity.
- One 60 cm mid-upper crown branch section was collected from each of three trees at the sample location and brought to the Nova Scotia Department of Natural Resources lab for further processing. Each branch section was processed through a 1% sodium hydroxide (NaOH) wash to remove the second instar larvae from their hibernaculum and then identified and counted.

RESULTS

Forest Health, NSDNR

Damage at Pine Lake in 2006

Aerial Surveys:

- No new defoliation or dead trees were detected in 2013 while conducting the annual survey. An increase in spread and/or intensity of damage was expected in 2013 in the Little Rocky Lake area which contained light defoliation in 2012, but it did not happen.

Ground Surveys:

- Forty-nine Multi-Pher® pheromone traps/lures were placed in mature and old growth white pine stands during June 2013 and were picked up in late fall and winter.
- Four traps contained 0 moths; 24 traps contained 1-10 moths; three traps contained 11-20 moths; one trap contained 21-30 moths. Seventeen traps were missing or on the ground.
- Twenty-one locations were assessed for overwintering L-2 larvae. Nineteen locations had 0 larvae; Kempton Bay Island 249 larvae per square meter of bark surface; Little Rocky Lake 225 larvae per square meter of bark surface.

YEARS OF DATA

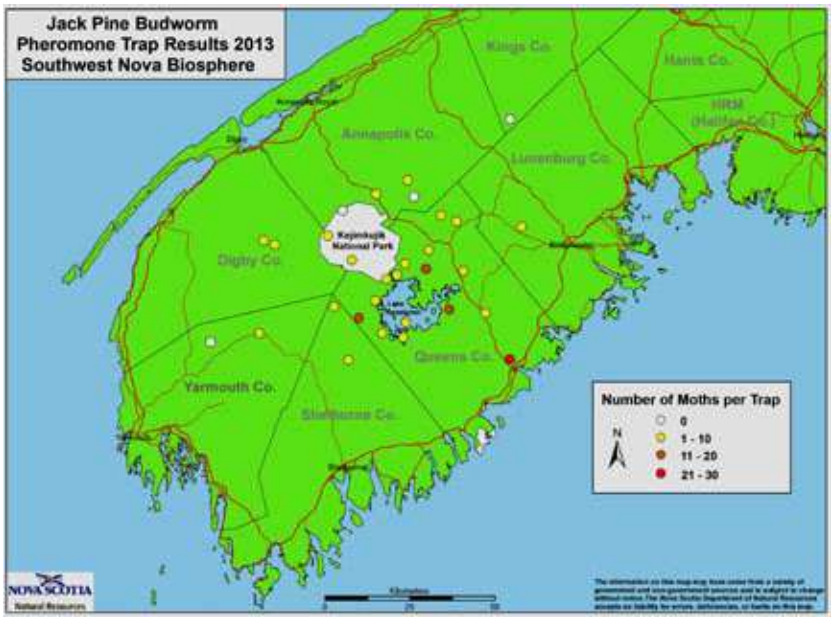
- Ongoing project since 2004

PARTNERS

- Nova Scotia Department of Natural Resources and Aviation Services

Forest Health, NSDNR

Conducting damage assessment survey



Forest Health, NSDNR

Pheromone trap catch results

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Rationale

Boreal felt lichen and other rare lichens that inhabit coastal forests in Nova Scotia are at risk because of air pollution and forestry. Boreal felt lichen and other rare cyanolichens are difficult to detect and as a result the knowledge of their ranges and distributions is incomplete. Little is known about which sources of air pollution pose the greatest threats and at what levels. A Geographic Information System (GIS) habitat algorithm was developed by the Nova Scotia government and has allowed the forest industry to use precaution when harvesting in potentially sensitive areas. This project has fostered partnership with industry to search for Boreal felt lichen. Since the algorithm was developed knowledge of Boreal felt lichen populations has increased greatly. The continuation of this long term data set will be crucial to conserving Nova Scotia populations of Boreal felt lichen.

Boreal felt lichen

Monitoring

BOREAL FELT LICHEN MONITORING IN NOVA SCOTIA

OBJECTIVES

- To find and protect Boreal felt lichen and other at risk lichen sites in Nova Scotia.
- To improve predictive ability of a GIS habitat algorithm to increase the likelihood of finding Boreal felt lichen.
- To increase knowledge of habitat characteristics and severity of threats at Boreal felt lichen sites over time.
- To raise the profile of rare lichens in Nova Scotia

METHODS

- In forested areas, sites predicted by GIS as likely habitat were searched for Boreal felt lichen.
- Known sites were permanently marked for long term monitoring.
- Data were collected on habitat parameters including: tree species, tree heights, tree diameters, tree ages, crown-closure, slope, aspect, drainage, ground cover and other parameters.
- When new Boreal felt lichen sites were found the provincial government and relevant stakeholders were notified. Any losses or habitat destruction were also reported.

Adult and juvenile Boreal felt lichen

RESULTS

- Two hundred and seventy-three trees with Boreal felt lichen were discovered from 2005 to 2013 through this project and during the same time 61 of those trees no longer contained Boreal Felt Lichen.
- In 2013, 17 trees containing Boreal felt lichen were lost, but an unprecedented 113 trees were found to have Boreal felt lichen on them. Two large concentrations were found at Sandy Cove and McPhail Lake in Halifax County.
- MTRI researchers found 147 trees with Blue felt lichen (Special Concern), 29 trees containing Vole ears (Endangered) and 12 trees containing Frosted glass whiskers (Special Concern). The locations of Frosted glass whiskers are the first for mainland Nova Scotia and are in Shelburne and Halifax counties.
- Habitat parameters were collected at some new sites. Sites were visited for annual monitoring.

RESULTS
Continued

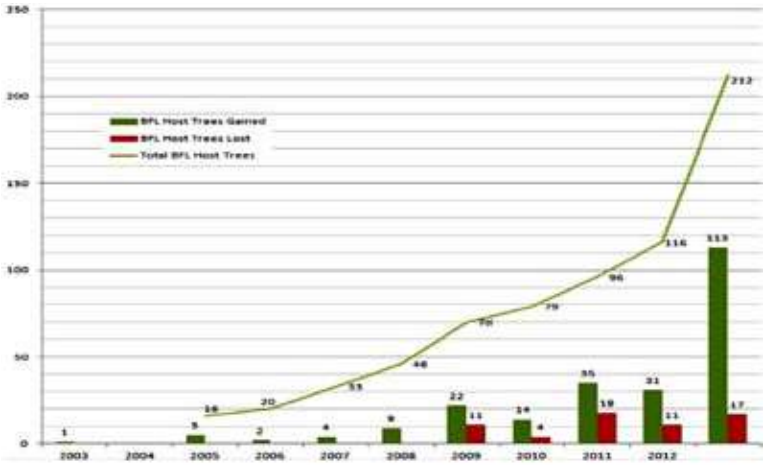
- Forest industry employees and DNR staff were taken out to a Boreal felt lichen site and searched for Boreal felt lichen to learn about the habitat.
- A temperature and humidity study of habitat was initiated using automated data loggers at Boreal felt lichen sites.

YEARS OF DATA

- Ongoing project since 2007

PARTNERS

- Environment Canada
- Federal Habitat Stewardship Program for Species at Risk
- New Page Corporation
- Nova Scotia Department of Environment
- Nova Scotia Department of Natural Resources
- Mersey Tobeatic Research Institute
- Mountain Equipment Co-op



B. Toms, MTRI

Number of BFL - host trees gained (green bar), BFL - host trees lost (red bar) and total number of BFL - host trees (green line)

B. Toms, MTRI

Boreal felt lichen habitat

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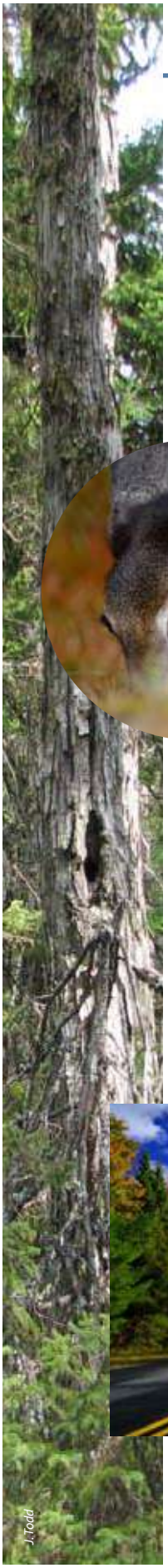


Rationale

Since the decline of the Mainland moose in the province, the White-tailed deer, a naturalized species, became one of the major herbivores affecting Kejimkujik forest ecosystems. Selective browsing of deer on certain species of herbaceous plants, shrubs and trees can exert extensive influences on forest community composition and structure. Significant increases in deer populations may result in a reduction of some forest plant components (*e.g.* sugar maple and yellow birch) through over-browsing. Alternatively, a decrease in local White-tailed deer abundance could result in changes in the predator trophic structure since deer are important prey for top predators, such as coyote and bobcat. White-tailed deer is also a game species and changes in deer populations can provide information about hunting pressure outside the park and the effectiveness of enforcement at Kejimkujik.

E. Le Bel

White-tailed deer grazing within Kejimkujik

Monitoring

RELATIVE ABUNDANCE OF WHITE-TAILED DEER

OBJECTIVES

- To monitor and assess changes in the population of White-tailed deer at Kejimkujik.
- To determine if the mean number of White-tailed deer observed per day at Kejimkujik (as assessed by the roadside population) is within the range of natural variation (*i.e.* between 1.39-5.89, as determined through analysis of data between 1987-2007) and if it has increased or decreased over time.

METHODS

- White-tailed deer have been monitored at Kejimkujik since 1976 through an annual roadside count, which was conducted each day in October along the Main Parkway and locations within Jeremy's Bay Campground. The number, age class and sex of observed deer were recorded.
- The sampling framework for this project represents only the roadside population of White-tailed deer at Kejimkujik.
- White-tailed deer roadside count data between 1987 and 2012 were analyzed to detect trends over time. A linear model was used to assess whether the slope of the temporal variable was significantly different from zero. The period from 1987 to present is presumed to reflect a stable population level for this region in the current conditions and was used for the assessment period for trend analysis.
- The status of White-tailed deer at Kejimkujik was also examined by comparing recent data to established thresholds. Thresholds for White-tailed deer abundance at Kejimkujik were developed based on statistical variability in the yearly mean of deer counted per day in the roadside survey at Kejimkujik between 1987 and 2007. To assess status, the linear model from the trend assessment was used to generate a point estimate (with associated error) of the measure for the most recent year, which was then compared to the established thresholds.

E. Le Bel

A great fall morning to be conducting the White-tailed deer roadside census in the park

J. Todd

RESULTS

- The average number of White-tailed deer observed each day in 2013 at Kejimkujik was quite high (7.8 deer obs/day), and in fact are the highest numbers observed since 1999 when

RESULTS
Continued

similar levels were recorded (7.5 deer obs/day). Numbers were also high in 2007 (6.8 deer obs/day), indicating that there may be a cyclical nature to relative deer abundance within Kejimkujik.

- This high number is outside the range of acceptable abundance according to established Kejimkujik thresholds. High deer numbers are known to cause detrimental effects to hardwood recruitment as they browse on the young trees and hinder their growth and establishment. There is however the possibility that as the forests within Kejimkujik mature, deer cannot find suitable browsing material and migrate toward the roadsides where new growth is more abundant, potentially elevating the roadside deer count.
- Detailed research into understanding the carrying capacity of White-tailed deer at Kejimkujik would allow for improved monitoring thresholds, determining the affect deer population numbers have on forest growth and regeneration, and to help improve future management decisions.

YEARS OF DATA

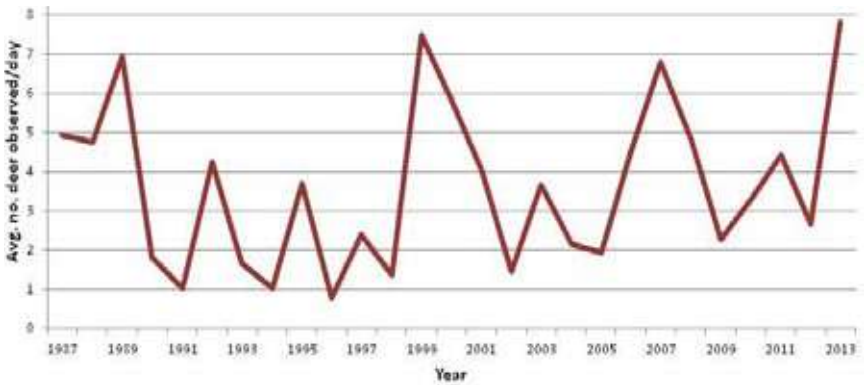
- Ongoing project since 1976

PARTNERS

- Parks Canada
- Nova Scotia Department of Natural Resources

E. Le Bel

White-tailed doe with two fawns observed at Kejimkujik



Parks Canada

Average daily White-tailed deer observations at Kejimkujik from 1986 to 2013

E. Le Bel

Two curious White-tailed deer

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Rationale

Invasive plant species have been identified as a significant threat to the ecological integrity of Kejimkujik. These species often displace native plants because of their innate hardiness and lack of natural controls. In order to understand the impact of invasive plant species at Kejimkujik, a research project was initiated in 2004 to inventory invasive plants within the park. Species were divided into several categories based on level of invasiveness. The species list was modified in 2008 to facilitate monitoring efforts and to focus on priority species that represent the greatest ecological threat. One of the major threats identified was Glossy buckthorn, which is an aggressive non-native shrub. Dense colonies of Glossy buckthorn can reduce native biodiversity and alter forest succession. It also has the ability to invade pristine areas located considerable distances from the parent population. Management of this species is a priority for Kejimkujik.

Glossy buckthorn at Cannon Brook, Kejimkujik

Monitoring

INVASIVE PLANT MONITORING AND RESTORATION

OBJECTIVES

Invasive Plants:

- To inventory the presence and distribution of existing invasive species in Kejimkujik.
- To identify priority species and areas of concern.
- To determine if the Invasive Plant Index is within acceptable range for trails within Kejimkujik and has it changed over the last five years.

Glossy buckthorn:

- To effectively eradicate all mature, seed producing Glossy buckthorn plants from all locations as they become known.
- To monitor areas of Glossy buckthorn eradication to ensure exhaustion of the seed bank.

METHODS

Invasive Plants:

- Twenty-three park trails were surveyed for presence and abundance of the priority invasive species.
- Each trail is surveyed in August every two years on a rotating schedule (11 trails one year, 12 trails the next year). A standard length of 3 km is used for each trail survey.

Glossy buckthorn:

- Young Glossy buckthorn are hand-pulled wherever they are detected and their Global Positioning System (GPS) locations are recorded in a database. This database allows park staff to log new occurrences, track eradication treatments and to conduct follow-up monitoring.
- Mature Glossy buckthorn will be removed by cutting all stems and the minimal required concentration of herbicide will be applied directly to the cut stump using a small foam applicator similar to a 'Bingo dabber'. Staff have been trained and certified for safe application of herbicides.

Category 1 Invasive Plants High Priority, excludes all other plant species and dominates sites indefinitely	Glossy Buckthorn
	Purple loosestrife
	Scotch broom
	Scotch pine
	Garlic mustard
	Common reed
	Japanese Knotweed
	Giant hogweed

Parks Canada

The eight Category 1 Invasive Plants at Kejimkujik

RESULTS

K. Rowter, Parks Canada

Scotch pine at Merrymekedge, Kejimkujik

Invasive Plants:

- No new occurrences of invasive plants were identified on the 11 trails monitored in 2013.
- Work is underway to modify the existing Invasive Plant Index to better reflect the monitoring of Category 1 invasive plants.

Glossy buckthorn:

- Eleven new observations of Glossy buckthorn within the park were recorded in the database (eight of 11 were young plants removed by hand).
- Further assessments were conducted with herbicide application to cut stumps to determine the minimum concentration required for eradication of mature plants.

YEARS OF DATA

- Ongoing since 2008

PARTNERS

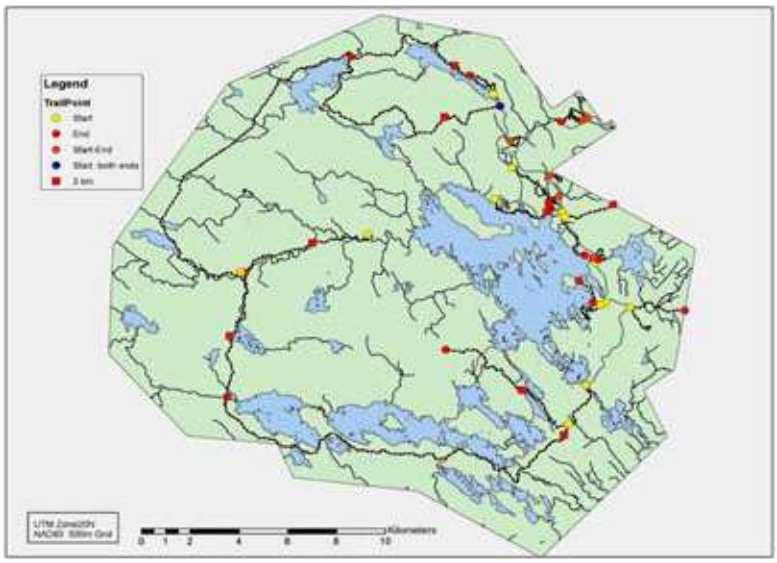
- Parks Canada

K. Rowter, Parks Canada

Young Glossy buckthorn along the Mersey River

K. Rowter, Parks Canada

Student J. Mildon recording a new Glossy buckthorn location on Cannon Brook



S. O'Grady, Parks Canada

Map of Invasive Plant Monitoring trail surveys in Kejimkujik

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Rationale

Plethodontid salamanders lack lungs and breathe through their glandular skin and the roof of their mouth, which must remain moist for respiration; they are vulnerable to desiccation and soil contaminants. Plethodontids can reach high densities in many forest habitats and play an important role in ecosystem food webs and detrital dynamics. They are useful indicator species of forest ecosystems due to their life history traits. They are completely terrestrial and occupy a small home range. They generally have long life spans (ten plus years), high annual rates of survivorship and low birth rates, resulting in stable population sizes under normal conditions. Thus a change in population is more likely to be an indication of some stress to a forest ecosystem rather than simply due to shifts in home range. In Nova Scotia there are only two native plethodontid salamanders: the Four-toed salamander (rare) and the Eastern red-backed salamander (common). Salamanders are monitored as one component of the integrated forest plots designed to assess and monitor the state of forest ecosystems at Kejimkujik and detect changes over time.

Red eft observed under a salamander board

Monitoring

PLETHODONTID SALAMANDER MONITORING

OBJECTIVES

- To monitor plethodontid salamander abundance in mixed and hemlock forest ecosystems of Kejimkujik.

METHODS

- Salamander abundance was assessed in six long-term integrated forest plots that were established in 2003 in mixed and hemlock forest ecosystems using a stratified random sampling design.
- Within these plots, salamander abundance was assessed once per week for four weeks in mid-September to mid-October each year.
- At each plot, the number of salamanders observed under 40 thick wooden boards (Artificial Cover Objects) was counted and recorded. Though the monitoring focus was placed on Eastern red-backed salamanders, all other salamander species were recorded when present.

RESULTS

- Since monitoring of Eastern red-backed salamanders began in 2003, the salamander population has remained stable in both the hemlock and mixed hardwood forest ecotypes.
- This relatively long term stability (11 years) in salamander abundance indicates that during this time period stressors such as climate change, acid rain and land use change have had no significant effect on salamander abundance in Kejimkujik forests.
- In 2013, volunteers joined park staff and explored the forests of Kejimkujik to assist with monitoring efforts.

Yellow-spotted salamander

YEARS OF DATA

- Ongoing project since 2003

PARTNERS

- Parks Canada

M. Crowley, Parks Canada

Eastern red-backed salamander eggs

E. Aulenback

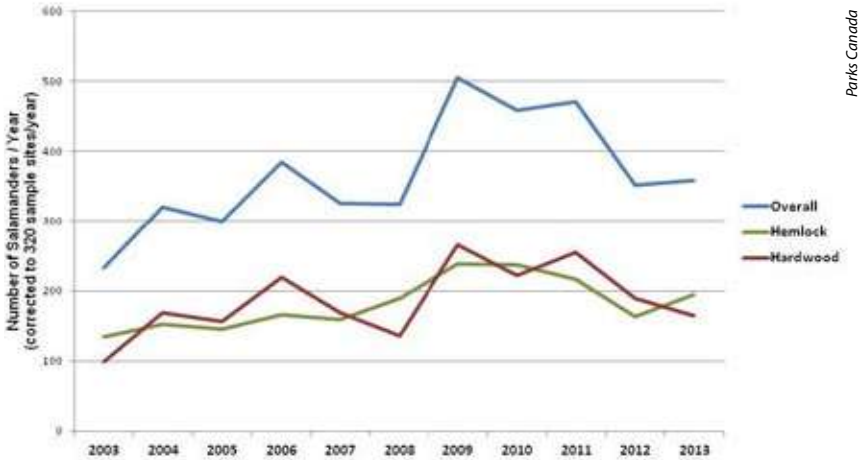
M. Crowley and K. Gulliver checking for salamanders

M. Crowley, Parks Canada

G. Turner assisting with monitoring efforts

E. Aulenback

Volunteers and park staff heading into the forest to sample salamanders



Parks Canada

Eastern red-backed salamander abundance at six monitoring sites (three in mixed hardwood forest ecotype, three in hemlock forest ecotype)

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Rationale

Red oak trees play a significant role in the Acadian Forest, providing both food and shelter for a diversity of wildlife. Monitoring Red oak plots in Kejimkujik over the past few years has shown poor levels of regeneration. Some of the contributing factors to the disturbance of Red oaks in the Acadian forest likely include past forestry practices and suppression of forest fires. Other contributing factors that may have altered Red oak regeneration and distribution also include browsing by White-tailed deer, acorn predation and stress from defoliators. The purpose of this work is to assess the health of mixedwood stands with Red oak and to determine appropriate sites for Red oak regeneration experiments both inside and outside Kejimkujik. These proposed experiments will help build a better understanding of management techniques to be used in Kejimkujik and other parts of the Acadian forest region.

Red oak leaf amongst other decaying leaves

Research

RED OAK REGENERATION IN MIXEDWOOD STANDS

OBJECTIVES

- To collect data to determine appropriate sites for Red oak regeneration experiments both inside and outside Kejimkujik.
- To set up and monitor White-tailed deer exclosures that protect hardwood seedlings and saplings from browsing.
- To monitor hardwood, especially Red oak, regeneration over a 10-year period within permanently marked transects and deer exclosures and determine the impact White-tailed deer have on Red oak regeneration.
- To assess the damage inflicted on mature Red oaks by the Oak leaf shredder and Oak leaf roller.
- To monitor Red oak recruitment in previously determined areas by completing vegetation transects and Forest Ecosystem Classification plots.

METHODS

- Researchers were trained to complete Forest Ecosystem Classification vegetation and soil plots. This involved digging soil pits, completing species inventories for 10 m by 10 m plots and estimating canopy cover by each tree species.
- Researchers were trained to complete belt transects of 150 by 2 m covering a total of 300 m² to quantify Red oak regeneration and competition and rare vascular plant species, both in control sites and treatment (prescribed burn) sites.
- Red oak defoliation was estimated visually in belt transects.
- Three deer exclosures measuring 2 m by 2 m were erected in the centre of randomly selected quadrats within each permanently marked site.

Cancer root, a rare vascular plant of Red oak forests

RESULTS

- Forest Ecosystem Classification was used in combination with logistical considerations to determine five permanent transect and exclosure sites inside Kejimkujik and four sites outside the park.
- A total of ten transects were permanently marked at five sites inside Kejimkujik.

RESULTS
Continued

A. Belliveau, MTRI

Red oak seedling found growing in a prescribed burn site

- Forty-two white-tailed deer exclosures have been erected at nine different sites, five inside Kejimkujik and four outside.
- Preliminary analysis of pre and post-burn data has demonstrated the prescribed burn area is succeeding forward as a Red maple and Witch hazel uplands forest and that White pine seedlings and saplings are significantly reduced.
- Data from transects showed that red oaks experienced on average about 39% defoliation in years prior to 2012, but only about 9% in 2012-2013 (n=52), indicating a recession in recent oak leaf roller and skeletonizer outbreaks.
- Transect data throughout the duration of this project also consistently showed deer browse of red oak seedlings of 40-45%.
- Exclosure data dating back to 2011 did not show any significant changes or increases in red oak seedling, which is likely an indication of the long-term nature of this research initiative and the many factors (*e.g.* red oak acorn bumper crop frequency, insect defoliation stress) in play.
- The number of individual cancer root plant stems increased significantly in both prescribed burn sites and decreased in one of two control sites; however, because of the variability in host plant (red oak) health, prescribed burn temperature, depth and coverage, it is not yet possible to establish a link between forest surface fires and the persistence of this rare parasitic plant species.

YEARS OF DATA

- Year 8 of an ongoing project

PARTNERS

- Mersey Tobeatic Research Institute
- Parks Canada
- Nova Scotia Community College
- Nova Scotia Department of Natural Resources
- Nova Scotia Economic Development
- Service Canada

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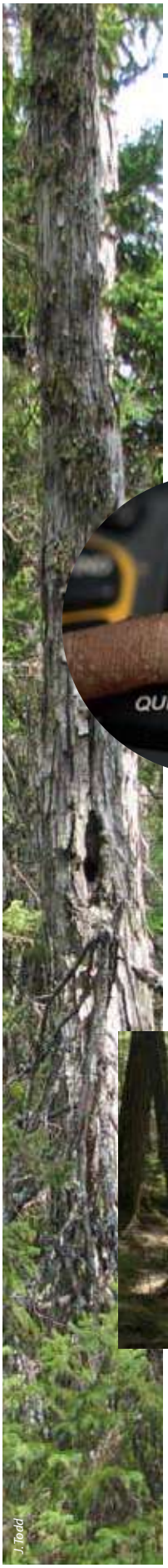
E. Le Bel

Post prescribed burn within Kejimkujik



Rationale

Old climax Acadian forest types are some of the most threatened ecological features in the province because they contain high volumes of high-value softwood and hardwood timber that is the primary target of the forest industry. In southwest Nova Scotia, woodlands formerly owned by Bowater and recently purchased by the provincial government may encompass significant areas of old climax Acadian forests. These land holdings have been managed for intensive, industrial forestry over many years and are characterized by a dense network of forestry roads, extensive old and recent clearcuts and young regenerating forests. However, given the significant finds of old forests in this area in a preliminary study by MTRI in 2010, there is good potential for finding old forests within the Medway and Rossignol districts, an area representing over 120,000 hectares. The purpose of this research is to identify areas of high conservation value on former Bowater lands to guide conservation efforts and land securement decisions.

A. Belliveau, MTRI

Hemlock core showing ~50 tree rings/cm

Research

OLD FORESTS IN THE MEDWAY AND ROSSIGNOL DISTRICTS

OBJECTIVES

- To collect and assemble geographic information pertinent to old forest stands.
- To spatially define forest types within these districts and identify potentially old forests.
- To collect field data for selected forest stands to assess their conservation value within the landscape.
- To provide data in the form of maps, georeferenced spreadsheets and photos of stands assessed to the Crown Share Land Legacy Trust Trustees, land trusts and other land securement decision-makers.

METHODS

- Using Geographic Information Systems (GIS), older climax Acadian forests were identified by targeting shade-tolerant coniferous, deciduous and mixedwood forests and also climax forest patches that may be younger but contain significant components of large legacy trees.
- A subset of highest-priority patches for field-truthing according to the GIS and advice from the Crown Share Land Legacy Trust Scientific Advisory Committee was selected.
- Forest stands were assessed on the ground using a rapid reconnaissance level methodology which captured species composition, structure, age, diameter, height, crown closure, regeneration, deadwood, ground cover, evidence of human disturbance, drainage and landform.
- High resolution photographs were taken at each stand and maps created with geographic points and tracks.
- Results were reported to the Crown Share Land Legacy Trust Trustees.


A. Belliveau, MTRI

Old-growth climax hemlock forest

RESULTS

- A total of approximately 870 hectares of forest were mapped and categorized, with a total of 86 stands.
- Over 73% (593 hectares) of all forests targeted through the GIS and ground-truthing methods described above were categorized as older Acadian forest types, which generally meets the criteria of Old Growth Class 1 in the Nova Scotia Old Forest Policy (2012), and are of high conservation value.

RESULTS
Continued

- The average age of trees cored was 194 years and 198 years in the Medway District (n=48) and the Rossignol District (n=26), respectively.
- The majority of forests described were composed of Eastern hemlock, Sugar maple, Yellow birch and Red spruce.
- Only about 9% of identified lands were characterized, which points to the fact that there are still significant knowledge gaps regarding the current extant locations, size and quality of yet undiscovered older climax Acadian forest types on these lands.

YEARS OF DATA

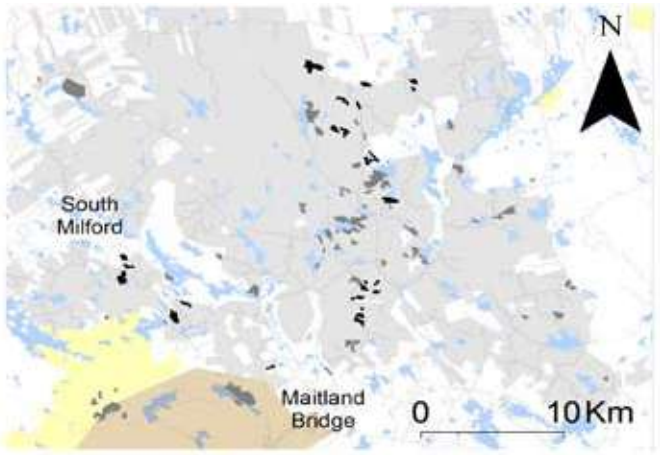
- Ongoing project since 2012

PARTNERS

- Mersey Tobeatic Research Institute
- Crown Share Land Legacy Trust Scientific Advisory Committee
- Nova Scotia Department of Natural Resources
- Nova Scotia Department of Environment

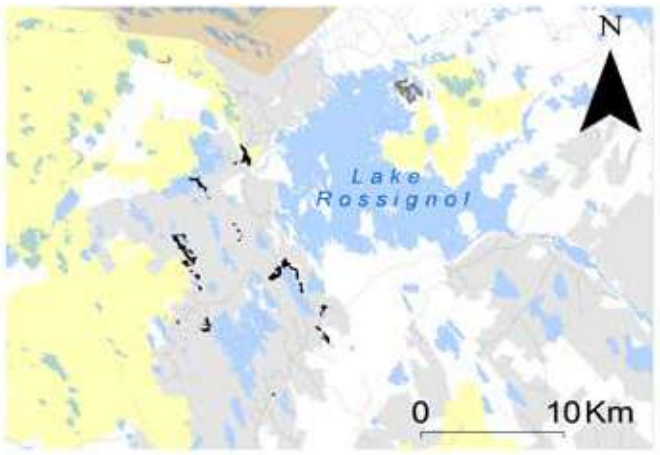
A. Belliveau, MTRI

Hemlock tree with a DBH greater than 85 cm



A. Belliveau, MTRI

Old forests (black) confirmed and mapped in Medway District during project, along with other confirmed old forests (dark gray) and Resolute Forest Products' former lands (light gray)



A. Belliveau, MTRI

Old forests (black) confirmed and mapped in Rossignol District during project, along with other confirmed old forests (dark gray) and Resolute Forest Products' former lands (light gray)

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Rationale

The use of DNA barcoding has greatly improved large-scale biodiversity assessments by overcoming the limits of traditional species identification. This technique differentiates species by variations in a short gene sequence. Malaise traps are tent-like structures that are effective at capturing insects from various groups and are easily deployed and cost-effective. Used in combination, the Biodiversity Institute of Ontario (BIO) and Parks Canada initiated the Canadian National Parks (CNP) Malaise Program in 2012 where 14 national parks in Central and Western Canada participated. In 2013, 14 national parks in Eastern Canada were involved in the program, Kejimkujik included. In addition, eight of the 14 parks were visited by four BIO staff on the BIObus (BIO's RV field vehicle) to conduct the Standardized Sampling Program. Various trapping techniques were used to obtain a more representative list of arthropod species within the park. All samples were brought to BIO by October 2013 to start processing. Complete park reports will be prepared and ready for Fall 2014.


V. Levesque-Beaudin

BIObus staff reaching out to the public at the "Into the Dark" Campground Activity

Research

ARTHROPOD DIVERSITY AND DNA BARCODING

OBJECTIVES

- Large-scale trapping of arthropods in Canadian National Parks to obtain tissue material and subsequently determine Canadian species diversity using DNA barcoding.
- Over the long term, creation of a complete DNA barcode library for all eukaryote species that occur in Canada.

METHODS

- General collecting (aquatic sampling, night sheet, bucket and bottle trap, hand collecting) occurred at various sites throughout the park.
- All associated collection data and sequences will be uploaded to the online Barcode of Life Datasystems (BOLD). Barcodes will be assigned a Barcode Index Number (BIN), which represents a unique species and can be compared to the DNA barcode reference library.

CNP Malaise Program:

- Two malaise traps (15 m apart) were deployed by BIO staff in Jeremy's Bay Campground, near the Ampitheatre, off of the Campfire Circle.
- Traps collected specimens for 20 weeks; Kejimkujik staff changed the sample bottles every week.

Standardized Sampling Program:

- Four BIObus staff visited Kejimkujik once in May and once in August. They conducted standardized sampling at Eel Weir Road and north and south of Big Dam Lake on the Channel Lake Wilderness Trail.
- Two malaise traps, ten pan traps, ten pitfall traps, one soil core, one intercept trap and one Burlese funnel deployed at each site for 1 week per visit. Each staff also performed sweep netting for 5 minutes at each site on three separate days (12 sweep netting events).

Analytical Protocol:

- DNA will be extracted from each specimen, and every individual will gain a DNA barcode sequence which enables the assignment of more detailed taxonomic information in the future.


A. Pawlowski

The BIObus in Jeremy's Bay Campground

RESULTS

- Results obtained from 2013 sampling will be available in the Fall of 2014.
- A previous sampling event took place at Kejimkujik in 2009.

YEARS OF DATA

- Year 2 of a 4 year project

PARTNERS

- Biodiversity Institute of Ontario
- University of Guelph
- Canadian Centre for DNA Barcoding
- Parks Canada
- Genome Canada: Ontario Genomics Institute
- Canadian Foundation for Innovation
- Ontario Ministry of Research and Innovation
- Ann McCain Evans and Chris Evans

S.Sukumar

Kejimkujik park staff and BIO staff set up a malaise trap for the CNP Malaise Program

A.Pawlowski and C.Sobel

Traps used in the Standardized Sampling Program: pan trap (top left), Berlese funnel (top right), flight intercept trap (centre), pitfall trap (bottom left), sweep netting (bottom right)

	Total
Specimens Collected	2320
Barcodes Generated	1871 (80.6% success rate)
Families Identified	171
Genera Identified	400
Species Identified	424
BINs Determined	945

K. Perez

Results from a previous sampling event conducted at Kejimkujik in 2009 to develop a baseline inventory of arthropods for the park. During this time, sampling techniques included hand collecting, night sheets and bucket traps

A. Pawlowski

Map and list of participating national parks in the Canadian National Parks Malaise Program 2013

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Photos on page 47, clockwise from top left:
- *Big Dam West, Kejimkujik,* by S. Klapstein
- *Surveying for loons,* by B. Toms, MTRI
- *Curly-grass fern,* by B. Toms, MTRI
- *Common loons,* by E. Le Bel
- *Electrofishing in Rogers Brook,* by T. Smith, Environment Canada

FRESHWATER

Rationale

The hydrological regime of a stream plays a critical role in determining the biodiversity and ecological processes of aquatic, wetland and riparian ecosystems. Stressors such as roads, dams, water diversions, deforestation, municipal development and climate change affect and alter hydrological processes. As a result, hydrological characteristics provide important information on the integrity of freshwater systems and how they may be changing over time. Critical parameters of hydrologic condition are assessed in five watersheds and used to monitor and report on the status and trends in stream flow at Kejimkujik.

P. Martel, Parks Canada

R. Brunt and D. Pouliot measuring stream velocity at Peskowesk Brook, Kejimkujik

Monitoring

STREAM FLOW MONITORING

OBJECTIVES

- To monitor the status and trends in stream flow in major transboundary watersheds at Kejimkujik.
- To determine if the Stream Flow Index is within the range of natural variation for major transboundary watersheds at Kejimkujik and if it is changing over time.

METHODS

- Stream flow was monitored at one site in each of the following five major transboundary watersheds at Kejimkujik: Mersey River, Little River, West River, Grafton Brook and Peskowesk Brook. The Mersey River site has been monitored by the Water Survey of Canada since 1968 and Parks Canada has been monitoring the other sites since 2008.
- A permanent stream gauging station was installed at each site, using an automated data logger to record a continuous record of water level.
- Measurements of water depth and stream flow were taken of a cross section of each stream periodically throughout the year to determine total discharge. Discharge measurements were done at a range of different water levels to define a rating curve for the relationship between water level and discharge for a given site.
- A time series of discharge data was generated from the measured water level data using the defined rating curve for each site.
- Historic discharge data from the Mersey River site were used to calculate five parameters, selected to represent the critical characteristics of hydrologic processes.
- Thresholds for each parameter were established based on statistical variability in historical data from each site between 1968 and 1988 (*i.e.* the condition is good if it is within one standard deviation from the historic mean; the condition is poor if it is more than two standard deviations from the historic mean). Using the thresholds, each parameter was given a score for each year and the scores were averaged to obtain a Stream Flow Index value for the Mersey River for each year between 1989 and 2006.

Hydrologic characteristic	Stream flow parameter
Magnitude	Mean daily flow
Duration	Min. average flow for 30-day period
Timing	Julian data of annual min. flow
Frequency	Number of high flow pulses greater than 3 times median flow
Rate of change	Richards-Baker Index (RBI)

D. Ure, Parks Canada

Parameters used to calculate the Stream Flow Index

P. Martel, Parks Canada

RESULTS

- A significant trend was detected and the Stream Flow Index appears to be declining for the Mersey River at Kejimkujik between 1989 and 2006, indicating that hydrologic condition of the watershed is decreasing over time.
- Currently, a long-term dataset only exists for the Mersey River watershed. Monitoring of the remaining four sites was initiated in 2008 and is ongoing. Site specific thresholds for these watersheds are still in development and require further analysis before long-term trends and conditions can be assessed.
- West River has experienced the highest fluctuation in seasonal water levels, displaying substantial dips and spikes representing periods of drought and precipitation respectively (see water level graph below).The relatively extreme variability of West River to precipitation inputs is likely due to the small size and structure of its headwater reservoir, limiting its ability to regulate stream flow following precipitation events.

YEARS OF DATA

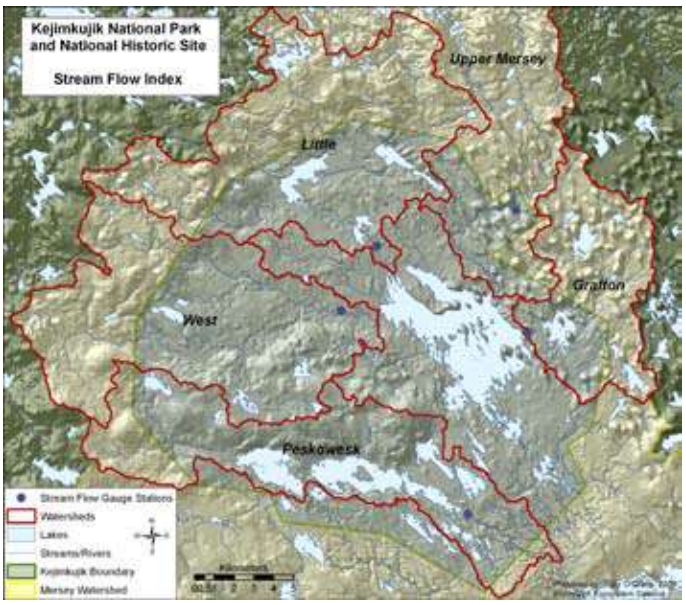
- Ongoing project since 2006

PARTNERS

- Parks Canada
- Water Survey of Canada, Environment Canada

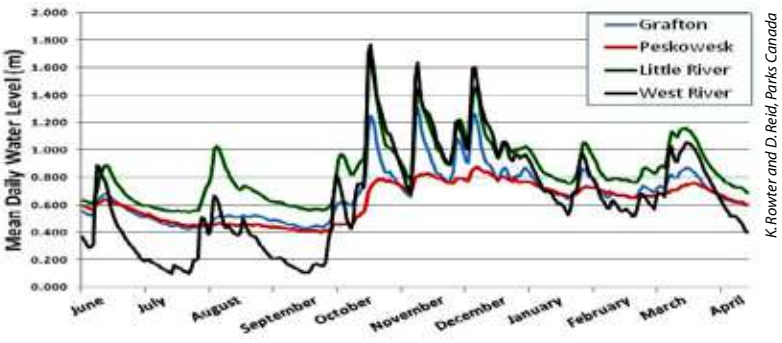
P. Martel, Parks Canada

Stream flow monitoring site at Grafton Brook, Kejimkujik



S. O'Grady, Parks Canada

Locations of stream flow monitoring stations (blue dots) in five major trans-boundary watersheds (in red) at Kejimkujik



K. Rowter and D. Reid, Parks Canada

Mean daily water level at four sites in Kejimkujik between 2011 and 2012

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R. Martel, Parks Canada

Rationale

In 2011, Nova Scotia Nature Trust, MTRI and Kejimkujik came together to create an Atlantic Coastal Plain Flora (ACPF) Volunteer Plant Monitoring Program. This program offers various volunteer opportunities to individuals or groups interested in helping with ACPF conservation and recovery efforts, in support of the ACPF Recovery Team's work. The Volunteer Plant Monitoring Program evolved from the Rare Plant Monitoring Program run by the Nova Scotia Nature Trust since 2000. The updated, collaborative plant monitoring program was designed to involve interested, conservation minded individuals and groups in community based science to collect information on the populations and habitats of particular species of ACPF on an annual basis. The data collected by monitors contribute to the growing understanding of ACPF, especially at-risk ACPF, in Nova Scotia. They also contribute to the stewardship of Nova Scotia Nature Trust's protected properties in southwest Nova Scotia.


B. Toms, MTRI

Curly-grass fern at Ponhook Lake

Monitoring

ACPF VOLUNTEER PLANT MONITORING

OBJECTIVES

- Collect data on presence of ACPF species and changes in their populations along lakeshores in southwest Nova Scotia.
- Document threats along the shorelines of lakes that are a high priority for recovery action.
- Engage volunteers in a meaningful monitoring program that contributes directly to the conservation of ACPF species.

METHODS

- In 2012, two ACPF identification and monitoring training events were offered by staff from Nova Scotia Nature Trust, MTRI and Kejimkujik.
- In 2013, volunteers were assigned to three sites known to have ACPF. Permission was received from landowners for monitors to work on their properties.
- Between July and September, volunteers estimated the abundance (small, medium, large) of particular at-risk or rare ACPF along the shoreline or in the wetland.
- At one to three spots at each site, volunteers measured water level to calculate the area of exposed shoreline.
- At each site, volunteers collected data on the quality of habitat, noting occurrences of disturbance (evidence of all terrain vehicle use, shoreline alterations, *etc*.) or other potential impacts (*e.g.* invasive plants).
- Volunteers completed data sheets and submitted them to the Nova Scotia Nature Trust.
- Additional training and volunteer recruitment efforts were planned for 2014.


E. Le Bel

Military rush

RESULTS

- Four volunteers worked individually or in teams to monitor at-risk ACPF along the shorelines of lakes in southwest Nova Scotia.
- Three ACPF sites were visited. Monitoring data were collected from Molega Lake and Gilfillan Lake. Observations and photorecords were collected from Ponhook Lake.
- At Molega Lake, data were recorded on Redroot, Brookside alder and Buttonbush. Water levels were observed by volunteers to

RESULTS
Continued

be unseasonably high in August. Observations were collected regarding new residential developments within the broader area. Surveyors noted an absence of leeches in the lake and also increased presence of grasses.

- Photorecords and casual observations were collected from the shoreline of Ponhook Lake.
- At Gilfillan Lake, data were collected on Plymouth gentian, Stout smartweed, Virginia meadow beauty and Greenbrier. The presence of new ATV tracks was observed and their locations were mapped.
- More volunteer surveyors are needed for 2014 in order to collect sufficient data to monitor species at ACPF sites.

YEARS OF DATA

- Ongoing project since 2011

PARTNERS

- Nova Scotia Nature Trust
- Mersey Tobeatic Research Institute
- Parks Canada
- Atlantic Coastal Plain Flora Recovery Team
- Nova Scotia Department of Environment
- Nova Scotia Department of Natural Resources
- Atlantic Canada Conservation Data Centre
- Federal Habitat Stewardship Program for Species at Risk
- Nova Scotia Habitat Conservation Fund
- Municipality of the District of Shelburne
- Municipality of the District of Lunenburg

NSNT

Cover of the ACPF plant monitoring protocol

P. Hudson

D. Mazerolle taking a photograph of a plant on Fanning Lake

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Rationale

Ongoing studies of invertebrate, fish and avian species indicate sustained high methyl mercury concentrations throughout the aquatic food web of Kejimkujik. Previous research, most commonly in Ontario and the high Arctic, has also shown the importance of solar radiation to the removal of this bioavailable and biomagnifying form of mercury, however this concept has not been studied in Nova Scotia lakes. Potential for photodegradation of methyl mercury may be reliant on the concentration of other solar radiation absorbent compounds such as dissolved organic matter (DOM) or dissolved ions. We studied the ability of lakes with varying dissolved organic carbon (DOC) concentrations to initially absorb radiation and secondly retain or lose that absorbent capability. This research will further our ability to predict solar radiation availability in these lakes, the photoreactivity of dissolved constituents, and will provide a framework for future mercury research under both laboratory and natural *in situ* conditions.

Big Dam West, Kejimkujik

Research

DISSOLVED ORGANIC CARBON AND METHYL MERCURY

OBJECTIVES

- To determine the photoreactivity of lake waters with different DOC concentrations seasonally throughout the ice-free portion of 2013.
- To measure real-time solar radiation distribution in the water columns of high and low carbon lakes in Kejimkujik over a substantial part of the ice-free period of 2013.
- To determine how photoreactivity of DOM will affect the photodemethylation of methyl mercury.

METHODS

- Six lakes, paired by location, were chosen to create a gradient of DOC concentrations, grouped into three high and three lower DOC concentrations.
- Lakes centers were sampled at 30 cm depth from the side of a canoe in June, August and late September.
- Water was filtered and irradiated with 47 W/m2 UVA for 24 hours to determine the photoreactivity of dissolved constituents in each lake at each time point throughout the field season.
- Ultraviolet (UV), photosynthetically active radiation (PAR), and temperature were continuously measured at three depths in one high and one lower carbon lakes from mid-June to the beginning of November.

East side view of float continuously measuring *in situ* UV, PAR and temperature at three depths

RESULTS

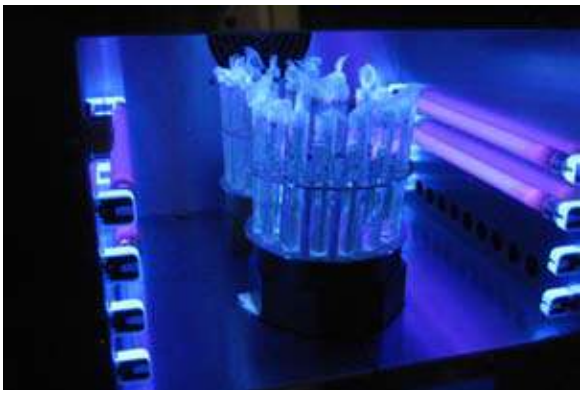
- Concentrations of DOC were consistently higher later in the field season, in fall versus summer. This could be linked to vegetation and allochtonous carbon inputs, but also to the degree of radiation each lake column received prior to sampling.
- Low and high carbon lakes did not receive the same amount of radiation at the same depth within the water columns. Much of the radiation was absorbed in the first 10-20 cm of high carbon lakes.
- Rates of photoreactivity of DOM in the six lakes were similar when put under the same experimental laboratory conditions.

YEARS OF DATA

- Year 1 of a 3 year project

PARTNERS

- Parks Canada
- Environment Canada
- Natural Science and Engineering Research Council (NSERC) of Canada
- CREATE Training Program in Climate Science (TPCS)
- Canada Research Chairs Program
- Acadia University
- St. Francis Xavier University
- Memorial University of Newfoundland



S. Klapstein

Water samples being exposed to UVA radiation inside a Luzchem photoreactor at MTRI

L. Klapstein

S. Klapstein checking on her floating equipment for measuring UV, PAR and temperature in Big Dam East and Big Dam West

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Rationale

Mercury (Hg) is emitted to and transported via the atmosphere; however, current atmospheric mercury levels cannot be assumed to be representative of fish mercury concentrations or subsequent mercury exposure of fish-consuming humans and wildlife. The Freshwater Inventory and Surveillance of Mercury (FISHg) program is part of Canada's Clean Air Regulatory Agenda Mercury Science Program, which defines the state of the Canadian environment with respect to mercury in order to inform the development and track the effectiveness of policy measures. The FISHg network monitoring program identifies the spatial and temporal trends in fish mercury concentrations at six lakes across Canada.

Setting off from Jake's Landing, Kejimkujik

Research

FRESHWATER INVENTORY AND SURVEILLANCE OF MERCURY

OBJECTIVES

- To establish a monitoring program for spatial and temporal mercury trends in fish, at six lakes across Canada, including Kejimkujik Lake.
- To provide data on mercury levels in fish across Canada in a single database.
- To identify the effectiveness of of Canada's Clean Air Regulatory Agenda on reducing fish mercury levels across Canada by establishing baseline fish mercury concentrations.

METHODS

- Water, sediment and fish (ten trout and ten perch) were collected in Kejimkujik Lake in the fall of 2012 and 2013.
- Ancillary information was collected annually from each lake in the FISHg project (fish trophic position, water concentrations of mercury and other metals, DOC, major nutrients, pH and other water quality parameters of site specific concern).

RESULTS

- Water quality results are available for Kejimkujik Site 1 for 2012 and 2013 samples. Overall, most parameters had similar concentrations in both years. Only color and DOC had higher levels or concentrations in 2013, possibly associated with the much higher water levels that year, compared with 2012.
- Mercury and methyl mercury concentrations are also available for all three sites and for both 2012 and 2103. Overall, both total mercury and methyl mercury had higher concentrations in 2013 compared to 2012. Total mercury concentrations in 2013 were approximately four times than that of the 2012 samples, while methyl mercury concentrations in 2013 were approximately twice that of the 2012 samples.
- Other metals were measured at two additional locations within the lake as well. Concentrations of all metals were similar between the three locations, with the exception of cadmium, which indicates possible contamination either in the field or the laboratory.
- Fish concentrations of mercury are still pending.

YEARS OF DATA

- Ongoing project since 2012

PARTNERS

- Environment Canada

T.Smith, Environment Canada

Electrofishing in Rogers Brook

Environment Canada

Sampling locations in Kejimkujik Lake

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Rationale

The Common loon is a highly visible water bird inhabiting many of the lakes within the Southwest Nova Biosphere Reserve. It is an icon of wilderness and people are captivated by its beauty and haunting call. Concerns have been raised about the health of loons after a study by the Canadian Wildlife Service found very high blood mercury concentrations in Kejimkujik loons. These levels have been associated with impaired reproduction and altered breeding behavior in some areas. LoonWatch began on 16 lakes within Kejimkujik in 1996. In 2006, the program was expanded to the greater landscape through MTRI, where volunteers are trained to observe and record loon activity and breeding success on their assigned lake throughout the summer using a national protocol developed by Bird Studies Canada. These two program components will provide a picture of how well loon populations are doing in the region.

M. Crowley, Parks Canada

Adult loon feeding its chick

Monitoring

THE KEJIMKUJIK-MERSEY LOONWATCH PROGRAM

OBJECTIVES

- To observe Common loon abundance and breeding success on lakes within Kejimkujik and in the Southwest Nova Biosphere Reserve with a focus on the Mersey and Medway watersheds.
- To determine status and trends in loon abundance, lake use and reproductive potential of resident birds.
- To monitor water quality on lakes being observed by Loon Watchers outside Kejimkujik.

METHODS

Inside Kejimkujik:

- LoonWatch used trained volunteers in a coordinated effort to simultaneously survey study lakes within a three hour observation period, in early June and during the third week of August.
- Loon monitoring combined data gathered from intensive LoonWatch days involving many volunteers, plus public observations and repeated surveys by Kejimkujik staff.

Outside Kejimkujik:

- Lakeside dwellers and cottagers with an interest in loons were recruited and provided with information about loons and the monitoring protocol.
- Trained volunteers were used to survey lakes in June for loon pairs, in July for newly hatched chicks and in August for surviving young.
- MTRI staff visited many of these lakes, canoed to the deepest part and measured water quality at one meter intervals, recording temperature, conductivity, dissolved oxygen and pH.
- Volunteer data were collected and compiled, then shared with Bird Studies Canada.
- MTRI and Environment Canada were also conducting more intensive work to better understand population dynamics and adult survivorship (see page 58).

E. Le Bel

Parks Canada staff and volunteers planning the survey within Kejimkujik

R. Martel, Parks Canada

RESULTS

Inside Kejimkujik:

- On June 2 2013, a total of 34 loons were observed on 16 lakes within Kejimkujik. During the second sampling on August 18 2013, 23 loons were observed. Only two chicks were observed, both on Loon Lake.
- The status of the loon population within Kejimkujik remains unchanged from 2012 and is considered to be 'fair but declining'.

J. McNeil, MTRI

Common loon

Outside Kejimkujik:

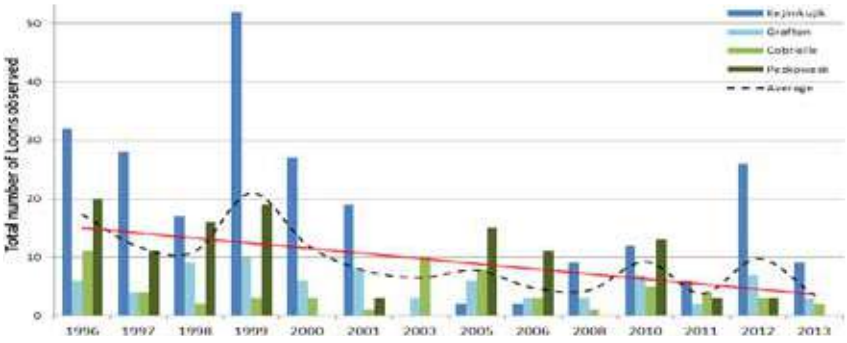
- In 2013, the Mersey LoonWatch program had approximately 21 volunteers monitoring loons on 17 lakes in the Southwest Nova Biosphere Reserve.
- Eleven loon chicks were recorded by loonwatchers on lakes outside Kejimkujik. Lakes that had chicks were Charlotte, Cameron, Jerry, Harmony, Tupper and Lake Joli. Two of these chicks were observed as large chicks that had a good chance of survival.
- The surface pH of volunteer lakes ranged from 4.55 – 7.3.
- Rainfall amounts were very high for the observation period of May – August with 486 mm, compared to last year's rainfall of 304 mm (Environment Canada's National Climate Data and Information Archive). An atypically high number of nests were observed to have been flooded in 2013, which may account for the lower number of chicks observed.

YEARS OF DATA

- Ongoing project since 1996 (Kejimkujik) and 2006 (Mersey LoonWatch)

PARTNERS

- Parks Canada
- Mersey Tobeatic Research Institute
- Bird Studies Canada
- Environment Canada



D. Reid, Parks Canada

Trends in loon abundance observed on the four most productive lakes within Kejimkujik since 1996 (LoonWatch surveys were not completed for these lakes in 2002, 2004 and 2007)

E. Le Bel

Kejimkujik 2013 LoonWatch volunteers and park staff

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Rationale

As an indicator of aquatic health, the Common loon has been a focus of research and monitoring at Kejimkujik and MTRI. Studies have shown that loons in the Kejimkujik area have high concentrations of mercury as a result of bioaccumulation, and that this may negatively affect survival and reproduction in the long term. Loon research for the 2013 field season included productivity and survivorship surveys and water quality testing. The focus this year was on adult survivorship through re-sighting of loons that were previously banded by the Canadian Wildlife Service and the Biodiversity Research Institute.


E. Le Bel

Common loon

Research

ADULT SURVIVORSHIP OF COMMON LOONS

OBJECTIVES

- To observe banded Common loons to enable researchers to identify information about individuals such as territory, mate fidelity, site fidelity and productivity.
- To develop and improve methodology for future study of adult survivorship through band re-sighting.

METHODS

- A total of 58 Common loons have been banded by Environment Canada. Seventeen loons were banded in the first banding period between the years of 1995 - 1997, and an additional 41 loons were banded between the years of 2009 - 2012. Loons were captured at night and banded with a unique combination of coloured leg bands in addition to a numbered Canadian Wildlife Service metal band. Loons were measured, sampled and then released.
- Between May 1 - August 19 2013, researchers from MTRI surveyed 17 lakes in and around Kejimkujik for banded loons.
- Loons were observed from lake shorelines or large rocks in the lakes using binoculars and spotting scopes set up on tripods. During observation periods with favorable conditions, researchers also observed loons from canoes.
- Researchers entered loon observations on a Global Positioning System (GPS) and recorded lake name, date, presence or absence of bands, colours and position of bands, and year banded. On a separate data sheet, researchers recorded lake site information, weather conditions, UTM location and time of observation, behavioral information, nest information and individual characteristics such as age (adult or chick) and sex.


J. McNeil, MTRI

Volunteers surveying for loons

RESULTS

- Researchers observed banded loons on 13 of the 17 lakes surveyed.
- A total of 24 banded loons were observed; 14 individuals with confirmed identities (all four bands observed indicating a unique colour combination) and ten partially confirmed individuals (did not observe all four bands, but identified as part of a unique colour combination). Forty-one percent of all loons that were banded in the Kejimkujik area since 1995 were sighted during the surveys (n=58).

RESULTS
Continued

- There was high site fidelity. All but one loon was observed on the lake where it was originally banded, and that individual was observed on a lake adjoining the lake where it was originally banded.
- Most observations (eight out of 14) were from adult birds banded in 2010, three were from 2012, two from 2009 and one from 1995. One bird, banded as a juvenile on Big Dam Lake in 2010, was observed on the same lake this year as part of a breeding pair.
- Only 29 of the 35 study lakes were surveyed this year for productivity. There were 13 territories on 12 lakes with evidence of breeding; 11 nests and five small chicks were observed. From the territories with evidence of breeding, four nests successfully hatched chicks, five nests were suspected to have been flooded and one nest had eggs that were suspected to have been predated. Because this work focused on resighting banded birds, some chicks and nests likely went undetected.

YEARS OF DATA

- Ongoing project since 2013

PARTNERS

- Environment Canada
- Parks Canada
- Mersey Tobeatic Research Institute

E. Le Bel

A raft of adult Common loons at Mountain Lake, Kejimkujik

M. Crowley, Parks Canada

A loon in its nest on Channel Lake

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Photos on page 61, clockwise from top left:
- *Blanding's turtle hatchling,* by J. McNeil, MTRI
- *Eastern ribbonsnake,* by W. Pitts
- *Radio-tracking Blanding's turtles,* by E. Le Bel
- *Water-pennywort,* by A. Belliveau, MTRI
- *Wetland in the spring,* Parks Canada

WETLANDS

Rationale

Atlantic Coastal Plain Flora (ACPF) is a unique group of unrelated plants that are mainly found along lake and rivershores, wetlands and saltmarshes in southwest Nova Scotia. Almost half of these species are listed as 'At Risk' or 'Sensitive' by the Nova Scotia General Status Ranks and some are globally rare. There are over 90 species of ACPF in Nova Scotia, including the Water-pennywort. Water-pennywort is a small plant with rounded, lobed green leaves. The leaves float like a lily pad in deep water and stand erect in shallow water or above the water line. This special plant is only found on a few lakes in all of Canada. It is listed as Threatened by the Species at Risk Act and Endangered by the Nova Scotia Endangered Species Act. The population in Kejimkujik is monitored annually by park staff and volunteers to assess its distribution and abundance. In 2013, the shorelines of Kejimkujik and Loon Lakes were also surveyed in August by expert botanists from the Atlantic Canada Conservation Data Centre (ACCDC).


E. Le Bel

MTRI

Water-pennywort

Monitoring

WATER-PENNYWORT AND ACPF SURVEYS IN KEJIMKUJIK

OBJECTIVES

- Monitor Water-pennywort population abundance and density on Kejimkujik Lake.
- Assess water levels, stem height and percent damage within Water-pennywort stands.
- Survey Kejimkujik Lake to look for the establishment of new stands and for other rare ACPF.

METHODS

- Water-pennywort surveys were conducted annually on Kejimkujik and George lakes within Kejimkujik. Surveys were conducted on known populations in both shoreline and aquatic habitats.
- Extensive surveys were conducted every few years to search for new stands.
- Population abundance, density, stem height, water depth and percent damage of individual Water-pennywort stands were assessed by systematic transect surveys in early August. Stand surface area was also measured. Survey results were compared to historic data in order to determine population size fluctuations.
- Extensive shoreline surveys were also undertaken for ACPF species listed as red and yellow by the Nova Scotia Department of Natural Resources General Status Ranks for the third year in a row by expert botanists at ACCDC. This survey complements the shoreline atlasing being done by MTRI for the Habitat Stewardship Program ACPF Project, as Kejimkujik Lake is listed as one of the 36 high priority lakes in the ACPF Recovery Strategy. In 2013, Loon Lake was also surveyed.

M. Crowley, Parks Canada

Searching for Water-pennywort

RESULTS

- Park staff and volunteers monitored Water-pennywort at six sites in Kejimkujik in August 2013. Water levels were the exact opposite of the 2012 lows, with many survey areas being thigh deep in water and numerous leaf stems > 1 m in length.
- Water-pennywort stand area and ramet density per stand fluctuate between years; however the Kejimkujik population appears to be stable.

RESULTS
Continued

- A Water-pennywort stand observed on Ell Island in 2007 was re-located with a small number of plants observed. This stand will be visited again in 2014.
- Part of the shoreline and islands of Kejimkujik and Loon Lake were surveyed by expert botanists at ACCDC. Many plant records were recorded and maps showing the locations of rare species will be prepared.
- A new discovery of Long's bulrush, a Species at Risk Act listed species, was observed in multiple locations on Loon Lake by an ACCDC botanist.

YEARS OF DATA

- Ongoing project since 1999; initial population estimates for Water-pennywort were conducted in 1983.

PARTNERS

- Parks Canada
- Atlantic Coastal Plain Flora Recovery Team
- Mersey Tobeatic Research Institute
- Atlantic Canada Conservation Data Centre

M. Crowley, Parks Canada

Learning about ACPF

M. Crowley, Parks Canada

Volunteers and staff monitoring Water-pennywort on Kejimkujik Lake

B. MacInnis

Water-pennywort stem well over 1 m in length

Stand Name	2007	2008	2009	2010	2011	2012	2013
Merrymakedge Beach	1677	1360	1275	2710	2474	1964	1712
Meadow Beach	466	606	434	555	1451	925	1078
Jim Charles	254	544	313	414	357	276	346
Jeremy's Bay (Indian Point)	3161	3590	3282	3573	3787	3430	4745
George Lake	145	159	32	247	52	134	48
Petroglyphs	851	1334	796	1700	1356	1488	1406

Parks Canada

Estimated aerial extent (m^2) of Water-pennywort stands at Kejimkujik

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Rationale

Blanding's turtles in Nova Scotia exist in three small populations and a few smaller concentrations in southwest Nova Scotia. They have been listed as Endangered under both the federal Species at Risk Act and the Nova Scotia Endangered Species Act. One of the concerns for this long lived (80+ years), slow maturing (20+ years) species is the lack of young adults in the population. Raccoons are the primary nest predators and their populations may be unusually high in human inhabited areas (*i.e.* campgrounds and communities). Rates of predation of unprotected nests are variable but can reach 100%. An annual volunteer-based nest protection program was established in Kejimkujik and later expanded to populations outside the park to engage the public in helping to protect and care for Blanding's turtle nests.

M. Crowley, Parks Canada

A female Blanding's turtle named Hope covering her eggs

Research

BLANDING'S TURTLE NEST PROTECTION

OBJECTIVES

- Protect Blanding's turtle nests from predation to improve recruitment into the populations.
- Provide an opportunity for volunteers to engage in species at risk recovery.
- Collect long term data on female survivorship, clutch size, hatching success and site fidelity.
- Locate previously unknown nesting areas.

METHODS

Nest protection (late May - June):

- Known nesting sites were monitored on a nightly basis during nesting season. Surveys began in early evening and continued until approximately 10 pm if no turtles were seen or until the last turtle had left the site.
- Five females on the Upper Medway River were radio tracked to locate new nesting sites.
- Volunteers watched females go through the nesting process and recorded data on turtle identification, behaviour, movements, weather, timing of activities and clutch size.
- Once a nest was completed and the female had left the site, volunteers covered the nest with a wire mesh cage and secured it with large rocks to protect the nest from predation.

Hatchling emergence (September - October):

- Nests were monitored periodically until the first hatchlings emerged and then were monitored daily by volunteers and researchers who marked, measured, weighed and released hatchlings turtles at the nest site.
- A subset of hatchlings in Kejimkujik was radio tracked upon emergence from the nest to locate habitats used throughout fall and winter.

J. McNeil, MTRI

A Blanding's turtle hatchling

E. Le Bel

RESULTS

Nest protection (late May - June):

- Nests were laid from June 1 to June 29 2013.
- Forty-five Blanding's turtle nests were located and protected; this includes one nest that was partially predated when found but with three remaining intact eggs.
- More than 70 volunteers contributed over 2000 hrs of effort to locate and protect these nests.
- Volunteers found two new nesting sites near a newly discovered concentration of turtles in the Upper Medway and were able to protect one nest.

J. McNeil, MTRI

A turtle named Smoothy at McGowan Lake depositing eggs in a nest

Hatchling emergence (September - October):

- Hatchlings emerged from September 3 to October 17 2013. Two nests at McGowan Lake emerged two weeks before the remaining nests began emerging.
- Emergence success was low this year in all three populations, with 145 hatchlings emerging from the more than 451 eggs (~32%).
- Volunteers radio-tracked ten hatchlings from Kejimkujik following release. Three of these were tracked until the end of October when the transmitters were removed.
- Approximately 80 volunteers contributed over 1400 hrs to monitor emergence and radio track hatchlings.

YEARS OF DATA

- Ongoing project since 1989 (Kejimkujik), 2000 (McGowan Lake) and 2002 (Plesant River)

PARTNERS

- Parks Canada
- Mersey Tobeatic Research Institute
- Friends of Keji Cooporating Association
- Acadia University
- Blanding's Turtle Recovery Team
- Canadian Wildlife Federation

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M. Crowley, Parks Canada

Volunteer J. Turner watching a Blanding's turtle named Hope digging a nest

Rationale

Blanding's turtles in Nova Scotia are listed as Endangered under both the federal Species at Risk Act and the Nova Scotia Endangered Species Act. They occur in the southwest region of the province, but the extent of their range is not well understood. Until the mid 1990's, the only known population occured in Kejimkujik. Two populations, McGowan Lake and Pleasant River, were discovered in 1996-7 and have been monitored regularly since their discovery. In 2006, volunteers Harold and Diane Clapp discovered a small concentration in the Tobeatic Wilderness Area and in 2012 they discovered another concentration on the Medway River. This ongoing project employs researchers and volunteers to monitor known populations, learn more about newly discovered areas and follow up on public sighting reports to seek out new locations of Blanding's turtles.

E. Le Bel

Blanding's turtle

Research

BLANDING'S TURTLE DISTRIBUTION AND MONITORING

OBJECTIVES

- Conduct live-trapping and visual surveys in new areas to determine if Blanding's turtles are present.
- Radio track turtles found in new areas to determine seasonal habitat use.
- Conduct live-trapping and visual surveys in known populations to collect long-term data on survivorship, abundance and movement patterns of all age classes.
- Provide an opportunity for volunteers to engage in species at risk recovery.
- Engage landowners in new areas discovered.
- Encourage new sighting reports from the public.

METHODS

- Live-hoop traps were set by trained staff and volunteers and baited with canned sardines in soy oil. Traps were set in groups of one to eight traps per site, depending on habitat size and configuration. Traps remained set for four to seven nights and were checked daily.
- Visual surveys were conducted on foot or by canoe, occasionally with the aid of trained conservation canines.
- All new turtles captured were measured, weighed and photographed. They were given a unique code by notching the outer scutes of their shell and were released at the capture site.
- On selected turtles, radio transmitters were attached to the back of the shell using epoxy. Care was taken to ensure that the selected transmitter weight did not exceed 5% of the turtle's body weight. Volunteers radio-tracked turtles with transmitters regularly throughout the active season.
- Landowners were contacted in the new areas where turtle were found.

D. Clapp

Rosie, a specially trained canine, finding a turtle

RESULTS

New concentration on Medway:

- Trapping and visual surveys lead to the capture of three new turtles (two juveniles and an adult male), bringing the total to 13 turtles marked in this area.

E. Le Bel

RESULTS
Continued

D.Clapp

New volunteer J.Smith capturing Grant, a new Blanding's turtle, whom she named after her father

- Five females were radio tracked throughout the season; two new nesting sites were located and summer and winter habitats were confirmed.
- Landowners were contacted, and one landowner allowed a nest to be protected on his land.

Monitoring McGowan Lake:

- Volunteer led trapping sessions were very successful. Eighty-four trap nights resulted in 33 captures of 28 individuals.
- Six new Blanding's turtles were found throughout the season: one female and three juveniles from trapping, one juvenile from conservation canine surveys and one juvenile incidental to nesting surveys.

New sighting reports:

- Three photo-verified sighting reports were received and will be investigated in 2014.
- One of these reports was in an entirely new watershed, approximately 18 km from the nearest known population.

YEARS OF DATA

- Ongoing project since 1996

PARTNERS

- Mersey Tobeatic Research Institute
- Canadian Wildlife Federation
- Environment Canada
- Parks Canada
- Friends of Keji Cooporating Association
- Acadia University
- Blanding's Turtle Recovery Team

D.Clapp

Rosie is the youngest Blanding's turtle found doing visual surveys

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Rationale

With over 150 two year old headstarted Blanding's turtles being reintroduced into Kejimkujik in 2011 and 2012, significant insight into the movement patterns and growth rates of both headstarted and wild turtles could be achieved. Headstarting is being implemented on a growing number of turtle species, and there is a lack of long-term studies on the success of these programs. This research project was a small part of the overall assessment of the headstarting program in Nova Scotia. The main goal of this study was to radio track a group of headstarted Blanding's turtles to determine their movement and growth after their reintroduction to the wild. Movement and growth of headstarted turtles were compared to that of wild juvenile turtles found in the same area to better understand advantages of headstarting.

N. d'Entremont

A three year old headstarted Blanding's turtle with radio transmitter

Research

RADIO TRACKING HEADSTARTED BLANDING'S TURTLES

OBJECTIVES

- To determine the difference between post release growth rate of headstarted Blanding's turtles and the growth rate of wild juvenile turtles.
- To determine the difference in the movement patterns of the newly released headstarted Blanding's turtles and the wild juvenile Blanding's turtles.
- To determine if incubation temperatures have an effect on habitat use and growth of headstarted Blanding's turtles.

METHODS

- The research was conducted at the Atkins Brook/West River area located in the northwest corner of Kejimkujik. This area is an important nesting and feeding area for the Blanding's turtles.
- Radio telemetry was used to track four groups of turtles; 2009-headstarts (3 years old in 2012), 2010-headstarts (2 years old in 2012), wild (3 years old), and wild (5-7 years old).
- Turtles were affixed with a radio transmitter weighing less than 5% of their body mass using quick set epoxy.
- Turtles were tracked once a week from July to September 2011, and from May to November 2012. Data collected during radio tracking included air and water temperature (°C), GPS location (UTMs), a detailed habitat description and turtle activity, position and perch. Weather data were also collected and included cloud cover, precipitation and wind speed.
- Carapace length, carapace width, plastron length, plastron width (all in mm) and weight (g) were measured the first week of every month.
- A statistical analysis was conducted using the statistical package R version 2.15.2.

A. Highfield

N. d'Entremont radio tracking headstarted turtles at Atkins Brook, Kejimkujik

RESULTS

- There was no significant difference in the growth rates of 2009-headstarts, 2010-headstarts, and similarly aged wild turtles.

E. Le Bel

RESULTS
Continued

- There was no significant difference in movement rates of 2009-headstarts, 2010-headstarts, and similarly aged wild turtles. Turtles aged 5-7 years old were found to move significantly more than all other groups studied.
- Incubation temperatures did not have any significant influence on either growth or movement of headstarted turtles.

YEARS OF DATA

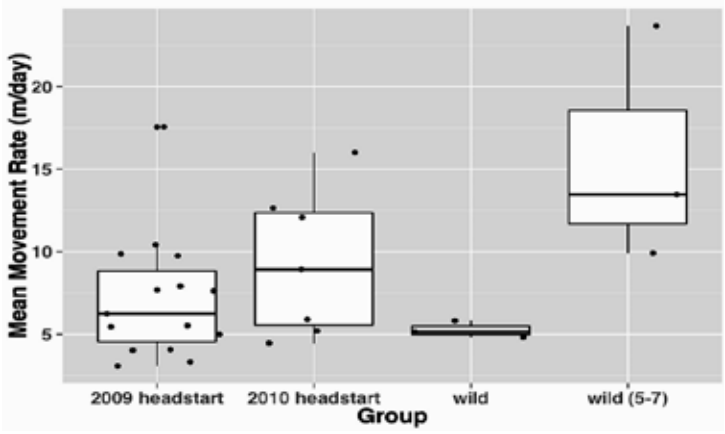
- 2 year study (2011 - 2012)

PARTNERS

- Acadia University
- Parks Canada
- Friends of Keji Cooperating Association

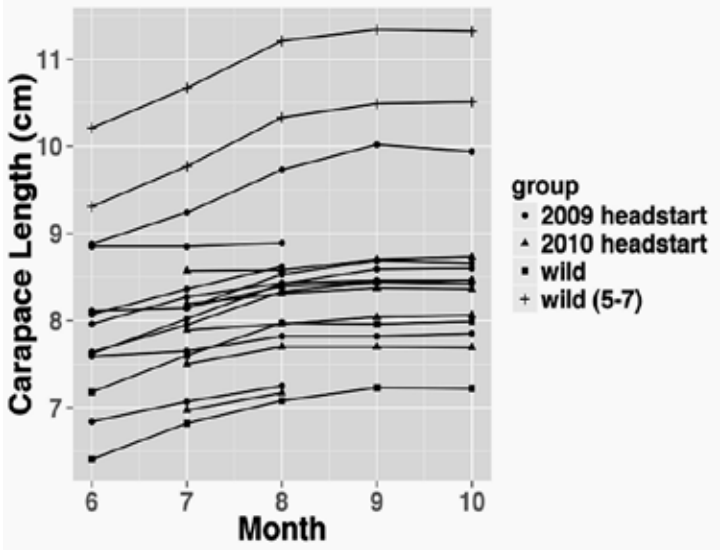
N. d'Entremont

J. Neish radio tracking in a canoe at Atkins Brook, Kejimkujik



N. d'Entremont

Mean movement rates (m/day) measured from April to November 2012 of 2009- and 2010-headstarts, wild (3yrs), and wild (5-7yrs) Blanding's turtles at Atkins Brook, Kejimkujik



N. d'Entremont

Carapace lengths of individual turtles from June to November 2012 of 2009- and 2010-headstarts, wild (3yrs), and wild (5-7yrs) Blanding's turtles at Atkins Brook, Kejimkujik

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Rationale

Blanding's turtles in Nova Scotia are listed as Endangered under both the federal Species at Risk Act and the Nova Scotia Endangered Species Act, in part due to their small population size. One recovery action aimed at boosting recruitment into the population is headstarting turtles. Hatchling turtles, obtained by either monitoring wild nests or by incubating eggs in a laboratory, are reared in captivity for 1-2 years and then released into the wild. Most are a bigger size than wild counterparts it is hoped they will have a better chance of survival. In the Kejimkujik population, headstarting has been undertaken regularly since 2002, resulting in the release of over 200 turtles (with 150 released in 2011 and 2012). Assessing the success of this program will require long-term monitoring as juvenile Blanding's turtles do not mature until approximately age 20 in Nova Scotia. This study was part of ongoing work to examine the efficacy of the headstarting program and to monitor the wild juvenile population in Kejimkujik.

W. Pitts

Radio transmittor attached to back of shell

Monitoring

BLANDING'S TURTLE HEADSTART AND WILD JUVENILES

OBJECTIVES

- Conduct live-trapping and visual surveys to assess the survivorship of headstarted and wild juvenile turtles in the Kejimkujik population.
- Continue to radio track a sub-set of headstarted turtles that were released in 2011 and 2012 to document movement patterns, growth and survivorship.

METHODS

- Turtle trapping, visual surveys and radio tracking were conducted following standard protocols developed by the Blanding's turtle recovery team (see page 66 for more details).
- All turtles captured were identified by a unique code notched into the outer margins of their shell following standard techniques. They were measured, weighed, photographed and released at the capture site.
- Live-hoop traps were set in groups of one to eight traps per site, depending on habitat size and configuration. Traps remained set for four nights and were checked daily.
- A sub-set of turtles was outfitted with radio transmitters and tracked regularly from April to October 2013. Transmitters were removed at the end of the season.

W. Pitts

Success with a live-hoop trap

RESULTS

Headstart and juvenile monitoring

- Twenty-one trap sessions (283 trap nights) resulted in the capture of 18 Blanding's turtles: eight headstarts, two wild juveniles and eight adults.
- One of the headstarts was a maturing male from the very first headstarting pilot project in the mid 1990's.
- One of the adults captured had not been seen since 1977.

E. Le Bel

RESULTS
Continued

Radio-tracking

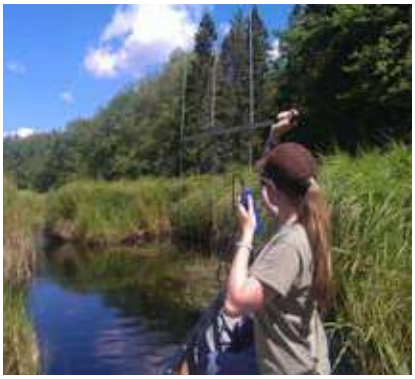
- Twenty-one turtles were radio tracked, including12 headstarts that were hatched in 2010 and released in 2012, six headstarts that were hatched in 2009 and released in 2011, and three wild juveniles.
- Ten of these were followed all season into fall.
- Six headstarts died during the season: three failed to survive the winter and three were depredated.
- Five turtles were lost, likely due to failure of the radio transmitters.

YEARS OF DATA

- Ongoing project since 2002

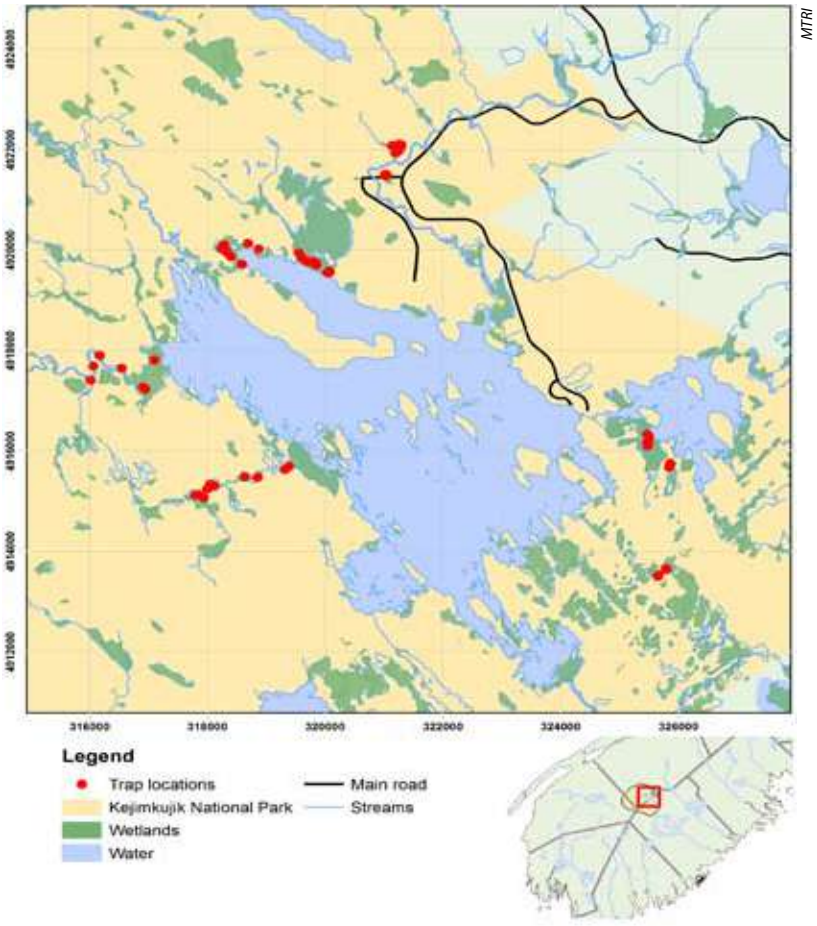
PARTNERS

- Parks Canada
- Friends of Keji Cooperating Association
- Mersey Tobeatic Research Institute
- Acadia University
- Blanding's Turtle Recovery Team
- TD Friends of the Environment Fund



W. Pitts

Radio tracking juvenile Blanding's turtles



MTRI

2013 Blanding's turtle trapping locations in Kejimkujik

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Rationale

The Atlantic population of the Eastern ribbonsnake is listed as a threatened species under the federal Species at Risk Act by the Committee on the Status of Endangered Species in Canada (COSEWIC) and the Nova Scotia Endangered Species Act. As an ectotherm, this snake's physiological activity and survival are highly dependent on environmental temperatures. Snakes are able to strategically move between warm and cool microclimates within their habitat in order to regulate their body temperature in response to changing environmental conditions. A better understanding of microhabitat and microclimate preferences of the ribbonsnake could improve our understanding about their movement patterns and thermal ecology. The ribbonsnake's cryptic nature makes them difficult to locate in the field, so assistance from scent-trained sniffer dogs has been recently used as a non-invasive method to help find these individuals in the field. This exploratory study hopes that a better understanding of this species' behaviour within microhabitats under various field conditions will improve monitoring and research strategies.

M. Thompson

Close-up of an Eastern ribbonsnake

Research

EASTERN RIBBONSNAKE MICROCLIMATES

OBJECTIVES

- Continuation of the ongoing monitoring and mark-recapture surveys of the ribbonsnake population at Grafton Lake within Kejimkujik.
- Improving knowledge concerning this species' microhabitat and microclimate preferences, allowing better prediction of their movements under different weather conditions.
- Improved prediction of snake movements under different conditions would allow better protection of wetland habitats at Grafton Lake against human disturbance through more strategic surveys when monitoring and researching this species in the future.

METHODS

- Surveys were conducted in summer and fall at Grafton Lake within Kejimkujik. Snakes were located in the field by human visual surveys and scent-tracking assistance from conservation canines.
- Mark-recapture procedures in the field aimed to collect a variety of information concerning snake characteristics, microhabitat elements, environmental temperatures and field conditions.
- Snakes were marked using ventral scale clip codes and all snake sightings were recorded on the Nova Scotia Species At Risk database.
- Temperature field maps were designed at the North Side Flats section at Grafton Lake. The water's edge and forest's edge within this section were thermally mapped in order to monitor this semi-aquatic species' movements in summer and fall months. Time of day, air temperature, surface temperature and ground temperature were measured to build thermal gradient maps of this snake's microclimate.
- The McGowan Bog was also surveyed on occasion to extend efforts to another population outside of Kejimkujik, however there was no snake sighting success in this area.

J. Delle Cave

E. Le Bel

Conservation canines, Sam and Cooper, training in the field

RESULTS

- Analysis is currently in progress and therefore results are pending.
- It is predicted that comparisons between mapped environmental microclimates and preferred microclimates of snakes will produce patterns that may allow for better prediction of snake movements under a variety of different weather conditions.

YEARS OF DATA

- Single year project (temperature mapping/microclimates)
- 2009 - 2013 (conservation canines)

PARTNERS

- Acadia University
- Dalhousie University
- Mersey Tobeatic Research Institute
- Parks Canada

M. Thompson

Conservation canine, Boomer, observing a snake

M. Thompson

Surveying North Side Flats, Grafton Lake in the fall

M. Thompson

Temperature Field Map Design at the North Side Flats, Grafton Lake

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Rationale

The chemistry of the water in a peatland system is determined by two principal factors: the quality and quantity of the water coming into the system and the chemical transformation within the system itself. As a result, the quality and quantity of water in a wetland can be strongly influenced by many stressors, including land use change and forestry practices, infrastructure and road development, hydrological modification, acid deposition and long-range transport of air pollutants and climate change. This project monitors water quality and quantity in peatlands (bogs) at Kejimkujik. The specific measures that are reported on are a water quality index, developed based on the status of key wetland water quality parameters (*i.e.* pH, conductivity, salinity, phosphorous, nitrogen, potassium and calcium) and mean monthly water level. These water quality and quantity parameters affect the growth of plants and peatland communities, so changes in these parameters are indicative of significant changes in peatland communities.

Parks Canada

Wetland in the spring

Monitoring

WETLAND WATER QUALITY MONITORING IN KEJIMKUJIK

OBJECTIVES

- To determine if mean monthly water levels are within the range of natural variation for bogs at Kejimkujik and whether they have increased or decreased over the past five years.
- To determine if key water quality parameters (*i.e.* pH, conductivity, salinity, Ca, N, K, P) are within the range of natural variation for bogs at Kejimkujik and whether they have increased or decreased over the past five years.

METHODS

- Ten medium-large bogs, greater than or equal to 15 ha in surface area, were sampled for water quality and level at Kejimkujik.
- Wetland water quality and level were sampled in piezometers or small diameter observation wells, that were installed at each site.
- Water quality measurements were done in May and October using *in-situ* probes and through laboratory analysis of collected water samples.
- Water levels were measured manually in May and October as well as automatically through the use of Onset HOBO data loggers that record water level every 12 hrs.
- The sampling frequency for this project is once annually for water quality and continuously for water level. Each site is visited twice annually to replace the data logger.

D. Pouliot, Parks Canada

Wetland in the fall

RESULTS

- A preliminary examination of the data indicates that sub-measures have remained relatively stable over the past eight years, however there has been a steady decline in dissolved oxygen (DO). This may be the result of a natural cycle of senescence with increased Biological Oxygen Demand (BOD) as the wetlands age. BOD is a measure of the oxygen required for decomposition of organic matter and the oxidation of inorganics such as sulfide. BOD is introduced through natural biotic processes and surface runoff. If BOD is high, then DO

E. Le Bel

RESULTS
Continued

is low and BOD in wetlands can approach 100%. More research may be required to identify specific BOD trends within Kejimkujik wetlands.

- The spike in conductivity and pH in the spring of 2010 is the result of one outlier sample site (South-West Branch of West River near Liberty Lake) which had elevated readings due to a high incidence of insect death within the sample well.
- As trend data become available (six years of data are now available), a more in-depth analysis is planned.

YEARS OF DATA

- Ongoing project since 2008

PARTNERS

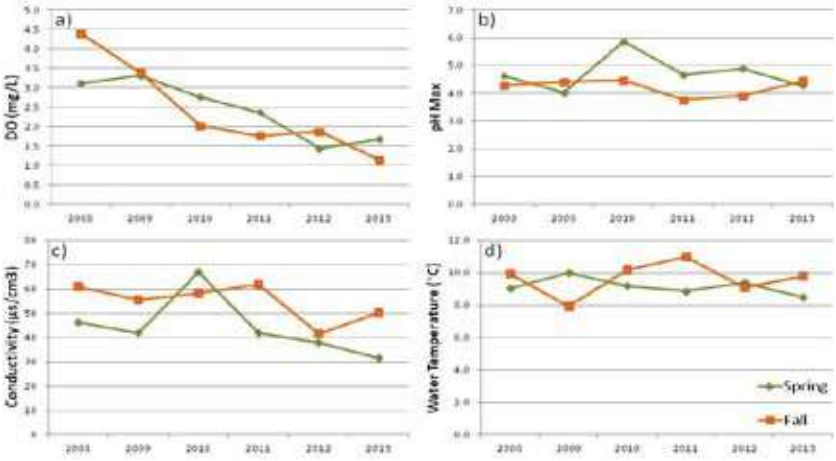
- Parks Canada
- Mersey Tobeatic Research Institute
- Environment Canada

M. Crowley, Parks Canada

Observation well at Heber Meadows with bailer inserted for water sample collection

M. Crowley, Parks Canada

J. Garber with a collected water sample in the bailer at Heber Meadows, Kejimkujik



Parks Canada

Average wetland data trends for spring and fall monitoring seasons in Kejimkujik since 2008, including: a) dissolved oxygen (DO), b) maximum pH, c) conductivity and d) water temperature

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Rationale

Eastern mountain avens (EMA) is listed as Endangered both federally and provincially. It is found only in Nova Scotia, mostly in sea level bogs on Brier Island and at one site on the Digby Neck, and in alpine New Hampshire. There is evidence that the population in Nova Scotia is declining and the continued presence of this globally rare species is hindered in Nova Scotia by a lack of knowledge. There have been few studies conducted with EMA. It is an herbaceous perennial that reproduces vegetatively through rhizomes, which produce clonal patches and sexually by seed. Very little is known of its basic life history. Propagation and growth studies can provide information on life history and be gathered without disturbing natural populations.

D. LaRue, MTRI

Eastern mountain avens

Research

PROPAGATION OF ENDANGERED EASTERN MOUNTAIN AVENS

OBJECTIVES

- To investigate propagation *in situ* and *ex situ* by rhizome.
- To conduct *in situ* studies of rhizome characteristics and growth.
- To develop germination protocols.
- To provide information on seed viability for seed storage at Acadia's Seed Bank.
- To study basic growth biology.

METHODS

- Over 200 individual plants were tagged in the field at several sites on Brier Island to track growth and new plant production.
- Rhizomes were collected from several sites on Brier Island and taken to the K.C. Irving Environmental Science Centre at Acadia University (Irving Centre) for propagation with permit from the Nova Scotia Department of Natural Resources.
- Rhizomes were cut into various lengths, with and without terminal rosettes, and placed in three types of media; two soils from Brier Island and a potting mixture.
- Seeds were collected from several sites and taken to the Irving Centre for germination studies with permit from the Nova Scotia Department of Natural Resources.
- Seeds were tested from two collection dates both fresh and after a five week cold treatment in the two soils from Brier Island and by the petri dish method for: days to germination, germination over time and percent germination.
- Rhizomes and seeds were set up in the field for propagation.

RESULTS

- Some rhizome cuttings of various sizes produced new plants in each of the three types of media.
- Seeds germinated with and without cold pretreatment in both soils and in petri dishes.
- Seed viability varied between the different collection sites.

E. Le Red

RESULTS
Continued

- Seeds without cold pretreatment germinated more erratically and slowly than those with a cold pretreatment.
- Seedlings and new rosettes from rhizomes have been potted for future studies.

YEARS OF DATA

- Year 1 of a 2 year project

PARTNERS

- Nova Scotia Museum of Natural History
- K. C. Irving Environmental Science Centre, Acadia University
- Mersey Tobeatic Research Institute

D. LaRue, MTRI

New seedling from germination trials

D. LaRue, MTRI

Avens rosette with rhizome tagged for monitoring growth

D. LaRue, MTRI

Extracted rhizome, cut into three sections for propagation

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Photos on page 79, clockwise from top left:
- *Sawn hardwood lumber,* by J. Barker, MTRI
- *Little brown bat with White-nose syndrome,* by H. Broders
- *Species at risk staff at Kejimkujik hoping for Monarchs,* by W. Pitts
- *Volunteers at the 2013 Volunteer Banquet,* by E. Le Bel
- *Hauling some freshly cut lumber,* by J. Barker, MTRI

HUMAN DIMENSIONS


E. Aulenback

Rationale

The Monarch butterfly is a species that captivates a wide audience due to its life history and long distance migration. It is designated as a species of Special Concern under the federal Species at Risk Act, which means it is at risk of becoming Endangered if the threats to its population are not reversed. The Monarch butterfly is impacted by habitat loss, chemical and pesticide use and storms throughout its range. The milkweed plant is key habitat for the Monarch butterfly because the females only lay their eggs on milkweed and caterpillars only eat their leaves (no milkweed = no Monarch butterflies). The education, motivation and empowerment of individuals and communities to help this species are key to the recovery process.


M. Crowley

Butterfly road sign in South Brookfield

Research

MONARCH BUTTERFLY STEWARDSHIP IN SNBR

OBJECTIVES

- To bring awareness of the Monarch butterfly to park visitors and residents of the Southwest Nova Biosphere Reserve (SNBR) and to promote the Butterfly Club, which encourages landowners to create butterfly habitat by planting chemical-free butterfly gardens.
- To partner with communities to help plant butterfly gardens in the SNBR.
- To provide educational opportunities and first-hand experiences to witness the transformations of this species through an interactive display at the Kejimkujik Visitor Center.
- To bring educational and teaching opportunities to the maritimes.

METHODS

- Outreach events, which included public talks, Butterfly Club, socials, presentations, garden planting and interpretive signs, were planned to spread the word and increase awareness of the Butterfly Club and how to help the Monarch butterfly.
- Butterfly Club kits were sold in a number of ways, including at farmer's markets across Nova Scotia in the summer and at the By The Mersey Gift Shop in Kejimkujik.
- Butterfly and caterpillar costumes and life stage models helped to facilitate learning experiences.


W. Pitts

Species at risk staff hoping for Monarch butterflies at Kejimkujik

RESULTS

- In Kejimkujik, Monarch butterflies were not observed and reports from Monarch Watch indicate only a small number of Monarch butterflies made it to Canada. Overwintering populations were at their lowest since monitoring began 20 years ago.
- One of the biggest factors impacting the Monarch butterfly is loss of habitat. More than 1000 Butterfly Club members are planting milkweed at their homes, schools, community centres and businesses, and are cumulatively working together to significantly increase the habitat for this species in Nova Scotia.
- In 2013, Young Naturalist Club members helped to plant a butterfly garden at Milford House during the Nature Nova

RESULTS
Continued

Scotia weekend. Roberta McDonald did several presentations about the Monarch butterfly and helped to plant two school butterfly gardens at Ecole Burton Ettinger School. Megan Crowley did a presentation on gardening for butterflies at the Bridgewater Garden Club. The Butterfly Club was featured on CBC Radio's Mainstreet program.

- Members have shared their stories and pictures at www.facebook.com/MonarchButterflyClub.

YEARS OF DATA

- Ongoing project since 2008

PARTNERS

- Parks Canada
- Friends of Keji
- Mersey Tobeatic Research Institute
- Monarch Teacher Network Canada
- Monarch Watch
- Canadian Wildlife Federation

J. Eggleton

Butterfly Club member J. Eggleton's garden

T. Lorenz

R. MacDonald teaching about the Monarch butterfly

Poster encouraging the public to join the Butterfly Club

M. Crowley

Young Naturalist Club members planting a butterfly garden at Milford House

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E. Aulenback

Rationale

The Southwest Nova Biosphere Reserve (SNBR) is one of Canada's "Biodiversity Hotspots". There are over 40 species at risk in the province and southwest Nova Scotia is home to over 80% of these plants and animals. Species at Risk Stewardship biologists from Kejimkujik have partnered with MTRI and other organizations such as First Nations, schools, community groups, industry and all levels of government to help recover the species at risk that live in this special region. Their work is to learn about species at risk in the SNBR, share their knowledge with the public and engage and empower interested families and communities in hands-on recovery actions for these species and the habitats that they depend on.


M. Crowley

S. McCarthy receiving the Key to Keji

Research

SPECIES AT RISK STEWARDSHIP IN SNBR

OBJECTIVES

- To promote environmental stewardship actions and advocacy and to create ambassadors for species at risk.
- To increase awareness and understanding within the general public about species at risk in the SNBR and generate sighting reports.
- To engage and involve Canadians in hands-on recovery actions that help recover key species at risk including Blanding's turtle (Endangered), Eastern ribbonsnake (Threatened), Monarch butterfly (Special Concern), Piping plover (Endangered) and Atlantic Coastal Plain Flora.

METHODS

- Species at risk stewardship volunteer opportunities in the SNBR include: Blanding's turtle nesting monitoring, trapping, radio-tracking and visual surveys; American eel potting; Eastern ribbonsnake surveys; Piping plover monitoring and habitat restoration; Atlantic Coastal Plain Flora monitoring; water quality sampling; rare lichen surveys and more.
- Partnerships continue to be established with individuals and organizations that work with species at risk in Nova Scotia to enhance communication and collaboration and ultimately the recovery of species at risk in the SNBR.
- Outreach strategies were developed to link science and stewardship to achieve awareness and appreciation for species at risk.


M. Crowley

R.Emin placing his stone along the volunteer Walk of Honour

RESULTS

- In 2013, over 240 volunteers contributed almost 11,000 hours of their time toward environmental conservation in the SNBR. Since 2000, this is over 130,000 hours.
- At the 8th annual volunteer banquet, over 100 people gathered to celebrate these achievements. Four people were inducted into the "Walk of Honour", four moved from bronze to gold and one from gold to platinum. Shirley McCarthy received the Key to Keji volunteer of the year award.
- A Walk of Honour BBQ was held in June to celebrate the volunteers inducted at the 2012 banquet. The Walk of Honour is behind the Kejimkujik Visitor Center and recognizes the volunteers that have cumulatively contributed over 250 (bronze), 1000 (gold) or 2000 (platinum) hours. The 16

RESULTS
Continued

inductees at the 2012 banquet were able to add their stone to the walk and Diane Clapp moved from gold to platinum.

- At the BBQ, Kejimkujik was awarded the designation of an Important Amphibian and Reptile Area by the Canadian Amphibian and Reptile Conservation Network. This is a first in Atlantic Canada and would not have been made possible without the hard work and many hours contributed by dedicated volunteers.
- To learn more and keep informed about upcoming opportunities, visit the "Kejimkujik-Southwest Nova Volunteer Programs" Facebook page. Google "Volunteers in Action" on the Parks Canada YouTube Channel to view a slideshow video.

YEARS OF DATA

- Ongoing project since 2006

PARTNERS

- Parks Canada
- Friends of Keji
- Mersey Tobeatic Research Institute
- Bear River First Nation
- Acadia First Nation
- Acadia University
- Dalhousie University
- Bird Studies Canada
- Southwest Nova Biosphere Reserve Association
- Federal Habitat Stewardship Program for Species at Risk

E. Le Bel

Volunteers celebrating their efforts at the annual Volunteer Banquet in December 2013

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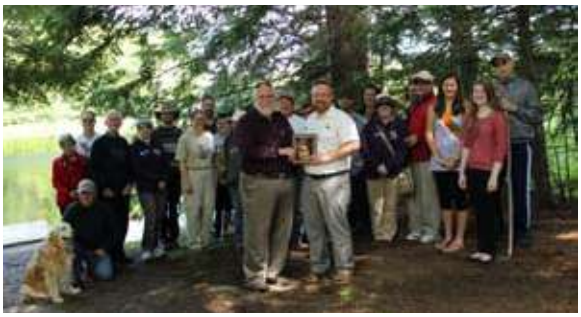
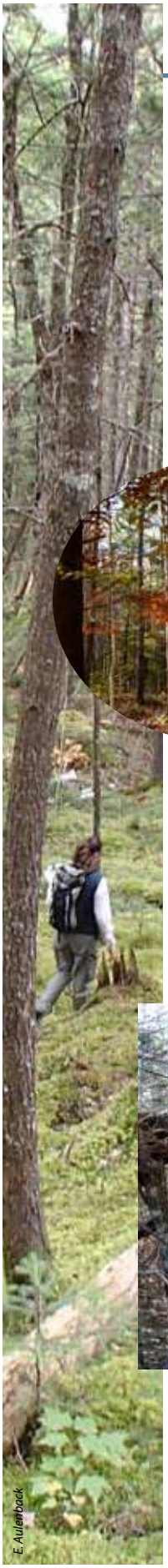


M. Crowley

2013 Walk of Honour BBQ and Silver Salamander Award


E. Aulenback

Rationale

Forest Stewardship Council (FSC) forest certification has been developing since the early 1990's as a response to public concern about unsustainable forestry systems around the world. It is a voluntary, market-based process developed to certify forest management practices to a set of globally recognized environmental, social and economic standards. In Nova Scotia, an aging demographic amongst landowners, along with less connection and woodland management experience amongst younger landowners, has led to lower forestry activity on small private woodlots. A harsh economic climate means that finding trustworthy, small-scale forestry contractors to help carry out forestry work has become challenging, and in turn has resulted in disengaged landowners and a slow-down in wood products flowing from private lands. In partnership with the Nova Scotia Department of Natural Resources and the Federation of Nova Scotia Woodland Owners (FNSWO), MTRI's certification program seeks to facilitate and support good forest stewardship through education and the organization of a pool of FSC certified woodlot owners.


J. Barker, MTRI

Uneven-aged stand

Research

WOODLAND STEWARDSHIP PROGRAM

OBJECTIVES

- To continue to work collaboratively to promote FSC certification in the Southwest Nova Biosphere Reserve (SNBR) and facilitate the certification of small, privately-owned woodlots.
- To prioritize outreach, education and landowner training to increase sustainable forest management and to encourage diverse use of forest resources.
- To collaborate with other forest-based organizations to develop and improve landowner engagement tools and sustainable management incentives and mechanisms.

METHODS

- Provided a range of training courses and in-field workshops to encourage ecologically-based, sustainable forest management and diversification of woodlot use to a variety of audiences, including youth.
- Presented information via a variety of media to raise awareness of the benefits of FSC certification and the MTRI/FNSWO program.
- Worked one-to-one with landowners to develop FSC compliant management plans and certify small privately owned woodlots.
- Collaborated with partners to explore new ideas and innovations in the forestry sector that support sustainable forest management.


J. Barker, MTRI

Old tree stumps are a haven for wildlife

RESULTS

- In 2013, 12 woodland management plans covering approximately 2083 acres of small privately owned woodlots were added to the MTRI FSC pool.
- Eighty-seven participants attended seven in-field improvement training courses/workshops offered during spring/summer 2013, including three introductory workshops, Forest Ecosystem Classification, chainsaw safety and crop tree management. Information booths were hosted at DNR's Western Region Woodland Conference and Provincial Woodlot Owner of the Year Field Day.

RESULTS
Continued

- MTRI's One Tree educational program was delivered to students in grade 5 and 6 at Islands Consolidated School, and species at risk and wood product activities were organized for 280 students from Queens, Annapolis and Lunenburg counties at the Nova Scotia Department of Natural Resources' "Kids in the Forest" field day.
- Five presentations were given around the biosphere reserve to promote forest certification and sustainable forest management.

YEARS OF DATA

- Ongoing project since 2009

PARTNERS

- Nova Scotia Department of Natural Resources
- Federation of Nova Scotia Woodland Owners
- Mersey Tobeatic Research Institute

J. Barker, MTRI

Hauling some freshly cut lumber

J. Barker, MTRI

Hardwood stand in southwestern Nova Scotia

J. Barker, MTRI

Woodlot owners participating in a tree marking training exercise in 2013

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E. Aulenback

Rationale

This project was a joint effort between Dalhousie University and MTRI, aimed at determining the barriers and opportunities for marketing sustainable certified forest products in Nova Scotia. The goal of this project was to provide recommendations to guide a future marketing campaign to promote locally produced, sustainable forest products from low impact, small scale harvests (where sustainable means local and/or certified) within Nova Scotia. In order for forestry to recover as a stable and robust industry in this province, a new approach needs to be taken that emphasizes the importance of sustainable forest products. A market that enables woodlot owners to produce these products without compromising their livelihoods is essential for this. With steps being taken to create community forests in southwest Nova Scotia, it is even more critical that new market opportunities for low-impact forest products are established for forestry.


J. Barker, MTRI

Sawn hardwood lumber

Research

SUSTAINABLE FOREST PRODUCT MARKETS

OBJECTIVES

- Assess consumer, retailer and producer behaviour toward forest products in Nova Scotia.
- Evaluate the barriers for the production and purchasing of sustainable forest products.
- Understand how sustainable forest products are valued and marketed in other jurisdictions.
- Come up with creative, market-based approaches to improve the marketing of sustainable forest products in Nova Scotia.

METHODS

- Underwent a comprehensive literature review of consumer behaviour and marketing strategies for forest products in other jurisdictions, including willingness-to-pay, value-added products, certification and labelling.
- Administered a survey (electronically and in-person) to roughly 250 people across the province to determine trends in forest product consumption specific to Nova Scotia.
- Conducted interviews with store managers and producers in order to gauge their current use and value of sustainable forest products, as well as site visits to assess the placement and labelling of such products.

RESULTS

- Price and quality are the main drivers for purchasing forest products for most consumers.
- Most consumers highly value the idea of buying local, and therefore a marketing campaign centred on the local aspects of sustainable forest products would be beneficial.
- Consumer awareness is quite low with respect to forest products; an educational campaign targeting the importance of healthy forests, where products can be purchased, and the role that consumers can play is essential.
- There is a lack of brand recognition for sustainable forest products; developing a uniform logo (such as "Select Nova Scotia" or "Choose Atlantic") is recommended, as well as improving product placement through store displays and labelling.

RESULTS
Continued

- There is a lack of cohesion between advocacy groups for woodlot owners throughout the province. Improving this will increase lobbying power and help to reduce economic barriers for producing sustainable forest products as other industries, such as egg and dairy products, have done.

YEARS OF DATA

- Year 2 of a 2 year project

PARTNERS

- Dalhousie University, School for Resource and Environmental Studies
- Nova Scotia Department of Natural Resources
- Mersey Tobeatic Research Institute

J. Barker, MTRI

White ash

J. Barker, MTRI

Hardwood boards

J. Barker, MTRI

Furniture made from locally harvested wood

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E. Aulenback

Rationale

The backyard biodiversity project aims to increase biodiversity in southwest Nova Scotia with a focus on rural communities. With the help of many landowners in these communities, the goal of reconnecting youth and landowners with nature while restoring ten hectares of native habitat will be met. Free starter kits were developed as an incentive for landowner participation. Along with this project we are encouraging landowners to plant native species, remove invasive species, put up bird feeders, keep pets on leash and plant chemical free butterfly gardens.


M. Boucher, MTRI

Black-capped chickadee in a lilac bush

Research

BACKYARD BIODIVERSITY

OBJECTIVES

- To restore ten hectares of native habitat in southwest Nova Scotia.
- To reconnect youth and landowners with nature.
- To successfully plant 600 native trees and shrubs.
- To have 75% survival rate for the native species planted.
- To increase native species by increasing native habitat.

METHODS

- MTRI completed a restoration project to its own backyard. High school students from Caledonia and Bridgetown helped plant a variety of trees and winterize plants in October 2012.
- Tours were given by MTRI staff to landowners in order to showcase MTRI's efforts in going green and to encourage restoration of backyards in southwest Nova Scotia.
- An online guide was developed in French and English versions from information gathered by experts in various fields and by researching various topics. The guide outlines ten ways to increase biodiversity in your own backyard. The guide is available on MTRI's website for the public.
- Newsletters, posters, radio interviews, presentations and online media such as Facebook were used to spread the word and get landowners involved.
- Fifty free starter kits were assembled and distributed to schools and landowners who pledged to restore particular spaces in their backyards. Kits included: nestbox, native trees, invasive species guidebook, butterfly garden sign for a chemical free garden, butterfly garden plants, a bag of seaweed soil amendment, post cards and seeds.
- Restored lands were followed-up and assessed through MTRI's evaluation in the summer and again in the fall of 2013 to monitor the project's success and to give additional advice for future expansion of the project on their properties.


A. Pray-Leslie, MTRI

Standing dead trees provide habitat for insects, mammals and cavity nesting birds such as woodpeckers

RESULTS

M. Boucher, MTRI

American tree sparrow (top) and Common redpoll (bottom) feeding in the late winter

- Three youth were hired at MTRI to work on the Backyard Biodiversity project for the spring and summer of 2013, to have one-on-one contact with landowners and youth, attend Farmer's Markets, present public talks and school presentations and give demonstrations at MTRI's field station.
- A total of 50 Backyard Biodiversity kits were assembled and distributed to 45 participants who pledged to increase biodiversity in their backyards; four schools were involved: Bear River Nursery, Barrington Elementary School, John C. Wickwire Academy and Chester Middle school. The remaining 41 pledges were landowners from Annapolis, Digby, Yarmouth, Shelburne and Queens counties.
- Seventeen evaluations were completed in the summer and fall of 2013 estimating at least 115 hectares were restored. A minimum of 156 native tree and 1745 plant species were planted with a 97% survival rate in rural communities in southwestern Nova Scotia who pledged to increase biodiversity in their backyards.
- MTRI hosted a get-together for participants and volunteers at the end of summer to celebrate the project's successes and to obtain their feedback.
- Barrington Elementary School was visited in the fall and given a presentation on Backyard Biodiversity by staff at MTRI, reaching out to a total of 15 children.

YEARS OF DATA

- Year 2 of a 2 year project

PARTNERS

- Environment Canada - EcoAction
- Mersey Tobeatic Research Institute
- Clean Nova Scotia
- Nova Scotia Youth Conservation Corps
- Wild Rose Farm
- First Caledonia Scout Troop

M. Boucher, MTRI

Caledonia high school class planting trees at MTRI

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E. Aulenback

Rationale

Bats have become increasingly at risk in Canada due to White-nose syndrome since it was first observed in New York in 2006. Since then it has spread through bat to bat contact arriving in Nova Scotia in 2010/2011. White-nose syndrome is caused by *Pseudogymnascus destructans*, a fungus which invades the body of bats while they overwinter in caves. The fungal infection causes the bats to awaken and burn their fat stores resulting in death by starvation or hypothermia. In 2013, MTRI and the Nova Scotia Department of Natural Resources collaborated to create www.batconservation.ca. The website consists of a web portal for reporting bats and also directs users to the Rare Species Reporting Hotline where they can also submit reports of bats.


H. Mailhot

Little brown bats

Monitoring

PUBLIC REPORTING OF BATS IN NOVA SCOTIA

OBJECTIVES

- Advertise the website to Nova Scotians.
- Raise awareness of White-nose syndrome and the decline of bat populations.
- Collect information on where bats are observed in Nova Scotia.

METHODS

- A website with a Google Maps input interface was created and reviewed by experts.
- The website was launched and advertised widely in Nova Scotia.
- Records were spatially proofed and phone call data were entered into the online database.


M.F. Elderkin

Little brown bat flying during the daytime

RESULTS

- The website received over 13,000 page views by 2536 unique visitors.
- Over 900 individuals provided over 1100 records to the database.
- Maps of the results were then produced and uploaded to the same website as a short report.
- Large concentrations of bats were reported to Nova Scotia Department of Natural Resources.

YEARS OF DATA

- Ongoing project since 2013

PARTNERS

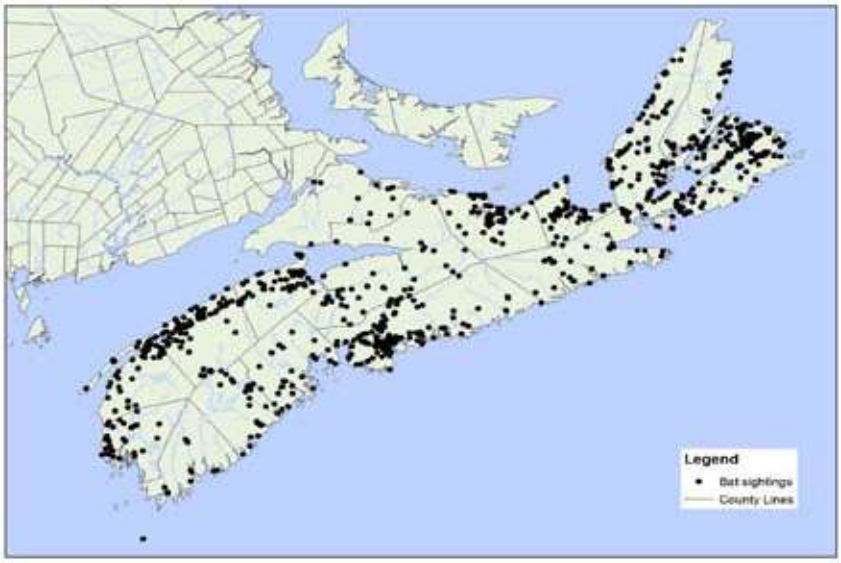
- Nova Scotia Department of Natural Resources
- Mersey Tobeatic Research Institute
- Canadian Cooperative Wildlife Health Network

H.Broders

Little brown bat with White-nose syndrome

NSDNR

Dead bats at a mine site in Nova Scotia



www.batconservation.ca

All bat sightings (including historic) submitted July-Nov 2013 in Nova Scotia

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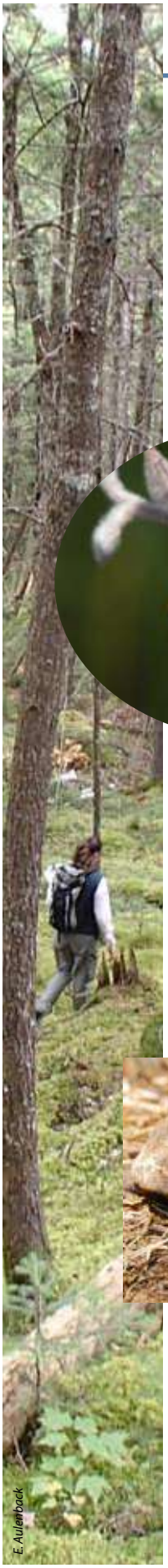
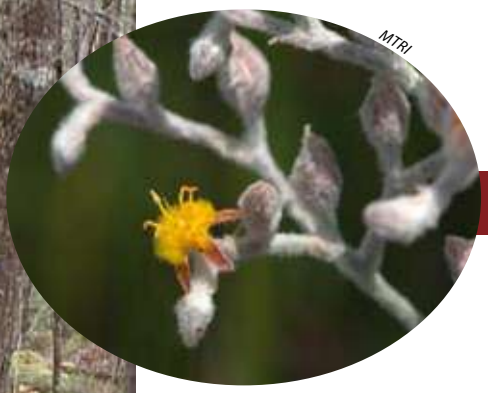

E. Aulenback

Rationale

MTRI, in collaboration with partners in the Eastern Habitat Joint Venture Nova Scotia Steering Committee, developed a Habitat Conservation Strategy for the Southwest Nova Scotia bioregion (SWNS). The project involved the identification, assessment and mapping of the current state and conservation status of species and ecological communities of conservation priority for southwest Nova Scotia. The strategy is intended to inform the decision-making and actions of regional conservation organizations by highlighting ongoing conservation priorities, gaps and opportunities for collaborative conservation.


MTRI

The threatened Golden crest can be distinguished by its small yellow flowers and white wooly hairs

Research

SOUTHWEST NS HABITAT CONSERVATION STRATEGY

OBJECTIVES

- To identify, assess and map high priority areas for the conservation of native biodiversity in southwest Nova Scotia.
- To inform and focus collective efforts to maintain and restore healthy, intact, and fully functioning ecosystems and support the recovery of populations of species at risk.
- To compile a list of the current and planned land protection and stewardship efforts by conservation organizations and identify ongoing gaps and opportunities.

METHODS

- A suite of habitat types considered a priority for the conservation of significant species in southwest Nova Scotia were selected based on literature and consultation with local and regional experts.
- Data on priority habitats, significant species and current threats were gathered from existing provincial, Atlantic Canada Conservation Data Centre and Maritime Breeding Bird Atlas databases, published literature and expert knowledge.
- Data were analyzed and integrated into a series of Geographic Information System (GIS) based maps depicting the spatial extent of priority habitat types, species occurrences and threats.
- The ecological integrity of and threat to each of the priority habitat types were assessed based on literature and expert knowledge to provide an overall impression of condition and conservation status.
- A Conservation Value Index assessment was performed to identify the sites in the bioregion of the highest priority for conservation. Each individual patch of habitat was assigned scores based on uniqueness, representivity, size and the presence of significant species. The scores were integrated to form a Conservation Value Index Map. The index can be used by conservation organization to identify key sites to direct conservation actions.
- Details on the current and planned conservation efforts of conservation organizations were assembled. This is intended to be used to identify ongoing conservation gaps, target areas and opportunities for collaborative actions.


B. Caverhill

A Wood turtle basking in the sun

RESULTS

- Nine habitat types were identified as conservation priorities for SWNS: Beaches and Dunes; Tidal Marshes; Tidal Flats; Coastal Islands; Freshwater Wetlands; Acadian Forest Mosaic; Riparian and Floodplain Systems; Grasslands/Agro-ecosystems; and Barrens.
- Five priority habitat types received 'Good' ecological integrity scores and four received 'Fair' scores.
- A Conservation Value Index was created depicting the conservation value of individual sites throughout SWNS. Conservation Value Index scores were as follows: Very High - 34%, High – 18%, Moderate - 18%, and Low - 30%.
- Twelve medium to high level threats to priority habitats were identified including residential development, agriculture, forestry and roads.
- The strategy outlines the conservation actions planned by partners over the next 5-year period and ongoing needs and opportunities.
- The final habitat conservation strategy, including a series of map products and list of planned conservation actions, are in the process of being finalized.

YEARS OF DATA

- Ongoing project since 2013

PARTNERS

- Mersey Tobeatic Research Institute
- Environment Canada
- Partners and collaborators of the Eastern Habitat Joint Venture Nova Scotia Steering Committee

MTRI

Canada warbler

A. Belliveau, MTRI

The Virginia meadow-beauty is an Atlantic Coastal Plain Flora (ACPF) species found on peaty lake margins and in bogs

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APPENDIX

INDEX OF PROJECTS BY RESEARCHER NAME

Researcher Name	Project	Page
McNeil, Jeffie	Blanding's Turtle Nest Protection	64
	Blanding's Turtle Distribution and Monitoring	66
	Blanding's Turtle Headstart and Wild Juvenile Monitoring	70
Mockford, Steve	Radio Tracking Headstarted Blanding's Turtles	68
O'Driscoll, Nelson	Dissolved Organic Carbon and Methyl Mercury in Kejimkujik Lakes	52
Porter, Katie	ACPF Volunteer Plant Monitoring	50
Pray-Leslie, Alicia	Adult Survivorship of Common Loons	58
Reid, Darrin	Estuarine Water Quality Monitoring	18
	Relative White-Tailed Deer Abundance in Kejimkujik	34
	Invasive Plant Monitoring and Restoration	36
	Plethodontid Salamander Monitoring	38
	The Kejimkujik-Mersey LoonWatch Program	56
	Wetland Water Quality Monitoring in Kejimkujik	74
Rowter, Kyle	Plethodontid Salamander Monitoring	38
	Stream Flow Monitoring	48
	Wetland Water Quality Monitoring in Kejimkujik	74
Rudderham, Jim	Jack Pine Budworm Population and Damage Assessments	30
Staicer, Cindy	Modeling Habitat for Landbirds at Risk	22
Thompson, Megan	Eastern Ribbonsnake Microclimates	72
Toms, Brad	McGowan Lake Chimney Swift Monitoring	28
	Boreal Felt Lichen Monitoring in Nova Scotia	32
	Public Reporting of Bats in Nova Scotia	90
	Southwest Nova Scotia Habitat Conservation Strategy	92
VanderKloet, Evelien	Sustainable Forest Product Markets	86
Veinot, Leah	Backyard Biodiversity	88
Westwood, Alana	Modeling Habitat for Landbirds at Risk	22

E. Le Bel

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