



# 2011 Annual Report

Research and Monitoring in the  
Greater Kejimikujik Ecosystem

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**Cover photos from top:**

- Herring gull on the coast by Alain Belliveau, MTRI
- Old growth forest horizon by Alain Belliveau, MTRI
- Misty morning, Oakland Lake by Alain Belliveau, MTRI
- Hare's tail cotton grass by Alain Belliveau, MTRI
- Sporting Lake canoe by Alain Belliveau, MTRI



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# 2011 Annual Report

Research and Monitoring in the Greater Kejimikujik Ecosystem



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# INTRODUCTION

This is the seventh Annual Report of Research and Monitoring in the Greater Kejimikujik 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 many of the research and monitoring projects that were conducted in the Kejimikujik area. The summaries are all written by the researchers who are listed as contacts for each project. 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 the spring of 2012 and is a compilation of the research and monitoring projects that were conducted in the Kejimikujik area in 2011 by Mersey Tobeatic Research Institute (MTRI) and its 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.

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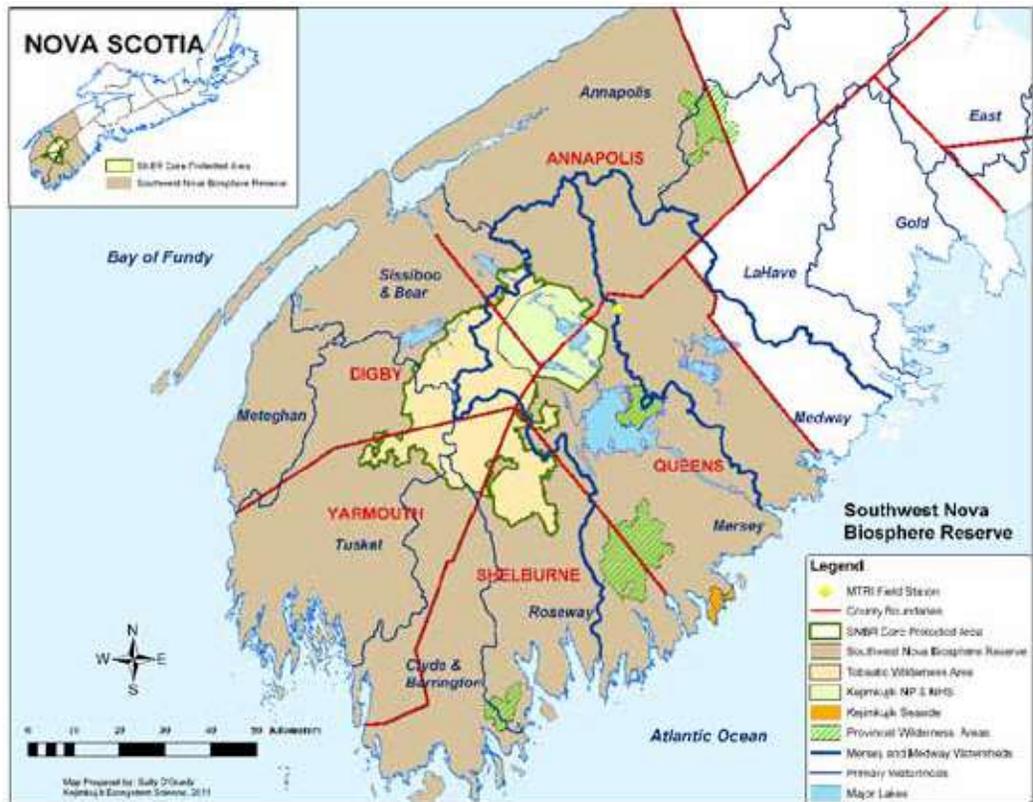
The research and monitoring projects detailed in this report are important tools for attaining sustainable management of our natural resources and maintaining ecological integrity of our protected areas. The monitoring projects are conducted to keep track of how the ecological systems around us are changing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

Kejimikujik represents the Atlantic Upland Natural Region in Parks Canada's network of protected areas. Kejimikujik consists of 381 km<sup>2</sup> inland and 22 km<sup>2</sup> on the coast and, in combination with the Tobeatic, is the core area of the Southwest Nova Biosphere Reserve. Since its establishment, Kejimikujik 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. Kejimikujik 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). Kejimikujik 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, Kejimikujik 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. Kejimikujik is identified by the Parks Canada Agency as a species at risk priority site where stewardship and recovery are paramount. More information about Kejimikujik can be found at [www.pc.gc.ca/pn-np/ns/kejimikujik](http://www.pc.gc.ca/pn-np/ns/kejimikujik) or at the Friends of Keji Cooperative Association website ([www.friendsofkeji.ns.ca](http://www.friendsofkeji.ns.ca)).



Kejimikujik Lake in January by J. Kinley, MTRI

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 Kejimikujik and Caledonia in Kempt, Queens County where it provides office workspace, 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 co-operative is available at [www.merseytobeatic.ca](http://www.merseytobeatic.ca).



S. O'Grady, Parks Canada

Kejimikujik 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 Kejimikujik 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.



# COASTAL



J. Kinley, MTRI

## Rationale

The Piping plover is a small shorebird that has been listed as an Endangered species by the Committee on the Status of Endangered Species in Canada (COSEWIC) since 1985. Piping plovers nest on white sandy beaches including St. Catherine's River Beach at the 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 overwintering grounds. The Piping plover is often referred to as a management dependent species, as sustained management actions are 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 the Kejimkujik Seaside (and southwest Nova) and to implement a suite of management strategies focused on protecting and sustaining plover numbers.

M. Crowley, Parks Canada



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 and restore a portion of nesting habitat on St. Catherine's River Beach.
- To take part in a multi-park remote camera project by examining predation and abandonment of nests through deployment of a digital video recorders.
- 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.
- Park staff worked beyond boundary with the Bird Studies Canada team to assist in monitoring at Ragged Harbour and other beaches.
- 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.
- A remote camera was deployed on nests with 4 eggs to monitor potential predation and reasons for nest abandonment.
- Plover habitat was restored on one section of St. Catherine's River Beach, through removal of dense marram grass, using a tractor and by hand.

### RESULTS

- Four pairs of Piping plovers were observed at St. Catherine's River Beach. Three of the pairs successfully nested and fledged a total of seven young. Remote cameras were deployed on all three nests, yielding footage including a nest move and adult and chick behaviour (<http://pipingplover.landandwater.ca>).
- Unfortunately, one of the adults of the fourth pair was predated and sent to the Atlantic Vet College for a necropsy.



M. Crowley, Parks Canada

Joint volunteer appreciation day at the Keji Seaside with Bird Studies Canada and Environment Canada



Parks Canada

A volunteer training guide has been developed by Environment Canada and is being distributed to volunteers

**RESULTS**  
Continued

- Park staff assisted with the 2011 international census inside and outside the park. At Little Port Joli Basin Beach in Kejimikujik a pair was observed but no nest was located.
- Over 65 volunteers contributed more than 450 hours to Piping plover recovery and stewardship efforts including monitoring, beach clean-up and habitat restoration efforts. A joint volunteer appreciation event with Bird Studies Canada was held at the Seaside with a great turnout.
- A draft volunteer training video was prepared by filming around the Maritimes with many plover partners and will be finalized in the summer of 2012.
- Over 35 plover-focused interpretation and outreach events (exhibits, booths, guided walks, presentations, etc) were held at the seaside and around the biosphere.
- Predator survey transects were completed over the season and the data was submitted to Environment Canada.

**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



M. Crowley, Parks Canada

Volunteers helping to collect inverts in Kouch as part of the captive rearing program



J. Bent

Volunteers participating in a survey at the Keji Seaside

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Parks Canada

Image of plover parent and chick captured by the remote camera





# FOREST



J. Kinley, MTRI

## 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 maintains a master record of all counts within the province and annually reports the counts with notes on the unique results of that year.

# Monitoring

## CALEDONIA CHRISTMAS BIRD COUNT



Downy woodpecker

### 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 utilize 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 count was held on one specific day from midnight to midnight.
- The count has always been held in the same area - a circle of 24 kilometers 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.



Red-tailed hawk

### RESULTS

- The December 18, 2011 count noted 32 bird species and 1111 total birds.
- Only 12 species have been reported consistently for every year of the Caledonia count but over 65 species have been noted on one or more counts.
- This is Nova Scotia's only entirely inland Christmas Bird Count and like other years, this count found many more woodpeckers and barred owls per party hour and less red tailed hawks than other counts in Nova Scotia.
- Thirty-one observers participated.
- Numbers of observers in the field, at feeders and total hours volunteered have declined over the past decade at least in part because of an aging group of volunteers.

YEARS OF DATA

Ongoing project since 1991

PARTNERS

- Nova Scotia Bird Society
- Mersey Tobeatic Research Institute



A. Belliveau, MTRI

A bird of prey over Sixth Lake



A. Lavers, MTRI

Barred owl

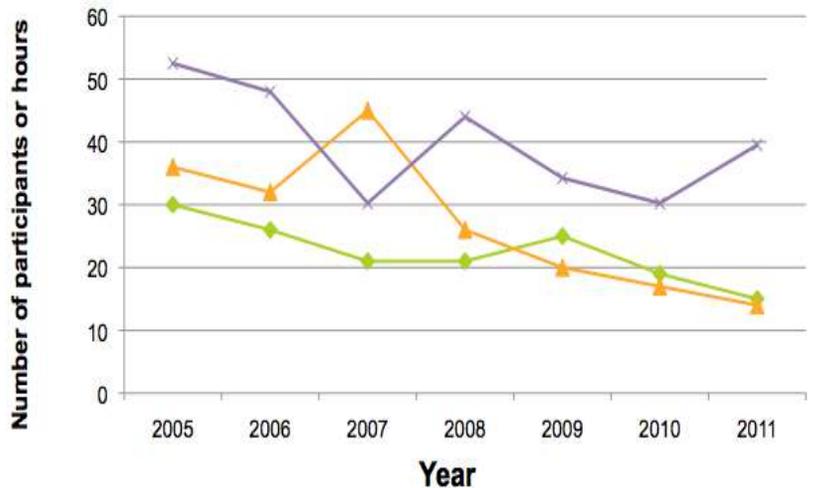


B. Caverhill, MTRI

American goldfinch

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A. Lavers, MTRI

The green line represents number observers in the field by year, the yellow line represents the number of parties at feeders and the purple line represents the number of total party hours

## Rationale

Boreal felt lichen and other rare lichens that inhabit coastal forests in Nova Scotia are threatened by air pollution and forestry practices. 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 GIS habitat algorithm was developed by the NS government and has allowed the forest industry to use precaution when harvesting in potentially sensitive areas. This project has fostered partnership between scientists and 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 NS populations of Boreal felt lichen.



Boreal felt lichen



Boreal felt lichen habitat

# Monitoring

## BOREAL FELT LICHEN MONITORING IN NOVA SCOTIA

### OBJECTIVES

- To improve the 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.
- To find and protect Boreal felt lichen and other at risk lichen sites 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.

### RESULTS

- Thirty-three sites and 74 trees with Boreal felt lichen were discovered from 2005 to 2010 through this project and during the same time 11 of those sites and 20 of those trees with Boreal felt lichen were lost.
- In 2011, eight new sites were found with 34 new trees containing Boreal felt lichen while 12 trees containing Boreal felt lichen at eight sites were lost.
- The first site in Queens County was discovered.
- Fifteen trees with Boreal felt lichen were found in Halifax County, ten in Richmond County, six in Guysborough County, two in Shelburne County and one in Queens County.
- Habitat parameters were collected at new sites. Sites were visited for annual monitoring.
- Forest industry employees were taken out to a Boreal felt lichen site and on Boreal felt lichen searches to learn about Boreal felt lichen habitat and a one day lichen workshop was held at MTRI.

YEARS OF DATA

Ongoing project since 2007

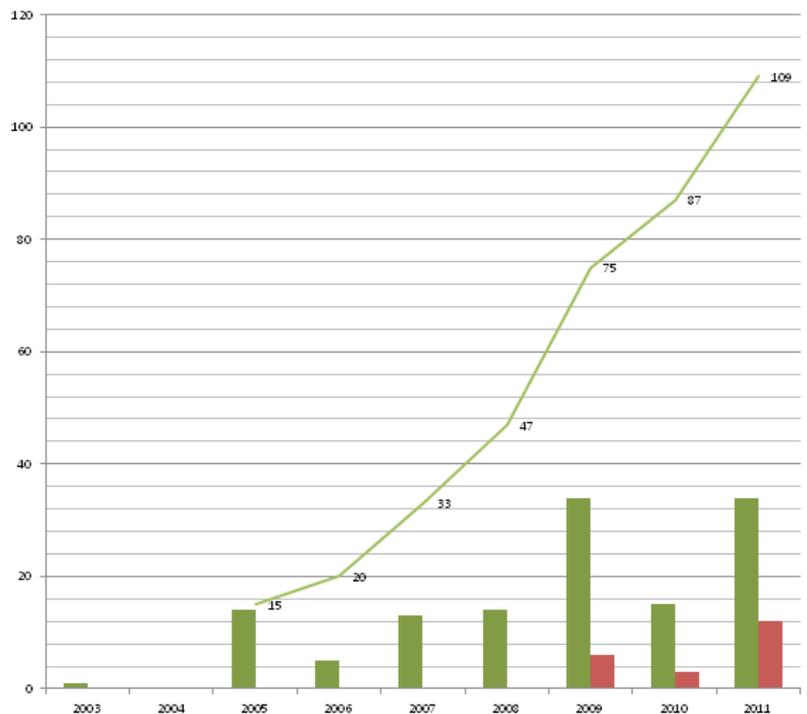
PARTNERS

- Environment Canada
- New Page Corporation
- Nova Scotia Department of Environment
- Nova Scotia Department of Natural Resources
- Mersey Tobeatic Research Institute
- Mountain Equipment Co-op
- Resolute Forest Products



M. Crowley

Brad Toms surveying Boreal felt lichen habitat



B. Toms, MTRI

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The number of Boreal felt lichen trees discovered and lost since 2003. The green bars represents the amount of Boreal felt lichen trees discovered for that year where the red bars represents the amount of trees with Boreal felt lichen lost. The green line represents the total number of trees gained.



## Rationale

Native Nova Scotia moose are provincially endangered with as few as 1000 animals scattered among four major population concentration areas, widely separated across the mainland. Moose decline has originated and persisted through a complex range of interrelated factors. A key factor identified under the moose recovery plan is the influence of available habitat. In response to the moose recovery plan goal of "maintaining the mainland moose population in Nova Scotia," the plan lists the "maintenance and enhancement of moose habitat" as a primary objective. Habitat research is a key moose recovery plan action, with a suggested emphasis on quantitative measures of habitat suitability and selection.

# Research

## ENDANGERED MAINLAND MOOSE HABITAT RESEARCH



Mainland moose

### OBJECTIVES

- Define, delineate (map) and assess moose habitat, a variety of scales.
- Build a predictive Moose habitat supply model.
- Determine the influence of habitat on Moose population parameters.
- Develop a basis for long-term moose habitat monitoring.

### METHODS

- Evidence of recent habitat selection and use by Mainland moose was compiled.
- A comprehensive field survey of moose habitat structure and composition (primarily at the patch scale) was conducted. Field survey data included: topographic variables (*e.g.*, elevation, slope, aspect, topo-position), land use, stand history, soil attributes (*e.g.*, moisture, nutrients, origin, depth, texture, etc.), vegetation composition (including vascular plant, lichen, and bryophytes species presence and abundance) and stand structural features.
- A field based stand-scale browse survey and assessment of habitat use was conducted.
- Moose forest-habitat definitions was linked to units in the Nova Scotia Forest Ecosystem Classification and provincial GIS thematic layers.
- Statistical and geographic analyses to define, map, quantify, and rank Moose habitat was conducted.

### RESULTS

- Preliminary results suggested that moose prefer areas with lower road densities, reduced residential and commercial development, and lower human population density.
- Moose use a variety of forested and non-forested habitat types including treed wetlands, open peatlands, mature and immature hardwood forest communities, closed canopy spruce forest, and early to late successional mixedwood forests.
- They also use forest edges around clearcuts and barrens as foraging habitat.
- Additional results are pending completion of field work and desktop analyses.
- Habitat surveys will continue in 2012.



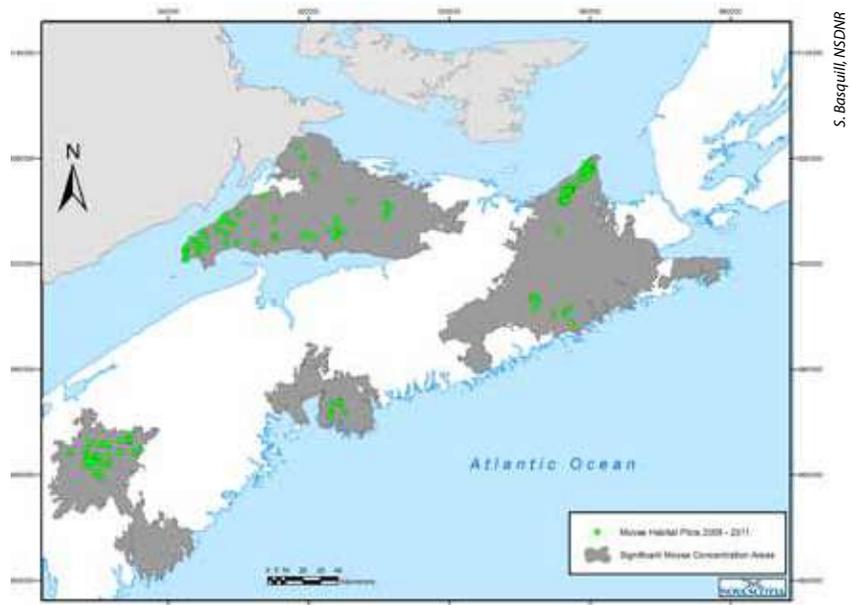
One type of moose habitat is early to late successional wood forests

YEARS OF DATA

Ongoing project since 2009

PARTNERS

- Nova Scotia Department of Natural Resources
- Parks Canada



Nova Scotia Department of Natural Resources Moose Habitat Surveys, 2009-2011

#### CONTACTS

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## Rationale

Forest Health is a section within the Forest Protection Division of the Department of Natural Resources. One of their responsibilities is to monitor and assess insect and disease populations and damage, and to provide technical advice and management options to forest stakeholders. In 2004, aerial surveys detected defoliation and mortality caused by the Jack pine budworm, a native insect, in mature 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 mature White pine rather than its usual host, Jack pine, which is its preferred host in other regions of Canada and the United States.



Pine Lake 2006: mortality and defoliation



L2 extraction wash procedure

# Monitoring

## JACK PINE BUDWORM POPULATION AND DAMAGE ASSESSMENTS

### OBJECTIVES

#### *Aerial survey:*

- To detect locations of defoliation, determine the size of the outbreak and record the severity of the damage.

#### *Ground surveys:*

- To place pheromone traps in mature stands of White pine to collect male moths to detect building populations.
- To collect branch samples to determine overwintering larval (L2) population levels.

### METHODS

#### *Aerial survey:*

- Using one helicopter, two observers flew flight lines 10 km apart at an altitude of 500 meters.
- Locations of defoliation or mortality were mapped 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, severe defoliation and mortality.

### RESULTS

#### *Aerial survey:*

- No new defoliation or dead trees were detected in 2011.

#### *Ground surveys:*

- Thirty Multi-Pher<sup>®</sup> pheromone traps/lures were placed in mature white pine stands in June 2011 and were picked up in late fall; four of these were found on the ground and two were missing.
- Twelve traps contained 0 moths; 4 traps contained 1 moth; 5 traps contained 2 moths; 1 trap contained 3 moths; 1 trap contained 4 moths; and 1 trap contained 11 moths.
- Five locations were assessed for overwintering L2 larvae, 0 larvae were found.

## YEARS OF DATA

Conducted yearly since 2004

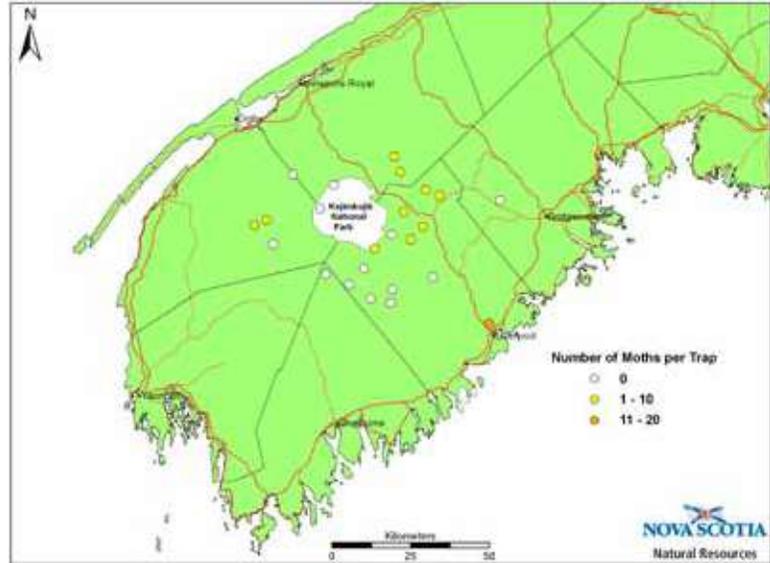
## PARTNERS

- Aviation Services
- Nova Scotia Department of Natural Resources



Forest Health, NSDNR

Adult moth (top) L2 Larvae (bottom)



Forest Health, NSDNR

Pheromone trap results



Forest Health, NSDNR

Aerial survey for damage



Forest Health, NSDNR

Overwintering L2 results

## CONTACTS

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## Rationale

The brown spruce longhorn beetle (BSLB), an introduced wood boring pest, is native to north and central Europe and Japan, where it uses stressed and dying conifers as hosts, most notably the Norway spruce. In 1999, the beetle was detected in Point Pleasant Park, Halifax, Nova Scotia, and subsequent investigations confirmed that beetles collected in the park as early as 1990 were BSLB. Studies conducted by the Canadian Forest Service since 1999 indicate that the wood-boring beetle is killing healthy spruce trees by feeding on the cambium and phloem and eventually girdling the tree. BSLB is considered to be a pest of quarantine significance in Canada.



Brown spruce longhorn beetle

# Monitoring

## BROWN SPRUCE LONGHORN BEETLE SURVEY

### OBJECTIVES

- To determine, using a detection survey, if the brown spruce longhorn beetle has spread beyond its known distribution in Nova Scotia.

### METHODS

- There were five trapping sites selected in Kejimikujik.
- The intercept panel traps were baited with a combination of two ultra-high-release host-volatile lures and a BSLB pheromone lure developed by the Canadian Forest Service.
- Sites were selected in spruce forests in close proximity to campgrounds and other locations that see high numbers of people. Traps were checked biweekly.

### RESULTS

- There were four submissions with 18 samples sent to the CFIA Entomology lab for identification.
- There were no detections for brown spruce longhorn beetle in Kejimikujik in 2011.

### YEARS OF DATA

Ongoing since 2007

### PARTNERS

- Parks Canada
- Nova Scotia Department of Natural Resources
- Natural Resources Canada - Canadian Forest Service



Brown spruce longhorn larva from its ventral view



K. Bolte, NRCANS-CFS

Brown spruce longhorn female



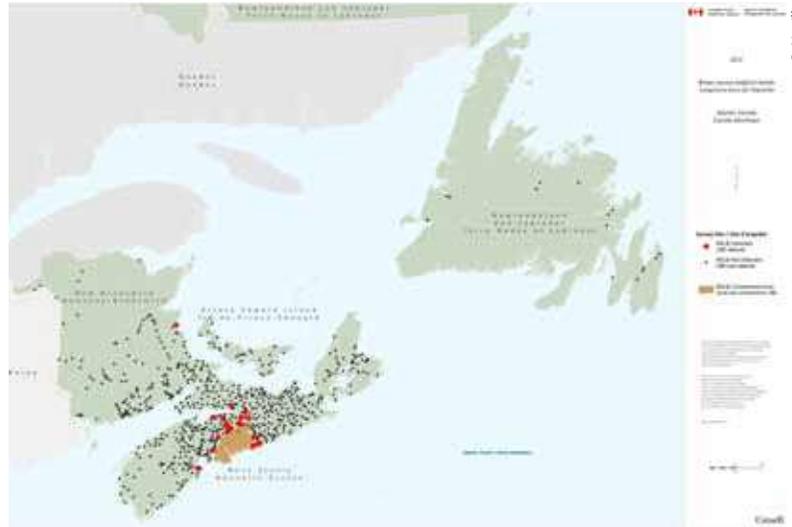
R. Neville

Marked tree infested with Brown spruce longhorn beetle



R. Neville

Burrow of a Brown spruce longhorn beetle in an infested tree



R. Neville

Brown spruce longhorn beetle sites throughout Atlantic Canada

### CONTACTS

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## Rationale

Botanical surveys were conducted by staff from the Atlantic Canada Conservation Data Centre (AC CDC) focusing on the shores of Kejimikujik and George Lakes and on the Snake Lake – Moosebone Bogs area. The large dataset of rare species locations can be used by Kejimikujik to help guide management actions along the shores of Kejimikujik and George Lakes and in other surveyed areas, and will be relevant to any future monitoring of significant lakeshore Atlantic Coastal Plain plant communities. Our work shows that if we hope to have a reasonably complete picture of the diversity of vascular plants occurring in Kejimikujik National Park, especially the species of greatest provincial significance, further data compilation and especially further fieldwork by knowledgeable botanists will be essential.



Habitat surveyed for vascular plants

# Research

## RARE VASULAR PLANTS SURVEYS IN KEJIMKUJIK

### OBJECTIVES

- To document distribution of rare flora on the shores of Kejimikujik and George Lakes in Kejimikujik, with a focus on Atlantic Coastal Plain species.
- To document rare flora of the Snake Lake and Moosebone Bogs area of Kejimikujik.
- To document total vascular plant species diversity in the above areas.
- To update the Kejimikujik vascular plant list in digital form.

### METHODS

- Botanical surveys by AC CDC botanists Sean Blaney and David Mazerolle amounting to 33.3 hours were conducted in Kejimikujik on August 18-19, 2011.
- Field time was primarily on the shores of George and Kejimikujik Lakes where a comprehensive rare plant inventory was conducted on foot for over 20 km of shoreline between Merrymakedge Beach and the Eel Weir boat launch.
- Ten kilometers of forest and peat lands around Snake Lake and the Moosebone Bogs were covered and made some incidental observations along the main park road were made. Botanists recorded area covered with GPS units and compiled full vascular plant species lists.
- Provincially rare species were recorded using GPS locations along with information on population size and extent, habitat and associated species.
- Data have been made available to Kejimikujik and incorporated into the AC CDC database for permanent storage, where it will be used in response to conservation-related data requests near the study area.

## RESULTS

- We documented 839 records of 259 vascular plant species (237 native, 22 exotic), including 441 records of 21 provincially rare species.
- Highlights included three Kejimikujik Lake locations for the Committee on the Endangered Status of Wildlife in Canada Special Concern species Long's bulrush (*Scirpus longii*) which had not been previously documented for the park, and a roadside occurrence of Chaffweed (*Anagallis minima*), a nationally rare species previously known in eastern Canada only from Sable Island, Nova Scotia.
- Our large data set of rare species locations can be used by Kejimikujik to help guide management actions along the shores of Kejimikujik and George Lakes and in other surveyed areas, and will be relevant to future monitoring of significant lakeshore Atlantic Coastal Plain plant communities.
- We significantly increased understanding of the park's biological diversity by discovering 23 new vascular plant species (3 provincially rare) for the park, and documenting 15 additional new park species (11 provincially rare) through analysis of pre-existing AC CDC data.
- These results demonstrate that current knowledge of the vascular flora of Kejimikujik, although fairly extensive compared to adjacent areas, is still very incomplete.
- If we hope to have a reasonably complete picture of the vascular plant diversity of Kejimikujik, especially the species of greatest provincial significance, further data compilation and fieldwork by knowledgeable botanists will be essential.

## YEARS OF DATA

Year 1 of a 2 year project

## PARTNERS

- Kejimikujik National Park
- Mersey Tobeatic Research Institute

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Long's bulrush flowers on the right and Woody bulrush flowers left

## Rationale

Transitions between plant communities on the landscape have become a focus of ecological research due to their relatively high diversity and sensitivity to global climate change. However, little is known about how vegetation changes across natural landscape boundaries such as the forested edges around lakes. Boundary structure affects flows of energy, material and organisms across such transitions. Determination of the effective width of these transitions will contribute towards mapping the extent of transition zones on the landscape that may have greater biodiversity and different habitat features that are important for wildlife conservation. Understanding the structure and composition of the transitions around old hemlock forest stands is particularly important given their significance for conservation.



K. Harper

A lakeshore edge of old-growth hemlock forest

# Research

## VEGETATION AT OLD-GROWTH FOREST LAKE EDGES

### OBJECTIVES

- To estimate the distance of edge influence (edge width) for forest structure, understory composition and tree growth at lakeshore edges of old-growth forest.
- To compare patterns of changes in vegetation structure and individual species across lakeshore forest edges of old and mature spruce forest stands.
- To determine if understory and structural diversity are greater at the edge compared to the adjacent old forest.

### METHODS



K. Harper

Christine Angelids and Anna Naylor estimating cover in a quadrat in interior old-growth hemlock forest

### RESULTS

- Transects were set up across 5 lakeshore forest edges in old-growth hemlock forests in southwest Nova Scotia with sampling points at 0, 5, 15, 25, 40, 60, 100, 140 and 180 m from the lakeshore edge.
- At each sampling point, we measured forest structure characteristics including canopy cover, live and dead tree density.
- Three trees were cored at each sampling point to measure tree ring width to estimate tree growth rates.
- Contiguous 1 x 1 m quadrats 0 to 60 m and across 5 m spans at 100, 140 and 180m were used to estimate cover of saplings and understory species.
- Similar data were collected at lakeshore edges in mature spruce forest in 2010.
- Analysis focused on comparing data at each edge distance with the reference data (at 100, 140 and 180 m) using randomization tests. Later, spatial pattern analysis will be used to compare patterns across the transitions.
- We found more small trees, fewer well-decayed logs, fewer saplings and greater shrub cover within 5 m of lakeshore edges of old-growth forest compared to interior forest.
- Distance of edge influence extended further (50-55 m) for greater leaf litter cover and lower moss cover.
- Patterns of individual species abundance varied across the transition zone.
- The lakeshore transition zone exhibited more differences in structure in old-growth hemlock forests compared to mature spruce forests which did not have significantly different structure

**RESULTS**  
Continued

YEARS OF DATA  
PARTNERS

compared to interior forest.

- More tree and shrub species were found up to 25 and 5 m, respectively, from the lakeshore edge compared to interior forest, but fewer moss and lichen species right at the edge.
- These lakeshore edges exhibit some unique features on the landscape such as higher woody plant diversity that suggest these transition zones could be important habitat features and may contribute to the conservation value of these old-growth hemlock forests.

Single year project

- Natural Sciences and Engineering Research Council of Canada



A. Naylor

Karen Harper coring a large hemlock tree in old-growth forest

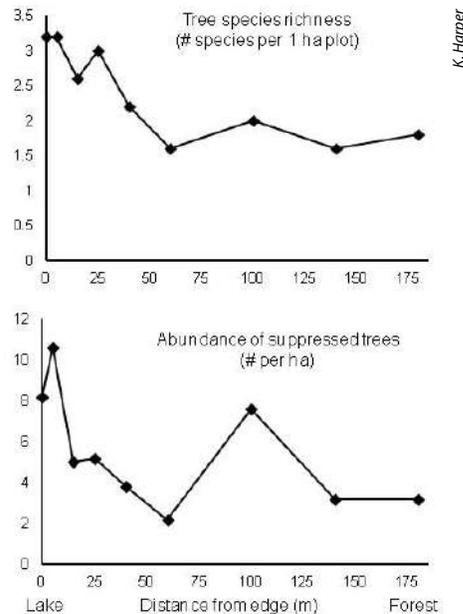


K. Harper

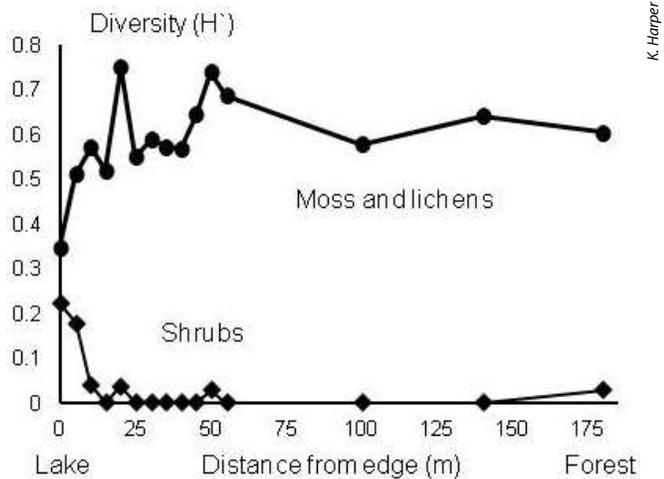
Looking from old-growth hemlock forest towards the lake showing more abundant shrubs at the lakeshore

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Average tree species richness and abundance of suppressed (short) trees from the lakeshore forest edge into interior old-growth hemlock forest. Tree species richness is highest at the edge while suppressed tree density peaks in abundance at 5 m from the edge.



Average diversity (estimated using the Shannon index) of shrubs, as well as of moss and lichens combined from the lakeshore forest edge into interior old-growth hemlock forest. Shrub diversity is highest while diversity of moss and lichens is lowest at the edge.

## 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 Endangered Status of Wildlife in Canada and under Species at Risk Act in 2008. In Nova Scotia several well known roost sites have been loosely 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 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 monitor population levels at known roost sites and to learn more about nesting ecology of Chimney swifts.

A. Prey-Leslie, MTRI



Chimney swifts

# Monitoring

## CHIMNEY SWIFT MONITORING IN THE SNBR

### OBJECTIVES

- To conduct counts at known roost sites on standardized dates and other dates during migration and nesting seasons.
- To introduce new volunteers to Chimney swift monitoring to expand base of available volunteers.
- To develop and test Urban habitat inventory methods are developed and tested.

### METHODS

- Chimney swifts were counted as they entered roost sites at dusk using visual and video counts.
- Roost sites for nesting birds were monitored.
- Incidental sightings of Common nighthawks were recorded.
- Inventory for chimney habitat through systematic searching and classification of chimneys.

### RESULTS

- MTRI staff and volunteers conducted seven casual surveys at the McGowan Lake roost and five out of six standardized surveys for a total of 12 counts at the McGowan Lake roost site.
- Counts occurred from 18 May 2011 to 01 August 2011.
- One survey was conducted at Oakdene School to confirm absence of swifts since the chimney was altered in the past.
- Counts also occurred at roosts in Middleton and Church Point.
- Counts at McGowan Lake peaked at 163 on 16 June 2011 and averaged 80 birds over 12 counts.
- The first maritime inventory of urban chimney habitat was completed in Wolfville, NS. Chimney habitat for the entire town was documented and will be used for future searches for nesting Chimney swifts.

YEARS OF DATA

Ongoing since 2011

PARTNERS

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



A. Prey-Leslie, MTRI

Chimney swift habitat at McGowan Lake.



A. Prey-Leslie, MTRI

Field workers monitoring a Chimney swift chimney

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# FRESHWATER



J. Kinley, MTRI

## Rationale

The Atlantic Coastal Plain Flora (ACPF) are a group of plants that exist largely on lakeshores and wetland habitats in Nova Scotia. Their populations are largely disjunct from other ACPF populations in Canada and several species have been listed under SARA. In 2010 MTRI, in partnership with the ACPF Recovery Team, Nova Scotia Nature Trust and Parks Canada initiated a project to collect baseline data for the Species at Risk Act listed ACPF populations, establish monitoring protocols and increase stewardship opportunities for landowners who live with ACPF.

# Monitoring

## ATLANTIC COASTAL PLAIN FLORA STEWARDS AND MONITORING

### OBJECTIVES

- To monitor populations of endangered, threatened and special concern ACPF on 32 high priority lakes identified in the recovery strategy.
- Monitor water quality in an attempt to detect threats to the low nutrient environment of ACPF.
- Engage landowners on the 32 high priority lakes.
- Collect habitat information on lakes where botanical surveys are conducted.

### METHODS

- Populations of SARA listed ACPF species were counted and geo-referenced along lake shores.
- Shoreline habitat was documented through geo-referenced photos and habitat parameter data.
- Landowners were engaged through door to door visits and public events.
- Landowners were directly involved in a variety of recovery activities.

### RESULTS

- Surveys were completed for six lakes: Shingle Lake, Lac de l'École, Wilsons Lake, Third Lake, Gillfillan Lake, and Lake Fanning.
- Partial surveys took place on five lakes: Kejimkujik Lake, Raynards Lake, Molega Lake, Ponhook Lake and Great Pubnico Lake. These lakes were too large to complete in a single year and will be completed over several years.
- Landowners were contacted at six lakes and seven public events were held. Forty volunteers contributed 420 hours to the project.
- An online, password protected data entry system was created and will now streamline data entry for habitat and water quality data.

Atlantic sedge



Field workers examining ACPF Clockwise Nick (head in the ground) Jerome D'Eon, Tom Neily and Alain Belliveau

A. Belliveau

YEARS OF DATA

Year 2 of a 5 year project

PARTNERS

- Kejimikujik
- Atlantic Canada Conservation Data Center
- Environment Canada
- Dalhousie University
- Nova Scotia Department of the Environment
- Sage Environmental Fund
- Nova Scotia Nature Trust
- Tusket River Environmental Protections Association
- RBC Blue Water Fund



A. Belliveau

Virginia meadow-beauty



M.F. Eberkin

Golden crest



B. Toms, MTR

David Mazerolle and Martin Thomas

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P. Hudson

Nick Hill leaning over the boat.



M. Crowley

ACPF volunteers having a BBQ; (from left) Pat Hudson, Carole Wilson, Megan Crowley, Lilian Perry, Brad Toms

## Rationale

Atlantic Coastal Plain Flora (ACPF) is a group of plants found along the low lying land of the Atlantic coastal plain. These plants are typically poor competitors against other plants and therefore they often thrive in the areas where other plants are not able to grow quickly. These are typically along lake shorelines with a high degree of winter ice scour, where flooding is common and in areas with low water nutrient levels (oligotrophic). Although ACPF can be found near water with moderate (mesotrophic) or even high (eutrophic) nutrient levels, increased lake nutrient levels have been identified as a significant threat to ACPF species.

# Monitoring

## MONITORING WATER QUALITY IN ATLANTIC COASTAL PLAIN FLORA HABITAT

### OBJECTIVES

- To sample water quality from a representative subset of 15 of the high priority lakes identified in the ACPF recovery strategy.
- To involve and recruit volunteers to monitor lake water quality in future years of the project.
- To contribute to existing water quality data sets from high priority ACPF lakes.
- To present results to community members to raise awareness about the importance of lake water quality and ACPF.

### METHODS

- Collected water samples and in-situ measurements of water quality data at the deepest point of the lake four times annually (May, July, August and October).
- Calculated the Carlsons trophic status index (TSI) (Carlson 1971) of each sampling site.
- Held water quality sampling training workshops for interested community members and volunteers in locations near both watersheds.
- Held a community information session in late fall to update interested people on the results of the project to date and temporal trends.

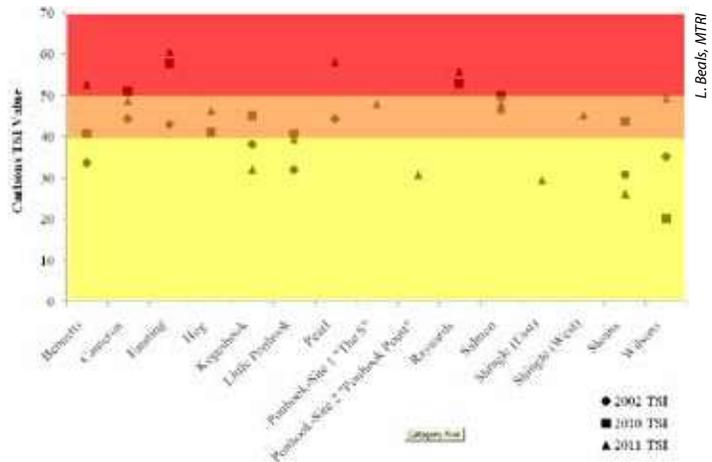
### RESULTS

- Two water quality sampling training workshops were held, one in the Tuskent area (Carleton) and one in the Medway area (Kempt).
- A total of 15 high priority lakes were sampled (Tuskent; seven, Medway; five), four times each (May, July, August, October).
- With data averaged over all four sampling periods, five sites were found to be oligotrophic, six mesotrophic and four eutrophic based on the Carlsons TSI value.
- Between 2010 and 2011, the Carlsons TSI increased for two



A. Belliveau

Kejimkujik Lake



Comparison of 2002, 2010, and 2011 Carlsons TSI values for sample sites. Colour bars denote the TSI category ranges with oligotrophic ranging from 0-39, mesotrophic from 40-49, and eutrophic from 50-69

**RESULTS**  
Continued

sites, stayed the same for four sites and decreased for four sites. Five of the sites had not been previously assessed.

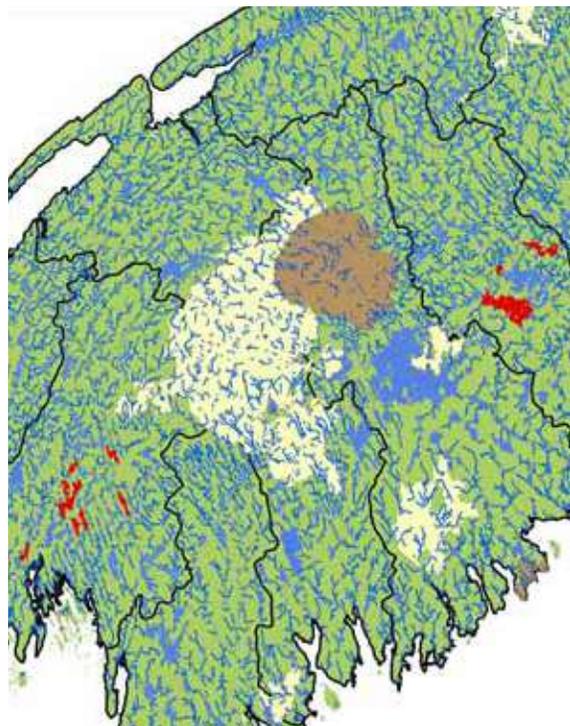
- Two information sessions were held after the sampling periods (in Carleton and Kempt) to disseminate the results of the project, collect feedback, and answer questions about water chemistry trends.

**YEARS OF DATA**

Year 2 of a 5 year project

**PARTNERS**

- Royal Bank of Canada Blue Water Fund
- Parks Canada
- Tusket River Environmental Protection Agency
- TD Friends of the Environment Foundation
- Acadia University



Location of sampled lakes in the Tuskent and Medway watersheds of Southwestern Nova Scotia

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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 Kejimikujik loons. These levels have been associated with impaired reproduction and altered breeding behavior in some areas. LoonWatch began on 16 lakes within Kejimikujik 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.



Adult loon

# Monitoring

## KEJIMKUJIK-MERSEY LOONWATCH PROGRAM

### OBJECTIVES

- To observe Common loon abundance and breeding success on lakes within Kejimikujik 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 LoonWatchers outside Kejimikujik.

### METHODS

#### *Outside Kejimikujik:*

- 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.

#### *Inside Kejimikujik:*

- LoonWatch uses 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 Kejimikujik staff.
- MTRI and Environment Canada are also doing more intensive work to better understand population dynamics and relative mercury levels in loons in the region.



Peter Hope loon watcher

## RESULTS



H. Isersee

Loon family on Harmony Lake

## YEARS OF DATA

- In 2011, the two LoonWatch programs had over 64 volunteers monitoring loons on at least 55 lakes in the Southwest Nova Biosphere Reserve and about the same number monitoring loons on 16 lakes inside Kejimikujik.
- Seven loon chicks were recorded by LoonWatchers outside Kejimikujik and at least five of these chicks were observed as chicks that had a good chance of survival.
- The surface pH of volunteer lakes ranged from 4.85-7.31.
- In Kejimikujik, a total of 17 loon chicks were observed on 13 territories and eight of them were observed to be large enough to have likely fledged.

## PARTNERS

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



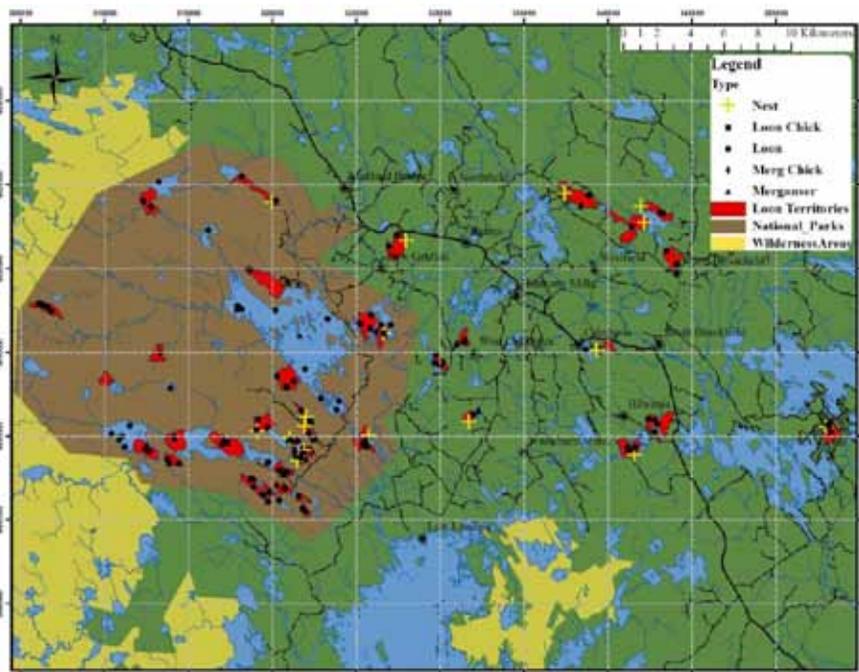
J. Bryk

Nest on Tupper Lake beaver dam

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L. Beals, MTRI

Common Loon and Common Merganser observations and loon territories, as recorded by researchers in Kejimikujik and surrounding area May - August 2011

## Rationale

The Common loon is widely used as an indicator of the health of lake ecosystems. The number of chicks that each territorial pair is able to raise is monitored on 35 study lakes within Kejimikujik and the surrounding region; this is a measure of the loon's reproductive success or productivity. Loon productivity is adversely affected by such factors as acid rain, structural and recreational development of lake shorelines, disturbance by boaters, water-level fluctuations, predators and mercury pollution. The Canadian Wildlife Service monitored loon productivity in Kejimikujik from 1988 until 1997. Loon Productivity was found to be limited by mercury levels in the loons and the fish they eat. Some lakes in Kejimikujik had high mercury levels in fish and low loon productivity and vice versa. The Canadian Wildlife Service resumed monitoring of fish mercury levels in 2006 and Common loon productivity in 2007.



Volunteers monitoring loon productivity

# Monitoring

## MONITORING COMMON LOON PRODUCTIVITY

### OBJECTIVES

- To monitor the number of territorial Common loon pairs on the study lakes.
- To monitor the number of loon chicks produced by these territorial pairs.
- To provide data on loon productivity for each study lake, which can then be related to environmental factors, human disturbance and mercury pollution.

### METHODS

- Twenty-four lakes within Kejimikujik and 11 lakes outside of the park and within the Southwest Nova Biosphere Reserve were surveyed for Common loons and Common mergansers at least three times from early June until September 2011 by trained researchers.
- Surveys included observations of adult loons, nests, eggs and chicks and Common mergansers and their chicks.
- When loons were located the time, date, weather, a GPS location of where the loon was first seen and behaviour were recorded. Maps were made of the GPS sightings and territories.
- Survey results were summarised in a database and productivity was calculated for each territorial loon pair.

### RESULTS

- Thirty-eight pairs of loons were observed, 21 of which were breeding pairs (nesting or with chick).
- Common mergansers were observed on 11 of the 35 study lakes.
- Of the nests located for the 21 breeding territories, 47% successfully hatched chicks, 21% of eggs were suspected to have been predated at the egg or downy chick stage, 16% were suspected to have been abandoned or unfertilized (found rotten) and 16% were suspected to have been stranding by dropping water levels during the incubation period.

**RESULTS**  
Continued

- A total of 17 downy chicks were observed on the 38 territories, eight of which were observed as large chicks in August or September and likely fledged.
- According to these observations, Common loon productivity for 2011 was higher than in the previous four years at 0.21 chicks per territorial pair

**YEARS OF DATA**

- Year 5 of a 5 year project

**PARTNERS**

- Parks Canada
- Mersey Tobeatic Research Institute
- Canadian Wildlife Services, Environment Canada
- TD Friends of the Environment Foundation
- Mountain Equipment Co-op
- Environment Canada
- Acadia University

	Year					Average
	2007	2008	2009	2010	2011	
# Residential Pairs	45	45	59	41	38	46
# Breeding Pairs	13	12	23	30	21	20
# Downy Young	18	12	8	29	17	17
# Large Young	13	4	3	7	8	7
Chick Mortality	0.28	0.67	0.63	0.76	0.53	0.57
Productivity	0.29	0.09	0.05	0.17	0.21	0.16
# Lakes with Breeding Pair	9	11	20	22	16	16

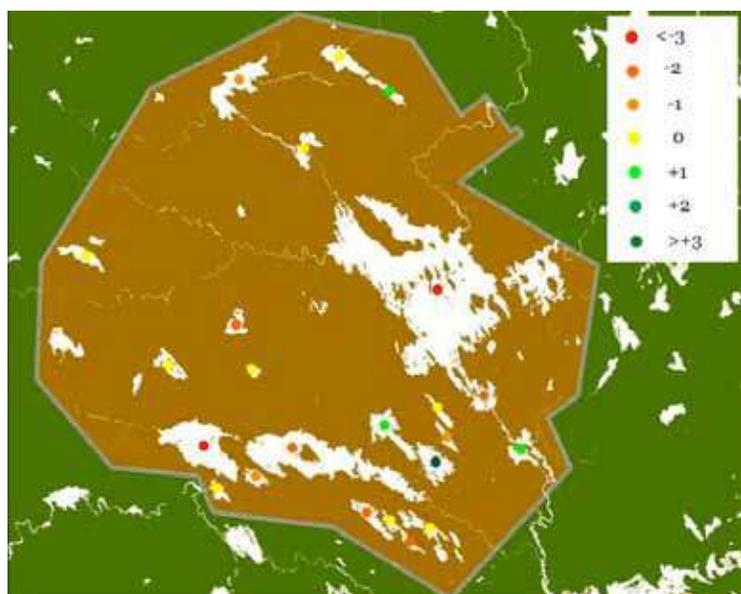
L. Beals, MTRI

Summary of data collected over the five year period from 2007 to 2011. Productivity is calculated as the ratio of large young to residential pairs for the year.

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L. Beals, MTRI

Comparison of the number of large chicks observed in KNPNS between two study periods; 1993-1997 and 2007-2011. Changes represent the net change in the average amount of large young seen in each period.

## Rationale

Climate change has been identified as an important potential influence on ecological integrity at Kejimikujik. A great deal of research has been conducted to support the use of changes in spring ice out date as an indicator of climate change because there is a strong correlation between ice out date and winter air temperature. Monitoring ice phenology and lake ice freeze-thaw cycles can aid in the understanding and prediction of how climate change is affecting aquatic ecosystems. Volunteers are important resources because as citizen scientists they can keep careful track of ice-in and ice-out dates and have provided many long-term datasets.



Ice cover on Kejimikujik Lake

# Monitoring

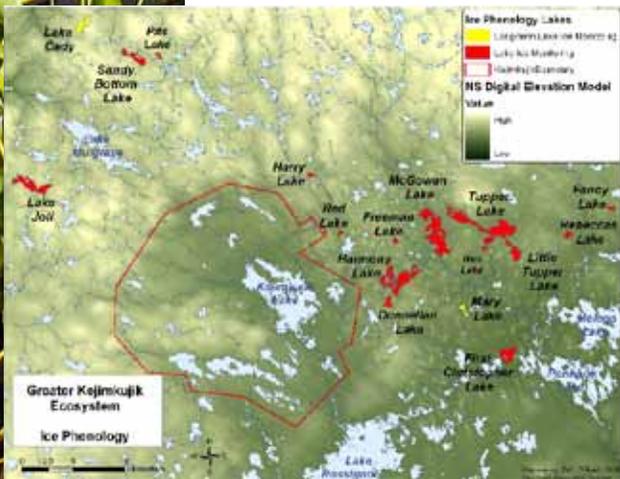
## ICEWATCH

### OBJECTIVES

- To monitor and assess changes in the duration of ice coverage on lakes around Kejimikujik.
- To determine if the mean duration of ice coverage (*i.e.*, Julian date of ice-off) is within the range of natural variation (*i.e.*, between 82 and 107 days, as determined through analysis of data between 1963 and 2007 for Mary and Cady Lakes) and if it has increased or decreased over time.

### METHODS

- Two dedicated community volunteers, Reg Baird and Irene Holdright, independently recorded ice observations for years resulting in a valuable long-term data set for ice phenology in southwest Nova Scotia (starting in 1963 for Mary Lake, Queens County and 1976 for Cady Lake, Annapolis County). These long-term data were used to identify the natural range of variability for lake ice in this region.
- Simple linear regression was used to examine the relationship between ice off dates on Mary and Cady Lakes (1976-2007) and results showed a strong relationship despite differences in location and lake size. As a result, thresholds developed from historical variation in the time-series of ice off data from these two lakes were applied to the suite of lakes surveyed in this program.
- Ice phenology has been assessed on 17 lakes in the Southwest Nova Biosphere Reserve since 2006 through a dedicated group of lakeshore residents and volunteers, coordinated through the Mersey Tobeatic Research Institute's IceWatch program.
- On each lake, community volunteers that live on watershores or that drive by the lake every day keep track of "ice-on" and "ice-off" events and the duration of complete ice cover until complete ice thaw is recorded.



Locations of IceWatch lakes in Southwest Nova Scotia

## RESULTS

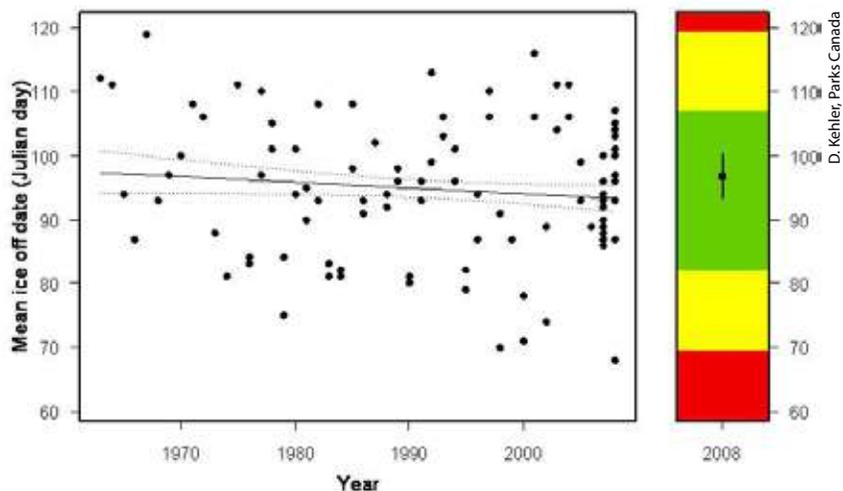
- Despite an anomalous warm winter, IceWatch data were examined for trends between 1963 and 2011 and no significant trend was detected. As a result, the ice off date appears to be stable on lakes in the Greater Kejimikujik Ecosystem (GKE) over the last 46 years.
- To obtain a status assessment, the trend model was used to estimate the condition of the measure for the most recent year of data. Using this approach, 2010-2011 shows the smallest period of ice cover on monitored lakes since 2006-2007.
- Scientific research shows that ice phenology is changing on lakes in the Northern Hemisphere in association with increasing air temperatures over the last 150 years. Much of the research presenting declining trends in lake ice-out dates has been conducted using long-term datasets (*i.e.*, greater than 100 years). The current time-series for the GKE includes 46 years of data. As a result, it is important to continue monitoring ice phenology in this region to determine if there are detectable long-term trends.

## YEARS OF DATA

Ongoing project since 2004

## PARTNERS

- Parks Canada
- Mersey Tobeatic Research Institute
- Ecological Monitoring Assessment Network
- IceWatch program volunteers who generously participate each year



Status and trend for ice off date for lakes in the Greater Kejimikujik Ecosystem (1963-2007)  
(Note: Green indicates good condition, yellow indicates fair condition, and red indicates poor condition as determined through analysis of natural variability in Mary and Cady lakes between 1962 and 2007).

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## Rationale

The American eel is a fascinating creature that has been listed as a species of Special Concern by Committee on the Endangered Status of Wildlife in Canada. Its life begins in the Sargasso Sea, a large area of the Atlantic Ocean east of Bermuda that is surrounded by major ocean currents. Tiny eel larvae turn into glass eels and make their way up the coast all the way to Nova Scotia and beyond. The American eel is found in seven national parks in Atlantic Canada. A multi-park project was initiated with Parks Canada and partners to try and learn more about the American eel in these parks. In Kejimikujik, eel potting began in 2011 to try to learn more about population size and distribution of adult eels in the park.

M. Crowley, Parks Canada



American eel

# Monitoring

## AMERICAN EEL MONITORING IN KEJIMKUJIK

### OBJECTIVES

- To learn about population size and distribution of the American eel in Kejimikujik.
- To involve volunteers and researchers in helping to monitor this fascinating species at risk.
- To raise awareness of the American eel, including the cultural significance of eels that the Aboriginal peoples of Atlantic Canada have had over thousands of years.

### METHODS

- Use live-traps (or “eel pots”) to monitor adult eels in Kejimikujik.
- Invite park visitors, volunteers and researchers to take part in this hands-on, memorable experience.
- Educate the public about the eel during public outreach events and interpretation.

### RESULTS

- Live-traps were set in Loon, George, Kejimikujik and Big Dam Lakes. It was a very exciting and successful first year with over 300 traps set and 143 adult eels caught (22 re-captures). Each eel was weighed, measured, pit-tagged and released.
- The average length of eel that was captured was 70 cm and the largest eel was a meter long and over three kg!
- Over 16 volunteers contributed over 150 hours of their time to this project and expressed how fun and exciting it was to participate.



Checking eel pots on George Lake

M. Crowley, Parks Canada

**RESULTS**  
Continued

- Donna Morris, Parks Canada cultural interpreter, led two engaging interpretive programs about the eel and shared her knowledge about this species.
- An American eel game was created and brochures about the eel were distributed at outreach events.

**YEARS OF DATA**

Ongoing since 2011

**PARTNERS**

- Parks Canada
- Department of Fisheries and Ocean
- The Confederacy of Mainland Mi'kmaw
- Université de Moncton
- Aboriginal communities across Atlantic Canada



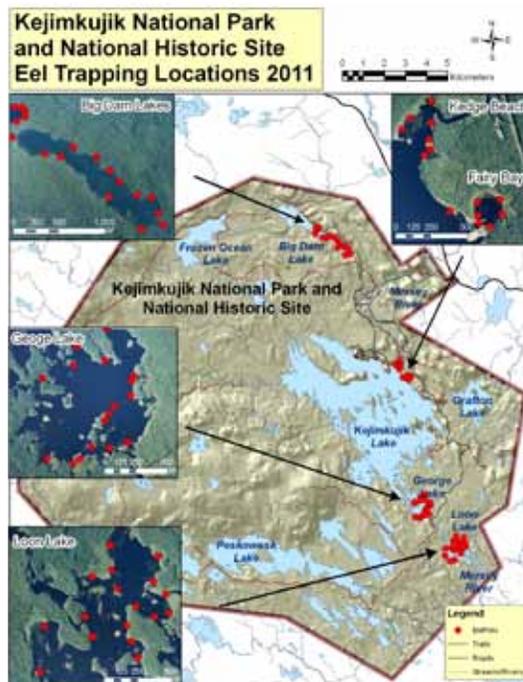
Duncan Smith releasing an eel

M. Crowley, Parks Canada



Volunteers and researchers checking an eel pot

M. Crowley, Parks Canada



S.O'Grady, Parks Canada

Location of eel pots in Kejimikujik

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# WETLANDS

J. Kinley, MTRI

## Rationale

Atlantic Coastal Plain Flora (ACPF) are 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 NS General Status Ranks and some are globally rare. There are over 90 species of ACPF in Nova Scotia, including the species 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 NS Endangered Species Act. The population in Kejimkujik is monitored annually by park staff and volunteers to assess its distribution and abundance. In 2011, the shoreline of Kejimkujik Lake was also surveyed for two days in August by expert botanists.

M. Crowley, Parks Canada



Water-pennywort

# Monitoring

## WATER-PENNYWORT MONITORING 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 are conducted annually on Kejimkujik and George Lakes within Kejimkujik. Surveys are conducted on known populations in both shoreline and aquatic habitats.
- Extensive surveys are conducted every few years to search for new stands.
- Population abundance, density, stem height, water depth and percent damage of individual Water-pennywort stands are assessed by systematic transect surveys in early August. Stand surface area is also measured. Survey results are 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 Nova Scotia Department of Natural Resources General Status Ranks for two days by expert botanists. This survey complements the shoreline atlas being done by MTRI for their Habitat Stewardship Program ACPF Project since Kejimkujik Lake is one of the high priority lakes listed in the ACPF Recovery Strategy.



M. Crowley, Parks Canada

Lyndsay monitoring Water-pennywort along the shoreline

### RESULTS

- Park staff and volunteers monitored Water-pennywort at six sites in Kejimkujik on August 4th, 5th and 8th 2011.
- Water lake levels were moderately high on Kejimkujik Lake in August and consequently the majority of the pennywort observed was floating on the top of the water like a lily pad. Some plants were observed to be growing erect out of the water in the lake and on the shoreline but no flowers were observed.
- Stand area and the density of ramets per stand fluctuate between years; however the Kejimkujik population appears to be stable.
- About one third of the shoreline of Kejimkujik Lake was

**RESULTS**  
Continued

intensively surveyed for ACPF on August 18-19 by botanists from the Atlantic Canada Conservation Data Center (ACDC) and with the help of researchers and volunteers. Over these two days, 839 records were taken for 259 vascular plant species (237 native, 22 exotic), including 441 records of 21 provincially rare vascular plant species.

- Three locations of Long's Bulrush, a SARA-listed species of Special Concern, were found along Kejimikujik Lake. This doubles the number of federally listed ACPF species at risk found in Kejimikujik. No new locations of Water-pennywort were observed. A report detailing all the findings was produced by ACCDC and is available upon request.

**YEARS OF DATA**

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

**PARTNERS**

- Parks Canada
- ACPF Recovery Team

Table 1: Estimated aerial extent (m<sup>2</sup>) of water pennywort stands at Kejimikujik

Stand Name	2007	2008	2009	2010	2011
Merrymakedge Beach	1677	1360	2710	2710	2474
Meadow Beach	466	606	434	555	1451
Jim Charles	254	544	313	414	357
Jeremy's Bay (Indian Point)	3161	3590	3282	3573	3787
George Lake	145	159	32	247	52
Petroglyphs	851	1334	796	1700	1356



M. Crowley

David Mazerolle from ACCDC by Long's Bulrush along Kejimikujik Lake



L. Veinot

Megan and Jenna monitoring Water-pennywort

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## Rationale

Eastern ribbonsnakes must find suitable underground sites to avoid freezing winter temperatures. However, it is not known if these sites typically occur within wetlands, at their edges or in adjacent terrestrial habitats. Knowing the characteristics of overwintering sites and their distance from the snake's summer wetlands is crucial for critical habitat identification, identifying threats and developing management plans for this species, which is listed as Threatened both federally and provincially. In winter 2009, the first known ribbonsnake overwintering area in terrestrial habitats was identified in Nova Scotia. Eleven ribbonsnakes were found at this site in a wooded area approximately 150 m from the nearest wetland. This project aimed to confirm continued use of the one known overwintering site and to identify additional overwintering sites through systematic surveys of upland areas adjacent to known concentrations of ribbonsnakes.



Eastern ribbonsnake swimming on Grafton Lake

# Research

## EASTERN RIBBONSNAKE OVERWINTERING HABITATS

### OBJECTIVES

- Conduct surveys in spring and fall at the one known overwintering site to document site use, snake abundance and site fidelity.
- Conduct surveys around known concentration sites in spring and fall to potential additional overwintering sites.

### METHODS

- Systematic surveys were conducted in spring and fall at terrestrial sites surrounding known occupied wetlands. Sites where snakes are found were revisited regularly to estimate the number of snakes using the site and the period of occupancy. Surrounding wetlands were visited occasionally during the active season to mark snakes and determine when they were moving.
- Surveys were conducted visually by experienced biologists and trained volunteers and were aided by dogs trained to identify ribbonsnakes by scent.
- Detailed data was recorded on search effort, weather conditions, geographic coordinates, habitat characteristics and snake behaviour and morphology.
- Attempts were made to capture all ribbonsnakes found. Snakes were individually marked by ventral scale clipping. Snakes were measured, weighed, photographed and released at the capture site.

### RESULTS

- Surveys took place in from mid March to early May and again from early October to early December. Surveys occurred at 35 sites around seven water bodies that were known to contain ribbonsnakes.
- Habitats surveyed included ten primarily wooded sites, eight wetlands, ten woodland-wetland interfaces and seven sites dominated by human-made features (e.g. roadways, gravel pits, lawns).
- Eight ribbonsnakes were found at the known overwintering at Grafton Lake in 2011; one individual in spring and seven in fall. One of the snakes had been previously captured in the wetland over 300 m away, providing the first confirmation that ribbonsnakes were coming to the overwintering site from the

**RESULTS**  
Continued

nearby wetland. Another snake had first been caught at the overwintering site in fall 2009, confirming his fidelity to the area for two winters. The first neonate was observed at the site.

- Several late fall and early spring sightings were recorded at other locations, indicating the possibility of a nearby overwintering site or travel route. Four of these sightings occurred a considerable distance from water and were in a variety of habitats including an abandoned gravel pit, a lawn, a driveway and a paved road.

**YEARS OF DATA**

Ongoing project since 2009

**PARTNERS**

- Canadian Wildlife Federation
- The Government of Canada through the Federal Department of the Environment (Habitat Stewardship Program)
- Mersey Tobeatic Research Institute
- Acadia University
- Parks Canada
- Eastern Ribbonsnake Recovery Team
- Dalhousie University



J. McNeil, MTRI

Survey on McGowan Lake



J. McNeil, MTRI

A volunteer releasing an Eastern ribbonsnake

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www.speciesatrisk.ca/ribbonsnake

## Rationale

The Atlantic population of the Eastern ribbonsnake is listed as Threatened under both the Federal Species at Risk Act (2002) and the Nova Scotia Endangered Species Act (2000) due primarily to its isolation and restricted distribution in southwest Nova Scotia. The Committee on the Endangered Status of Wildlife in Canada Status Report for the Eastern Ribbonsnakes (2002) identifies lack of knowledge as the primary current threat. The extent of the species' range in the province is one of the primary knowledge gaps. In recent years, search efforts have located new sites containing ribbonsnakes, but most have been confined to a core area on the Mersey and Medway River watersheds. There have been a few reported sightings outside of this core, including along the LaHave and upper Annapolis River watersheds, but these areas have traditionally received very little dedicated search effort.

J. McNeil, MTRI



Eastern ribbonsnake

# Research

## DETERMINING EASTERN RIBBONSNAKE RANGE

### OBJECTIVES

- Expand knowledge of the range of Eastern ribbonsnakes in the province by conducting systematic surveys on the LaHave and Annapolis River watersheds.
- Confirm the continued presence of ribbonsnakes at the two previously known locations on these watersheds.
- Continue to solicit public sighting reports and search new areas within the core range.

### METHODS

- Visual surveys were conducted in and around wetlands in the LaHave and upper Annapolis river watersheds.
- Surveys were conducted visually by experienced biologists and trained volunteers and were aided by dogs trained to identify ribbonsnakes by scent.
- Detailed data was recorded on search effort, weather conditions, geographic coordinates, habitat characteristics and snake behaviour and morphology.
- Attempts were made to capture all ribbonsnakes found. Snakes were measured, weighed, photographed and released at the capture site.

### RESULTS

- Twenty-seven locations were surveyed for ribbonsnakes along the LaHave and upper Annapolis River watersheds from July to October but no new locations for ribbonsnakes were found.
- Ribbonsnakes were found at one of the two sites known to previously contain ribbonsnakes, at Seven Mile Lake.
- Habitat characteristics at each site were recorded and sites with the most appropriate ribbonsnake habitat were identified for additional surveys in 2012.

YEARS OF DATA

Year 1 of a 2 year project

PARTNERS

- Canadian Wildlife Federation
- The Government of Canada through the Federal Department of the Environment (Habitat Stewardship Program)
- Mersey Tobeatic Research Institute
- Acadia University
- Eastern Ribbonsnake Recovery Team



Jeffie McNeil on a Grafton Lake survey



Examining an Eastern ribbonsnake

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# HUMAN DIMENSIONS



A. Belliveau, MTRI

## Rationale

Forest Stewardship Council (FSC) forest certification has been developing since the early 1990s, 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 November 2009, MTRI received funding from the Community Development Trust Fund to promote FSC certification of small woodland owners in Nova Scotia. The goal of this two year project is to work closely and collaboratively with smallholders, woodlot owner groups, and other partners throughout Nova Scotia to provide services to improve forest management practices on small private woodlands through forest certification, help smallholders prepare to meet the increasing global demand for certified forest products and demonstrate a commitment to promoting sustainable forestry practices in the region.

J. Barker, MTRI



Shelterwood regeneration

# Research

## FOREST CERTIFICATION FOR SMALL WOODLOT OWNERS

### OBJECTIVES

- To gain an understanding of changes in forestry and barriers to certifying woodlots as perceived by woodlot owners.
- To identify cooperative opportunities and prioritize outreach to increase sustainable forest management through collaboration with the Certification Working Group.
- To continue promotion of FSC certification in the SNBR and facilitate the certification of small, privately-owned woodlots.

### METHODS

- In March and April, six workshops were hosted in different communities for woodland owners around the SNBR, partly to raise awareness of the certification project, but also to gather feedback on perceived changes in woodlots and forestry.
- One-to-one and collective landowner meetings and interviews throughout the year.
- Presentations were made on forest certification to a wide range of audiences and at three in-field workshops.

### RESULTS

- Twelve woodland management plans were completed for twelve landowners in the MTRI FSC pool. A total of 27 woodlots totaling 7580 acres are now FSC certified in the combined FNSWO/MTRI pool.
- Feedback gained from around the SNBR at Forest Health workshops in the spring highlighted a need for education and awareness raising of ecologically sound forestry, and linking youth education and forest health.
- Audiences of over 78 were reached via presentations at in-field workshops and MTRI's annual Woodlot Demo in the fall.



J. Barker, MTRI

A small Balsam fir in an uneven-aged stand

YEARS OF DATA

Year 2 of a 2 year project

PARTNERS

- Nova Forest Alliance
- Nova Scotia Department of Natural Resources
- Federation of Nova Scotia Woodland Owners



J. Barker, MTRI

Winter trail in snow



J. Barker, MTRI

Participant at a Forest Health Workshop viewing a demonstration

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## Rationale

We live in a special place! The Southwest Nova Biosphere Reserve 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 Kejimikujik 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 unique and 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, Parks Canada



Filming the release of Centennial, the 100th headstarted Blanding's turtle, back into the wilds of Kejimikujik



ACPF Identification and Information Guide

# 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), Water-pennywort (Threatened) and other 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, Eastern ribbonsnake surveys, Piping plover monitoring and habitat restoration, Atlantic Coastal Plain Flora monitoring and 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 SAR in the SNBR.
- Outreach strategies are developed to link science and stewardship to achieve awareness and appreciation for species at risk.

### RESULTS

- In 2011 over 350 volunteers contributed more than 12,000 hours of their time toward environmental conservation in the SNBR. This year the program not only recorded its 1,000th volunteer, but its 100,000th volunteer hour since 2000.
- This effort was celebrated in December at the sixth annual volunteer banquet celebration; a very fitting way to cap off the centennial year for Kejimikujik. There were 12 new inductees into the volunteer "Walk of Honour" and "Centennial Volunteer Awards" presented to seven individuals. The sixth volunteer newsletter was created and distributed.
- A BBQ was held in August to honour the volunteers inducted

**RESULTS**  
Continued



M. Crowley, Parks Canada

Volunteers getting ready to head out turtling

**YEARS OF DATA**

at the 2010 banquet. The Walk of Honour is behind the Kejimikujik Visitor Center and recognizes the volunteers that have cumulatively contributed over 250 (bronze), 1000 (gold) or 2000 (platinum) hours. Six volunteers were added to the walk and one moved up from gold to platinum.

- An “Atlantic Coastal Plain Flora in Nova Scotia: An Identification and Information Guide” was created by Megan Crowley and Lindsey Beals and published by MTRI. It complements the Species at Risk and Healthy Lakes and Wetlands guides.
- A Kejimikujik Mi’kmaw celebration day was held to celebrate 100 years of guiding and the release of 100 headstart Blanding’s turtles. Lighthouse media created a video on the headstarting process which can be viewed at: [www.southshorenova.ca/videos/events/index64.php](http://www.southshorenova.ca/videos/events/index64.php)

Ongoing program 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
- Government of Canada Habitat Stewardship Program



M. Crowley, Parks Canada

Volunteers celebrate their achievements at the 6th Annual Volunteer Banquet

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[www.pc.gc.ca](http://www.pc.gc.ca)



M. Crowley, Parks Canada

Hallie and Krystal with their stones at the Walk of Honour BBQ

## Rationale

Located on the north shore of the Annapolis River, in Granville, the Melanson Settlement National Historic Site (c. 1664-1755) is one of the most intact pre-deportation Acadian settlements in the Maritime Provinces. From 1984 to 1986, archaeologists from Parks Canada completely excavated one house cellar and tested two other cellars, uncovering almost 100,000 artifacts and faunal remains. In October 2010 a team from Université Laval and Parks Canada surveyed the site for new archaeological features, and tested around house cellars for midden deposits rich in artefacts, animal bones and seashells. In May-June 2011, more extensive excavations were undertaken on four different areas of the site, focusing mainly on the household middens. This fieldwork research was the second phase of an ongoing archaeology doctoral project which focuses on 17th and 18th century Acadian foodways and animal husbandry practices.

# Research

## ARCHAEOLOGY AT THE MELANSON SETTLEMENT NHS

### OBJECTIVES

- To provide a representative sample of the diet of at least two Acadian households.
- To distinguish the chronology of use and understand the nature of these household middens.
- These objectives are directly associated with some of my dissertation's questions.
- To understand the socio-economic dynamics inside an Acadian settlement.
- To provide a more complete picture of French Acadian foodways, by integrating this data with the archaeological remains of other Acadian sites in the Maritimes.

### METHODS

- We used a hand-held soil core sampler to find the extent of the midden deposits.
- A 0.64 cm mesh screen was used to sift through the midden soil. The use of a smaller mesh size would have made sifting of the rich organic midden soils almost impossible.
- In all midden contexts, two L of soil was sampled for archaeobotanical analysis and an additional eight L of soil was sampled for recovery of small faunal remains. These were processed in the field lab using geological column sieves (four mm, one mm and 500 µm).
- In general, the middens were excavated in arbitrary layers of five cm, in order to provide chronological depth, as the stratigraphy was difficult to perceive.

### RESULTS

- The first unit we opened revealed the remains of a wooden drain, as well as part of a house footing, probably built sometime after the 1740s. A small midden was also identified and excavated only a few metres away.
- We excavated a portion of a midden next to a large cellar feature probably associated with the Belliveau family household. It contained a large amount of soft-shell clams and animal bones, as well as a variety of household artifacts, such as ceramics originating from New England, England, France and Germany, cast iron pot fragments, buckles, buttons, straight pins, smoking



Archaeological team excavating the Belliveau house midden. From left to right: Alyssa Woods, Anne-Marie Faucher, Alexandre Pelletier-Michaud, Natalie Jess



Wooden drain running out of the cellar of House Feature #4 (17B19B)

**RESULTS**  
Continued

- pipes, leather fragments as well as the handle of a pewter porringer.
- A third midden was excavated; this one shallower than the previous one, but with a much higher concentration of shell remains. Artefacts were less varied than in the previous middens, and were mainly limited to tobacco pipe bowls and stems, ceramic sherds (mostly from New England, England and Germany) and cast iron pot fragments.
- Extensive soil sampling was undertaken for all the contexts excavated at the site. Preliminary analysis shows the presence of charred cereal grains, and fruit seeds, as well as different wood species. The analysis of artefacts and faunal material is still on-going.

**YEARS OF DATA**

Year 2 of a 2 year project

**PARTNERS**

- Parks Canada
- Groupe de recherche en archéométrie de l'Université Laval
- Social Sciences and Humanities Research Council (SSHRC)



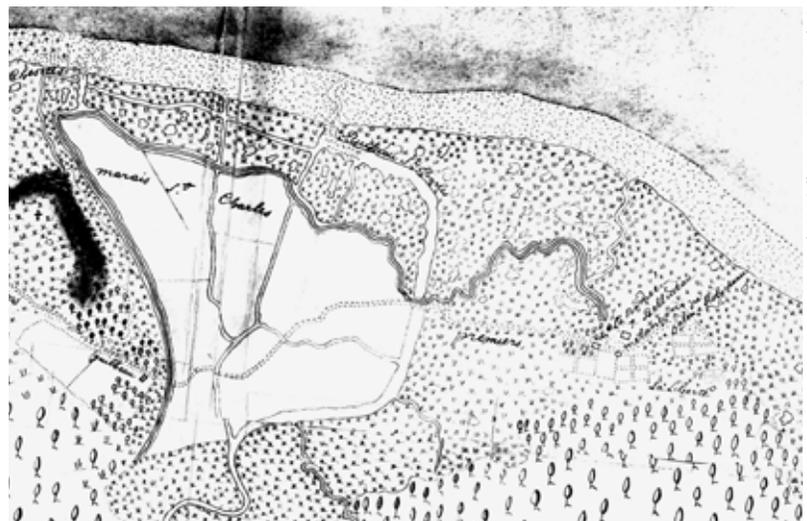
S. Noël

Pewter porringer handle, c.1660-1680



S. Noël

Midden associated with House Feature #7, with large concentration of shells



LNA, National Map Collection, V1/249/Annapolis R.

Detail of « Plan de la Banlieue du fort Royal a Lacadie Et de ses Environs » by Delabat, 1708

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## Rationale

The SNBR is made up of the five counties in southwest Nova Scotia and has a protected core that is made up of Kejimkujik and the Tobetic, which are deemed a species at risk "hot spot." Although there is a core area of protection and other protected areas scattered throughout, these areas cannot sustain and protect habitat and species alone. In order for the protected areas to maintain their ecological integrity, the surrounding areas must assist in providing sustainable management and harvesting practices that will benefit the species, the habitat and the entire region as a whole. The forest health stewardship project is engaging communities and landowners in developing community-defined land management zones in the SNBR for species at risk and landscape connectivity. It is also developing and implementing a community-driven landowner stewardship recognition program.

J. Barker, MTRI



Stewart Fotheringham shares hose logging techniques at a forest health workshop

# Monitoring

## LANDSCAPE CONNECTIVITY AND FOREST HEALTH STEWARDSHIP

### OBJECTIVES

- To lay the groundwork for achieving landscape connectivity in Southern Nova Scotia.
- To engage communities and landowners in developing community-defined land management zones in the SNBR for species at risk and landscape connectivity.
- To develop and implement a community-driven landowner stewardship recognition program.
- To work with partners in collaborating and networking for landscape connectivity research.

### METHODS

- Held community workshops and in-field workshops aiming to share knowledge and highlight stewardship tools, forest health and landscape connectivity.
- Began development of GIS maps to help with prioritizing areas for landscape connectivity in Southern Nova Scotia.
- Developed stewardship tools for Southern Nova Scotia, based on literature review and community ideas.
- Worked with landowners to develop/design a minimum of 3 woodlot models to be showcased.
- Worked with community to develop a stewardship recognition program to help promote forest stewardship and landscape connectivity.



J. Kinley, MTRI

The Forest Steward Recognition award winners

### RESULTS

- Held nine community workshops, five in-field workshops and 23 one on one interviews around the SWNBR. Shared information on landscape connectivity and received inputs towards the creation of stewardship tools, and recognition program.
- Created maps of landownership, focal species sightings, involved landowners, core protected areas and previously proposed priority areas for landscape connectivity.
- Held a forest stewardship recognition event.
- Created a list of 9 stewardship tools.
- Identified and worked with three woodlot models.

## YEARS OF DATA

Year 2 of a 2 year project

## PARTNERS

- Nova Forest Alliance
- Parks Canada
- Nova Scotia Department of Natural Resources
- Applied Geomatics Research Group
- Resolute Forest Products
- Acadia University
- Dalhousie University
- Nova Scotia Community College
- Nova Scotia Department of Environment
- Southwest Nova Biosphere Association
- Nova Scotia Nature Trust
- Association of Sustainable Forestry
- Tuskent River Environmental Protection Association
- Ecology Action Centre
- Barrington/Pubnico Lakes Environmental Committee



Forest steward logo

B. Keoghoe, MTRI

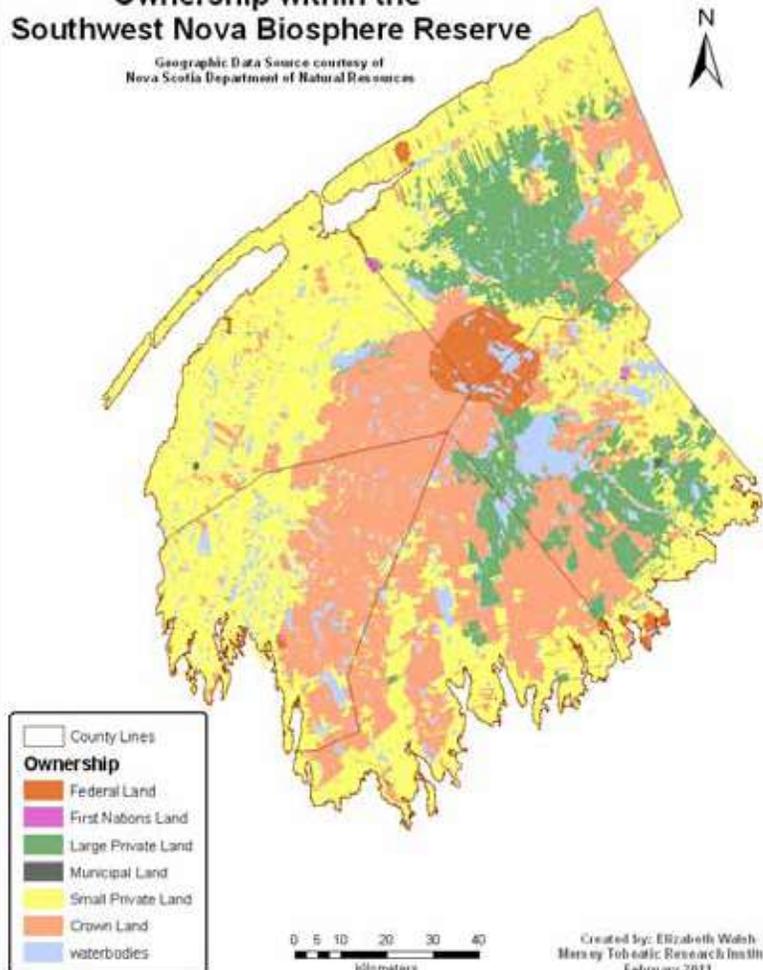


Mark Alvis working with greenwood at a forest health workshop.

B. Keoghoe, MTRI

## Ownership within the Southwest Nova Biosphere Reserve

Geographic Data Source courtesy of Nova Scotia Department of Natural Resources



E. Walsh, MTRI

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Landownership map of Southwest Nova Scotia

## Rationale

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

# Research

## MONARCH BUTTERFLY STEWARDSHIP IN SNBR

### OBJECTIVES

- To bring awareness of the Monarch butterfly to park visitors and residents of the SNBR and promote the butterfly club, which encourage 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 magical transformations of this species through an interactive display at the Kejimikujik Visitor Center.
- To bring educational and teaching opportunities to the Maritimes.

### METHODS

- To spread the word and increase awareness of the Butterfly Club and how to help the Monarch through public talks, the butterfly club, socials, presentations, garden planting and interpretive signs.
- Summer staff at MTRI attended farmer's markets across Nova Scotia with Butterfly Club kits and information. Club kits were sold at the By the Mersey Gift Shop in Kejimikujik.
- Butterfly and caterpillar costumes and life stage models helped to facilitate learning experiences.

### RESULTS

- Butterfly talks were delivered in the biosphere reserve to interested groups and communities, including a weekly "Monarch Magic" interpretive program in Kejimikujik, with the goal to engage visitors and promote the butterfly club.
- A "Butterfly Social" was held at the Art of Germany B&B in partnership with Keji and MTRI. It was filled with food, games, face painting and fun. Kids and adults alike enjoyed locating and observing caterpillars on the milkweed. This event was well attended and featured in the local newspaper.
- Caterpillars were reared at the interactive display in the Kejimikujik Visitor Center to the amazement and excitement of onlookers. Butterflies released in the fall were tagged in partnership with Monarch Watch to learn more about migration routes.
- Models of a Swamp milkweed and an Aster plant were produced

M. Crowley, Parks Canada



Monarch visiting the butterfly garden at the Kejimikujik SAR office

M. Crowley, Parks Canada



Models showing the Monarch life cycle will be displayed at the Kejimikujik Visitor Center

**RESULTS**  
Continued

with Monarch life stages to display in the Kejimkujik Visitor Center Display when live caterpillars are not present.

- The gardens at Kejimkujik and MTRI were well cared for and are doing great.
- The Butterfly Club is now on Facebook! Members can share their stories and pictures and interact with each other. "Like" the Butterfly Club by visiting [www.facebook.com/MonarchButterflyClub](http://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
- Canadian Wildlife Federation
- Southwest Nova Biosphere Reserve



S. MacInnis

Sherry releasing a butterfly in Kejimkujik



J. McRuer

Presentations on the Monarch and butterfly gardens are done throughout the biosphere



N. Moase

Butterfly Social at the Art of Germany B&B

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