



Kenauk Institute - 2015 Annual Report



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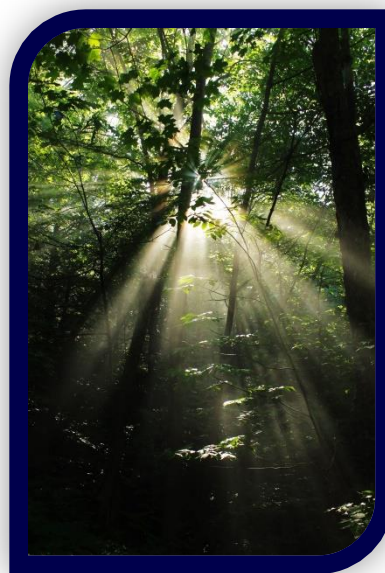


Executive Summary

The mission of The Kenauk Institute is to support, coordinate and supervise scientific research, involve local schools in environmental education, and connect Kenauk with the broader community. The vision is to establish a baseline inventory of biodiversity and monitor the property with a 100 year time horizon. With time, Kenauk will become a laboratory for monitoring climate change and human impacts.

The Kenauk Institute has been proud to partner with Kenauk Nature and the Nature Conservancy of Canada, using research and conservation to ensure Kenauk's legacy as a pristine wilderness for centuries to come. Kenauk has proved to be an ideal location for a research institute because of its expansive size (65,000 acres), its uniqueness as a pristine watershed and since it acts as a wildlife corridor. The abundance and diversity of flora and fauna in combination with the properties unique history provides endless possibilities for research which has become apparent through the high demand for projects. Thanks to dedicated teams of researchers we are already well on our way to our goal of long term monitoring and conservation.

Throughout 2015, The Kenauk Institute has seen a lot of progress towards becoming an established and permanent center for ecological studies; including the successful completion of 7 research projects as well as the development of facilities and marketing strategies.



Board of Directors

The Kenauk Institute is honored to have such a dedicated board of directors.

- Mr. Doug Harpur – Chair
- Mr. Patrick Pichette – B.A., M.A.
- Ms. Sara Lydiatt – B.A., M.A.
- Dr. Altaf Kassam – B.Sc., PhD, M.B.A.
- Dr. Christian Messier – B.Sc., M.Sc., PhD
- Dr. David Philipp – B.Sc., M.Sc., PhD
- Dr. Christopher Buddle – B.Sc., M.Sc., PhD



Research Coordinator

- Liane Nowell – B.Sc., M.Sc.

2015 Research Projects

Seven research projects were successfully completed during the year of 2015.

1. CERFO Vernal Pool Project

Title: The development of a mapping method for vernal pools using LiDAR and multispectral satellite images.

University / Organization: CERFO – Centre d’Enseignement et de Recherche en Foresterie de Sainte-Foy.

Researchers: Jean Fink, biologist; Mathieu Varin, geomatician, M.Sc.; Philippe Bournival, forestry engineer, M.Sc.; Martin Dupuis, professor, M.Sc., Cégep de Sainte-Foy.



Description: Vernal pools perform many ecological functions.

Unstable because of their short hydroperiod, they are formed by a depression in the land where water temporarily accumulates on a seasonal basis. As a result, they are specialized wildlife habitats due to their isolation from water systems. This gives them an increasingly recognized importance, especially as breeding habitats for invertebrates, amphibians and reptiles as well as foraging grounds for waterfowl. Some species at risk are also known to inhabit these environments which are a priority for protection and maintaining their ecological functions. Vernal pools are small in size (<0.1 ha) and temporary, making them difficult to identify and therefore protect. They are usually mapped by photo interpretation, a tedious and expensive technology when applied regionally. Often hidden by the forest canopy, they are difficult to spot despite the use of pictures taken during the spring, when leaves still aren't present. One approach for identifying vernal pools quickly is the use of semi-automated satellite imagery which has the potential to accurately identify and map them, and ultimately, make sure they are taken into account in biodiversity conservation strategies.

Results Summary:

- Detailed multispectral maps were acquired and treated for this project.
- 3 561 potential vernal pools were identified with a total average surface area of 252 m² which encompasses 0.25% of Kenauks property.
- 2 221 potential vernal pool complexes were identified with a total average of 404 m².
- 88 vernal pool complexes were validated and 39 new vernal pools were identified which will be validated using LiDAR. A vernal pool complex is at least 2 vernal pools within 30 meters of each other.
- Species observations were also made at each vernal pool to contribute to our overall biodiversity inventory.

Next Steps / Deliverables: This project received a second grant from Passport Innovation to continue their work on vernal pool mapping. In 2016, Phase 2 of this project will be completed with a detailed and accurate method for mapping vernal pools as well as detailed maps of the vernal pools at Kenauk which will facilitate conservation, management and future research projects.

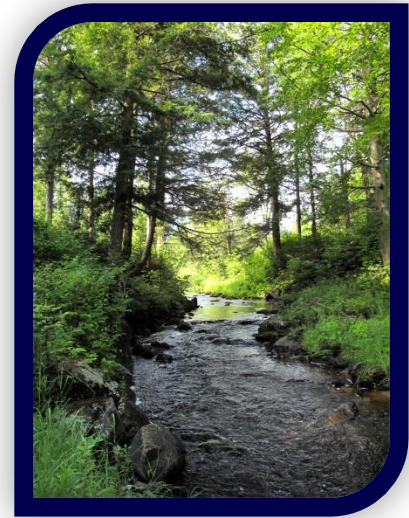
2. CERFO Integrated Resource Management Project

Title: Acquisition of knowledge essential to the integrated management of resources on the property of Kenauk.

University / Organization: CERFO – Centre d’Enseignement et de Recherche en Foresterie de Sainte-Foy.

Researchers: Jean Fink, biologist; Mathieu Varin, geomatichian, M.Sc.; Philippe Bournival, forestry engineer, M.Sc.; Martin Dupuis, professor, M.Sc., C  jep de Sainte-Foy.

Description: The territory of Kenauk is one of the largest and oldest private wildlife reserves in Canada. Kenauk is focused on sustainable forestry, tourism, conservation and the enhancement of wildlife and its habitats. With distinct missions, the owners are faced with ongoing challenges, harmonizing uses to achieve their objectives in the context of integrated and sustainable resource management. Kenauk Nature wants to diversify its service offering and also aims to improve wildlife habitat and ensure the sustainability of resources for maintenance activities. Zoning Kenauk on a fine scale is foreseen to define the management of the various resources for the territory. Doing this planning based on thorough knowledge of the properties’ characteristics, including wetlands and habitats for species at risk is essential. However, current knowledge is fragmented and insufficient. Conventionally, this picture would be obtained by performing a property inventory and by acquiring aerial photos for analysis. However these methods are time consuming, costly and often inaccurate. A possible solution to acquire knowledge for integrated management planning is to use innovative remote sensing technology, such as multispectral satellite imaging. This approach would allow better accuracy, a significant reduction in costs and facilitate an updated cartography map. The main objective of this project was to validate these methods for use in acquiring knowledge of a territory for land management planning and conservation.



Results Summary:

- Detailed multispectral landsat maps of Kenauk’s property in 1984, 1999 and 2009 were acquired and compared for land uses, including forestry. These maps will be useful for Kenauks land management planning and facilitating future research.
- Since 1984:
 - A progression towards predominantly deciduous forests has occurred since strip cutting favors deciduous regrowth versus coniferous.
 - There has been a 1.5 times increase in area cut and a decrease in wetland surface area but not in the number of wetlands, which may be caused by fragmentation due to forestry.
- In 2009 Kenauks land use was: 77% forest, 9% wetlands, 6% water, 8% recent forestry cuts

2009 Land Use Categories	Surface Area (km ²)	Proportion of Kenauk
Anthropogenic	0.12	0%
Agriculture	2.50	1%
Wetlands	1.92	1%
Water Bodies	17.09	7%
Recent Forestry Cuts	20.00	8%
Mixed Forest	31.13	12%
Coniferous Forest	50.60	20%
Deciduous Forest	132.51	52%
Total	255.87	100%

Next Steps / Deliverables: This project is complete. A detailed report, including maps, can be downloaded on the website.

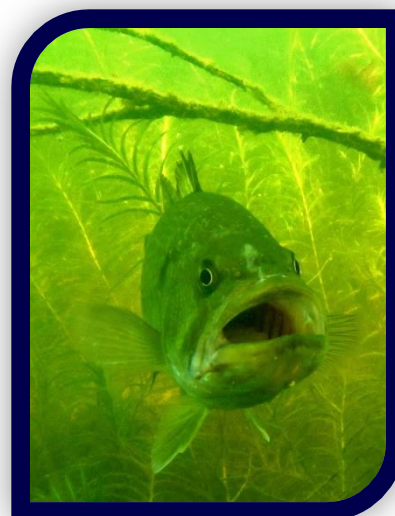
3. University of Illinois Bass Project

Title: Using experimental whole lake management to assess the impact of angling during the spawning season on bass recruitment.

University / Organization: Illinois Natural History Survey at the University of Illinois.

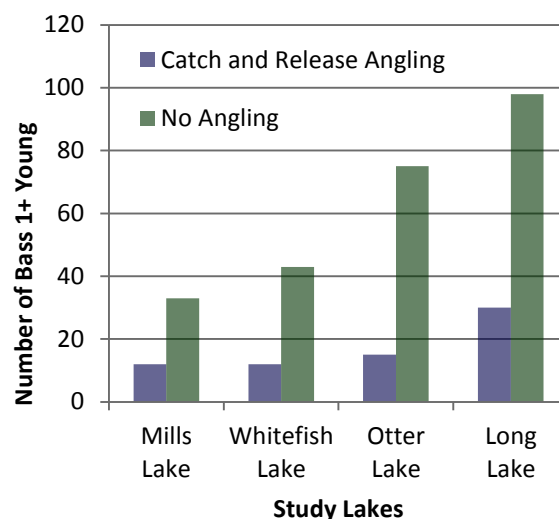
Researchers: Dr. David P. Philipp, Julie Claussen, and Jeff Stein, Illinois Natural History Survey at the University of Illinois; Dr. Steven Cooke, Carleton University; Dr. Cory Suski, University of Illinois; Michael Allen, University of Florida; and Jeffrey Koppelman, Missouri Department of Conservation.

Description: Largemouth bass spawn annually during the spring, creating shallow nests built by the male along lake shorelines. After eggs are deposited by a female and fertilized by the male, the females exit the nest, leaving the male alone to provide sole parental care for the brood for as long as 5-6 weeks. During this parental care period, the males are especially vulnerable to angling. There has been a long-standing controversy over whether or not angling for nesting bass (even catch-and-release) can be detrimental to their individual reproductive success and consequently to population level recruitment. To address this controversy, the ongoing study at Kenauk Nature and the Queens University Biological Station is using two alternative management scenarios (catch-and-release fishing vs no fishing during the bass spawning season), to directly assess how angling nesting bass affects population level reproductive success. Specifically, the two management scenarios were alternated each year in each of the four study lakes for eight years. Following the end of the parental care period each year, snorkelers swam the entire shoreline of each study lake to visually assess relative year class strength. Thus it was possible to use natural populations to evaluate the negative impacts of angling nesting bass on reproductive success and recruitment in a realistic management scenario.



Results Summary:

- Preliminary analyses of this long-term data show a strong negative relationship between the level of angling during the spawning seasons and year-class strength.
- It was documented that the angling of nesting bass causes individual brood loss and nest abandonment, thereby resulting in a decrease or complete loss of an individual's reproductive success.
- In each of the four study lakes, recruitment (as measured by the relative strength of the 1+ year class) was substantially higher during years when there was a closed season compared to angling years.
- Alternatives to current regulations that allow (even promote) angling for nesting bass should be explored.



Next Steps / Deliverables: This project started in 2007 and is now complete. Multiple publications that will influence federal angling policy are now being written. They will be posted on the website as they are completed.

4. NCC Biodiversity Inventory

Title: NCC Biodiversity Inventory.

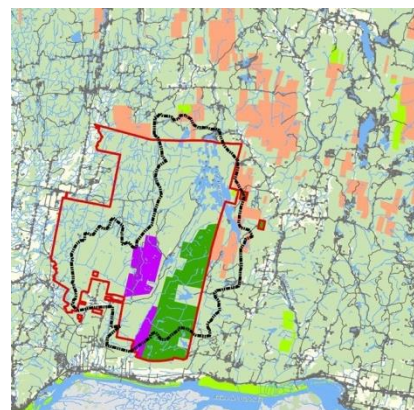
University / Organization: The Nature Conservancy of Canada.

Researchers: Marie-Andrée Tougas-Tellier and Joel Bonin

Description: In 2014, the Nature Conservancy of Canada (NCC) began a series of inventories on the territory of Kenauk. This work aims to document the rich biodiversity of this vast and iconic property, to exemplify its value and manage it accordingly (e.g., identification of areas with high conservation potential, establishment of forest corridors, etc.). Research conducted in collaboration with botanists, zoologists, ornithologists, forest professionals and ecologists have confirmed the exceptional ecological richness of this site. The initial results of this inventory and a review of the scientific literature have allowed NCC to produce a synthesis of knowledge on the flora and fauna of this sector and the needs of each species in terms of habitat. This territory inventory is accompanied by a list of concrete recommendations for land stewardship and the management of its natural resources. This document will serve as a framework for planning target species management and conservation action plans for the entire territory of Kenauk and will guide future inventories that will continue in 2016 and 2017.



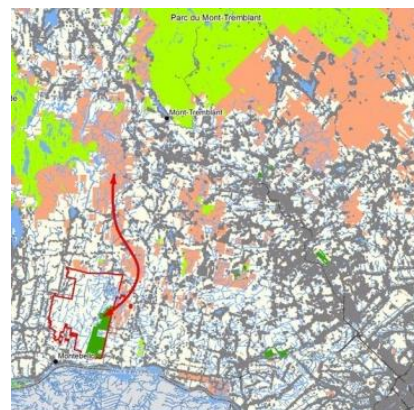
NCC is also prioritizing the preservation of Kenauk's ecological features to ensure its dynamic role within the landscape-scale ecosystem. Kenauks' conservation planning will therefore include a larger scale objective to protect a wildlife corridor to the North. The continuous forest cover to the North of Kenauk provides suitable conditions for wildlife movement and migration. Primary species of interest include moose and wolves, and secondary targets include other terrestrial non-game species. Continuous forest is also important for forest interior birds, indigenous plants and amphibians with limited dispersal capacity. The objective is to maintain landscape connectivity for free dispersal of those different target groups.



Results Summary:

- So far the presence of 28 species at risk has been validated, including *Conopholis Americana*, the four-toed salamander, and the largest black maple stand listed in the province of Quebec.
- Old forest fragments that foster several bird species such as the Canada warbler and the wood thrush were also identified.
- In terms of fish, channel darters were also found, an indicator species for the quality of the riparian environment.

Next Steps / Deliverables: This inventory will continue in 2016 and 2017. Extensive species lists of flora and fauna have been created which will facilitate long term monitoring, conservation and future research. Species lists are posted on the website and will continue to be updated.



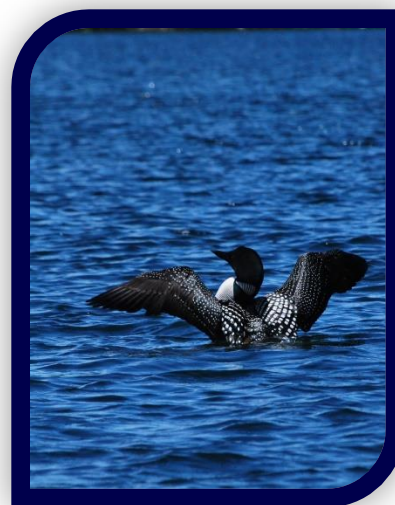
5. McGill Loon Nesting Project

Title: McGill Loon Nesting Project.

University / Organization: McGill University.

Researchers: Robert Alvo and Liane Nowell

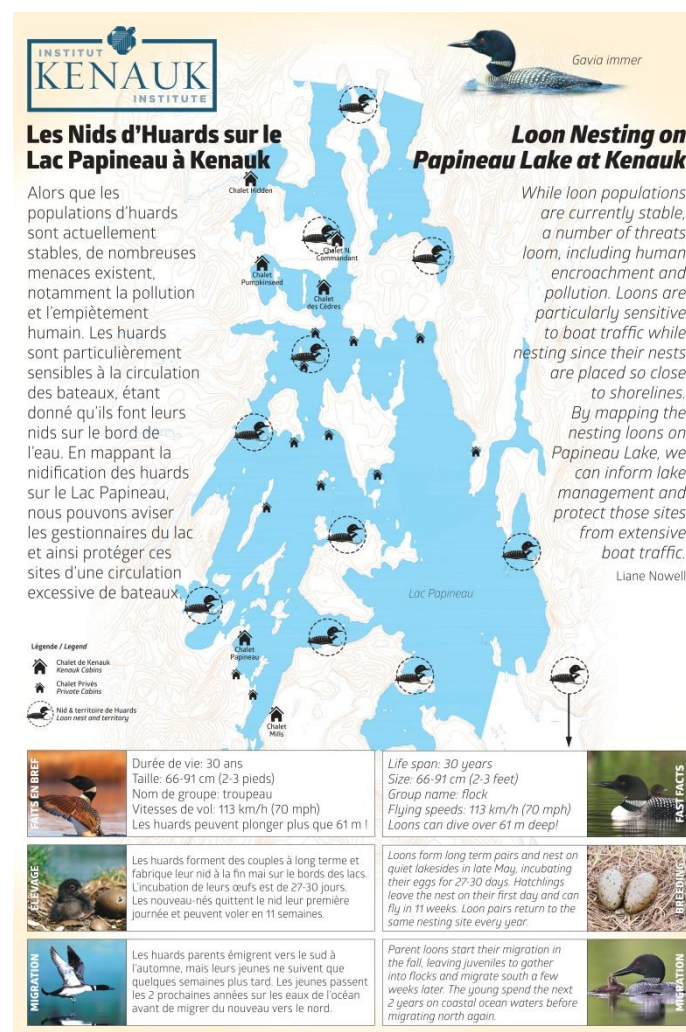
Description: While loon populations are currently stable, a number of threats loom, including human encroachment and pollution. Regional declines have occurred at the southern edge of their range and in the Midwest of the United States loons have disappeared from breeding sites entirely. Loons are particularly sensitive to boat traffic while nesting since their nests are placed so close to shorelines. Male loons select nest sites in quiet, protected areas along lakeshores and often reuse the same nesting site annually. By mapping the nesting loons on Papineau Lake, we hope to protect those sites from extensive boat traffic.



Results Summary:

- 11 loon pairs and nesting sites were identified and mapped on Papineau Lake.
- An educational poster showcasing these sites and their importance was created.

Next Steps / Deliverables: This inventory and mapping will continue in 2016. Nesting sites and numbers will continue to be mapped for long term monitoring. Creating awareness on Papineau Lake of vulnerable loon nesting sites will become a priority.



6. McGill Black Maple Project

Title: Does the diversity and community structure of arthropods vary by vertical stratification and tree type?

University / Organization: McGill University

Researchers: Dr. Christopher Buddle

Description: Biodiversity conservation depends on deep knowledge about the smaller and hyper-diverse animals in the world, including insects and spiders. Research on spiders and insects occurring in tree canopies in southern Quebec has shown some differences between tree species, and also distinct differences between the understory and the tree canopies. Given the interesting history of the Kenauk forest region, and the uniqueness of some tree species such as black maple trees, this will prove itself as an interesting and important pilot research project. This research is a biodiversity assessment in the canopy and understory of three tree species found in Kenauk, with Black and Sugar Maple being two of the focal species and Basswood acting as a control. For arthropods, canopies will be sampled with 'beating' the foliage, and with permanent Lindgren funnel traps that catch flying insects. Samples will be paired with the same methods in the understory to make a proper comparison of the canopy to the understory. These data will attempt to answer whether or not the diversity and community structure of arthropod varies by vertical stratification and tree type. Additionally, the biodiversity of birds will be assessed during the active season, using point calls, determining if diversity varies by forest type and time of year. Understory herbaceous vegetation will also be studied using quadrat sampling to determine how vegetation diversity varies depending on overstory tree composition. By the end of the pilot project, the diversity of three very different groups (herbaceous plants, arthropods and birds) will be assessed. These data will be invaluable when considering additional long-term ecological monitoring at Kenauk.



Results Summary:

- The forest canopy is known to be a major source of diversity, holding up to 50% of all living organisms.
- Samples were sorted into 6 groups: beetles (515), long-horned beetles (37), caterpillars (114), ants (21), spiders (225) and other (1218).
- Flies (Diptera) were the most common insects caught (648) and beetles were the second highest with (515). The majority of insects were caught using Lindgren funnels.
- Some taxa, like Hemiptera, mites and beetle larvae, showed a preference to certain tree species, in this case, Basswoods.
- Only 7 species were found in all tree strata (understory, mid canopy, upper canopy). 34 species were found in both the understory and upper canopy. 37 species were found only in the understory and 39 species were found only in the upper canopy.

Next Steps / Deliverables: This phase of the project is now complete. A continuation project studying arthropod diversity in tree canopies will however continue in 2016 and 2017 as a dedicated M.Sc. study. Publications for this project are in review now and will be posted on the website once complete.

7. Carleton Trout Project

Title: Quantifying the best handling practices for trout.

University / Organization: Carleton University

Researchers: Dr. Steven Cooke

Description: The Fish Ecology and Conservation Physiology (FECF) Laboratory at Carleton University is committed to ensuring that recreational fisheries are sustainable and to that end they work with a variety of partners to improve the science and practice of catch-and-release. Beyond limiting fishing effort on lakes, much of the Kenauk reserve is managed under a catch-and-release framework. Nonetheless, Kenauk must engage in extensive and costly stocking efforts to maintain fishing quality which implies that there is some level of post-release fishing mortality. It is therefore necessary to quantify catch-and-release mortality to inform stocking practices and to identify opportunities for reducing that mortality such that the need for costly stocking could be reduced. We have generated the necessary biological knowledge for the industry partner to ensure long-term viability of their recreational fisheries using defensible research methods. The project involved the capture of trout between spring and early fall to understand how water temperature and fish condition influence catch-and-release outcomes. Fish were captured using common gear used by clients, as well as fought and handled for various periods of time to reflect a diversity of angler expertise. Details on species, water temperature, gear type, fish size, hook location, bleeding, and fish vitality (assessed with a reflex impairment technique) was recorded and fish were temporarily marked and held for 48hrs in lake net pens to evaluate mortality rate. Data will be incorporated into a model to identify the factors that influence reflex impairment which will identify opportunities for reducing mortality and sublethal impacts.



Results Summary:

- Four studies on brook trout were conducted to develop best practices recommendations for anglers.
- 1) Hook type: Multiple treble, single and baited hooks were used and compared for hooking injury. Treble and baited hooks tend to be more damaging because they cause more tissue damage, take longer to unhook, and are often swallowed. 182 brook trout were caught and while no differences between hook types were found it is still recommended to use single un-baited hooks.
- 2) Net type: Nets can remove slime coats and scales which provide natural defenses to physical damage and wound infection. Different net materials (knotted polyester, knotless nylon, rubberized nylon, rubber mesh) and sizes may cause different levels of injury. After sampling 153 fish, differences in injury were found; it is recommended to use non-abrasive nets and avoid small mesh sizes which tangle easily.
- 3) Water temperature and air exposure: 337 fish were caught across 3 seasons, variously air exposed and compared for post angling condition. It was found that air exposure in any water temperature impacts fish condition and air exposure over 1 min is likely to result in equilibrium loss and death. It is recommended that anglers reduce air exposure as much as possible, particularly in summer.
- 4) Fish revival: This study tested different hand-held recovery methods (back and forth, figure 8) anglers use to assist fish after equilibrium loss. It was found that there are no benefits to assisting fish with recovery; handling fish is only cause for stress. It is recommended to allow fish to recover on their own.

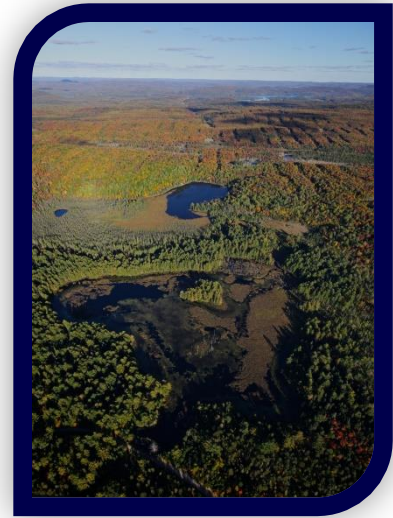
Next Steps / Deliverables: This project is now complete. A best handling practices guide for trout is being written and will be posted on the website and disseminated to anglers once complete.

2016 Upcoming Research Projects

Fifteen research projects are planned for the summer of 2016, most of which fall under two major categories: effects of forestry management and Papineau Lake conservation.

NSERC Forestry Projects

Goal: Compare forestry techniques (strip cutting vs. selective cutting vs. no cutting) in terms of its impacts on increasing the overall resilience of the forest to global change (climate change, invasive species, pollution etc.). An NSERC grant will provide overarching funds for the four research projects below which will simultaneously achieve this goal. These projects will implement and track management strategies with Kenauk's forestry operations.



1. Biodiversity Project (NSERC Forestry Project Component)

Title: Effects of even-aged versus uneven-aged silviculture and resulting landscape quality on understory plants, insects, soil microbes and bird diversity.

University / Organization: McGill University, Guelph University, and Université de Québec en Outaouais (UQO)

Researchers: Dr. Christopher Buddle and Dr. Kyle Elliot (McGill University), Dr. Alex Smith (Guelph University), Dr. Yann Surget Groba and Dr. David Rivest (UQO), Dr. Christian Messier (UQO/UQAM)

Description / Goals: Biodiversity is central to human well-being, and to the resilience and health of our ecosystems. This is especially relevant today as we face unprecedented environmental challenges, from climate change to invasive species. In north-eastern North America, forest ecosystems, such as Kenauk, harbor immense biodiversity, much of which is largely unexplored. From insect pollinators to carbon-capturing trees, critical ecosystem functions are provided by the flora and fauna which inhabit Kenauk. As we adapt to our changing environments, and prepare for the future, benchmarking this biodiversity is essential, as is studying the ways this biodiversity is best maintained and conserved for future generations. This research will focus on quantifying how the biodiversity of flora and fauna at Kenauk has adapted to past harvesting (ie. strip cutting), and is positioned for future changes in the forest. Surveys will be completed in permanent sample plots, placed both within the forests that have been managed in the past, and in uncut 'control' plots. Permanent sample plots will be the basis for long-term ecological monitoring at Kenauk. The focal study organisms for the first phase of this research will include arthropods (insects and spiders) living from the forest floor to the canopy, understory plant species, and the avian (bird) diversity. Students at all levels (undergraduate, Master's and PhD students) will work on the biodiversity theme, each with a different taxonomic focus, but with an integrated sampling plan, both within the theme area, but also project wide.

2. Hydrology and Vernal Pool Project (NSERC Forestry Project Component)

Title: Effects of even-aged versus uneven-aged silviculture and resulting landscape quality on the hydrology and biodiversity of vernal pools.

University / Organization: Université de Québec en Montréal (UQAM) and Université de Québec en Outaouais (UQO)

Researchers: Dr. Marie Larocque (UQAM), Dr. Angélique Dupuch and Dr. Yann Surget Groba (UQO)

Description / Goals: Vernal pools consist of very rich ecosystems and are essential to the life cycle of many organisms including threatened amphibians. Despite their ecological importance, these habitats are generally not mapped and are not taken into account in management plans because of their small size and temporary state. Similarly, their hydrologic dynamics across different geomorphologic contexts are poorly documented. Forestry can seriously affect sources of water, water quality and temperature, as well as connectivity among vernal pools. Currently the effect of these changes on vernal pool hydrology and herpetofauna are unknown. The objectives include: 1) quantify the hydrological dynamics of vernal pools across different geomorphological contexts; 2) evaluate the impact of even-aged and uneven-aged silviculture on vernal pool hydrological dynamics, herpetofauna diversity, abundance and connectivity; and 3) provide recommendations to decrease the impact of silviculture on vernal pools and their associated herpetofauna. Fifty vernal pools will be selected for this study (10 in each site): unexploited forests, young (10-15 year-old harvest) and older sites (25-30 year-old harvest) with even-aged silviculture, as well as young and older sites with uneven-aged silviculture. All the pools will be surveyed for their size and depth and will be visited regularly to identify their hydroperiod. At all the sites, environmental DNA will be analysed to estimate herpetofauna diversity (via a metabarcoding approach) and abundance (via quantitative PCR). Functional connectivity among the vernal pools will be estimated using a landscape genetic approach (to estimate gene-flow among sites) and a capture-mark-recapture study of the most common species. Among the 50 sites, a subset will be equipped with different sensors (water level, water temperature and water electrical conductivity, air temperature, precipitation) to assess the temporal evolution of their water budget and water quality.

3. Tree Growth and Productivity Project (NSERC Forestry Project Component)

Title: Effects of even-aged versus uneven-aged silviculture on tree growth and forest productivity.

University / Organization: Université de Québec en Montréal (UQAM), Université de Québec en Outaouais (UQO) and Centre d'Enseignement et de Recherche en Foresterie de Sainte-Foy (CERFO)

Researchers: Philippe Nolet (UQO), Guy Lessard (CERFO), Dr. Christian Messier (UQO/UQAM)

Description / Goals: The objectives of this project include: 1) assess the effects of both forestry approaches (even vs uneven) on forest productivity and regeneration and compare them to unmanaged stands; 2) assess the effects of both approaches on floristic and soil biodiversity with a comparison to unmanaged stands; 3) verify whether forest productivity and regeneration (Obj. 1) is related to floristic and soil biodiversity (Obj. 2); and 4) identify the advantages of each approach in terms of forest resilience to global change. This project will contribute to the permanent sample plots network to be installed on Kenauk's territory. Each plot of the

network will provide detailed information of the various parameters identified in Objectives 1 and 2. More specifically, forest productivity will be assessed through growth ring analyses and resilience through an evaluation of functional diversity and tolerance to drought (the most important risk related to climate change) of the seedlings found in the permanent sample plots.

4. Forest Resilience Project (NSERC Forestry Project Component)

Title: Assessing the best management strategies in relation to increasing the overall resilience of forests to invasive pests, disease and climate change.

University / Organization: Université de Québec en Montréal (UQAM), Université de Québec en Outaouais (UQO) and Centre d'Enseignement et de Recherche en Foresterie de Sainte-Foy (CERFO)

Researchers: Dr. Christian Messier (UQO/UQAM), Dr. Frédérick Doyon and Philippe Nolet (UQO), Guy Lessard (CERFO)

Description / Goals: Forests are increasingly being managed for a multitude of ecosystem services occurring at both the stand and landscape scales. However, these services are being threatened by rapidly changing biotic and abiotic factors such as invasive diseases, insects and climate change. For example, in the last 40 years the Kenauk forests have been invaded by dutch elm and beech bark diseases and more recently the ash-bore epidemic which are decimating important tree species. Many more insects and diseases, already found in the north-eastern US, are also likely to move into Kenauk in the next 40 years. This is occurring simultaneously with rapidly changing climates and increasing human demands. To respond to these challenges, forest managers are required to develop new management strategies aimed at maintaining or increasing the overall resilience of the forest so as to maintain its ability to continue providing vital ecosystem services. Based on the theory of complexity science, this project will evaluate at the stand and landscape scales, using simulation models, the best management strategies to insure forests will continue providing ecosystem services. To ensure an effective adaptation strategy, the following steps will be followed: 1) develop a vulnerability assessment for invasive diseases, insects and climate change; 2) plan and develop long-term scenarios using new analytical tools and models that specifically acknowledge the prevalence of highly uncertain social, economic, climatic, and ecological conditions; and 3) test silvicultural practices that favour as high a tree species diversity as possible with the right balance of functioning traits to insure as high a resilience to disturbances and stressors that are predicted for this region.

5. Invasive Slug Project

University / Organization: Université de Québec en Outaouais (UQO)

Researchers: Dr. Angélique Dupuch (UQO)

Description / Goals: The goal of this project is to determine the ecological factors that facilitate the successful invasion of non-indigenous slugs. The hypothesis that disturbances, like logging, help invasive species will be tested by doing a comparison of the presence of native versus non-native slugs and their proliferation in the Outaouais region. This project will have three components: 1) an inventory of slug species in logged areas vs undisturbed forests; 2) vegetation surveys; and 3) learning about slug displacement and feeding behaviors.

6. NCC Biodiversity Inventory (continuation)

University / Organization: The Nature Conservancy of Canada

Researchers: Marie-Andrée Tougas-Tellier and Joel Bonin (NCC)

Description / Goals: In 2014, the Nature Conservancy of Canada (NCC) began a series of inventories on the territory of Kenauk which will continue in 2016. This work aims to document the rich biodiversity of this vast and iconic property, to exemplify its value and manage it accordingly.

7. CERFO Vernal Pool Project (phase 2)

University / Organization: CERFO – Centre d'Enseignement et de Recherche en Foresterie de Sainte-Foy

Researchers: Jean Fink, biologist; Mathieu Varin, geomatician, M.Sc.; Philippe Bournival, forestry engineer, M.Sc.; Martin Dupuis, professor, M.Sc., Cégep de Sainte-Foy

Description / Goals: Complete the approach to identify and map vernal pools quickly using semi-automated satellite imagery to ensure they are taken into account in biodiversity conservation strategies.

8. Moose Project

University / Organization: CERFO – Centre d'Enseignement et de Recherche en Foresterie de Sainte-Foy and MLLP with the Government of Quebec

Researchers: Jean Fink, biologist; Mathieu Varin, geomatician, M.Sc.; Philippe Bournival, forestry engineer, M.Sc.; Martin Dupuis, professor, M.Sc., Cégep de Sainte-Foy

Description / Goals: This project aims to determine the optimal density for moose on the property of Kenauk. It will determine appropriate forest management strategies to maintain these healthy populations in terms of food availability and covered shelter. It will also determine habitat connectivity using spatial analyses and the potential for wildlife corridors, both on small and large scales. The many objectives include: 1) evaluate the density and distribution of moose across Kenauk; 2) measure the demographics of this population (male, female and calve ratios); 3) measure the amount of food available; 4) evaluate the utilization of available foraging grounds during the winter; and 5) determine the optimal density for moose on the property. This will be accomplished using aerial and vegetation surveys in partnership with the MFFP (Ministère des Forêts, de la Faune et des Parcs).

9. Coyote Scat Project

University / Organization: The Kenauk Institute and The Nature Conservancy of Canada

Researchers: Liane Nowell and interns

Description / Goals: Identify the diversity of coyote prey on the Kenauk property and use this data in hunting management. Coyote scat samples will be collected and analyzed for prey hair samples.

Papineau Lake Projects

Goal: To ensure the long term protection and conservation of Papineau Lake, it's waters, flora and fauna. Using multiple projects, data will be collected to create a baseline of the lakes health/status and to create management strategies. The community of Boileau and all lake users will be included in this goal using educational programs and research involvement.

10. Papineau Lake Hydrology Project

University / Organization: Université de Québec en Montréal (UQAM) and the Montreal Botanical Gardens

Researchers: Dr. Marie Larocque (UQAM), Stéphanie Pellerin (Montreal Botanical Gardens)



Description / Goals: The goal of this project is to understand the hydrologic dynamics of Papineau Lake and how those dynamics are related to shoreline wetlands. Three specific objectives will contribute to this goal. 1) Establish a monitoring network and hydrological alert system around Papineau Lake. Quantifying the lakes hydrodynamics will allow an estimation of how the lake will be affected in the long-term by land use changes and climate change. Probes that measure water levels and inflow/outflow volumes will be installed throughout the lake for long term monitoring as well as a weather station. This objective will also include developing a hydrological model of the watershed for simulating future scenarios, such as climate change. 2) Locate and characterize the lakes coastal wetlands and identify the anthropogenic pressures they face. This objective would be achieved in collaboration with Stéphanie Pellerin who specializes in coastal wetlands and Ducks Unlimited with their wetland mapping data. Indicator species, species at risk and insect bioacoustics signatures will be identified in these areas so as to designate them as protection zones. The natural and anthropogenic pressures these wetlands face will be identified, with a specific focus on shoreline thermal regimes and shoreline erosion by waves. 3) Create a list of recommendations to prevent / mitigate the negative effects of these pressures on the wetlands of Papineau Lake. An eco-nautical map of Papineau showing areas of specific concern would be created along with a set of regulations to help reinforce the conservation of the entire lake and watershed.

11. Papineau Lake Water Quality Monitoring Project

University / Organization: Government of Quebec and Organisme des Bassins Versant

Researchers: Liane Nowell and interns

Description / Goals: The goal of this project is for Papineau Lake to become part of the Volunteer Lake Monitoring Program (VLMP) with the Government of Quebec. The Kenauk Institute will periodically take water samples (e.g. secchi readings, fecal coliforms, phosphorus, chlorophyll a) throughout each summer and establish a long term monitoring protocol for water quality with annual comparisons.

12. McGill Loon Nesting Project (phase 2)

University / Organization: McGill University

Researchers: Liane Nowell and interns

Description / Goals: Since loons are particularly sensitive to boat traffic while nesting and often reuse the same nesting site annually, this project will be continued again in 2016. By mapping the nesting loons on Papineau Lake, we can hopefully protect those sites from extensive boat traffic and monitoring annual differences in loon nesting.

13. Impacts of Invasive Bass on Mussel Diversity and Dispersal Project

University / Organization: Nature Museum of Canada

Researchers: Dr. André Martel (Nature Museum of Canada)

Description / Goals: The goal of this project is to assess how mussels use different species of fish to disperse their eggs within a lake. The effect of invasive bass species on mussel diversity and abundance will also be identified. A baseline of mussel species present in the various lakes at Kenauk will be inventoried in conjunction with our biodiversity project.

14. Wetlands Mapping Project

University / Organization: Ducks Unlimited Canada

Researchers: Dr. Stéphanie Murray (Ducks Unlimited)

Description / Goals: The goal of this project is to map all the wetland areas in the Outaouais region using satellite imagery and on-site validation with the CERFO team at Kenauk.

15. Looking for the Champlain Sea

University / Organization: The Kenauk Institute

Researchers: Dr. Peter Fransham, Liane Nowell and interns

Description / Goals: The goal of this project is to identify the extent of the Champlain Sea encroachment on the property of Kenauk and classify geological sites of interest for exploration. Mapping the shoreline of the Champlain Sea could be used as part of educational programs and an interpretive walking trail.

Research Partnerships

University / Organization: Bates University

Researcher: Dr. Carla Essenberg

University / Organization: Canadian Museum of Nature

Researcher: Dr. André Martel

University / Organization: Carleton University

Researcher: Dr. Steven Cooke

University / Organization: Centre d'Enseignement et de Recherche en Foresterie de Sainte-Foy (CERFO)

Researchers: Jean Fink, Mathieu Varin, Philippe Bournival, Martin Dupuis, and Guy Lessard

University / Organization: Ducks Unlimited Canada

University / Organization: Government of Quebec Volunteer Lake Monitoring Program

University / Organization: Guelph University

Researcher: Dr. Alex Smith

University / Organization: Illinois Natural History Survey at the University of Illinois

Researchers: Dr. David P. Philipp and Julie Claussen

University / Organization: Institut des Sciences de la Forêt tempérée (ISFORT)

Researcher: Dr. Christian Messier (UQO/UQAM)

University / Organization: McGill University

Researchers: Dr. Christopher Buddle and Dr. Kyle Elliot

University / Organization: Organisme de Bassins Versants des Rivières

University / Organization: The Nature Conservancy of Canada

Researchers: Marie-Andrée Tougas-Tellier and Joel Bonin

University / Organization: Université de Québec en Montréal (UQAM)

Researchers: Dr. Marie Larocque and Dr. Stéphanie Pellerin

University / Organization: Université de Québec en Outaouais (UQO)

Researchers: Dr. Yann Surget Groba, Dr. David Rivest, Dr. Angélique Dupuch, Dr. Philippe Nolet, and Dr. Frédérick Doyon

University / Organization: Université du Québec à Trois-Rivières (UQTR)

Researcher: Dr. Raphaël Proulx



Facilities

Seven pods and one teepee were purchased in 2015. Creating scientific and educational facilities / accommodations will be the foundation of the Kenauk Institute.

Teepee

A 24 foot diameter teepee was purchased from WiTente and installed at Whitefish Lake. This teepee, dubbed our 'teepee of knowledge', will serve as an educational hub. It will be filled with educational posters and displays for Kenauk clients and visiting hotel guests.

In 2016 a second identical teepee was purchased to be placed at the Lac Commandant Auberge in Boileau. This teepee will also be filled with educational materials and help inform local community members of the Kenauk Institutes goal to protect Papineau Lake and manage it with the Nature Conservancy of Canada for long term conservation.



Pods

Seven pods were purchased from Patriote and temporarily installed at Whitefish Lake. These pods include 4 professor accommodations and 4 student accommodations (2 pods divided in half) as well as one pod which will be a washroom equipped with toilets and showers. These pods will act as accommodations for visiting researchers and potentially clients when not in use.

In 2016 these pods will be furnished and used. Researchers have already begun reserving them for this upcoming summer. A kitchen facility will also be built in the guide shack (an existing and nearby building) for people from the pods to use.



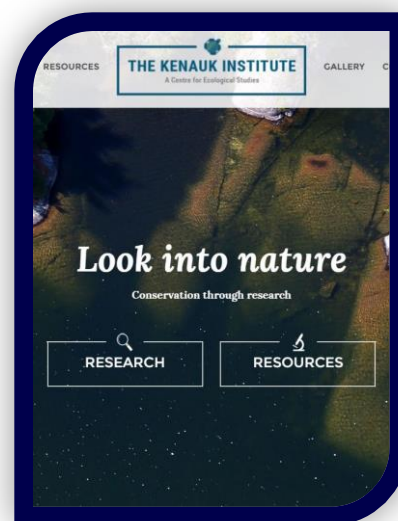
Marketing

Kenauk Institute website and facebook pages were created in 2015.

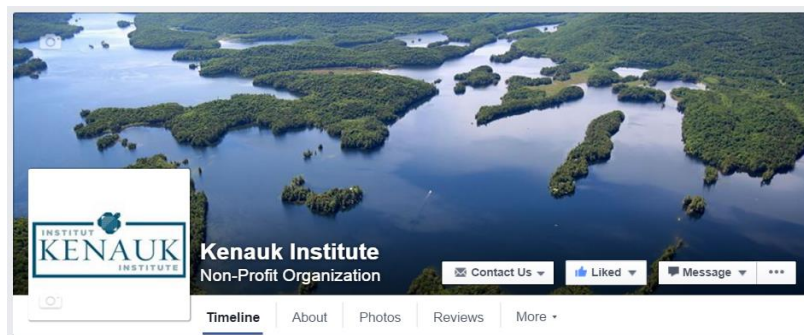
Website – www.kenaukinstitute.org

The website was created with Design Shopp and includes: home, about us, research, resources, gallery, contact us, and French pages. It is being updated continuously as new information becomes available, such as research project reports and publications as well as maps and species lists.

In 2016 it will be updated with the new research projects and potentially an educational programs section.



Facebook – www.facebook.com/kenaukinstitute/



The purpose of the Kenauk Institute facebook page is primarily for education, outreach and awareness. It is being updated with weekly posts about biology related material (ie. fun facts about an animal or event), holidays, and research projects with the Kenauk Institute.

Weekly Facebook Page Update (week of April 7 - 14, 2016)

Metric	Last Week	Previous Week	Trend
Page Visits	19	13	↑46.2%
Weekly Total Reach	575	444	↑29.5%
Post Engagement	155	71	↑118.3%
Total Page Likes	421	409	↑0.7%