

A Research Strategy for Algonquin Provincial Park

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Abstract

Algonquin Provincial Park has developed an issues-oriented and operational Research Strategy in the context of the principles of Ecosystem Management. A series of problems and issues related to the natural environment of the park are identified with a connected set of research projects. The projects are prioritized via a numerical ranking scheme and are available for on-the-shelf funding. Each specific project is described briefly. Three projects – two related to forest/wildlife and the other to amphibian decline – received funding in 1997.

Preface

This Research Strategy for Algonquin Park was developed subject to the Algonquin Park Ecosystem Management Strategy. The broader Ecosystem Strategy was developed to address a set of problems and issues related to the natural environment of Algonquin Park – one of which was the lack of a research policy itself. Each project described here is thus related directly to a specific problem/issue described in the broader strategy. For more details the reader is referred to the Terms of Reference of the Ecosystem Management Strategy. The project team members for the ecosystem and research strategies are described in Appendix 1.

The Problem

Algonquin Park has been a focus for research in the natural sciences for decades. Indeed it is said that more research has been done in Algonquin than any protected area anywhere. At any given time there are between 30 and 40 projects active at three research stations. The park has a well-developed administrative procedure for the application and approval process but no overriding research strategy. There is a pressing need to develop criteria to prioritize research and a comprehensive set of candidate projects. This need will become more relevant as funding may develop from Ontario Parks, Algonquin Forestry Authority (AFA), and other partners.

Solution

Develop criteria to set research priorities as well as a set of on-the-shelf projects available for funding.

Research is defined as the acquisition of new knowledge of interest to the broad community of a scientific discipline. A distinction should be made between research and resource monitoring. Monitoring is aimed at determining trends in ecosystem inventory, usually a population. Research is aimed at evaluating findings – including those from monitoring – temporally and spatially in an attempt to improve our understanding. Monitoring can thus be a component of research but is often done strictly for resource management purposes.

Algonquin Park has a well-developed procedure for the review and approval of unsolicited research applications, but this is essentially an administrative tool and makes only a cursory judgement of the scientific merit or relevance to park management needs. Staff essentially react to a set of unrelated proposals. There is no overall direction to research activities in the park. What is needed is a set of criteria for and the development of a set of candidate projects that are priorities to the Ontario Ministry of Natural Resources (OMNR), Ontario Parks and the park. These criteria would then guide the allocation of anticipated funding. Note that this strategy is not meant to preclude the approval of non-priority projects. Research in all disciplines is welcome in the park so long as restrictions in the established approval process are met.

It should be noted that Ontario Parks has developed a corporate research strategy to guide research across the entire park system. A strategy, specifically for Algonquin, should be consistent with the principles and priorities of the broader strategy.

The criteria for the Strategy will apply only to research directed at the natural environment of the park. Sociological research related to natural values will be considered but research that is strictly in the social sciences – while perfectly valid – will not be ranked by these criteria.

Specific Criteria

Criteria will be at two levels: A) criteria that must be met or are mandatory; and, B) criteria to rank the relative value of projects.

A) Mandatory Criteria

1. The project must be consistent with the objectives of OMNR, Ontario Parks, the Park Management Plan and the Ecosystem Strategy.
2. The project must be directed to at least one of the problems and issues identified in the Ecosystem Strategy. The problems and issues are as follows: 1) Research – Lack of Direction; 2) Monitoring; 3) Information and Technology Needs; 4) Introductions; 5) Water Control; 6) Fire Suppression; 7) Forest/Wildlife Diversity; 8) Recreation/Development; 9) Role of Nature Reserve Zones; 10) Atmospheric Pollution; 11) Hunting and Trapping; and, 12) Regional/Global Role. These issues are described in more detail in the Terms of Reference for the Ecosystem Strategy.
3. The research must not result in an unacceptable loss or diminution of any natural value. “Unacceptable” is a judgement call. Most research related losses result from the destructive sampling – i.e., collecting – of fish, plant or wildlife populations. A rule of thumb will be that no population will be impacted such that it can not recover to pre-sampling levels within two generations.

B) Criteria for Ranking Projects

The following are desirable features of proposed projects. Each project shall have points assigned as indicated and summed as a guide to ranking.

1. Relevance to Ecosystem Integrity: The extent to which a project addresses an issue of ecosystem health or integrity – structure, function, and

composition – or relates to principles of conservation or restoration biology will result in assignment of a point value perforce subjectively. As a discretionary guide, the established problems and issues are ranked and assigned points as follows relative to a subjective assessment of their overall ecosystem impact. Some problems, for example, Regional/Global Role, are not ecosystem perturbators as such and thus cannot be ranked here.

Forest/Wildlife Diversity	4 points
Fire Suppression	4 points
Introductions	3 points
Atmospheric Pollution	3 points
Recreation/Development	2 points
Water Control	1 point
Hunting/Trapping	1 point

2. Resolution of Resource Management Issues: Projects that contribute knowledge to solving specific resource management issues, such as Lake Trout Slot Limit are assigned four points.
3. Social/Ecological Concerns: Projects that contribute knowledge to issues that have a high profile or level of concern for park users or Ontario society as a whole, such as ozone depletion and amphibian egg survival, or relate to a high profile issue of human use of a resource are assigned four points.
4. Resource Loss: Projects that relate to a specific and clearly identified resource or population loss or decline, such as Hemlock in Algonquin, are assigned four points.
5. Global Role: Projects that relates to the park's broader global role or utilize the park's unique features to address a question of universal interest, for example social behaviour of an unexploited ungulate population, are assigned four points.
6. Biodiversity/Conservation: Projects that advance knowledge of the park's biodiversity and its conservation are assigned four points.
7. Species at Risk: Research on any species at risk recognized by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or the Committee on the Status of Species at Risk in Ontario (COSSARO) is assigned two points.

An example of how the point scheme is applied is given in Appendix 2.

Candidate Projects

The Project Team developed the following set of projects. Each project is described briefly and the entire set is then prioritized. Again, the reader is referred to the Terms of Reference of the Ecosystem Management Strategy for a description of the problems and issues within which the projects are framed.

Problem/Issue: Forest/Wildlife Diversity

Title: Land Water Linkage for Spawning Brook Trout

Description: Algonquin Park is essentially the last area in southern Ontario with self-sustaining brook trout populations. This world-class resource depends critically on small near-shore seepage areas to maintain successful reproduction. Early indications are that associated groundwater recharge areas vary in size with areas measured in hectares of associated forest. For a subset of lakes (N = 10?) we should determine the extent of recharge areas needed to sustain groundwater seepage in brook trout lakes. These areas probably do not conform to simple boundary/border recommendations in forestry guidelines and can best be viewed as specific exemptions – recharge areas, that is – to forestry guidelines. After sites are located and initial groundwater monitoring is conducted, hydrologic and seismic methods will be used to delineate the recharge areas associated with the near-shore seepage areas. These sites will then be monitored to track variation.

Problem/Issue: Introductions

Title: Modelling the Long-term Effects of the Introduction of Non-Native Fish in Algonquin Park

Description: Algonquin Park contains the only major complex of intact native trout fisheries left in Southern Ontario. These fisheries are sensitive to ecological perturbation and in particular to the introduction of non-native, coarse fish which are effective competitors, particularly with brook trout. Such introductions are occurring at an alarming rate and may in time spell the doom of the park's famed trout fisheries. A spatial and temporal model would shed light on the outcome of this problem.

A second project under this theme that is area-specific is described as follows:

Title: Distribution of New Piscivores in the Galeairy Lake - Lake of Two Rivers Watershed

Description: Two new piscivores, largemouth bass and walleye, have been reported from Galeairy Lake. These predators have the ability to alter fundamentally fish communities in general and brook trout/lake trout fisheries in particular. The appearance of these top predators presents the possibility of new fisheries developing in the highway corridor. In a more general context, their introduction presents an opportunity to track the expansion of these species in this watershed in a spatial context as well as upcoming changes in the lake food webs. The project would involve two phases. First, researchers would assess the distribution and growth of fish and track these over time. Second, they would conduct food habit and trophic-isotopic analyses of food web impacts.

Problem/Issue: Forest/Wildlife Diversity

Title: Stream Crossing and the Fish Movement

Description: Culverts and small bridges regularly cross over streams throughout the park, most often for purposes of forest management. Although crossings are constructed according to guidelines designed to control erosion, there are negative implications for fish populations. One such implication, which is particularly common when culverts are left in site, is obstruction of movement. This potential impact could be serious for species like brook trout that move seasonally to spawn or seek cold water refugia. The effect has not been studied in the relatively confined headwater drainage creeks of the park.

The next three projects are connected to the Problem/Issue of monitoring but have more than just monitoring as an end. All three involve researching the dynamics of population change.

Problem/Issue: Monitoring

Title: Anuran Population Regulation

Description: There is growing concern about an apparent global decline of Anuran amphibian (frog) populations. Studies are underway in the park to monitor certain frog populations but this work should be expanded to examine fully the process of population regulation and thus gain insight into why populations may be changing.

Problem/Issue: Monitoring

Title: Population Dynamics of the Wood Turtle

Description: The wood turtle, currently designated vulnerable in Ontario, has been recommended for upgrade to threatened status by COSSARO. As such, the wood turtle and two fish, the shortjaw cisco and deepwater sculpin, will have the highest official at risk status of any vertebrate breeding in the park. These are not endangered species. Algonquin, in fact, has three of five significant populations of the species in Ontario. Some preliminary assessment has been done but the population dynamics of the wood turtle in Algonquin is poorly understood.

Problem/Issue: Monitoring

Title: Status of Rare Plants

Description: The park has an extensive array of Nature Reserve Zones, many of which were established to protect representative floristic communities. Some of these contain regionally rare plants, though none are globally rare or endangered. In most cases, the status of these plant populations has not been evaluated since the zones were established. Surveys should be initiated to review the status and reproductive potential of these populations.

Problem/Issue: Regional/Global Role

Title: Genetic Diversity of Wolves

Description: The wolf as forest predator is one of the park's enduring images. There is however concern that despite its considerable size, the park is too small to contain a wolf population large enough to have sufficient heterozygosity for genetic health. There is also uncertainty regarding the true genetic identity of the Algonquin wolf in the wolf-coyote-coydog continuum and with respect to subspecific status. The question of genetic diversity could be approached through either theoretical models or an assessment of the real genotype and genetic diversity in the wolf population.

Problem/Issue: Atmospheric Pollution

Title: Acidification Impacts – Western Uplands

Description: The issue of acid precipitation and its impact in Algonquin Park remains something of an enigma. Earlier predictions of the catastrophic loss of fisheries have not come to pass and it is indeed difficult to attribute resource loss to acidification definitively. There are however clearly depauperate aquatic communities in the lakes of the western uplands, which is an area subject to very high acid deposition. It would be most useful to determine the real extent of biotic loss in the area due to acidification and model the progression of events.

Problem/Issue: Forest/Wildlife Diversity and Fire Suppression**Title:** Effect of Forest Management on Wildlife

Description: This project includes any of a potentially large set of studies that would shed light on how the terrestrial wildlife community of the park has been altered by forest management, including fire suppression, particularly with reference to its natural state. Any such research should lead to strategies for mitigation – such as the modification of current practice toward a more natural forest condition – and also add to the body of knowledge to allow for comprehensive modelling of forest management and wildlife diversity – a long-term goal. The studies may range from species-specific to the diversity of entire communities or may focus on featured or keystone species which act as barometers to guilds or community types. A consideration of the historic role of fire is an integral part of this research theme. There are seven specific projects as follows:

- a) An evaluation of forest structure and wildlife diversity in managed versus relatively pristine stands. Practically all the forest in the park has been harvested at one point although there are isolated uncut stands and some areas which were only very lightly logged.
- b) A model of the pattern and frequency of fire and windthrow on the pre-settlement landscape.
- c) Research at large or small spatial scales of the extent to which modern logging practices emulate the effect of natural agents of change such as fire and gap recruitment on forest ecological integrity – i.e., composition, structure and function – and wildlife diversity. An example would be to examine the long-term effect of suppression of fire near shorelands.
- d) The effect of logging on representative featured species such as the pileated woodpecker or keystone species such as the beaver.
- e) The effect of logging on a species or group of species for which conservation is a concern such as the wood turtle and Neotropical songbirds.
- f) The effect of logging roads on production and distribution of wildlife. Roads may lead to many positive habitat changes such as production of vernal pools, nesting habitat for turtles and excellent substrates for regeneration of yellow birch and berry-producing forbs. However, their role in increasing fragmentation and promoting local introductions of exotics is unknown. Both positive and negative changes need to be understood at a variety of scales to predict impacts of roads on the diversity and sustainability of local flora and fauna during the development of park management plans.
- g) Significance of stand boundaries and transitional zones – ecotones – to diversity of flora and fauna. Many recommendations to forest managers for maintenance of diverse forest values are expressed as stand related recommendations. Many of the prescriptions are based on stand boundaries for Forest Resource Inventory (FRI) and forest operations do not change these boundaries. Furthermore, often the core of stands is very different than the periphery of stands in structure and composition. However, many species have home ranges spanning a number of forest stand areas and transitional zones. Similarly, natural disturbance does not respect boundaries as managers do. More functional guidelines to meet both forest operations and sustainability objectives may require testing hypotheses as to the relative contribution of core as compared to transitional components of stands and how important changing boundaries might be in the long-term for emulating natural disturbances.

Problem/Issue: Recreation/Development**Title:** Impacts of Campsites, Landings and Portages on Soil, Vegetation and Wildlife Habitat**Description:** In many ecosystems, including Algonquin, the impacts of humans at campsites, landings and portages can be locally severe. Particularly at campsites, present human usage may preclude long-term sustainability of sites for recreational use and lead to permanent exclusion of some flora and fauna. In Algonquin, except for moose in spring, there is presently limited knowledge of impacts of campsites on wildlife. Research is required on development of techniques to measure human effects followed by application of the techniques to assess sites for sustainability and monitor remedial actions.**Problem/Issue:** Monitoring/Regional Global Role**Title:** Status of Neotropical Migrant Birds**Description:** There is evidence of a long-term decline of continental populations of certain Neotropical migrant passerine birds. Reasons for these evident declines are uncertain but habitat fragmentation – of forests for example – and the destruction of wintering habitat such as rainforests, are leading candidates. Large protected areas like Algonquin Park may be playing a key role in conservation of these species and in fostering the process of natural population regulation at the landscape level. The status of Neotropical migrants should be assessed in Algonquin Park in the context of the global problem and also with respect to landscape level habitat stability that is unique to places like the park.**Problem/Issue:** Atmospheric Pollution**Title:** Status of Gray Jay (*Perisoreus canadensis*) in Algonquin Park**Description:** There is a long-term and ongoing study of the behavioural ecology of the gray jay in Algonquin Park. The work has led to insight into the unique adaptive behaviour that these birds use to cope with the harsh northern winter. Recent evidence suggests that gray jays are declining in the park as they recede to core optimum habitat. There is a hypothesis that this decline reflects an influence of a warming climate on the feeding ecology of the birds. Thus the gray jay may be a sensitive indicator of a global environmental problem and an object example of the role large natural areas can serve in providing benchmarks for research and monitoring.**Problem/Issue:** Role of Nature Reserve Zones**Title:** Big Crow White Pine**Description** The White Pine Nature Reserve Zone east of Big Crow Lake was the first such zone established in Algonquin and protects one of the very few sizeable stands of old growth pine left in the park. In recent years, it has become clear that these huge pines are disappearing as a result of senescence. The stand is a biological and historic treasure. In the absence of intervention, pine will be lost from the site. A management plan, based on sound silvicultural research, is required to perpetuate the stand in a manner that best mimics natural succession.**Conclusion**

The foregoing projects have been priority ranked by applying the point values in the ranking criteria and are displayed by problem/issue category in Table 1.

Projects, such as “Genetic Diversity of Wolves”, which address a resource management issue but also relate to an issue of broader global concern are ranked highly. The ranking scheme will be used to allocate any funds the park may receive for research or to solicit proposals. The ranking is not absolute and may be viewed simply as a guide for decision making. However, project funding must not depart markedly from the ranking displayed in Table 1 without suitable justification. It also is recognized that projects could be combined. For example “Declining Neotropical Songbirds” could be assessed in terms of forest management as well as the global perspective.

Problem/Issues	Project	Points*
Introductions	Non Native Fish	20
	Galeairy watershed	20
Forest Wildlife Biodiversity	Logging versus species of concern	23-25**
	Wildlife – pristine vs. logged forest	20
	Brook trout land water interface	20
	Logging vs. natural change	20
	Logging roads	16
	stand boundaries/diversity	16
	Logging vs. features/keystone species	14
	Stream crossings	12
Monitoring	Fire model	8
	Neotropical songbirds	23
	Anuran pop. Regulation	18
	Wood turtle	18
Regional/Global Role	Rare plants	7
	Genetic diversity of wolves	23
Atmospheric Pollution	Acidification of western uplands	19
	Gray Jay populations	19
Rec./Development	Campsite impacts	10
	Nature Reserve	Big Crow Pine

Table 1: Candidate Research Projects in Order of Priority for Funding, Algonquin Park. (* points allocated according to criteria in text; ** 23 or 25 points depending on whether or not species is under COSSARO or COSEWIC)

Appendix 1: Algonquin Park Ecosystem Management Strategy

Project Team

Norm Quinn (Chair)	Algonquin Park
Peter Dawson	Algonquin Park
Dan Strickland	Algonquin Park
Dave Goodwin	Algonquin Park
Carl Corbett	Algonquin Forestry Authority
Bill Crins	South Central Region
Brian Naylor	South Central TDU
Dennis Voigt	Research
Tom Beechey	Ontario Parks

Affiliated

Brian O'Donoghue	South Central Region
Mark Ridgway	Research
Ed Addison	Research

Appendix 2: Examples of Project Ranking by Point Scheme

The following hypothetical projects will serve to illustrate how the point scheme is applied.

1) Regional/Global Role - "Status of Declining Neotropical Songbirds in Algonquin Park and the Importance of large Protected Areas"

Criteria	Points
1) Integrity	3 (composition – significant effect)*
2) Resource Issue	4
3) Social Concerns	4 (high profile – i.e., National Geographic, 1995)
4) Resource Loss	4
5) Global Role	4
6) Biodiversity	4
7) Species at Risk	0 (non-ranked)
PROJECT TOTAL	23 points

2) Atmospheric Pollution - "Effect of Soil Acidification on Regionally Rare Plants in Algonquin Park"

Criteria	Points
1) Integrity	1 (relatively minor composition)*
2) Resource Issue	4
3) Social Concerns	4
4) Resource Loss	0 (no known loss)
5) Global Role	0 (rare plants in Algonquin are not Globally rare)
6) Biodiversity	4
7) Species at Risk	0 (none recognized by COSSARO or COSEWIC)
PROJECT TOTAL	11 points

Project 1 would therefore be funded before project 2.

Note, the point scores for integrity in both cases depart from the scores recommended for each problem/issue (criterion 1 above). Regional/global role has no assigned project score but the specific project, "Status of Declining Neotropical Songbirds in Algonquin Park and the Importance of Large Protected Areas" clearly has an integrity impact, specifically one of composition. Thus it scored fairly high. Similarly, the second project "Effect of Soil Acidification on Regionally Rare Plants in Algonquin Park", although clearly an atmospheric pollution issue and thus deserving 3 points was subjectively assigned only 1 point because rare plants, by definition, are not major ecosystem players and thus any effect on integrity is small. This illustrates that the point figures assigned for criterion 1 are only meant as guides.