

ECOLOGICAL MONITORING OF ONTARIO'S PROVINCIAL PARKS AND CONSERVATION RESERVES – ECOREGION 5E PILOT

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Abstract

Across the province, Ontario Parks is responsible for the management of provincial parks and plays a role in the management of conservation reserves. Ontario Parks is accountable to the public of Ontario to manage these protected areas in an ecologically sustainable manner. There are a number of atmospheric, terrestrial, and aquatic parameters that can potentially be measured as indicators of ecological sustainability. Ontario Parks is investigating the information that can be derived from various other monitoring programs already in existence, endeavouring to build on the efforts of others rather than duplicate existing programs or develop an entire new suite of ecological indicators. Other sources of monitoring information include various branches of the Ontario Ministry of Natural Resources, other Ontario ministries, and federal government services. Ontario Parks is conducting a pilot project on ecoregion 5E, a more manageable area than the entire province, to determine what information is available, what this information reveals about provincial parks and conservation reserves in the context of the greater landscape, and what additional monitoring may be required.

Introduction

Ontario Parks has adopted a comprehensive, ecosystem-based approach to monitoring ecosystem sustainability within the system of protected areas. This monitoring approach, or framework, is based upon three inter-related components of ecosystem sustainability: ecological integrity, social well-being, and economic health.

Fundamental to this approach is our ability to identify and describe ecosystems both spatially and temporally. Ontario is a vast province, with a wide range of ecosystems including tallgrass prairies, deciduous and boreal forests, waterways and wetlands, and tundra. Ontario's ecological land classification is a hierarchical system that provides a standardised approach for classifying the provincial landscape into understandable ecological levels, and will serve as the basis for delineating and describing ecosystems.

Protected areas are not isolated from the activities occurring throughout the surrounding landscape. Comprehensive monitoring of Ontario's system of protected areas will be most effective if conducted in the context of this greater ecosystem. Thus a landscape view is appropriate for this ecological monitoring program.

Background

Objectives for Ecological Monitoring

Ontario Parks is responsible for managing the system of protected areas within Ontario. Associated with that responsibility are three major objectives for monitoring.

First, monitoring will facilitate an adaptive management approach to help Ontario Parks achieve the goals and objectives defined by the Ontario Ministry of Natural Resources (OMNR) and Ontario Parks. These goals and objectives involve various aspects of resource management, such as representation, protection, and sustainable use. Timely, accurate and relevant knowledge and information are required to enable sustainable resource management. Information and knowledge are supported through experience and research. As new information and knowledge are gained, Ontario Parks must be prepared to learn and adapt. An adaptive management approach is fundamental to ecologically sustainable management of resources.

Second, monitoring will allow the establishment of relatively undisturbed benchmarks in the system of protected areas against which conditions in the more disturbed intervening landscape can be measured. This information will help to address OMNR's ecological sustainability mandate both within protected areas and across the provincial landscape.

Third, Ontario Parks is accountable to the people of Ontario and its various partners and stakeholders to demonstrate that the protected areas system is being managed in an ecologically sustainable manner. Reporting on the status of the protected areas system may best be accomplished through a *State of the Resources* report. Such a report requires supporting data and information collected in a consistent manner over time. A monitoring program would support a *State of the Resources Reporting* system for Ontario Parks.

In addition, data and information resulting from Ontario Parks' monitoring activities will contribute to other monitoring initiatives at local, provincial, national and global scales. We are actively seeking partnerships with other initiatives.

Hierarchical Monitoring Framework

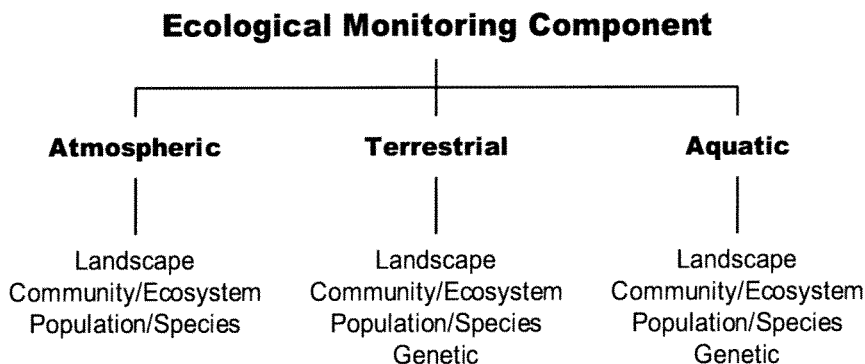
A comprehensive monitoring framework provides an organizational context through a hierarchical approach. This approach is based on two fundamental concepts. The first recognises three primary attributes of ecosystems: composition, structure and function. Together, the composition, structure and function of a particular area constitute its biodiversity. Composition refers to the various elements of an area, structure involves the physical pattern or organisation of those elements, and function refers to ecological and evolutionary processes that occur.

The second concept is that higher levels of organization incorporate and constrain the behaviour of lower levels. In other words, events at a provincial scale have impacts down to the local level, while individual local events may not be felt provincially.

While the monitoring framework includes three components – ecological, social and eco-

nomie – the ecological component is further divided into three sub-components: atmospheric, terrestrial and aquatic. Each of these sub-components is in turn divided into as many as four categories: landscape, community/ecosystem, population/species, and genetic (Figure 1). Within each category, a number of ecological indicators or parameters may be measured.

Figure 1. Hierarchical structure of the ecological component of Ontario Parks' ecosystem-based monitoring framework.



Ecological Sub-components

The atmospheric, terrestrial, and aquatic sub-components are integrally linked to one another, and each influence the others in various ways. These sub-components are also connected to and influence the other monitoring components (social well-being and economic health).

Atmospheric monitoring includes airborne pollutants, climate change, and weather occurrences. Although these conditions are measured atmospherically, responses to these conditions may be measured atmospherically, terrestrially and/or aquatically. Monitoring of lichen growth to reflect air quality is one example of a terrestrial response.

The primary focus of terrestrial monitoring is terrestrial responses to land-based activities. A secondary focus is obvious aquatic responses to these activities. For example, runoff from contaminated sites may seep into groundwater or adjacent stream channels, with deleterious effect to both human health and aquatic ecosystems.

Aquatic monitoring includes activities occurring either aquatically or terrestrially. The primary focus of monitoring is aquatic responses. A secondary focus of terrestrial responses from aquatic activities. The loss of riparian habitat due to persistent low water levels would be an example.

Ecological Categories – Composition, Structure and Function

The atmospheric, terrestrial, and aquatic sub-components are themselves broken down into perspectives of landscapes, communities/ecosystems, populations/species, and genet-

ics relating to compositional, structural and functional features. Within each category there are a number of ecological indicators and/or parameters that could be monitored.

Landscape structural features and functions operate across all other ecological scales. Communities/ecosystems are organisational units within landscapes that are characterised by abiotic (soil, temperature, moisture) and biotic (plants, resident/transient animals) features. Populations/species are component parts of ecosystems. The status of a particular species population affects other species and the overall condition of the ecosystem.

Genetic features define the characteristic of individuals within a population. The accumulated expression of genes spatially and temporally is a critical element of long-term evolution, affecting the health of entire populations and the condition of the ecosystem as a whole.

Ecological Indicators

Ecological indicators are selected to provide information on a particular aspect of the ecosystem that represents a response by the ecosystem to a specific stress. The selection of indicators requires knowledge of the management objectives, the stress, and the possible impact of the stress on the ecosystem. However, it must be recognised that the measured indicators will not necessarily be exclusive to any one sub-component and that there are important linkages among the three sub-components and to social well-being and economic health.

Ecoregion 5E Pilot Study

Ontario Parks has embarked on a pilot study to investigate the implementation of this ecosystem-based approach to monitoring.

Why a pilot study?

With Ontario being such a large and diverse landbase, it was decided to begin with a more manageable portion of the province. Using Ontario's ecological land classification system as a basis, an ecoregion was determined to be a more manageable, yet still significant and meaningful, area.

Provincial parks and conservation reserves are not isolated from the remaining landscape. Ontario Parks is just one of a number of players on the landscape, each of which has complementary and possibly overlapping data needs. Rather than develop an entirely new monitoring program, Ontario Parks is investigating the activities of those other players to determine what information is being collected and how it can be used for Ontario Parks' monitoring purposes.

There are a large number of ecological parameters and indicators that could be measured. The goal is to work co-operatively with partners, sharing activities, sites, and data whenever possible. This is more cost-efficient, and enables a sharing of expertise and experi-

ence. Ontario Parks needs to be positioned as one of the partners on the Ontario landscape. Ultimately, suitable data collected through monitoring initiatives from a number of partners on the Ontario landscape will be used for *State of the Resources Reporting* by Ontario Parks.

Objectives

Four major objectives are defined for the pilot study in Ecoregion 5E:

1. to determine the availability and accessibility of ecological monitoring data-essentially, who is collecting what data, and when, where, why and how is that data being collected and how accessible is that data to Ontario Parks;
2. to determine the data/information gaps and needs, based on that knowledge-will this information suit the needs of Ontario Parks? Spatially, there may be gaps in some data collection networks - there may also be gaps in the type of data or information being collected;
3. to develop a template for State of the Resource Reporting for Ontario Parks - that is, what can and should we be reporting on to meet Ontario Parks' obligations; and,
4. to determine resource requirements for state of the resources reporting on an ecoregional basis-this will allow us to identify the costs and financial feasibility of monitoring and reporting on the state of resources for the provincially.

Why choose Ecoregion 5E?

We chose Ecoregion 5E, the Georgian Bay Ecoregion, for this pilot project for a number of reasons. This ecoregion is fairly central in the province. It overlaps four of the six administrative zones of Ontario Parks, and two of the three administrative regions of OMNR. Ecoregion 5E includes a mix of Crown and patent land, with a gradient from more patent land in the south to more Crown land in the north. This provides an opportunity to experience the issues associated with both types of land tenure. Although predominantly Great Lakes-St. Lawrence forest, 5E has examples of transitional and boreal forest types. Vegetation and land cover data are available from both Forest Resource Inventory (FRI) and Landcover 28 coverages. A wealth of information currently exists from a variety of sources, partly because of the high human use of the area (recreation, industry, etc.). And finally, there are a number of other ongoing studies, including a social and economic benefit study being conducted by Ontario Parks on Ontario Living Legacy (OMNR, 1999) signature sites within 5E.

Ecoregions north and south of 5E have very different characteristics from those of 5E that will pose various challenges. For example, only 45% of Ontario's area is within the Area of the Undertaking for timber management. This limits the amount of vegetation information that will be available from detailed FRI, and places more reliance on Landsat-derived Landcover28 data. Ecoregions to the north have some data limitations related to the lower level of environmental monitoring. This likely results from the remoteness of portions of the area and the lower human population densities.

Data Sources

There are a number of players collecting terrestrial, aquatic and atmospheric information on the Ontario landscape. Some of the sources of information we have compiled to date for ecoregion 5E are presented in Table 1.

Table 1. Examples of types and sources of environmental information being collected in Ontario Parks.

DATA TYPE	SOURCE ¹
Terrestrial	
Classified Landsat Imagery (Landcover28)	OMNR
Forest Resource Inventory (FRI)	OMNR
Forest Growth and Yield Plots	OMNR - Growth and Yield Program
Forest Health Plots	OMNR; Canadian Forest Service
Ecological Land Classification Plots	OMNR - Ecological Land Classification Program
Central Ontario Forest Ecosystem Classification	OMNR - Growth and Yield Program
Wildlife Assessment Plots	OMNR - Wildlife Assessment Program
Forest Bird Monitoring Plots	OMNR; Canadian Wildlife Service
Population/Harvest Statistics for Game Mammals	OMNR - Wildlife Section
Population/Harvest Statistics for Furbearers	OMNR - Wildlife Section
Forest Harvest/Regeneration	OMNR - Forest Management Branch
Forest Insect/Disease Damage	OMNR - Forest Management Branch
Forest Fires	OMNR - Aviation, Flood and Fire
Wind Damage	OMNR
Roads	OMNR
Human Population	Statistics Canada
Aquatic	
Lake Survey Data (1960's - 1980's)	OMNR - Fisheries Section
Water Quality - abiotic/microbiotic	
Drinking and swimming water	OMNR - Ontario Parks; MOE
General Water Quality	MOE
Water Quality - macrobiotic	
Lake Partners Program	MOE
Ontario Benthos Monitoring Network	MOE
Guide to Eating Ontario Sportfish	MOE
Fish Communities/Population Status	OMNR - Fisheries Section
Second-order Watersheds	OMNR - Geomatics Service Centre

¹EMAN - Ecological Monitoring and Assessment Network; MOE - Ontario Ministry of the Environment; OMNR - Ontario Ministry of Natural Resources; WRIP - Water Resources Information Project.

Activities

A number of steps are required to accomplish this task. The first is to collect any and all relevant data and compile this data into a functional GIS database. Baseline analysis will be conducted on this existing data – essentially, in most cases, this is time zero for future reference. When historical data permits, we will also attempt to paint the picture from the past to the present. We will look for gaps in the existing datasets to identify areas with insufficient coverage and what is not being monitored that should be monitored? Finally, we will identify resource requirements for this work, in terms of staff, equipment, agreements and time schedules, and how this translates into needs at the provincial scale.

This pilot study will yield products with implications for partnerships with others on the provincial landscape (and beyond), state of the resource reporting for Ontario Parks and OMNR and enhanced information and knowledge concerning individual protected areas and the intervening landscape.

The analysis will result in the establishment of benchmark values for protected areas and for comparison with the intervening, managed landscape. Furthermore, data and information needs will be identified. Ontario Parks will have developed a template for state of the resources reporting, a monitoring strategy and knowledge of the resource requirements to achieve such reporting at a provincial scale.

Co-operation with others managing and monitoring the Ontario landscape and integration of data collection and analysis with these others will result in greater efficiencies for all involved. Park superintendents and other staff will have access to better information about individual protected areas, and Ontario Parks will be well positioned to embark on state of the resource reporting for provincial parks and conservation reserves.

References

Ontario Ministry of Natural Resources (OMNR). 1999. *Ontario's Living Legacy: Land Use Strategy*. Queen's Printer for Ontario: Toronto, ON. 136 pp.