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Canada

Gatineau Park
Ecosystem Conservation Plan

February 2010

DDM Del Degan, Massé Experts-conseils

GATINEAU PARK
ECOSYSTEM CONSERVATION PLAN

Presented to the

NATIONAL CAPITAL COMMISSION

Prepared by

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February 2010

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EXECUTIVE SUMMARY

The Ecosystem Conservation Plan is a planning tool that fits into the National Capital Commission's planning hierarchy immediately below the Gatineau Park Master Plan (NCC, 2005c), which itself follows on from the Plan for Canada's Capital (NCC, 1999a). The Ecosystem Conservation Plan presents goals and objectives for the conservation and protection of natural spaces, and as such influences other strategic documents such as the Interpretation Plan, the Green Transportation Plan, the Heritage Conservation Plan and the Recreational Service Supply Plan.

The Ecosystem Conservation Plan is required because the ecological integrity of Gatineau Park's natural environments has visibly deteriorated over the years, resulting in a number of conservation problems which the Park must now address. The conservation issues identified are:

- Protecting biodiversity
- Protecting species at risk
- Limiting habitat fragmentation
- Protecting the ecological continuity zone
- Limiting pressures from human activities and their impacts
- Acquiring and updating the knowledge required for an ecosystemic management approach geared towards ecological integrity.

An assessment found that the health of Gatineau Park's ecosystems is generally acceptable at the present time, but will tend to deteriorate if appropriate management measures are not taken. In particular, the Park's aquatic and wetland environments, along with certain valued ecosystems, are facing the greatest risk of deterioration.

In response, a Conservation Vision was drawn up to provide guidelines for conservation actions between now and 2035. The aim of the Vision, which is based on the conservation issues, is to preserve the ecological integrity of the Park's ecosystems and conserve the exceptional character of many of the Park's components. The methods used to achieve this will include participatory management and innovative management approaches. The Vision is supported by a number of principles and orientations that serve as guidelines for the conservation approach, including the precautionary principle and adaptive management.

Six conservation priorities are proposed as a means of achieving the orientations identified in the vision:

- Reduce the impacts of pressure on ecosystems
- Maintain or restore the natural processes and balances needed for ecosystems to function properly
- Maintain or restore diversity of indigenous animal and plant species
- Increase habitat availability, quality and connectivity
- Conserve or restore the Park's valued ecosystems
- Minimize the impacts of recreational activities on the ecological integrity of the Park and raise public awareness of conservation issues

The conservation priorities form the basis for the plan of action. They are used to target management actions and describe the tools needed to carry out those actions.

The plan of action applies at three different levels, namely the greater ecosystem, the regional ecosystem and the Park's own ecosystems. Each level presents its own conservation problems, and the Plan proposes a number of conservation actions to address those problems.

The principal conservation actions involve:

- Expanding knowledge of the ecological corridors identified around the Park;
- Fostering a watershed-based approach to water management;
- Expanding knowledge of species at risk;
- Developing a management strategy for invasive species;
- Reducing ecosystem fragmentation (e.g. by eliminating unofficial trails);
- Reducing the impacts of recreational activities on the ecological integrity of the Park's ecosystems.

A digital analysis of sensitive components and components of interest in the Park's ecosystems led to the identification of areas of significant ecological value. These findings were used to define five valued ecosystems, namely the Eardley Escarpment, Eardley Plateau, La Pêche Lake, the Three-Lake Chain and Pink Lake Plateau. In additional to being unique and exceptional, these ecosystems are also fragile, and are therefore considered to be priorities for the implementation of conservation actions. Because of their poor condition, restoration plans will also be prepared for the Eardley Escarpment, the Three-Lake Chain and La Pêche Lake.

To support the conservation actions, the Plan also provides for a strategy aimed at reducing stress factors. Five priority objectives have been set, based on the information currently available:

- Minimize the spread of invasive species and prevent new intrusions
- Mitigate the effects of excessive grazing by white-tailed deer
- Monitor and control visitor numbers and use of the Park
- Limit or prohibit certain recreational activities that are detrimental to ecosystem integrity
- Reduce the impacts of human development

A digital analysis was used to locate and map the sectors most affected by stress factors. Together, the map and priority objectives will be used to guide the stress reduction strategy and target an acceptable level of pressure for each individual ecosystem, based on its fragility and health.

The Plan proposes a monitoring program that will be used to assess the effectiveness of the proposed conservation measures. The program uses a number of indicators, most of which have previously been applied in Gatineau Park. The monitoring program will therefore allow for the inclusion of various monitoring activities already taking place in the Park. The performance of the conservation approach between now and 2035 will be assessed by measuring the selected indicators at different intervals.

The Plan presents a number of proposed communication measures to support the conservation approach. These measures, which target visitors, associations and the scientific community, will help strengthen the involvement of all these parties through partnerships, with a view to supporting the conservation actions.

A number of management decisions are required to implement the Gatineau Park Ecosystem Conservation Plan, and some of these decisions will have repercussions on other planning documents, including the Master Plan. Six minor disparities between the Park's current zoning system and the conservation proposals in the Ecosystem Conservation plan are identified.

The Gatineau Park Ecosystem Conservation Plan takes a cautious, holistic approach and draws on current major trends in the management of protected areas, both in Canada and abroad. It is essential that the Plan be implemented, and the NCC will invest its energies in this task for the benefit of present and future generations of Canadians.

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INTRODUCTION

The mandate of the National Capital Commission (NCC) is to build Canada's capital into a source of pride for all Canadians, a meeting place, a source of learning about Canada, and a site for the preservation of the nation's heritage.

In May 2005, the NCC approved the Gatineau Park Master Plan (NCC, 2005c), which establishes the vision, strategic orientations, desired actions and objectives for Park management, development and use in the coming decades (NCC, 2005c). The Master Plan is based on the principal issues and concerns affecting the Park, and establishes a number of strategic objectives that reflect current trends in the management of nationally significant protected areas. Of all the proposals contained in the Master Plan, that relating to the preparation of a Ecosystem Conservation Plan was given highest priority, as a means of protecting the integrity of the Park's components and significant natural environments.

The Gatineau Park Ecosystem Conservation Plan is a strategic action plan designed to guide natural environment management and protection strategies and implement the main orientations regarding the natural environment set out in the Gatineau Park Master Plan (NCC, 2005c). It will enable the NCC to play its role of protecting the diversity, integrity and sustainability of the Park's ecosystems.

The Ecosystem Conservation Plan was produced in three stages:

- Evaluation of Park ecosystem health (DDM, 2006a);
- Gatineau Park Conservation Vision Statement (DDM, 2006b);
- Preparation of the Ecosystem Conservation Plan itself, with a statement of conservation and restoration measures and the introduction of a program to monitor the proposed actions.

The first part of this document describes the Park and presents the context in which the Ecosystem Conservation Plan was drawn up. The section on the frame of reference explains how the Park functions at different levels within its environmental context. The problems inherent in preserving the Park's ecosystems are identified, and the conservation vision is then introduced. This is followed, in the second part, by a description of ecosystem conservation priorities and a plan of action that proposes a number of conservation objectives, strategies and measures, along with a restoration strategy. Implementation and monitoring programs are presented in the third part, which also examines the impact of the Ecosystem Conservation Plan on Park zoning.

PART I :
CONTEXT OF ECOSYSTEM THE CONSERVATION PLAN

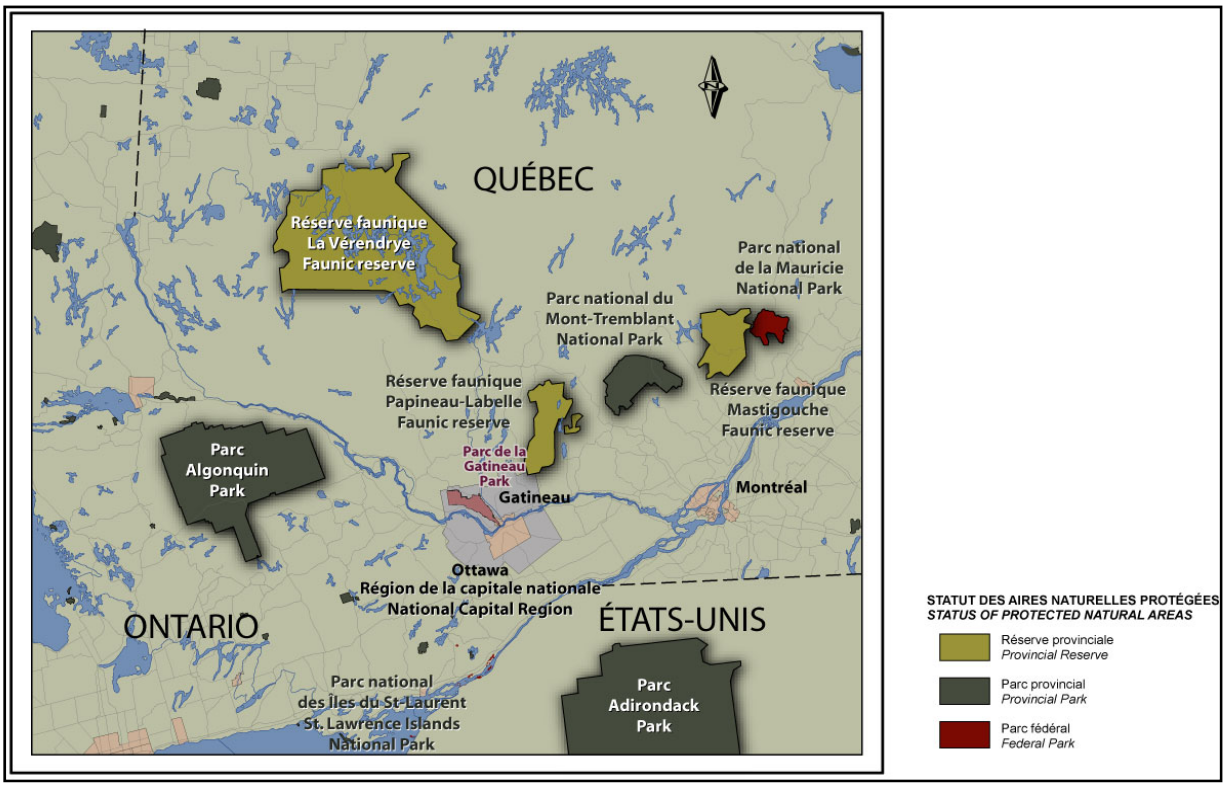
1. CONTEXT AND ORIENTATIONS

The Gatineau Park Ecosystem Conservation Plan is a planning document approved by the NCC's Board of Directors. It sets out the principles, orientations and conservation vision underlying the statement of conservation and restoration actions. In the NCC planning hierarchy, it fits immediately below the Gatineau Park Master Plan (NCC, 2005c), which itself follows on from the Plan for Canada's Capital (NCC, 1999a). In addition, the Gatineau Park Ecosystem Conservation Plan addresses conservation problems existing both within the Parks boundaries as well as in the area of influence in which the Park is located.

1.1 SETTING OF THE PARK

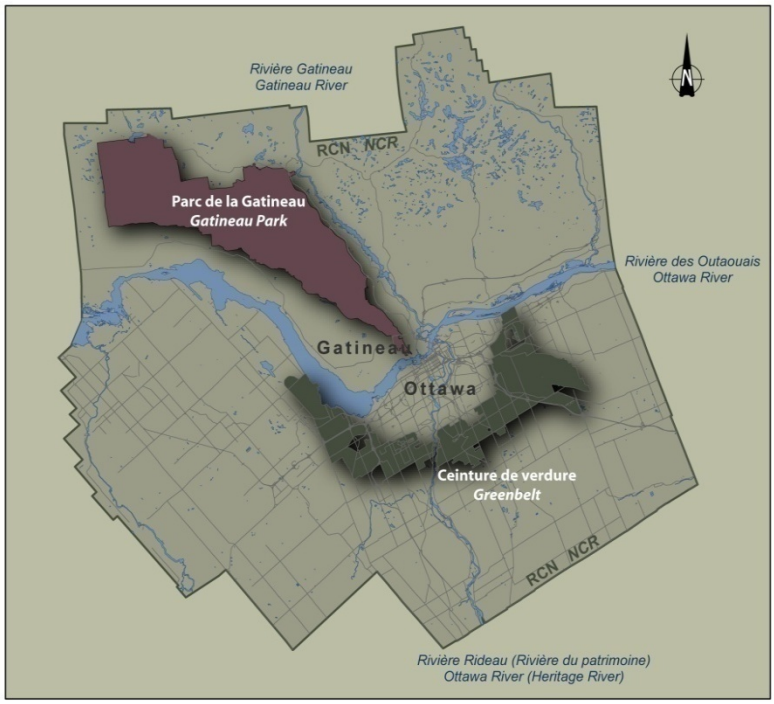
Gatineau Park is located in Eastern Canada, in the National Capital Region (NCR), at the extreme south-west of the Province of Québec. Other significant protected natural areas located within 150 km of the Capital include the Adirondak Park in New York State, Algonquin Park in Ontario, the St. Lawrence Islands National Park and the La Vérendrye and Papineau-Labelle Wildlife Reserves in Québec (see Figure 1).

FIGURE 1
GEOGRAPHICAL CONTEXT OF GATINEAU PARK



More specifically, the Park extends over a distance of 50 kilometres between the Ottawa and Gatineau Rivers, to the north-west of the Gatineau-Ottawa urban conglomeration, as shown in Figure 2. It covers a total area of 36,131 hectares and accounts for 7.7% of the National Capital Region's total area.

FIGURE 2
GATINEAU PARK IN THE NCR



1.2 REGIONAL CONTEXT

In the context of Québec and Ontario, the NCR is located on the north-western edge of the Québec-Windsor urban corridor. It is approximately 200 km from Greater Montreal, which is Québec's most densely-populated region, and is Canada's fourth-largest agglomeration with a population of more than one million. Three-quarters of the Park borders onto rural environments, mainly farmland, while its southernmost portion extends into the urbanized areas of the City of Gatineau. This latter feature sets Gatineau Park apart from the National Parks as well as other natural areas in Eastern Canada.

Human use over a period of more than 200 years has had a significant impact on the regional landscape mosaic. The Park is located in a highly fragmented regional landscape.

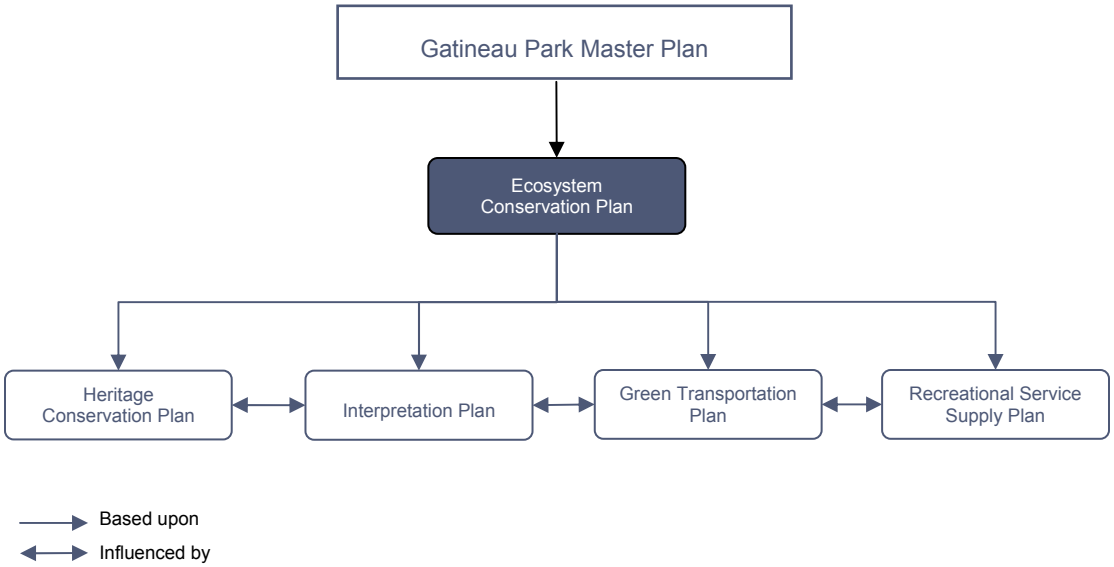
1.3 MASTER PLAN

The Gatineau Park Ecosystem Conservation Plan was initiated as a result of recommendations made in the Gatineau Park Master Plan (NCC, 2005c). In fact, it is the first management plan to be developed in the wake of the Master Plan and is intended to help guide the development of the other park management plans.

The Master Plan is a strategic tool that forms part of an overall planning framework headed by the Plan for Canada's Capital (NCC, 1999a) (see Figure 3) and that was originally designed to serve as a basis for the preparation of other, more detailed plans. It describes the Park's mission as welcoming Canadians and other visitors, and allowing them to discover Canada's natural environment, visit sites that bear witness to the country's history, and engage in outdoor activities. The Park's management vision for the coming decades focuses on the conservation of natural and cultural environments. Gatineau Park will therefore be aprotected natural area managed primarily with a view to conservation, and then secondarily for recreational purposes. The Ecosystem Conservation Plan is one of the instruments introduced to implement the Master Plan. It will be followed by four other management documents, also forming part of the implementation process, which will structure the programs, projects and other detailed proposals from the Master Plan. Figure 4 shows the relationship between the Master Plan and the various management instruments.

FIGURE 3
NCC PLANNING HIERARCHY

FIGURE 4
POSITIONING OF THE ECOSYSTEM CONSERVATION PLAN



Gatineau Park is defined as “the Capital’s Conservation Park”. This vision guarantees the presence of a conservation park in the National Capital Region, for the benefit of all Canadians and future generations.

The following priority orientations flow from the Park’s mission:

- To preserve and develop the Park’s unique natural and cultural heritage;
- To offer high quality recreational experiences that are respectful of the natural environment;
- To inspire all Canadians, Capital visitors and residents to respect conservation values.

The Park has five principal functions:

- A “conservation” function, involving the protective stewardship and restoration of natural ecosystems in order to preserve natural environments within the National Capital that are representative of the country as a whole.

- A “recreation and ecotourism” function, which involves offering a range of quality attractions and activities, and a demonstration of the close and respectful relationship that exists between Canadians and their natural environment.
- A “heritage and culture” function that bears witness to the builders, inhabitants, history and cultural environment of both the country and the region.
- A “political” function, expressed through the Park’s national dimension, Canada’s environmental commitments and the sites at which political functions are carried out.
- A “communication” function, through which Canadians and other visitors are informed, by means of reception, interpretation and promotion, of the NCC’s achievements and leadership in the areas of conservation, outdoor recreation, ecotourism and cultural heritage, and of Canada’s commitment to environmental protection.

The NCC intends to devise a realistic conservation strategy for the Park that is consistent with current trends in natural park management. It is difficult to guarantee intrinsic conservation of the entire Park because of the presence of external global factors such as acid rain, air pollution and global warming. However, every available action must be taken to preserve, and where necessary restore, the Park’s significant ecosystems and environments.

2. FRAME OF REFERENCE

The frame of reference sets out Gatineau Park's basic features, and describes its influence and ecology. In other words, it defines the components that characterize the Park.

2.1 RECIPROCAL INFLUENCES BETWEEN THE PARK AND ITS REGION

2.1.1 THE PARK'S ROLE IN ITS REGION

The NCC, and Gatineau Park in particular, plays a significant role in the effort to maintain biodiversity and ecosystem quality in the broader natural region. As a conservation area, the Park fulfills a number of important ecological and scientific functions.

Ecological roles:

- Preservation of ecological processes that maintain functional representative examples of regional ecosystems.
- Preservation of local and regional community and species biodiversity, including species at risk[1].
- Contribution to the preservation of genetic variability at regional scale and within individual species.
- Provides for the reproduction and dispersal to adjacent areas for several species, especially those with large home ranges.

Scientific Roles:

- Reference area used to improve scientific knowledge of the composition, structures and functions of natural ecosystems.
- Ecological monitoring area bearing witness to the natural region and ecozone in which it is located, offering an opportunity to monitor the development and measure the natural state of ecosystems subjected to stress factors.
- Protection and development of rare and exceptional features specific to and characteristic of the region.

Researchers from various universities, federal and provincial government departments and other institutions have carried out scientific research projects in Gatineau Park.

The Park, through its contribution, plays a major role in maintaining a natural area that provides benefits for the well-being and quality of life of the surrounding residents.

2.1.2 ECOLOGICAL CONNECTIVITY WITH NEIGHBOURING AREAS

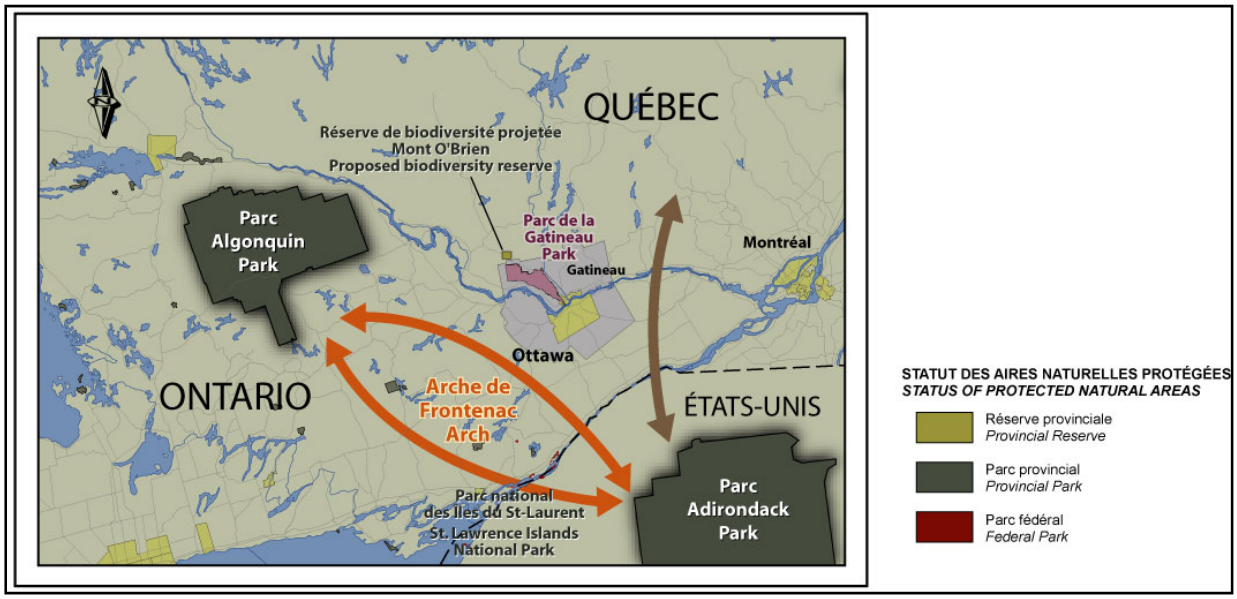
Gatineau Park's vast natural territory forms the central element of a network of natural areas. To understand the ecosystemic impact of Gatineau Park and the surrounding areas, they must be examined at four different levels, namely the greater ecosystem in which the Park is situated (> 100,000 km^2), the Park as an element of its region (5,000 à 15,000 km^2), the Park itself, through its basic bio-physical components (50 à 1,000 km^2) and the individual ecosystems and communities (< 20 km^2). The Ecosystem Conservation Plan is therefore not limited to the ecosystems within the Park's boundaries, but must also encompasses the greater and regional ecosystems as well.

[1] The term "species at risk" used in this report refers to the plant and animal species with special status at the federal (Species at Risk Act) and provincial (Québec's Act respecting threatened or vulnerable species (Loi sur les espèces menacées ou vulnérables)) levels. It also includes the species on the COSEWIC list and the provincial list of species likely to be designated as threatened or vulnerable

GREATER ECOSYSTEM

Gatineau Park contains a representative sample of the wealth and diversity of the interface between the Lower Laurentians region of the Canadian Shield and the St. Lawrence Lowlands. It is located at the junction of the Canadian Shield's "South Laurentians" ecoregion and the Mixed Forest Plain's "Lower St. Lawrence" ecoregion (Ecological Stratification Working Group, 1995). It is situated near the Frontenac Arch Biosphere Reserve, which forms a bridge for species migration between Ontario and the United States (see Figure 5). The region is Canada's richest in terms of biodiversity, and Gatineau Park clearly benefits from its influence. As a result, the Park has inherited an extremely rich set of ecosystems. This broad framework of ecological interactions, exchanges and species migration has defined Gatineau Park's relationship with its natural areas, and constitutes the greater ecosystem in which the Park is situated (more than 100,000 km^2).

FIGURE 5
ECOLOGICAL CONTEXT OF GATINEAU PARK



REGIONAL ECOSYSTEM

Gatineau Park also lies within a regional ecosystem (5,000 to 15,000 km^2) which corresponds in general terms to the National Capital Region (NCR). It shares this regional ecosystem with the Greenbelt located south of the City of Ottawa and the Gatineau and Ottawa Rivers, both of which are significant elements of the natural landscape.

THE PARK'S ECOSYSTEMS

Gatineau Park contains a number of rich and diverse ecosystems (50 to 1,000 km^2) representative of the ecological regions within or adjacent to its boundaries, as well as some rare and exceptional natural components. Figure 6 shows most of the ecological components present in the Park at the time this Plan was prepared. These features provide ample justification for its status as an extraordinary conservation area forming part of Canada's natural heritage (NCC, 2005c). It is important to note that this map will evolve as new information is gathered on the Park's natural components.

The Park's natural wealth is also enhanced by the proximity of other natural spaces.

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COMPOSANTES ÉCOLOGIQUES DU PARC DE LA GATINEAU
GATINEAU PARK ECOLOGICAL COMPONENTS

Source

Information géographique de référence provenant des bases de données de la Commission de la capitale nationale et de Del Degan, Massé.

Geographic information provided by National Capital Commission and Del Degan, Massé databases.

km 0 0,5 1 2 3 4 5 km

MTM, NAD 83, Fuseau 9
MTM, NAD 83, Zone 9

FIGURE 6

Février 2010
February 2010

DDM Del Degan, Massé Experts-conseils

Flore / *Flora*

- Flore en péril / *Flora at Risk*
- Genévrier de Virginie / *Eastern Red Cedar*

Faune / *Fauna*

- Faune en péril / *Fauna at Risk*
- Poisson en péril / *Fish at Risk*
- Héronnière active / *Active heronry*
- Observation de plongeon huard / *Observation of Common Loon*
- Frayère / *Spawning*
- Héronnière (zone tampon) / *Heronry (buffer zones)*
- Ravage de cerfs (1998) / *Ravage of deers (1998)*

Habitats potentiels / *Potential Habitats*

- Petit Blongios / *Least Bittern*
- Pie-Grièche migratrice / *Loggerhead Shrike*

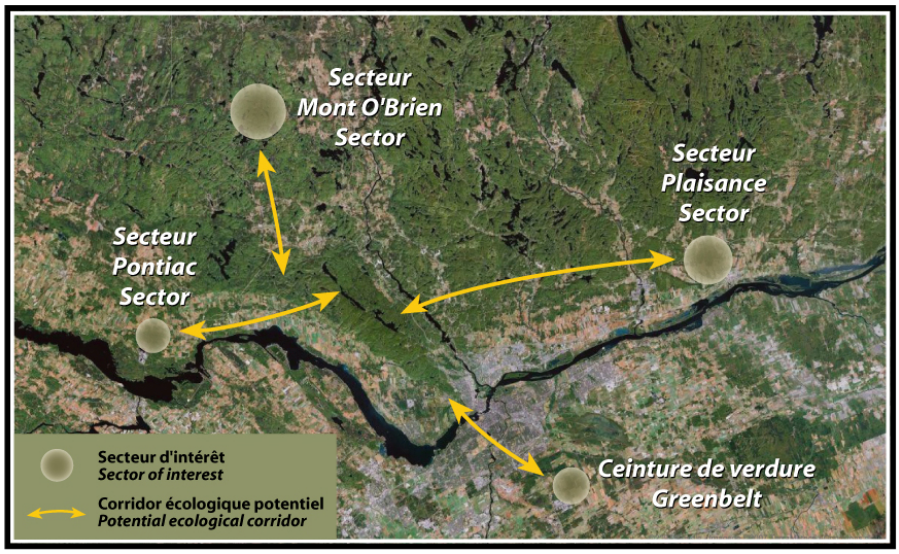
Écosystèmes / *Ecosystems*

- Île / *Island*
- Lac d'intérêt / *Lake of interest*
- Milieu humide / *Wetland*
- Tourbière / *Peat bog*
- Dénudé sec / *Dry area*
- Forêt ancienne / *Old-growth forest*
- Escarpement d'Eardley / *Eardley escarpment*
- Écosystème forestier exceptionnel (EFE) / *Exceptional forest ecosystem*
- Forêt d'importance / *Significant forest*

LAC-DES-LOUPS
SAINT-LOUIS DE-MASHAM
SAINT-FRANÇOIS DE-MASHAM
SAINTE-CÉCILE DE-MASHAM
WAKEFIELD
LUSKVILLE
GATINEAU
OTTAWA
QUÉBEC
ONTARIO
Rivière des Outaouais
Gatineau

Figure 7, taken from a satellite image, shows how the Park fits into its regional environment and the sectors of interest connected to the Park via ecological corridors. The Plaisance sector includes the Plaisance National Park (Québec), which is home to a large number of resident and migratory species. The Pontiac sector contains numerous wetlands that are home to several species of interest. The Greenbelt includes several natural areas and provides a green corridor that allows wildlife to migrate to the southern portion of the area. Lastly, the Mont O'Brien area acts as a sanctuary for plants and wildlife due to the size and diversity of its natural habitats.

FIGURE 7
LOCATION OF THE REGIONAL ECOSYSTEM OF GATINEAU PARK



2.2 ECOLOGICAL FRAMEWORK

Gatineau Park is situated in a climate zone characterized by hot summers and cold, snowy winters (Environment Canada, 1989). With its southerly location, it enjoys a milder climate than other regions of southern Québec.

In geological terms, the Park forms part of the Grenville Province, one of the seven geologic provinces or structural entities forming the Canadian Shield. This Province is composed partly of metamorphosed rocks, of which the Gatineau Hills constitute the most obvious example.

The Park of today reflects these influences, which have helped shape its landscape. At the heart of the Park is an undulating plateau (the Eardley Plateau), with altitudes varying from 230 m to 320 m. The plateau is bounded to the south-west by an escarpment (the Eardley Escarpment) that runs along a series of faults and constitutes the interface between the Canadian Shield and the St. Lawrence Plain. The plateau slopes north-eastwards, and is divided along its centre by the valley of Philippe, Mousseau and Meech Lakes.

Further north on the plateau are a number of rounded hills (the Gatineau Hills), and to the north-west lies a depression containing the Park's largest body of water, La Pêche Lake.

The Park's bedrock, topography and surficial deposits shape the drainage pattern and influence the distribution of dependent vegetation and wildlife.

Gatineau Park's forest ecosystem is dominated by a mosaic of mixed and hardwood stands that are representative of the Great Lakes/St. Lawrence Forest Region. The mosaic belongs to the sugar maple-basswood (*Tilia americana*) bioclimatic domain, which covers 82% of the Park's area (294.73 km^2) and forms the dominant framework for all the other ecosystems. There are relatively few openings in the forest cover, namely La Pêche Lake, the Philippe-Mousseau-Meech chain of lakes, the Lac des Fées sector, the farmland (mostly near the Park boundaries), energy transmission corridors and road right of ways.

Some of the forest areas or stands in the Park also have a very high conservation value. The red oak-white oak (*Quercus rubra-Quercus alba*) stands, red oak-red cedar (*Juniperus virginiana*) stands and sugar maple-bitternut hickory (*Carya cordiformis*) stands are among the rarest types of plant communities in Québec and the Ottawa Valley. The upland white pine-black maple (*Acer nigrum*) the cedar-red maple stands (*Acer rubrum*) and hemlock-red maple (*Acer rubrum*) stands, and a jack pine (*Pinus banksiana*) stand, are also among the Parks more remarkable[1] forests, being extremely rare both locally and regionally.

The Park's profile and the broad variety of ecosystems are also conducive to the presence of many species. Indeed, the diversity of species in the Park, in each of the following categories, is far greater than elsewhere in Québec:

- More than 1,600 plant species (DDM, 2005a – updated in 2008);
- 54 mammal species (DDM, 2005a – updated in 2008), including some characterized by large home ranges and dense forest habitat, as well as some large carnivores and ten species specific to aquatic environments;
- 232 bird species (DDM, 2005a – updated in 2008) have been observed so far in the Park, representing approximately 80% of the species surveyed in the Outaouais Region and 60% of those known to be present in Québec as a whole (Environnement Québec, 1996 in DDM, 2002);
- 17 amphibian species and 11 reptile species (DDM, 2005a – updated in 2008), accounting for approximately 78% of all the species in this group already identified in the greater Outaouais region (DDM, 2002);
- More than 50 fish species, divided into 13 families, have been identified so far in the Park's waters (DDM, 2005a – updated in 2008). Stenotherm (cold water) species populations are scarce, and some have nearly disappeared.

Of all the species identified, 133 are classified as endangered (NCC, 2008 list).

2.2.1 THE PARK'S ECOSYSTEMS

The Park hosts a range of natural ecosystems divided into three principal physiographic zones, namely:

- The Gatineau Hills, which include hardwood forests dominated by sugar maple, beech and oak stands, along with varying percentages of eastern white pine (*Pinus strobus*);
- The Eardley Escarpment, with its hot, dry microclimate conducive to rare southerly plant species (e.g. white oak);
- The Eardley Plateau, a large area with little topographic variation and a cool, damp climate, located in the heart of the Park and containing mixed boreal forests along with a concentration of wetlands, swamps and bogs.

Five valued ecosystems and two valued habitats have been identified within Gatineau Park's ecosystems and physiographic zones (DDM, 2007):

- La Pêche Lake (ecosystem);
- Eardley Plateau (ecosystem);
- Eardley Escarpment (ecosystem);
- Pink Lake Plateau (ecosystem);
- Three-Lake Chain[2] (ecosystem);
- Folly Bog (habitat);
- Lac des Fées (habitat).

[1] Similar to the MRNF's EFEs (exceptional forest ecosystems), the region's remarkable forests include remnant forests, old-growth forests and rare forests that are either in the process of being classified, or cannot easily be classified due to their small size or limited number of key species.

[2] In the 2007 study, the Meech Lake and Philippe Lake ecosystems were addressed separately. Since then, however, the boundaries of these ecosystems have been revised and they have been grouped together to form the Meech, Philippe and Mousseau Lake drainage basin, and hence the "Three-Lake Chain" valued ecosystem.

La Pêche Lake

The La Pêche Lake valued ecosystem is characterized by its shoals and swamps, a large number of secondary waterbodies, its variable relief and forest stands that provide a broad range of natural habitats for mammals and birds among others. During the summer, La Pêche Lake is used for swimming, small watercraft and wilderness camping. The swamps and islands attract several species of birds (migration and nesting), including waterfowl, herons (*Ardea sp.*) and the common loon (*Gavia immer*). The least bittern (*Ixobrychus exilis*), an endangered bird species, has been observed to nest at La Pêche Lake, and a white sucker (*Catostomus commersoni*) spawning ground has also been identified. The presence of the Gatineau tadpole snail (*Physella parkeri latchfordi*) has been mentioned on a number of occasions in the last 20 years.

Eardley Plateau

The Eardley Plateau includes some extensive wetlands that are highly conducive to wildlife. It is dominated by maple forests. This portion of the Park is used extensively by hikers, skiers, cyclists and cars. Its vegetation includes stands with both northerly and southerly characteristics. The sector was severely damaged by the 1998 ice storm. A white-tailed deer (*Odocoileus virginianus*) winter yard is also found in this sector.

Eardley Escarpment

The Eardley Escarpment is Gatineau Park's richest and most fragile natural environment. It comprises a south-south-west-facing cliff approximately 300 m high, and has a hot, dry microclimate that is extremely unusual for the region. The combination of this microclimate and the steep slopes means that the Eardley Escarpment is both fragile and prone to erosion. Climbing (which is governed by an agreement with the NCC), informal hiking trails and equestrian activities (also governed by an agreement with the NCC) have the potential to damage both plant life (especially the species at risk) and wildlife. Several plant species in this sector are at the northern limit of their distribution. The Eardley Escarpment is noted for its broad range of vegetation, including 40 species at risk (in 2007). Two oak forest types, which are extremely unusual at this latitude, are located in the warmer sectors of the escarpment – one a red oak-white oak forest and the other a red oak-red cedar forest. The Escarpment also hosts the largest population of red cedar in Québec. Most of the Park's white-tailed deer spend winters on Eardley Escarpment, which provides protection from the cold northerly winds. There is also less snow cover and an earlier spring thaw, making it easier for them to move around.

Pink Lake Plateau

The Pink Lake Plateau is represented by a mosaic of aquatic, riparian and wetland environments (swamps, ponds) associated with the larger lake. It is characterized by its variable relief and forest stands, including some old-growth forests[3] and a large number of habitats essential for wildlife and plants, including some species at risk.

Three-Lake Chain

The Philippe Lake, Mousseau Lake and Meech Lake environment is characteristic of the Gatineau Hills, with hardwood forests growing on gentle slopes, interspersed with many small lakes and wetlands. The three drainage basins are located entirely within Gatineau Park's boundaries. As well as forming a chain of lakes, these three bodies of water are very similar in terms of morphology and physical/chemical characteristics. All three are considered to be mesotropic lakes, and are used for different purposes: recreation in the case of Philippe Lake, conservation and political functions for Mousseau Lake, and recreation and residential development for Meech Lake. Access to Mousseau Lake is restricted, and very little research has been done in that area. However, the presence of rainbow smelt (*Osmerus mordax*), white sucker and brook trout (*Salvelinus fontinalis*) spawning grounds has been mentioned. These latter two species are also found in Philippe Lake. Sightings of the Gatineau tadpole snail have been reported in all three lakes.

[3] Very old forests where the dominant trees have reached an age that is exceptional for the environment in which they are situated and for their geographical location. Old-growth forests are one of the three categories of exceptional forest ecosystems (EFEs) (MRNF, 2009).

FOLLY BOG

Folly Bog hosts a significant range of rare species and species typically found in bogs. The bog was formed when a lake was covered over and then filled in by the growth of sphagnum. Mammal populations are relatively limited, due mainly to the proximity of urban development. However, the bog attracts several wetland-specific bird and amphibian species, including the four-toed salamander (*Hemidactylium scutatum*), which is a species at risk.

LAC DES FÉES

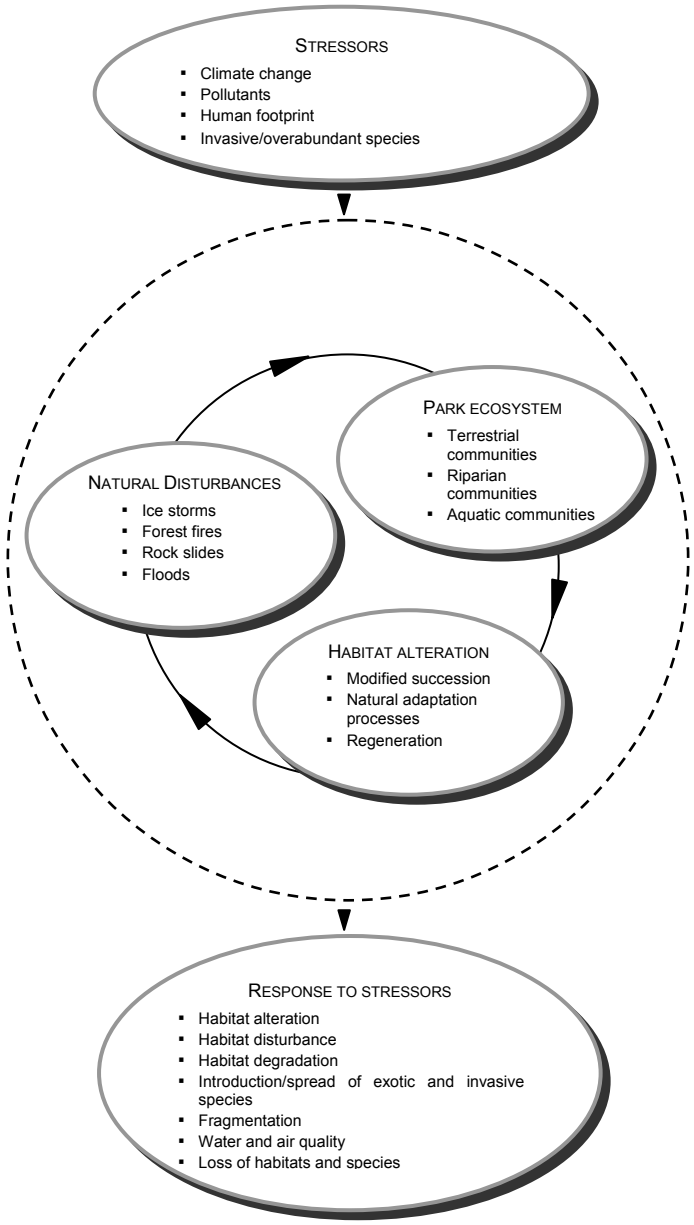
The Lac des Fées environment is composed of rock outcrops along the shores and steep slopes covered by mature hardwood trees to the west. These conditions have created an isolated environment that is unique in the Gateway Sector of the Park. Lac des Fées is used extensively due to its proximity to the city and ease of access, resulting in a highly disturbed landscape. The forest stands around the south-western section of the lake, along with the area of swamp, are ecologically important due to their age, rarity and rich plant life. More than 50 plant species have been identified in this sector, 16 of which are species at risk (DDM, 2005a). The present condition of the Lac des Fées environment is conducive to the presence of bird species that are able to adapt to roadsides, wooded strips, old fields, urban forest stands and the human presence. Examples include the red-winged blackbird (*Agelaius phoeniceus*), the European starling (*Sturnus vulgaris*), the coal tit (*Parus ater*), and others. However, the red-shouldered hawk (*Buteo lineatus*) also nests at Lac des Fées and the Cooper's hawk (*Accipiter cooperii*) has been observed on several occasions in a forest adjacent to the Lac des Fées valued habitat (Morneau, 2001; 2002; Transport Canada, POC and NCC, 2003).

2.2.2 ECOSYSTEM AND ECOLOGICAL INTEGRITY

The Park's general ecosystem model is presented in diagram form in Figure 8. The model illustrates the impacts on Park biodiversity of stresses triggered by the dynamics of ecosystem-altering natural and human disturbances.

Climate change, pollutants and the human footprint alter natural processes and habitats. Climate change, for example, is certain to upset the Park's natural dynamics. The NCC, in collaboration with the University of Waterloo, has studied the repercussions of climate change for recreational and tourist activities, as well as for the entire question of biological conservation of the Park's ecosystem (Scott et coll., 2005). Basically, the study found that climate change will be the stressor with the greatest impact on the Park's ecosystem in the coming decades.

FIGURE 8
MODEL OF GATINEAU PARK'S ECOSYSTEM



THE NOTION OF ECOLOGICAL INTEGRITY

As more information has become available on how natural environments function, especially in the last decade, the full complexity of the task of managing conservation areas has become apparent. In the past, conservation parks were managed on the basis of their administrative boundaries, with no consideration for peripheral activities or natural processes in surrounding areas. However, we now know that the capacity to maintain resident biological populations depends to a large extent on all the human activities and natural phenomena at the regional and landscape levels. This complex situation is exacerbated by the need to incorporate a whole range of human values towards nature, as documented in the Brundtland report (1988), such as biodiversity, sustainable use and research, into land protection and management plans. Also to be considered is the still not perfectly understood impact of the large number of visitors using these areas.

Ever since Canada and the provinces supported the *Convention on Biological Diversity* (1992) and the subsequent development of the *Canadian Biodiversity Strategy* (1995), conservation areas have played a significant role in the protection of biodiversity and resource quality.

As a result of conservation areas having an increasingly complex mission, their managers have gradually been forced to adopt a form of management based on the notion of ecosystems and related concepts, including conservation biology, landscape ecology, restoration ecology and adaptive management. This general, integrative approach provides an understanding of the range of spatial and temporal interactions, and enables them to be considered in the management process. The notion of ecological integrity was a natural extension of the ecosystem-based approach, and has formed the conceptual and strategic basis for the management of Canada's national parks since the early 1990s.

Ecological integrity is defined as an ecosystem state considered to be characteristic of the natural region of which the ecosystem forms a part, particularly in terms of the composition and abundance of indigenous species and biological communities, and of the pace of change and the sustaining of ecological processes (Canada National Parks Act). In other words, an ecosystem retains its integrity when all the indigenous animal and plant populations are able to live, survive and propagate, and the processes governing its functions are intact.

This definition has some significant consequences that far exceed its apparent simplicity. The preservation of ecological integrity requires:

- An understanding of how ecosystems function and the stressors that hinder their natural development. It is important to understand the Park's ecosystems and the greater ecosystem within which the Park is situated, and also to be familiar with ecosystem composition, functions and dynamics within a framework that allows for developing long-term objectives;
- Inclusion of the notion of boundaries and ecological processes at a regional level in Park management practices;
- An approach based on collaboration with regional partners and managers of adjacent land, as part of a regional management framework founded on human values such as biodiversity and sustainable development. Ecological integrity must encompass physical, biological, social and cultural criteria. Management methods used in adjacent areas and the major goals and objectives of protected areas must be compatible, otherwise the fundamental protection mission of the protected areas will not be achieved;
- Identification of clear goals and objectives for ecosystem management and the adoption of coherent approaches based on modern ecological concepts;
- The application of rehabilitation measures where there is well-documented evidence of ecological change over time to show that human disturbances have diverted or may divert ecosystem development away from its normal course;
- Preparation of an ecological monitoring program by identifying indicators and measurement techniques that can be used to monitor ecosystem development and compare actual and desired natural ecosystem health;
- An adaptive management intervention strategy based on the results of predictive models that are tested constantly by ongoing ecological monitoring activities.

3. ECOSYSTEM CONSERVATION – ISSUE ANALYSIS

The Plan for Canada's Capital (NCC, 1999a) defines the Park primarily as a conservation area. However the Park also contributes to the quality of life of local residents and plays a cultural and political role in the Capital that not only requires risky compromises from an environmental standpoint, but also complicates the decision-making process. This situation has generated a number of conservation issues:

- The Park's ecosystems have been marked by the human footprint.
- The Park's boundaries were not drawn up on the basis of whole, functional ecosystems.
- The Park is not isolated from neighbouring land, nor is it sheltered from the impacts of neighbouring activities.
- The easements and property rights (e.g. private properties and developments, residential leases) are not consistent with the Park's mission.
- The Park will come under increasing pressure from tourist and recreational activities, mainly due to growing regional demographics.
- As a result of regional development, the Park will also be pressured to provide more recreational and residential infrastructures, and may be fragmented by regional transportation corridors.

3.1 CONSERVATION ISSUES

Gatineau Park's managers face a number of significant issues caused by the regional context, intensive use, ecological values and current ecosystem health. These issues include:

- Protecting biodiversity;
- Protecting species at risk;
- Limiting habitat fragmentation;
- Protecting corridors as zones of ecological continuity;
- Limiting pressure from human activities (e.g. private enclaves, peripheral urban development);
- Acquiring and upgrading the knowledge required for an ecosystemic management approach geared towards ecological integrity.

The challenges ensuing from these issues are:

- To implement the environmental policies set out in the Plan for Canada's Capital (NCC, 1999a), and in particular, to give priority to ecosystem preservation;
- To maintain the natural functions of the Park's ecosystems and its ecological values in a context where the limitations imposed by recreational use are increasing, adjacent environmental resources are changing and the pressure from urban development is growing;
- To reinforce the conservation function;
- To integrate the Park's ecological needs with those of neighbouring areas, in order to mitigate the impacts of external stressors on the Park's ecosystems;
- To aim for a management strategy geared towards ecosystems;
- To limit, counter and reduce stress from human activities. This applies particularly to recreational pressure on habitats;
- To maintain the populations of all indigenous species with habitats in the Park. This involves halting the decline in certain populations;
- To limit fragmentation of wilderness areas.

3.2 Stressors and Their Known or Anticipated Impacts

In recent years, a number of situations have increased the stress factors likely to affect conservation of the Park's natural environments and their connections with surrounding natural areas.

Human activities have had tangible impacts on some natural environments, especially in the southern sector of the Park. Increasing demand for recreational use and urban development is altering and fragmenting the Park's natural habitats.

In peripheral areas, agricultural use and, further south, the urban development surrounding the Park, is cutting off the connections between the Park's ecosystems and adjacent natural environments.

During the revision of the Gatineau Park Master Plan (NCC, 2005c), the factors likely to affect the Park's ability to sustain its ecological functions over the next decade were identified and examined. Table 1 lists the main sources of stress.

Table 1
Summary of Main Sources of Stress

Stress factors contributing to the high level of cumulative[4] environmental effects	Main consequences
Recreational activities and other uses (Activities and infrastructures inside the Park)	
Specific recreational activities (climbing, off-road trail bike use)	▪ Direct habitat loss ▪ Alteration of species behaviour ▪ Alteration or fragmentation of species and habitats ▪ Potential impoverishment of indigenous populations and biodiversity ▪ Alteration of ecosystem structures and functions
Sport fishing, poaching and illegal harvesting activities	
Transportation corridors and vehicular traffic	
Private properties and development	
Global factors linked to the Park	
Lack of a natural buffer zone	▪ Direct habitat loss ▪ Alteration of species behaviour ▪ Alteration or fragmentation of species and habitats ▪ Potential impoverishment of indigenous populations and biodiversity ▪ Ecological isolation
Intensity and spreading of recreational activities	
Multiple access roads	
Less self-sufficiency in terms of resources and processes	
Limited corridors and ecological continuity between the Park and its general ecosystem	
Urban growth adjacent to Park boundaries	
Proximity of the urban area and density of the road network	▪ Direct habitat loss ▪ Alteration of species behaviour ▪ Alteration or fragmentation of species and habitats ▪ Potential impoverishment of indigenous populations and biodiversity ▪ Ecological isolation
Uncontrolled access	
Regional transportation corridors through the Park	
Increased demand for services and activities	
Use of renewable resources around the Park and in shared watersheds	
Farming and logging	▪ Direct habitat loss ▪ Alteration of species behaviour ▪ Alteration or fragmentation of species and habitats ▪ Potential impoverishment of indigenous populations and biodiversity ▪ Ecological isolation
Industrial and mining activities	
Historical resource use	
Harvesting of the forest and wildlife resources	▪ Alteration or fragmentation of species and habitats ▪ Impoverishment of indigenous populations and biodiversity ▪ Alteration of ecosystem structure and function
General regional and larger scale factors	
Global climate change	▪ Impoverishment of indigenous populations and biodiversity ▪ Alteration of ecosystem structure and function
Air pollution	

Source : DDM, 2006a.

[4] Cumulative effects: effects on the environment that accumulate over time and in space as a result of other activities and prior, current or imminent projects in a given area (see Canadian Environmental Assessment Act).

3.3 HEALTH OF THE PARK'S ECOSYSTEMS

The health of Gatineau Park's ecosystems was studied in detail in 2006(DDM, 2006a). Two categories of ecosystems were considered, as shown in Table 2. The first category comprises the major ecosystems, which are generally representative, while the second comprises the valued ecosystems, which provide exceptional ecological value (DDM, 2007). The framework used to analyze the Park's health was based on ten indicators, which were applied to the ecosystems and assessed using 30 biotic and abiotic elements for which sufficient documentation was available in both the Park and the surrounding region. This initial evaluation of the Park's ecological health was based primarily on existing studies. The Park's database (ecological summary known as the *synthèse écologique*) contains summary records, as well as integrative texts incorporating a large number of research reports, and much of the data was taken from this source. Intermittent monitoring data were available for some of the measured elements, but in most cases the information was from one-time studies. Accordingly, the results for some indicators can be regarded as standards, whereas in other cases they amount to a qualitative evaluation. All the same, the results of monitoring programs that have recently been or will shortly be introduced will gradually provide a more informed view of the impacts of stressors on ecosystem sustainability in the Park, along with a better view of the Park's health over time.

The summary of findings regarding the health of Gatineau Park is shown below for each of the ten main indicators measured.

TABLE 2
ANALYSES FRAMEWORK USED TO ASSESS THE HEALTH OF GATINEAU PARK'S ECOSYSTEMS

ECOSYSTEMS	
INTEGRATIVE	VALUED
Terrestrial, riparian, wetland and aquatic environments	La Pêche Lake sector, Eardley Plateau, Eardley Escarpment, Pink Lake Plateau, Three-Lake Chain
INDICATORS	
Condition of surface water, air and soils, human pressure and the human footprint, the condition of terrestrial, riparian, aquatic and wetland environments, the state of indigenous biodiversity, and stewardship (resources available to Park managers for environmental protection).	
MEASUREMENT ELEMENTS	
Related to the physical and chemical parameters, the human environment, species and landscapes.	

CONDITION OF SURFACE WATER

Principal findings

- The fairly high phosphorous concentration in the surface water of several of the Park's lakes tends to suggest significant human pressure on the aquatic environment. This pressure is likely to continue.
- The pollutants associated with the aquatic environment derive as much from inside the Park as from outside.
- Gatineau Park's lakes have a certain buffering capacity due to the neutralizers contained in drainage basin soils, and do not appear to be unduly threatened by acid rain.
- The Park's waters meets the bacteriological quality standards for swimming.
- Water distributed for consumption is treatable to meet the bacteriological, physical and chemical standards for drinking water

Summary

The analysis of water quality parameters led to the conclusion that water quality in the Park is acceptable. Characterization parameters are close to but below thresholds for human health. Phosphorous concentrations in the water are fairly high but stable. The trend is towards stable levels.

CONDITION OF AIR

Principal findings

- The levels of many of the region's air pollutants are declining as a result of pollution abatement agreements signed by Canada and the United States in the last decade.
- Concentrations of all pollutants examined in connection with air quality are either stable or declining.
- Ozone concentrations are high, and recent research has shown that ozone is harmful to terrestrial ecosystems. Concentrations are increasing in some areas of the Great Lakes and St. Lawrence River Valley, but are stable in the Gatineau Park region.

Summary

Pollutant impacts on the air are acceptable. The air quality index is below the human health threshold and the trend is towards stability. Air ozone concentrations are fairly high but stable; they are, however, likely to impact upon the health of the environment in the short term, and their effects are unknown. The general trend is towards stable levels.

CONDITION OF SOILS

Principal findings

- Sulphur and nitrogen deposits over much of Eastern Canada exceed the critical load for forest soils (Brydges et al., 2000).
- Preliminary estimates suggest that 18 of the 29 stations in the forest ecosystem surveillance network (commonly known by its French acronym RESEF) receive acid deposits in excess of the critical load (Houle et al., 2001).
- The two Outaouais stations are among those with the highest level of acidity (Houle et al., 2001).

Summary

The analysis of excess acid levels in soils suggests that soils are in poor condition but are likely to improve as a result of the marked drop in sulphate emissions in North America (Environment Canada, 2005).

HUMAN PRESSURE AND HUMAN FOOTPRINT

Principal findings

- The Park is subject to growing pressure from tourist and recreational activities, mainly due to the growth in regional demographics.
- The riparian ecotones (shorelines) are used extensively for recreational and residential purposes.
- A significant percentage of Gatineau Park's built environment is not subject to the control mechanisms provided by the Park's zoning system, and therefore faces a number of special conservation issues.
- The Park's ecological systems and landscapes are fragmented. Some terrestrial and riparian habitats have been lost or reduced in sizes.

Summary

Conditions are acceptable overall, but poor in some sectors of the Park. All the indicator measurements are fairly high and are tending to rise. There are some permanent constraints on ecosystem preservation, and the trend is towards deterioration.

CONDITION OF THE TERRESTRIAL ENVIRONMENT

Principal findings

- Analysis of landscape fragmentation shows that isolation, fragmentation due to activities and infrastructures, the lack of continuous natural buffer zones and the limited number of migration corridors leading outside the Park will adversely affect the Park's ability to support viable levels of biological populations.
- Landscape ecology analyses based on vegetation mosaic patterns show a broad diversity of habitats and links.
- Overpopulation of winter white-tailed deer yards conflicts with the goal of preserving other resources in the Park.

Summary

Overall, the condition of the Park's terrestrial environment is acceptable. Fragmentation levels in the Park's core forested area are acceptable, but have nevertheless weakened the capacity of certain sectors to maintain their integrity. Some constraints relating to Park use are permanent. An in-depth examination of mosaic configuration reveals a good existing potential for wildlife habitats in the Park in general, and in its valued ecosystems. The general trend is towards stability.

CONDITION OF RIPARIAN HABITATS

Principal findings

- The rich and extensive riparian environment constitutes an essential habitat that supports the Park's biodiversity.
- Current pressures from recreational use are increasing locally and are likely to threaten this value in the longer term.

Summary

The Park's riparian habitats are in acceptable condition. The Park is characterized by its extensive riparian habitat. Pressure from recreational use is significant in the summer season. Use is localized, but is likely to increase if no further measures are established. Shoreline use is acceptable overall, but weakens the ability of certain sectors to preserve their integrity. Although local deterioration is expected, the overall condition of the Park's riparian habitats is stable but precarious.

CONDITION OF AQUATIC ENVIRONMENTS

Principal findings

- Surface water quality elements are acceptable, as mentioned earlier.
- The impacts of the human presence on or peripheral to the aquatic environment are probably significant, although no detailed information is available at this time.
- Approximately ten of the Park's fish species are likely to have been introduced either accidentally or deliberately. Their presence threatens the natural biodiversity and integrity of natural communities in the Park's lakes.
- Stenotherm (typically cold water) species populations are sparse in the Park and some have virtually disappeared. They are threatened mainly by deterioration in the oligotrophic status of the lakes and pressure from sport fishing.
- Common loon nesting in Gatineau Park is synonymous with the integrity of certain lake environments and a limited amount of human disturbance.
- The current Eurasian water-milfoil (*Myriophyllum spicatum*) population level is acceptable. The possible propagation of this species is worrying, however, because of its considerable and rapid impact on aquatic environmental integrity.
- Gatineau Park is a critical habitat for the Gatineau Tadpole Snail. Populations of this species have been small but stable in recent decades.

Summary

The condition of the Park's aquatic environment is acceptable. Water quality, however, is gradually declining. Shoreline habitat use is on the increase, and is partly responsible for eutrophization. At the same time, fish communities have been disrupted. The general condition of the aquatic environment shows a trend towards deterioration.

CONDITION OF WETLANDS

Principal findings

- Gatineau Park's beaver (*Castor canadensis*) population is large but has remained relatively stable for the last 20 years.
- The purple loosestrife (*Lythrum salicaria*), an introduced wetland species, is present virtually throughout the Park and is capable of displacing certain indigenous species.

Summary

The Park's wetland environments are in acceptable condition. However, pressure on the natural integrity of the wetlands from the large beaver population and purple loosestrife contamination is increasing. The general trend of this indicator will continue to deteriorate.

STATE OF INDIGENOUS BIODIVERSITY

Principal findings

- Overabundant and invasive species generate undesirable effects in the ecosystem.
- Analysis of the natural landscape indicates that the forest habitat offers good potential for a variety of species with small to medium home ranges.
- In recent years, the indigenous fish populations in a certain number of lakes have been altered significantly.
- The constant presence of a common loon population in the Park – a species at the top of the food chain and with a large home range – suggests that species with smaller home ranges are also well-established.

Summary

The state of the Park's biodiversity is good and remains stable. An index of the current state of biodiversity was calculated for a certain number of indicators representing the major groups making up the Park's ecological community (DDM, 2005a, b and c). This index, used as part of a biodiversity monitoring program, will reflect the impacts of land use on the Park's specific and natural ecosystemic diversity.

STATE OF STEWARDSHIP

Principal findings

- The Park's planning documents propose a form of management based on ecosystems and ecological integrity.
- The resource management program has introduced and implemented a number of tools that will help managers to deal with the growing pressures facing the Park.
- The budgets allocated to the natural resource management program have remained stable over time.
- The role of interpretation as an education and awareness tool is hindered by the lack of resources.
- The NCC has undertaken a number of statutory duties towards the environment as a means of fulfilling its international, national and regional responsibility to protect ecosystem integrity and quality, maintain biodiversity and achieve sustainable development.

Summary

The state of stewardship in the Park is sufficient to deal with the various conservation issues it will face in the future. This indicator should improve as a result of the new Biodiversity Monitoring Program and the introduction of an Ecosystem Conservation Plan.

CONCLUSION

This review suggests that the general health of Gatineau Park is acceptable, and its current balance is stable but fragile. Generally speaking, the indicators show that ecological conditions are acceptable or good. For half the indicators, the trend is towards stability, whereas the remainder are expected to deteriorate, hence the fragile nature of the Park (see Figure 9). Based on future development trends around the Park and anticipated climate change in the next 50 years, the relative stability of ecosystem health will certainly be threatened. Accordingly, if no steps are taken to reverse the impacts of certain stressors, the health of the Park will quickly begin to deteriorate.

GATINEAU PARK / PARC DE LA GATINEAU

Key Ecosystem Drivers / Processus écosystémiques essentiels

CCN NCC | Canada

SYNTHÈSE DE L'ÉTAT DE SANTÉ DES ÉCOSYSTÈMES DU PARC DE LA GATINEAU

GATINEAU PARK ECOSYSTEM HEALTH

FIGURE 9

Février 2010
February 2010

DDM Del Degan, Massé Experts-conseils

STRESSORS

Climate changes, development outside the park, air pollution, increasing visitor numbers, park isolation, acid rains, fragmentation

FACTEURS DE STRESS

Changements climatiques, développement hors Parc, pollution de l'air, accroissement de l'achalandage, isolation du Parc, pluies acides, fragmentation

CONDITION OF GATINEAU PARK ECOSYSTEMS

ÉTAT DES ÉCOSYSTÈMES DU PARC DE LA GATINEAU

TERRESTRIAL ENVIRONMENTS

Old-growth hardwood, softwood and mixed forests

MILIEUX TERRESTRES

Forêts anciennes résineuses, mélangées et feuillues

STRESSORS

Recreational activities
Non-native or invasive species
Farming activities
Fragmentation

FACTEURS DE STRESS

Activités récréatives
Espèces introduites ou envahissantes
Activités agricoles
Fragmentation

↔

RIPARIAN HABITATS

Diversity of plants and wildlife

HABITATS RIVERAINS

Diversité de la faune et de la flore

STRESSORS

Recreational activities
Farming activities
Private properties
Invasive species

FACTEURS DE STRESS

Activités récréatives
Activités agricoles
Propriétés privées
Espèces envahissantes

↔

AQUATIC ENVIRONMENTS

Various lake types
Diversity of species and processes

MILIEUX AQUATIQUES

Variété de types de lacs
Diversités d'espèces et de processus

STRESSORS

Fishing
Non-native or invasive species
Water-related activities
Farming activities
Waste waters / Pollution

FACTEURS DE STRESS

Pêche sportive
Espèces introduites ou envahissantes
Activités nautiques
Activités agricoles
Eaux usées et pollution

↓

WETLANDS

Diversity of plants and wildlife
Sensitive sites

MILIEUX HUMIDES

Diversité de la faune et de la flore
Sites sensibles

STRESSORS

Invasive species
Waste water / Pollution

FACTEURS DE STRESS

Espèces envahissantes
Eaux usées et pollution

↓

ADDITIONAL INDICATORS / INDICATEURS SUPPLÉMENTAIRES

Surface water quality / État de l'eau de surface	↔
Air quality / État de l'air	↔
Soil condition in term of pollutants / État des sols par rapport aux polluants	↑
Human pressure and footprint / Pression et empreinte humaine	↓
Condition of native biodiversity / État de la biodiversité indigène	↔
State of environmental stewardship / État de l'intendance	↑

Elevation / Altitude (*Metres* / Mètres)

320

***ECOSYSTEM CONDITION* / ÉTAT DE L'ÉCOSYSTÈME**

- *Poor* / Faible
- *Acceptable* / Acceptable
- *Good* / Bonne

***TREND* / TENDANCE**

- *Declining* / Détérioration
- *Stable* / Stable
- *Improving* / Amélioration

Ottawa River / Rivière des Outaouais

Lac des Fées

GENERAL CONDITION / ÉTAT GÉNÉRAL

↔

VALUED ECOSYSTEMS / ÉCOSYSTÈMES VALORISÉS [1]

EARDLEY ESCARPMENT

Unique habitat
Rare species
Microclimate

ESCARPEMENT D'EARDLEY

Habitat unique
Espèces rares
Microclimat

STRESSORS

Farming activities
Recreational activities
Deer population
Insect epidemic
Invasive species

FACTEURS DE STRESS

Activités agricoles
Activités récréatives
Population de cerfs
Épidémie d'insectes
Espèces envahissantes

↓

EARDLEY PLATEAU

Wetlands
Old-growth hardwood forests
Rare species

PLATEAU D'EARDLEY

Terres humides
Forêt feuillue ancienne
Espèces rares

STRESSORS

Recreational activities
Road traffic
Fishing
Invasive species

FACTEURS DE STRESS

Activités récréatives
Circulation routière
Pêche sportive
Espèces envahissantes

↔

LA PÊCHE LAKE AND SURROUNDING AREA

Mix of forests, wetlands and aquatic environments
Rare species

LAC LA PÊCHE ET SON VOISINAGE

Mélange de forêts, de milieux humides et aquatique
Espèces rares

STRESSORS

Recreational activities
Fishing
Waste waters / Pollution
Invasive species

FACTEURS DE STRESS

Activités récréatives
Pêche sportive
Eaux usées et pollution
Espèces envahissantes

↔

THREE-LAKE CHAIN

Entire watershed
Rare species
Hardwood forest

CHAÎNE DES TROIS LACS

Bassin de drainage entier
Espèces rares
Forêt feuillue

STRESSORS

Recreational activities
Waste waters / Pollution
Invasive species
Private properties
Urban development

FACTEURS DE STRESS

Activités récréatives
Eaux usées et pollution
Espèces envahissantes
Propriétés privées
Développement urbain

↓

PINK LAKE PLATEAU

Meromictic lake
Rare species

PLATEAU DU LAC PINK

Lac méromictique
Espèces rares

STRESSORS

Recreational activities
Road traffic

FACTEURS DE STRESS

Activités récréatives
Circulation routière

↑

1. Del Degan, Massé inc., 2005, Évaluation et identification des écosystèmes et des habitats naturels valorisés

4. CONSERVATION VISION FOR THE PARK

The Conservation Vision is a statement that establishes a desired future, based on current knowledge and concerns. It expresses the fundamental elements of the conservation approach for Gatineau Park, and is inspired by an understanding of the values held by the citizens of a country. Opinion polls and government research have revealed a number of values that are of importance to Canadians, including preservation of the natural environment. These are the values that are represented in the vision statement (DDM, 2006b), the basic elements of which are summarized below.

4.1 VISION STATEMENT 2035

The Vision Statement 2035 describes the desired future for the Gatineau Park environment. Principles and orientations are proposed which serve to guide action towards the achievement of the vision.

The basic vision is as follows:

> **Gatineau Park is a model of innovation and sustainable environmental management, preserving the integrity of its ecosystems and exceptional ecological diversity through innovative management measures focused on the notions of ecosystem and cooperation.**

4.2 PRINCIPLES AND ORIENTATIONS

The principles are the values and beliefs that serve as a basis for ecosystem management. They are supported by orientations that form a set of strategies leading to the desired level of ecological integrity. Together, the principles and orientations form a cohesive, coherent approach for realization of the Ecological Vision and implementation of the Ecosystem Conservation Plan.

The guiding principles and orientations include the goal of ecological integrity, a scientific approach, consideration of uncertainty in the decision-making process (the precautionary principle and adaptive management), the maintenance of natural processes, joint management of the Park ecosystems, and public involvement. The following principles will serve as guidelines for maintaining and even improving the Park's ecological integrity, thereby allowing for even more robust[5] ecosystems.

PRINCIPLE 1 A MANAGEMENT APPROACH FOCUSED ON ECOSYSTEMS AND DIRECTED PRIMARILY AT ACHIEVING ECOLOGICAL INTEGRITY IN ORDER TO SUSTAIN AND IMPROVE THE OVERALL HEALTH OF THE PARK AND OF THE BROADER ECOSYSTEM IN WHICH IT IS SITUATED.

Orientation

- Optimize the ecological integrity of Gatineau Park by maintaining and restoring all stages of natural ecological community succession, aquatic systems and indigenous plant and wildlife species that should normally prevail in the Park and in its natural regions (the "Southern Laurentians" ecoregion in the Boreal Shield and the "St. Lawrence Lowlands" ecoregion in the Plains and Mixed Forest), and allowing them to develop naturally.

PRINCIPLE 2 ADAPTIVE MANAGEMENT AND A SCIENTIFIC APPROACH AIMED AT UNDERSTANDING AND PLANNING ECOSYSTEM MANAGEMENT AND WORKING TOWARDS ECOLOGICAL INTEGRITY.

Orientations

- A. Adopt adaptive ecosystem management as a means of adjusting management practices and increasing the protection given to ecological integrity.

[5] Robustness is a target state but not a principle.

- B. Understand the functioning of the Park's ecosystems and the broader ecosystem in which it is situated from the standpoint of composition, functions, dynamics and the stress factors that interfere with their natural development.

PRINCIPLE 3 A DECISION-MAKING PROCESS AND MANAGEMENT METHODS BASED ON THE PRECAUTIONARY PRINCIPLE, TO ENSURE THAT ECOLOGICAL INTEGRITY TAKES PRIORITY

Orientation

- Invoke the precautionary principle every time it is not possible to predict whether a proposed change is likely to have irreversible consequences for the environment. This is a basic principle that should be applied generally.

PRINCIPLE 4 ECOSYSTEM MANAGEMENT THAT ALLOWS ECOLOGICAL PROCESSES TO FOLLOW THEIR NATURAL COURSE, IN ORDER TO SUPPORT NATURAL DYNAMICS

Orientation

- Manage ecological processes in a way that allows them to continue to play their natural role in ecosystem dynamics, provided they do not generate major impacts (ecological integrity, species at risk, public safety).

PRINCIPLE 5 ACTIVE ECOSYSTEM MANAGEMENT WHEN ECOLOGICAL INTEGRITY IS COMPROMISED

Orientation

- Initiate interventions with ecosystems or species in cases where research casts reasonable doubt on the ability of nature to correct natural and human disturbances without support.

PRINCIPLE 6 A FORM OF MANAGEMENT THAT SEEKS ONGOING SUPPORT FROM THE GENERAL PUBLIC FOR THE REHABILITATION AND MAINTENANCE OF ECOSYSTEM HEALTH AND INTEGRITY

Orientations

- A. Prevent, control or correct the actual or potential negative impacts of infrastructures, recreational development and visitor activity on the health and natural development of the Park's ecosystems.
- B. Raise public awareness of the NCC's conservation mandate both generally and specifically within Gatineau Park, so as to obtain public support for its ecosystem management strategies.

PRINCIPLE 7 MANAGEMENT BASED ON COLLABORATION WITH REGIONAL STAKEHOLDERS, AN ECOSYSTEMIC APPROACH AND RESPONSIBLE URBAN DEVELOPMENT SO AS TO SUPPORT THE ECOLOGICAL INTEGRITY OF THE PARK AND THE SUSTAINABLE DEVELOPMENT OF THE REGION

Orientation

- Understand and communicate the major Park-related issues generated by development policies in adjacent areas, so as to influence the plans and decisions of municipal and regional stakeholders as well as certain behaviours of neighbouring residents, with a view to mitigating the stress factors that threaten the Park's ecological integrity.

PART II :
ECOSYSTEM CONSERVATION PLAN

5. ECOSYSTEM CONSERVATION

Over the last 20 years, environmental stresses have become more widespread and have affected the components of the Park to varying degrees. Given the complexity of the phenomena that define the environment and their effect on the overall health of the Park, a realistic conservation strategy must be defined based on local, regional and national conditions.

The conservation of natural areas for the benefit of future generations is a fundamental value of Canadians, as well as being universal. A plan must be defined to meet the objectives of the conservation vision for Gatineau Park's ecosystems. The preservation of natural environments must be a constant focus, especially in designated protected areas.

The NCC has a long tradition of conserving and protecting natural environments in Gatineau Park. Since more than 40 years, over a thousand studies have been conducted, by the park's professionals as well as by researchers form scientific and university institutions. Many different inventories, monitoring programs and resource protection programs have also been carried out for biotic and abiotic environments as well as for animal and plant species. All these programs have contributed to research into the natural components of the Park.

The Park's current conservation work is structured by a number of planning and monitoring documents, including:

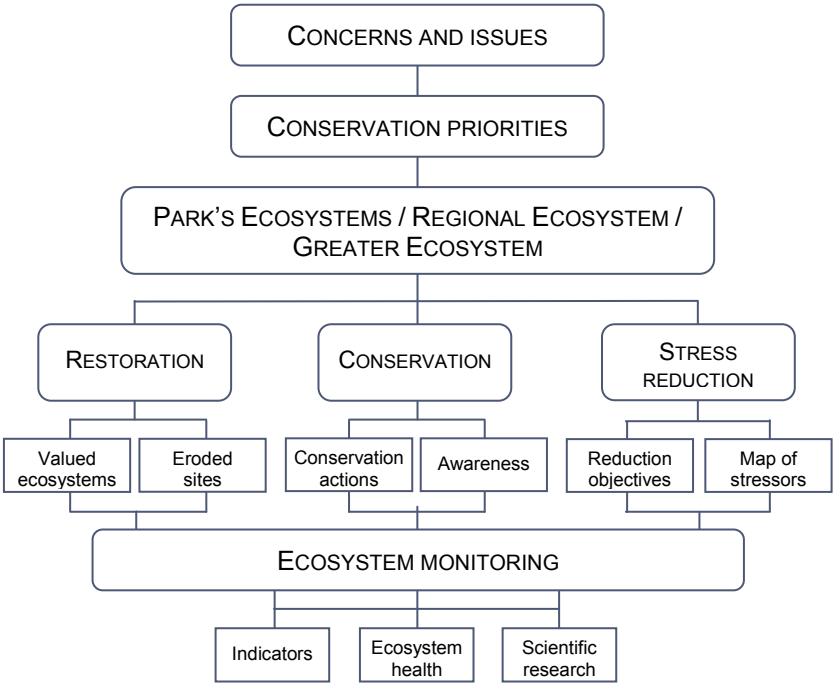
- the Corporate Natural Resource Research Program (NCC, 2004c);
- the Gatineau Park Master Plan (NCC, 2005c);
- the Species at Risk Protection Plan (NCC, 2006b);
- the Gatineau Park Biodiversity Monitoring Program (DDM, 2005a, b and c);
- Valued Ecosystems and Habitats in Gatineau Park (DDM, 2007);
- management plans (5) and management strategies (2);
- digital data bases (GIS);
- the Ecological Analysis (synthèse écologique);
- regular follow-up reports on various species and habitats.

Once again, the vision for Gatineau Park requires that the conservation approach be structured in a coherent and holistic way. The strategy based on the conservation vision involves five key steps:

1) the establishment of conservation priorities;
2) the identification of conservation zones;
3) the definition of ecosystem conservation processes;
4) the drafting of a conservation action plan;
5) the drafting of an ecosystem restoration plan.

The Ecosystem Conservation Plan is founded on current conservation activities and programs in Gatineau Park, but aims to enhance current efforts to achieve the principles and orientations of the Conservation Vision (Figure 10).

FIGURE 10
SUMMARY OF THE PLANNING PROCESS FOR THE ECOSYSTEM CONSERVATION PLAN



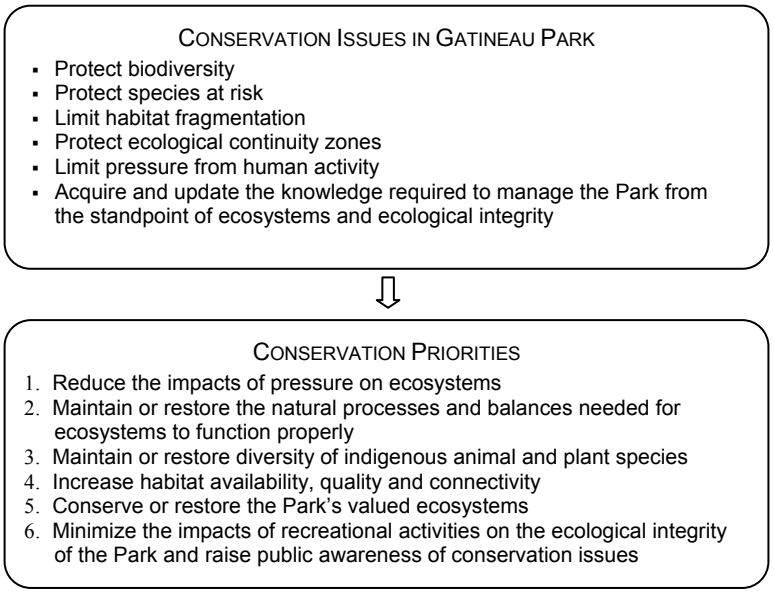
5.1 CONSERVATION PRIORITIES

It is important, in any plan of action, to define priority objectives for ecosystem conservation in order to optimize management efforts and ensure that the vision is achieved.

The approach is divided into two steps. First, conservation priorities are determined; and second, conservation areas are identified for the application of conservation measures.

The review of the health of Park ecosystems measured the ecological integrity of each ecosystem and revealed a number of problems, leading to the identification of several conservation issues. Figure 11 presents the conservation issues in the Park and the resulting conservation priorities.

FIGURE 11
GATINEAU PARK CONSERVATION PRIORITIES



PRIORITY 1 REDUCE THE IMPACT OF PRESSURES ON ECOSYSTEMS

The ecosystems in Gatineau Park are subject to various pressures resulting from the human activities. Stress factors affect ecosystem integrity by altering components and processes. The impacts of pressure can be observed in various places, and take various forms. If the impact of pressures on ecosystems is to be reduced, a number of conservation problems must be taken into account. An overall stress reduction strategy is defined and presented in section 6 (Implementation) of the Conservation Plan.

PRIORITY 2 MAINTAIN OR RESTORE THE NATURAL PROCESSES AND BALANCES NEEDED FOR ECOSYSTEMS TO FUNCTION PROPERLY

The second conservation priority involves maintaining fundamental ecosystem development processes, including:

- natural disturbances in terrestrial and aquatic ecosystems caused by forest fires, insect epidemics, wind damage, ice storms, natural eutrophization of bodies of water, natural drying of wetlands, floods, forest aging, etc.;
- predator/prey relationships in food chains at higher trophic levels;
- the balance between animal and plant communities.

The current health of the Park suggests that some natural processes have been modified or even interrupted, leading to imbalances in ecosystem composition and function. Intensive grazing by white-tailed deer, the absence of forest fires and floods, and the disappearance of certain predators are clear examples of this.

PRIORITY 3 MAINTAIN OR RESTORE DIVERSITY OF INDIGENOUS ANIMAL AND PLANT SPECIES

The International Convention on Biological Diversity highlighted a number of problems and identified actions to protect natural capital. Gatineau Park is a sanctuary for biodiversity, and several initiatives have so far been taken to maintain the existing natural capital. Having said this, degradation factors have reduced the potential of some of the Park's components. For example, habitat fragmentation, climate change and other stress factors are causing the reduction and even the disappearance of certain indigenous species, as well as the colonization and expansion of undesirable non-native species. Studies and actions such as control of invasive species are needed to increase indigenous biodiversity in the Park.

PRIORITY 4 INCREASE HABITAT AVAILABILITY, QUALITY AND CONNECTIVITY

Human activities have fragmented natural areas and restricted the movement of various species. Potential connectors between the Park's ecosystems and habitats and adjacent natural areas must be preserved and strengthened. A conservation approach to Park and regional ecosystems is now required to promote the conservation of connectivity in its different forms.

PRIORITY 5 CONSERVE OR RESTORE THE PARK'S VALUED ECOSYSTEMS

Research to assess the quality of the Park's ecosystems has identified certain valued ecosystems which, because of their composition and function, contribute exceptionally to the biodiversity and representativity of the Park. For these valued ecosystems, conservation issues must be defined and suitable management practices must be applied. These ecosystems are in a fragile condition and are subjected to various pressures.

PRIORITY 6 MINIMIZE THE IMPACT OF RECREATIONAL ACTIVITIES ON THE ECOLOGICAL INTEGRITY OF THE PARK AND RAISE PUBLIC AWARENESS OF CONSERVATION ISSUES

The issue for Park managers is to be able to reconcile conservation perspectives with recreational perspectives. Their task is therefore to manage human activities in and around the Park in a way that maintains the ecological integrity of the Park's ecosystems. Based on the feedback received and the principles set out in the Ecosystem Conservation Plan, the Park must attempt to reduce and prevent the impacts of activities on ecosystems, and must also engage in awareness-raising and obtain cooperation from the general public.

5.2 CONSERVATION AREAS

The six conservation priorities presented above are defined geographically as conservation areas, ranked according to the urgency of conservation required. The Park is large and a hierarchy must be established to optimize conservation efforts. Different types of conservation areas are proposed to assist the decision-making process.

In applying the conservation priorities, special attention is paid to the valued ecosystems. They are treated as priorities due to their importance as well as their fragility.

The methodology used to evaluate the conservation areas is based on that used for the development of conservation priorities in the Mingan Archipelago National Park (DDM, 2004a, b, c) as well as on the evaluation and identification of valued ecosystems and natural habitats (DDM, 2007).

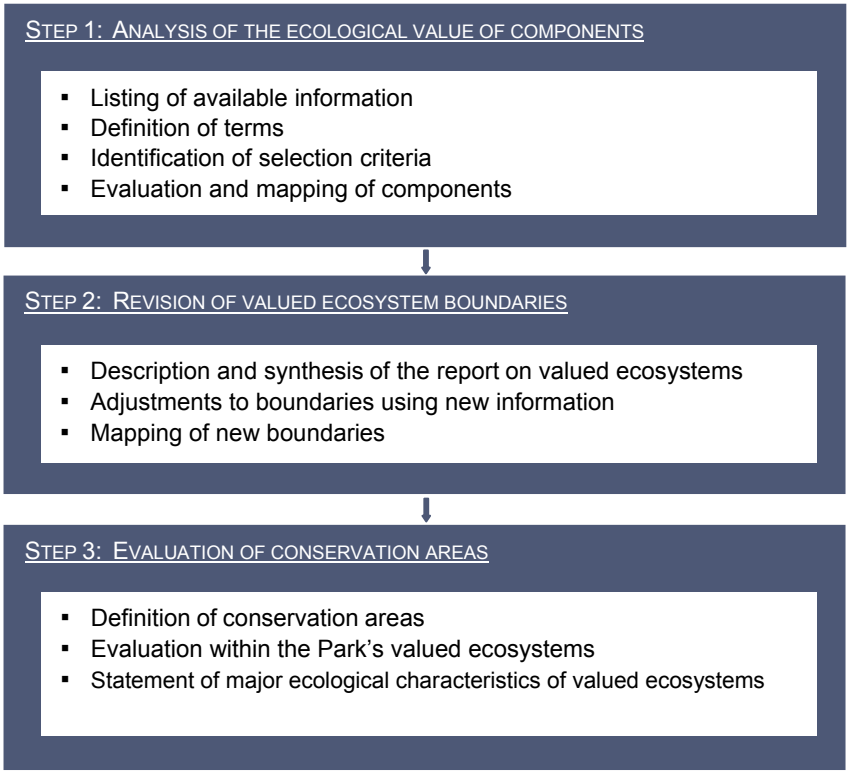
The conservation areas have been defined using SIG, in three stages (see Figure 12):

Stage 1: Inventory and assessment of the ecological value of the Park's natural components

Stage 2: Revision of the valued ecosystem boundaries

Stage 3: Identification of the conservation areas

FIGURE 12
CONSERVATION AREA EVALUATION METHODOLOGY



This approach uses the various elements of interest related to Park ecosystems (location of species with special status, their habitat, etc.) and available in digital format. These elements are grouped together and summarized to form components of interest in digital format. The precautionary principle is applied, to take into account the level of uncertainty and lack of accuracy inherent in such an approach, as well as the lack of sufficient information for a full assessment in many cases.

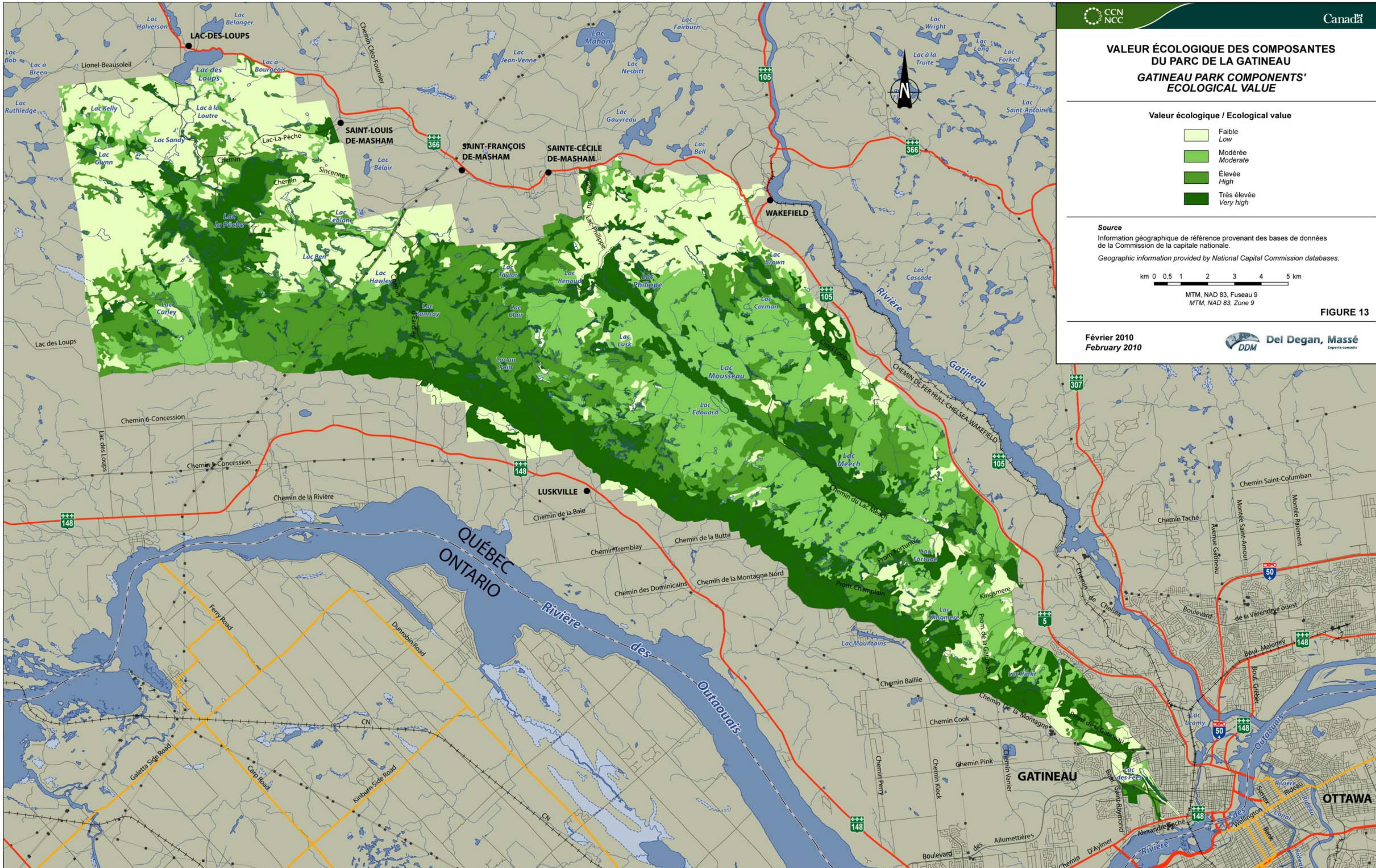
The components selected relate to different aspects of the Park's plant life, wildlife, habitats and ecosystems. The first step in identifying conservation areas is to assess the ecological value of each of the above components, using a points system based on three criteria (rarity, fragility and representativity – see Appendix 1).

Once the components have been ranked, they must then be represented spatially using an eco-forest map (Ministry of Mines and Forests, 1991). On the map, forest stands are broken down into a set of polygons of different sizes that form the conceptual framework to which the components of interest are applied. This means that, regardless of the type of digital representation (line, point, polygon), the surface area of every forest polygon will contain all the available information.

In some cases several different components will overlap in the same forest polygon. Where this happens, the total ecological value of the polygon is calculated by adding the values of the various components. For example: the components "endangered plant (16 points)", "observed presence of the common loon (16 points) and "La Pêche Lake (11 points)" are all present in a given polygon. As a result, this polygon's ecological value is 43. In other words, the ecological value of each polygon is equal to the sum of the point scores of all its components.

Once the ecological values of all the polygons were calculated, groupings based on the value scores were formed and classified qualitatively (low, moderate, high or very high ecological value). Figure 13 maps the various categories in the Park.

The ecological value of a polygon highlights its level of sensitivity, based on its constituent elements (e.g. endangered species, habitat, etc.). This makes it possible to geographically locate sensitive areas of the Park.


CCN NCC
Canada
VALEUR ÉCOLOGIQUE DES COMPOSANTES DU PARC DE LA GATINEAU
GATINEAU PARK COMPONENTS' ECOLOGICAL VALUE
Valeur écologique / Ecological value
Faible Low
Modérée Moderate
Élevée High
Très élevée Very high
Source
Information géographique de référence provenant des bases de données de la Commission de la capitale nationale.
Geographic information provided by National Capital Commission databases.
km 0 0,5 1 2 3 4 5 km
MTM, NAD 83, Fuseau 9
MTM, NAD 83, Zone 9
FIGURE 13
Février 2010
February 2010
Del Degan, Massé
LAC-DES-LOUPS
SAINT-LOUIS DE-MASHAM
SAINT-FRANÇOIS DE-MASHAM
SAINTE-CÉCILE DE-MASHAM
WAKEFIELD
LUSKVILLE
GATINEAU
OTTAWA
QUÉBEC
ONTARIO
Rivière des Outaouais
Rivière Gatineau
Lac la Pêche
Lac Philippe
Lac Mousseau
Lac Meech

The next step was to make the information usable by grouping the polygons together within known ecosystem boundaries, those of the valued ecosystems.

In doing this, the values of the various ecosystems could be compared, and the comparison was used to establish four different priority levels for conservation areas in the Park, as follows:

CONSERVATION AREAS, TYPE I

These conservation areas include ecosystems in which 75% or more of the polygons have high or very high ecological value, in other words:

- ecosystems that are both rare and fragile, or very rare and very fragile, at various scales (region, Québec, Canada);
- ecosystems that are unique because of the presence of components with very high ecological value;
- ecosystems that are very important in terms of the conservation of biotopes for multiple rare species.

Pressure from human activities and natural sources in these areas could eventually lead to the extinction of these features. The damage caused by these pressures could be irreversible for these ecosystems, especially in terms of nesting sites or the survival of certain plant species of special interest.

CONSERVATION AREAS, TYPE II

These conservation areas include ecosystems in which 50-75% of the polygons have high or very high ecological value, in other words:

- ecosystems that are both rare and fragile, but can resist a certain degree of use;
- ecosystems that have a range of biotypes offering potential for several species of special interest;
- ecosystems that have rare or very rare components, along with very representative components;
- ecosystems with a high degree of ecological integrity;
- ecosystems that are important for maintaining biodiversity.

These ecosystems are less fragile than Type I ecosystems, but if their wealth and diversity were to be weakened by any kind of pressure, this could be harmful for the rest of the Park.

CONSERVATION AREAS, TYPE III

Type III conservation areas include ecosystems where less than half the polygons have high or very high ecological value:

- Several components of interest are present and confined to specific sectors;
- The ecosystems are home to biotopes of special interest for representative species.

This type of conservation area is generally larger, with several elements of special interest. They provide a certain quantity and quality of biotopes for several species. The also contain landscape elements that are representative of the natural region, as well as some rare species. These ecosystems are generally not fragile, because of their spatial extent or their ecological integrity.

CONSERVATION AREAS, TYPE IV

These areas raise certain conservation concerns because of a combination of rarity and representativity:

- Their components are not generally fragile, but are frequented by visitors or reknown for their scientific interest;
- Occasionally, they contain abundant, representative components that may be relatively fragile.

These ecosystems are located within the Park boundaries, but are not valued ecosystems. Nevertheless, if some of these should be found to be of special interest in the future or to deserve special attention, they should then be classified in one of the other conservation types, depending on their degree of fragility.

CLASSIFICATION OF VALUED ECOSYSTEMS

The valued ecosystems have already been identified (DDM, 2007). However, it is important to set boundaries based on watersheds for the purposes of implementing the management proposals in the Ecosystem Conservation Plan. The previously identified boundaries were therefore revised with this in mind, and now offer a zoning system that has been adjusted to reflect management objectives (see Appendix 1). It should be noted that the resulting map meets the needs of the study and in no way interferes with the Master Plan zoning system currently in force in the Park (NCC, 2005c).

Each valued ecosystem was assessed on the basis of the conservation areas described above, and was mapped as shown in Figure 14. Table 3 presents the results of the assessment.

TABLE 3
CONSERVATION AREAS BY VALUED ECOSYSTEMS

VALUED ECOSYSTEM	CONSERVATION AREA
Eardley Escarpment	I
Eardley Plateau	II
Three-Lake Chain	I - III[6]
La Pêche Lake	II
Pink Lake Plateau	I

The results of this classification will be used at two different levels. First, they will direct the conservation and restoration actions implemented within each valued ecosystem; and second, they will be used to situate each ecosystem on the Ecosystem Conservation Plan implementation schedule.

It should be noted that the results of the assessment and the new geographic boundaries are used to determine the priority areas for conservation actions, and in no way affect the conservation designations established during the identification and assessment of the Park's valued ecosystems and natural habitats (DDM, 2007). For example, Eardley Plateau contains a Type II conservation area, but maintains its "exceptional" conservation ranking.

The assessment of conservation priorities is therefore an essential first step in intiating the conservation process. The results will be applied throughout the period covered by the action plan.

5.3 ECOSYSTEM CONSERVATION PROCESS

This section presents the last step in the conservation analysis that will precede the action plan. The information collected and analyzed will be used to draw up an overview of the current situation and the targets for the future (Vision for 2035). Next, the main conservation statements are determined, defined and prioritized. The conservation process must support the implementation of ecosystem management.

The use of a process as a management tool involves two aspects: the notion of interrelationships, and target outcomes. The ecosystem conservation process implies that various substantial elements will have to be integrated to reach the target level of ecological integrity.

The conservation vision sets the tone by specifying, in the "ecological integrity" section, the various elements that must be considered, such as, for example, the viability of the populations of species at risk, allowing natural processes to run their course and the control of invasive species. However, in meeting these objectives, several questions must be asked:

- Is the current level of ecological integrity fully known?
- What needs to be done to reach the target level of ecological integrity?

A process for the conservation of the Park's ecosystems has been developed on the basis of all these elements (Figure 15).

[6] Most of the Three-Lake Chain ecosystem is classified as Type III, but the three lakes themselves are classified as Priority I.

CCN NCC

Canada

AIRES DE CONSERVATION DU PARC DE LA GATINEAU
GATINEAU PARK CONSERVATION AREAS

Aires de conservation / *Conservation Areas*

- I
- II
- III
- IV

Source

Information géographique de référence provenant des bases de données de la Commission de la capitale nationale.

Geographic information provided by National Capital Commission databases.

km 0 0,5 1 2 3 4 5 km

MTM, NAD 83, Fuseau 9
MTM, NAD 83, Zone 9

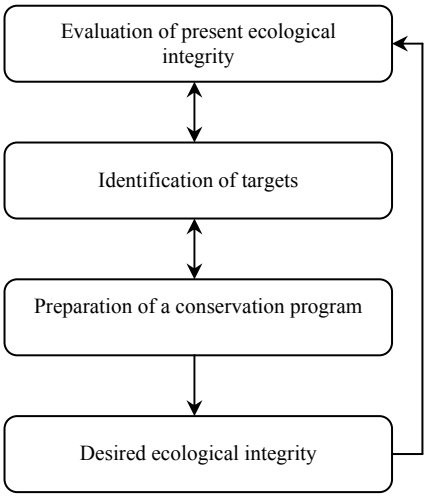
FIGURE 14

Février 2010
February 2010

DDM Del Degan, Massé Experts-conseils

LAC-DES-LOUPS
SAINT-LOUIS DE-MASHAM
SAINT-FRANÇOIS DE-MASHAM
SAINTE-CÉCILE DE-MASHAM
WAKEFIELD
LUSKVILLE
GATINEAU
OTTAWA
QUÉBEC
ONTARIO
Rivière des Outaouais
Gatineau
Rivière
Lac des Loups
Lac Halverson
Lac Bélanger
Lac Bob
Lac à Breen
Lionel-Beausoleil
Lac Ruthledge
Lac Kelly
Lac à la Loutre
Lac Sandy
Lac Glynn
Lac-La-Pêche
Chemin
Sincennes
Lac la Peche
Lac Leblanc
Lac Belair
Lac Ben
Lac Hawley
Lac Curley
Lac Ramsay
Chemin d'Eardley
Chemin du Lac-Philippe
Lac Taylor
Lac Renaud
Lac Clair
Lac Philippe
Lac au Foin
Lac Lusk
Lac Mousseau
Lac Edouard
Lac Meech
Chemin du Lac Meech
Lac Fairburn
Lac Jean-Venne
Lac Mahon
Lac Nesbitt
Lac Gauvreau
Lac Bell
Lac Wright
Lac Long
Lac Forked
Lac à la Truite
Lac Saint-Antoine
Lac Brown
Lac Caséade
Lac Carman
Cross Loop
CHEMIN DE FER HULL-CHELSEA-WAKEFIELD
Chemin 6-Concession
Chemin 5-Concession
Chemin de la Rivière
Chemin de la Baie
Chemin Tremblay
Chemin de la Butte
Chemin des Dominicains
Chemin de la Montagne Nord
Prom. Champlain
Prom. Fortune
Lac Fortune
Kingsmere
Lac Kingmere
Lac Mountains
Prom. de la Gatineau
Lac Pink
Chemin Baillie
Chemin Cook
Chemin Pink
Chemin Perry
Chemin Klock
Chemin Vanier
Chemin de Chelsea
Chemin De la Montagne
Boul. Saint-Raymond
Lac des Fées
Lac Leamy
Chemin Saint-Columban
Chemin Taché
Avenue Gatineau
Montée Saint-Amour
Montée Paiement
Boulevard de la Vérendrye ouest
Boul. Maloney
Boul. Gréber
Boulevard des Allumettières
Chemin D'Aylmer
Alexandre-Taché
Rivière Rideau
Canal Rideau
Ferry Road
Dunrobin Road
Galetta Side Road
Carp Road
Kinburn Side Road
CN
I
II
III
IV

FIGURE 15
ECOSYSTEM CONSERVATION PROCESS



Four key steps are proposed to structure the planning process, but the four steps, although presented in the form of a hierarchy, are all of equal importance. In addition, to ensure adaptive management, the steps in the process must be in a state of constant feedback and continual review.

The conservation process will be applied to all the valued ecosystems and to specific issues such as species at risk, invasive species, biodiversity, natural processes and human land use.

The current level of ecological integrity, like the target outcomes, must be studied in more depth. As a precaution, it is suggested that conservation actions be defined in parallel with the above process, in order to ensure that stressors are in fact reduced. These actions will allow for adapted, coherent management options to be developed based on the best available current knowledge.

5.4 CONSERVATION ACTION PLAN

5.4.1 APPROACH

The action plan is the outcome of discussions and analysis conducted under the Gatineau Park Ecosystem Conservation Plan. It focuses on the desired results, rather than on the processes and steps required to obtain those results. Accordingly, it supports the conservation vision, sets conservation priorities and completes the conservation process. Various conservation issues arising from this process are set out in Table 4.

TABLE 4
CONTEXT FOR DEVELOPING THE ACTION PLAN

CONSERVATION PRIORITY*	CONSERVATION PROBLEM ADRESSED IN ACTION PLAN	REFERENCE TO THE CONSERVATION VISION
2. Maintain or restore the natural processes and balances needed for ecosystems to function properly	Climate change, air pollution	Orientation A of principle 2 Orientation of principle 3 Orientation of principle 4
	Natural processes and balance (snowstorms, ice storms, flooding, high water, fires, insect epidemics, predator/prey relationships, natural habitat mosaic)	
3. Maintain or restore diversity of indigenous animal and plant species	Biodiversity and viability of species (at-risk species, invasive species)	Orientation of principle 1 Orientation A of principle 2
4. Increase habitat availability, quality and connectivity	Ecological corridors	Orientation B of principle 2
	Terrestrial, aquatic, riparian and wetland ecosystems	Orientation A of principle 2 Orientation of principle 1
5. Conserve or restore the Park's valued ecosystems	Restoration plan Ecosystem-based conservation actions Long-term monitoring program	Orientation of principle 1 Orientation A of principle 2 Orientation of principle 5
6. Minimize the impact of recreational activities on the ecological integrity of the Park and raise public awareness of conservation issues	Impacts of recreational activities Conservation awareness Collaboration and partnerships	Orientations of principle 6 Orientations of principle 6 Orientation of principle 7

Notes:

Conservation priority 1 – *Reduce the impacts of pressures on ecosystems*– is discussed in a separate section (Section 6.3, Stress reduction strategy).

Each conservation issue will be considered and dealt with using current data and target outcomes. Its content will take uncertainty into account, as well as the continual acquisition of information that typically occurs with this type of study.

A conservation issue will lead to conservation actions, based on consultations with various stakeholders and managers, environmental studies and research projects. To propose an efficient and rapid analysis process, treatment of each issue will be broken down as follows:

1) CONTEXT AND CURRENT SITUATION states the specific problem.
2) CONSERVATION APPROACH states the conservation orientation, given the Park context.
3) KEY CONSERVATION ACTIONS are based on the approach that is developed. Sufficient knowledge must be available to implement them. The key conservation actions have been identified from the state of the current knowledge base and the scope of the problem.

Conservation actions are the final step, offering a selection of options to maintain ecological integrity.

In addition, given the different scales at which the issues are relevant, each problem of the action plan is considered based on its spatial impact:

- The greater ecosystem is affected by global phenomena such as climate change, and considers the Park parting the contest of a network of protected natural areas.
- The regional ecosystem focuses efforts on sustaining ecosystems within watersheds or major physiographic features, through partnerships and coordination at the NCR level.
- The Park's ecosystems focus on achieving and maintaining ecological integrity by preserving and restoring natural and indigenous components and processes. A number of strategies can be evoked for this purpose, including rehabilitation plans for valued ecosystems.

Finally, conservation actions must be based on advanced knowledge, research and monitoring. They must also include a "communication" component to maintain a close link with the general public and ensure its cooperation.

CONCEPTS AND PRINCIPLES

The various statements and proposals made in connection with conservation problems take into consideration the basic principles set out in the conservation vision, namely the precautionary principle and the practise of adaptive management. It is important to deal with conservation issues and actions in a way that takes into account the constantly changing and transitional nature of ecosystems as a result of global environmental change and pressure from human activity. Natural processes, under certain conditions, should be managed in a way that allows them to play their proper role in ecosystem dynamics. This acceptance or predominance of natural processes is not, however, appropriate in situations where there is a population imbalance, a risk for human safety or a threat to ecological integrity. The action plan can therefore be based on activities involving various protection, preservation, conservation and restoration actions, defined as follows:

- Protection includes all regulatory measures and resource management and public education programs designed to maintain ecosystems in as natural a state as possible (Panel on the Ecological Integrity of Canada's National Parks, 2000).
- Preservation includes all measures to prevent alterations to, or the deterioration or destruction of, a natural or cultural resource. It includes conservation activities to consolidate and maintain the form, materials and integrity of a resource (Panel on the Ecological Integrity of Canada's National Parks, 2000).
- Conservation includes all measures targeting the rational use, maintenance or preservation of natural or cultural resources (Panel on the Ecological Integrity of Canada's National Parks, 2000).
- Restoration is a process to assist the re-establishment of a degraded, damaged or destroyed ecosystem, with the goal of restoring its ecological integrity (SERI[7], 2007).

RESEARCH AND MONITORING

Since the 60's, the NCC has fostered more than 1,200 scientific research projects, conducted in-house by teams of Park professionals, or externally by scientific institutions, academics and consulting firms. The findings are used to support management decisions and provide elements for new approaches and orientations. The elements identified in the Ecosystem Conservation Plan raise a number of new questions and clearly demonstrate the need for new knowledge. Indeed, some of the conservation actions include suggestions for research or consolidation of existing knowledge.

Research needs are identified in several documents as well as key sections of the Ecosystem Conservation Plan, including:

- The study of ecosystem health and the stress reduction strategy, both of which raise questions about the stress factors and other problems affecting the Park;
- The orientations derived from the conservation vision, which encourage scientific support throughout the conservation planning process;
- The ecosystem conservation process, which includes ecological integrity objectives;
- The conservation actions of this plan, which require the acquisition or reinforcement of management knowledge (plans, strategies, preventive and protective measures, etc.);
- The ongoing natural resource management program, which makes reference to various existing land and biodiversity protection agreements and treaties.

The main topics on which research is required can also be identified and defined from the issues addressed in the Ecosystem Conservation Plan. For example, the plan of action should aim to enhance and confirm knowledge of:

- Ecological integrity;
- Biodiversity;
- Connectivity;
- Management methods;
- Global warming and climate change;
- Human use.

[7] Society for Ecological Restoration International

5.4.2 CONSERVATION AT THE GREATER ECOSYSTEM LEVEL

5.4.2.1 CLIMATE CHANGE AND ATMOSPHERIC POLLUTION

1. CONTEXT AND CURRENT SITUATION

Over the last decade, climate change has seriously threatened ongoing efforts to save many species and ecosystems, mainly because of global warming, atmospheric pollutants and acid rain (Scott et al., 2005). Several internationally-recognized scientific studies and environmental organizations have concluded that climate change is a major issue for protected areas, especially with regard to biodiversity.

Of the four main environmental concerns mentioned in the Gatineau Park Master Plan (NCC, 2005c), three are directly connected to climate change:

- Risk of habitat loss. The more climate conditions change, the greater the risk of habitat deterioration and loss for certain species. Some plant and animal communities will evolve as a result of climate change.
- Risk of natural process disturbance. Climate change will alter some of the natural processes in Gatineau Park, including major disturbance factors such as forest fires and insect and disease cycles. The distribution of certain species will also change, leading to an increase in the number of "new" species.
- Risk of biodiversity loss. Climate change will alter the biodiversity in Gatineau Park. Some rare species found in the Park that are adapted to the cold, could be threatened by a warmer climate, while others from the south could become acclimatized.

The study of Gatineau Park ecosystem health (DDM, 2006a) concludes that air quality, in terms of pollutants, is acceptable. Ozone concentrations, however, remain relatively high, which may influence the health of the environment over the short term. The characterization parameters are close to, but below, the thresholds for human health (based on the standards of the Québec Ministère du Développement durable, de l'Environnement et des Parcs, 2006).

Given the range of its activities and its commitment to environmental protection, the NCC took an essential step by including the question of climate change in its strategic planning (Scott et al., 2005). It has established a number of adaptation strategies focusing on the recreation and tourism sectors. It has also confirmed its leadership in the area of scientific research and partnerships by taking part in research projects with various government departments to collect data on climate change. These involve, among other things, setting up stations to measure acid rain and atmospheric pollution in Gatineau Park, and a pilot project on tulip flowering. The NCC continues to support initiatives aimed at reducing the impact of urban development in the National Capital Region. For example, the Gatineau Park Master Plan (NCC, 2005c) stipulates that no other roads will be built in the Park, and that strategies to develop a green transportation system are currently being devised.

2. CONSERVATION APPROACH

Climate change is a worldwide problem that cannot be resolved at the local level. Nevertheless, Gatineau Park can act as a pioneer in the application of real strategies to minimize activities leading to climate change. Actions can be taken throughout the Park via different partnerships, for example in the areas of transportation and research. This approach will confirm the NCC's clear commitment to leadership and innovation in the field sustainable environmental management (DDM, 2005b).

3. KEY CONSERVATION ACTIONS

- Assess and implement the adaptation strategies presented in the report on climate change (Scott et coll., 2005), based on the context of changing ecosystems and the activities that take place in the Park.
- Develop a Green Transportation Plan in accordance with the recommendations made in the Gatineau Park Master Plan (NCC, 2005c), in order to limit and control the motor traffic and travel in central parts of the Park which are dedicated to conservation.
- Continue partnerships with Québec's Ministère des Ressources naturelles et de la Faune and Environment Canada in monitoring programs for acid rain and atmospheric pollution.

5.4.3 CONSERVATION AT THE REGIONAL ECOSYSTEM LEVEL

5.4.3.1 ECOLOGICAL CORRIDORS

1. CONTEXT AND CURRENT SITUATION

The health of the Park's ecosystems and the survival of many of its species depend on the links that exist with other natural spaces. This means that buffer zones and ecological corridors are vital elements in maintaining the integrity of the Park's ecosystems.

Buffer zones are spaces that differ in terms of size, but provide for a transition between two environments. As their name suggests, they form a natural barrier against the stressors that threaten sensitive natural spaces. Consideration should therefore be given to the possibility of protecting and developing these zones as a means of preserving the Park's ecosystems in general, and its valued ecosystems in particular.

Ecological corridors are part of the landscape and are necessary for maintenance of biodiversity, at all levels. They have five main functions (Forman, 1995):

- Conduit: they offer a corridor for the dissemination of animal, plant and fungal species.
- Habitat: they can act as a habitat or refuge where species complete their entire life cycle.
- Filter: what favours one species may not favour another—corridors may act as conduits for one species and blocks for another.
- Source: the corridors themselves may constitute a reservoir of colonizing individuals.
- Sink: on the other hand, corridors may act, for certain species, as a disjointed habitat colonized by one or more populations, on the periphery of the main habitat in the landscape matrix.

Corridors also increase the viability of local species populations (Bennett and Mulongoy, 2006) by reducing their isolation and promoting an increase in numbers, genetic exchange and the probability of (re)colonization.

It is clear that the perimeter of Gatineau Park is becoming increasingly developed, whether for farming or housing, and that the number and especially the size of the corridors is decreasing yearly.

Mapping was carried out to identify potential corridors for the Park. The geographical position of the corridors was established manually using aerial photographs supported by on-site aerial surveys to identify key features that form natural corridors, such as mountain barriers, watercourses and natural areas. Gatineau Park and the Ottawa and Gatineau rivers were selected as habitats of ecological interest to be connected by ecological corridors.

Once the surveys were complete, the length and breadth of the corridors were measured to calculate their carrying capacity in light of the needs of the target species (i.e. endangered animal species) in Gatineau Park. A number of stakeholders such as Action Chelsea for the Respect of the Environment (ACRE) and the Nature Conservancy of Canada) were also consulted for the information currently available on the composition and ecological interest of the corridors.

Lastly, a number of corridors were delimited, at different levels. They are shows in Figure 16.

At the greater ecosystem level, the ecological network was mapped according to a supra-landscape analysis connecting large-scale ecological elements such as parks, reserves and migration routes. Given the size of the connectors, an overall management approach, supported by national and international partners, is needed.

At the regional level, several key sectors have been identified around the Park: the sector of Plaisance National Park, natural areas in the Greenbelt and Pontiac sectors and the Mont O'Brien sector. Although urban development separates some of these sectors from Gatineau Park, a number potential ecological corridors nevertheless exists.

There are 14 potential ecological corridors around Gatineau Park. Their size, composition and function vary, but all of them are able to link the Park to adjacent elements such as the Gatineau and Ottawa Rivers and the forests to the north of the Park.

The information available on these 14 corridors was then analysed in greater detail, and certain corridors were found to be of particular interest with respect to the Park's ecological integrity. This qualitative analysis was based on three selection criteria, namely the corridor's potential linkages, its integrity and the quality of information currently available.

Criterion 1: Potential linkages

Used to assess how the corridor links Gatineau Park to surrounding elements of interest, i.e. the Pontiac sector to the west, the Greenbelt to the south, the Plaisance sector to the east and the northern forests, including Mont O'Brien.

Criterion 2: Integrity of the corridor

Given the context in which the Park is situated, many corridors have been altered by residential and industrial development, roads, etc. This criterion examines the corridor's potential based on its ecological components, such as the presence of forest cover, other connective elements such as watercourses, visible evidence of fragmentation, and size.

Criterion 3: Available information

Research (NCC, 2002; Wampach and Laparé, 2005, ACRE, 2007, St. Hilaire, 2007, CNC, 2007, Wampach, 2007) concerning some of the corridors identified in the study has been carried out by associations (ACRE) and non-profit organizations (Nature Conservancy of Canada, Canada Parks and Wilderness Society - CPAWS), as well as by governments (MTQ). Their findings provide additional information on the corridors and their potential connectivity.

Preliminary analysis led to the identification of four particularly significant corridors:

The Breckenridge Creek corridor provides a direct link between the Park and the Ottawa River, as well as a potential link with the Greenbelt sector. Most of the corridor is wooded. Breckenridge Creek runs through the corridor, providing an aquatic link between the Park and the Ottawa River. The Nature Conservancy of Canada (CNC) has carried out research and monitoring in this area (NCC, 2002; Wampach and Laparé, 200t, 2007), and has identified a number of endangered species including the Northern chorus frog (*Pseudacris triseriata)* (Saint-Hilaire, 2007) and the Blanding's turtle (*Emydoidea blandingii)* (NCC, 2008).

The Larrimac Corridor links the Park to the Gatineau River. Most of its area is wooded, and it is intersected by several watercourses. Action Chelsea for the Respect of the Environment (ACRE) has examined the natural spaces in this sector, and classified the corridor as having a high conservation value (ACRE, 2007). This initial project may therefore serve as a basis for future research.

The Shawville Corridor includes a range of habitats and ecosystems, and is composed of woodland, watercourses and wetland. It provides a direct link between the Park and the Ottawa River, and because of its location appears to form a link with the Pontiac sector. Although very little research has been done in this area, it is nevertheless likely to be of interest to the Park as a potential corridor because of its size and location.

The Masham Corridor is a large area, composed of woodland along with several streams and creeks. It links the Park to the Northern forests, including the Mont O'Brien sector. So far, no research or characterization studies have been carried out, but the area nevertheless appears to be suitable as a corridor for the Park because of its size and un-fragmented character.

The importance of the **Champlain-Voyageurs** corridor should also be noted. Because of its location, it is exposed to a number of stressors, and both its size and some of its ecological components have been altered as a result. Despite this, it still offers potential as a valuable link between the southern portion of the Park, which is located in a highly urbanized area, and the Greenbelt (Shirley's Bay).

The results of this analysis are qualitative in nature. Even so, they provide a basis for future studies of the conservation process in these corridors. In addition to the five corridors mentioned above, several other potential corridors exist, and characterization studies are required to identify their true ecological value. The NCC has also identified a number of green or recreational corridors that play an important role in its mandate.

2. CONSERVATION APPROACH

The management focus for ecological corridors around Gatineau Park must be on the preservation of existing corridors and the creation and protection of potential corridors to help maintain biodiversity in the Park.

PRINCIPAUX CORRIDORS ÉCOLOGIQUES POTENTIELS DU PARC DE LA GATINEAU
MAJOR POTENTIAL ECOLOGICAL CORRIDORS AROUND GATINEAU PARK

Corridor du nord
North Corridor

SAINT-LOUIS-DE-MASHAM

Corridor de Masham
Masham Corridor

WAKEFIELD

Corridor de Wakefield
Wakefield Corridor

Corridor de Shawville
Shawville Corridor

Corridor de Pontiac
Pontiac Corridor

PARC DE LA GATINEAU PARK

Corridor nord-est du Parc
Northeast Park Corridor

Corridor de Larrimac
Larrimac Corridor

Rivière

Gatineau

LUSKVILLE

QUÉBEC

ONTARIO

Corridor de Luskville
Luskville Corridor

Corridor du ruisseau Breckenridge
Breckenridge Creek Corridor

Corridor du ruisseau Chelsea
Chelsea Creek Corridor

Rivière des Outaouais

Corridor d'Aylmer
Aylmer Corridor

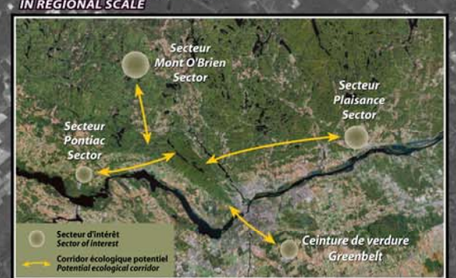
Corridor Philémon-Wright
Philemon-Wright Corridor

GATINEAU

Corridor Champlain-Voyageurs
Champlain-Voyageurs Corridor

LE RÉSEAU ÉCOLOGIQUE
À L'ÉCHELLE DU GRAND ÉCOSYSTÈME
ECOLOGICAL NETWORK
IN THE SCALE OF GREATER ECOSYSTEM

LES CORRIDORS ÉCOLOGIQUES
À L'ÉCHELLE RÉGIONALE
ECOLOGICAL CORRIDORS
IN REGIONAL SCALE



Canada

CCN NCC

CCN NCC

Canada

PRINCIPAUX CORRIDORS ÉCOLOGIQUES POTENTIELS DU PARC DE LA GATINEAU

MAJOR POTENTIAL ECOLOGICAL CORRIDORS AROUND GATINEAU PARK

Corridor écologique potentiel
Potential ecological corridor

Corridor retenu
Selected corridor

SOURCE

Information géographique de référence provenant des bases de données de la Commission de la capitale nationale.

Geographical information provided by National Capital Commission databases.

km 0 1 2 3 4 5 km

Projection MTM, NAD 83, Fuseau 9

MTM, NAD 83, Zone 9

FIGURE 16

Février 2010
February 2010

DDM Dei Degan, Massé

3. KEY CONSERVATION ACTIONS

- Acquire the necessary information on the 14 identified ecological corridors by means of a qualitative analysis through studies and inventories, including surveys and monitoring of biodiversity in each corridor and an assessment of the terrestrial and aquatic stress factors. Characterization of the ecological corridors will permit establishing their ecological role and their importance in maintaining biodiversity. The health of the corridors could be assessed using the same methodology as for the Park's ecosystems, i.e. by selecting and assessing a number of biotic and abiotic parameters. This work could also be done in partnership with the municipalities and organizations concerned. At the same time, the study could identify measures to ensure the conservation of the selected corridors.
- Draw up a plan for the preservation of the ecological corridors identified in partnership with the municipalities, associations and other bodies concerned.
- Support the creation of partnerships at the regional, national and international levels to gather the information and tools needed to develop a network of corridors at different scales.

5.4.3.2 TERRESTRIAL ECOSYSTEMS

1. CONTEXT AND CURRENT SITUATION

Terrestrial ecosystems function on the basis of an ongoing dynamic balance between natural disturbances, plant succession and biological populations. The preservation of ecological integrity and biodiversity depends on knowledge of the evolving spatial, functional, biotic and abiotic characteristics of the ecosystems concerned. Pressure on ecosystems can be observed at various spatial levels (global, regional and local) and timeframes (long, medium, short term), necessitating management methods that are adapted over time and space (Pelletier, 1997).

The Park is part of a mosaic of forests, farmland and urban development. The forest ecosystem, which covers 85% of the Park, is regressing in the peripheral areas, where urban development is on the increase. The terrestrial environment in the Park, with scattered private and public enclaves, is used increasingly for recreational activities. Although the present plant and animal potential is sufficient to support biodiversity, natural ecosystem dynamics and development could cause the situation to change. The population levels of non-native, opportunistic and invasive species have a tolerable impact on biodiversity and ecosystem functions, but the situation is deteriorating. The ecological condition of the terrestrial ecosystems is likely to have a major impact on the Park's overall biodiversity and health (DDM, 2006a).

Parks Canada uses approximately fifteen different indicators to monitor biodiversity, ecological functions and pressure on terrestrial and riparian ecosystems in Canadian parks (McCrank et al., 2005; Parks Canada, 2006a). The NCC monitors some of these same components, including the diversity of plant and animal species in the Park, certain invasive plant species and species at risk, as well as the impact of certain human activities (NCC, 2004b). In addition to its various strategic planning tools, the NCC has drawn up a Plan to Protect Plant and Wildlife Species at Risk in Gatineau Park (NCC, 2006b), along with a Biodiversity Monitoring Program (DDM, 2005a, b, c) and a Valued Ecosystem and Habitat Evaluation System (DDM, 2007) that are expected to provide information on, and improve monitoring of, terrestrial ecosystems in the Park.

2. CONSERVATION APPROACH

Management of terrestrial ecosystems in Gatineau Park is designed to protect and maintain ecological integrity through knowledge acquisition, the implementation of protection measures, monitoring and public awareness campaigns.

3. KEY CONSERVATION ACTIONS

- Maintain existing or initiate new recreational activity monitoring in Conservation Areas (Type I to Type IV, in that order), so as to identify environmental problems and design and implement adaptive management measures.
- Continue the measures established under the protection plan for species at risk in Gatineau Park (NCC, 2006b).
- Continue to monitor the indicators for terrestrial environments in the Park under the biodiversity monitoring program: vascular plants, avian fauna, micromammals, species at risk, plants at risk and invasive plants (garlic mustard (*Alliaria officinalis*) and glossy buckthorn (*Rhamnus frangula*)), habitat mosaic, environmental fragmentation and plant and wildlife potential.

- Wherever possible, minimize the impacts of aggressive invasive species (plants and wildlife) that affect indigenous ecosystems and species (see section 5.4.4.2.2 on invasive species).
- Continue the process which has been initiated for the banning snowmobiles from the Park, as a consequence of the decision made in the Gatineau Park Master Plan (NCC, 2005c) to eliminate off-road motor vehicles from the Park.

5.4.3.3 AQUATIC AND RIPARIAN ECOSYSTEMS WETLANDS

1. CONTEXT AND CURRENT SITUATION

The Park has a large number of aquatic environments in the form of roughly 50 lakes, numerous ponds, one river and several dozen streams (DDM, 2002). Bodies of water cover around 8% of the Park's surface, and are connected by a complex network of small watercourses. Over half of all the water bodies are either intermittent streams or beaver ponds, especially on the Eardley Plateau. La Pêche, Philippe, Mousseau and Meech lakes, which flow into the Gatineau River, account for 80% of water surface area. The main watersheds in the Park are those surrounding La Pêche, Philippe, Mousseau and Meech lakes, the last three being located entirely within the Park and drained by Meech Creek. Gatineau Park has streams spread throughout its area, flowing into or out from the main lakes. The major streams are Meech Creek (the outflow from Meech lake), Chelsea and Fortune Creeks (connected to Fortune lake), and the tributaries of the La Pêche River. La Pêche River itself joins Des Loups, À la Loutre and La Pêche lakes, and is only partially within Park boundaries (DDM, 2002; NCC, 2004b).

Over 50 species of fish, divided into 13 families, have been identified in the Park's waters (DDM, 2005a). They account for approximately 63% of all fish species present in the Greater Outaouais region (according to Environnement Québec data, 1996), and approximately 15 of these species, including the stenothermal group to which the salmonid family belongs, are of interest to sport fishers. This group is at greatest risk from both the potential decline in the oligotrophic nature of the Park's lakes, and from pressure due to fishing.

The decline in the Park's salmonid populations was already apparent in the early 1970s. Rubeck (1971, in Coad, 2005), ascribed this mainly to overfishing and the additional nutrient inflow caused by the growing human presence.

All the populations of coldwater species (stenothermal) in the Park are small, and some have virtually disappeared. In Gatineau Park, the distribution of salmonids, which comprise four species, has been considerably influenced by stocking (DDM, 2006a, section 3.9.1), sport fishing and introduced species (e.g. smallmouth bass (*Micropterus dolomieu)* (Coad, 2007). Only the brook trout and the lake herring (*Coregonus artedi)* are still found in some of the Park's lakes (Coad, 29007; Pitre et al., 2007). However, their continued presence is largely the result of population "maintenance" efforts (stocking) prior to 1982.

The riparian environments (shorelines) are the interface between bodies of water or wetlands and terrestrial environments. The width of this interface zone depends on the biological species present. The riparian habitats are those that are often used most intensively by Park visitors, and also have special value for wildlife. Their biotic communities are typically more diversified than in terrestrial environments (DDM, 2006a).

The wetlands are made up of marshes, swamps, bogs and other shallow-water zones. These fragile environments offer important and sometimes unique habitats for a number of species, some of which are at risk. They cover about 6% of the Park's area. Some of the Park's animal and plant species cannot live outside the wetlands. The Eardley Plateau has the highest concentration of wetlands (DDM, 2002 and 2006a; NCC, 2004b).

Human activities influence wetland dynamics in several ways. They increase the flow of nutrients to the detriment of these ecosystems. Organic and inorganic matter in waste water and run-off leads to an increase in primary production and eutrophization, and a reduction in some animal and plant populations. Human activities can also lead to the proliferation of invasive species, an increase in erosion, the destruction of plant cover along the waterline, the destruction of aquatic and semi-aquatic wildlife habitat, and a decrease in the indigenous fish population (Plante, 1996; NCC, 2004b). Situations such as these can be observed in several bodies of water in Gatineau Park, including Des Fées, Philippe, Meech, Pink and La Pêche lakes, and the La Pêche and Chelsea watercourses (NCC, 2004b). The health of these environments is considered to be acceptable, but is deteriorating gradually. Recreational pressure on aquatic and riparian environments is strong during the summer. Use is localized, but is expected to increase if no additional controls are exercised. Intensive use and the presence of private houses impact on the ability of shoreline areas to maintain their integrity. There is clear pressure from beavers and some invasive species on natural integrity in wetland environments (DDM, 2006a). Lastly, the presence of certain structures, including human-made dams, obstruct the free transit of water and fish (see section 5.4.4.1.2).

Parks Canada uses more than thirty descriptive components to monitor biodiversity, ecological functions and pressure on aquatic and riparian environments in Canadian parks (Sargent et al., 2005; Parcs Canada, 2006). The NCC monitors some of these same components, such as water quality for drinking and for bathing, phosphorous content, invasive aquatic plants, the common loon and the beaver population (NCC, 2004b; Sargent and coll., 2005). As pointed out in the section on terrestrial ecosystems, the NCC is behind several initiatives to introduce monitoring and protection for aquatic and riparian environments and wetlands.

2. CONSERVATION APPROACH

The management of aquatic and riparian ecosystems and wetlands should focus on preserving natural abiotic and biotic conditions and reducing the undesirable effects of human activities. Action must be taken locally, as well as at the watershed level, to hydrological and ecological links between these environments (Plante, 1996; Ministère de l'Environnement, 2004).

3. KEY CONSERVATION ACTIONS

- Identify the sites and causes of riparian degradation in Gatineau Park's lakes and introduce measures to reduce stress.
- Identify and assess the impacts of formal and unofficial trails on lakeshores and introduce measures to reduce stress.
- Continue various measures established under the Plan to Protect Plant and Wildlife Species at Risk in Gatineau Park (NCC, 2006b) (see section 5.4.4.2.1 on species at risk)
- Continue to monitor the indicators for aquatic, riparian and wetland environments in the Park under the Biodiversity Monitoring Program: freshwater mussels, anura (frogs and toads), invasive plants (Eurasian water milfoil and purple loosestrife) and the common loon.
- Wherever possible, minimize the impacts of aggressive invasive species (wildlife and plants) that affect aquatic and riparian ecosystems, wetlands and indigenous and species (see section 5.4.4.2.2 on invasive species).
- Monitor water quality in headwater lakes and streams and characterize those for which insufficient information is available. Identification of headwater lakes and streams will help to foster the survival of species at risk in these environments, and to control future intrusion or spread by invasive species. Water quality could be monitored using the parameters developed for the assessment of ecosystem health.
- Continue discussions with municipalities and associations in the watersheds in and around the Park to promote watershed-based water management.
- Continue with the steps which have been initiated to remove motor boats from the Park's lakes. This action follows on from the decision made in the Gatineau Park Master Plan (NCC, 2005c) to eliminate off-road motor vehicles from the Park.
- Promote collaboration and partnerships with private landowners in the immediate vicinity of significant aquatic environments and wetlands in the Park, so as to encourage riparian protection.
- Update and implement the Gatineau Park Sport Fishing Management Plan (NCC, 1983) (see section 5.4.4.4 on recreational activities).
- Incorporate the notion of free movement of fish into the planning of future projects affecting the aquatic environment (e.g. installation and repair of culverts).

5.4.4 CONSERVATION OF PARK ECOSYSTEMS

5.4.4.1 NATURAL ECOSYSTEM PROCESSES AND BALANCE

5.4.4.1.1 WIND STORMS AND FREEZING RAIN

1. CONTEXT AND CURRENT SITUATION

Freezing rain and heavy winds often occur together in ice storms. Many major ice storms have taken place in Canada over the last 40 years: for example, February 1961 in Montreal, January 1968 in Ontario, March 1983 in Winnipeg,

April 1984 in St. John's (Newfoundland), 1986 in Ontario and Québec, and January 1998 in an area stretching from the Maritimes to the Ottawa and St. Lawrence Valleys (Lecomte et al., 1998).

2. CONSERVATION APPROACH

If an ice storm occurs in the coming winters, Gatineau Park will apply a management process that leaves ecological processes free to run their course in order to support natural ecosystem dynamics, unless they involve population imbalance, a risk for human safety or an impact on ecological integrity (for example, species at risk).

3. KEY CONSERVATION ACTIONS

- Monitor the progress of affected environments to verify that natural disturbances do not generate major impacts or risks (for example, continue to work with Carleton University on the study of ice storm impacts launched in 1998).

5.4.4.1.2 FLOODING AND SEASONAL HIGH WATER

1. CONTEXT AND CURRENT SITUATION

Flooding is part of the natural hydrological cycle. By covering floodplains, water brings nourishment to the wetlands in Canada's main deltas. These periodic episodes of high water can create an environment in which wildlife and plant life reach a balance that depends on repeated seasonal flooding (Environment Canada, 2007f).

Flooding can result from one or more causes: beavers, run-off from snow-melt, heavy rain from storms, run-off from urban environments, or failure of a control structure (Environment Canada, 2007f).

In Gatineau Park, despite the proximity of the Ottawa and Gatineau Rivers, flooding is rare because of the many water retention works (artificial dams) (CREDDO, 2004) and the Park's beaver management program.

2. CONSERVATION APPROACH

High water is a natural phenomenon that is necessary to the biological processes of the Park's wetland and floodplain areas. Management must focus on the preservation of natural processes that are essential to the survival of many different species, while providing protection for residential areas. Action must be taken at the local level, in conjunction with municipalities, and also at the drainage basin level, to dismantle as many non-necessary artificial dams as possible.

3. KEY CONSERVATION ACTION

- Dismantle non-necessary artificial dams to let natural processes run their course when possible and allow for the free movement of fish[8].
- Uphold the guidelines presented in the Fisheries and Oceans Canada (2007) document on best management practices for the design and installation of permanent culverts under 25 metres in length, when installing or repairing culverts, in order to allow for free movement of fish through the Park's culverts.

5.4.4.1.3 FIRE

1. CONTEXT AND CURRENT SITUATION

According to Lopoukhine (1974), the Gatineau Park area sustained major fire disturbance in the early 20th century that has largely determined the forest cover visible today. Better fire control in the years following the creation of the Park led to a considerable reduction in burned areas. Current data on the natural dynamics of forest groups in the Park and the characteristics of sample plots can be used to predict the probable development of the forest ecosystem in the absence of fire, and shows how the removal of fire could lead to the eventual disappearance of specific stands, as well as the effect on plant and animal diversity. The question of fire was addressed in the Gatineau Park Vegetation Management Plan (Somer, 1987). Given the size of the Park, the type of vegetation, the age of the forests, the proximity of residential neighbourhoods around the Park and the presence of private homes inside the Park, the plan recommended maintaining the present practice of immediately extinguishing forest fires.

[8] According to section 35 of the Fishing Act, in Fisheries and Oceans Canada, 2007.

In Canadian national parks, the policy is to minimize interference with natural processes in order to ensure normal ecosystem development. All fires, however, are systematically extinguished. Controlled burning is used to meet specific ecosystem management objectives, for example to re-establish fire-dependent species. The US National Parks Service has developed active fire management programs for several of its parks. Between 1970 and the early 2000s, the dominant policy was to allow wildfire under controlled conditions in certain "natural fire" zones, unless unacceptable loss was involved. However, this practice has been strongly criticized.

Allowing wild fires would be inappropriate in Gatineau Park because of its small size and recreational use, the location of its intensive-use zones, the presence of residential enclaves and uncontrolled access. It is nevertheless important to ensure that the role of wildfire as a natural process be considered in ecosystem management, in order to maintain certain characteristics or specific and essential ecological features, such as the presence of fire adapted species or communities.

2. CONSERVATION APPROACH

The proposed approach is first to determine whether fire, as a natural process, plays a significant role in natural ecosystem development, based on the Park's specific situation. Appropriate management measures can then be devised and assessed from the standpoint of ecosystem management (maintenance of dependent ecosystems, restoration of more natural species and age distributions, etc.).

3. KEY CONSERVATION ACTION

- Determine the role and ecological importance of fire in vegetation dynamics on the Eardley Escarpment. This evaluation will take place when the Gatineau Park Vegetation Management Plan (Somer, 1987) is revised, and will involve identifying the various management approaches and determining the extent to which fire does in fact play a role in ecosystem dynamics.

5.4.4.1.4 INSECT EPIDEMICS

1. CONTEXT AND CURRENT SITUATION

Despite the extensive damage caused to vegetation by insect attacks, these, like fire, are natural agents in the renewal of forest stands. They are partly responsible for the mosaic of varied age and composition structures (DDM, 2002). The main insects pests found in Gatineau Park are the spruce budworm (*Choristoneura fumiferana*), Asian gypsy moth (*Lymantria dispar*), forest tent caterpillar (*Malacosoma disstria*), redheaded pine sawfly (*Neodiprion lecontei*) and white pine weevil *(Pissodes strobi*) (NCC, 2004b).

In Gatineau Park, as in other protected areas in Québec and the Canadian national parks, preservation is generally encouraged. The prevailing policy, although not officialized in the form of a directive, is to let natural disturbances run their course, if monitoring shows that they have no major impacts. There is therefore no action strategy to fight insect epidemics. In Gatineau Park, its size, the many different recreational facilities and the presence of private homes are constraints that must be taken into account when assessing the risks involved in this management approach (DDM, 2002). The control of insects and tree disease is only considered in specific cases where the situation could become irreversible or pose a threat to public safety, or where prescribed by regulation (e.g. the Canadian Food Inspection Agency (CFIA) is responsible for monitoring the emerald ash borer (*Agrilus planipennis)*, which was observed in Ottawa in 2008). For this reason, spruce budworm and Asian gypsy moth numbers are monitored every two years in the Park when the infestation level is low to moderate, and every year when the infestation is severe (NCC, 2004b, 2007b and 2007e). In addition, insects and tree diseases are monitored annually throughout the province (MRNF).

2. CONSERVATION APPROACH

It is recommended that insect populations and epidemics affecting forest health should continue to be monitored, with the goal of predicting and assessing the scope of each attack, the damage caused, the visual impact, and to predict the probable evolution of the epidemic. Using this data, the infestation can be left to run its course or action can be taken if the risks become too great.

3. KEY CONSERVATION ACTIONS

- Where applicable, let infestations run their course but continue to monitor insect population levels and forest health impacts, except in the case of legal restrictions or impacts affecting ecological integrity, species at risk or public safety.

- Apply decisions made by competent authorities (e.g. Agriculture and Agri-food Canada) where appropriate.
- Continue to monitor and contribute to the monitoring of potential infestations by insects, (the emerald ash borer and Asian longhorned beetle), with the appropriate authorities.

5.4.4.1.5 PREDATOR/PREY RELATIONSHIPS

1. CONTEXT AND CURRENT SITUATION

This section examines certain species that present specific conservation problems, among other things due to their strength or position in the food chain. Based on current knowledge, the eastern wolf (*Canis lupus lycaon*), coyote (*Canis latrans*) and black bear (*Ursus americanus*) are all predators that influence ecosystem functionality by controlling the population dynamics of prey such as the white-tailed deer and beaver, as well as the distribution of species lower down the food chain. Their predation helps preserve the diversity and richness of vegetation in the Park and the ecological integrity of the forest ecosystem as a whole (Hegmann, 1996; Pelletier, 1997). Despite the pressures of predation and other regulating factors on the prey population, white-tailed deer and beaver remain abundant and sometimes even over-abundant in the case of the deer (NCC, 2004b; Tecsult, 2005).

The eastern wolf is a species with a large home range that is listed as a species of concern in Canada, but to which there is no legal protection (i.e. prohibition against harming, harassing, capturing, trapping, etc.) (Environment Canada, 2007e). Even though it is protected within the boundaries of Gatineau Park where it has sufficient resources, it remains vulnerable. If the typical home range used by individuals or packs is compared to the total area of the Park, it appears probable that some individuals use neighbouring forested areas, especially to the northwest.

The coyote shares its habitat and competes with the eastern wolf, cougar (*Puma concolor couguar*), Canadian lynx (*Lynx canadensis*), red fox (*Vulpes vulpes*) and black bear. The elimination of the wolf from some regions has not only removed a strong competitor for the coyote, but has also reduced the pressure of direct predation (Canadian Wildlife Service, 2007a). The coyote is a generalist, opportunistic species that is now common in the Park (NCC, 1991b). It is one of the few mammals whose distribution is increasing, even though it has been persecuted for many years.

The black bear is one of the most frequently-encountered large mammal species in Gatineau Park. Regular observation has shown that it is not present in all sectors of the Park (NCC, 2004b). The black bear is an indigenous species in the Park, but its presence in peripheral areas where its natural habitat has been disrupted and facilities (waste bins, bird feeders, barbecues) have not been adapted to its feeding habits, appears to be a problem.

In the spring of 2005, the Park's white-tailed deer population numbered around 1,200 individuals and in some locations exceeded the environmental carrying capacity (Tecsult, 2005). Although the severe winter of 2007-2008 undoubtedly reduced the Park's deer population, overpopulation will reoccur if winter conditions are normal in the next few years (Donald Jean, MRNF, personal letter). Overpopulation of large herbivores has an impact on the ecological integrity of ecosystems. Grazing affects the Park's vegetation and may have consequences for other animal species, for the physical condition of the deer themselves, and for the population of at-risk plant species. If climate conditions in the region continue to favour white-tailed deer, the population in the Park is likely to increase in the coming years, given that it is a protected species and that regulating factors, including predation (by the black bear, eastern wolf and coyote), are ineffective at limiting population levels (Tecsult, 2005; DDM, 2006a). In recent decades, five types of study have been used to monitor the evolution of the deer population in Gatineau Park: deer yard inventories, population inventories, grazing inventories (available food), winter mortality and winter climatic conditions (NCC, 2007d). There is also a Management Plan for White-tailed Deer (Dryade, 1983) and a management strategy, including a program for the period 2002-2017 (NCC, 2001d).

Despite its abundance (7.79 colonies/10 km^2 (Beaudoin-Roy, 2006)), the beaver population in the Park has remained relatively stable for the last 20 years. As a result, the effect of high beaver density on the ongoing natural succession pattern in aquatic environments is considered acceptable overall. Alterations to succesional patterns have tended to stabilize over the long term, but are ongoing (DDM, 2006a). Like many of the other components of the Park environment, beavers receive special attention in terms of conservation, and a Beaver Management Plan (Dryade, 1984) and strategy (NCC, 2001c) have been drawn up, along with a monitoring program (inventory, site inspection, develop, maintenance, population control) that are revise on an irregular basis (NCC, 2004b).

2. CONSERVATION APPROACH

Given that natural predation appears to be relatively low for some prey species, and that the predators have large home ranges, conservation efforts to protect natural habitats and ecological corridors should be sufficient to maintain or increase habitat quality and population levels for the species concerned, thereby maintaining natural predation processes in the Park. The wolf, for example, is a keystone species that plays a vital role in balancing trophic levels

in the Park's ecosystems. An effort must be made to maintain or increase populations, among other things by consolidating the corridors used by the species.

The abundant and potentially over-abundant herbivore populations (deer and beaver) are covered by adequate NCC management and monitoring programs. White-tailed deer management in Gatineau Park must be based on the goal of maintaining a viable population while avoiding over-abundance. This may require proactive management measures involving culling in peripheral areas where a situation of over-abundance occurs within the Park. In the case of the beaver, however, given the relative stability of the population and the existing monitoring and control mechanisms, no additional new management measures are required.

3. KEY CONSERVATION ACTIONS

- Identify the impacts of overabundant wildlife species on ecosystem health. This study will serve as a basis for revising the white-tailed deer (Dryade, 1983) and beaver (Dryade, 1984) management plans. Among other things, it will be used to establish the current situation, establish the desired population levels and examine various population reduction methods.
- Continue programs and strategies to manage and monitor the white-tailed deer and beaver populations.
- Monitor the use of corridors by predators and suggest measures to improve their role in maintaining predator population levels in general, and wolf populations in particular.
- In the case of continuing overpopulation, encourage the culling of deer in areas peripheral to the Park, in partnership with the MRNF.

5.4.4.1.6 NATURAL HABITAT MOSAIC

1. CONTEXT AND CURRENT SITUATION

Wildlife species perceive the environment at different levels, depending on the distribution of habitats and the size of their home range. In ecological terms, the landscape is perceived as a mosaic of ecological units or parcels making up key wildlife habitats and corridors that fit together to form a biological and physical matrix (DDM, 2005b).

Landscape fragmentation is generally recognized as one of the main causes for the decline of certain species (Wilcox et Murphy, 1985), since it may cause interior habitat loss. The use of land adjacent to a fragment, especially for urban development, may result in a level of pressure that has a profound effect on the biodiversity of this fragment patch.

The current mosaic of habitats in the Park provides sufficient support for biodiversity and vital habitats, but ecological systems and landscapes are fragmented. There have been losses and reductions of terrestrial and riparian habitats, and a departure from the natural wild state. The built environment (infrastructures, facilities, recreational installations, historic buildings, private properties and developments, roadways) is likely to have a negative impact on the behaviour of wild species, exposing them to habitat fragmentation and loss, and does not necessarily reflect the ecological values of a conservation park (DDM, 2006a).

2. CONSERVATION APPROACH

The conservation of natural diversity and natural landscape continuity is one facet of the concept of ecological integrity. From this perspective, if we protect diversity and ecosystem continuity, we will at the same time also protect most of the associated species (Hunter, 1990).

3. KEY CONSERVATION ACTIONS

- Continue to develop ecological corridors (see section 5.4.3.1 on ecological corridors).
- Continue to protect habitats in valued ecosystems (see section 5.4.4.3 on valued ecosystems).
- Continue to monitor indicators for the mosaic of habitats in the Park as part of the biodiversity monitoring program: habitat mosaic, landscape fragmentation and plant life and wildlife potential.

5.4.4.2 BIODIVERSITY AND SPECIES VIABILITY

5.4.4.2.1 SPECIES AT RISK

1. CONTEXT AND CURRENT SITUATION

In both Canada and Québec, a species is considered at risk if there is evidence to suggest that it could become extinct if nothing is done to rectify the situation. Several federal and provincial government initiatives to conserve and protect species at risk have been launched, some through legislative measures. Species at risk are those that have already been, or are likely to be, legally designated as such. The Government of Canada has established a country-wide list pursuant to its *Species at Risk Act* and the COSEWIC[9] list. In Québec, the *Act respecting threatened or vulnerable species* contains a list of species designated as threatened or vulnerable, along with a list of plant and wildlife species liable to be designated as threatened or vulnerable. Gatineau Park is the protected natural area with the most plant species at risk in Québec (Jolicoeur, 1994). Overall, in 2008, it was home to a total of 133 species (82 plant species and 51 animal species) that were designated as being at risk in either Canada or Québec. Of these, 19 plant species and 16 wildlife species had legal protection in Canada or Québec (NCC, 2008).

The NCC recognizes the value and importance of these species at risk and the legal obligations attached to them. In view of the precarious situation of several species at risk in Gatineau Park and their dispersal over the area, a major effort is required to ensure their protection and comply with legal obligations. This is why a Plan to Protection Plant and Wildlife Species at Risk in Gatineau Park has been developed (NCC, 2006b). Among other things, the plan proposes appropriate protection and rehabilitation initiatives for each species at risk in the Park with legal protection in Canada or Québec.

2. CONSERVATION APPROACH

Because of its conservation mandate and environmental leadership responsibilities, the NCC cooperates as much as possible in the drafting and implementation of the main existing and proposed protection measures in Canada (recovery programs, actions plans, management plans and the Interdepartmental Recovery Fund, IRF) as well as in Québec (situation reports, recovery plans, action plans) for species at risk that are present in Gatineau Park (NCC, 2006b). The positive consequences of proactive management measures justify the continuation and reinforcement of all these initiatives.

3. KEY CONSERVATION ACTIONS

- Continue the various measures established by the plan to protect plant and wildlife species at risk in Gatineau Park (NCC, 2006b): update the knowledge base, support scientific research, develop and implement protection guidelines, participate in federal and provincial conservation and recovery programs, carry out environmental assessments and obtain the necessary permits, exercise surveillance via conservation officers, and apply measures to protect the species concerned.
- Locate and characterize potential habitats for species at risk in order to sustain viable populations. This action will support the species at risk protection plan by helping to identify the sectors that need to be restored as a priority in order to maintain species at risk in the Park's ecosystems and in peripheral areas. It will also provide updated and more detailed information on potential habitats for species at risk, some of which have already been digitally identified (NCC, 2004b, database).
- Identify movement of wildlife species at risk within the Park's ecosystem as well as in the regional and greater ecosystems. This action will support the species at risk protection plan and help maintain the Park's ecological integrity.
- Continue to monitor the indicators associated with species at risk under the Biodiversity Monitoring Program: Plants and Wildlife at Risk. In addition, the presence of species at risk will be confirmed by the monitoring of vascular plants, bird life, micromammals, freshwater mussels and anura.
- Continue or begin work with the federal and provincial species at risk committees and with the programs of government departments working on species at risk (for example, Environment Canada's Interdepartmental Recovery Fund (IRF)).

[9] Committee on the Status of Endangered Wildlife in Canada. http://www.cosewic.gc.ca

5.4.4.2.2 INVASIVE SPECIES

1. CONTEXT AND CURRENT SITUATION

In Canada, all biological organisms are affected by the presence of invasive species. These are non-native species that propagate outside their natural distribution zone and have a negative impact on indigenous biodiversity. In some case, the extent of invasion may be massive.

Invasive species can be plants (e.g. buckthorns), insects (e.g. emerald ash borer), fish (e.g. zebra mussel (*Dreissena polymorpha*)) and even fungi (e.g. butternut canker (*Sirococcus clavigignenti-juglandacearum)*). The most common invasive species are plants; animal species are usually described as opportunistic rather than invasive. The zebra mussel, however, is an example of an invasive animal species that is currently under close watch in the Outaouais Region and is also a concern in Gatineau Park, even though it has not yet been detected there.

Exotic species that are introduced into an ecosystem may have an impact on indigenous species, habitats or the ecosystem as a whole. They may cause a reduction in or the disappearance of indigenous populations, and alter the ecosystem's functions.

The NCC is aware of the environmental issues related to invasive species and has launched a number of initiatives since 1995, including monitoring of purple loosestrife and Eurasian water milfoil (NCC, 2004b; NCC, 2007a). It has also set up a program to monitor biodiversity that will focus on the invasive species of most concern (garlic mustard, Eurasian water milfoil, purple loosestrife and glossy buckthorn) since they threaten the survival of indigenous species and species at risk in aquatic, terrestrial and wetland environments. A preliminary survey in 2006 will be used as a point of reference to assess the degree of expansion of these species over time (NCC, 2006c)

2. CONSERVATION APPROACH

Some invasive species may harm Park ecosystems irreversibly, for example by damaging biodiversity, indigenous species and species at risk. There are, however, currently few or no methods for eradicating many of the invasive species. The emphasis must therefore be on the prevention of new introductions. For the less invasive species that have a minimal impact on ecosystems, sporadic monitoring will be carried out. For highly invasive species that alter ecological integrity, valued ecosystems or species at risk, however, active management is preferred where possible or if it has been prescribed by regulation (e.g. CFIA and the emerald ash borer). In such a case, a variety of methods can be used, depending on the species and the level of invasion (e.g. chemical eradication for buckthorn).

3. KEY CONSERVATION ACTIONS

- Develop and implement a management strategy to minimize, wherever possible, the impacts of aggressive invasive species with repercussions for ecosystems and indigenous species, and to prevent new invasive species from being introduced. This will involve studying and mapping invasive plant species in the Park, then estimating the level of invasion and their impacts on indigenous biodiversity. It will then be possible to decide on the desired population level, and examine the various ways of achieving the reduction.
- Continue to monitor the indicators associated with invasive plant species as part of the biodiversity monitoring program for invasive species. In addition, the presence of any new invasive species will be confirmed during monitoring of freshwater mussels (detection of zebra mussels).
- Participate in the committees and programs of associations and government departments working on the question of invasive species (for example, Environment Canada's Invasive Alien Species Partnership programs (IASPP).
- Implement the key conservation actions identified for destructive insect epidemics (see section 5.4.4.1.4 on insect epidemics).

5.4.4.3 VALUED ECOSYSTEMS

Valued ecosystems are natural areas of high conservation interest. Because of their location and composition, they present specific conservation challenges; for this reason it is appropriate to couple conservation efforts with restoration of the most severely disturbed zones.

5.4.4.3.1 CONSERVATION ACTIONS BY ECOSYSTEM

EARDLEY ESCARPMENT

1. CONTEXT AND CURRENT SITUATION

The Eardley Escarpment's ecological value for conservation and biodiversity is very high due to the diversity and rarity of its plant communities (Gagnon and Bouchard, 1981). Because of the Escarpment's micro-climate, it has developed a flora that is unusual in Western Québec. The conditions on the Escarpment slopes are closer to those found further south, for example in the American Mid-West, than to the general conditions in Québec. The warm micro-climate on the slopes is conducive to the growth of certain specific species such as the blunt-lobe cliff fern (*Woodsia obtusa*), the walking fern (*Asplenium rhizophyllum*), the white oak, the red cedar and the common hackberry (*Celtis occidentalis*). In many places the vegetation is savanna-like, with large grasses and scattered trees. The difficult soil conditions on the Escarpment are manifested in the slow growth and under-developed appearance of the trees, even those that are more than one hundred years old.

Most of the species at risk are associated with the Escarpment's calcareous rock outcrops and open oak stands (Lavoie, 1992). These species are often vulnerable; nearly 40% exhibit limited distribution, require specialized habitats and have small populations. The Eardley Escarpment ecosystem also has a number of other species that are threatened or vulnerable, or likely to be designated as such. Gagnon et al. (1993) studied the population dynamics of eight species of threatened or vulnerable plant species, including the woodland sunflower (*Helianthus divarticatus*), the Douglas knotweed (*Polygonum douglasii*) and the fragrant sumac (*Rhus aromatica*), which are all vulnerable species in Québec. As far back as 1986, Gagnon and Hay examined the richwood sedge (*Carex oligocarpa*), a species at risk and one of only seven known occurrences of the plant in Canada.

As far as the red cedar is concerned, monitoring efforts by the NCC in 2002 estimated the population at 15,000 individual plants on the Eardley Escarpment (NCC, 2002a), accounting for 80% of the total number in Québec (Forest, 1994). Because of their habitat, most of the specimens are located on the Escarpment cliffs, and are therefore directly subjected to the pressures caused by rock climbing activities.

The other benefits of the Escarpment's micro-climate include a number of bird species which can be observed above the cliffs. The birds take advantage of rising air currents and warm winds directed upwards by the Escarpment's topography. Birds of prey migrate through the region in spring and early fall. During these periods, it is possible to observe the red-tailed hawk (*Buteo jamaicensis)* and the turkey vulture (*Cathartes aura*). Owls, rarely seen because of their nocturnal habits, are also common on the Escarpment. A number of potential nesting sites for the peregrine falcon (*Falco peregrinus anatum)* are located on Eardley Escarpment, and are monitored every five years by the MDDEP.

Terrestrial wildlife is also abundant on the Escarpment. For example, there is a major deer wintering area on the western portion of the Escarpment. In March and early April, it is common to see dozens of cervids grazing in the fields at the foot of the Escarpment, or travelling along trails packed by their movements on the snow-covered slopes. In winter, packs of wolves visit the Escarpment, hunting for white-tailed deer. This part of the Park is also inhabited by black bear, which can be observed on occasion. The bears are attracted by the plentiful supplies of berries growing at the top of the hills. Their dens are usually located alongside the crest of the Escarpment. The raccoon (*Procyon lotor*), the porcupine (*Ondatra zobethicus*), the squirrel (*Sciurus carolinensis*, *Tamiasciurus hudsonicus*) and the chipmunk (*Tamias striatus*) are also common species.

In 1990, a juniper hairstreak (*Callophrys grynea*), a butterfly closely associated with red cedar, was collected for the first time in Québec at the bottom of Eardley Escarpment. It is now classified as a threatened species in Québec by the Société d'entomologie du Québec (SEQ). Insect populations associated with the red cedar and other Escarpment plants have been studied on numerous occasions (Landry, 1990; Landry and Landry, 1991; Goulet, 1994; Laplante, 2001). The findings reflect the wealth and unique entomological composition (Lepidoptera, beetles, hymenoptera) of this unique habitat in Quebec.

Because of all these factors, Eardley Escarpment is without question Gatineau Park's richest natural environment and is given a type 1 conservation area designation. Due to its hot, dry climate and steep slopes, it is also the most fragile, and is particularly sensitive to erosion. As a result, recreational activities such as rock climbing can have a significant impact. Appendix 2 presents a detailed description of the Eardley Escarpment and the potential impacts of an activity such as rock climbing on the environment.

The current health of the escarpment is considered acceptable, but is tending to deteriorate (DDM, 2006a). Despite its morphology, its terrestrial ecosystems are deteriorating, mainly because of human use. In addition, white-tailed deer

use the area intensively, creating high impacts on the forest understory (see section 5.4.4.1.5). Recreational activities in the escarpment area such as horse riding, hang gliding and rock climbing may also have an impact on the ecosystem (see section 5.4.4.4 and Appendix 2).

2. CONSERVATION APPROACH

The Eardley Escarpment is an exceptional ecosystem of great value to the Park and to the region as a whole. The fragility of its components renders it vulnerable to all forms of pressure. Conservation of the escarpment involves protecting the most vulnerable sectors, restoring damaged areas and raising user awareness.

3. KEY CONSERVATION ACTIONS

- Confine rock climbing to the two or three already most damaged rock walls, where rehabilitation work will not be effective (see section 5.4.4.4 on recreational activities).
- Close the hang-gliding site on the Escarpment, including the parking lot and access trail (see section 5.4.4.4 on recreational activities.
- Continue to gather knowledge on ecosystem components in order to target specific management interventions.
- Continue the white-tailed deer management program (see section 5.4.4.1.5 on predator-prey relationships).
- Continue implementation of the various measures proposed in the Plan to Protect Plant and Wildlife Species at Risk in Gatineau Park (CCN, 2006b), namely to identify species at risk in the ecosystem and apply appropriate conservation measures (e.g. exclos) (see section 5.4.4.2.1 on species at risk).
- Prepare a program for the restoration of damaged areas (see section on the ecosystem restoration strategy (5.5)).
- Manage invasive species according to the identified approach (see section 5.4.4.2.2 on invasive species).
- Improve monitoring of this exceptional ecosystem (greater presence of conservation officers).

EARDLEY PLATEAU

1. CONTEXT AND CURRENT SITUATION

The Eardley Plateau includes a range of ecosystems adjacent to the Eardley Escarpment, and several species at risk are found throughout these two areas. The plateau has a large number of animal and plant species at risk. For example, the Golden eagle (*Aquila chrysaetos*), timber wolf and Blanding's turtle have all been sighted. In addition, the ecosystems that make up the Eardley Plateau are representative of those in the region, with a large number of wetlands, lakes of interest (for example, Black Lake) and old-growth forests.

Due to its size, diversity and location, the Eardley Plateau is an important ecosystem for the maintenance of biodiversity within the Park and within the region. The presence of several species at risk and the wealth of its habitats determine its status as a Type II conservation area.

The state of the ecosystem is generally acceptable, although some signs of deterioration have been observed (DDM, 2006a). Wetland areas are tending to deteriorate, mainly because of the propagation of invasive plant species. Plant species such as the purple loosestrife take advantage of the network of wetlands to propagate and colonize the area. Human activities such as hiking and sport fishing also result in some degree of deterioration, and can also act as a vector for the introduction of new, undesirable species (zebra mussel) and the propagation of invasive species (Eurasian water milfoils).

2. CONSERVATION APPROACH

Because of the representativeness and variety of the ecosystems on Eardley Plateau, it is a special place for biodiversity. Its current stable state must be preserved, by preventing any increase in the stress factors.

3. KEY CONSERVATION ACTIONS

- Use the proposed approach to manage invasive species (see section 5.4.4.2.2 on invasive species).
- Update and apply the Sport Fishing Management Plan (NCC, 1983) (see section 5.4.4.4 on recreational activities).

- Continue with the various measures proposed in the Plan to Protect Plant and Wildlife Species at Risk in Gatineau Park (NCC, 2006b), namely to identify the species at risk present in the ecosystem and apply the appropriate conservation measures (see section 5.4.4.2.1 on species at risk).
- Work with the equestrian association, to move the 5.5 km stretch of equestrian trail located in the western portion of the Park to a new site outside the integral conservation zone (see section 5.4.4.4 on recreational activities).

THREE-LAKE CHAIN

1. CONTEXT AND CURRENT SITUATION

The Three-Lake Chain is the only major watershed that is located entirely within the Park boundaries. It consists of a succession of three lakes (Philippe, Mousseau and Meech Lakes), and most of this designated area consists of aquatic environments. As a result, many species dependent on this type of environment are present, including the common loon and great blue heron (*A. herodias*). Several species are at risk, such as the Gatineau tadpole snail, but most are representative of the region (e.g. the common loon, heron, amphibia, etc.).

The area also contains specific habitats such as islands, and important sites for species of interest (e.g. spawning grounds for rainbow smelt, white sucker and brook trout). Some of the lakes surveyed (e.g. Renaud Lake) are of ecological interest (NCC, 2004b).

Although certain species at risk are present, its representativeness is the main criteria by which this significant ecosystem is classified as conservation Type III.

Like the Eardley Escarpment, the state of the Three-Lake Chain is tending to deteriorate. The wetlands and aquatic ecosystems are beginning a process of change, and are subjected to a range of pressures from intensive human presence. The use of the area for recreational activities and the presence of private properties both place stress on the host environment in the form of water pollution, habitat fragmentation and the erosion of riparian habitats. The weakening of the ecosystem has allowed invasive species to colonize the area, and urban development has also increased pressure on the natural environment.

2. CONSERVATION APPROACH

The Three-Lake Chain, a network of lakes within the same watershed, acts as a biofilter for Gatineau Park. Conservation of this area must be based on protection of its principal features, restoration of the most eroded zones, and reduction of human pressure.

3. KEY CONSERVATION ACTIONS

- Use the proposed approach to manage invasive species (see section 5.4.4.2.2 on invasive species).
- Apply conservation actions for aquatic ecosystems, especially concerning water quality (see section 5.4.3.3 on aquatic ecosystems).
- Prepare a program for restoration of damaged areas (see section 5.5 on the ecosystem restoration strategy).
- Continue with the various measures proposed in the Plan to Protect Plant and Wildlife Species at Risk in Gatineau Park (CCN, 2006b), namely to identify the species at risk in the ecosystem and apply the appropriate conservation measures (see section 5.4.4.2.1 on species at risk).

LA PÊCHE LAKE

1. CONTEXT AND CURRENT SITUATION

The La Pêche Lake area consists of a series of aquatic ecosystems framed by riparian terrestrial habitats and wetlands. As is the case in the Three-Lake Chain, aquatic ecosystems are dominant, however this watershed extends beyond the Park's boundaries.

The range and size of the habitats attract numerous species dependent on this type of environment. Several animal and plant species of interest are found in the area, including the least bittern and the common loon. The habitats of interest, in addition to the riparian zones, include extensive wetlands, as well as islands and sites suitable for use as white sucker spawning grounds.

Because of their diversity, these ecosystems offer potential for several species with restricted ecological niches. The network hosts a level of biodiversity that is important for the Park and represents a key link for the survival of numerous species of interest. In addition, La Pêche Lake has low capacity to absorb pollutants, especially in the southern sector (NCC, 2004b). It is therefore fragile, and the ecosystem is classified as a Type II conservation area.

The state of the La Pêche Lake ecosystem is stable and acceptable (DDM, 2006a), and is sufficiently dynamic to ensure the survival of the species that use it. The human presence is moderate, concentrated mainly along the shoreline. Several recreational activities are practised, including sport fishing, canoe-camping (12 sites) (DDM, 2002). This human pressure creates an impact that is starting to affect the ecosystem, with the appearance of invasive plants, the deterioration of aquatic and wetland ecosystems and shoreline damage.

2. CONSERVATION APPROACH

Because of its general condition and the diversity of its ecosystems, La Pêche Lake is a high quality valued ecosystem. The focus must therefore be on reducing human impacts and preventing possible damage.

3. KEY CONSERVATION ACTIONS

- Use the proposed approach to manage invasive species (see section 5.4.4.2.2 on invasive species).
- Update and apply the Sport Fishing Management Plan (NCC, 1983) (see section 5.4.4.4 on recreational activities).
- Apply key conservation actions for aquatic ecosystems, in particular concerning water quality (see section 5.4.3.3 on aquatic ecosystems).
- Prepare a program for the restoration of damaged areas (see section 5.5 on the ecosystem restoration strategy).
- Continue with the various measures proposed in the Plan to Protect Plant and Wildlife Species at Risk in Gatineau Park (CCN, 2006b), namely to identify the species at risk in the ecosystem and apply the appropriate conservation measures (see section 5.4.4.2.1 on species at risk).
- Initiate partnerships with municipalities adjacent to the watershed for water management issues.

PINK LAKE PLATEAU

1. CONTEXT AND CURRENT SITUATION

The Pink Lake Plateau is located at the eastern end of the Eardley Escarpment and Plateau. Because of this, it has a high concentration of valuable ecosystems and is a strategic site for the movement of various species. It is home to many species at risk, several of which are also found on the Escarpment.

The Pink Lake Plateau is also a composite of several valuable ecosystems. Pink Lake itself is a meromictic lake. A number of wetlands and extensive old-growth forests have been identified in the area.

The wealth and specific features of its habitats, enable this ecosystem to accommodate many rare species. Like the Eardley Escarpment, it is both rich and fragile. The uniqueness (Pink Lake) and exceptional quality (old-growth forests) of these environments also means that they are sensitive to certain uses and activities.

Because of its rarity and fragility, the environment is classified as a Type I conservation area.

The condition of this ecosystem is good and tends towards stability (DDM, 2006a). However, its exceptional character and location make it an attractive base for human activities, which are on the increase. A number of recreational activities take place here, and the road network intersects the ecosystem at several different locations. The present state of the ecosystem is acceptable, however the long term prospect is precarious.

2. CONSERVATION APPROACH

Pink Lake Plateau, a high-quality ecosystem, is one of the jewels of Gatineau Park. Conservation actions must therefore focus on protecting its attributes, increasing its connections and preventing human impacts in the areas most used for human activities.

3. KEY CONSERVATION ACTIONS

- Use the proposed approach to manage invasive species (see section 5.4.4.2.2 on invasive species).
- Apply key conservation actions for aquatic ecosystems, in particular concerning water quality (see section 5.4.3.3 on the aquatic ecosystems).
- Continue with the various measures proposed in the Plan to Protect Plant and Wildlife Species at Risk in Gatineau Park (CCN, 2006b), namely to identify species at risk in the ecosystem and apply the appropriate conservation measures (see section 5.4.4.2.1 on species at risk).

In addition to these ecosystems, the report on the Valued Ecosystems and Natural Habitats in Gatineau Park (DDM, 2007) identified a number of other habitats of interest for the Park. Their smaller size individual and components do not allow them to be described as valued ecosystems, but they nevertheless present a number of features conducive to the presence of different species, including species of interest.

Some of these habitats are situated in the southern portion of the Park, at Folly Bog and Lac des Fées. These two valued habitats contain a range of environments including old-growth forests, rock outcrops and various wetlands. Thanks to their geographical location, these habitats form a connection between the southern portion of the Park and other natural spaces including the Gatineau and Ottawa Rivers and the Greenbelt. Their location in an urban environment means that it is especially important to ensure that they are preserved.

There is currently very little information available on the dynamics of Lac des Fées and Folly Bog. It would therefore be appropriate to begin the conservation process by characterizing these natural habitats and assessing their health, as was done for the valued ecosystems.

5.4.4.4 MITIGATING THE IMPACTS OF RECREATIONAL ACTIVITIES

A number of ecological ecosystem components in Gatineau Park have been or are likely to be altered by recreational activities. This section presents some proposed management approaches for activities causing specific conservation problems.

SPORT FISHING

1. CONTEXT AND CURRENT SITUATION

Fifteen of the 50 or so fish species in the Park, especially the coldwater group (to which the salmonid family belongs) can be described as being of interest for sport fishing. However, all the coldwater populations are sparse, and some have virtually disappeared from the Park. The salmonid group, composed of four species (brook trout, lake herring, lake trout (*Salvelinus namaycush)* and lake whitefish (*Coregonus clupeaformis)*), is at the greatest risk of extinction from the Park due to deteriorating oligotrophic conditions (eutrophization) and pressure from sport fishing. Only the brook trout is still found in some of the Park's lakes (Coad, 2007; Pitre et al., 2007).

Based on current knowledge, it is difficult to assess the true impact of sport fishing on Gatineau Park's fish life. It is believed that the large local population of sports fishermen results in an intensity of fishing pressure that far exceeds the reproduction potential of the Park's lakes (NCC, 2004a). The NCC applies provincial sport fishing regulations and manages the activity in accordance with the rules applicable to provincial fishing zone No. 10, in which the Park is located. A provincial fishing permit is required, and conformity with fishing regulations is monitored (DDM, 2002).

2. CONSERVATION APPROACH

Given the state of indigenous fish populations in the Park, sport fishing needs to be structured with Park specific regulations in line with the precautionary principle.

3. KEY CONSERVATION ACTIONS

- Update and apply the Sport Fishing Management Plan (CCN, 1983). This will allow the activity to be structured and regulated in a way specific to Gatineau Park, using a sustainable, adaptive management approach that includes conservation of aquatic environments and sensitive fish species as well as control over fishing permits, site access (fishing access quotas) and catches (creel limits).
- Identify measures that are likely to maximize the reproduction of indigenous species.
- Work with the MRNF to identify Park specific regulations for sport fishing.

MOUNTAIN BIKING

1. CONTEXT AND CURRENT SITUATION

Mountain biking is extremely popular in North America, attracting nearly 10 million participants (Morlock et al., 2006). The activity has expanded significantly over the last 30 years, and its potential social and environmental impacts are now being questioned. The main issues include non-compliance with regulations, suitability of trails, overuse of certain trails, trails in sensitive, poorly drained or steep environments, and conflicts between users (Goeft and Alder, 2001; White et al., 2006). All these elements constitute environmental stressors and can either speed up erosion or cause soil compaction. Managers have taken different approaches to these problems, including public information and awareness-raising, partnerships with cyclists' associations and more controversial measures such as regulations governing the use of trails on public land (Edger, 1997).

In Québec, the Fédération québécoise des sports cyclistes (FQSC) and the International Mountain Biking Association (IMBA) are implicated in the development of mountain biking in its various forms. Among other things, they advise managers on the development of trails, and focus on the construction of durable and environmentally sustainable mountain biking trails (FQSC, 2007).

Mountain biking is strictly regulated in Gatineau Park. It is permitted from May 15 to November 30 on the 90 km of combined hiking/cycling trails. These trails are approximately 2 m wide and are covered with a mixture of earth and gravel that is generally conducive to recreational use and touring. The NCC has no narrow single-track trails suitable for sports/performance use, since the environmental impacts of this type of activity are felt to be too serious on steep slopes (NCC, 2003d). Despite the existence of a more technically difficult network of trails at Camp Fortune (an NCC property leased to a private company), mountain bike enthusiasts are not completely satisfied and some of them still use the Park's dedicated hiking trails and some unofficial trails for their sport, thereby running the risk of user conflicts and surface erosion (DDM, 2002). Environmental monitoring has been carried out on authorized and unauthorized mountain bike trails in Gatineau Park since the early 1990s (NCC, 1990; NCC, 1991a). It has confirmed that unauthorized trails are used by some cyclists, and usually suffer more damage than the official mountain bike trails (NCC 1999b; NCC, 2000a; NCC, 2001e, NCC, 2003d).

2. CONSERVATION APPROACH

Because of the Park's conservation and recreational missions, mountain biking must be managed carefully to minimize its environmental impacts. Emphasis should be on public information and awareness, planning, control, adaptive management of the trails and partnerships (NCC, 2005c).

3. KEY CONSERVATION ACTIONS

- Continue environmental monitoring of official mountain bike trails in order to assess deterioration over time.
- Continue and enhance monitoring of unofficial mountain bike trails in order to assess the level of damage.
- Identify and implement the necessary restoration measures (see section 5.5 on the ecosystem restoration strategy).

ROCK CLIMBING

1. CONTEXT AND CURRENT SITUATION

Climbers have used different locations in Gatineau Park, including the rock walls of Eardley Escarpment, for many years. The Escarpment, however, is highly fragile and extremely sensitive to erosion due to its hot, dry climate and steep slopes. Based on the conservation categories identified in the Gatineau Park Master Plan (NCC, 2005c), the Eardley Escarpment is located in the integral conservation zone, which is subject to maximum conservation and zero development. Only low-intensity recreation is tolerated, and the building of trails is prohibited. The assessment of ecosystem health revealed that certain components of the area are deteriorating (DDM, 2006a). In addition, the ecosystem has been classified as a valued ecosystem (DDM, 2007), and contains Type I conservation areas (see Section 5.2). The Park's ecological vision recommends decision-making and management methods based on the precautionary principle, to ensure that ecological integrity takes priority (DDM, 2006b).

At the present time, a three-year interim agreement has been signed by the Park and the climbers' associations, and access to five of the 40 rock walls is now partially or completely prohibited. In recent years, following a change in

climbing styles, the number of walls in use declined. Traditional rock climbing, where rock walls are selected for their natural features, has been largely abandoned in favour of so-called sport climbing, where enthusiasts seek out easily accessible rock walls to maximize the time available for their recreational pursuits (Duchesne, 2007). For example, 475 climbers[10] were observed on the Escarpment, and most used six walls (NCC, 2007d).

Considerable research has been done on the impact of climbing on the host environment, especially in Gatineau Park (NCC, 1995). Among other things, the researchers focused on preservation, damage to the rock wall and potential declines in plant and animal populations. They found that climbing has a clear impact on the cliff ecosystem, and proposed that steps be taken to mitigate that impact.

Six major types of impacts were identified in the research (see Appendix 2):

- A reduction of up to 60% in the richness of plant and animal species (Genetti and Zenone, 1987; Farris, 1995; Camp and Knight, 1998; Farris, 1998; Baker, 1999; Krajick, 1999; Richardson, 1999; Gagnon, 2002; NCC, 2002a; McMillan et al., 2003; Rusterholz et al., 2004; CPAWS, 2005);
- A decline in plant cover of up to 40% (Genetti and Zenone, 1987; Farris, 1995; Nuzzo, 1995; Kelly and Larson, 1997; Farris, 1998; Baker, 1999; Krajick, 1999; Malkin, 2000; McCarthy, 2003; Rusterholz et al., 2004);
- Soil erosion through compacting, displacement, degradation, creation of depressions, etc.(Genetti and Zenone, 1987; Francis, 2001; McMillan et al., 2003; Cornish, 2004; CPAWS, 2005);
- Erosion of cliff walls showing signs of scarring, cracking, long-term chalk stains, etc. (Francis, 2001; NCC, 2002b; McCarthy, 2003; Cornish, 2004; Kelly and Larson, 2004; CPAWS, 2005);
- Alteration of plant and animal community composition, in terms of abundance, age structure, species, invasive species, etc. (Nuzzo, 1995; Kelly and Larson, 1997; Camp and Knight, 1998; Farris, 1998; Baker, 1999; Oosthoek, 2002; McMillan et al., 2003; Rusterholz et al., 2004);
- Habitat loss through denuding of the rock surface, degradation and reduction in area of habitats conducive to certain species, such as the red cedar (Camp and Knight, 1998; NCC, 2002a; Rusterholz et al., 2004).

Generally speaking, one of the principal impacts of climbing on cliff ecosystems is a reduction in the richness of species. The greater the disturbance, the greater the loss of biodiversity, and the more the environment loses its resilience (i.e. its ability to recover its balance after a disturbance). This can cause irreversible damage to natural processes, and ultimately, the disappearance of species that use this environment (see Appendix 2). Other findings suggest a correlation between the level of impact of climbing on vegetation and the level of difficulty of the climbing wall (Knuts and Larson, 2005).

2. CONSERVATION APPROACH

According to the Park's zoning system, the Eardley Escarpment is located in an "integral conservation zone" dedicated solely to conservation, where recreational activities are prohibited (NCC, 2005c). In addition, a number of studies have highlighted the exceptional nature of the Escarpment ecosystem: valued ecosystem, presence of species at risk, extent of environmental impacts, and fragility. Accordingly, a recreational activity with such potentially serious impacts as rock climbing, in an integral conservation zone, should in principle be eliminated.

Having said this, research (see Appendix 2) has shown that a complete ban on the activity is not a viable solution. It is therefore proposed that the activity be limited to a small number of rock walls (two or three), which should ensure that the ecosystem's ecological integrity is not compromised. Two or three walls would offer nearly 50 different climbing routes. When selecting the walls, elements such as current condition (i.e. choosing the most damaged wall), accessibility (trails), popularity (use by climbers) and the ecological importance of the site (species at risk, observations) should be taken into account.

3. KEY CONSERVATION ACTIONS

- Identify the two or three most seriously damaged walls for climbing activities, using the following criteria: impacts on the Eardley Escarpment ecosystem, level of damage and popularity.
- Change the boundaries of the integral conservation zone in the Gatineau Park Master Plan (NCC, 2005c) to accommodate these specific walls.

[10] The total number of climbers observed during visits to Eardley Escarpment climbing sites during the summer of 2007.

- Restore the environment of those climbing sites that are not selected for retention, including any access trails (see section 5.5 on the ecosystem restoration strategy).
- Continue to monitor the activity's environmental impacts on the selected rock walls.

HANG GLIDING

1. CONTEXT AND CURRENT SITUATION

The sport of hang gliding have become increasingly popular in Québec since the early 1980s. It has been classified as an official recreational activity in Gatineau Park for many years under an agreement with the Ottawa Hang Gliding and Paragliding Club, which is responsible for supervising the activity and maintaining the trail. Hang gliding has gradually been replaced by parasailing, which takes place outside the Park in a field close to the Escarpment.

The Eardley Escarpment is the only location in the Park used for hang gliding. The launch site is located near the Champlain Look-out. It can be accessed on foot, via a short trail used mainly for this activity. The actual site is fairly small, and consists of an assembly area and a take-off area. The NCC monitors the trail every two years to identify damage, potential public safety problems, environmental impacts and any remedial action or other interventions to be carried out by the Club if necessary (NCC, 2004b; NCC, 2006f).

The main known environmental impacts of these activities are alteration of soils (compaction, erosion), alteration and destruction of plant life (trampling, vegetation removal), disturbance of wildlife (disruption, stress), introduction of exotic species (displacement of native species), waste production (litter), and user and safety conflicts (risk of accidents) (Jouret, 2000; South African National Parks, 2004). As is the case for rock climbing, hang gliding takes place in a particular environmental context: within the rich and sensitive environment of the Eardley Escarpment, which is located in an integral conservation zone, is classified as a Type I conservation area, enjoys status as an exceptional valued ecosystem, is home to several species at risk, and is already in a precarious situation in terms of its health. The general principles applicable to this area are maximum conservation and zero development. Only very low intensity recreation is tolerated in this zone, and no new trails can be created. Accordingly, Gatineau Park's ecological vision recommends a decision-making process and management methods based on the precautionary principle in order to give priority to ecological integrity (DDM, 2006b).

2. CONSERVATION APPROACH

According to the Park's zoning system, Eardley Escarpment is located in an "integral conservation zone" dedicated solely to conservation, where recreational activities are prohibited (NCC, 2005c). In addition, a number of studies have highlighted the exceptional nature of the Escarpment ecosystem: valued ecosystem, presence of species at risk, extent of environmental impacts, and fragility. There has been no hang-gliding activity observed at this site in the last two years, and the site has deteriorated because it has not been adequately maintained by the Club. Given that the activity is located in the integral conservation zone and has, in any case been replaced by parasailing (which takes place at a site located outside the Park), the trail and parking lot should be closed and restored.

3. KEY CONSERVATION ACTIONS

- Close the trail and parking lot formerly used for hang gliding.
- Restore the trail and parking lot after closure (see section 5.5 on the ecosystem restoration strategy).

HORSE RIDING

1. CONTEXT AND CURRENT SITUATION

Horseback riding is one of the Park's officially recognized activities, and takes place on approximately 16 km of dedicated trails (including 2.5 km outside the Park, on private land) that are mostly former forest access roads. In the Park, the riding trail runs along the bottom of Eardley Escarpment in the Heart of the Park Sector. Based on the zoning categories in the Gatineau Park Master Plan (NCC, 2005c), the portion of trail between Luskville and the Eardley-Masham road is located in the extensive recreation zone (8 km), while the section between Eardley-Masham and Steele Line falls in the integral conservation zone (5.5 km). The trail is accessible from several different points and is sometimes used illegally by ATVs. Some sections of the trail are also used for farming purposes and shared with tractors. The NCC monitors the horse-riding trail twice a year to identify damage, potential public safety problems, environmental impacts, and any remedial action and other interventions to be carried out (NCC, 2004b; NCC, 2007f).

A number of North American and Australian researchers have examined the environmental impacts of horse riding (Newsome et al. 2002, South African National Parks, 2004). These impacts have recently been summarized and analyzed by Widner and Marion (1994), Landsberg et al. (2001) and Philips and Newsome (2002). The principal impacts are damage to vegetation, increases in trail width and depth, soil compaction and erosion, chemical alteration of soil and water quality, the introduction of exotic plants, disturbance of wildlife (especially birds), conflicts between users and safety risks. In the specific case of Gatineau Park, soil degradation has also been observed due to the fact that some of the trails have a clay base (NCC, 2007f). All the above impacts are likely to harm the ecological integrity of certain environments, especially along the section of trail located near Eardley Escarpment. As was the case for rock climbing and hang gliding, horse riding in Gatineau Park takes place, at least in part, in a very particular environmental framework. This is because of the richness and sensitivity of the Eardley Escarpment, which is home to several species at risk, is located partly in an integral conservation zone, is classified as a Type I conservation area, enjoys status as a valued ecosystem, and is already in a precarious situation in terms of its health. The general principles applicable to this area are maximum conservation and zero development. Only very low intensity recreation is tolerated in this zone, and no new trails can be created.

2. CONSERVATION APPROACH

According to the Park's zoning system, the Eardley Escarpment is located in an "integral conservation zone" dedicated solely to conservation, where recreational activities are prohibited (NCC, 2005c). In addition, a number of studies have highlighted the exceptional nature and fragility of the Escarpment ecosystem: valued ecosystem, presence of species at risk, extent of environmental impacts, and fragility. Approximately 35% of the equestrian trail is located in the integral conservation zone (5.5 km out of a total of 16 km). This 5.5 km stretch should be relocated outside the integral conservation zone

3. KEY CONSERVATION ACTIONS

- In partnership with the equestrian association, move the last 5.5 km stretch of horse located in the western portion of the Park to a site outside the integral conservation zone.
- Restore the closed section of the trail in the integral conservation zone (see section 5.5 on the ecosystem restoration strategy).
- Continue to monitor the environmental impact of the activity on the remainder of the official trail.

5.5 ECOSYSTEM RESTORATION STRATEGY

When biodiversity and ecosystem health have been altered, an active management approach is recommended and may include restoration processes, as is the case for certain valued ecosystems. Restoration, however, requires the capacity to use various techniques and the availability of basic data on ecosystem health. Because this information is simply not available in many cases, the first step must be to establish a restoration process. This process must proceed in stages based on the level of uncertainty and the acquisition of new knowledge over time.

A restoration process has therefore been developed (see Appendix 3). It is based on extensive research and provides the foundation for restoration programs in each of the proposed conservation areas.

5.5.1 RESTORATION PROCESS IN GATINEAU PARK

The restoration process described in Appendix 3 was fine-tuned to reflect both the context of Gatineau Park and the Ecosystem Conservation Plan framework. The components of the process reflect the vision and the underlying principles. As a result, the restoration process will take place in synch with the conservation process.

The restoration process is set out in diagram form in Figure 17.

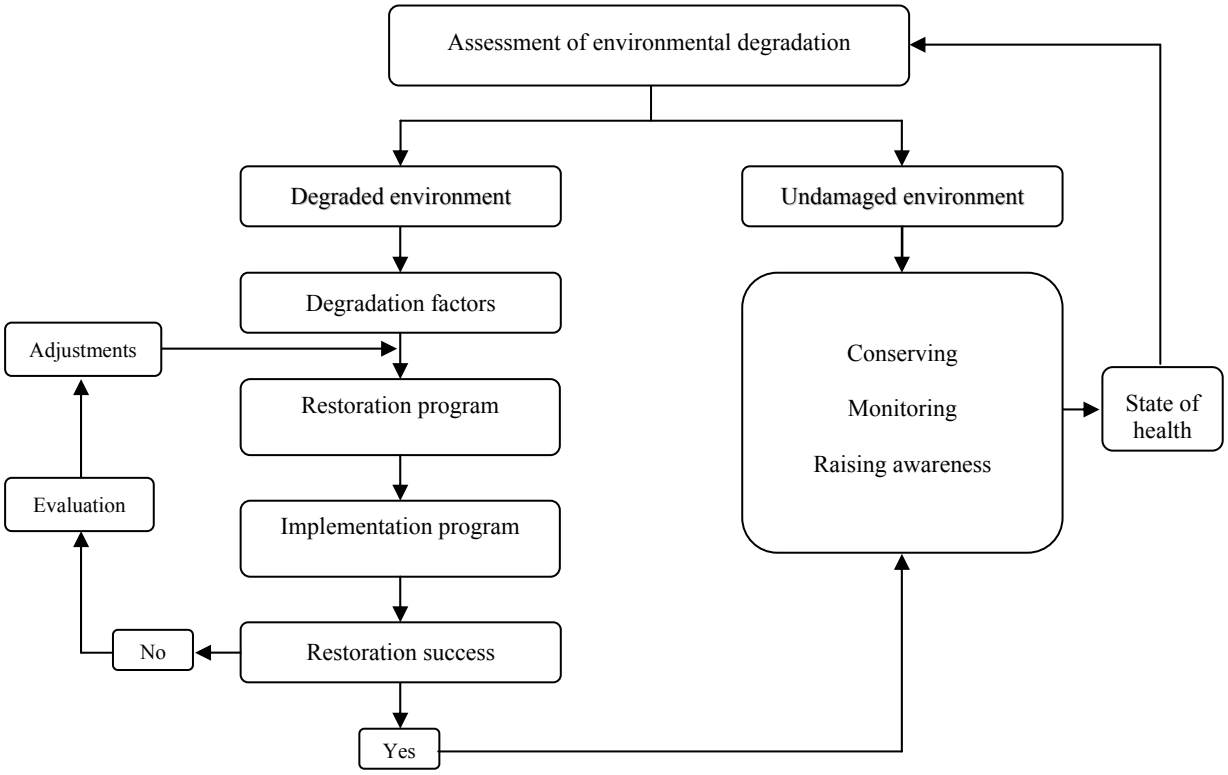
Figure 17 shows a dynamic process in which the parameters are constantly reassessed. Different avenues can be taken, depending on the success of the program. The process is divided into three main phases, namely evaluation of environmental degradation, factors causing degradation and the success of the measures applied (see Appendix 3). It therefore provides a basic framework for the various restoration programs to be carried out in Gatineau Park.

A preliminary study of restoration in Gatineau Park was carried out for the purposes of the Conservation Plan (see Appendix 3). It identified four main factors responsible for damage in the park, namely recreation, invasive species, human infrastructures and overgrazing by white-tailed deer. These factors are present in the Park's ecosystems to

varying degrees, and have varying levels of impacts. Six general restoration actions were devised to address these factors, and are described briefly.

The next two sections list some of the restoration measures based on the priorities for the Park, namely to improve the health of the Park's valued ecosystems and to mitigate the impacts of recreational activities. These measures take into consideration the knowledge currently available from observations, monitoring and research in the Park in recent years. They will either precede or form part of future restoration programs to be instituted in the Park.

FIGURE 17
RESTORATION PROCESS



5.5.2 VALUED ECOSYSTEMS

Taking into account the study of ecosystem health in Gatineau Park (DDM, 2006a) as well as more recent information, three ecosystems were found to be in poor condition and deteriorating, namely the terrestrial ecosystems in the Eardley Escarpment, and the aquatic and riparian environments in the La Pêche Lake ecosystem and the Three-Lake Chain. These findings are supported by the issues analysis which was carried out for these ecosystems.

The poor condition of some of these ecosystem components renders them unable to recover on their own. Target actions to support their recovery must therefore be identified and then developed through a restoration program.

EARDLEY ESCARPMENT

Terrestrial ecosystem health in Eardley Escarpment is influenced by two damaging factors, namely rock climbing (Appendix 2) and excessive grazing by the Park's white-tailed deer population. These pressures reduce the reproductive capacity of the sector's plants, and many areas are now bare, a situation that has exacerbated soil erosion (see section on predator-prey relationships (5.4.4.1.5)).

Restoration should therefore target revegetation of the most severely affected (eroded and over-grazied) areas. This involves:

- Identifying the areas of the Escarpment that have been severely eroded;
- Determining an appropriate revegetation method (exclosure fencing, plantings) using adaptive management;
- Implementing appropriate methods;
- Preparing a program to monitor the success of the revegetation process.

THREE-LAKE CHAIN AND LA PÊCHE LAKE

The human footprint is the factor that most affects the condition of the aquatic and riparian environments in these two ecosystems. The intense human footprint in these areas is due to recreational activity, human presence and development. All these pressures have fragmented the environment and altered the riparian ecotones. Site connectivity and riparian ecotone functions must therefore be restored. This involves:

- Identifying and locating the most damaged riparian ecotones (erosion, inappropriate public use, lawns, etc.).
- Assessing appropriate restoration methods (e.g. buffer zones along roadsides, plantations, wildlife bridges).
- Assessing appropriate revegetation methods (e.g. planting, layering, seeding).
- Supporting restoration by protecting restored areas and controlling development.
- Supporting restoration by raising user awareness and protecting restored areas.
- Introducing a program to monitor the success of the revegetation process.

Restoration activities are also required in other ecosystems. Accordingly, it would be appropriate to identify, locate and assess areas in poor condition in all the valued ecosystems. New restoration plans based on the results of this process could then be prepared.

5.5.3 RECREATIONAL ACTIVITIES

A number of recreational activities take place in the Park and attract large numbers of visitors every year. Although these activities are valuable assets for the Park, some of them alter the ecological components of its ecosystems.

Activities such as sport fishing, mountain biking, rock climbing, hang gliding and horse riding cause trails to erode, lead to the creation of unofficial trails, increase the potential for intrusions of invasive species, and enhance the fragility of sensitive habitats and species at risk.

Accordingly, the proposed ecosystem conservation programs must be supported by the restoration of sites damaged by recreational activity, especially in the valued ecosystems.

The restoration approach should focus on mitigating the environmental impacts of recreational activities. Based on current knowledge, the factors causing damage and the implicated sites sites, mitigation involves restoration of:

- Unofficial trails;
- Former snowmobile trails, after their closure in 2010;
- Rock climbing sites and access trails which are to be closed,
- The stretch of the horse equestrian trail located in the integral conservation zone;
- The hang gliding parking lot and trail.

In these cases, the restoration strategy will follow that proposed in the Gatineau Park restoration process (see section 5.5.1).

PART III :
IMPLEMENTATION OF ECOSYSTEM CONSERVATION PLAN

6. IMPLEMENTATION PROPOSALS

The actions and solutions presented in the action plan need to be implemented, and they have been listed and ranked in priority order for that purpose. Ideas aimed at enriching the communication, awareness and collaborative effort are identified with a view to ensuring that the Ecosystem Conservation Plan is successful in the eyes of the general public. In addition, a strategy designed to reduce stresses on Park ecosystems is proposed as a means of supporting the conservation process. To ensure that the management measures are successful, an ecosystem monitoring program based on a series of environmental indicators is also proposed. The last section identifies differences between the results of the Ecosystem Conservation Plan and the proposals set out in the Master Plan, and suggests some adjustments.

6.1 PRIORITY RANKING FOR CONSESRVATION ACTIONS

The conservation process for Gatineau Park comprises a large number of conservation actions, and a decision support tool is therefore required to rank them in priority order prior to implementation. First and foremost, priority depends on the urgency of each specific measure. All the conservation actions and research topics listed are important in terms of achieving the Plan's goals, but some need to be implemented earlier than others, due to factors such as threat level, current situation and so on.

In all, 12 criteria were used to rank the conservation actions into three priority groups:

- The importance of achieving ecological integrity objectives;
- State of the resource;
- The characteristics of the conservation action itself (e.g. cost, effectiveness).

Each criterion was assessed using a series of questions, with different points allocated for each answer. Some of the criteria were weighted, since they were more pertinent to the conservation objectives; for example, the level of stress was deliberately given a higher weighting than the other criteria. Appendix 4 lists the various criteria and their weightings.

The final point totals were used to rank the actions and projects into one of the three priority categories, namely short-term (0-5 years) for Priority I actions, medium term (5-10 years) for Priority II actions, and long term (10-15 years) for Priority III actions. These priority groups can be adjusted to suit changing circumstances (e.g. operational needs, budgets, new recommendations, etc.). Again, Appendix 4 presents the final points for each action and project, and Table 5 presents the actions and projects along with the scope of their application.

TABLE 5
PRIORITY RANKING OF TOP CONSERVATION ACTIONS

KEY ACTION	PRIORITY
GREATER ECOSYSTEM	
CLIMATE CHANGE AND ATMOSPHERIC POLLUTION	
Assess and implement the adaptation strategies presented in the report on climate change (Scott et al., 2005), based on changing ecosystem contexts and the activities that take place in the Park.	III
Develop a green transportation plan in accordance with the recommendations made in the Gatineau Park Master Plan (NCC, 2005c), in order to limit and control motor traffic and travel in central portions of the Park dedicated to conservation.	I
Continue partnerships with Québec's Ministère des Ressources naturelles et de la Faune and Environment Canada regarding monitoring programs for acid rain and atmospheric pollution.	I

TABLE 5 (cont.)

KEY ACTION	PRIORITY
REGIONAL ECOSYSTEM	
ECOLOGICAL CORRIDORS	
Complete the information on the 14 ecological corridors identified by means of a qualitative analysis through studies and inventories, including surveys and monitoring of biodiversity in each corridor and an assessment of the stress factors affecting terrestrial and aquatic environments (map of The Main Ecological Corridors Potentials around Gatineau Park).	**I**
Draw up a preservation plan for the ecological corridors identified in partnership with the municipalities, associations and other bodies concerned (also applies to "Natural Habitat Mosaic").	**I**
Support the creation of partnerships at the regional, national and international levels in order to gather the information and tools needed to develop a network of ecological corridors at different scales.	**II**
TERRESTRIAL ECOSYSTEMS	
Carry out or continue environmental monitoring of recreational activities in conservation areas (Type I to Type IV, in that order), so as to identify environmental problems and allow for the design and implementation of adapted management measures.	**Ongoing monitoring**
Continue the measures established under the Gatineau Park Species at Risk Protection Plan (NCC, 2006b).	**Ongoing monitoring (see "Species at Risk"; section 5.4.4.2.1)**
Continue to monitor the indicators for terrestrial environments in the Park under the biodiversity monitoring program: vascular plant species, avian wildlife, micromammals, species at risk, plant species at risk and invasive plants (garlic mustard (*Alliaria officinalis)* and glossy buckthorn (*Rhamnus frangula)*), habitat mosaic, environmental fragmentation and plant and wildlife potential (see also "Habitat Mosaic", "Species at Risk" and "Invasive Species").	**Ongoing monitoring**
Wherever possible, minimize the impacts of aggressive invasive species (plants and wildlife) that affect terrestrial ecosystems and indigenous species.	**I (see "Invasive Species"; section 5.4.4.2.2)**
Continue the process of banning snowmobiles from the Park.	**I**
AQUATIC AND RIPARIAN ECOSYSTEMS AND WETLANDS	
Identify the sites and causes of waterside degradation around the recreational lakes in Gatineau Park and develop measures to reduce stress.	**I**
Identify and assess the impact of formal and informal lakeside trails and develop measures to reduce stress.	**I**
Continue the various measures established under Gatineau Park Species at Risk Protection Plan (NCC, 2006b).	**Ongoing monitoring (see "Species at Risk"; section 5.4.4.2.1)**
Continue to monitor the indicators for aquatic, riparian and wetland environments in the Park under the biodiversity monitoring program: freshwater mussels, anura, species at risk, invasive plants (Eurasian water milfoil and purple loosestrife) and the common loon.	**Ongoing monitoring**
Wherever possible, minimize the impacts of aggressive invasive species (wildlife and plants) that affect aquatic and riparian ecosystems, wetlands and indigenous species.	**I (see "Invasive Species"; section 5.4.4.2.2)**
Monitor water quality in headwater lakes and streams and characterize those for which insufficient information is available.	**I**
Continue discussions with municipalities and associations in the watersheds around the Park to promote watershed-based water management.	**I**
Continue with steps to remove motor boats from the Park's lakes.	**I**
Promote collaboration and partnerships with private landowners in the immediate vicinity of significant aquatic environments and wetlands in the Park, so as to encourage riparian protection.	**I**
Update and apply the sport fishing management plan (NCC, 1983).	**II (see "Sport Fishing"; section 5.4.4.4)**
Incorporate the notion of free passage for fish into the planning of future projects affecting the aquatic environment (e.g. installation of and repairs to culverts).	**Ongoing monitoring**

TABLE 5 (CONT.)

KEY ACTION	PRIORITY
PARK'S ECOSYSTEMS	
NATURAL ECOSYSTEM PROCESSES AND BALANCE	
Wind and ice storms	
Monitor the progress of affected environments to check that the storms do not generate major impacts or risks (e.g. continue to work with Carleton University on the study of the 1998 ice storm impacts).	**Ongoing monitoring**
Flooding and high water	
As far as possible, dismantle non-necessary artificial water retention works to let natural processes run their natural course and allow for free passage of fish.	**III**
Comply with the instructions set out in the Fisheries and Oceans Canada (2007) document on the design and installation of permanent culverts of less than 25 metres when installing or repairing culverts, in order to ensure that fish are able to move freely through the Park's culverts.	**Ongoing monitoring**
Fire	
Determine the role and ecological importance of fire in plant dynamics in the Park's forest ecosystems. This evaluation will take place when the Park's vegetation management plan (Somer, 1987) is revised.	**II**
Insect epidemics	
Where applicable, let attacks run their course but continue to monitor insect population levels and infestations, except where they affect ecological integrity, species at risk or public safety, or where there is a legal requirement to address them.	**I**
Apply decisions made by competent authorities (e.g. CFIA, Agriculture Canada) where appropriate.	**Ongoing monitoring**
Continue and take part in the monitoring of actual or potential infestations by insects (e.g. ash borer, gypsy moth), with the authorities in question.	**I**
Predator/prey relationships	
Identify impacts of overabundant plant species on ecosystem's health.	**III**
Continue programs and strategies to manage and monitor the white-tailed deer population (also applies to "Eardley Escarpment") and the beaver population.	**Ongoing monitoring**
Monitor the use of corridors by predators and suggest measures to improve their role in maintaining predator population levels in general, and wolf populations in particular.	**II**
Encourage the hunting of deer in areas peripheral to the Park where the deer population is too large, in partnership with the MRNF"	**II**
Natural Habitat Mosaic	
Continue to develop ecological corridors.	**I (see "Ecological Corridors"; section 5.4.3.1)**
Continue to protect habitats in valued ecosystems.	**Ongoing monitoring (see "Valued Ecosystems"; section 5.4.4.3)**
Continue to monitor indicators associated with the Park's habitat mosaic as part of the biodiversity monitoring program: habitat mosaic, environmental fragmentation and plant life and wildlife potential.	**Ongoing monitoring**
BIODIVERSITY AND SPECIES VIABILITY	
Species at risk	
Continue the various measures established by Gatineau Park Species at Risk Protection Plan (NCC, 2006b) (also applies to "Terrestrial Ecosystems", "Aquatic Ecosystems", "Eardley Escarpment", "Eardley Plateau", "The Three-Lake Chain", "La Pêche Lake" and "Pink Lake Plateau").	**Ongoing monitoring**
Locate and characterize potential habitats for species at risk in order to sustain viable populations.	**I**
Identify flows of wildlife species at risk and the spread of plant species at risk within the Park's ecosystems as well as in the regional and greater ecosystems	**II**
Continue to monitor the indicators associated with species at risk under the biodiversity monitoring program: plants and wildlife at risk (also applies to "Terrestrial Ecosystems" and "Aquatic Ecosystems").	**Ongoing monitoring**
Continue or begin work with the federal and provincial species at risk committees and with the programs of government departments working on species at risk (e.g. Environment Canada's Interdepartmental Recovery Fund (IRF)).	**I**

TABLE 5 (cont.)

KEY ACTION	PRIORITY
PARK'S ECOSYSTEMS (cont.)	
BIODIVERSITY AND SPECIES VIABILITY (CONT.)	
Invasives species	
Develop and implement a management strategy in order, where possible, to minimize the impacts of aggressive invasive species with repercussions for ecosystems and indigenous species, and to minimize the possibility of new invasions (also applies to "Terrestrial Ecosystems", "Aquatic Ecosystems", "Eardley Escarpment", "Eardley Plateau", "The Three-Lake Chain", "La Pêche Lake" and "Pink Lake Plateau").	**I**
Continue to monitor the indicators associated with invasive plant species under the biodiversity monitoring program: invasive species.	**Ongoing monitoring**
Become involved with the committees and programs of associations and government departments working on the question of invasive species (e.g. Environment Canada's EcoAction and Invasive Alien Species Partnership programs (IASPP)).	**I**
Implement the key conservation actions identified for insect infestations.	**I (see "Insect Epidemics"; section 5.4.4.1.4)**
VALUED ECOSYSTEMS	
Eardley Escarpment	
Confine rock climbing to the two or three most damaged rock walls, where rehabilitation work will not be effective.	**I (see "Climbing"; section 5.4.4.4)**
Close the hang-gliding site on the Escarpment (parking lot and access trail) (see section 5.4.4.4).	**I (see "Hang-Gliding"; section 5.4.4.4)**
Continue to gather knowledge on ecosystem components in order to target specific intervention sectors.	**I**
Pursue the white-tailed deer management program (see section 5.4.4.1.5).	**Ongoing monitoring (see "Predator/Prey relationships"; section 5.4.4.1.5)**
Continue with the various measures proposed in the Gatineau Park Species at Risk Protection Plan (NCC, 2006b), namely to identify species at risk in the ecosystem and apply appropriate conservation measures (e.g. deer exclosures).	**Ongoing monitoring (see "Species at Risk"; section 5.4.4.2.1)**
Prepare a program to restore damaged areas (see Ecosystem Restoration Strategy, section 5.5) (also applies to "The Three-Lake Chain" and "La Pêche Lake").	**I**
Use the proposed approach to manage invasive species.	**I (see "Invasive Species"; section 5.4.4.2.2)**
Improve monitoring of the Eardley Escarpment exceptional ecosystem (presence of conservation officers).	**I**
Eardley Plateau	
Use the proposed approach to manage invasive species.	**I (see "Invasive Species"; section 5.4.2.2)**
Update and apply the Gatineau Park sport fishing management plan (NCC, 1983).	**II (see "Sport Fishing"; section 5.4.4.4)**
Continue with the various measures proposed in the Gatineau Park Species at Risk Protection Plan (NCC, 2006b), namely to identify the species at risk present in the ecosystem and apply the appropriate conservation measures.	**Ongoing monitoring (see "Species at Risk"; section 5.4.4.2.1)**

TABLE 5 (cont.)

KEY ACTION	PRIORITY
PARK'S ECOSYSTEMS (cont.)	
VALUED ECOSYSTEMS (CONT.)	
Eardley Plateau (cont.)	
In partnership with the equestrian association, move the last 5.5 km stretch of equestrian trail located in the western portion of the Park to a site outside the integral conservation zone.	**I (see "Horse Riding"; section 5.4.4.4)**
Three-lake chain	
Use the proposed approach to manage invasive species.	**I (see "Invasive Species"; section 5.4.4.2.2)**
Apply the key conservation actions for aquatic ecosystems, especially concerning water quality.	**I (see "Aquatic Ecosystems"; section 5.4.3.3)**
Prepare a program for restoration of damaged areas (see section 5.5) (also applies to "Eardley Escarpment" and "La Pêche Lake").	**I**
Continue with the various measures proposed in the Gatineau Park Species at Risk Protection Plan, namely to identify the species at risk in the ecosystem and apply the appropriate conservation measures.	**Ongoing monitoring (see "Species at Risk"; section 5.4.4.2.1)**
La Pêche Lake	
Use the proposed approach to manage invasive species.	**I (see "Invasive Species"; section 5.4.4.2.2)**
Update and apply the Gatineau Park sport fishing management plan (NCC, 1983).	**II (see "Sport Fishing" section 5.4.4.4)**
Apply the key conservation actions for aquatic ecosystems, in particular concerning water quality.	**I (see "Aquatic Ecosystems"; section 5.4.3.3)**
Prepare a program for the restoration of damaged areas (see section 5.5) (also applies to "Eardley Escarpment" and "The Three-Lake Chain").	**I**
Continue with the various measures proposed in the Gatineau Park Species at Risk Protection Plan (NCC, 2006b), namely to identify the species at risk in the ecosystem and apply the appropriate conservation measures.	**Ongoing monitoring (see"Species at Risk"; section 5.4.4.2.1)**
Create water management partnerships with municipalities adjacent to the watershed.	**II**
Pink Lake Plateau	
Use the proposed approach to manage invasive species.	**I (see "Invasive Species"; section 5.4.4.2.2)**
Apply the key conservation actions for aquatic ecosystems, in particular concerning water quality.	**I (see "Aquatic Ecosystems"; section 5.4.3.3)**
Continue with the various measures proposed in the Gatineau Park Species at Risk Protection Plan (NCC, 2006b), namely to identify species at risk in the ecosystem and apply the appropriate conservation measures.	**Ongoing monitoring (see "Species at Risk"; section 5.4.4.2.1)**

TABLE 5 (cont.)

KEY ACTION	PRIORITY
PARK'S ECOSYSTEMS (cont.)	
RECREATIONAL ACTIVITIES	
Sport fishing	
Update and apply the Gatineau Park sport fishing management plan (NCC, 1983). (Also applies to "Aquatic Ecosystems", "Eardley Plateau" and "La Pêche Lake".)	**II**
Identify measures that are likely to maximize the breeding of fish species at risk.	**III**
Work with the MRNF to identify specific regulations for sport fishing in the Park.	**II**
Mountain biking	
Continue environmental monitoring of official mountain bike trails in order to assess deterioration over time.	**Ongoing monitoring**
Continue and reinforce monitoring of unofficial mountain bike trails in order to assess the level of damage.	**Ongoing monitoring**
Identify and implement the necessary restoration measures (see section 5.5).	**I**
Rock climbing	
Identify two or three walls on which rock climbing could take place, based on their impact on the Eardley Escarpment ecosystem, their current level of damage and their popularity (also applies to "Eardlye Escarpment").	**I**
Change the boundaries of the integral conservation zone, as set out in the Gatineau Park Master Plan (NCC, 2005c), to accommodate these walls.	**I**
Restore the environment of former climbing sites that are not selected, including any access trails (see section 5.5).	**I**
Continue to monitor the activity's environmental impacts on the selected walls.	**Ongoing monitoring**
Hang-gliding	
Close the trail and parking lot (also applies to "Eardley Escarpment").	**I**
Restore the trail and parking lot after closure (see section 5.5).	**I**
Horse riding	
In partnership with the equestrian association, move the last 5.5 km stretch of the equestrian trail located in the western portion of the Park to a site outside the integral conservation zone (also applies to "Eardley Plateau").	**I**
Restore the closed section of the trail located in the integral conservation zone (see section 5.5).	**I**
Continue to monitor the environmental impact of the activity on the remainder of the official trail.	**Ongoing monitoring**

6.2 COMMUNICATION, RESEARCH AND COLLABORATION

Communications and awareness-raising are essential to support the Ecosystem Conservation Plan and ensure its effectiveness as well as its positive reception by the public (users, residents, NCC staff, visitors, etc.). A number of techniques must be considered specifically for conservation purposes. These could include: the NCC website, publications in newspapers, displays, community relations, public consultations and communication of the results of the five-yearly ecosystem monitoring process, etc. This section therefore proposes a number of avenues and ideas for reinforcing current achievements and supporting the conservation approach.

6.2.1 COLLABORATION AND PARTNERSHIP

The NCC has worked closely with various organizations and institutions since the 1980s. Over time, these collaborations have been enriched by many exchanges and joint initiatives. Each year, for example, approximately 40 natural resource oriented research projects are carried out by scientists, supported by a grant program and an annual meeting at which findings are presented and discussed. The NCC is aware of the benefits of this type of collaboration for the conservation process, and intends to continue and strengthen the process. This section takes a dual approach to the subject of collaboration, first describing current actions taken within the Park, and then proposing new actions to enrich collaboration between the Park, the scientific community, residents, users and visitors.

6.2.1.1 SCIENTIFIC COMMUNITY

The NCC involves the scientific community in the conservation decision-making process, uses available scientific resources to move forward with its conservation process, and creates opportunities to extend its science capacity.

Every year, approximately 40 scientific research permits are issued by the Park. To attract more research projects relevant to the management of the Park's natural resources, a fund of approximately $20,000 is distributed to the scientific community every year, based on a priority ranking of projects. Research findings are incorporated into the Park database on a regular basis, and the scientific community is invited to an annual meeting designed to maintain the information network and foster discussions between researchers (NCC, 2002c). Finally, a committee of external experts was set up and consulted throughout the development of the Ecosystem Conservation Plan. The scientific community was also asked to submit comments at several workshops organized during the process.

A number of other actions can also be taken to reinforce exchanges with the scientific community and encourage it to become involved in ecosystem conservation. Examples include the preparation of a publication providing information about the Park's ongoing scientific activities and findings, the creation of committees of experts from the scientific community, and so on.

6.2.1.2 MUNICIPALITIES, RESIDENTS, USERS AND OUTSIDE ORGANIZATIONS

The NCC has always encouraged the involvement of the general NCR population, for example when preparing the 2005-2015 Master Plan. Throughout the Plan revision process, which took place between 2001 and 2005, targeted (focus groups) and public consultations were held to gather comments from interest groups and the general public, which subsequently served as a basis for plan proposals. Workshops with municipalities, environmental interest groups and recreational associations also took place during the process of preparing the Ecosystem Conservation Plan.

A number of agreements, joint initiatives and partnerships were entered into with the Town of Chelsea and the City of Gatineau, to ensure a collaborative approach to planning. A collaborative initiative was also put into place with Parks Canada, to strengthen the respective capacities of the two organizations. A variety of organizations are actively involved in Park initiatives. For example, the Meech and Kingsmere residents' associations attended the public consultations, allowing for cooperative management with the NCC (NCC, 2002c). Other organizations, such as the Canadian Parks and Wilderness Society (CPAWS), the Gatineau Park Protection Committee, the Conseil regional de l'environnement et du développement durable de l'Outaouais (CREDDO) and the Nature Conservancy of Canada all scrutinize the Park's conservation mission (NCC, 2002c). The Friends of the Park work with the NCC, helping to develop and support interpretation programs in the Park (NCC, 2005c; Friends of Gatineau Park, 2005). In addition, the NCC works with several recreational and tourist associations to ensure that their respective activities are practised responsibly in the Park (e.g. the International Mountain Biking Association, IMBA), and also to promote recreational sites outside the Park (e.g. the Association touristique de l'Outaouais, ATO),

New partnerships aimed at improving ecosystem conservation, could be formed with nature protection associations, French- and English-language universities in Canada, scientific interest groups, research centres, other provincial and national parks, regional municipalities and Outaouais region tourism businesses. The NCC could also take part in the consultation process of local and regional organizations involved in the management and conservation of natural resources, with a view to develop collaborative approaches to the management and development of the regional ecosystem and the protection of biodiversity. In addition, information could be made more readily accessible through regular reports on advances in Park management and the creation of a shared database. Finally, the NCC could communicate with and raise awareness among Park residents and neighbouring municipalities regarding the subject of good environmental management practices.

6.3 STRESS REDUCTION STRATEGY

Research carried out in the Park in recent years has identified a series of stress factors, along with their impacts on Park ecosystems, which were subsequently quantified by the study of ecosystem health in the Park. Most of the conservation issues are either caused by or are closely related to these stress factors. Consequently, reducing the impact of stressors on the Park's ecosystems is a key element in the conservation process.

If conservation initiatives are to be effective, action must be taken up front, by establishing objectives and introducing a strategy to minimize pressure on the Park's ecosystems. This approach is consistent with the principles and

orientations set out in the conservation vision, particularly the orientation arising from principle 2, which requires an understanding of the stress factors that interfere with natural ecosystem development.

Based on these considerations, the following six major objectives should help reduce the impacts on ecosystems:

OBJECTIVE 1: MINIMIZE PROPAGATION OF INVASIVE SPECIES AND PREVENT NEW INVASIONS

In Gatineau Park, as in most other protected natural areas, invasion and spreading of undesirable non-indigenous species is a significant problem, due to the potential impacts on ecosystem dynamics. Several sectors of Gatineau Park are affected by growing populations of invasive plants (see section 5.4.4.2.2), but the problem is particularly serious in the more fragile (valued) ecosystems. In view of the negative impacts on indigenous biodiversity and natural ecosystem balance, it is vital for the success of the conservation process that the spread of these species be kept to a minimum. Active management based on current knowledge is therefore required, and learning through experimentation should also be encouraged.

OBJECTIVE 2: MITIGATE THE IMPACTS OF OVER-GRAZING BY WHITE-TAILED DEER

The Park's white-tailed deer population, which comprised approximately 1,200 animals in the spring of 2005 (Tecsult, 2005), has grown significantly due to lack of predators, a series of mild winters and plentiful natural resources, resulting in overpopulation and consequent pressure on vegetation as a result of grazing (section 5.4.4.1.5). The impacts of this large deer population do not affect the Park as a whole, but are clearly visible in specific sectors, including Eardley Escarpment, and affect the most fragile (valued) ecosystems. Active management of the deer population is therefore required to maintain the sustainability of the Park's natural resources. A number of measures can be taken, based on current knowledge.

OBJECTIVE 3: MONITOR AND CONTROL VISITOR NUMBERS AND USE IN THE MOST SEVERELY DAMAGED SECTORS

A number of factors described throughout this Plan are related to a constant increase in Park use. This results from seasonal recreational use as well as the presence of private enclaves and multiple access roads. The impacts of this are beginning to be felt, especially in some of the valued ecosystems. The NCC should therefore consider the conclusions of the Ecosystem Conservation Plan as a means to coordinate the other Master Plan implementation proposals (always in light of the park's mission). For example, the recreation plan should take into account the results of the Ecosystem Conservation Plan, so that it is coherent with proposals relating to the conservation and restoration of damaged sectors.

OBJECTIVE 4: LIMIT OR PROHIBIT RECREATIONAL ACTIVITIES THAT ARE HARMFUL TO ECOSYSTEM INTEGRITY

The Park offers good potential for various types of recreational activities. However, some of these activities, such as campsites and beaches, have significant impacts on ecosystems. Some of the Park's lakes are used intensively in busy periods, and this high level of activity alters the environment and disturbs wildlife. Other activities such as rock climbing and mountain biking, the use of unauthorized trails and poaching, may have impacts on species and ecosystem dynamics. Here again, the valued ecosystems suffer the most. The pressure generated by the spread and intensity of recreational activities must be addressed at the same time as conservation actions are taken. Accordingly, the recreation plan should be formulated on the basis of these considerations, and the impacts of recreational activities in the Park's more fragile sectors should be reassessed within the context of the Park's mission.

OBJECTIVE 5: REDUCE THE IMPACT OF HUMAN-INDUCED DEVELOPMENT

A number of structures such as roads and private residences are present in the Park. Residential development, industrial activity and logging also take place around the Park's periphery, fragmenting habitats and reducing connectivity between ecosystems. In addition, the actual use of these structures disturbs wildlife and increases the risk of animal mortality (e.g. roads). Steps must be taken to reduce these impacts both inside and outside the Park, both in the field (e.g. creation of buffer zones, reduction of concrete surfaces) and in decision-making (e.g. round table discussions, collaborative action), with due regard for the other objectives of the Master Plan.

STRESS REDUCTION STRATEGY

The goal of the stress reduction strategy is to identify the sectors most affected by pressure, in order to guide management actions. Although the above objectives apply to the Park as a whole, they are often targeted primarily at specific sectors.

Digital analysis using the database set up during identification of the conservation areas has been used to support the stress reduction objectives. The database contains information on the locations of various stress factors. Each factor is ranked according to impact intensity, and is shown on a map (see Appendix 1). When these data were compared with ecological value findings (see Figure 13), it became possible to map the level of human pressure on the Park's ecosystems (see Figure 18).

The results were divided into four categories of impact (very high, high, moderate, low). For example, an area where the impact is classified as high would be a site with high ecological value that is under pressure from a variety of stressors.

The comparison also highlights the most fragile areas, and those most affected by stressors. These areas are the most likely to deteriorate.

As the map shows, most of the areas under strongest pressure are aquatic environments composed of bodies of water and their shorelines (riparian areas). Most of these sectors are in valued ecosystems. Clearly, these findings support the need for stress reduction objectives.

The electronic version of the map also contains a database listing the stressors identified in each sector. It can therefore be used to target local actions. As with the map of conservation areas, this product is obviously limited by the accessibility and scope of the information obtained, but the results are sufficient to serve as a basis for a realistic stress reduction strategy.

Stress impact levels are clearly shown, and the general strategy should therefore aim to progressively reduce them over time. In each new period, the impact level for a given sector should be reduced to the category below, and so on. For example, "very high" impact levels in a given sector should be reduced to "high" in the next period, and so on, until they can be classified as "low" or even "non-existent" in some cases.

Sectors with high or very high impact levels should also be treated as priorities. They often contain valued ecosystems, and are highly susceptible to deterioration.

Impact levels on ecosystems will be reassessed every five years and stress reduction objectives will be reviewed at the same time as the Ecosystem Conservation Plan, i.e. every 15 years (see Figure 19 in section 6.5).

CCN NCC

Canada

IMPACT DES PRESSIONS ANTHROPIQUES SUR LES ÉCOSYSTÈMES DU PARC DE LA GATINEAU

HUMAN IMPACT ON GATINEAU PARK ECOSYSTEMS

Degré d'impact / *Impact*

- Faible *Low*
- Modéré *Moderate*
- Élevé *High*
- Très élevé *Very high*

Source

Information géographique de référence provenant des bases de données de la Commission de la capitale nationale.

Geographical information provided by National Capital Commission databases.

km 0 0,5 1 2 3 4 5 km

MTM, NAD 83, Fuseau 9
MTM, NAD 83, Zone 9

FIGURE 18

Février 2010
February 2010

DDM Del Degan, Massé Experts-conseils

6.4 ECOSYSTEM MONITORING PLAN

Given the scope of the Ecosystem Conservation Plan, tools are needed to monitor and measure the success of the various proposals. A series of environmental indicators has been identified, selected and matched using a method designed to obtain the desired information.

To monitor changes in the ecosystem, all its components, especially those responsible for any variations, must be captured. Past conservation efforts have also shown that ecosystems come under pressure from various sources, and this pressure alters their processes and their components. The NCC has responded to this situation by introducing a series of management methods. This cause-and-effect relationship, explained by the Organisation for Economic Co-operation and Development (OECD) in 1993, led to the identification of a core group of indicators that can be used to examine environmental performance. The indicators were selected and structured on the basis of the pressure/health/ response model.

The pressure indicators were derived from the stress reduction strategy, which sets out a number of objectives based on the conservation priority of "reducing the impacts of pressure on ecosystems". Indicators have been identified for each of these objectives.

The health indicators are derived from the ecosystem conservation priorities and the conservation actions that support them.

Lastly, the response indicators reflect the NCC's management, communications and awareness efforts aimed at ensuring the sustainability of this system.

The indicators were selected using a two-part process. First, a list of indicators was drawn up for the conservation actions set out in the action plan. These indicators were then classified according to their place in the pressure/health/response model. Lastly, the research previously carried out by the NCC was taken into consideration The Park already has several natural resource monitoring programs, including: biodiversity monitoring, natural resource and environmental management, ecosystem health, etc. The indicators and measurements used in these studies were examined and included in this list.

In view of the volume of information involved, the monitoring program is presented in table form, divided into sections as follows:

OBJECTIVES: This section sets out, in concrete terms, the conservation priorities and related objectives. Based on the pressure/health/response model, the objectives are divided into three subsections, namely reduction of ecosystem stressors (pressure), monitoring of ecosystem health (health) and management efforts and success (response). The first subsection contains the objectives set out in the stress reduction strategy, while the other two contain the corresponding conservation priorities.

INDICATORS: This section lists the various indicators for the objectives. The indicators already used in monitoring programs are highlighted (*,†) and referenced.

COLLECTION METHOD: This section briefly describes the method used to measure each indicator:

- The term "statistics" refers to data that already exist or are collected every year by the NCC. They are then used for analysis purposes.
- The term "inventory" refers mainly to species indicators, and consists in surveying the presence of a given species, its development over time, or an action taken in its regard. An inventory method needs to be developed.
- The term "sampling" refers more specifically to static components such as habitats or vegetation, and examines elements such as coverage, nuisance and qualitative data. A sampling method also needs to be developed.
- The term "mapping" refers to the use of spatial reference data to access information. Analysis usually takes the form of photo-interpretation and refers to widespread or large-scale subjects.
- "Data analysis" is used when a range of information is required to achieve the target result. Generally speaking, the information is statistical in nature and procedures such as inventories and sampling are not required to collect it.

- A "survey" is used to obtain information from people. Methods such as polls and questionnaires can be used to do this.

FREQUENCY: The term "frequency" refers to the timing between two data collection events. It is selected on the basis of experience elsewhere, and varies from one to ten years.

"BREAKDOWN": "Breakdown" refers to the procedure of highlighting the sectors affected by a measure. For the sake of precision, significant ecosystems are examined separately from the Park's other ecosystems, meaning that six subsections are used, namely Park ecosystems, Eardley Escarpment, Eardley Plateau, Three-Lake Chain, La Pêche Lake and Pink Lake Plateau.

In all, 30 environmental indicators are identified, as shown in Table 6. Approximately half are in current use in NCC studies. They will be used to profile ecosystem pressure, ecosystem health and the effectiveness of ecosystem management measures every five years. The results, structured in line with the table, will be used as a decision support tool, showing which elements need to be remedied or strengthened. The assessment exercise will also enable many of the Ecosystem Conservation Plan management tools to be updated (e.g. the assessment of stressor impacts).

All these indicators will need to be reassessed when the Ecosystem Conservation Plan is reviewed in 15 years' time, in order to reflect changes in the ecosystems and any new knowledge that may have become available. In view of this aspect, a timetable has been prepared and is presented in Table 7. It shows the data collection periods for each indicator, up to the year in which the Ecosystem Conservation Plan will be reviewed. The indicator start dates are variable; some are already active, and in these cases the timetable reflects the dates already established in other programs.

The timeframe clearly shows the scope of the work to be done in the coming years, and will serve as an effective planning tool. It is complementary to the monitoring program, and should be reviewed at the same time.

It should be noted that the indicators and monitoring program presented in Tables 6 and 7 are intended as guidelines for the NCC to develop detailed monitoring programs. Some indicators could therefore be modified, combined or reduced.

TABLE 6
MONITORING PROGRAM FOR GATINEAU PARK'S ECOSYSTEMS[11]

OBJECTIVES/ CONSERVATION PRIORITIES	INDICATORS	COLLECTION METHOD	FREQUENCY	VALUD ECOSYSTEMS					
				Park Ecosystems	Eardley Escarpment	Eardley Plateau	Three-Lake Chain	La Pêche Lake	Pink Lake Plateau
Reduction of ecosystem stress factors (pressure)									
1. Minimize spreading of invasive species and prevent new invasions Conservation priorities 1, 2, 3 and 4	▪ Diversity of freshwater molluscs†	▪ Inventories	▪ Every 5 years						
	▪ Interventions to control populations of invasive species	▪ Statistics	▪ Every 3 years	✓	✓	✓	✓	✓	✓
	▪ Area covered by invasive species**†	▪ Sampling	▪ Every 3 years						
2. Mitigate the impacts of over-grazing by white-tailed deer Conservation priorities 1, 2, 3 and 4	▪ White-tailed deer grazing rates in the most severely affected areas*	▪ Inventories	▪ Every 10 years		✓				
	▪ Number and size of deer yards in the Park*	▪ Inventories	▪ Every 5 years						

[11] The indicators and monitoring program described here are intended as guidelines for the preparation of a detailed monitoring plan, as well as for management and other decisions.

TABLE 6 (cont.)

OBJECTIVES/ CONSERVATION PRIORITIES	INDICATORS	COLLECTION METHOD	FREQUENCY	VALUD ECOSYSTEMS					
				Park Ecosystems	Eardley Escarpment	Eardley Plateau	Three-Lake Chain	La Pêche Lake	Park Ecosystems
Reduction of ecosystem stress factors (pressure) (cont.)									
3. Monitor and control visitor numbers and use in the most severely damaged areas Conservation priorities 1, 5 and 6	▪ Number of unofficial trails* ▪ Physical and chemical quality of the water in control lakes*	▪ Mapping ▪ Sampling	▪ Every 5 years ▪ Every 2 years	✓	✓	✓	✓	✓	✓
4. Limit or prohibit recreational activities that are harmful to ecosystem integrity Conservation priorities 1, 5 and 6	▪ Number of activities governed by management policies and plans ▪ Number of participants per activity	▪ Statistics ▪ Statistics	▪ Every 5 years ▪ Every 4 years	✓	✓	✓	✓	✓	
5. Reduce the impact of human-induced development Conservation priorities 1, 4 and 5	▪ Area occupied by built structures ▪ Extent of environmental fragmentation†	▪ Statistics ▪ Mapping by photo-interpretation	▪ Every 5 years ▪ Every 8 years	✓			✓		✓
Monitoring of ecosystem health (health)									
1. Maintain or restore the natural processes and balances needed for ecosystems to function properly Conservation priority 2	▪ Recovery rate of plant cover following disturbances (% of seedlings on control plots) ▪ Recurrence of natural disturbances (number of fires, infestations, floods etc. identified) ▪ Diversity of the habitat mosaic † ▪ Air condition (Ottawa station) ††	▪ Sampling, reports ▪ Statistics ▪ Mapping by photo-interpretation ▪ Data collection	▪ Every 10 years ▪ Every 10 years ▪ Every 8 years ▪ Every 5 years	✓	✓	✓	✓	✓	✓
2. Maintain or restore diversity of indigenous animal and plant species Conservation priority 3	▪ Occurrence of species at risk*† ▪ Condition of indigenous biodiversity†† ▪ Plant and wildlife potential of the ecosystems†	▪ Data collection ▪ Data collection ▪ Mapping by photo-interpretation	▪ Every 5 years ▪ Every 5 years ▪ Every 8 years	✓	✓	✓	✓	✓	✓
3. Increase habitat availability, quality and connectivity Conservation priority 4	▪ Condition of terrestrial environments†† ▪ Condition of riparian environments†† ▪ Condition of wetland environments†† ▪ Condition of aquatic environments††	▪ Sampling ▪ Data collection ▪ Statistics ▪ Sampling	▪ Every 5 years ▪ Every 5 years ▪ Every 5 years ▪ Every 5 years	✓	✓	✓	✓	✓	✓
4. Conserve or restore the Park's valued ecosystems Conservation priority 5	▪ Size of restored areas ▪ Number of management plans implemented	▪ Data collection ▪ Statistics	▪ Every 5 years ▪ Every 3 years		✓	✓	✓	✓	✓

TABLE 6 (cont.)

OBJECTIVES/ CONSERVATION PRIORITIES	INDICATORS	COLLECTION METHOD	FREQUENCY	VALUD ECOSYSTEMS					
				Park Ecosystems	Eardley Escarpment	Eardley Plateau	Three-Lake Chain	La Pêche Lake	Park Ecosystems
Impact and success of management measures (response)									
1. Minimize the impacts of recreational activities on the ecological integrity of the Park Conservation priority 6	▪ Condition of stewardship†† ▪ Number of research projects implemented ▪ Budget allocated to conservation ▪ Size of ecosystem areas set aside for conservation	▪ Statistics ▪ Statistics ▪ Statistics ▪ Statistics	▪ Every 3 years ▪ Yearly ▪ Yearly ▪ Every 5 years	✓	✓	✓	✓	✓	✓
2. Raise public awareness of conservation issues Conservation priority 6	▪ Number of partnerships created for the purpose of conservation actions ▪ Rate of public participation in education and awareness activities	▪ Statistics ▪ Surveys	▪ Yearly ▪ Every 4 years	✓	✓	✓	✓	✓	✓

† Indicator proposed as part of biodiversity monitoring (DDM, 2003)
†† Indicator proposed as part of the assessment of ecosystem health in the Park (DDM, 2006).
* Already monitored under the Park's existing monitoring programs (Jacob 2003).
* * Partly monitored under the Park's existing monitoring programs (Jacob, 2003).

TABLE 7
TIMEFRAME FOR THE MONITORING PROGRAM[12]

INDICATORS	2010	2011	2012	2013	2014		2015	2016	2017	2018	2019		2020	2021	2022	2023	2024	
Pressure																		
Diversity of freshwater molluscs	X						X						X					
Interventions to control populations of invasive species			X				X			X				X			X	
Area covered by invasive species		X			X				X				X			X		
White-tailed deer grazing rates in the most severely affected areas				X												X		
Number and size of deer yards in the Park				X						X						X		
Number of unofficial trails				X						X						X		
Physical and chemical quality of the water in reference lakes	X		X		X			X		X			X		X		X	
Number of activities governed by management policies and plans				X						X						X		
Number of users per activity	X				X					X					X			
Area occupied by built structures					X						X						X	
Extent of environmental fragmentation			X										X					
Health																		
Recovery rate of plant cover following disturbances											X							
Recurrence of natural disturbances											X							
Diversity of the habitat mosaic			X										X					
Air quality				X						X						X		
Occurrence of species at risk					X						X						X	
Condition of indigenous biodiversity				X						X						X		
Plant and wildlife potential of the ecosystems			X										X					
Condition of terrestrial environments				X						X						X		
Condition of riparian habitats				X						X						X		
Condition of wetlands				X						X						X		
Condition of aquatic environments				X						X						X		
Size of restored areas				X						X						X		
Number of management plans implemented		X			X				X				X			X		
Response																		
Condition of stewardship			X				X			X				X			X	
Number of research projects implemented	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	
Budget allocated to conservation	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	
Size of ecosystem areas set aside for conservation					X						X						X	
Number of partnerships created for conservation actions	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	
Rate of public participation in education and awareness activities	X				X					X					X			

Profile of ecosystem health

[12] The indicators and monitoring program described here are intended as guidelines for the preparation of a detailed monitoring plan, as well as for management and other decisions.

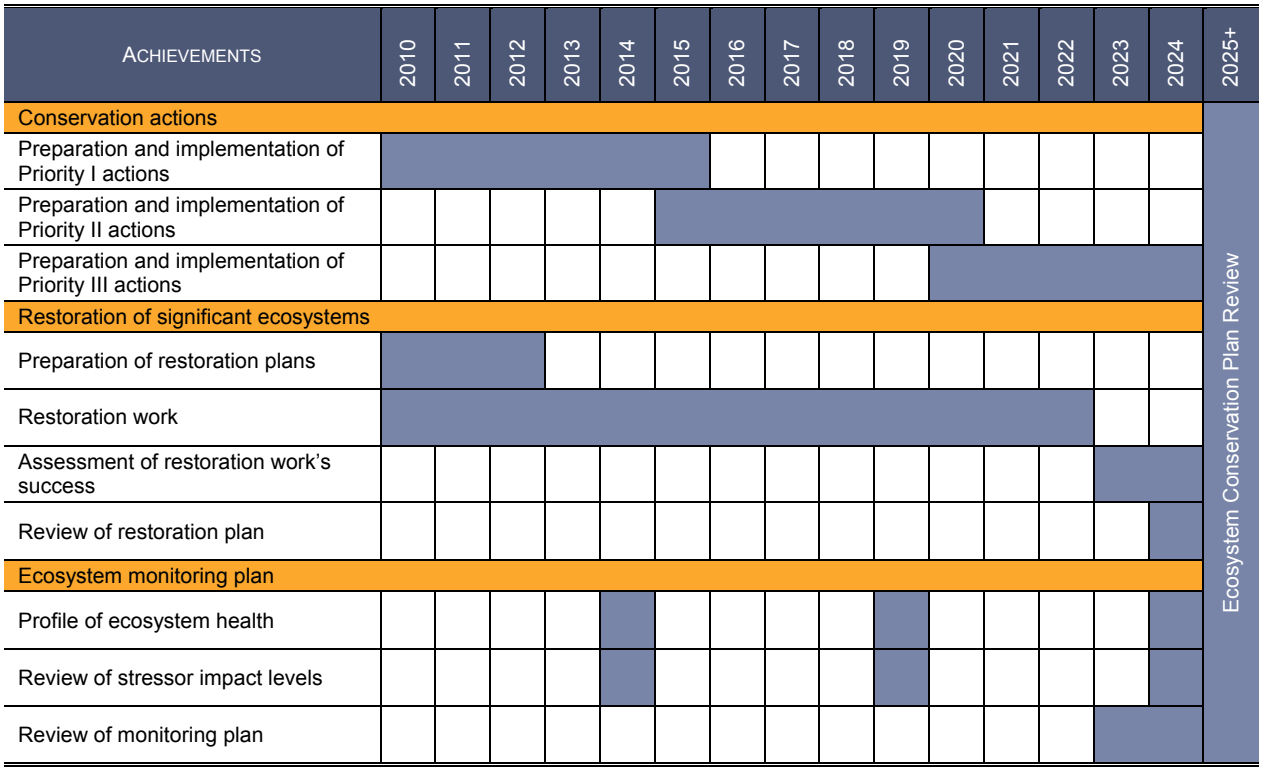
6.5 Ecosystem Conservation Plan – Reviews and Timeframe

The Conservation Vision describes the desired state of the Park's ecosystems in 2035 and sets out the objectives to be achieved by that time. The Ecosystem Conservation Plan, however, in the spirit of adaptive management, will be revised after 15 years. In the context of constantly evolving ecosystems, as well as changes in knowledge and management techniques, it will be important to adjust and adapt the Plan's content to reflect those changes. During the first 15 years of application, the effectiveness of the various methods and their results in the field will be judged. The Plan will then be adjusted, and new knowledge acquired in the interim will also be incorporated. The implementation process is cyclical in nature; in other words, if an objective is not achieved, it will be necessary to go back to the preceding step.

Figure 19 sets out a timeframe for the Ecosystem Conservation Plan, and concludes with a review. Because the Plan proposes so many projects, they have been grouped together in major themes for the purposes of the following timeframe:

- The conservation actions;
- The valued ecosystem restoration plan;
- The review of stressor impact levels;
- The monitoring program review;
- The Ecosystem Conservation Plan review.

Figure 19
Ecosystem Conservation Plan Timeframe



6.6 CONSTRAINTS AFFECTING THE APPLICATION OF THE ECOSYSTEM CONSERVATION PLAN

The timeframes and conservation measures in this document are based on the situation as it currently stands. Nevertheless, it is important to consider certain complications that could hinder the scheduled application of the Plan.

Most of the measures involve some cost (whether high or low), which must be included in the Park's budget. In certain cases, however, the cost may be too high or the required funds may not be approved. An essential element of the implementation process will therefore be to take budgetary issues into consideration.

Some measures require specific techniques or the involvement of specialists. Agencies other than the NCC will need to be assigned responsibility for some of the tasks.

Finally, knowledge acquisition and the magnitude of certain tasks will require collaboration with the scientific community, special-interest groups and public institutions. Planning and realizing these different forms of partnership may involve various jurisdictions and implementation may prove to be a delicate task. The measures may also risk falling prey to social and political pressures.

6.7 ECOSYSTEM CONSERVATION PLAN: IMPACTS ON THE MASTER PLAN

The various proposals in the Ecosystem Conservation Plan warrant revisiting the zoning of the Gatineau Park Master Plan (NCC, 2005c), in order to ensure consistency. When the Master Plan was produced, further study was still required to identify the actual boundaries of the valued ecosystems. Research aimed, among other things, at identifying valued ecosystems (DDM, 2007) and determining the health of Park ecosystems (DDM, 2006a) has since been completed. These studies, along with the proposals for implementation of the Ecosystem Conservation Plan, have led to some suggested refinements to the Master Plan. Adoption of these suggestions will be confirmed when the Master Plan is revised.

Only a few variances were noted in the boundaries of the current zoning. However, to ensure consistency with the Ecosystem Conservation Plan, we recommend that the status of six specific sites where discrepancies were noted should be examined; Figure 20 lists these sites and summarizes how they diverge from the corresponding conservation approach.

DISCREPANCY 1 EXTENSIVE RECREATION ZONE SURROUNDING LA PÊCHE LAKE

The perimeter of La Pêche Lake is currently zoned "extensive recreation", a designation which favours leisure activities. However, the fragile nature of this environment and the urgent need for management operations now requires an increase in conservation measures, in particular for shoreline areas where restoration would be needed in some places. The current status and resulting uses of this zone therefore do not seem consistent with the conservation proposals for this sector.

Since the lake's entire perimeter falls within a valued ecosystem and since heightened priority is given to riparian habitats, it would be appropriate to increase the conservation level around the periphery of this ecosystem.

As a result, the entire area would become an "integral conservation" zone, although two sectors would continue to be used for recreational purposes, namely the beach and the canoe-camping sites. Nevertheless, it appears that based on the precautionary principle, it would be wise to apply special measures and management directives in these sectors.

DISCREPANCY 2 EXTENSIVE RECREATION SECTOR ADJACENT TO THE EARDLEY ESCARPMENT

This area, located near the rock walls and cliffs of the Eardley Escarpment with its "integral conservation" designation, is currently zoned "extensive recreation". The area is located within a valued ecosystem and is in a top-priority conservation area (Figure 14). Increasing its zoning level to "conservation and extensive recreation" would therefore be appropriate because the features of a natural environment such as the Eardley Escarpment, do not allow for extensive recreational use in nearby areas.

Another part of this area is currently classified as "exceptional" for conservation purposes (DDM, 2007). It would therefore be appropriate to reclassify this area as an "integral conservation" zone, and to allow continued use of only a portion of the equestrian trail at the base of the Escarpment.

DISCREPANCY 3 CLIMBING WALLS IN THE INTEGRAL CONSERVATION ZONE

Most of the climbing walls are located in the integral conservation zone of the Eardley Escarpment, which is contrary to the management parameters for this area. For the two or three rock walls where climbing will continue to take place, it is recommended that a small portion of the Escarpment be converted into an “extensive recreation” zone. Depending on the climbing walls that are selected, the zone boundaries will need to be fine-tuned according to the components of interest such as plant species at risk. This adjustment will also confine the activity to a single location and allow other sectors to be controlled. It also implies the development of proper trails and an adequate level of security for the site.

DISCREPANCY 4 SEMI-INTENSIVE RECREATION SECTOR ON THE SOUTH SHORE OF PHILIPPE LAKE

This area surrounds the southern part of Philippe Lake, where a number of recreational facilities are located (e.g. beaches and camping). According to the map of valued ecosystems and their classification as conservation areas (Figure 14), this area includes the Three-Lake Chain valued ecosystem.

This ecosystem is able to tolerate a certain level of human activity, but this must be kept to a minimum so as not to increase the fragility of the environment. The current “semi-intensive recreation" zoning is not always consistent with this ecosystem’s conservation objectives and priority level. Conservation of riparian environments and water quality are priorities which must be taken into account and appropriate measures will need to be taken.

It would be appropriate to reduce the size of the “semi-intensive recreation” zone and convert it into an "extensive recreation” zone, except for the beach and camping areas. Special control and follow-up measures will also be required.

DISCREPANCY 5 SEMI-INTENSIVE RECREATION SECTOR AROUND MEECH LAKE

This area surrounds about half of Meech Lake. Like the previous sector, it is located in the Three-Lake Chain valued ecosystem where a conservation approach must be followed.

The area is currently zoned for "semi-intensive recreation”. While this ecosystem can tolerate a certain level of human activity, it must be kept to a minimum so as not to increase the fragility of the environment, degrade the riparian areas or deteriorate water quality. The current “semi-intensive recreation" zoning is not entirely consistent with the conservation objectives and priority level established for this valued environment. Some of the shoreline, however, is privately owned (mostly on the south shore), thereby limiting the possibility of reducing the size of this zone.

It is recommended that the size of this zone be reduced by converting it to “extensive recreation”, except for the beach areas and the southern shore of the lake.

DISCREPANCY 6 PARKWAY SECTOR EXTENSIVE RECREATION ZONE

This area is comprised mainly of the Eardley Plateau valued ecosystem and includes much of the Park trail system as well as part of the Parkway.

As things stand, this area is zoned "extensive recreation”, which is consistent with current usage. However, the fragility of this environment and the urgent need for management operations, as shown by research, means that more emphasis should be placed on conservation. The current state and usage of this area do not appear to be entirely consistent with a conservation approach.

It is recommended that the size of the “extensive conservation” zone be reduced and that the “conservation and extensive recreation” zone be expanded slightly.

In all, the proposed changes to Master Plan zoning classifications affect an area of 3,525 ha, or 9% of the Park’s total area. The largest sector affected by the changes is located at La Pêche Lake, where 2,100 ha would be converted into an “integral conservation” zone. As a result, the “integral conservation” zone would be increased by 11%, and the “conservation and extensive recreation” zone by 13%.

Divergence 1 : Récréation extensive → Conservation intégrale
Se situe à l'intérieur d'un écosystème valorisé avec priorité de conservation des milieux riverains. Étant donné la fragilité des milieux, on doit hausser le niveau de protection à conservation intégrale, à l'exception de la plage et des sites de canot-camping existants.

Divergence 1 : Extensive recreation → integral conservation
Located within a valued ecosystem with conservation priority placed on riparian environments. Given the fragile nature of these environments, the level of protection must be raised to "integral conservation," with the exception of the beach area and existing canoe-camping sites.

Divergence 4 : Récréation semi-intensive → Récréation extensive
Se situe à l'intérieur d'un écosystème valorisé dans la démarche de conservation. Ces milieux peuvent supporter une certaine utilisation par l'homme, mais celle-ci doit demeurer faible afin d'assurer la pérennité du milieu. Une récréation semi- intensive ne cadre pas sur toute la surface avec les objectifs de conservation de ces zones. Il est recommandé de réduire la surface de cette zone en convertissant une partie de celle-ci en *récréation extensive.*

Divergence 4 : Semi-intensive recreation → extensive recreation
Located within a valued ecosystem that requires a conservation approach. These environments can tolerate a certain level of human activity, which must remain fairly low to ensure environmental sustainability. Semi-intensive recreation is not compatible with the conservation objectives in all parts of these areas. It is recommended to reduce the size of the area zoned for semi-intensive recreation and to change the zoning in some places to "extensive recreation."

Divergence 2 : Récréation extensive → Conservation intégrale
Se situe dans le prolongement de l'écosystème valorisé de l'escarpement d'Eardley et possède un niveau de conservation exceptionnel (DDM, 2007a). Ce secteur doit donc être rehaussé en zone de conservation intégrale.

Divergence 2 : Extensive recreation → integral Conservation
Located within an extension of the Eardley Escarpment valued ecosystem, with an exceptional conservation value. This sector requires designation as an "integral conservation" zone.

Divergence 2 : Récréation extensive → Conservation et récréation extensive
Se situe dans le prolongement d'un écosystème valorisé. La vocation de récréation à elle seule ne coïncide pas avec les objectifs de conservation de ce territoire. Il serait alors opportun de convertir cette zone en statut de *conservation et récréation extensive.*

Divergence 2 : Extensive recreation → conservation and extensive recreation
Located within an extension of a valued ecosystem. The recreation function is inconsistent with the conservation objectives for this area. It is more appropriate to change the zoning for this area to "conservation and extensive recreation."

Divergence 3 : Conservation intégrale → Récréation extensive
Révision des limites du zonage afin de permettre l'escalade sur deux à trois parois avec une entente de cogestion avec les groupes intéressés.

Divergence 3 : Integral conservation → extensive recreation
Revision of zoning boundaries to allow rock climbing on two or three rock walls, with an agreement between the interested parties to jointly manage this activity.

Divergence 6 : Récréation extensive → Conservation et récréation extensive
Se situe à l'intérieur d'un écosystème valorisé. Même réduite, une récréation extensive privilégie la pratique du plein air. Étant donné la fragilité du milieu, la priorité doit être portée sur la conservation. Il est recommandé de réduire la superficie de cette zone en faveur de la zone de conservation et récréation extensive.

Divergence 6 : Extensive recreation → conservation and extensive recreation
Located within a valued ecosystem. Even with the zone reduced somewhat in size, the "extensive recreation" area still permits outdoor activities. Given the fragile nature of the environment, zoning that places greater emphasis on conservation is preferable. It is recommended that the size of this zone be reduced and that part of it be zoned as "conservation and extensive recreation."

Divergence 5 : Récréation semi-intensive → Récréation extensive
Se situe à l'intérieur d'un écosystème valorisé dans la démarche de conservation. Ces milieux peuvent supporter une certaine utilisation par l'homme, mais celle-ci doit demeurer faible afin d'assurer la pérennité du milieu. Une récréation semi-intensive ne cadre donc pas partout avec les objectifs de conservation de ces zones. Une réduction des superficies de récréation semi-intensive dans la mesure du possible est recommandée.

Divergence 5 : Semi-intensive recreation → extensive recreation
Located within a valued ecosystem that requires a conservation approach. This environment can tolerate a certain level of human activity, which must remain fairly low to ensure environmental sustainability. Semi-intensive recreation is not compatible with the conservation objectives in all parts of these areas. It is recommended to reduce as much as possible the size of the area zoned for semi-intensive recreation.

CCN NCC

Canada

MODIFICATIONS AU ZONAGE DU PARC DE LA GATINEAU
GATINEAU PARK ZONING CHANGES

Lien récréatif extensif
Extensive recreational link

Limite de secteur
Sector limit

ZONAGE ACTUEL / *ACTUAL ZONING*

CONSERVATION / *CONSERVATION*

- C1 — Conservation intégrale / *Integral conservation*
- C2 — Conservation et récréation extensive / *Conservation and extensive recreation*

RÉCRÉATION / *RECREATION*

- R1 — Récréation extensive / *Extensive recreation*
- R2 — Récréation semi-intensive / *Semi-intensive recreation*
- R3 — Récréation intensive / *Intensive recreation*

ACCUEIL / *RECEPTION*

- A/VR1 — Accueil principal / *Main visitor reception area*

AGROTOURISME ET CONSERVATION / *AGROTOURISM AND CONSERVATION*

- AC1 — Agrotourisme et conservation / *Agrotourism and conservation*

PATRIMOINE / *HERITAGE*

- P/H1 — Patrimoine / *Heritage*

INSTITUTION / *INSTITUTION*

- I1 — Institution / *Institution*

MODIFICATION AU ZONAGE / *ZONING CHANGE*

CONSERVATION / *CONSERVATION*

- C1 — Conservation intégrale / *Integral conservation*
- C2 — Conservation et récréation extensive / *Conservation and extensive recreation*

RÉCRÉATION / *RECREATION*

- R1 — Récréation extensive / *Extensive recreation*

Source
Information géographique de référence provenant des bases de données de la Commission de la capitale nationale.
Geographical information provided by National Capital Commission databases.

km 0 0,5 1 2 3 4 5 km

MTM, NAD 83, Fuseau 9
MTM, NAD 83, Zone 9

FIGURE 20

Février 2010
February 2010

DDM Del Degan, Massé Experts-conseils

CONCLUSION

As a result of its position, Gatineau Park is a prime natural area for all Canadians, whether visitors to or residents of the National Capital Region. The diversity of its species and habitats and the quality of its resources provide visitors with a high-quality green tourism experience and helps them to appreciate nature. Its ecosystems, however, have faced a growing threat of degradation in recent years.

Fundamentally, a number of species are disappearing, habitats are changing, and the quality of the resource is sometimes questionable. As a natural space, Gatineau Park is typical of the St. Lawrence Lowlands, and offers a number of rare and unique, but also fragile, attributes. The unwavering concern of Park management is to maintain the area's resources and diversity, thereby allowing for an ecosystemic approach that contributes to the protection, conservation and restoration of ecological integrity.

These threats to the Park's ecological integrity are not irreversible. The objectives of the Gatineau Park Ecosystem Conservation Plan are to protect, conserve, and restore the ecological integrity of the Park's ecosystems. Because the ecosystems and the information concerning them are in constant evolution, consideration has been given to a number of critical points, which form the basis of the Ecosystem Conservation Plan:

- The primary goal of this approach is to conserve ecological integrity though ecosystemic management.
- The Conservation Vision defines the desired state of the Park in 2035. This vision is sets out principles and orientations to help achieve ecological integrity.
- Two key principles support and assist decision-making for management of the ecosystems: the precautionary principle, and adaptive management.
- Ecosystem management takes place at three levels: the greater ecosystem, the regional ecosystem and the Park's ecosystems.
- The Ecosystem Conservation Plan is supported by a variety of studies, including the Identification and Assessment of Valued Ecosystems and Natural Habitats (DDM, 2007), the Health of the Park's Ecosystems (DDM, 2006a), the Conservation Vision Statement for the Park (DDM, 2006b) and a scientific description of Eardley Escarpment and the issues it faces (Appendix 2).
- The intent of the conservation approach is to be cohesive. That is, it should unite the various actors involved in ecosystem conservation at the various scales of consideration.

As a result of its wide scope and content, the process of implementing the Ecosystem Conservation Plan is complex and many factors must be considered. Since the 1960s, the NCC has always maintained close contacts with the scientific community and implements many projects and studies on the conservation of ecosystems.

The Plan grants an important place for scientific research and collaboration, and this has allowed for the development of several basic management tools. For example:

- Conservation actions are established based on principles and orientations set out in the Vision of the Park in 2035;
- Various issues are raised whose resolution must involve conservation measures. There are many such measures or actions, and a priority list has been established;
- New knowledge will constantly be acquired through scientific research projects, in continuity with research programs already established by the NCC for several years;
- Adoption of a watershed level approach to ecosystem conservation is proposed;
- A restoration plan must be prepared for the valued ecosystems to allow them to recover their ecological integrity;
- Various tools, such as an ecosystem surveillance program, are required to track changes to ecosystems as a result of conservation actions;
- The Ecosystem Conservation Plan will be revised every 15 years to reflect the results of environmental monitoring and new knowledge, and to guide future management actions;

- Collaboration with various public and private institutions, special interest groups, and scientific organizations is proposed;
- The conservation approach will be supported by all the actors involved in the Park, and partnerships will be required to ensure the Ecosystem Conservation Plan's viability;

At last, Gatineau Park has a planning tool that will help it achieve ecological integrity and preserve its ecosystems. The Ecosystem Conservation Plan offers a cautious and holistic approach that is based on the current management trends for protected areas in Canada and throughout the world. Implementation of this plan is an essential task by which the NCC's efforts will benefit all Canadians and future generations.

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GLOSSARY

Adaptive management:

A process designed to achieve management goals and obtain reliable information from feedback; a scientifically valid means of learning by experience.

Conservation:

The implementation of measures designed to achieve rational use and the maintenance or preservation of natural or cultural resources (Panel on the Ecological Integrity of Canada's National Parks, 2000).

Cumulative effects:

Environmental effects that accumulate over time and within a given space, as a result of other activities and of prior, current and imminent projects in a given area (*Canadian Environmental Assessment Act*).

Dry area:

An area with dry soil and no trees (Natural Resources Canada, 2001).

Ecological integrity:

The condition of an ecosystem that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes (*Canada National Parks Act*).

Species at risk:

Refers to the plant and animal species with special status at the federal (Species at risk act) and provincial (Québec's Act respecting threatened or vulnerable species (Loi sur les espèces menacées ou vulnérables)) levels. It also includes the species on the COSEWIC list and the provincial list of species likely to be designated as threatened or vulnerable

Exceptional forest ecosystem (EFE):

A stand of interest that is notable for its biodiversity. EFEs are divided into three categories: old-growth forests, shelter forests and rare forest ecosystems (MRNF, 2009).

Important forest:

A woodlot of environmental importance, chosen for its rarity, age, aesthetic value or heritage value (NCC, 1998).

Old-growth forest:

A very old forest in which the dominant trees have attained an exceptional age, in view of their host environment and geographical location. Old-growth forests are one of the three categories of exceptional forest ecosystems (MRNF, 2009).

Precautionary principle:

Principle by which a prudent approach is taken in all interventions with the potential to alter the natural environment, and by which protective measures are applied even where there is no scientific evidence to suggest unfortunate consequences for the environment.

Preservation:

The implementation of measures to prevent the alteration, deterioration or destruction of a natural or cultural resource. The term covers conservation activities aimed at consolidating and maintaining the form, material and integrity of a resource (Panel on the Ecological Integrity of Canada's National Parks, 2000).

Protection:

A set of regulatory measures, resource management programs and public education programs aimed at maintaining ecosystems in as natural a state as possible (Panel on the Ecological Integrity of Canada's National Parks, 2000).

Restoration:

The process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed, with the aim of restoring ecological integrity (SERI 2007).

Vision:

In this study, the conservation vision represents the desired future status and image of the territory (in 2035).

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APPENDIX 1

EVALUATION OF ECOLOGICAL COMPONENTS AND DEGREE OF IMPACT OF STRESSORS

REVISION OF VALUED ECOSYSTEM BOUNDARIES

EVALUATION OF ECOLOGICAL COMPONENTS

The ecological value of each component is assessed according to three criteria:

- **Rarity**: The relative abundance in terms of number and range of a component, expressed at the level of the Park, the region, the province, or the country. For example, a species may be rare at the provincial level, whereas the habitat may be rare at Park level (e.g. common loon nest).
- **Fragility**: The criterion most directly linked to environmental tolerance, and, like rarity, a key element of this process. Fragility refers to the component's vulnerability to use, its sensitivity, and ots use as a result of its attraction for visitors (DDM, 2004a). As with rarity, the assigned level of fragility is based on the scientific literature and on field studies of the species or habitat.
- **Representativity**: One of the roles assigned to the Park, namely ecosystem representativity. This criterion covers not only the typical characteristics of the landscape or bioclimatic conditions, but also their contribution to the representativity of the natural regions in which the Park is situated.

It is important to note that these three criteria are separate. A component may be fragile without being rare, or may be representative as well as being abundant. The ecological value of a component is calculated by assigning a grade for each of the three criteria. In accordance with their definitions, rarity and fragility are considered to be the key factors in the assessment process and are therefore given greater weight than representativity.

For each component, a rating of 2, 3, 5 or 8 is assigned for rarity and fragility, and a rating of 1, 3 or 5 is assigned for representativity. This rating system is used as a comparative tool to evaluate the components quantitatively. The basic figures were selected randomly, but their variation and ranking reflect the objectives of the study.

A component may have a final ecological value ranging from 5 to 21. The following table shows the ratings assigned to each component.

Components (Numerical layers)	Criteria			Total (ecological value)
	Fragility	Rarity	Representativity	
Topic: Plant life				
Plants at risk (2007)	5	8	3	16
Red cedar populations	8	5	5	18
Topic: Wildlife				
Wildlife at risk (2007)	5	8	3	16
Spawning grounds	8	5	1	14
Active heron nesting areas (+ buffer zones)	8	2	3	13
Common loon observations	8	5	3	16
Fish at risk	5	8	3	16
Deer yards (1998)	3	3	5	11
Topic: Potential Habitats				
Potential habitat of Least Bittern	3	5	1	9
Potential habitat of Loggerhead Shrike	3	3	1	7
Topic: Ecosystems				
Eardley Escarpment	8	8	3	19
Islands	8	8	3	19
Black Lake	8	2	1	11
La Pêche Lake	5	5	1	11
Meech Lake	5	5	5	15
Pink Lake	8	5	5	18
Renaud Lake	5	2	1	8
Wetlands	8	5	1	14
Old forests	2	2	1	5
Peat Bogs	8	5	1	14
Significant forests	5	5	3	13
Exceptional forest ecosystems (EFE)	5	8	3	16
Dry area	8	5	1	14

CCN NCC

Canada

RÉVISION DES LIMITES DES ÉCOSYSTÈMES VALORISÉS
REVISION OF VALUED ECOSYSTEM BOUNDARIES

Écosystèmes valorisés
Valued ecosystems

- Nouvelle limite / *New boundary*
- Ancienne limite / *Old boundary*

Niveau de conservation*
Conservation level

- Exceptionnel / *Exceptional*
- Très élevé / *Very high*
- Élevé / *High*

* *Source* Évaluation et identification des écosystèmes et des habitats naturels valorisés (DDM, 2007a)
Evaluation and identification of valued ecosystems and natural habitats (DDM, 2007a)

Source
Information géographique de référence provenant des bases de données de la Commission de la capitale nationale.

Geographic information provided by National Capital Commission databases.

km 0 0,5 1 2 3 4 5 km

MTM, NAD 83, Fuseau 9
MTM, NAD 83, Zone 9

FIGURE A1

Février 2010
February 2010

DDM Del Degan, Massé Experts-conseils

LAC-DES-LOUPS
SAINT-LOUIS DE-MASHAM
SAINT-FRANÇOIS DE-MASHAM
SAINTE-CÉCILE DE-MASHAM
WAKEFIELD
LUSKVILLE
GATINEAU
OTTAWA
LAC LA PÊCHE
LA PÊCHE LAKE
CHAÎNE DES TROIS LACS
THREE-LAKE CHAIN
PLATEAU D'EARDLEY
EARDLEY PLATEAU
ESCARPEMENT D'EARDLEY
EARDLEY ESCARPMENT
PLATEAU DU LAC PINK
PINK LAKE PLATEAU
QUÉBEC
ONTARIO
Rivière des Outaouais
Gatineau
Rivière
Lac des Loups
Lac Halverson
Lac Bélanger
Lac Bob
Lac à Breen
Lionel-Beausoleil
Lac Ruthledge
Lac Kelly
Lac Sandy
Lac Glynn
Lac à la Loutre
Lac à Bourgeois
Chemin Cleo-Fournier
Chemin Lac-La-Pêche
Sincennes
Lac Belair
Lac Leblanc
Lac Ben
Lac Hawley
Lac Curley
Lac Mahon
Lac Jean-Venne
Lac Nesbitt
Lac Fairburn
Lac Gauvreau
Lac Bell
Lac Taylor
Lac Renaud
Lac Philippe
Lac Clair
Lac Ramsay
Lac Lusk
Lac au Foin
Lac Mousseau
Lac Edouard
Lac Meech
Chemin du Lac-Meech
Chemin du Lac-Philippe
Chemin Blackburn
Chemin Tremblay
Chemin de la Butte
Chemin de la Montagne Nord
Chemin des Dominicains
Chemin de la Baie
Chemin de la Rivière
Chemin 6-Concession
Chemin 5-Concession
Ferry Road
Galetta Side Road
Carp Road
Kinburn Side Road
Dunrobin Road
CN
Lac Brown
Lac Carman
Lac Caseade
Lac à la Truite
Lac Wright
Lac Long
Lac Forked
Lac Saint-Antoine
Cross Loop
CHEMIN DE FER HULL-CHELSEA-WAKEFIELD
Lac Fortune
Prom. Fortune
Prom. Champlain
Lac Kingsmere
Kingsmere
Prom. de la Gatineau
Lac Mountains
Lac Pink
Chemin Baillie
Chemin Cook
Chemin Pink
Chemin Perry
Chemin Klock
Chemin Vanier
Chemin de la Montagne
Prom. de la Gatineau
Lac des Fées
Lac Leamy
Chemin de Chelsea
Boulevard de la Vérendrye Ouest
Paul-Maloney
Boul. Gréber
Boul. Saint-Raymond
Montée Saint-Amour
Montée Paiement
Chemin Saint-Columban
Chemin Taché
Avenue Gatineau
Boulevard des Allumettières
Chemin D'Aylmer
Alexandre-Taché
Sussex
Rideau
Canal Rideau
Bank
Wellington
Rivière Rideau
Outaouais
105
366
148
50
5
307

EVALUATION OF LEVEL OF IMPACT OF STRESSORS

Evaluating the degree of impact of stressors involves assessing the environment's sensitivity to the presence of stress factors. The stress factors present within the Park were listed and rated on the basis of the available information. The rating assigned to a stress factor varies according to the ecological value of the polygon in which it is located (see Figure 13 of the Gatineau Park Ecosystem Conservation Plan). For example, a power line in a polygon with a "very high" ecological value will have a rating of 20, but the same stress factor in another polygon with a "low" ecological value will have a rating of 5. The variability of this rating system reflects the sensitivity of the environment.

The rating corresponding to the sum of stress factors listed on one polygon reflects its level of impact. The findings were divided into four classes or levels of impact: low, moderate, high and very high. The result of this classification is shown spatially in Figure 18 of the Gatineau Park Ecosystem Conservation Plan.

STRESS FACTORS	IMPACT (RATING)			
	ECOLOGICAL VALUE			
	VERY HIGH	HIGH	MODERATE	LOW
Artificial dams	20	15	10	5
Lookout points	20	15	10	5
Power lines	20	15	10	5
Rock climbing walls	30	20	15	10
Beaches	30	20	15	10
Private properties	30	20	15	10
Presence of Eurasian water milfoil	20	15	10	5
Presence of purple loosestrife	20	15	10	5
Trails at Camp Fortune	20	15	10	5
Climbing wall trails	20	15	10	5
Unofficial trails	20	15	10	5
Recreational trails	20	15	10	5
Canoe camping sites	30	20	15	10
Critical sites at Camp Fortune	30	20	15	10
Spruce budworm infestation sites	10	8	5	3
Camp sites	30	20	15	10
Parking areas	30	20	15	10
Landslide zones	10	8	5	3
Eroded areas	10	8	5	3

APPENDIX 2

EARDLEY ESCARPMENT
DESCRIPTION AND CONSERVATION ISSUES

DEFINITION OF AN ESCARPMENT

In geology, an escarpment is a transitional zone between different physio-gegraphic provinces that involves a steep elevation differential characterized by a cliff. More commonly, an escarpment is a transition from one series of sedimentary rocks to another series of a different age and composition. It is usually the result of loss of the newer rock (situated on top of the older rock) through erosion.

Some escarpments were formed by tectonic movement (deforming movements of the Earth's crust or volcanic activity), and in particular by the vertical movement of the Earth's crust along a fault, creating a fault scarp. A fault is a fracture in the ground in which the adjacent surfaces are displaced along the plane of the fracture.

An escarpment can be divided into several portions, each subject to different levels of natural and human-induced impacts.

The first portion is the summit or roof (the upper surface of the escarpment, or the land immediately above it), and the foot or base (the land located at the bottom, covered with piles of rocks that have fallen from the cliff during erosion). It is here, at the summit and base, that the most abundant vegetation is found, in a variety of layers.

Between the two, the vertical or sloping portion of the escarpment is known as the wall. This is the portion that is most exposed to natural elements such as wind and rain, and usually has a large number of cracks, crevasses and ledges. A ledge or platform is a natural protrusion above a steep slope, formed by a resistant layer, around a plateau, with a softer layer below. Often, a thin layer of soil builds up on the ledge, allowing for the development of plant life. Cracks are discontinuities, breaks or tabular openings in the rock, ranging from a few centimetres to several decimetres in length, and from a few millimetres to several centimetres in width. They are produced by physical constraints. Crevasses, for their part, are superficial openings in the rock, sometimes used by plant or animal species as shelter.

ESCARPMENT RARITY, FRAGILITY AND WEALTH

Eardley Escarpment is located in the Province of Québec, and runs along the line between the Canadian Shield and the St. Lawrence Lowlands. It is also the richest and most fragile environment in Gatineau Park.

Eardley Escarpment is a cliff lying along a south-south-west line. It is approximately 300 metres high, with an average height of more than 200 metres, and is the dominant topographical element in the Outaouais region. It begins in the City of Gatineau and runs north-eastwards along the Ottawa River for several dozen kilometres, forming a characteristic rock slope alignment.

This type of environment is extremely rare; there are only a handful of documented escarpments in Canada and the world.

According to Gagnon (1981), Eardley Escarpment's ecological value for conservation is very high due to the diversity of its plant communities. In addition, its red oak (*Quercus rubra*), white oak (*Quercus alba*) and red oak/red cedar (*Juniperus virginiana*) stands are some of the rarest vegetation communities in the Ottawa Valley and Québec.

The plant species at risk are mainly associated with the Escarpment's carbonate rock outcrops and open oak stands, where their principal concentrations are found (Lavoie, 1992). These species are often vulnerable; nearly 40% exhibit limited distribution, require specialized habitats and have small populations.

Because of the Escarpment's micro-climate, it has developed a form of plant life that is unusual in Western Québec. The conditions on the Escarpment slopes are closer to those found further south, for example in the American Mid-West. The warm micro-climate is conducive to the growth of certain specific species such as the blunt-lobe cliff fern (*Woodsia obtusa*), the walking fern (*Asplenium rhizophyllum*), the white oak, the red cedar and the common hackberry (*Celtis occidentalis*). In many places, the vegetation resembles a savannah, with tall grasses and sparse trees. The slow growth and underdeveloped aspect of the trees, some of which are more than 100 years old, are evidence of the difficult edaphic conditions on the Escarpment.

Other threatened and vulnerable species, as well as species likely to be designated as such, are found in the Eardley Escarpment ecosystem. Gagnon et al. (1993) studied the population dynamics of eight threatened or vulnerable plant species, including the woodland sunflower (*Helianthus divaricatus*), Douglas' knotweed (*Polygonum douglasii*) and the fragrant sumac (*Rhus aromatica*), which are vulnerable species in Québec. Gagnon and Hay (1986) studied the

eastern few-fruit sedge (*Carex oligocarpa*), this being only the seventh known location in Canada of this species at risk.

The Escarpment, which is the only place within Gatineau Park where the red cedar is found, contains the largest population of red cedar in Québec, estimated at 15,000 trees (NCC, 2002c) and accounting for 80% of the total population in Québec (Forest, 1994). According to Forest (1994), the Eastern red cedar is one of the rarest species of trees in Québec, found almost exclusively within the oak-red cedar stands on Eardley Escarpment. This is a very rare type of community within the province, found only in the Ottawa Valley. Because the red cedar populations are located mainly on the Escarpment walls, they are under direct pressure from rock climbing activities. The most popular rock climbing site is also home to the second largest concentration of red cedar in the Park.

The other benefits of the Escarpment's micro-climate include a number of bird species above the cliffs. The birds take advantage of rising air currents and warm winds directed upwards by the Escarpment's topography. Birds of prey migrate through the region in spring and early fall. During these periods, it is possible to observe the red-tailed hawk (*Buteo jamaicensis)* and the turkey vulture (*Cathartes aura*). Many species use the cliff for nesting, and groups of crows and rooks are regularly observed by climbers. Owls, rarely seen because of their nocturnal habits, are also common on the Escarpment. There are several potential nesting sites for the American peregrine falcon (*Falco peregrinus anatum*) on the Eardley Escarpment. These nesting sites are monitored every five years by the MDDEP.

Land-based wildlife is also abundant on the Escarpment. For example, the cervids winter on the western portion of the Escarpment. During March and early April, it is not unusual to see dozens of animals feeding in the fields at the base of the Escarpment, or travelling the network of paths they create by trampling the snow covered slopes. In winter, packs of wolves (*Canis lupus lycaon*) visit the Escarpment, hunting for white-tailed deer (*Odocoileus virginianus*). This part of the Park is also inhabited by black bear (*Ursus americanus*), which can be observed on occasion. The bears are attracted by the plentiful supplies of berries growing on top of the hills. Their dens are usually located alongside the Escarpment crest. Other common species include the racoon (*Procyon lotor*), muskrat (*Ondatra zibethicus*), squirrel (*Sciurus carolinensis*, *Tamiasciurus hudsonicus*) and chipmunk (*Tamias striatus*).

In 1990, a juniper hairstreak (*Callophrys gryneus*), a butterfly often found around the red cedar, was captured for the first time in Québec at the bottom of Eardley Escarpment. It is now classified as a threatened species in Québec by the Société d'entomologie du Québec (SEQ). Insect populations associated with the red cedar and other Escarpment plants have been studied on numerous occasions, highlighting the entomological richness of this habitat (Landry, 1990). In 1991, new lepidoptera species were seen along the Escarpment (Landry and Landry, 1991), while in 2001, researchers found six species of beetles that had never before been documented in Québec (Laplante, 2001). Goulet (1994) also found the first examples in Québec of three hymenoptera families, linked to the presence of the red cedar. The discovery of these species in Québec highlights the unique character of this region's wildlife.

Because of all these factors, Eardley Escarpment is without question Gatineau Park's richest natural environment. Because of its hot, dry climate and steep slopes, it is also the most fragile, and is particularly sensitive to erosion.

IMPACTS OF ROCK CLIMBING ON THE HOST ENVIRONMENT, AND CONSERVATION OPTIONS

A study by Dubé (1995) showed the significant impact of climbing on some Eardley Escarpment habitats. Many other studies have also been carried out, some on the question of protecting plant species and others on damage to the rock face and the potential decline in the number of wild animal species. In all, six major impacts have been identified. The table below summarizes the available information. In addition, Kuntz and Larson (2005) report that the impact of rock climbing varies according to the degree of difficulty of the wall. The study recommends the use of walls with a level of difficulty higher than 5.10, rather than easier walls, since their impact on the environment is less severe,.

The conservation options set out in the table have been applied in some locations, and it is therefore possible to comment on them:

- Closure of climbing sites: This management option has frequently been proposed in the literature. It allows plant and animal species to re-colonize the environment, increases species wealth, protects the plant cover and avoids loss of essential habitats. However, the literature also shows that it often does not produce satisfactory results because climbers continue to use the prohibited sites, and the closures are difficult to enforce. Even so, the results observed on Mont Saint-Hilaire are encouraging. (Camp and Knight, 1998; Rusterholz et al., 2004; Kelly and Larson, 1997; McMillan and Larson, 2002)

Closure of certain climbing paths and installation of permanent paths: This option, too, is mentioned frequently in the literature. It allows users to continue their activity, except during critical periods of the year, for example during flowering or nesting. The literature shows that climbers tend to comply with this type of rule. A management plan can also be introduced, allowing those in charge to set limits on climbing and introduce measures to ensure environmental sustainability (Camp and Knight, 1998; Rusterholz et al., 2004)

Introduction of monitoring programs: Also cited frequently in the literature, this option identifies damage to the ecosystem and allows for ongoing observation of the impacts of rock climbing and recreational activities on the cliffs and related communities. Based on these observations, managers are able to assess the intensity of the activities and decide on a management approach. A monitoring program may be combined with complete or partial closure of climbing sites. (Rusterholz et al., 2004; Richardson, 1999; McMillan and Larson, 2002)

Status quo: Many of the reports cited in this document show that the environment is affected significantly by rock climbing activities on the Escarpment cliff, and that measures are needed to correct this situation. In addition, it has been shown that the environment's level of resilience declines steadily as a result of species loss and community impoverishment, preventing the ecosystems from resuming their functions and developing normally after disturbance.

IMPACTS ON THE ENVIRONMENT	CONSERVATION OPTIONS
REDUCTION IN SPECIES WEALTH	
Decline in plant and animal species (Baker, 1999; Rusterholz et al., 2004; CPAWS, 2005). **D**ecline in lichen species on climbing sites, compared to non-climbing sites (Farris, 1998). **D**ecline in tree, bush and non-graminaceous grass species on climbing sites, compared to non-climbing sites (Camp and Knight, 1998). **D**ecline in snail population wealth (McMillan et al., 2003). **M**ore bird species (60 %) on non-climbing sites (Krajick, 1999). **L**oss of diversity in bryophyte, moss and liverwort species (McMillan and Larson, 2002; Kingsley, 2002). **H**ealth considered severe for three of the seven red cedar species (NCC, 2002a). **D**ecline in the number of three calcicole fern species: the walking fern (*Asplenium rhizophyllum*), purple cliffbreak (*Pellea atropurpurea*) and bluntlobe cliff fern (*Woodsia obtusa*) (Gagnon, 2002). **S**ignificant differences in the number of species and relative frequency of many species (Farris, 1995). **S**ubstantial damage to vegetation in areas used by rock climbers (Genetti and Zenone, 1987).	Close or control of access paths and inform users (Camp and Knight, 1998; Cornish, 2004; Farris, 1998; Francis, 2001; Kelly and Larson, 1997; McMillan and Larson, 2002; Nuzzo, 1995; Richardson, 1999; Rusterholz et al., 2004)
A DECLINE IN PLANT COVER	
Decline of more than 5% on climbing sites, compared to non-climbing sites (Rusterholz et al., 2004). **G**reater density of large white cedars on non-climbing sites (Farris, 1998). **D**ecline in lichen cover (Krajick, 1999). **D**ecline in plant cover at the base of climbing sites (McCarthy, 2003). **L**ess abundant plant life (Baker, 1999). **S**ignificant differences in total vegetation cover (Farris, 1995). **V**egetation shift and loss of plant growth sites (Genetti and Zenone, 1987).	Reduce access during critical (breeding) periods and install permanent path systems (Camp and Knight, 1998; Farris, 1998; Francis, 2001; Kelly and Larson, 1997; McMillan and Larson, 2002; Nuzzo, 1995; Rusterholz et al., 2004)
SOIL EROSION	
Soil compaction (McMillan et al., 2003). **S**oil displaced by climbers (Francis, 2001). **I**ncrease in soil degradation (Cornish, 2004). **C**reation of deep run-off runnels in the soil (Genetti and Zenone, 1987). **S**igns of soil erosion (CPAWS, 2005).	Limit access to climbing sites and prohibit the use of pitons and carabiners (Camp and Knight, 1998; Farris, 1998; Francis, 2001; Rusterholz et al., 2004; Cornish, 2004)
EROSION OF CLIFF WALLS	
Physical signs of damage on cliff walls (Francis, 2001; Cornish, 2004; Kelly and Larson, 2004). **E**vidence of rain-resistant chalk on the rock walls (McCarthy, 2003). **S**igns of cliff wall erosion (CPAWS, 2005).	Prohibit the use of pitons and carabiners, reduce treading and inform users (Camp and Knight, 1998; Farris, 1998; Kelly and Larson, 1997; Rusterholz et al., 2004; Cornish, 2004)

IMPACTS ON THE ENVIRONMENT	CONSERVATION OPTIONS
ALTERATION OF PLANT AND ANIMAL COMMUNITY COMPOSITION	
Change in the frequency of dwarf trees such as the creeping germander (*Teucrium chamaedrys*) and mountain germander (*Teucrium montanum*) (Rusterholz et al., 2004). **I**ncrease in monocotyledon populations on sites used by climbers (Farris, 1998). **F**ew trees in younger age classes (Kelly and Larson, 1997). **C**hange in snail population composition (McMillan et al., 2003). **I**nvasions of invasive species on sites used by climbers (Oosthoek, 2002). **D**ifferent bird communities, altering spatial distribution (Camp and Knight, 1998). **C**hanges in the number of invasive bird species (Camp and Knight, 1998).	Introduce monitoring programs (Camp and Knight, 1998; Farris, 1998; Francis, 2001; Kelly and Larson, 1997; McMillan and Larson, 2002; Nuzzo, 1995; Richardson, 1999; Rusterholz et al., 2004)
HABITAT LOSS	
Large percentage of bare rock (Rusterholz et al., 2004). **D**ecline in the number of growth sites suitable for plants (Camp and Knight, 1998). **D**egradation of the red cedar (*Juniperus virginiana*) habitat (NCC, 2002a).	Close or control access and inform users (Camp and Knight, 1998; Cornish, 2004; Farris, 1998; Francis, 2001; Kelly and Larson, 1997; Nuzzo, 1995; Richardson, 1999; Rusterholz et al., 2004)

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APPENDIX 3

GATINEAU PARK ECOSYSTEM RESTORATION PLAN

DEFINITION AND RESTORATION APPROACH

There are many definitions of the term “restoration” in the literature, but the basic idea is similar in each case. This particular restoration plan uses the definition proposed by the *Society for Ecological Restoration*, namely that restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed with a view to ensuring that it recovers its ecological integrity.

The restoration process therefore requires managers to participate in a process aimed at restoring the ecological integrity of the ecosystem. The approach comprises two aspects, namely restoration techniques, and the ecological integrity of the environment in question.

Environmental restoration may be a passive process, such as allowing natural disturbances to take their course, or an active process, such as the re-introduction of species or rehabilitation of damaged environments. Ecological restoration is not designed to enhance biodiversity or foster the development of one species over another. A restored ecosystem is one that contains sufficient biotic and abiotic components for its own dynamics and evolution.

It is often difficult to say at what point in its history an environment was considered to be “integral”. However, it is important to make this clarification, since it provides a spatial and temporal reference for the future desired state.

Managers should consider restoration in terms of the reversibility of the environment’s condition. Some ecosystems have been damaged too extensively, and have lost too many of their functions and characteristics. The level of effort required to restore them is huge, and even then, may not be enough to achieve the desired level of integrity.

Because of all these elements, restoration is a complex concept. One of the greatest difficulties is to determine the level of degradation.

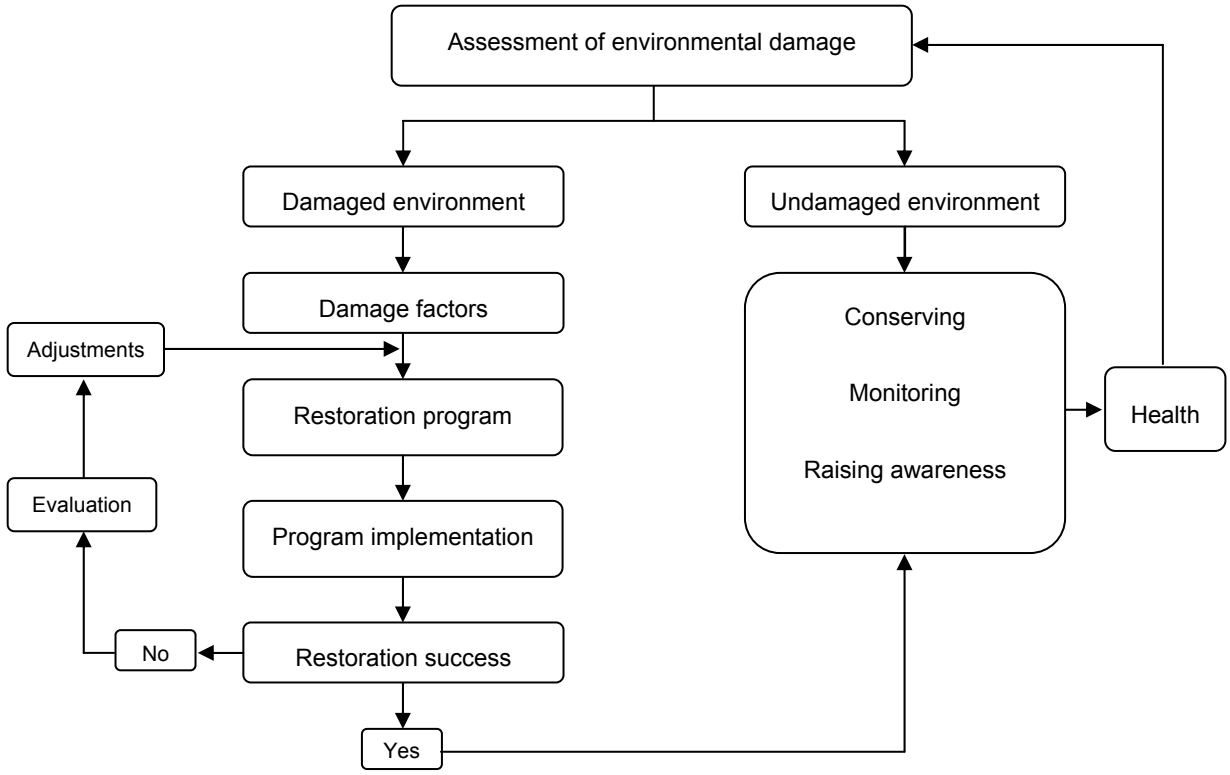
METHOD

Given the complex nature of this concept, the approach used must focus on adaptive management. Ecosystem restoration can be divided into six basic steps:

- Assessment of environmental damage;
- Statement of damage factors;
- Preparation of action program;
- Program implementation;
- Verification of restoration success;
- Finalization of process.

The following diagram illustrates the restoration process and the various paths that make up that process. A reassessment is required at the end of each step.

SUMMARY OF RESTORATION STEPS



1) ASSESSMENT OF ENVIRONMENTAL DAMAGE

It is difficult to assess the exact level of damage to an ecosystem. However, a certain number of parameters can be used to obtain an accurate overview and serve as a guide for subsequent decisions.

For example, measurable parameters such as water pH, shoreline erosion, ecological corridor density, number of sensitive species using the environment, and so on, will highlight the causes of damage.

Many different measurable parameters may exist, depending on the ecosystem in question. A list therefore needs to be drawn up, based on the damage factors. For example, the “human use” factor may generate measurable elements such as “shoreline vegetation density”, “level of suspended matter in the water” and “shoreline compaction”.

In many cases, the parameters will be the same as those used to measure ecosystem health. Ecosystem health can be used not only for monitoring purposes, but also to highlight the level of damage and detect threats to the ecosystem.

2) DAMAGE FACTORS

Damage factors are used to identify the causes of damage and decide on the types of action required. Ecosystems can be damaged by many different factors, depending on the type of environment, its location within the broader environment, and past and present use of the area. Certain factors may also be interdependent, and they should therefore be addressed at the same time to ensure that the restoration process is successful.

3) RESTORATION PROGRAM

The restoration plan sets out a general approach, while the program presents the actual restoration process. This means that several restoration programs may be implemented under the plan, depending on the type of ecosystem and the level of damage. Each program is based on available information, and directs the restoration actions.

To be relevant and consistent, the statement of restoration actions should be based on a number of criteria. For a restoration process in a natural area used for both conservation and recreation, three elements in particular must be considered (Parks Canada Agency, 2007) – in other words, the program must be:

- Effective in restoring and maintaining ecological integrity
- Efficient in using practical and economic methods to achieve functional success
- Engaging through implementing inclusive processes and by recognizing and embracing interrelationships between culture and nature

In addition, the restoration process should reflect the broad principles set out in the Ecosystem Conservation Plan, namely the precautionary principle and adaptive management.

Program techniques should include a variety of tools. They should be adjusted to the context, and be consistent and rigorous, but also flexible enough to be altered if necessary.

4) PROGRAM IMPLEMENTATION

The restoration process involves the application of solutions designed to restore ecosystem integrity. Restoration actions and techniques need to be monitored on site, and a number of experimental sites should therefore be identified, in order to test the selected methods and techniques in a limited area. These sites should be small, all their components should be known, and variations in their condition should not affect adjacent ecosystems. Examples would include small, fenced areas, and small lakes.

If the tested methods or techniques are successful, they can then be applied to larger areas.

5) RESTORATION SUCCESS

Changes must be assessed and monitored throughout the restoration process. This allows successful measures to be identified, and the overall process to be adjusted as required. Restoration success is measured using indicators, which in many cases are associated with species sensitive to environmental variations and species classified as threatened or vulnerable (Gayton, 2001; Parks Canada, 2007).

Restoration success is also assessed by testing certain features that are essential in maintaining the ecosystem's characteristic composition, structure and functions (Parks Canada, 2007), by means of monitoring, research and practical experience. The definitions of these features tend not to vary. The *Society for Ecological Restoration International* proposes guidelines to help understand the connections between ecosystem features, future desired states and restoration activities in its *SERI Primer* (*Society for Ecological Restoration International Science and Policy Working Group*, 2004), and identifies nine features of restored ecosystems:

- The restored ecosystem contains a characteristic assemblage of the species that occur in the reference ecosystem and that provide appropriate community structure.
- The restored ecosystem consists of indigenous species to the greatest practicable extent. In restored cultural ecosystems, allowances can be made for exotic domesticated species and for non-invasive ruderal[13] and segetal[14] species that presumably co-evolved with them. Ruderals are plants that colonize disturbed sites, whereas segetals typically grow intermixed with crop species.
- All functional groups necessary for the continued development and/or stability of the restored ecosystem are represented or, if they are not, the missing groups have the potential to colonize by natural means.
- The physical environment of the restored ecosystem is capable of sustaining reproducing populations of the species necessary for its continued stability or development along the desired trajectory.

[13] Plants that grow spontaneously in land disturbed by agriculture or construction and next to roadways, often near inhabited areas.

[14] Annual plants that germinate in winter and grow in grain and other crop fields.

- The restored ecosystem apparently functions normally for its ecological stage of development, and signs of dysfunction are absent.
- The restored ecosystem is suitably integrated into a larger ecological matrix or landscape, with which it interacts through abiotic and biotic flows and exchanges.
- Potential threats to the health and integrity of the restored ecosystem from the surrounding landscape have been eliminated or reduced as much as possible.
- The restored ecosystem is sufficiently resilient to endure the normal periodic stress events in the local environment that serve to maintain the integrity of the ecosystem.
- The restored ecosystem is self-sustaining to the same degree as its reference ecosystem, and has the potential to persist indefinitely under existing environmental conditions. Nevertheless, aspects of its biodiversity, structure and functioning may change as part of normal ecosystem development, and may fluctuate in response to normal periodic stress and occasional disturbance events of greater consequence.

6) PROCESS FINALIZATION

Here, restoration is studied, validated, tested and applied to damaged ecosystems. Its success is measured regularly, and environmental changes are observed. There are two possible outcomes:

- The ecosystem's features have not been restored and the level of damage needs to be reassessed. This step highlights any problems in the process and allows for adjustments to be made, and is repeated as often as necessary, as part of an adaptive management approach.
- Restoration is conclusive and the ecosystem's features have been restored. In this case, the focus shifts to conservation. Ecosystem health is assessed regularly, to ensure that the restored condition is maintained.

Like the ecosystems to which it applies, the field of restoration is changing constantly. The restoration process is based on feedback, with constant assessments and monitoring.

RESTORATION IN GATINEAU PARK

The restoration framework serves as a guide for the application of protocols according to the restoration priorities for Gatineau Park, which are to enhance the health of its valued ecosystems and to reduce the impact of recreational activities.

However, in the case of certain elements of damage, there is insufficient information to finalize the process. This section highlights the aspects to be considered, and proposes avenues for the preparation of a methodological framework based on the best available knowledge and experience.

1) DAMAGE FACTORS

There are two types of damage factors, namely those relating to aquatic ecosystems and those relating to valued ecosystems.

DAMAGE FACTORS: AQUATIC ECOSYSTEMS

Three main stressors are responsible for damage to aquatic ecosystems:

- Invasive species
- Human use and recreation
- Development and private properties

Invasive species are observed in and around all the Park's main bodies of water, many of which have been classified as degraded. The spreading power of these species is such that they can adversely affect the biodiversity of the invaded area. Target invasive species in the Park include the Eurasian water milfoil (*Myriophyllum spicatum)*, the purple loosestrife (*Lythrum salicaria)*, the zebra mussel (*Dreissena polymorpha)* and a number of introduced fish species. It is easy for these species to spread because of the number of lakes in the Park and their interconnectivity. Invasive species are therefore a significant damage factor.

Human use and recreation is reflected in the widespread and growing use of the Park's main lakes by visitors. Since 1991, attendance has increased to more than 500,000 visits per year (Sodem 2001), and is currently situated at 4,000 visits per km². In addition, visitor numbers tend to be concentrated at certain sites, such as Meech Lake, which currently receives nearly 39% of total visitor traffic (DDM, 2002). Many of the Park's lakes are surrounded by recreational structures and developments, including campsites, recreational trails and facilities for special activities. The impacts of visitor attendance are many, and include shoreline degradation, water pollution, a greater risk of introduction and spread of invasive species, as well as disturbance of nesting species. Many ecosystems have been weakened by the human footprint, and their situation is now deteriorating. The issue of attendance is therefore a significant factor in ecosystem damage.

There are a number of developments and private properties in Gatineau Park. The Park shares its territory with a number of infrastructures created by humans, including roads, electricity transmission lines and recreational facilities, as well as private homes. The presence of these infrastructures has led, among other things, to increased water pollution, habitat fragmentation, the introduction of non-indigenous species, alteration of certain ecosystem functions and an increase in visitor numbers both inside and around the Park. While not yet at an alarming level, the pressure from these elements may well cause the Park's ecosystems to decline rapidly in the future.

DAMAGE FACTORS: VALUED ECOSYSTEMS

Eardley Escarpment is extremely vulnerable to two damage factors, namely human use and white-tailed deer. Human use is mainly in the form of rock climbing. The climbing routes and site access areas exhibit the most damage; in some cases, their condition is virtually irreversible. The white-tailed deer (*Odocoileus virginianus)*, for their part, use parts of the rock wall for shelter, and graze the area intensively. The plant species found on the grazing sites are specific to the ecosystem, and pressure from grazing, as well as from trampling, diminishes their reproductive abilities. As a result, population numbers are declining and some areas are now completely bare of all vegetation, causing soil erosion to accelerate.

The valued ecosytems of La Pêche Lake and its chain of three lakes, which include several aquatic ecosystems and wetlands, also present restoration issues. The various damage factors inherent to aquatic ecosystems, as well as heavy visitor traffic and recreational activities at certain sites, damage and destabilize the health of these areas, resulting in the deterioration of the biodiversity and internal processes of these fragile ecosystems.

DAMAGE FACTORS: PARK ECOSYSTEMS

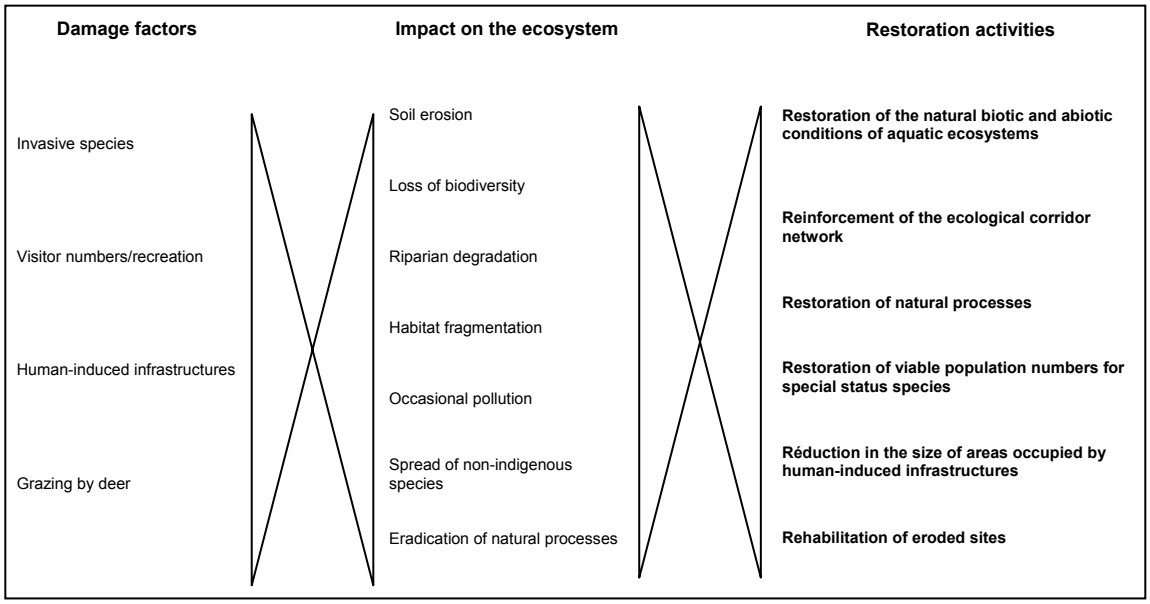
Although emphasis has been placed on valued ecosystems and aquatic ecosystems, the degree of damage done to Park ecosystems as a whole must not be neglected. Some damage factors, such as recreational activities, the development of an informal network of trails, and the proliferation of invading plants, can also cause ecosystem functions to deteriorate. Therefore, it is essential to consider each ecosystem when evaluating the level of restoration required.

2) POTENTIAL RESTORATION ACTIONS

The damage factors are the basic elements from which restoration actions are developed. In many cases their scope is broad and they have several different impacts on the Park's ecosystems, affecting processes, species or habitats already covered by ecosystem conservation objectives. For example, a conservation strategy has already been introduced for invasive species in the Park, and the restoration action for damage caused by invasive species will take this strategy into account.

The damage factors were analyzed and six general restoration actions were identified. These actions are summarized in the following diagram.

DEFINITION OF RESTORATION ACTIONS



There are many possible techniques for each restoration action. The table below summarizes the restoration actions and proposes a list of potential techniques. While the list is by no means exhaustive, it nevertheless provides some interesting avenues for the creation of restoration programs.

RESTORATION ACTIONS AND POTENTIAL TECHNIQUES

RESTORATION ACTIONS	TECHNIQUES
Restoration of the natural biotic and abiotic conditions of aquatic ecosystems	▪ Creation of habitats conducive to the reproduction of species of interest ▪ Restoration of the water's physical and chemical properties ▪ Active management of invasive species
Reinforcement of the ecological corridor network	▪ Creation of biological corridors ▪ Restoration of vegetation to fragmented areas ▪ Restoration of vegetation on informal and extensively used trails
Restoration of natural processes	▪ Restoration of natural processes (for example: fires, floods) ▪ Declassification of dams ▪ Creation of floodwater expansion zones
Restoration of viable population numbers for special status species	▪ Creation of habitats conducive to sedentarization of species ▪ In some cases, introduction of individual animals ▪ Displacement of threatened populations
Reduction in the size of areas occupied by human-induced infrastructures	▪ Purchase of privately owned land ▪ Demolition of infrastructures and restoration of vegetation on demolition sites
Rehabilitation of eroded sites	▪ Planting of suitable indigenous plant species ▪ Shoreline maintenance work ▪ Active management of invasive species

ACTION 1: RESTORATION OF THE NATURAL BIOTIC AND ABIOTIC CONDITIONS OF AQUATIC ECOSYSTEMS

This restoration action targets Gatineau Park's aquatic ecosystems in general, and those located in valued ecosystems in particular. The primary aim is to enhance indigenous biodiversity in these areas. One way of doing this is to create habitats conducive to species of interest; for example, by creating breeding or spawning sites for birds (e.g. the common loon (*Gavia immer)*) and certain fish species. Fisheries and Oceans Canada (2006), in a publication on the restoration of damaged aquatic habitats, proposes a number of methods that can be used to create spawning grounds for fish species of interest. Biodiversity can also be enhanced through an active management program targeting invasive plants. Complete manual eradication of certain plant species should also be considered. In both cases, tests should be carried out in small areas before extending the technique to the Park in general.

Abiotic conditions must also be restored as part of the process of restoring aquatic ecosystems. The physical and chemical properties of the water are key elements here, and restoration may involve reducing nutrient inputs or cleaning of highly eutrophized lakes. Here again, actions should be tested on small areas of water to ensure that they will be successful.

ACTION 2: REINFORCEMENT OF THE ECOLOGICAL CORRIDOR NETWORK

This restoration action is designed to reduce habitat fragmentation (visible or presumed) caused by damage factors. In the case of visible fragmentation, the links between ecosystems can simply be re-created. A number of techniques are available to do this (e.g. bridges, fish ladders, restoration of vegetation in breaks, corridor enlargement), depending on the origin of the break.

In the case of presumed fragmentation, it is more difficult to identify the links because the infrastructures responsible for the breaks have been in existence for many years. Initially, the needs and displacement of the target species should be studied. Here, it is generally preferable to create a biological corridor so as to restore ecosystem functions and enhance biodiversity.

ACTION 3: RESTORATION OF NATURAL PROCESSES

The human presence has often had the effect of altering natural episodes in ecosystems. Restoring these episodes allows the ecosystems to recover their functions and indigenous biodiversity. In the specific case of Gatineau Park, certain guidelines for the restoration of natural episodes must be taken into consideration – for example, fire and flood cycles. Fire may be conducive to the recovery of indigenous species in ecosystems such as Eardley Escarpment, meaning that management by fire may be a suitable restoration technique.

Natural variations in water levels, combined with flooding, are essential to the maintenance and reproduction of many indigenous species. One potential restoration technique is to dismantle any existing dams, thereby restoring natural variations in water levels and promoting the migration of aquatic species. Alongside this technique, floodwater reception areas or flood plains could be created, since they are conducive to the presence of certain amphibian and waterfowl species.

ACTION 4: RECOVERY OF VIABLE POPULATIONS OF SPECIES AT RISK

Species legally designated as being at risk (see Gatineau Park Species at Risk Protection Plan, 2006) are also more sensitive to damage factors. As a result, many of these species are now in a delicate situation in the Park, and short-term action is required. There are several possibilities, including displacement of certain species (e.g. wild leek (*Allium tricoccum)*) to similar, more integral ecosystems, introduction of additional individuals, and restoration of habitats conducive to sedentarization. Displacement could be applied to areas that are subject to damage (e.g. from visitor use), and when the viability of a given species is threatened by stressors, additional individuals could be introduced, although the bearing capacity of the host environment must first be determined.

There are several ways of restoring habitats conducive to sedentarization, including the creation of breeding (spawning, nesting) sites or feeding sites (e.g. planting certain plant species, creating clearings).

ACTION 5: REDUCTION IN THE SIZE OF AREAS OCCUPIED BY HUMAN INFRASTRUCTURES

This action targets private properties found in the Park. One possibility would be for the NCC to purchase privately-owned properties. This would reduce the level of fragmentation and help restore indigenous biodiversity. Buildings on the sites acquired in this way could be demolished and the sites could be restored by planting vegetation and adding nutrients.

ACTION 6: REHABILITATION OF ERODED SITES

This action mainly targets riparian ecosystems and some more specific ecosystems such as Eardley Escarpment. Eroded sites share many similar characteristics, i.e. bare soil, impoverished biodiversity and altered functions. There are a number of potential rehabilitation techniques, including planting indigenous species that are compatible with the site. In the case of riparian ecosystems, planting also reinforces the shorelines of lakes and slows down the erosion process. Similarly, shoreline support work will also help to restore riparian ecosystems, with methods such as propagation by cutting, braiding and branch beds. As is the case for aquatic ecosystems, an active management program for invasive plants is also needed.

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APPENDIX 4

PRIORITY RANKING FOR CONSERVATION ACTIONS:
LIST OF CRITERIA AND FINAL POINTS SYSTEM

LIST OF CRITERIA

Most of the criteria listed below were taken from the Terrestrial Ecosystem Conservation Plan for the Parc de la Mauricie (Pelletier, H., 1997), whose conservation objectives are similar to those of Gatineau Park.

A MANDATE-RELATED CRITERIA

A-1 PRESERVATION OF ECOLOGICAL INTEGRITY

The project increases the level of protection or ensures the diversity, integrity and natural development of ecosystems, in line with managerial concerns. Rating = 5

The project helps to improve overall knowledge of the Park's resources and usage, but is not vital for the achievement of the objectives, nor is it vital to the immediate concern of protecting ecological integrity. Rating = 3

The project addresses secondary management objectives. Rating = 1

A-2 CONTRIBUTION TO REGIONAL OBJECTIVES

The project is consistent with regional objectives relating to the protection of biological diversity, the protection and maintenance of habitat diversity and integrated resource management. It adds to the characterization of the greater regional ecosystem. Rating = 3

The project is indirectly related to, or corresponds to a stage in, the development of regional agreements. Rating = 2

The project mostly addresses internal objectives of Gatineau Park. Rating = 1

A-3 SOCIAL OR POLITICAL PRESSURE

The project helps to minimize or eliminate pressure from private or public organizations concerning specific management methods. Rating = 3

The project helps to minimize the risk of pressure from the public in general concerning ecosystem management methods and objectives in Gatineau Park. Rating = 2

The project is unrelated to pressures from the public in general. Rating = 1

B CRITERIA RELATED TO THE RESOURCE'S SITUATION

B-1 IMPORTANCE OF THE RESOURCE

The component is regarded as being rare, unique or highly representative of the Park and its natural region, or is of particular interest to the public. Rating = 5

The component is characteristic of the natural ecosystems and may be somewhat scarce, although not having status as being unique or rare in the Park or in the natural region. Rating = 3

The component does not have unique or rare status in the Park or the natural region, or is not representative, or this aspect is not applicable to the project. Rating = 1

B-2 FRAGILITY OF THE RESOURCE

The resource in question has a very low tolerance to stress, exhibits symptoms of imbalance and is likely to deteriorate irreversibly if no action is taken. Rating = 5

The resource in question is able to tolerate certain interactions. Damage is reversible either naturally or with the adoption of proper protection or rehabilitation measures. Rating = 3

The resource has a very high tolerance to stress that minimizes the risk of degradation and is able to recover without human intervention, or this aspect is not applicable to the project. Rating = 1

B-3 LEVEL OF DISTURBANCE OR IMPORTANCE OF STRESS FACTORS

The level of disturbance or threat is such that action is required in the very short term (three years) to maintain a component of the ecosystem. Eradication of this component (structure and function) will lead to loss of biodiversity or will alter the ecosystem's functions. The repercussions will be felt in the short term. All projects targeting species at risk receive this rating. Rating = 10

The level of disturbance or threat is such that action is required in the medium term (10-15 years). The threat is likely to cause degradation of the resource's health or create a permanent imbalance of ecosystems in the medium or long term. The species concerned are not necessarily at risk. Rating = 7

The threats may alter the structure and functions of the ecosystem, but not irreversibly, even in the long term. The component in question supports other elements of the ecosystem or is linked to other parts of the ecosystem. Any damage is likely to impact on the other components. Action in the medium to longer term is desirable. Rating = 4

The resource is able to resist the impact of the stressors with only minor alterations, or this aspect is not applicable to the project. Rating = 1

B-4 KNOWLEDGE OF THE RESOURCE

Knowledge of the resource or problems relating to its management is considered very limited. Rating = 3

The resource and related management problems are well-documented in the literature, but very little information is available concerning the specific context of the Park. Rating = 2

The resource and related management problems are well-documented in the scientific literature, and information concerning the specific context of the Park is considered satisfactory for current needs. Rating = 1

C CRITERIA RELATED TO PARK DEVELOPMENT

C-1 PUBLIC EDUCATION AND AWARENESS

The project is likely to improve the knowledge of the general public and of the public and private organizations with an interest in environmental issues, and will raise their awareness of the mandate served by national parks and the specific orientations of Gatineau Park. Rating = 3

The project has indirect impacts on the above factors. Rating = 2

The project has very little impact on the above factors. Rating = 1

C-2 INTEREST FOR VISITORS

The project is likely to be of significant interest to visitors, and will enhance the quality of their experience. Rating = 3

The project is of interest to a limited group of visitors and will enhance the quality of their experience. Rating = 2

The project is of little interest to visitors. Rating = 1

D CRITERIA RELATED TO THE PROJECT'S CHARACTERISTICS

D-1 COST-BENEFIT RATIO

The project's cost-benefit ratio is low. Generally speaking, the project can be carried out using internal expertise or with funding from the departmental budget. The necessary technology already exists. Rating = 10

The project's cost-benefit ratio is moderate. Although not specialized, the project may run into technical difficulties. Part of it can be carried out by Park personnel, but funding is required from another level of the organization, or from partners. However, the project is vital in terms of improving the current level of management. Rating = 5

The project's cost-benefit ratio is high. The project is highly specialized, or the technology required is complex or needs to be developed. It cannot be carried out internally. The project is likely to be costly and any positive impacts on the resource will only be felt in the long term. Rating = 1

D-2 SITUATION IN THE IMPLEMENTATION SEQUENCE

The project is a prerequisite to a large number of activities identified in the ecosystem management program. Rating = 5

The project requires analysis of available data and occasional collection of information in order to establish specific, controllable objectives. Rating = 3

The project has no impact on implementation of the ecosystem management program, requires analysis of data from several different projects and must be planned over the long term. Rating = 1

D-3 DUPLICATION

The project will help solve a large number of the problems set out in the plan of action. Rating = 3

The project will help solve some of the problems set out in the plan of action. Rating = 2

The project is unique and will help solve just one problem. Rating = 1

Based on the final rating, the project is classified into one of three priority categories, each attached to a specific implementation timeframe, as follows:

Priority I, between 2010 and 2015: Projects with a rating that is ≥ 85 % of the final score and/or that require continuous monitoring

Priority II, between 2015 and 2020: Projects with a rating of between 70 % and 85 %, inclusively

Priority III, between 2020 and 2025: Projects with a rating of < 70 % of the final score

TABLE OF ASSESSMENT RESULTS

KEY ACTION	CRITERION												TOTAL	PRIORITY
	MANDATE			RESOURCE				PUBLIC		PROJECT				
	A			B				C		D				
	1	2	3	1	2	3	4	1	2	1	2	3		
GREATER ECOSYSTEM														
CLIMATE CHANGE AND ATMOSPHERIC POLLUTION														
Assess and implement the adaptation strategies presented in the report on climate change (Scott et al., 2005), based on changing ecosystem contexts and the activities that take place in the Park.	5	3	2	1	1	10	1	2	2	5	5	2	39	III
Develop a green transportation plan in accordance with the recommendations made in the Gatineau Park Master Plan (NCC, 2005c), in order to limit and control motor traffic and travel in central portions of the Park dedicated to conservation.	5	3	3	3	3	10	2	2	3	10	3	3	50	I
Continue partnerships with Québec's Ministère des Ressources naturelles et de la Faune and Environment Canada regarding monitoring programs for acid rain and atmospheric pollution.	5	3	3	3	3	10	2	3	3	10	3	3	51	I
REGIONAL ECOSYSTEM														
ECOLOGICAL CORRIDORS														
Complete the information on the 14 ecological corridors identified by means of a qualitative analysis through studies and inventories, including surveys and monitoring of biodiversity in each corridor and an assessment of the stress factors affecting terrestrial and aquatic environments.	5	3	3	5	5	10	3	2	2	10	5	3	56	I
Draw up a preservation plan for the ecological corridors identified in partnership with the municipalities, associations and other bodies concerned (also applies to "Natural Habitat Mosaic").	5	3	2	5	3	10	3	2	2	10	5	3	53	I
Support the creation of partnerships at the regional, national and international levels in order to gather the information and tools needed to develop a network of ecological corridors at different scales.	3	3	3	1	3	10	2	2	2	5	5	1	40	II
TERRESTRIAL ECOSYSTEMS														
Carry out or continue environmental monitoring of recreational activities in conservation areas (Type I to Type IV, in that order), so as to identify environmental problems and allow for the design and implementation of adapted management measures.														Ongoing monitoring
Continue the measures established under the Gatineau Park Species at Risk Protection Plan (NCC, 2006b).														Ongoing monitoring (see "Species at Risk", section 5.4.4.2.1)
Continue to monitor the indicators for terrestrial environments in the Park under the biodiversity monitoring program: vascular plant species, avian wildlife, micromammals, species at risk, plant species at risk and invasive plants (garlic mustard (*Alliaria officinalis)* and glossy buckthorn (*Rhamnus frangula)*), habitat mosaic, environmental fragmentation and plant and wildlife potential (see also "Habitat Mosaic", "Species at Risk" and "Invasive Species").														Ongoing monitoring

TABLE OF ASSESSMENT RESULTS (CONT.)

KEY ACTION	CRITERION												TOTAL	PRIORITY
	MANDATE			RESOURCE				PUBLIC		PROJECT				
	A			B				C		D				
	1	2	3	1	2	3	4	1	2	1	2	3		
REGIONAL ECOSYSTEM (cont.)														
TERRESTRIAL ECOSYSTEMS (CONT.)														
Wherever possible, minimize the impacts of aggressive invasive species (plants and wildlife) that affect terrestrial ecosystems and indigenous species.	5	3	2	5	5	10	2	2	2	10	3	3	52	I (see "Invasive Species", section 5.4.4.2.2)
Continue the process of banning snowmobiles from the Park.	5	2	3	5	5	10	1	2	2	10	3	2	50	I
AQUATIC AND RIPARIAN ECOSYSTEMS AND WETLANDS														
Identify the sites and causes of waterside degradation around the recreational lakes in Gatineau Park and develop measures to reduce stress.	5	3	2	3	3	10	2	3	3	10	5	3	52	I
Identify and assess the impact of formal and informal lakeside trails and develop measures to reduce stress.	5	3	3	5	5	7	2	2	3	10	3	2	50	I
Continue the various measures established under Gatineau Park Species at Risk Protection Plan (NCC, 2006b).														Ongoing monitoring (see "Species at Risk", section 5.4.4.2.1)
Continue to monitor the indicators for aquatic, riparian and wetland environments in the Park under the biodiversity monitoring program: freshwater mussels, anura, species at risk, invasive plants (Eurasian water milfoil and purple loosestrife) and the common loon (see also "Species at Risk" and "Invasive Species").														Ongoing monitoring
Wherever possible, minimize the impacts of aggressive invasive species (wildlife and plants) that affect aquatic and riparian ecosystems, wetlands and indigenous species.	5	3	2	5	5	10	2	2	2	10	3	3	52	I (see "Invasive Species", section 5.4.4.2.2)
Monitor water quality in headwater lakes and streams and characterize those for which insufficient information is available.	5	3	3	5	5	10	2	3	3	5	5	3	52	I
Continue discussions with municipalities and associations in the watersheds around the Park to promote watershed-based water management.	3	2	2	5	5	10	2	3	3	10	3	3	51	I
Continue with steps to remove motor boats from the Park's lakes.	5	2	3	5	5	10	1	2	2	10	3	2	50	I
Promote collaboration and partnerships with private landowners in the immediate vicinity of significant aquatic environments and wetlands in the Park, so as to encourage riparian protection.	5	3	3	5	5	10	2	3	1	10	1	2	50	I

TABLE OF ASSESSMENT RESULTS (CONT.)

KEY ACTION	CRITERION												TOTAL	PRIORITY
	MANDATE			RESOURCE				PUBLIC		PROJECT				
	A			B				C		D				
	1	2	3	1	2	3	4	1	2	1	2	3		
REGIONAL ECOSYSTEM (cont.)														
AQUATIC AND RIPARIAN ECOSYSTEMS AND WETLANDS (CONT.)														
Update and apply the sport fishing management plan (NCC, 1983).	5	2	2	3	5	10	2	3	3	5	3	2	45	II (see "Sport Fishing", section 5.4.4.4)
Incorporate the notion of free passage for fish into the planning of future projects affecting the aquatic environment (e.g. installation of and repairs to culverts).														Ongoing monitoring
PARK'S ECOSYSTEMS														
NATURAL ECOSYSTEM PROCESSES AND BALANCE														
Wind and ice storms														
Monitor the progress of affected environments to check that the storms do not generate major impacts or risks (e.g. continue to work with Carleton University on the study of the 1998 ice storm impacts).														Ongoing monitoring
Flooding and high water														
As far as possible, dismantle non-necessary artificial water retention works to let natural processes run their natural course and allow for free passage of fish.	5	2	1	1	3	7	2	2	2	5	3	2	5	III
Comply with the instructions set out in the Fisheries and Oceans Canada (2007) document on the design and installation of permanent culverts of less than 25 metres when installing or repairing culverts, in order to ensure that fish are able to move freely through the Park's culverts.														Ongoing monitoring
Fire														
Determine the role and ecological importance of fire in plant dynamics in the Park's forest ecosystems. This evaluation will take place when the Park's vegetation management plan (Somer, 1987) is revised.	3	2	2	5	5	7	3	3	3	10	1	2	46	II
Insect epidemics														
Where applicable, let attacks run their course but continue to monitor insect population levels and infestations, except where they affect ecological integrity, species at risk or public safety, or where there is a legal requirement to address them.	5	2	1	5	5	10	3	2	2	10	3	2	50	I
Apply decisions made by competent authorities (e.g. CFIA, Agriculture Canada) where appropriate.														Ongoing monitoring
Continue and take part in the monitoring of actual or potential infestations by insects (e.g. ash borer, gypsy moth), with the authorities in question.	5	3	3	3	3	10	1	3	2	10	5	3	51	I

TABLE OF ASSESSMENT RESULTS (CONT.)

KEY ACTION	CRITERION												TOTAL	PRIORITY
	MANDATE			RESOURCE				PUBLIC		PROJECT				
	A			B				C		D				
	1	2	3	1	2	3	4	1	2	1	2	3		
PARK'S ECOSYSTEMS (cont.)														
NATURAL ECOSYSTEM PROCESSES AND BALANCE (CONT.)														
Predator/prey relationships														
Identify impacts of overabundant wildlife species on ecosystem's health.	5	2	1	1	3	7	2	2	2	5	3	1	34	III
Continue programs and strategies to manage and monitor the white-tailed deer population (also applies to "Eardley Escarpment") and the beaver population.														Ongoing monitoring
Monitor the use of corridors by predators and suggest measures to improve their role in maintaining predator population levels in general, and wolf populations in particular.	5	3	2	5	5	10	3	2	2	5	3	2	47	II
Encourage the hunting of deer in areas peripheral to the Park where the deer population is too large, in partnership with the MRNF"	5	2	2	3	5	10	2	3	3	5	3	2	45	II
Natural Habitat Mosaic														
Continue to develop ecological corridors.	5	3	2	5	3	10	3	2	2	10	5	3	53	I (see "Ecological Corridors, section 5.4.3.1)
Continue to protect habitats in valued ecosystems.														Ongoing monitoring (see "Valued Ecosystems", section 5.4.4.3)
Continue to monitor indicators associated with the Park's habitat mosaic as part of the biodiversity monitoring program: habitat mosaic, environmental fragmentation and plant life and wildlife potential (see also "Terrestrial Ecosystems").														Ongoing monitoring
BIODIVERSITY AND SPECIES VIABILITY														
Species at risk														
Continue the various measures established by Gatineau Park Species at Risk Protection Plan (NCC, 2006b) (also applies to "Terrestrial Ecosystems", "Aquatic Ecosystems", "Eardley Escarpment", "Eardley Plateau", "The Three-Lake Chain", "La Pêche Lake" and "Pink Lake Plateau").														Ongoing monitoring
Locate and characterize potential habitats for species at risk in order to sustain viable populations.	5	3	3	5	5	10	1	2	3	10	5	2	54	I
Identify flows of wildlife species at risk and the spread of plant species at risk within the Park's ecosystems as well as in the regional and greater ecosystems	3	3	1	5	5	10	3	1	2	10	3	2	48	II
Continue to monitor the indicators associated with species at risk under the biodiversity monitoring program: plants and wildlife at risk (also applies to "Terrestrial Ecosystems" and "Aquatic Ecosystems").														Ongoing monitoring

TABLE OF ASSESSMENT RESULTS (CONT.)

KEY ACTION	CRITERION												TOTAL	PRIORITY
	MANDATE			RESOURCE				PUBLIC		PROJECT				
	A			B				C		D				
	1	2	3	1	2	3	4	1	2	1	2	3		
PARK'S ECOSYSTEMS (cont.)														
BIODIVERSITY AND SPECIES VIABILITY (CONT.)														
Species at risk (cont.)														
Continue or begin work with the federal and provincial species at risk committees and with the programs of government departments working on species at risk (e.g. Environment Canada's Interdepartmental Recovery Fund (IRF)).	3	2	2	5	5	10	3	2	2	10	5	2	51	I
Invasive species														
Develop and implement a management strategy in order, where possible, to minimize the impacts of aggressive invasive species with repercussions for ecosystems and indigenous species, and to minimize the possibility of new invasions (also applies to "Terrestrial Ecosystems", "Aquatic Ecosystems", "Eardley Escarpment", "Eardley Plateau", "The Three-Lake Chain", "La Pêche Lake" and "Pink Lake Plateau").	5	3	2	5	5	10	2	2	2	10	5	3	54	I
Continue to monitor the indicators associated with invasive plant species under the biodiversity monitoring program: invasive species (see also "Terrestrial Ecosystems" and "Aquatic Ecosystems").														Ongoing monitoring
Become involved with the committees and programs of associations and government departments working on the question of invasive species (e.g. Environment Canada's Invasive Alien Species Partnership programs (IASPP)).	5	2	2	3	5	10	2	3	3	10	3	3	51	I
Implement the key conservation actions identified for insect infestations.	5	2	1	5	5	10	3	2	2	10	3	2	50	I (see "Insect Epidemics", section 5.4.4.1.4)
VALUED ECOSYSTEMS														
Eardley Escarpment														
Confine rock climbing to the two or three most damaged rock walls, where rehabilitation work will not be effective.	5	3	3	5	5	10	1	2	2	10	3	2	51	I (see "Rock Climbing", section 5.4.4.4)
Close the hang-gliding site on the Escarpment (parking lot and access trail) (see section 5.4.4.4).	5	3	3	5	5	10	1	2	2	10	3	2	51	I (see "Hang-Gliding", section 5.4.4.4)
Continue to gather knowledge on ecosystem components in order to target specific intervention sectors.	3	2	2	5	5	10	2	2	2	10	5	3	51	I

TABLE OF ASSESSMENT RESULTS (CONT.)

KEY ACTION	CRITERION												TOTAL	PRIORITY
	MANDATE			RESOURCE				PUBLIC		PROJECT				
	A			B				C		D				
	1	2	3	1	2	3	4	1	2	1	2	3		
PARK'S ECOSYSTEMS (cont.)														
VALUED ECOSYSTEMS (CONT.)														
Eardley Escarpment (cont.)														
Pursue the white-tailed deer management program (see section 5.4.4.1.5).														Ongoing monitoring (see "Predator-Prey Relationships", section 5.4.4.1.5)
Continue with the various measures proposed in the Gatineau Park Species at Risk Protection Plan (NCC, 2006b), namely to identify species at risk in the ecosystem and apply appropriate conservation measures (e.g. exclos).														Ongoing monitoring (see "Species at Risk", section 5.4.4.2.1)
Prepare a program to restore damaged areas (see Ecosystem Restoration Strategy, section 5.5) (also applies to "The Three-Lake Chain" and "La Pêche Lake").	5	3	2	5	5	10	2	2	2	10	3	2	51	I
Use the proposed approach to manage invasive species.	5	3	2	5	5	10	2	2	2	10	3	3	52	I (see "Invasive Species", section 5.4.4.2.2)
Improve monitoring of the Eardley Escarpment exceptional ecosystem (presence of conservation officers).	5	3	3	5	5	10	1	2	2	10	3	2	51	I
Eardley Plateau														
Use the proposed approach to manage invasive species.	5	3	2	5	5	10	2	2	2	10	5	3	54	I (see "Invasive Species", section 5.4.2.2)
Update and apply the Gatineau Park sport fishing management plan (NCC, 1983).	5	2	2	3	5	10	2	3	3	5	3	2	45	II (see "Sport Fishing", section 5.4.4.4)

TABLE OF ASSESSMENT RESULTS (CONT.)

KEY ACTION	CRITERION												TOTAL	PRIORITY
	MANDATE			RESOURCE				PUBLIC		PROJECT				
	A			B				C		D				
	1	2	3	1	2	3	4	1	2	1	2	3		
PARK'S ECOSYSTEMS (cont.)														
VALUED ECOSYSTEMS (CONT.)														
Eardley Plateau (cont.)														
Continue with the various measures proposed in the Gatineau Park Species at Risk Protection Plan (NCC, 2006b), namely to identify the species at risk present in the ecosystem and apply the appropriate conservation measures.														Ongoing monitoring (see "Species at Risk", section 5.4.4.2.1)
In partnership with the equestrian association, move the last 5.5 km stretch of equestrian trail located in the western portion of the Park to a site outside the integral conservation zone.	5	3	3	5	5	10	1	2	2	10	3	2	51	I (see "Horse Riding", section 5.4.4.4)
Three-lake chain														
Use the proposed approach to manage invasive species.	5	3	2	5	5	10	2	2	2	10	5	3	54	I (see "Invasive Species", section 5.4.4.2.2)
Apply the key conservation actions for aquatic ecosystems, especially concerning water quality.	5	3	2	5	3	10	2	2	3	10	5	3	53	I (see "Aquatic Ecosystems" section 5.4.3.3)
Prepare a program for restoration of damaged areas (see section 5.5) (also applies to "Eardley Escarpment" and "La Pêche Lake").	5	3	2	5	5	10	2	2	2	10	3	2	51	I
Continue with the various measures proposed in the Gatineau Park Species at Risk Protection Plan, namely to identify the species at risk in the ecosystem and apply the appropriate conservation measures.														Ongoing monitoring (see "Species at Risk", section 5.4.4.2.1)
La Pêche Lake														
Use the proposed approach to manage invasive species.	5	3	2	5	5	10	2	2	2	10	5	3	54	I (see "Invasive Species", section 5.4.4.2.2)

TABLE OF ASSESSMENT RESULTS (CONT.)

KEY ACTION	CRITERION												TOTAL	PRIORITY
	MANDATE			RESOURCE				PUBLIC		PROJECT				
	A			B				C		D				
	1	2	3	1	2	3	4	1	2	1	2	3		
PARK'S ECOSYSTEMS (cont.)														
VALUED ECOSYSTEMS (CONT.)														
La Pêche Lake (cont.)														
Update and apply the Gatineau Park sport fishing management plan (NCC, 1983).	5	2	2	3	5	10	2	3	3	5	3	2	45	II (see "Sport Fishing", section 5.4.4.4)
Apply the key conservation actions for aquatic ecosystems, in particular concerning water quality.	5	3	2	5	3	10	2	2	3	10	5	3	53	I (see "Aquatic Ecosystems", section 5.4.3.3)
Prepare a program for the restoration of damaged areas (see section 5.5) (also applies to "Eardley Escarpment" and "The Three-Lake Chain").	5	3	2	5	5	10	2	2	2	10	3	2	51	I
Continue with the various measures proposed in the Gatineau Park Species at Risk Protection Plan (NCC, 2006b), namely to identify the species at risk in the ecosystem and apply the appropriate conservation measures.														Ongoing monitoring (see "Species at Risk", section 5.4.4.2.1)
Create water management partnerships with municipalities adjacent to the watershed.	3	2	3	1	5	7	2	2	2	10	5	3	45	II
Pink Lake Plateau														
Use the proposed approach to manage invasive species.	5	3	2	5	5	10	2	2	2	10	5	3	54	I (see "Invasive Species", section 5.4.4.2.2)
Apply the key conservation actions for aquatic ecosystems, in particular concerning water quality.	5	3	2	5	3	10	2	2	3	10	5	3	53	I (see "Aquatic Ecosystems", section 5.4.3.3)
Continue with the various measures proposed in the Gatineau Park Species at Risk Protection Plan (NCC, 2006b), namely to identify species at risk in the ecosystem and apply the appropriate conservation measures.														Ongoing monitoring (see "Species at Risk", section 5.4.4.2.1)

TABLE OF ASSESSMENT RESULTS (CONT.)

KEY ACTION	CRITERION												TOTAL	PRIORITY
	MANDATE			RESOURCE				PUBLIC		PROJECT				
	A			B				C		D				
	1	2	3	1	2	3	4	1	2	1	2	3		
PARK'S ECOSYSTEMS (cont.)														
RECREATIONAL ACTIVITIES														
Sport fishing														
Update and apply the Gatineau Park sport fishing management plan (NCC, 1983) (also applies to "Aquatic Ecosystems", "Eardley Plateau" and "La Pêche Lake").	5	2	2	3	5	10	2	3	3	5	3	2	45	II
Identify measures that are likely to maximize the breeding of fish species at risk.	3	3	1	3	5	10	2	1	1	3	3	2	37	III
Work with the MRNF to identify specific regulations for sport fishing in the Park.	5	2	2	3	5	10	2	3	3	5	3	2	45	II
Mountain biking														
Continue environmental monitoring of official mountain bike trails in order to assess deterioration over time.														Ongoing monitoring
Continue and reinforce monitoring of unofficial mountain bike trails in order to assess the level of damage.														Ongong monitoring
Identify and implement the necessary restoration measures (see section 5.5).	5	3	2	5	5	10	2	2	2	10	3	2	51	I
Rock climbing														
Identify two or three walls on which rock climbing could take place, based on their impact on the Eardley Escarpment ecosystem, their current level of damage and their popularity (also applies to "Eardlye Escarpment").	5	3	3	5	5	10	1	2	2	10	3	2	51	I
Change the boundaries of the integral conservation zone, as set out in the Gatineau Park Master Plan (NCC, 2005c), to accommodate these walls.	5	3	3	5	5	10	1	2	2	10	3	2	51	I
Restore the environment of former climbing sites that are not selected, including any access trails (see section 5.5).	5	3	3	5	5	10	1	2	2	10	3	2	51	I
Continue to monitor the activity's environmental impacts on the selected walls.														Ongoing monitoring
Hang-gliding														
Close the trail and parking lot (also applies to "Eardley Escarpment").	5	3	3	5	5	10	1	2	2	10	3	2	51	I
Restore the trail and parking lot after closure (see section 5.5).	5	3	2	5	5	10	2	2	2	10	3	2	51	I
Horse riding														
In partnership with the equestrian association, move the last 5.5 km stretch of equestrian trail located in the western portion of the Park to a site outside the integral conservation zone (also applies to "Eardley Plateau").	5	3	3	5	5	10	1	2	2	10	3	2	51	I
Restore the closed section of the trail located in the integral conservation zone (see section 5.5).	5	3	2	5	5	10	2	2	2	10	3	2	51	I
Continue to monitor the environmental impact of the activity on the remainder of the official trail.														Ongoing monitoring