



TERRA NOVA

NATIONAL PARK
OF CANADA

Management Plan



Parks Canada Parcs Canada

Canada

JUNE 2009

TERRA NOVA

NATIONAL PARK
OF CANADA

Management Plan

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Foreword



Canada's national historic sites, national parks and national marine conservation areas offer Canadians from coast-to-coast-to-coast unique opportunities to experience and understand our wonderful country. They are places of learning, recreation and inspiration where Canadians can connect with our past and appreciate the natural, cultural and social forces that shaped Canada.

From our smallest national park to our most visited national historic site to our largest national marine conservation area, each of these places offers Canadians and visitors several experiential opportunities to enjoy Canada's historic and natural heritage. These places of beauty, wonder and learning are valued by Canadians – they are part of our past, our present and our future.

Our Government's goal is to ensure that Canadians form a lasting connection to this heritage and that our protected places are enjoyed in ways that leave them unimpaired for present and future generations.

We see a future in which these special places will further Canadians' appreciation, understanding and enjoyment of Canada, the economic well-being of communities, and the vitality of our society.

Our Government's vision is to build a culture of heritage conservation in Canada by offering Canadians exceptional opportunities to experience our natural and cultural heritage.

These values form the foundation of the new management plan for Terra Nova National Park of Canada. I offer my appreciation to the many thoughtful Canadians who helped to develop this plan, particularly to our dedicated team from Parks Canada, and to all those local organizations and individuals who have demonstrated their good will, hard work, spirit of co-operation and extraordinary sense of stewardship.

In this same spirit of partnership and responsibility, I am pleased to approve the Terra Nova National Park of Canada Management Plan.

A handwritten signature in black ink, consisting of a stylized, cursive name that appears to be 'Jim Prentice'. The signature is written over a horizontal line.

Jim Prentice
Minister of the Environment

Recommendations

Recommended by:



Alan Latourelle
Chief Executive Officer
Parks Canada



William (Bill) Brake
Field Unit Superintendent
Newfoundland East Field Unit
Parks Canada

Executive Summary

Established in 1957, Terra Nova National Park of Canada (NPC) is part of the Canadian system of national parks, protecting a representative example of the Eastern Newfoundland Atlantic Region characterized by extensive boreal forest and irregular rocky coastline. Parks Canada, the federal government agency that administers the national park, is mandated to protect the park's natural values and ecological integrity and to connect Canadians with this special place, through providing opportunities for visitors to understand, appreciate and enjoy the park.

This revised plan updates the 1997 park management plan for Terra Nova NPC, providing current direction to managers for the protection of the ecological values of the national park, for the provision of meaningful visitor experiences, and for public education and outreach about the values of the national park and about Parks Canada. The management plan is fiscally responsible and does not propose measures that could not be accommodated within the park's existing budget allotment. Priorities identified in this management plan will guide sustainable business plan decisions, and implementation of the management plan will be reported annually.

A strategic environmental assessment of this management plan indicated no significant impacts or cumulative effects from the implementation of the proposals and concepts identified in the plan. Important cultural and environmental benefits will be realized through the implementation of the plan.

The management plan realizes a vision developed for Terra Nova NPC with the input of stakeholders.

In Future:

- Terra Nova National Park of Canada will continue to protect a treasured piece of the most easterly terrestrial natural region in Canada where long fingers of the sea touch the sheltered landscape of an island boreal forest. This special place of rugged coastlines, inland ponds, lakes and forest, was shaped by the great forces of the last glaciation. It will continue to be influenced most strongly by the unique combination of the cold Labrador Current, complete with arctic pack ice and icebergs, washing the shores of a boreal forest that developed in isolation from the neighbouring continent. In this place of cool summers and mild winters, the rugged landscape of the outer headlands contrasts sharply with the sheltered arms and coves, and dense forests of black spruce and balsam fir. This thriving island boreal ecosystem is alive with Newfoundland marten, caribou, beaver, Atlantic salmon, brook trout and black bear.
- Parks Canada will continue to identify and monitor the internal and external influences that affect the ecological integrity of Terra Nova NPC through a variety of ecological monitoring and research programs, and through active involvement in regional land use planning programs. Terra Nova NPC will be recognised as a "core area" in a much larger network of protected areas, nodes and corridors, and will be regarded as a key partner in landscape level ecosystem protection initiatives – both marine and terrestrial in nature.

- Visitors to the park will connect with this ancient landscape that has for millennia been home to many different peoples. Through a variety of interpretive programs they will be able to learn how the rich natural resources of the land and sea first attracted the ancient Maritime Archaic Indians followed by the Paleo and Dorset Eskimo, and how European settlers were later attracted by the abundant fish and rich forest resources of the inner sounds. The cultural resources that testify to this early Aboriginal and European history will be securely protected. Cultural knowledge will be enhanced through co-operative efforts involving both First Nations peoples and regional residents.
- In Terra Nova NPC, visitors will find a wide range of opportunities to engage all of their senses in a remarkable coastal national park experience. They will find opportunities to learn about the park's national significance, its natural environment and cultural heritage. Whether they are hiking the rugged Outport Trail, paddling the sheltered arms and coves, sharing a campfire with family and friends, or enjoying the local traditional culture, visitors will experience a true sense of place that will deepen their personal support for Parks Canada's integrated mandate. Terra Nova NPC programs, services and friendly staff will facilitate a range of experiences that suit a variety of abilities and interests, with opportunities for personal relaxation and fulfilment, exploration and discovery, meaningful social interaction with family, other visitors and staff, and rewarding physical challenges for the more adventurous visitors.
- Terra Nova NPC will be an increasingly popular destination for thousands of visitors. The local tradition of spending time in "the park" will be alive and well, with many young adults who spent their childhood in the park now returning to camp with their own children. The many hiking trails, picnic areas and camping facilities, combined with great recreational and educational opportunities, also

make the park a perfect vacation destination for other Canadians and international travellers. This popularity will ensure that Terra Nova NPC continues to be the most important tourism draw in Eastern Newfoundland, and a vital asset to the long-term economic health of the entire region.

Highlights of the Management Direction:

Ensuring Ecological Integrity

- Increase awareness and public support for achieving ecological integrity through stewardship programs, education, partnerships and engaging the public in research and monitoring.
- Implement measures outlined in the park's Fire Management Plan to promote natural forest regeneration.
- Implement research and management initiatives, along with Gros Morne NPC, Aboriginal communities and stakeholders, related to non-native moose populations and associated detrimental ecological impacts on the forest ecosystem.
- Assess and evaluate development proposals and decommissioning projects with the aim of ensuring that there is no increase in the development footprint within the park.
- Reduce the impacts of park infrastructure and utility corridors by removing them when no longer in use, reducing the amount of disturbed area and mitigating the impacts of existing infrastructure.
- Work with land managers responsible for land outside park boundaries to contribute to land use decisions and to mitigate or reduce impacts of external land uses on park ecosystems.
- Complete the work necessary to declare a designated wilderness area in the park as part of the next park management plan review.

Cultural Resource Management

- Develop a Cultural Resource Values Statement by identifying the park’s cultural resources, their values and related key messages.
- Complete an inventory and spatial database of *in situ* archaeological and historic features, including an assessment of current condition and known threats and of conservation/protection needs.
- Prepare a plan for the conservation and management of *in situ* cultural resources to guide protection efforts and interpretation of the cultural history of the park.
- Engage Aboriginal communities of Newfoundland and Labrador in the protection and interpretation of prehistoric and historic cultural features.
- Engage local communities and surviving former residents of the park in the protection and interpretation of historic cultural features and stories.

Visitor Experience

- Conduct a full review of the camping offer within the park.
- Conduct research on the segment of the public that do not visit the park to provide a better understanding of the visitors’ needs and expectations in order to evaluate the current visitor experience opportunities that are offered.
- Continue to support a variety of camping experiences in the park throughout the year.
- Explore the winter service offer in the park, such as grooming select cross-country ski trails and facilitating access to key day use areas.
- Assess the park trail system with consideration given to the access it provides to a variety of park ecosystems and trail condition and use.
- Undertake social science research to monitor the effectiveness of heritage presentation and outreach efforts to better inform management decisions.

- Undertake social science research to monitor and assess visitors’ satisfaction with park experiences, facilities and services and to better understand visitors’ interests, motivations and preferences to better inform management decisions about the visitor experience offer.
- Assess the issue of fee collection and ensure consistent application of the fee policy for all park users.
- Participate in regional promotion and marketing efforts in partnership with local tourism associations, Aboriginal communities and other interested parties.
- Undertake social science research and use others’ social science research to improve the effectiveness of publicity and communication efforts.

Outreach and Education

- Enhance the educational component of the Web site for Terra Nova NPC.
- Develop and implement a heritage presentation plan for the park.
- Prepare visitors for the visitor experiences of the park and the park service offer through a variety of media.
- Increase public awareness to suitably prepare for the visit and to participate in recreational activities in the park.
- Seek new opportunities to work with educational institutions and formalize existing partnerships. Partner with other agencies and groups to communicate conservation and environmental issues.
- Recapitalize the lobby of the Visitor Centre to better interpret the terrestrial ecosystems of the park.
- Create a short looped trail near the Visitor Centre to interpret the human history of the Salton’s area.
- Work in collaboration with Aboriginal groups to develop cultural history interpretation in the park.

Stakeholder and Partner Relations

- Continue to work with local communities to open communication about park management decisions, park operations and administration, and continue to consider implications of park decisions on local communities.
- Provide guidance to local communities to develop community-specific interpretation in communities, when appropriate opportunities arise.
- Develop partnerships with Aboriginal communities in Newfoundland and Labrador on projects of mutual interest and mutual benefit.
- Develop new and strengthen existing partnerships as opportunities arise.
- Establish stakeholder issue-based working groups to gain stakeholder input and to provide information for park management decisions and an avenue for consultation and input.
- Continue to offer third-party concessions at the Visitor Centre, Newman Sound Campground and at Sandy Pond day use area.
- Continue to work with the managers of the golf course in the park to seek environmental improvement, resolution of the fee collection issue and on other issues of mutual interest.

Operations and Administration

- Be a regional leader in environmental initiatives by meeting defined targets for greenhouse gas reduction, by exploring alternative energy conversion of park facilities and through environmentally sound waste management practices.
- Finalize a Fire Management Plan for the park and implement recommendations including possible “FireSmart” modifications at visitor and operational facilities.
- Inspect and assess park wharves and determine future wharf requirements, considering visitor experience, resource conservation, emergency response and asset management needs.

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1.0 Introduction



View from Mount Stamford. *Parks Canada – Dale Wilson, 1997*

1.1 PLANNING THE NEXT FIVE YEARS AND BEYOND FOR TERRA NOVA NATIONAL PARK OF CANADA

Since 1957 when Terra Nova National Park of Canada (NPC) was established by a federal-provincial agreement, the park has been part of the system of national parks found across Canada representing the country's distinctive landscapes. Terra Nova NPC protects a representative example of the Eastern Newfoundland Atlantic Region, one of the thirty-nine terrestrial natural regions of Canada.

Parks Canada is the federal government agency that administers Terra Nova NPC, through the Newfoundland East Field Unit. Parks Canada is responsible for protecting the natural values and ecological integrity of the national park and for connecting Canadians with this special place, through providing opportunities for visitors to understand, appreciate and enjoy the national park. Parks Canada is dedicated to ensuring that

national parks are maintained and used for the benefit, education and enjoyment of the people of Canada and left unimpaired for future generations. Parks Canada prepares a park management plan to guide the strategic management direction for the park; the park management plan is reviewed on a five-year cycle.

This revised plan updates the 1997 park management plan for Terra Nova NPC. The park management plan review, commenced in 2005, aimed to update park management direction to reflect new legislation and policy governing Parks Canada's activities as well as the current context of the park and current challenges park managers face. This revised management plan provides adjusted direction to managers for the protection of the ecological and other values of the national park, for providing meaningful visitor experiences, and for public education and outreach about

the values of the national park and about Parks Canada. The park management plan helps managers respond to operational needs and opportunities for co-operation with others, providing the broad framework for park management and guiding more detailed planning. The park management plan guides the selection of priorities for investment and expenditure outlined in the Field Unit's sustainable business plan. In advance of the next park management plan review, a *State of the Park Report* will be prepared. Over the course of the next five years, park managers will work with the public to establish a designated wilderness area within Terra Nova NPC, an area within the park that is accorded a high level of legislative and regulatory protection.

This management plan has been prepared with public input. Park stakeholders, numbering over one hundred groups, organizations, individuals and communities were offered the opportunity to participate in the park management plan review. Stakeholders shaped the park vision and expressed their ideas about future park management (See APPENDIX A for an overview of the public consultation process).

1.2 LEGISLATIVE AND POLICY CONTEXT

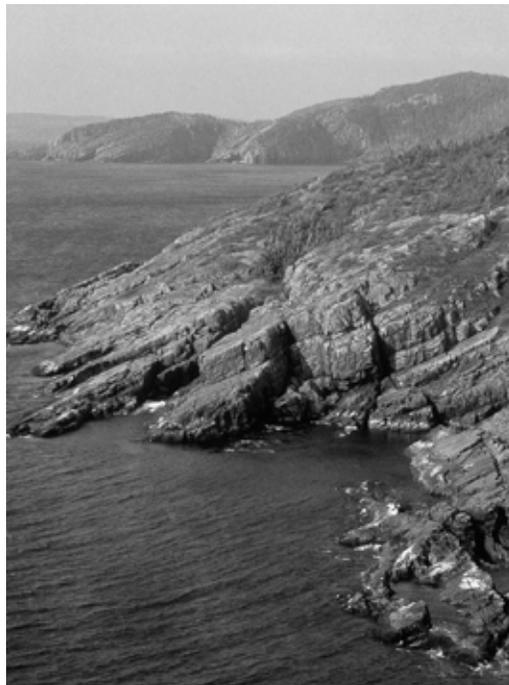
This management plan for Terra Nova NPC was developed within the legislative and policy context common to all national parks in Canada. Legislation requires that park management plans be reviewed every five years, and Parks Canada policy and guidelines describe the content of park management plans and a requirement for public involvement in the review and updating of the plans:

- *Parks Canada Agency Act* (1998) confers on the Parks Canada Agency the responsibility for federal protected heritage areas, including national parks. Requirements for reporting and planning, including the preparation of an Agency-wide *State of the Protected Heritage Areas Report* every two years, are outlined in this act.
- *Canada National Parks Act* (2000) guides the establishment and management of national parks. Section 4(1) states that the "national parks of Canada are hereby dedicated to the people of Canada for their benefit, education and enjoyment, subject to this Act and the regulations, and the parks shall be maintained and made use of so as to leave them unimpaired for the enjoyment of future generations." The *Act* further states that the "maintenance or restoration of ecological integrity, through the protection of natural resources and natural processes, shall be the first priority of the Minister when considering all aspects of the management of parks". The Act requires Parks Canada to prepare a management plan for each national park, and to review these management plans every five years. Management plans are tabled in Parliament.
- *Parks Canada Guiding Principles and Operational Policies* (1994): *National Parks Policy* provides direction on: management planning for national parks, including the use of zoning as a management tool to ensure the protection of natural and cultural values and appropriate location and intensity of human use; ecosystem-based management as the conceptual and strategic basis for the protection of park ecosystems; and ensuring opportunities for public understanding, appreciation and enjoyment of national parks. *Cultural Resource Management Policy* provides direction on ensuring that the cultural resources and cultural heritage values of all protected heritage areas administered by Parks Canada are protected and presented appropriately. For subjects on which the management plan is silent, managers will seek guidance from existing Parks Canada policy and directives.
- *Parks Canada Guide to Management Planning* (2001, 2007) provides direction on the process, responsibilities and approval requirements for national park management plans.

1.3 AN INTEGRATED APPROACH TO REALIZING PARKS CANADA'S MANDATE

Parks Canada's mandate requires that managers take an integrated approach to ensure the protection of a national park's ecological integrity while building public support for the park's natural and cultural values through offering opportunities for visitors to learn about, understand and enjoy the park.

The *Canada National Parks Act* defines "ecological integrity" with respect to a national park as "...a condition 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." In simpler language, ecological integrity is ensured if the native plants and animals of the national park persist; if ecosystem processes can continue to function providing habitat for plants and animals; and if human use is compatible. In short, ecological integrity refers to the health and well being of the national park. The ecological integrity of Terra Nova NPC is explained and its condition assessed in an *Ecological Integrity Statement* (2001) and in the national park monitoring plan.



Outer Newman Sound. *Parks Canada – Dale Wilson, 1996*

Facilitating Canadians' connection with Terra Nova NPC through providing opportunities for public understanding and enjoyment of the natural and cultural values of a national park helps to fulfill other elements of the Parks Canada's mandate. Unique and meaningful visitor experiences provide the basis for public understanding and appreciation of the protected area; the visitor experience is a cornerstone to successful management of a national park and for ensuring support for the park's ecological integrity in the long term.

1.4 THE ROLE OF TERRA NOVA NPC IN THE SYSTEM OF NATIONAL PARKS

Terra Nova NPC is part of a system of national parks, which collectively represent the thirty-nine distinctive natural terrestrial regions of Canada. National parks are located in every province and territory, on the Atlantic, Pacific and Arctic coasts, throughout the interior mountains, plains, Great Lakes, and in the farthest northern and southern reaches of Canada. The national parks system is not yet complete. To date, forty-two national parks have been established, representing twenty-eight of the thirty-nine natural regions. The aim is to protect at least one outstanding area representative of each natural region. Efforts to complete the system of national parks are ongoing.

Terra Nova NPC represents the Eastern Newfoundland Atlantic Region, a region that encompasses the majority of the Island of Newfoundland. This region stretches from the easternmost point in Newfoundland and Labrador on the Avalon Peninsula and extends west to the Long Range Mountains (the other natural region on the island, the Western Newfoundland Highlands, is represented by Gros Morne NPC).

2.0 Park Description and the Planning Context



Kayakers setting up camp in Minchins Cove. *Parks Canada – Dale Wilson, 1997*

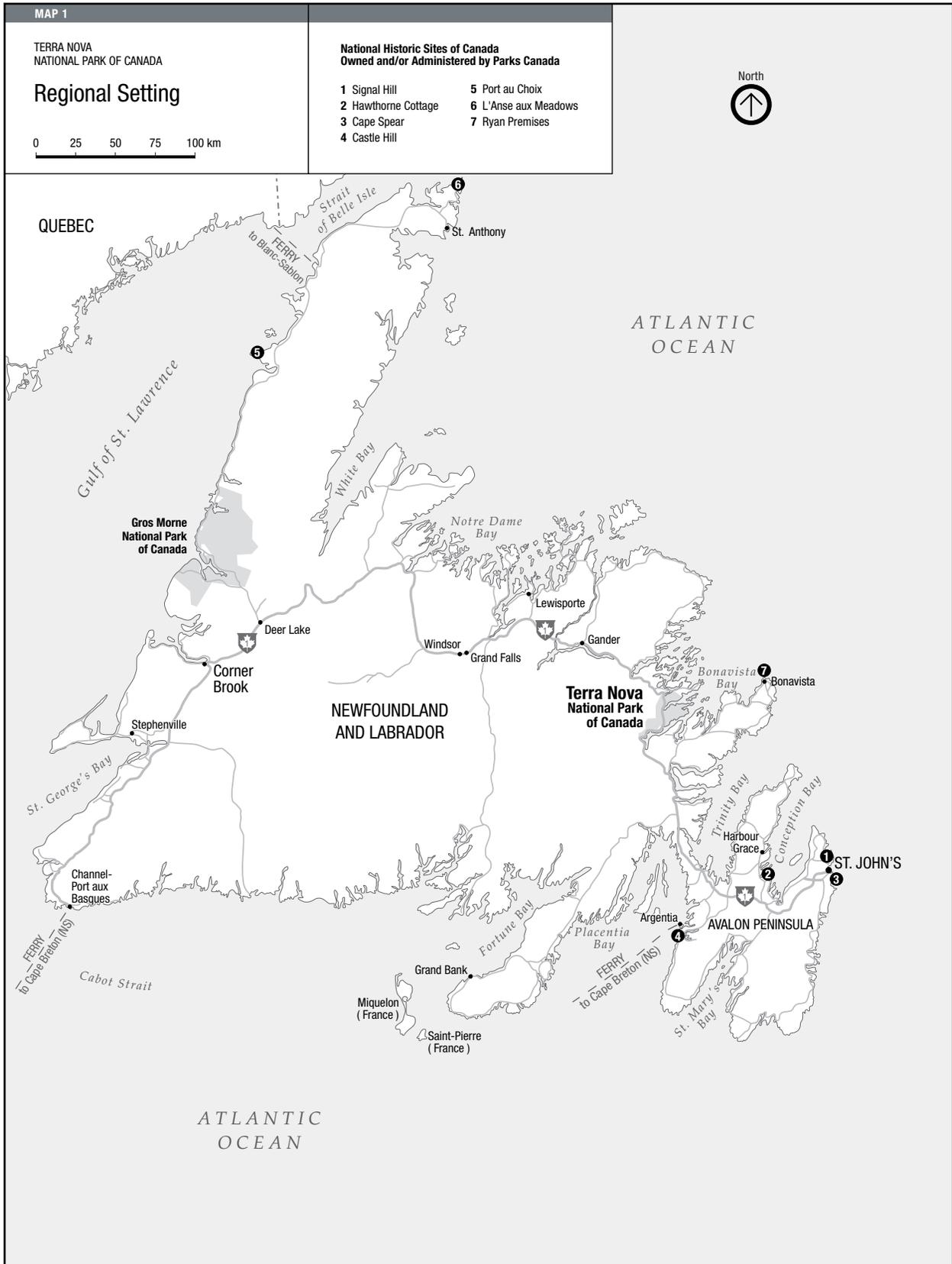
2.1 REGIONAL SETTING

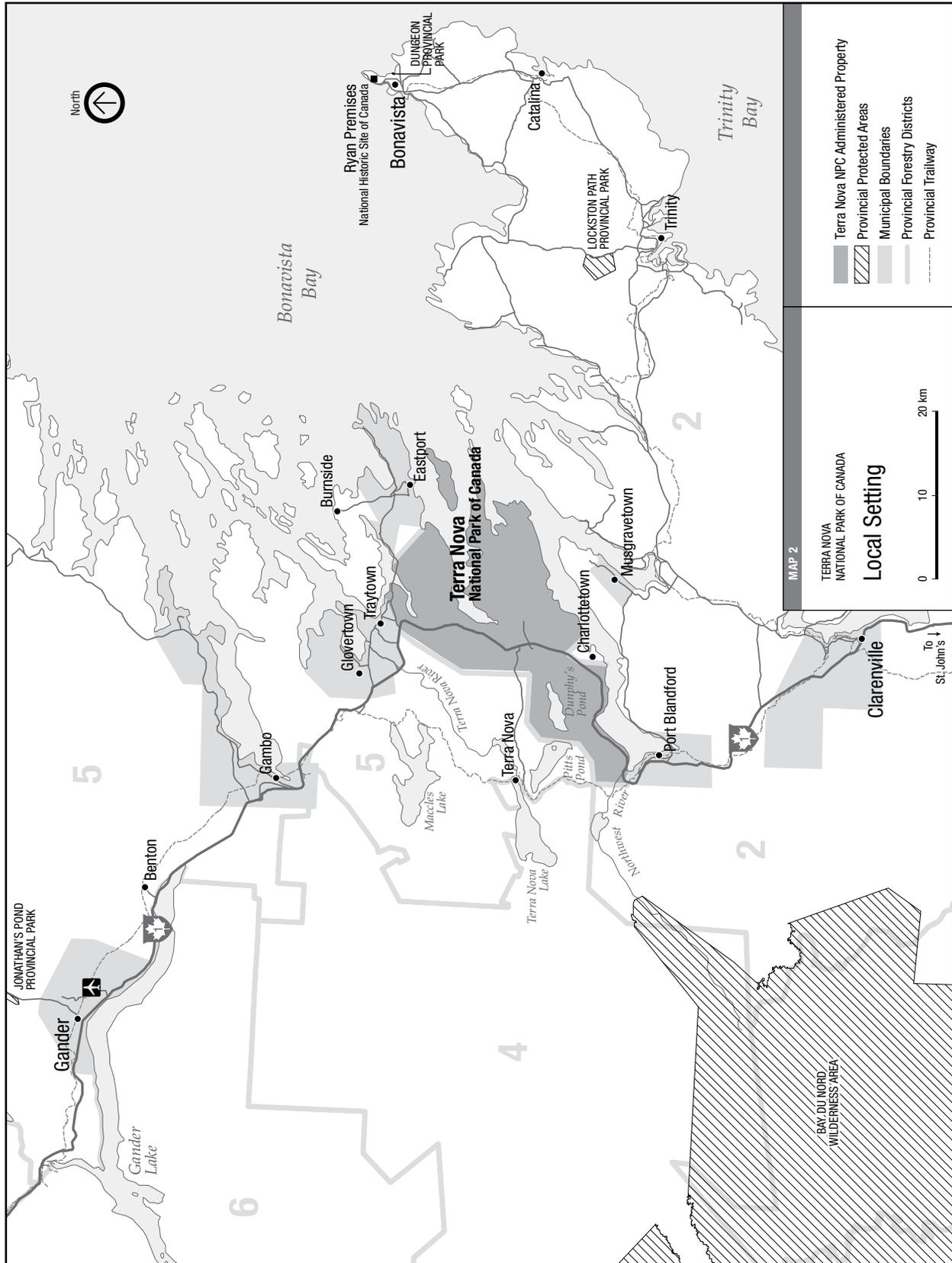
Terra Nova NPC is located in central, coastal Newfoundland and Labrador, on the Island of Newfoundland, about 200 km from the capital, St. John's (see MAP 1: Regional Setting). The communities closest to Terra Nova NPC include the enclave community of Charlottetown, Port Blandford south of the park, Terra Nova west of the park, Glovertown, Traytown and Culls Harbour northwest of the park and the communities of the Eastport Peninsula to the northeast of the park (see MAP 2: Local Setting).

The majority of land adjacent to the park is under provincial jurisdiction. The primary land uses occurring in the greater ecosystem surrounding the park include forestry (commercial and domestic timber harvesting) and recreational development (cabins). To date, commercial forest operations have been focused along the western edge of the park, with domestic timber harvesting occurring within the enclave of Charlottetown and along the park's northeast boundary,

on the Eastport Peninsula. Recreational cabin development occurs sporadically along the shores of inland ponds, lakes and waterways with dwellings concentrated in areas such as Terra Nova Lake to the west and Terra Nova River/ Maccles Lake to the northwest. Some small-scale resource extraction (sand, gravel and rock) occurs along the western and northwestern edges of the park. There are no current plans for development of hydroelectric facilities on large rivers bordering the park; however, such development has been considered in the past and may be reconsidered in future.

Terra Nova NPC is recognized as part of the network of protected heritage areas in the province. Heritage areas are protected variously by the federal government (Parks Canada, Canadian Wildlife Service and Fisheries and Oceans Canada) and by the Province of Newfoundland and Labrador. To the south of Terra Nova NPC is located the provincial Bay du Nord Wilderness Reserve, designated in 1990 to protect an





area representative of the Maritime Barrens-Central Barrens sub-region. The 2895 km² Wilderness Reserve includes the Baie du Nord River, designated a Canadian Heritage River, and protects much of the range of the Middle Ridge caribou herd.

The national park straddles two provincial tourism regions: Kittiwake (extending from Lewisporte to the western boundary of the park including the Eastport Peninsula) and the Discovery Trail (including the Bonavista Peninsula to the east of the park). The Provincial Trailway, a provincial rails to trails multi-use recreational trail that is popular in winter for long-distance snowmobile trips, runs to the west of the park. The park contributes to the regional economy by serving as a key tourism attraction, as well as more directly through jobs and expenditures.

Activities and land use decisions in the regional context of the park can have potentially significant impacts on park ecosystems, and on the operation and administration of the park. Park managers recognize the need to harmonize the role of the park in the region and to have the support of surrounding residents and land managers/responsible agencies for park management and operations.

2.2 LAND USE HISTORY

Terra Nova NPC has a rich history of human use, traceable to the past 5000 years. The earliest peoples, Maritime Archaic, Dorset Eskimo and Beothuk were coastal dwellers, living throughout Bonavista Bay. Five prehistoric Aboriginal sites have been identified in the park, and archaeological evidence supports the occupation of both Maritime Archaic and Dorset Eskimo in the park. Although the presence of Beothuk occupation in the park is not confirmed, there is substantial evidence of a Beothuk presence at the nearby Beaches Site in Burnside. Little is known generally about the historic or modern Aboriginal presence and use of the park.

In the early 1500s, European fishermen began to exploit the waters of Newfoundland and Labrador. These fisheries were exclusively

migratory in nature, and permanent settlement did not begin to occur until a century later. The early-17th-century colonies were all on the Avalon Peninsula, and it was not until the 1670s that the English settlement frontier began to extend into Bonavista Bay, especially Salvage. In addition to fishing, these early settlers also exploited the area's forests in order to build boats, stages and living quarters, and they trapped fur-bearing animals like beaver and otter as a means of supplementing their earnings from the fishery.

By the end of the 19th century, there were settlements in Glovertown, Traytown, Rosedale, Sandy Cove, Happy Adventure, Eastport, Port Blandford, Charlottetown and Terra Nova. Fishing and forestry were the mainstays of the local economy. Although there were numerous sawmills by the 1920s, especially in Clode and Newman Sounds, most of these had closed by mid-century. Between 1920 and 1950, the largest mills were at Minchin's Cove, Salton's Brook and Big Brook, the latter still in operation when the park was established in 1957.

Terra Nova NPC was favoured over other candidate sites to become the first national park in Newfoundland and Labrador. The area was chosen because it was characteristic of Newfoundland and Labrador's coastal landscape, including rugged coastline, encompassing wooded lands dotted with lakes and rivers, providing habitat for native species. Its location on the Trans Canada highway and relative proximity to the provincial capital, St. John's, also provided urban residents with a vacation destination. The national park was viewed with promise as an economic generator for the region. The federal government's further commitment to fund a portion of the Trans Canada Highway through the national park was attractive to the Province. In 1957, Terra Nova National Park of Canada became a reality, established through a federal-provincial agreement and gazetted under the *National Parks Act*. In the 1970s, the original park area was expanded to include part of the Northwest River.

2.3 THE NATIONAL PARK TODAY

Terra Nova NPC protects an area of 402 km² of insular eastern Newfoundland and Labrador (see MAP 3: Park Map). The national park extends from the junction of provincial Highway 331 and the Trans Canada Highway at the western end of the park, includes a portion of the Eastport peninsula, encompasses a substantial area west of the Trans Canada Highway, surrounds the enclave community of Charlottetown and extends southeast to the community of Port Blandford. The national park includes several offshore islands, although the waters below the mean low tide mark are excluded, and the park's coastline follows Newman Sound and a portion of Clode Sound. This area supports rich intertidal and estuarine ecosystems.

Part of the Appalachian Mountain System, the national park is characterized by low relief and a series of rounded hills rising to 200 m above sea level. Arms, sounds, coves and inlets indent the coast and the rocky headlands feature sea arches and caves. Pleistocene epoch glaciation is evident in the irregular coastline, bogs, freshwater lakes and deposits of glacial till. The climate has a marked maritime influence especially due to the Labrador Current, and is characterized by brief cool summers and moderate winters.

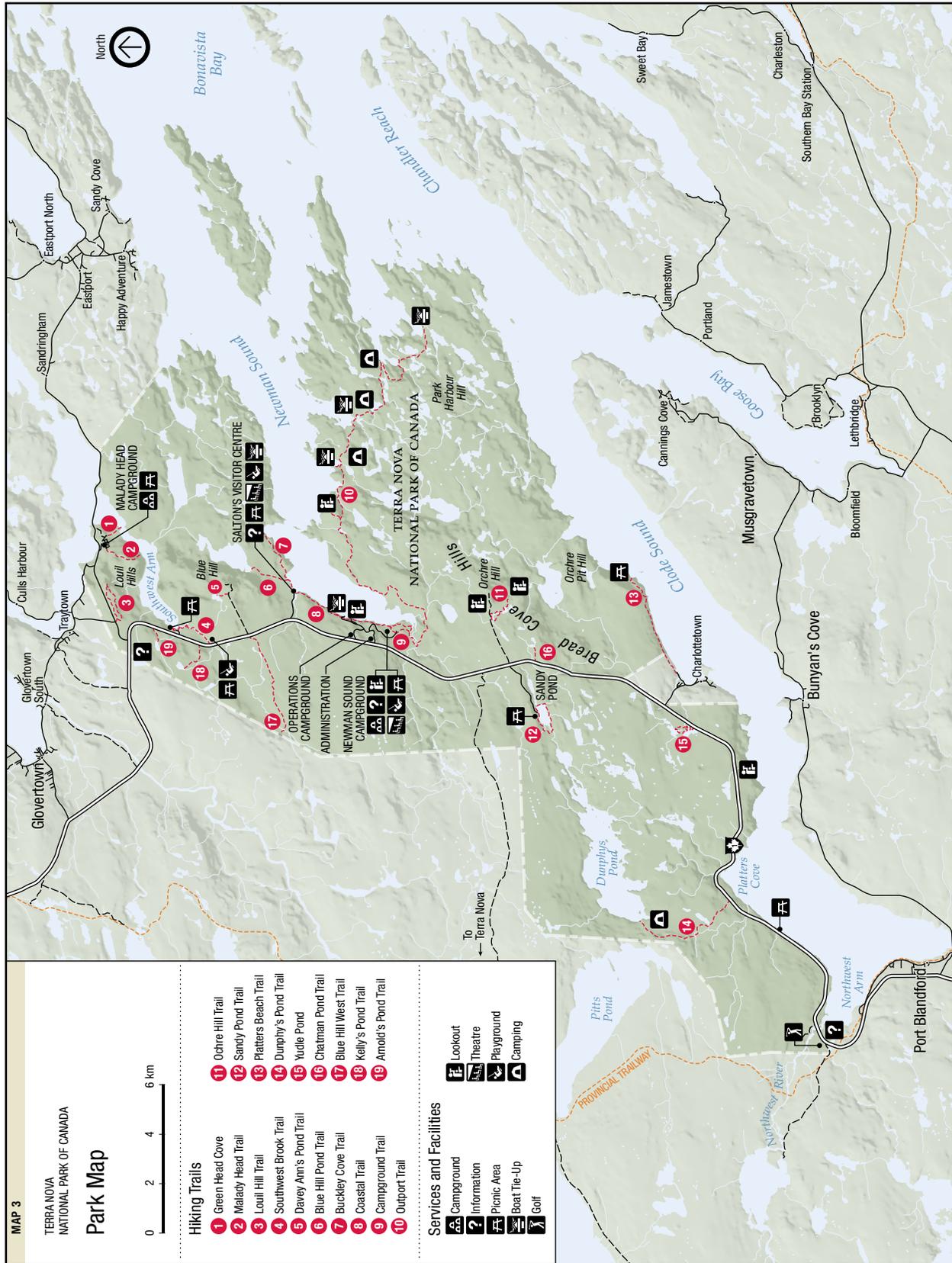
Terra Nova NPC boasts a strong relationship with the marine environment given its 238 km of marine coastline and that no point in the park is further than 5 km from the ocean. The park contains 134 ponds, 86 brooks and rivers and extensive wetland habitat in the form of bogs, fens, marshes and swamps.

Located at the eastern edge of the Boreal Shield Ecozone, the park contains two ecodistricts (as defined by the Canadian Forest Service and the Forest Service of Newfoundland and Labrador): Central Newfoundland Forest; and, North Shore Forest. Drumlinoid hills and boreal forests, bogs and fens characterize the western glaciated part of the park. The eastern part along the coast is sparsely vegetated rocky terrain, with deeper ponds and a rugged shoreline.

Seventy-percent of the park is forested, with Black spruce (*Picea mariana*) being the dominant tree species, and smaller areas covered in Balsam fir (*Abies balsamea*) and hardwoods including white birch, red maple and trembling aspen. Seven percent of park is characterized as barren land, including rock barrens, Kalmia barrens and transition barrens. Including trees, 523 species of vascular plants are present in the park. Of these, 427 are indigenous, 89 are introduced, 29 are rare and seven are hybrid in nature.

The national park has a relatively limited number of animal species. Of the 21 species of terrestrial mammals found in the park only twelve are native to insular Newfoundland and Labrador. The Newfoundland marten (*Martes americanus*), listed as an endangered species on the List of Wildlife Species at Risk set out under the *Species at Risk Act* and extirpated from the park in the late 1970s, is being reintroduced. Non-native mammals present in the park include moose (*Alces alces*), snowshoe hare (*Lepus americanus*) and red squirrel (*Sciurus hudsonicus*). Of approximately 169 bird species found in the park, 63 use the park as breeding grounds. Seven freshwater or anadromous fish species, including native trout, salmon and arctic char, are found within freshwater ponds and brooks of the park.

The national park receives approximately 200 000 visitors per year, including drive-through traffic. The two campgrounds (Newman Sound and Malady Head) and primitive campsites combined attract approximately 14 600 camper nights per year (2005 figures). The visitors to the park are primarily from in-province and largely from the Avalon Peninsula and the eastern part of the Island of Newfoundland. Visitation occurs primarily in the summer months, and camping is the most popular activity. The park is divided by a stretch of 43 km of the Trans Canada Highway running north-south through the park, and by other local roadways. Park administration and operations are primarily located at Newman Sound.



3.0 Park Vision

Realizing a Shared Vision for Terra Nova National Park

The vision is a central element of the management plan for the national park. The vision offers a view of the desired future of Terra Nova NPC and the management plan identifies shorter-term results and management actions to be undertaken over a period of five years to achieve the vision. The vision for Terra Nova NPC has been developed with input from interested Canadians.

In 15 years:

- Terra Nova National Park of Canada will continue to protect a treasured piece of the most easterly terrestrial natural region in Canada where long fingers of the sea touch the sheltered landscape of an island boreal forest. This special place of rugged coastlines, inland ponds, lakes and forest, was shaped by the great forces of the last glaciation. It will continue to be influenced most strongly by the unique combination of the cold Labrador Current, complete with arctic pack ice and icebergs, washing the shores of a boreal forest that developed in isolation from the neighbouring continent. In this place of cool summers and mild winters, the rugged landscape of the outer headlands contrasts sharply with the sheltered arms and coves, and dense forests of black spruce and balsam fir. This thriving island boreal ecosystem is alive with Newfoundland marten, caribou, beaver, Atlantic salmon, brook trout and black bear.
- Parks Canada will continue to identify and monitor the internal and external influences that affect the ecological integrity of Terra Nova NPC through a variety of ecological monitoring and research programs, and through active involvement in regional land use planning programs. Terra Nova NPC will be recognised as a “core area” in a much larger network of protected areas, nodes and corridors, and will be regarded as a key partner in landscape level ecosystem protection initiatives – both marine and terrestrial in nature.
- Visitors to the park will connect with this ancient landscape that has for millennia been home to many different peoples. Through a variety of interpretive programs they will be able to learn how the rich natural resources of the land and sea first attracted the ancient Maritime Archaic Indians followed by the Paleo and Dorset Eskimo, and how European settlers were later attracted by the abundant fish and rich forest resources of the inner sounds. The cultural resources that testify to this early Aboriginal and European history will be securely protected. Cultural knowledge will be enhanced through co-operative efforts involving both First Nations peoples and regional residents.
- In Terra Nova NPC, visitors will find a wide range of opportunities to engage all of their senses in a remarkable coastal national park experience. They will find opportunities to learn about the park’s



Newman Sound estuary bird exhibit.

national significance, its natural environment and cultural heritage. Whether they are hiking the rugged Outport Trail, paddling the sheltered arms and coves, sharing a campfire with family and friends, or enjoying the local traditional culture, visitors will experience a true sense of place that will deepen their personal support for Parks Canada's integrated mandate. Terra Nova NPC programs, services and friendly staff will facilitate a range of experiences that suit a variety of abilities and interests, with opportunities for personal relaxation and fulfilment, exploration and discovery, meaningful social interaction with family, other visitors and staff, and rewarding physical challenges for the more adventurous visitors.

- Terra Nova NPC will be an increasingly popular destination for thousands of visitors. The local tradition of spending time in "the park" will be alive and well, with many young adults who spent their childhood in the park now returning to camp with their own children. The many hiking trails, picnic areas and camping facilities, combined with great recreational and educational opportunities, also make the park a perfect vacation destination for other Canadians and international travelers. This popularity will ensure that Terra Nova NPC continues to be the most important tourism draw in Eastern Newfoundland, and a vital asset to the long-term economic health of the entire region.

4.0 Ensuring Ecological Integrity



Red fox. Parks Canada – Greg Stroud

Ecological integrity (EI) is a key consideration in the management of national parks, and ensuring ecological integrity is part of the Parks Canada mandate. Ecological integrity in Terra Nova NPC is ensured through a number of complementary management measures and through improving public understanding, awareness and support for the ecological values of the national park by way of offering meaningful visitor experiences and education.

Parks Canada takes an ecosystem-based approach and employs a strategy of adaptive management in the management of national parks. Ecosystem-based management takes a holistic view of the natural environment, recognizing that park ecosystems extend beyond park boundaries, that park management decisions may affect surrounding lands and that decisions made on adjacent lands may affect the park's ecological integrity. Accordingly, a broad base of support for park management activities needs to be developed. Science and other knowledge-based systems must provide a credible foundation for making sound management decisions.

4.1 ECOLOGICAL STATE OF THE NATIONAL PARK

A. State of Ecological Integrity

Terra Nova NPC includes five ecosystem types: forest, freshwater, marine coastal, wetland and barrens. FIGURE 1 illustrates the current ecosystem health of each ecosystem type in the park. Terra Nova NPC provides habitat for 21 species of terrestrial mammals, seven species of freshwater fish, and 523 species of vascular plants. In general, populations of native terrestrial fauna in Terra Nova NPC are fluctuating within typical ranges of density while other non-native species, such as moose, red squirrel and snowshoe hare, have become hyper-abundant. In the case of moose, their population level has reached a point beyond the carrying capacity of the forest around them resulting in significant changes to the forest composition and ecology of the park. The abundance and distribution of the endangered Newfoundland marten (*Martes americana atrata*) have increased in the greater Terra Nova region, though the population is still below viability. This recovery is attributable to a series of re-introductions beginning in

Forest	Freshwater	Coastal/Marine	Wetland	Barren
(79% of park area)	(7% of park area, includes large ponds but not brooks and streams)	(238 km)	(15% of park area)	(1.2% of park area)
↓ Fair Condition	↔ Fair Condition	↔ Good Condition	↔ Good Condition	↔ Fair Condition

Figure 1. State of ecosystem health in park ecosystems. Arrows: ↔ = condition is stable ↓ = condition is worsening

the early 1980s, as well as forest and furbearer management initiatives on adjacent provincial land. The national park is also thought to provide habitat for the provincially endangered red crossbill that is known to be associated with late-successional, conifer forests.

Forest Ecosystem

Forest ecosystem health has declined in Terra Nova NPC because of the adopted management policy of fire suppression and the impacts of non-native species on forest regeneration. Although monitoring measures determining the health of the forest ecosystem in Terra Nova NPC have only recently been implemented, ongoing research studies and observations indicate that forest health is impaired, and in decline.¹ Fire suppression has resulted in an atypical, skewed distribution of forest age classes with older age classes (> 100 years) dominating the landscape. Non-native wildlife including moose, snowshoe hare, red squirrels, masked shrews and several slug species have negatively impacted the ability of the forest to regenerate by reducing seed input and selectively foraging on dominant tree species. A measure of browse intensity within balsam fir, black spruce, and insect-disturbed stands also indicates that 80% of available stems have been browsed in certain forest types. These measures, combined with others outlined in the Forest Ecosystem Monitoring Program (see APPENDICES C and D), will continue to provide data on the status of forest health in the future.

Freshwater Ecosystem

The freshwater ecosystem in Terra Nova NPC, at present, is in fair condition. The primary salmon run (Northwest River) has shown

considerable improvement over the past five years. The park continues to monitor the impact of recreational fishing on some ponds. Fragmentation of aquatic habitats has been improved. Water quality in the park is suitable for aquatic life and ongoing monitoring measures have shown it to be generally free of contaminants and/or pollutants (see APPENDIX E).

Of the seven species of freshwater fish found in Terra Nova NPC, three are recreationally harvested: Atlantic salmon, brook trout and rainbow smelt. The health of fish populations is currently being assessed and research is determining the effects of recreational harvest on freshwater species. Unauthorized fishing activity occurs on a sporadic basis along the coastal areas outside of the park, with potential effects on trout and salmon populations. Invasive fish species have not been found in park waters though their presence in other systems of the east coast of Newfoundland and Labrador could make them a threat in the future.

Coastal/Marine Ecosystem

At present, the coastal/marine ecosystem is thought to be in fair health and unchanging. Nearshore fish communities (e.g., Atlantic cod) are still showing the effects of the fishery collapse, and sedimentation due to the Eastport causeway may be affecting aquatic life within the Southwest Arm Estuary. However, tern and otter populations appear to be stable within this ecosystem. Shorebird abundance surveys also indicate no change in population numbers.

Wetland Ecosystem

There are four principal types of wetlands in Terra Nova NPC: fens, bogs, marshes, and swamps. Although a full monitoring program has not yet been implemented, current information suggests that this ecosystem is in good condition. Measures to support

¹ Measures such as density of balsam fir saplings/seedlings are well below target densities for balsam fir-mixed wood forests (less than 1500 stems per hectare for balsam fir regenerating stands). Other measures such as tree age class distribution show that the number of early-aged forest stands are low or absent for certain forest types.

this current status include vegetation community and habitat assessments undertaken by Brouillet et al. (1998), as well as the fact that many of the park's wetlands are fairly inaccessible. However, some riparian, as well as large bog and fen systems in the park are located at the park boundary and are susceptible to greater ecosystem impacts such as resource harvesting (i.e., forestry), all-terrain vehicle use and cabin development. Climate change and airborne pollutants are also potential stressors on wetlands.

Barrens Ecosystem

Barrens in Terra Nova NPC are in fair condition, according to current information. Recent investigation into summit barrens indicates that trail impacts are occurring, including widening of the trail tread, creation of new informal trails parallel to established trails, soil compaction and erosion. These impacts affect the structure and function of the fragile heath and lichen habitat. Many summit barren habitats within the park have been recognized as Zone 1 areas due to their uniqueness and rare vegetation. Total surface area of bare ground in hectares was the measure used to determine the amount of barren disturbance of accessible areas in 2005.

B. Key Stressors and Impacts

Factors which impact on the biodiversity and ecosystem functioning of Terra Nova NPC include: the absence of fire, the dominant disturbance factor; the impacts of invasive, non-native species; external and internal land use practices; and pollution and climate change.

Absence of Fire

Fire is the primary source of natural disturbance in the black spruce-dominated forests of eastern and central Newfoundland. The extensive tracts of even-aged forest characteristic of this region are the result of recurring fires throughout the past century. Many of the plant and animal species found in this region are fire-dependent and have co-evolved with this natural process.² A policy of fire suppression since the time of park establish-

² Species that have evolved as codependent on fire include plants such as white pine, black spruce, white birch and pin cherry, and animals such as beavers, red crossbills and woodpeckers.



Boreal chickadee. Parks Canada – Greg Stroud

ment reduced the role of fire in the ecosystem and has resulted in skewed age distribution where late-successional forest dominates across the landscape. Under more naturally occurring conditions, frequent small-scale fires would have created forest patches of variable age and configuration. Fire suppression and the associated build-up of combustible fuels have increased the likelihood of a large-scale, catastrophic fire occurring. The continued full suppression of fire in the ecosystem will likely lead to further decline of forest composition and structure. Active fire management initiatives are required to bring the boreal forest ecosystem back to a more natural state.

Cumulative Impacts of Non-native Species

The cumulative impacts of non-native herbivores have seriously impeded the natural functioning of the forest ecosystem. These species include moose, snowshoe hare, red squirrels, masked shrews and several species of non-native slugs. Ongoing studies have shown that these species are impacting conifer and hardwood regeneration at each life history stage, with a resulting shift in the climax community from stands dominated by black spruce, balsam fir, white birch and other hardwoods to open canopied areas dominated by grasses, ferns and *Kalmia* heath. Disruption of this functional process will have significant, long-term consequences on entire ecosystem components including overstory and understory plant assemblages, songbird communities, and below ground processes such as nutrient cycling, soil chemistry and the diversity of fungal communities.

Habitat Loss and Fragmentation

Habitat loss and fragmentation from anthropogenic development within and beyond Terra Nova NPC has affected both terrestrial and aquatic systems. Within Terra Nova NPC, the construction of roads, utility corridors, and campgrounds has reduced the amount of forest cover by 439 hectares. This habitat loss and fragmentation may affect the use of these areas by wildlife species that are sensitive to habitat change (i.e., nesting raptors, caribou, Newfoundland marten). The alteration of habitat due to development is also known to increase the rate of establishment by non-native, invasive plants that in turn may further diminish the integrity of the site. The 439 ha of developed land and infrastructure in the park equates to approximately 1% of the park area. The area of development has remained stable since the 1970s and active restoration efforts have resulted in a small reduction of the park footprint. Habitat connectivity is being monitored in both aquatic and terrestrial systems.

The existence of a major through-highway in the park has affected wildlife numbers and their movement/behavioural patterns. For example, vehicle traffic contributes to significant wildlife mortality, including 15-30 moose annually and an unknown number of smaller animals such as snowshoe hare, squirrels, and birds. Road corridors may also inhibit the movement of some species in the park. Visitors feeding wildlife along park roadways and at campgrounds leads to the habituation of some animals (e.g., bears, foxes and coyotes) to human contact. This process can ultimately jeopardize the survival of these individuals, and creates unnecessary public safety hazards. The Eastport causeway has affected the tidal pattern of Southwest Arm. Improperly installed drainage culverts along the Trans Canada Highway, which affect 38% of park watersheds (42% of the park by area), have limited the access to headwater areas for some anadromous fish.

In the greater ecosystem of Terra Nova NPC, road construction and development, commercial forest harvesting, cabin development, agricultural development and the introduction of non-native species have influenced ecosystems. Cumulative forest loss

from timber harvesting and fires and targeted or accidental mortality led to the decline and extirpation of Newfoundland marten in the early 1900s; current threats to habitat compromise the recovery effort.

Pollutants

The potential leaching of contaminants into groundwater is a concern for the Square Pond watershed because of its adjacency to the municipal landfill site. This landfill site is also a source of local air pollution for the park, particularly within the Southwest Arm watershed area. Nutrient loading in the Northwest River from golf course operations is also a concern. However, water quality monitoring has not revealed any elevated levels of contaminants from these two sites. Acid rain and other sources of pollution appear to have had minimal impact on aquatic ecosystems.

4.2 CURRENT MANAGEMENT RESPONSES

Knowledge and understanding of the terrestrial and aquatic ecosystems of Terra Nova NPC provides a basis for adaptive management in the park. Research and monitoring of park ecosystems contributes to an understanding of the health of the individual national parks and their greater ecosystems, and of the state of the Atlantic-Quebec bioregion within which the park occurs. This understanding provides the foundation for effective management action. Terra Nova NPC has knowledgeable and able staff (ecologist, terrestrial and aquatic biologists, resource conservation staff), providing a strong science capacity for the park.

A. Research, Knowledge and Monitoring

Research

Parks Canada possesses a good base of knowledge regarding the ecosystems of Terra Nova NPC, particularly for terrestrial ecosystems, although the current knowledge of aquatic ecosystems in the park is low. Understanding of park ecosystems is based on research and monitoring dating from the early 1970s. A large-scale monitoring program has also been developed for the park that addresses such issues as species listed



Anglers at Chain Bridge Pool, Northwest River. Parks Canada

under the *Species at Risk Act*, invasive species, and plants and small mammals. (See APPENDIX C for an overview of select research and monitoring initiatives). Although a specific research plan for the park is not in place, the park regularly assesses current and future research needs. Research also occurs when academic interests correspond with park issues or management needs. Information gaps include the impacts of invasive species on native ecosystems, marine components and freshwater aquatic ecosystems. The interests and understanding of people who live around the park and use its facilities and natural areas is another area of investigation. Traditional knowledge pertaining to the area is another gap; traditional knowledge, in combination with scientific research and monitoring data, can provide a long-term perspective about ecosystem health and associated changes over time.

Partnerships with universities and other government agencies are well established as mechanisms to conduct research, and are established with Memorial University, Lakehead University and the provincial Department of Natural Resources to assess the impacts of non-native species on forest ecosystems; and with Memorial University, Indian Bay Ecosystem Corporation (IBEC), Dalhousie University, the Canadian Rivers

Institute and the University of New Brunswick to develop new approaches for aquatic ecosystem restoration and management. Additionally, local residents have contributed information about recent human history, cultural events and traditional land use. Local knowledge about fish populations has been collected, and protection of other species, such as river otters, may benefit from work with local and provincial partners. Over time, partnerships between Parks Canada, academic institutions, local communities and Aboriginal peoples will be strengthened to collect and analyze traditional knowledge. Park managers also intend to enhance the involvement and stewardship potential of local people in the day-to-day collection of scientific data.

Monitoring

Parks Canada has streamlined monitoring activities in Terra Nova NPC to accord with other parks in Atlantic Canada and Quebec within a common bioregion. This bioregional approach to monitoring aims to ensure the use of common measures where possible so that changes in the health of park ecosystems can be readily identified and addressed. The program aims to be scientifically sound, strategic and cost-effective, capable of detecting change in stressors and impacts.

Terra Nova NPC includes all of the ecosystem indicators defined for the Atlantic-Quebec bioregion: forests, barrens, wetlands, freshwater and coastal/marine. For each ecosystem indicator, a comprehensive set of measures will be developed by 2008. The priority for Terra Nova NPC has been to develop and implement forest and aquatic measures³, and to refine targets and thresholds for these measures. Key monitoring activities at Terra Nova NPC consists of three main components: forest stand measures, landscape measures and park-wide measures. Aquatic ecosystem monitoring includes a network of stream monitoring sites, a restricted set of pond monitoring sites and several broad-scale measures. Measures for the remaining ecosystems – wetlands, barrens and coastal/marine – remain to be developed. Research into the effects of non-native herbivores (including moose, snowshoe hare, red squirrels) on the forest ecosystem has provided valuable insight on the relative impact of each of these species. Moose have had the greatest impact, to the extent that forest ecosystems have been dramatically altered and natural successional patterns significantly modified. A monitoring program to document the expected shift in small mammal community structure following the invasion of non-native red-backed voles has also been established.

B. Ecosystem Management

Maintaining Biodiversity

Parks Canada maintains biodiversity through a range of efforts including protecting species listed under the *Species at Risk Act* and reintroducing extirpated species. Newfoundland marten, an endangered species, were reintroduced to Terra Nova NPC in the early 1980s as part of the Newfoundland Marten Recovery Team's efforts to re-establish a population in the Terra Nova region. In 2005, the population was estimated at 30-35 individuals, although it is recognized that a larger population could be sustained across the greater landscape. Parks Canada seeks to inform and influence land managers beyond park boundaries to mitigate the effects of human

activities, including industrial forest harvesting, accidental trapping and snaring, cottage development and agricultural development that pose some threat to habitat supply and survival of individual martens. Stewardship working groups have had some positive effects on the recovery of aquatic species in the area, notably for Atlantic salmon in the Northwest River. Biodiversity will also be maintained by mitigating the impacts that key non-native species (i.e., moose) are having on forest ecosystems.

Management of Impacts of Invasive Species

Parks Canada is actively exploring management responses to address the impacts moose have had on forest succession, and is planning to further understand the impacts of moose relative to other non-native species such as squirrels and hares. Parks Canada has reduced the spread of invasive vegetation (e.g., purple loosestrife in Southwest Arm and Platters Beach) through the physical removal of plants. Changes in roadside construction and restoration practices have been made in order to reduce the prevalence of non-native plants (e.g. elimination of hydro-seeding of non-native grasses; elimination of using roadside organic material containing non-native seed in restoration projects). Plans are being developed for active restoration work in a number of disturbed areas within the park. Techniques being employed, including use of native trees, shrub and grass species for planting requirements, will ensure the removal and reduction of invasive plant species introduced to the areas.

Restoring Fire Cycles

Parks Canada has undertaken research to determine the fire history in the region around Terra Nova NPC and to understand the ecological role that fire has played. Forests in eastern and central Newfoundland and Labrador have evolved with fire as the major source of disturbance. Species that occur in the park are fire dependent, relying on fire for tree regeneration and for the creation of habitat for a variety of animals species. Parks Canada is implementing a Fire Management Plan for the park that includes public education and engagement regarding

³ See Appendix D: Bioregional Measures of the Forest Ecosystem and Appendix E: Bioregional Measures of the Freshwater Park Ecosystem.

the role of fire in the boreal forest ecosystem, and studying the effects of past fires.

The Development Footprint

Parks Canada has reduced the area covered by development in the park and will continue to reduce this area as opportunities arise. However, park managers continue to face periodic pressure to permit more development through the park (e.g., utility corridors). In these cases, Terra Nova NPC should continue to support critical projects aimed at meeting the needs of adjacent communities in a manner that maintains or enhances the ecological integrity of the park. Accordingly, any proposed development in Terra Nova NPC, including the removal of old facilities or the construction of new ones, will be examined to ensure minimal risk to, and maximum benefits for, park ecosystems. The design of new development will seek to minimize the footprint of park operations and reduce landscape fragmentation. The park would like to further develop partnerships within the greater ecosystem to enhance landscape connectivity especially through establishment of wildlife corridors and protection in certain areas, such as the Eastport peninsula and the region from the western boundary of Terra Nova NPC to the Terra Nova River.

Site Restoration

Parks Canada attempts to actively restore the natural vegetation and landscape form in disturbed areas within the national park. Such opportunities normally occur in tandem with recapitalization of assets in an area, and are identified through assessing cumulative impacts and habitat fragmentation in the park. Edge habitat is of high concern, as park development has resulted in 383 km of interface between developed areas and natural habitat. Potential restoration sites have been inventoried, mapped using GIS, and identified for restoration. Priority sites include the Big Brook gravel pit, the old abandoned Eco-Science building and parking lot, the old playground location in the housing area, old, unused loops in the Newman Sound Campground, the site of the old Newman Sound visitor cabins, the Headquarters Wharf area, the old Charlottetown warden

Residence site, and the old Conservation Corp camp location. Priorities will be refined as opportunities arise, and will be based on selecting projects that are the most ecologically effective, economically efficient and socially engaging.

Managing Resource Harvesting

With the exception of a regulated sport fishery, resource harvesting in Terra Nova NPC is not permitted⁴. Parks Canada enforces this prohibition through public education, compliance activities and law enforcement. Parks Canada regulates the sport fishery in Terra Nova NPC through a permit system and catch restrictions, as well as periodic closures under a Superintendent's order where it is necessary to do so for the protection, conservation and management of fish in park waters. As well, cooperative management is employed on water bodies with joint jurisdiction, such as through the Northwest River Atlantic Salmon Conservation Working Group, a joint effort of Fisheries and Oceans Canada, Parks Canada and community residents. Resource harvesting beyond the boundary of Terra Nova NPC has the potential to impact migrating populations of wildlife. Parks Canada works with the Province of Newfoundland and Labrador's Environment and Conservation Department, Wildlife Division, to mitigate the accidental mortality of Newfoundland marten in snares and traps set legally for other furbearers outside of the park. Parks Canada is also assessing the health of river otter populations that occur along the terrestrial/marine interface. Park staff will continue to work with local residents and external organizations to seek the sustainability of those activities related to resource harvesting outside of the park that have impacts inside the park.

Zoning

Zoning is a tool used by Parks Canada to integrate visitor experience, education and resource protection in ways that ensure ecological integrity is maintained. The park zoning plan identifies areas that are of high

⁴ Exceptions would include if harvesting is authorized under special conditions, existing Aboriginal or treaty rights, comprehensive land claim settlements and/or park establishment agreements.

ecological value, or are particularly sensitive to disturbance and directs visitor and operational use to more resilient areas. The majority of the park is currently designated as Zone 2: Wilderness Area. (See Chapter 10: Zoning Plan, and see MAP 4: Zoning Map). In future, a wilderness area will be declared under the *Canada National Parks Act*, encompassing most of the zone 1 and 2 areas of the park. This declared wilderness area will afford a higher level of legislative protection to these areas.

C. Public Understanding and Support

Education is a key part of the integrated Parks Canada mandate. Through public education and awareness, Parks Canada builds support for key actions that will improve ecological integrity in Terra Nova NPC. Even though current support for education programs in the park is high, recent studies have shown that public understanding of the concept of ecological integrity, as well as the threats to park ecological integrity is low, especially for residents of local communities and repeat campers (Bath 1999, Pitcher 2006). The Heritage Presentation staff in the park have a strong role to play in conveying these messages to key audiences through personal and non-personal programming.

In addition, a dedicated Communications Specialist facilitates the communication of all resource conservation issues. Communication plans, prepared for all ecological integrity issues, outline key communication objectives, appropriate messages, target audiences and identify the best delivery methods for building support for management actions. Appropriate evaluation techniques are also incorporated into all plans to measure the effectiveness of the communications for each issue.

In order to increase the support of key stakeholders for the park, Parks Canada aims to supplement traditional interpretation and outreach programs with greater participation on community, regional and provincial working groups⁵. Because the land use decisions beyond park boundaries influence the

ecological integrity of the park, Parks Canada must engage other land managers and interested parties to arrive at solutions that offer mutual benefit.

D. Law Enforcement

Park wardens in cooperation with other agencies are responsible to enforce laws protecting the park and its resources. Compliance staff assist in this role by engaging the public and informing them of regulations. Illegal activities that impact the park include poaching (salmon, moose, trout), illegal snaring, illegal fishing, illegal snowmobiling and illegal cutting of firewood. A law enforcement plan guides enforcement activities, identifying priorities of aquatic resource protection, wildlife protection, environmental protection, visitor use issues and cultural resource protection.

Strategic Goal:

To protect, maintain and restore ecosystem structures and processes of the Eastern Newfoundland Atlantic Region in Terra Nova NPC.

Objectives:

1. Protect and restore natural forest succession.
2. Protect and restore natural community structure and processes of aquatic ecosystems.
3. Sustain viable native species populations in the park and the greater ecosystem.
4. Protect and restore natural ecosystem connectivity.
5. Facilitate or encourage public understanding, and support management decisions that aim to ensure ecological integrity.

Management Actions:

Parks Canada will:

- increase awareness and public support for achieving ecological integrity through stewardship programs, education, partnerships and engaging the public in research and monitoring;
- undertake social science research on pertinent ecological issues especially regarding public beliefs, understanding and awareness, to better inform management

⁵ Examples of groups that Parks Canada participates in currently: regional forest management boards, forestry zone planning, the Northwest River Atlantic Salmon Conservation Working Group, Species at Risk Recovery Teams and Education/Stewardship Committees, Marine Protected Areas Working Group.

decisions to ensure the park's ecological integrity;

- develop and implement consultation and communication strategies regarding invasive species (e.g., introduced moose) based on social science research;
- work with stakeholders in the recovery of species listed under the *Species at Risk Act* such as cod, red crossbill and marten;
- conduct research and monitoring projects with partners, including local residents, university and government researchers and Aboriginal communities including:
 - determining the impacts of invasive species (moose, red squirrel, snowshoe hare) on forest succession;
 - effectiveness of fire as a management tool in the park;
 - baseline information on aquatic ecosystems and impacts of sport fishing;
 - inventories for invertebrates, fungi, and lichens, as well as status surveys for forest vegetation distribution, rare plants, and lichens;
 - impact assessment studies (e.g., roadside pollution, roadside restoration, impacts of local landfill on adjacent areas);
- continue to develop and test monitoring protocols on remaining wetland and barren ecosystems, and refine measures for aquatic and forest ecosystems;
- monitor the key measures of ecosystem indicators as per the bioregional monitoring plan for the park, and ensure that monitoring activities contribute to State of the Park reporting, and park management decisions;
- continue to monitor species listed under the *Species at Risk Act*, and continue to work with others to ensure the viability of these species in the park and the greater park ecosystem;
- implement measures outlined in the park's Fire Management Plan to promote natural forest regeneration;
- address the impacts of invasive species using research and active management;
- implement research and management initiatives, along with Gros Morne NPC, Aboriginal communities and park stakeholders, related to non-native moose populations and associated detrimental ecological impacts on the forest ecosystem;
- implement the direction, measures and initiatives proposed in the Terra Nova NPC Aquatic Management Plan;
- assess and evaluate development proposals and decommissioning projects with the aim of ensuring that there is no increase in the development footprint within the park;
- develop and implement restoration plans for priority sites based on the principles of being ecologically effective, economically efficient and socially engaging;
- reduce the impacts of park infrastructure and utility corridors by removing them when no longer in use, reducing the amount of disturbed area and mitigating the impacts of existing infrastructure. New development should only occur if merited for public benefit or for park operational purposes, when compatible with the Agency's integrated mandate and the ecological integrity of the park;
- work with land managers responsible for land outside park boundaries to contribute to land use decisions and to mitigate or reduce impacts of external land uses on park ecosystems, and encourage the development of a regional integrated land use plan;
- work with others to document and understand potential effects of land use adjacent to the park and support sustainable land use planning and development;
- prepare a *State of the Park Report* in advance of the next park management plan review;
- complete the work necessary to declare a designated wilderness area in the park during the next management plan review; and
- ensure the Field Unit Law Plan is updated annually and implemented, and continue to work with other law enforcement and emergency service agencies to help achieve ecological integrity and public safety objectives.

5.0 Cultural Resource Management

Terra Nova NPC possesses a rich human history. Communication of the human history of the park provides important insight for the visitor into natural values of the park and their importance for many generations of users. Parks Canada has a responsibility to protect the cultural heritage as well as the natural heritage found in the park and to present these values to enrich visitors' experiences of the park.

The park's cultural resources include:

- archaeological sites in Clode Sound, from Maritime Archaic Indian (approximately 5000 to 3500 years BP) and Paleo-Eskimo (approximately 2500 to 2200 BP) periods. To date, five sites have been excavated in the park at Clode Sound but many others have yet to be documented or studied. The prehistoric archaeological sites have contained artifacts such as blades, flakes and scrapers;
- many historic 19th and 20th century settlement and seasonal-use features in the park, including mill sites and homesteads;
- the Minchins Cove cemetery, containing graves of residents of Minchins Cove from the 1880s, during the time when Minchins Cove was a seasonal sawmilling community.

Known cultural resources in the park have been mapped, although other archaeological features and possibly other historic cultural resources may be as yet unrecorded in the park. An electronic spatial database should be developed for archaeological features and for historic cultural resources to facilitate monitoring and management of these resources.

The state of *in situ* cultural resources is not well documented. According to the *State of the Parks 1997 Report*, the condition of the park's cultural resources ranged from



Interpreting the Forest. Malady Head Campground
Parks Canada – David Saunders

good to fair; the resources' condition has remained stable or improved. Baseline data is incomplete for cultural resources in the park, although in general resources are stable and undisturbed, as noted in a September 2005 preliminary assessment of the known archaeological sites. The cemetery is now protected by a fence and in "good" condition. Some known cultural resources have disappeared and salvage archaeology is sporadic.

Approximately 3000 artifacts have been excavated from the park's known archaeological features. Artifacts and associated records are stored in a Parks Canada facility in Halifax. However, other undiscovered artifacts may be at risk from erosion or theft.

In the fall of 1999, former occupants of the park area were interviewed as part of an oral

history project. In addition, staff conducted additional genealogical research for Minchins Cove. Local communities regard communication of the human history of the park as important, and the park continues to work with the communities to ensure that their stories are told.

Management direction for the cultural resources of the park is outdated or lacking. While the 1990 *Resource Management Plan for Pre-Historic Sites in Terra Nova National Park* offered direction for the five pre-contact sites that have been tested and/or excavated in Clode Sound, no plan was prepared for the fifteen features identified by J. Tuck in 1979, the Minchin Cove features identified by R. Ferguson in 1977, or the features subsequently identified by Sawicki (1980; 1984) and Schwartz (1992).

Mi'kmaq communities in Newfoundland and Labrador have expressed an interest in enhancing the knowledge of human history in the national park, and in future protection or interpretation of cultural resources in the park. The Federation of Newfoundland Indians and Miawpukek First Nation may have oral tradition that can provide information about any recent use and occupation of the region by Aboriginal peoples.

Goal:

To ensure the protection and presentation of the park's cultural values according to *Parks Canada's Cultural Resources Management Policy*.

Objectives:

1. Protect and manage *in situ* cultural resources and the historic and archaeological collections of Terra Nova NPC, based on sound historical and archaeological research.
2. Communicate the key messages related to the park's historic values to visitors and other audiences.

Management Actions:

Parks Canada will:

- develop a Cultural Resource Values Statement by identifying the park's cultural resources, their values and related key messages;
- dedicate Field Unit resources to cultural resource management in the park, and ensure that staff receive cultural resource management and other appropriate training;
- complete an inventory and spatial database of *in situ* archaeological and historic features, including an assessment of current condition and known threats and of conservation/protection needs;
- prepare a plan for the conservation and management of *in situ* cultural resources to guide protection efforts and interpretation of the cultural history of the park;
- ensure sound management of the artifact collection, specifically the registry of artifacts and policy for use of the artifact collection;
- identify needs for further research in support of cultural resource management;
- engage Aboriginal communities of Newfoundland and Labrador in the protection and interpretation of prehistoric and historic cultural features; and
- engage local communities and surviving former residents of the park in the protection and interpretation of historic cultural features and stories.

6.0 Visitor Experience



Kayaking near the Visitor Centre, Newman Sound. *Parks Canada – Dale Wilson, 1997*

Over 200 000 visitors visit Terra Nova NPC annually and a majority of these are repeat users from in-province. Terra Nova NPC offers opportunities for visitors to experience the terrestrial and marine ecosystems typical of eastern Newfoundland and Labrador, through a range of recreational activities (see APPENDIX B for a list of recreational activities) and through educational experiences of the park. In general, the predominant visitor experience may be characterized as front country camping and recreation in a boreal forest setting, attractive to family groups and repeat visitors. Visitors have the opportunity to have solitary, self-sufficient experiences, as well as serviced, interactive experiences with ready access to amenities. Opportunities to experience the park permit visitors to see, appreciate and understand the natural diversity and cultural heritage that the park protects, and to deepen personal support for Parks Canada's efforts to protect park ecosystems. Generally, the park offers meaningful visitor experiences in keeping with the expectations of the visitor population. The high number of repeat users leads to high expectations about the park's service offer.

6.1 VISITOR PROFILES

Understanding who visits the park, as well as prospective visitors' needs and expectations helps park managers to provide appropriate experiences, facilities and services. At Terra Nova NPC, the visitor profile remains largely consistent; however, social science research is helping to further determine visitors' understanding of key messages and expectations of the park.

Campers

Campers typically come from the Avalon Peninsula region or from the nearby communities of central Newfoundland and Labrador. Four visitation patterns have been identified among campers: those visiting on weekends, those visiting for a short stay (e.g., 2–3 days, mix of origins), those visiting for longer periods of time (2–3 weeks) and those who stay all summer (e.g., 8–10 weeks). They are attracted by the accessibility and level of services of the park. Annually, approximately 51 000 visitors camp in the park. In general, campers seek variety in evening programs, campfire programs and children's activities. The camping market segment increasingly seeks serviced camping, although some campers seek an unserviced, rustic or challenging camping experience.

Day Users

Day users are primarily local residents who visit the park's day use areas, including Sandy Pond (for swimming, boating) and picnic areas, as well as recreational fishers, hikers and golfers. These users enjoy the park's natural environment and visitor amenities but may have less interest in learning about the national park values or reasons for establishment. Such users do not seek interpretive programming or services, although they may participate in special programs and use high quality services and facilities at day use areas. They expect information about the availability of services and closures and require associated print material (e.g., maps) for their activities.

Highway Users

Approximately 1.6 million vehicles pass through the park each year. While the majority of people incidentally travel through the park en route to elsewhere, a proportion of this user group may be considered a prospective audience and is factored into the park's visitation count. This audience seeks little or no services aside from a safe and passable roadway, but is a potential audience for roadway signage and information, day use experiences, the Visitor Centre and services and experiences in the communities of the region.

Education Groups

This target market includes specialized learning groups from institutions or organized groups. Educational groups of school-aged children from Gander to Clarendville use the park programs primarily in the spring and fall. Non-visiting school audiences (students and teachers) are a target audience for outreach efforts (e.g., terrestrial program for high school biology and environmental science students). Education groups seek enhanced information on the Web site and other material in advance of a visit, and would benefit from promotion of educational programs and opportunities.

Tour Groups (Bus, Cruise)

Many tour groups originate from off-island. There has been an increase in tour groups

especially since the opening of the Visitor Centre. Many tour group visitors are from the Maritimes, Ontario and New England states (although international visitor groups are increasing), who are usually an older age group, often affluent, and may have accessibility needs. This target market typically visits the Visitor Centre and has a limited amount of time to enjoy programming aside from exhibits and the orientation video.

Local Residents

Local community residents, especially day users, make use of picnic areas and Sandy Pond day use area, hiking trails and evening programs. They seek access to familiar parts of the park, historical connections and special acknowledgement of their relationship to the park. This target market generally resents paying a fee to enter and use the park, but may be drawn by special programs with local interest. This group would benefit from concerted efforts to explain opportunities for park use and information about children's programming and special events in the park.

6.2 VISITOR EXPERIENCES, SERVICES AND FACILITIES

Terra Nova NPC offers a range of park experiences to visitors, primarily recreational and educational in nature.

A. Recreational Experiences**Camping**

Camping is the most popular activity in the park, undertaken by approximately 51 000 visitors per year (14 600 camper nights). Different camping experiences can be found at Newman Sound (347 sites, of which 101 have electrical service), Malady Head (99 unserviced sites) and 33 sites at eight primitive camping areas. Demand for serviced camping is on the rise. While not as popular as the serviced campground, Malady Head campground still appeals to a segment of park visitors and will remain open. The park's camping offer should be comprehensively reviewed to ensure a variety of camping experiences are available to meet different visitor interests.



Hiking the coastal trail, Newman Sound.

Day Use

The park receives a large number of day users in the park during the summer months, primarily using picnic areas, the Sandy Pond day use area (swimming, boating) and the lookoffs. As well, day users fish recreationally, golf and are increasingly participating in geocaching¹. Collection of day use fees is an ongoing challenge and needs to be addressed.

Hiking

Terra Nova NPC has approximately 69 km of trails. Since the last management plan, the trail system has been modified. The construction of the Visitor Centre has resulted in heavier use of the Coastal Trail, Buckley Cove and Blue Hill and greater demand for looped trails in that area. Visitors use some of the hiking trails as day use hikes, particularly those close to Newman Sound Campground. However, many trails are underused. The Outport Trail offers the only experience of a longer, multi-day hike with opportunity for primitive camping; this trail was once a loop, but is now linear due to the poor condition of one section of the trail.

Mountain Biking

Mountain biking is an emerging activity, and cyclists seek trails designed for varying abilities. Mountain biking trails are currently designated at Blue Hill West Trail and Dunphy's Pond, both some distance from the Newman Sound Campground, and at Greenhead Cove Trail, which starts at Malady Head Campground.

¹ Geocaching is an emerging pastime where Global Positioning System coordinates are posted on the Internet corresponding to a physical location on the ground with a "cache" containing a message or object.

Boating and Swimming

Aquatic activities are increasing in popularity. Visitors can swim, canoe, kayak and windsurf at the Sandy Pond day use area; as well, from Sandy Pond canoeists and kayakers can follow a water route into the backcountry for wilderness camping. Visitors can also kayak from the Salton's Visitor Centre. Kayakers are increasingly seeking routes or suggestions for day use and multi-day experiences. Other visitors access the park in their own sailboats or motorized vessels. The Salton's Visitor Centre offers docking and a range of other services (laundry, telephone, washrooms), and coastal sites in the park have wharves and firepits. The popularity of cruise excursions is increasing, although at present the opportunity is restricted to smaller cruise-ships in Newman Sound.

Fishing

Sport fishing for brook trout is permitted in the park in most ponds and streams. This activity is regulated by permit and by bag limits. Salmon fishing is only permitted at Northwest River, with the season subject to the recommendations of a joint working group. Currently, icefishing is restricted to Dunphy's Pond.

Golfing

Terra Nova NPC has an 18-hole golf course within its boundaries, managed under lease agreement by Twin Rivers Golf. Approximately 18 000 rounds are played annually at the golf course. Golfers may not realize that they are in a national park, since many enter the course from outside the park



Twin Rivers Golf Course. Parks Canada – Dale Wilson

and there is limited signage once in the golf course. Collection of user fees for golfers is a challenge and needs to be addressed.

Winter Activities

The park is open year round. Winter camping, ice fishing, cross-country skiing and snowshoeing are activities that visitors can undertake and winter school activities are organized. However, there is a widespread perception that the park is closed during the winter.

Discussion:

The park is primarily a camping park with a high repeat visitation, and the visitorship is highly sensitive to change in the kind or level of service. Park managers seek to meet demands for visitor service, but are constrained by aging infrastructure and competing demands. To support future management decisions Parks Canada will undertake several comprehensive assessments to review the park facilities, service offer, camping, trails and wharves. Following these assessments, priority areas for recapitalization and renewal will be identified.

Local communities have expressed an interest in linking local trails to the park's trail system. Such possible links will have to

be investigated with consideration given to ecological integrity, operations, public safety and visitor expectations. As well, any additional trail length may require compensating measures, such as the decommissioning and restoration of other trail segments elsewhere. Decisions about which trail segments to decommission would be taken only after analysis of visitor use patterns and after considering effects on the visitor experience.

The park is perceived as not being open for business in the winter. This perception is supported by a lack of personal programming and limited vehicle access to the campgrounds or trails. Few park facilities are winterized. Parks Canada aims to increase winter use of the park through greater promotion and an appropriate service offer, by first testing activities such as:

- keeping the Salton's Visitor Centre open year round as a centre of activities;
- encouraging use of Newman Sound Campground roadways as cross country ski trails, with winterized cooking shelters and heated washroom facilities;
- ploughing access to park entrances and day use areas; and
- encouraging use of Southwest Arm day use area for ice fishing.

Snowmobiling will not be permitted in the park except for park administrative and operational purposes on the authorization of the park Superintendent. Corridors through the park for snowmobile access will not be permitted; such corridors would further fragment the park and would have impacts on the park's ecological integrity, visitor experience and public safety.

Park visitors and stakeholders have identified the poor information and orientation for visitors in the park as problematic. The issues include poor or ineffectual signage along the Trans Canada Highway, poor directional signage to key facilities or service nodes, poor location of information and orientation for new visitors, lack of signage or other demarcation of park entrances so that visitors recognize they are in a national park. A signage study has been undertaken and will be implemented as resources are available particularly at park entrances, at

Newman Sound Campground and at the Visitor Centre. Public safety in the park is a shared responsibility between Parks Canada and visitors. Orientation and information for visitors should communicate how to prepare for a safe visit in the park.

Many areas of Terra Nova NPC are accessible to visitors with disabilities, including both of the campgrounds, the Salton's Visitor Centre and surrounding area, Newman Sound day use area, Sandy Pond day use area and all playgrounds and the Lookoff at Blue Hill, as well as administration facilities. Several trail systems in the park are not accessible.

Some visitors have remarked on the unevenness in service offer by staff, which is likely due to the difference in training of park staff, and staff from partner agencies. Partners and staff need to be recognized as a target audience for communications, and training should be consistent so that all those who interact with visitors offer a consistent level of service.

Fee collection is a problem in the park. Approximately 10 000 permits are sold each year (including daily, seasonal and tour group permits). Some park users do not pay fees for service. Some visitors expressed confusion about the method of paying fees, particularly in the absence of clearly defined park entrances or information. A comprehensive and equitable approach to ensure payment of fees for service needs to be explored.

Every five years, the park conducts a Visitor Satisfaction Survey, which provides some information on the level of visitor understanding of messages, level of satisfaction about services, and some knowledge of demographics of visitors. Further research needs include economic impacts on local communities to permit managers to communicate to others the economic benefits of the park in the regional context, and improved understanding of visitor use patterns especially to inform management decisions related to the park's trail system.

B. Educational Experiences

Parks Canada strives to communicate with Canadians about its activities for three purposes: to raise awareness of the system

of national historic sites, national parks and national marine conservation areas; to foster understanding and enjoyment of individual heritage places; and to strengthen emotional connections to and a sense of ownership of heritage places as important symbols of Canada. Effective communication of the key values of Terra Nova NPC adds to the visitor's experience of the park and is an integral part of maintaining public support for the park and its management activities.

Parks Canada has identified national messages and the key values of Terra Nova NPC that should be communicated to the public. These include:

National Messages:

- Canadians have a lot to be proud of in our national heritage places.
- Terra Nova NPC is a place where long fingers of the sea touch the sheltered landscape of an island boreal forest.
- With your help, Parks Canada will strive to protect the ecological integrity of our important heritage places for the benefit of all Canadians.

Park-specific Messages:

- The northern boreal landscape of Terra Nova NPC is a representative example of the unique character of Eastern Newfoundland and Labrador.
- Some introduced species (particularly moose) have a negative effect on the boreal forest.
- Fire is a natural part of change in the boreal forest.
- The cold, productive waters of the North Atlantic, influenced by the Labrador Current, reach into the heart of the park as long sheltered fingers of the sea.
- A rich intertidal community thrives where the land meets the sea.
- The rugged nature of the Newfoundland and Labrador environment has given rise to seasonal lifestyles based on resource use.
- Aboriginal peoples had a presence in the park before Europeans arrived.
- Local people have a history in the park, and their lives have been shaped by the landscape.

On-site heritage presentation programming in the park is concentrated in the Newman Sound Campground, Sandy Pond day use area and at Salton's Visitor Centre. Personal programming in the park includes guided hikes and theatre programs, supplemented by annual special events (e.g., Folk Festival). Parks Canada staff, park concession staff and staff of the Heritage Foundation for Terra Nova NPC deliver in-park programs. The regular interpretive programming will continue to be offered with an increased emphasis on hands-on ecology programs; staff will aim to increase participation by local youth specifically and by park visitors in general. A guided Healing Hike makes reference to Aboriginal traditional medicines and use of plants, and conveys broader messages about the human history of the park. Recreational guided programs (e.g., a hiking club) may be considered to augment the largely educational guided programming. Increased winter programs and special events (e.g., winter survival, skiing and snowshoeing) will be considered. Interpretive panels in the park are situated at trailheads, along popular hiking trails, at look offs, at the Nature House and at park entrances. In 1999/2000, panels were erected near cultural points of interest in Newman and Clode Sounds, providing information about the Aboriginal and European history of the area.

The Salton's Visitor Centre houses marine exhibits, historical/archaeological artifacts and murals and an orientation video about the park. The role of the Centre in the park's heritage presentation and orientation and information offer needs to be reexamined. This centre was established to provide interpretation for a national marine conservation area adjacent to the park that was not established. Few visitors recognize the Centre as a venue for information and orientation, and few visitors return a second time to the Centre for its heritage presentation offer. Heritage presentation efforts at the Centre do not effectively convey messages about the park's ecological integrity, and may contribute to the impression audiences have that the park protects a marine area (Pitcher 2006). Improvements are planned for the Centre's

interpretation of terrestrial and aquatic ecosystems. Publications for sale or publicly available provide additional information about the park.

Discussion:

Not all visitors partake in educational experiences offered in the park. Popular evening activities include those activities with some entertainment component (theatre program, campfire program). Some visitors identified that changing programs could increase their interest in park programs.

Aboriginal history of the park may not be effectively interpreted. Current interpretation provides an overview of history via interpretive panels on some trails and a display in the Visitor Centre. Special events (e.g., canoe building program) delivered in partnership with Aboriginal communities in Newfoundland and Labrador have been effective in telling the Aboriginal history of the park.

The effectiveness of in-park programming is partially assessed periodically through the Visitor Information Program² and custom surveys. Recent social science research³ measured the level of understanding and support for the system of national parks, the roles of Terra Nova NPC, and understanding of ecological integrity as it pertains to Terra Nova NPC. In general, the research found a low level of understanding of Parks Canada and Terra Nova NPC's role and about ecological integrity. This survey provides baseline data to track changes in the understanding, attitudes and behaviours of both repeat visitors and local community residents and is informing the design of interpretive programs.

C. Publicity and Communications

Publicity and communications for Terra Nova NPC is tied to Parks Canada's broader communication activities in Newfoundland and Labrador and Atlantic Canada rather than at

2 Terra Nova National Park Visitor Satisfaction Survey, 1999 (Visitor Centre); Terra Nova National Park Visitor Satisfaction Survey, 1998 (Front country campgrounds), Terra Nova National Park Visitor Satisfaction Survey, 1998 (Interpretive Activities)

3 Applying Social Science to Research in National Parks: Evaluating visitor and community understanding towards Canada's national park system: Final Report (2006) by Jill Pitcher, Bath and Associates.

the local level. However, park staff work with local tourism associations to partner on some marketing initiatives (e.g., advertising in tourism publications). The *Terra Nova Sounds*, the park's annual visitor guide, and the *Newfoundland and Labrador Vacation Planner* are available in the park and through outside partners such as at provincial visitor information centres.

Discussion:

Parks Canada is unable to fund extensive marketing campaigns and lacks personnel dedicated to marketing in eastern Newfoundland and Labrador. Expectations remain high that Terra Nova NPC staff will play a lead role in regional tourism development, economic and community improvement in this region and building relationships.

The lack of marketing and poor signage has resulted in decreasing visitation to the Salton's Visitor Centre and the park. Parks Canada aims to work with local communities and regional tourism, economic development and marketing bodies to investigate collaborative options and develop partnerships. Efforts the park can undertake in this area include improving signage on the highway and refocusing the Visitor Centre to serve a visitor reception role for the region.

Local residents are a key market for increased visitation. Options should be explored to increase their attendance, such as holding more youth programs (e.g., Junior Naturalist Program) or programs of interest identified by local communities (e.g., guided interpretive programs, dinner theatre, campfire events), having community appreciation days to promote the park offer and promoting the early-bird pass/reduced shoulder season camping rates. Promotion of regional events (e.g., 50th anniversary of the park establishment) provides a way to unify and focus marketing efforts to attract audiences.

Goal:

To ensure that visitor experiences in Terra Nova NPC are diverse, compelling and support the integrated approach to fulfilling the Parks Canada mandate.

Objectives:

1. Provide opportunities for visitors to experience terrestrial, marine and freshwater environments of the park year round.
2. Increase understanding, appreciation and support for ecological integrity, Terra Nova NPC's role in the system and for Parks Canada Agency among park visitors and local communities.
3. Orient, inform and welcome park visitors and encourage respectful use of the park's natural values.
4. Ensure a high level of visitor satisfaction with park experiences, facilities and amenities.
5. Increase local community use of the park.
6. Raise the profile of and attract new visitors to Terra Nova NPC and the region.
7. Maintain the current loyal visitation of the park.

Management Actions:

Parks Canada will:

- conduct a full review of the camping offer within the park, with the goal of establishing the appropriate service offer that meets Parks Canada's goals with regard to maintaining or improving ecological integrity, increasing visitation, increasing revenue, enhancing the visitor experience and providing a safe and enjoyable visit;
- conduct research on the segment of the public that do not visit the park, in order to provide a better understanding of the visitors' needs and expectations and evaluate the current visitor experience opportunities that are offered;
- continue to support a variety of camping experiences in the park throughout the year, including semi-serviced, non-serviced, primitive and group camping;
- continue to offer both electrical and unserviced sites, potable water, a dumping station, communal fire pits, and camper amenities and programs at Newman Sound Campground, and explore opportunities to improve visitor amenities, such as addressing wastewater management, improved potable water access, campsite size and other services;
- maintain Malady Head Campground as a rustic, tranquil campground with basic

services and opportunities for group tenting, and enhance the camping experience by restoring selected sites to natural conditions;

- maintain the primitive campsites on the Outport Trail and at Dunphy's Pond, and consider additional locations in the park for primitive campsites accessible by sea kayak and hiking;
- work with the users of Over's Island to ensure an appropriate level of use for the area that is consistent with Parks Canada's mandate;
- inspect and assess wharf access to coastal primitive campsites to improve the visitor experience;
- explore the winter service offer in the park, such as grooming select cross-country ski trails and facilitating access to key day use areas;
- assess the park trail system for the access it provides to the range of park ecosystems and for trail condition and use, considering the following:
 - providing access to a variety of ecosystems, within their capacity to support visitation;
 - enhancing the national park's ecological integrity and minimize habitat fragmentation;
 - accommodating visitor use patterns and preferences, including mountain biking, an activity rising in popularity, where appropriate;
 - rendering the trail system more efficient to recapitalize and maintain;
 - exploring opportunities to connect with trail systems beyond park boundaries and, if appropriate, partner with adjacent communities to expand the trail system;
 - ensuring that the trail system meets the objectives of the park and ensure that future developments over the long run result in no net increase of disturbance by the trail system to park ecosystems;
- encourage appropriate exploration of the marine environment adjacent to the park by continuing to encourage a boat tour concession in the park and providing wharf access following an inspection and assessment of park wharves;
- orient and inform park visitors year round at points throughout the park by effectively identifying and providing a sense of welcome at park entrances, providing effective directional signage to park amenities and services, and improving the Visitor Centre to provide a regional information role year round with visitor amenities and services;
- offer special programming to engage local residents, visitors and stakeholders in scientific research and monitoring to broaden understanding and support for heritage protection efforts and for park ecosystem values;
- undertake social science research to monitor the effectiveness of heritage presentation and outreach efforts to better inform management decisions;
- continue to encourage and support third-party provision of enhanced visitor experiences and services in the park at established visitor service areas;
- undertake social science research to monitor and assess visitors' satisfaction with park experiences, facilities and services and to better understand visitors' interests, motivations and preferences, and use this information to support visitor experience management decisions;
- assess new or emerging recreational activities for their compatibility with the park's ecological integrity and visitor experience;
- assess the issue of fee collection and ensure consistent application of the fee policy for all park users;
- participate in regional promotion and marketing efforts in partnership with local tourism associations, Aboriginal communities and other interested parties;
- undertake social science research and use others' social science research to improve the effectiveness of external relations and marketing efforts; and
- investigate ways to increase use of the park by local community residents.

7.0 Outreach and Education



Bread Cove Brook. Parks Canada

Parks Canada undertakes outreach efforts in order to communicate to non-visiting audiences the values of the park. Outreach efforts communicate park themes and ecological integrity issues at Terra Nova NPC, primarily targeted at local schools and youth groups. Outreach programs are offered by Parks Canada staff and by staff of the Heritage Foundation for Terra Nova National Park. External funding and partnerships have allowed for more extensive programming on the Newfoundland marten and waste management education. In addition, brochures, handouts and other print media, and exhibits in local communities are used to raise local community awareness about the park's ecological integrity issues and to mitigate human impacts on the ecological integrity of Terra Nova National Park. These projects are often made possible through partnerships and external funding.

The Parks Canada Web site also provides another tool to reach virtual audiences. While the Web site for Terra Nova NPC is well developed it could benefit from an improved education component. The Internet is favoured both by educational groups (teachers, students) as well as prospective visitors seeking trip planning information. Pre-trip information outreach is a means of also preparing visitors for their park experience with respect to public safety. The Internet and other technologies provide opportunities for reaching diverse and distant audiences about the values of Terra Nova NPC.

7.1 AUDIENCES

Outreach and education efforts should be designed for park visitors, especially as a way to assist trip planning, and to shape visitor expectations about their park experience, as

well as for non-visiting audiences. Expectations of visiting audiences have been described in section 6.2. Other audiences for outreach and education include virtual visitors and educational groups.

Virtual Visitors

Virtual visitors learn about the park through the Internet, and seek accurate and up to date information for a range of purposes (trip preparation, education, general knowledge). This audience seeks a comprehensive and regularly updated Web site as well as access to print material.

Educational Groups

Educational groups are those audiences who may be learning about/teaching about Terra Nova NPC but may have no opportunity to visit the park. This audience includes teachers and students, who seek a comprehensive and regularly updated Web site as well as specialized educational program material.

Goal:

To ensure understanding, appreciation and support for Terra Nova NPC through effective communication of key messages to non-visiting audiences.

Management Actions:

Parks Canada will:

- develop and implement a heritage presentation plan for the park, based on an assessment of the heritage presentation offer, that identifies key messages for the park, reviews target audiences, and proposes activities and programs to ensure effective communication of messages;
- enhance the educational component of the Web site for Terra Nova NPC;
- prepare visitors for the visitor experiences of the park and the park service offer through a variety of media, including the Parks Canada Web site;
- increase public awareness to allow visitors to suitably prepare for the visit and participate in recreational activities in the park;
- seek new opportunities to work with educational institutions, formalize existing partnerships, and create new partnerships with other agencies and groups to communicate conservation and environmental issues;
- work in collaboration with Aboriginal groups to develop cultural history interpretation in the park;
- recapitalize the lobby of the Visitor Centre to better interpret the terrestrial ecosystems of the park; and,
- create a short looped trail near the Visitor Centre to interpret the human history of the Salton's area.

8.0 Stakeholder and Partner Relations



Aboriginal Awareness Day, Salton's Visitor Centre. Nick Langor, 2007

Terra Nova NPC benefits from collaborative relationships that help Parks Canada to meet its responsibilities to protect the natural and cultural heritage of the park, and to help Canadians to connect with this special place. Collaboration occurs in the fields of ecosystem protection and research, heritage presentation and outreach, and with the Province on asset management, with regional partners on marketing and promotion, with various groups on training and development initiatives, and with Aboriginal communities on a range of initiatives. The park's cooperating association, the Heritage Foundation for Terra Nova National Park, plays a key role in securing external funding in support of heritage presentation and resource conservation initiatives. The Heritage Foundation provides integral support services in the park at Salton's Visitor Centre (the Heritage Gift Shoppe) and at the Newman Sound Campground (grocery store, laundry and Nature House).

Park concessionaires provide invaluable additional services and products in the park. At the Salton's Visitor Centre, Oceanwatch Tours provides boat tours in Newman Sound; Terra Nova Adventures provides sea kayak rentals, lessons and guided tours; and the Starfish Eatery offers meals and snacks. At

Sandy Pond day use area, a concessionaire provides canoe and kayak rental and food services. Twin Rivers Golf Course, under long-term lease to third-party operators, provides visitors with high quality 18-hole and 9-hole golfing greens and associated services.

Law enforcement and compliance occurs in partnership with the Canadian Coast Guard, Fisheries and Oceans Canada fisheries officers and guardians, provincial conservation officers and the RCMP. Enforcement-related activities in the park include education and compliance efforts, and enforcement of the *Canada National Parks Act* and its regulations, and any other applicable acts or regulations. Public safety and emergency services agencies assist park staff to respond to emergencies and activities within park boundaries. In general, there is good cooperation and common understanding of the respective roles and responsibilities of each agency.

Ecosystem protection and research is undertaken in cooperation with other government departments, and the academic community. Research partnerships have been outlined in Chapter 4, and include partnerships established or desired with universities, local communities and Aboriginal peoples.

Ensuring positive relations with local communities is an ongoing concern for the park. Park managers seek to strengthen relationships with local communities, particularly with schools, tourism partners and local residents. A formal liaison committee once existed, but over time it was found to be an ineffective means of communicating with the park. Relationships with local communities are uneven, with some communities having closer ties to the park than others. Recent investigations about the interests of communities and the best methods to work and communicate effectively with local communities identified mechanisms such as joint projects, regular meetings with communities, issue-specific working groups and establishing a contact list for quick dissemination of information. Supporting the communities, through having listings of regional community events for example and having a presence at local special events and fundraisers, would demonstrate Parks Canada's interest in strengthening local relationships.

Terra Nova NPC is exploring potential collaboration with Aboriginal peoples in Newfoundland and Labrador, particularly with Mi'kmaq of Miawpukek First Nation and the Federation of Newfoundland Indians. Key areas of interest and joint effort have been identified, including presentation of Aboriginal culture and history, joint natural sciences research, monitoring and ecosystem protection. Parks Canada continues to work closely with Aboriginal communities to collaborate on various issues of mutual interest.

Goal:

To form strong partnerships and effective working relationships between Terra Nova NPC and others, that will strengthen mutual understanding and gain public support for the park's integrated mandate.

Management Direction:

Parks Canada will:

- continue to work with local communities to open communication about park management decisions, park operations and administration and continue to consider implications of park decisions on local communities;
- provide guidance to local communities to develop community-specific interpretation in communities, when appropriate opportunities arise;
- develop partnerships with Aboriginal communities in Newfoundland and Labrador on projects of mutual interest and mutual benefit;
- develop new and strengthen existing partnerships as opportunities arise, with specific interest in developing partnerships with:
 - the Heritage Foundation for Terra Nova National Park to continue to support the provision of visitor service, research and education;
 - the scientific community, to undertake research, where appropriate, with priority given to research projects with relevance to park management and to continue to support academic research;
 - tourism interests, to raise the regional tourism profile and attract visitors;
 - environmental and protected heritage area non-profit organizations, schools, universities, other government departments and other levels of government, to collaborate on public education and environmental protection aims;
- establish stakeholder issue-based working groups to gain stakeholder input and to provide information for park management decisions and an avenue for consultation and input related to ecological integrity issues, tourism/marketing, education/communication and visitor experience;
- continue to offer third-party concessions at the Visitor Centre, Newman Sound Campground and at Sandy Pond day use area; and
- continue to work with the managers of the golf course in the park to seek environmental improvement (e.g., Audubon certification), resolution of the fee collection issue and address other issues of mutual interest.

9.0 Operations and Administration



Biking along the bridge at Salton's Brook. Parks Canada – Nick Langor, 2006

The daily operations and administration of Terra Nova NPC are an integral part of ensuring the park is available to the Canadian public to access, enjoy and appreciate. The park's administration and operations are centred in the park: operations and many park staff offices are located in the park compound, and administrative functions and the Field Unit Superintendent's office are located in the Administration Building, near the Newman Sound Campground.

Key operational functions include law enforcement and public safety, fire protection, asset management (roadway and park facility maintenance) and environmental management in the park in general.

Law Enforcement and Public Safety

Parks Canada's law enforcement responsibilities centre on resource protection, as per the *Canada National Parks Act* and its regulations, which are the primary legislative and regulatory tools. Parks Canada works with other agencies, including the Canadian Coast Guard, RCMP and provincial and municipal agencies in the areas of illegal resource harvesting, public disturbance and emergency response. Parks Canada ensures the safety of visitors and staff in the park in accordance with a Public Safety Plan.

Fire Protection

Protection of park assets and adjacent communities from wildfires is a key concern of Parks Canada. Parks Canada has prepared a Fire Management Plan outlining use of fire as a vegetation management tool in the park as well as outlining fire response practices. This plan identifies zones of response, including areas close to park infrastructure and communities where fire response will be immediate and public safety and protection of property are paramount. Memoranda of Understanding have been established with other agencies to ensure prompt, collaborative action in the event of a wildfire that threatens communities or assets.

Roadways

Roadways in the park include 43 km of Trans Canada Highway and 29 km of secondary roadways, including the provincial Highways 310 and 301 within the park. Approximately 1.6 million vehicles annually pass through the park on the Trans Canada Highway. Each year there are a number of moose-vehicle collisions within the park, which has led to safety precautions such as increased signage and reduced speed limits through the park. Parks Canada respects the recommendations

of a 1994 study to add passing lanes to the Trans Canada Highway, but to date funding has not been identified for this major project. Parks Canada seeks to reduce the impacts of the Trans Canada Highway through measures such as restoration of the right-of-way with native vegetation use, through salt-management and improvements in culvert design.

Public Utilities

Currently, utility lines run through the park serving the park and adjacent communities with electricity, telephone and high-speed internet/cable service. The majority of utility lines run parallel to or close to roadways. Demand for installation of new utility services through the park is increasing. Parks Canada needs to respond consistently to utility service providers to ensure the ecological integrity of the park while not impeding the cost-effective and timely provision of important utilities for park operations, visitor use and local communities. A principle of “no net loss” should guide work with service providers to ensure that new infrastructure will not further fragment park lands.

Environmental Management System and Environmental Leadership

Parks Canada has national priorities for environmental management. The Environmental Management System for a park provides a framework that guides operations, purchasing and selection of new infrastructure. Managers of Terra Nova NPC should continue to strive for improvements in priority areas of environmental management in the park, and should consider the reestablishment of an environmental management system team to oversee efforts.

Park Facilities

The *Terra Nova National Park Building Analysis and Consolidation Study* (2003) recommended a number of adjustments to the use of existing structures in the park. The major recommendations have been accomplished, including moving staff from the Ecoscience Building and planning to decommission this building. Wharves in the park will be inspected and assessed, considering their contribution to visitor experience as well as operational and emergency response needs.

Water Supply

The park’s primary drinking water supply is Rocky Pond. The surface supply is regularly monitored and tested. Park managers will undertake field testing of new water treatment technologies that have proven effective under conditions similar to those found in the park, in an effort to enhance the management of the park’s water supply.

Goal:

To ensure efficient and effective park operations and administration that are fiscally and environmentally responsible and accountable to the public.

Objectives:

1. Ensure safe roadways in the park that facilitate access and circulation with minimal impact on park ecosystems.
2. Provide opportunities for a safe visitor experience.
3. Ensure well maintained facilities and infrastructure.
4. Demonstrate environmental leadership through park operations.

Management Actions:

Parks Canada will:

- maintain park roadways to ensure public safety, using environmentally responsible maintenance practices, and mitigate the impacts of the Trans Canada Highway on the park’s ecological integrity and aesthetic values through vegetation management, salt management, and culvert design improvements;
- complete and implement a Public Safety Plan for the park that emphasizes accident prevention in program and facility planning, and preparedness to respond to emergencies;
- ensure agreements and memoranda of understanding are developed with relevant agencies related to public safety;
- ensure the Field Unit Law Plan is updated annually and implemented;
- be a regional leader in environmental initiatives by meeting defined targets for greenhouse gas reduction, by exploring alternative energy conversion of park facilities and through environmentally sound waste management practices;

- undertake environmental management improvements through reestablishing an Environmental Management System Team, preparing and implementing an Environmental Management System plan, and tracking national environmental priorities;
- finalize a Fire Management Plan for the park and implement recommendations including possible “FireSmart” modifications at visitor and operational facilities;
- reduce the impacts of park infrastructure and utility corridors by removing them when no longer in use, reducing the amount of disturbed area and mitigating the impacts of existing infrastructure (priority candidates for removal over the next five years include: the Ecoscience Building; the decommissioned toilet and shower in Malady Head campground; and the swinging bridge over Wing’s Brook);
- review accommodation needs for park operations, considering operational needs, environmental impacts and financial implications;
- inspect and assess park wharves and determine future wharf requirements, considering visitor experience, resource conservation, emergency response and asset management needs; and
- identify and refer buildings forty years or more in age for evaluation by the Federal Heritage Building Review Office (FHBR).

10.0 Zoning Plan

The national park zoning system classifies areas according to their environmental values and suitability to provide and support visitor experience opportunities, facilities and infrastructure. The five zone categories are identified in *Parks Canada Guiding Principles and Operational Policies*. Terra Nova NPC has Zones 1 through 4 (see MAP 4: Zoning Plan).

The zoning plan has been amended slightly from the 1997 management plan, to reflect new knowledge or understanding of the park ecosystems' capacity to sustain use or reflect the current understanding of the use of areas.

Zone 1: Special Preservation (3.11km² or 1% of the park)

Zone 1 lands deserve special preservation because they contain or support unique, threatened or endangered natural or cultural features, or are among the best examples of the features that represent the natural region the park represents. Preservation is paramount. Motorized access is not permitted. This management plan confirms Zone 1 areas that were identified previously, including the Black Spruce-Cladina community, with adjusted boundaries, and Copper Island. Barren hill tops and the estuary of inner Newman Sound have been added as Zone 1 areas due to their environmental sensitivity and presence of rare vegetation.

Sites that are ecologically sensitive or of cultural heritage significance have been identified and updated based on studies undertaken since the last management plan. These areas merit an augmented degree of care and monitoring, although they are too small in area to merit being included as Zone 1 and are considered "Environmentally and Culturally Sensitive Sites." The park Superintendent may direct the special protection of these sites.

Zone 2: Wilderness (394.17km² or 98% of the park)

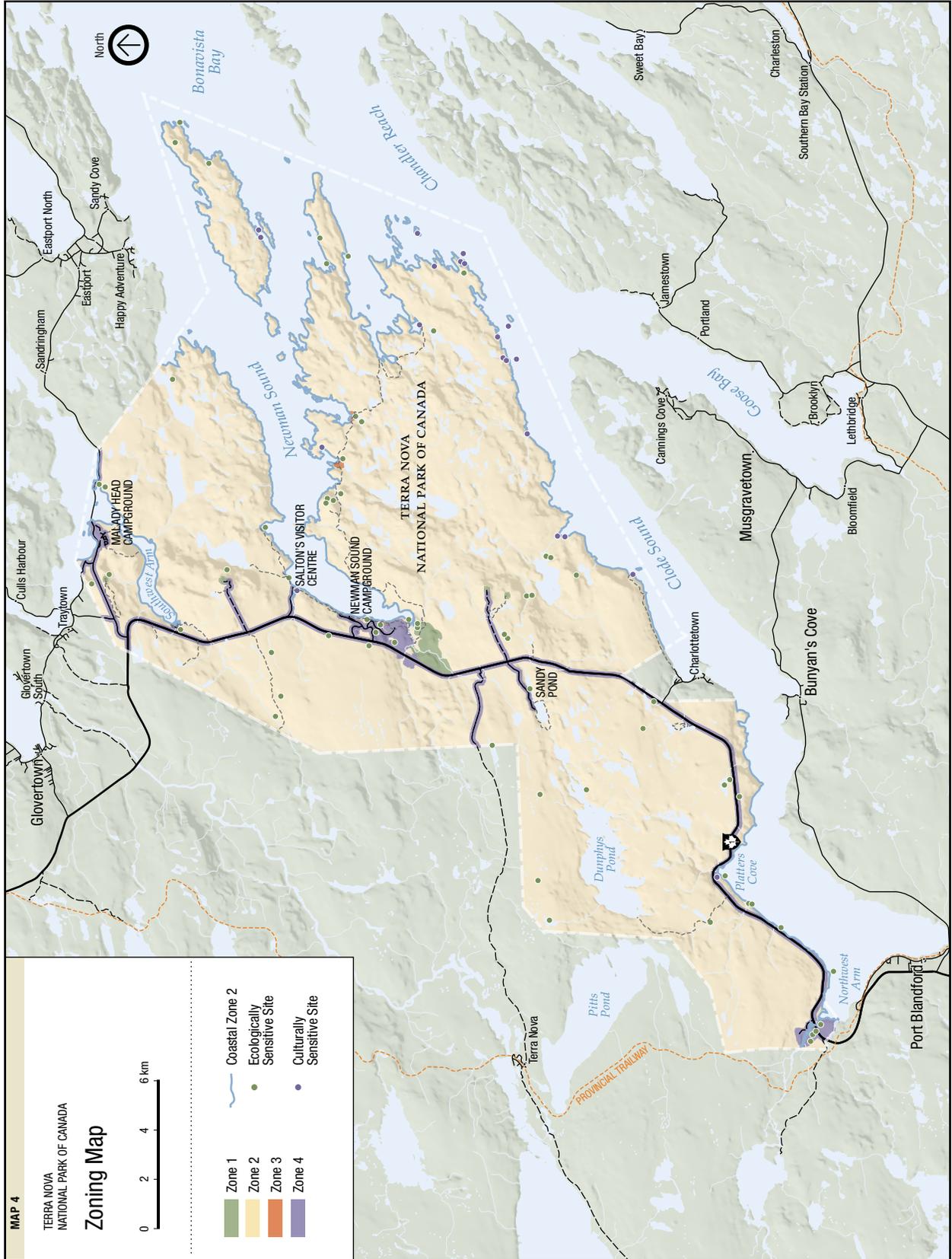
Zone 2 contains extensive areas that are good representations of the natural region and are conserved in a wilderness state. The perpetuation of ecosystems with minimal human interference is the key consideration. Zone 2 encompasses the majority of the park area. Adjustments from the last management plan are: the rezoning of Sandy Pond and the trail around the pond from Zone 3 to Zone 2, to better reflect the low-impact nature of use; the area between Newman Sound Campground and Salton's Visitor Centre, which had been reserved for future development that will no longer occur; and the rezoning of areas between roadways in Newman Sound Campground.

Zone 3: Natural Environment (0.34km² or 0.1% of the park)

Zone 3 areas are managed as natural environments, and provide opportunities for visitors to experience a park's natural and cultural heritage values through outdoor recreation activities requiring minimal services and facilities of a rustic nature. Zone 3 areas in the park remain largely unchanged from the last management plan, and include day use areas along the Trans Canada Highway and primitive campsites with wharves.

Zone 4: Outdoor Recreation (5.09km² or 1.3% of the park)

Zone 4 areas are those areas capable of accommodating a broad range of opportunities for understanding, appreciation and enjoyment of the park's heritage values and related services and facilities in ways that impact the ecological integrity of the park to the smallest extent possible and whose defining feature is the permitting of motorized vehicles on existing roadways. Zone 4 areas in the park are restricted to the Trans Canada Highway corridor, other roadways in the park, Newman Sound and Malady Head campgrounds and the golf course.



Non-conforming Use

Some zones support uses or activities that do not conform to the spirit and intentions of the zone type. In most cases these non-conforming activities will eventually be phased out when their presence is no longer required. Non-conforming uses include a road to Rocky Pond water supply (used infrequently) and utility corridors that fall within Zone 2 areas of the park (i.e., beyond the zone 4 park roadways).

Wilderness Area Declaration

The *Canada National Parks Act* provides for the designation, by regulation, of wilderness areas of the park. The intent of wilderness area declaration is to assist in ensuring a high level of ecological integrity by preventing activities likely to impair wilderness character. Only development and activities required for essential services and the protection of park resources will be permitted in declared wilderness areas. Human activities in declared wilderness areas will be managed based on ecological and visitor experience objectives and recreational use strategies, in accordance with the *Canada National Parks Act*.

Over the life of this management plan, park managers will work to seek public input to and acceptance of the concept of a declared wilderness area in the park. The designated wilderness area will be further considered in association with the next management plan review for Terra Nova NPC.

Goal:

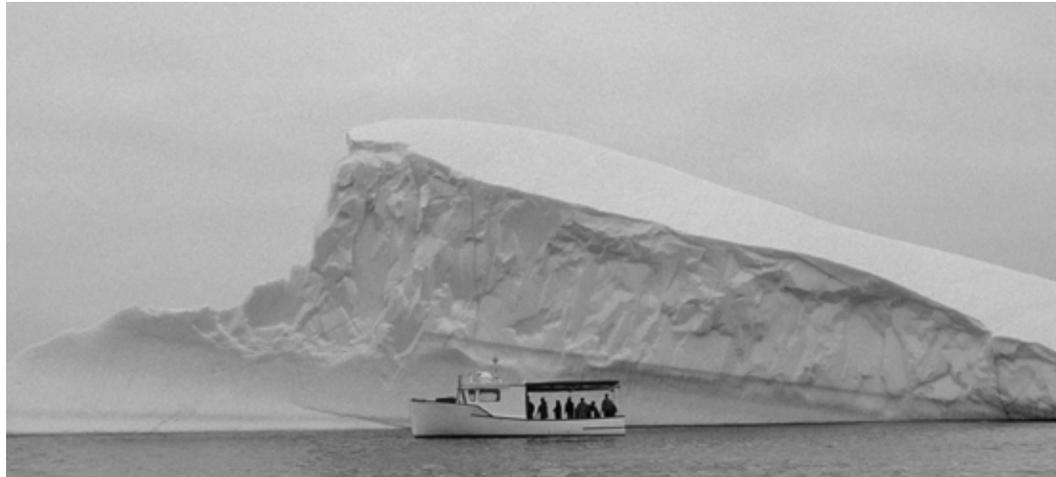
To ensure the appropriate zoning of Terra Nova NPC to protect ecological and other values of the park while offering opportunities for visitors to access the park, and while allowing for the necessary facilities and amenities to support visitors and adjacent communities.

Management Actions:

Parks Canada will:

- situate any new visitor experience opportunities, or new amenities or facilities in accordance with the park zoning plan;
- manage the park in accordance with the zoning plan; and
- complete the work necessary to declare a designated wilderness area in the park as part of the next park management plan review.

11.0 Impact Evaluation and Strategic Environmental Assessment



Oceanwatch boat tour. Parks Canada

A strategic environmental assessment of this management plan for Terra Nova NPC was conducted in accordance with the *1999 Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*, with additional guidance from *Parks Canada Management Directive 2.4.2–Impact Assessment* (1998) and the *Parks Canada Guide to the Environmental Assessment of Management Plans* (2000).

The strategic environmental assessment was conducted during the final draft stage of management plan preparation, to accommodate any necessary changes to the management plan prior to the development of this final text. The strategic environmental assessment focused on evaluating the direct, indirect and cumulative impacts of proposed strategies, actions and operational practices on the natural and cultural heritage of the park and its broader ecological setting.

In general, negative and positive impacts of the management direction have been anticipated by the management planning team and appropriate cautions and direction to

minimize negative effects are incorporated in the plan. Overall, the strategic environmental assessment recommends that park managers:

- ensure that the management of cultural resources does not diminish the natural values of the park;
- employ a spatial database to map ecological and cultural resources and visitor and operational facilities to assist management and identify potential cumulative effects;
- periodically review the park zoning plan between management plan review cycles, especially for ecological and culturally sensitive sites. (Note: the time to review the zoning plan is in tandem with the management plan review, although zoning plan amendments can occur in the interim, subject to public consultation and environmental assessment; this would be tabled as an amendment to the management plan); and
- ensure that any recapitalization or redevelopment considers a principle of “no net loss” in the park.

Several of the management plan proposals may trigger the need for a specific environmental assessment under the *Canadian Environmental Assessment Act*. These may include:

- active management of invasive species;
- restoration activities;
- new recreational activities;
- vegetation management, salt management and culvert design;
- removal of decommissioned infrastructure;
- recapitalization of park infrastructure/ introduction of new services; and
- sub plans, such as fire management plan, species at risk recovery strategies, aquatic management plan and cultural resource management plan.

On the whole, the proposed development and management of the national park does not present detrimental impacts to the national park. The strategic environmental assessment of the management plan states that:

The proposed vision, strategic direction and actions outlined in the [management plan] are consistent with Parks Canada and other federal environmental policies. Proposed actions strongly support the maintenance of ecological integrity within this national park. Potential adverse effects identified during detailed environmental assessments of the proposed projects and plans can be mitigated.

12.0 Implementation Strategy

The actions proposed in this management plan for Terra Nova NPC are implemented through the Field Unit's sustainable business plan. While the management plan is envisioned as a strategic guide with a life span of ten to fifteen years (reviewed every five years), the annual sustainable business plan offers a picture of five years at a time. The sustainable business plan identifies those actions of the management plan that will be realized within the next five years, and their timing and cost. Any changes to the five-year forecast are captured by the review and update of the sustainable business plan.

Implementation of this management plan is the responsibility of the Newfoundland East Field Unit Superintendent. The Field Unit Superintendent's three primary accountabilities at Terra Nova NPC are:

1. Ensuring ecological integrity and the cultural heritage values of the park.
2. Improving service to clients.
3. Making wise and efficient use of public funds.

Implementation of the actions proposed for Terra Nova NPC in this management plan, once approved, depends on the availability of financial resources.

New management initiatives are distinguished from on-going management direction. New initiatives are prioritized, identifying those initiatives that will be achieved within the first five years following management plan approval (specifying those that are contingent upon financial resources being available, particularly for site development), and those initiatives that will be achieved in future years of the life of the management plan. These priorities may be reconsidered in response to new circumstances or information, or changing national priorities and decisions. No priority has been assigned to initiatives beyond this broad phasing. Further prioritizing will occur during the course of Field Unit sustainable business planning.

Progress on the management plan implementation will be communicated through annual reporting on business plan performance. The management plan will also be subject to periodic review, and can be amended to reflect changing circumstances. The public will be consulted about major changes.

Service Line	Management Action	Priority Within the Next Five Years	Future Year Priority
<i>Ensuring Ecological Integrity</i>	Increase awareness and public support for achieving ecological integrity through stewardship programs, education, partnerships and engaging the public in research and monitoring.	•	
	Undertake social science research on pertinent ecological issues especially regarding public beliefs, understanding and awareness, to better inform management decisions to ensure the park's ecological integrity.	•	
	Develop and implement consultation and communication strategies regarding invasive species (e.g., introduced moose) based on social science research.	•	
	Work with stakeholders in the recovery of species listed under the <i>Species at Risk Act</i> such as cod, red crossbill and marten.	•	•
	Conduct research to inform park management decisions.	•	
	Work with partners, including residents, university and government researchers and Aboriginal communities in collaborative research and monitoring projects.	•	
	Continue to develop and test monitoring protocols or approaches on remaining wetland and barren ecosystems, and refine measures for aquatic and forest ecosystems.	•	
	Monitor the key measures of ecosystem indicators as per the bioregional monitoring plan for the park, and ensure that monitoring activities contribute to <i>State of the Park</i> reporting, and park management decisions.	•	•
	Continue to monitor species listed under the <i>Species at Risk Act</i> , and continue to work with others to ensure the viability of these species in the park and greater park ecosystem.	•	
	Implement measures outlined in the park's Fire Management Plan to promote natural forest regeneration.	•	
	Address the impacts of invasive species using research and active management.	•	
	Implement research and management initiatives, along with Gros Morne NPC, Aboriginal communities and other park stakeholders, related to non-native moose populations and associated detrimental ecological impacts on the forest ecosystem.	•	
	Implement the direction, measures and initiatives proposed in the Terra Nova NPC Aquatic Management Plan.	•	
	Assess and evaluate development proposals and decommissioning projects with the aim of ensuring that there is no increase in the development footprint within the park.	•	•
	Develop and implement restoration plans for priority sites based on the principles of being ecologically effective, economically efficient and socially engaging.	•	•
Reduce the impacts of park infrastructure and utility corridors by removing them when no longer in use, reducing the amount of disturbed area and mitigating the impacts of existing infrastructure.	•	•	

Service Line	Management Action	Priority Within the Next Five Years	Future Year Priority
<i>Ensuring Ecological Integrity</i>	Work with land managers responsible for land outside park boundaries to contribute to land use decisions and to mitigate or reduce impacts of external land uses on park ecosystems, and encourage the development of a regional integrated land use plan.	•	•
	Work with others to document and understand potential effects of land use adjacent to the park and support sustainable land use planning and development.	•	•
	Prepare a <i>State of the Park Report</i> in advance of the next park management plan review.	•	
	Complete the work necessary to declare a designated wilderness area in the park as part of the next park management plan review.	•	•
	Ensure the Field Unit Law Plan is updated annually and implemented; continue to work with other law enforcement and emergency service agencies to help achieve ecological integrity and public safety objectives.	•	
<i>Cultural Resource Management</i>	Develop a Cultural Resource Values Statement by identifying the park's cultural resources, their values and related key messages.	•	
	Dedicate Field Unit resources to cultural resource management in the park, and ensure that staff receive cultural resource management and other appropriate training.	•	•
	Complete an inventory and spatial database of <i>in situ</i> archaeological and historic features.	•	
	Prepare a plan for the conservation and management of <i>in situ</i> cultural resources to guide protection efforts and interpretation of the cultural history of the park.	•	•
	Ensure sound management of the artifact collection, specifically the registry of artifacts and policy for use of the artifact collection.	•	•
	Identify needs for further research in support of cultural resource management.	•	
	Engage Aboriginal communities of Newfoundland and Labrador in the protection and interpretation of prehistoric and historic cultural features.	•	•
	Engage local communities and surviving former residents of the park in the protection and interpretation of historic cultural features and stories.	•	
<i>Visitor Experience</i>	Conduct a full review of the camping offer within the park.	•	
	Conduct research on the segment of the public that do not visit the park, in order to provide a better understanding of the visitors' needs and expectations and evaluate the current visitor experience opportunities that are offered.	•	
	Continue to support a variety of camping experiences in the park throughout the year, including semi-serviced, non-serviced, primitive and group camping.	•	•
	Explore opportunities to improve visitor amenities at Newman Sound Campground, such as addressing sewage waste management, improved potable water access, campsite size and other services.	•	
	Enhance the experience at Malady Head Campground by restoring selected sites to natural conditions.	•	

Service Line	Management Action	Priority Within the Next Five Years	Future Year Priority
<i>Visitor Experience</i>	Consider additional locations in the park for primitive campsites accessible by sea kayak and hiking.	•	•
	Work with the users of Over's Island to ensure an appropriate level of use for the area that is consistent with Parks Canada's mandate.	•	
	Inspect and assess wharf access to coastal primitive campsites to improve the visitor experience.	•	
	Explore the winter service offer in the park, such as grooming select cross-country ski trails and facilitating access to key day use areas.	•	
	Assess the park trail system for the access it provides to the range of park ecosystems and for trail condition and use.	•	
	Encourage appropriate exploration of the marine environment adjacent to the park.	•	
	Orient and inform park visitors year round at points throughout the park by effectively identifying and providing a sense of welcome at park entrances, providing effective directional signage to park amenities and services, and improving the Visitor Centre to provide a regional information role year round with visitor amenities and services.	•	
	Offer special programming to engage local residents, visitors and stakeholders in scientific research and monitoring to broaden understanding and support for heritage protection efforts and for park ecosystem values.	•	•
	Undertake social science research to monitor the effectiveness of heritage presentation and outreach efforts to better inform management decisions.	•	•
	Continue to encourage and support third-party provision of enhanced visitor experiences and services in the park at established visitor service areas.	•	
	Undertake social science research to monitor and assess visitors' satisfaction and to better understand visitors' interests, motivations and preferences to better inform management decisions.	•	•
	Assess new or emerging recreational activities for their compatibility with the park's ecological integrity and visitor experience.	•	•
	Assess the issue of fee collection and ensure consistent application of the fee policy for all park users.	•	•
	Participate in regional promotion and marketing efforts in partnership with local tourism associations, Aboriginal communities, and other interested parties.	•	•
	Undertake social science research and use others' social science research to improve the effectiveness of external relations and marketing efforts.	•	
Investigate ways to increase use of the park by local community residents.	•		

Service Line	Management Action	Priority Within the Next Five Years	Future Year Priority
<i>Outreach and Education</i>	Develop and implement a heritage presentation plan for the park based on an assessment of the heritage presentation offer.	•	
	Enhance the educational component of the Web site for Terra Nova NPC.	•	•
	Prepare visitors for the visitor experiences of the park and the park service offer through a variety of media.	•	•
	Increase public awareness to allow visitors to suitably prepare for the visit and participate in recreational activities in the park.	•	•
	Seek new opportunities to work with educational institutions and formalize existing partnerships. Partner with other agencies and groups to communicate conservation and environmental issues.	•	•
	Work in collaboration with Aboriginal groups to develop cultural history interpretation in the park.	•	
	Recapitalize the lobby of the Visitor Centre to better interpret the terrestrial ecosystems of the park.	•	
	Create a short looped trail near the Visitor Centre to interpret the human history of the Salton's area.	•	
<i>Stakeholder and Partner Relations</i>	Continue to work with local communities to open communication about park management decisions park operations and administration and continue to consider implications of park decisions on local communities.	•	•
	Provide guidance to local communities to develop community-specific interpretation in communities, when appropriate opportunities arise.	•	
	Develop partnerships with Aboriginal communities in Newfoundland and Labrador on projects of mutual interest and mutual benefit.	•	•
	Develop new and strengthen existing partnerships as opportunities arise.	•	•
	Establish stakeholder issue-based working groups to gain stakeholder input and to provide information for park management decisions and an avenue for consultation and input.	•	•
	Continue to offer third-party concessions at the Visitor Centre, Newman Sound Campground and at Sandy Pond day use area.	•	
	Continue to work with the managers of the golf course in the park to seek environmental improvement, resolution of the fee collection issue and on other issues of mutual interest.	•	•

Service Line	Management Action	Priority Within the Next Five Years	Future Year Priority
<i>Operations and Administration</i>	Maintain park roadways to ensure public safety, using environmentally responsible maintenance practices.	•	•
	Complete and implement a Public Safety Plan for the park.	•	•
	Ensure agreements and memoranda of understanding are developed with relevant agencies related to public safety.	•	•
	Ensure the Field Unit Law Plan is updated annually and implemented.	•	•
	Be a regional leader in environmental initiatives by meeting defined targets for greenhouse gas reduction, by exploring alternative energy conversion of park facilities and through environmentally sound waste management practices.	•	•
	Undertake environmental management improvements through reestablishing an Environmental Management System Team, preparing and implementing an Environmental Management System plan, and tracking national environmental priorities.	•	
	Finalize a Fire Management Plan for the park and implement recommendations including possible “FireSmart” modifications at visitor and operational facilities.	•	•
	Reduce the impacts of park infrastructure and utility corridors by removing them when no longer in use, reducing the amount of disturbed area, and mitigating the impacts of existing infrastructure.	•	•
	Review accommodation needs for park operations.	•	
	Inspect and assess park wharves and determine future wharf requirements, considering visitor experience, resource conservation, emergency response and asset management needs.	•	
Identify and refer buildings forty years or more in age for evaluation by the Federal Heritage Building Review Office (FHBRO).	•		
<i>Zoning</i>	Situate any new visitor experience opportunities, or new amenities or facilities in accordance with the park zoning plan.	•	•
	Manage the park in accordance with the zoning plan.	•	•
	Complete the work necessary to declare a designated wilderness area in the park as part of the next park management plan review.	•	•

Acknowledgements

Parks Canada would like to thank all those who contributed to the development of this management plan. The management plan benefited from the input of many stakeholders who volunteered their time and shared their passion for the park. Particular thanks go to the members of the Community Working Group, representatives from the park's neighbouring communities, who contributed an invaluable local perspective throughout this process. Thanks to the Chief, Council and community of Miawpukek First Nation and to the Federation of Newfoundland Indians for sharing their interest, knowledge and stories. Finally, thanks to the park's concessionaires, staff and researchers who provided their perspectives about the internal workings of the park and contributed much to this management plan.

Community Working Group

Representatives and Alternates to the Group identified by their respective community or school:

Bunyan's Cove

Bruce Tucker, Gilbert Phillips

Charlottetown

Robyn Spracklin, Brenda Chaulk, Larry Spracklin

Eastport

Glenn Babstock, Mac Kelligrew

Glovertown

David Saunders, Maxine Gordon, Sam Butt

Happy Adventure

Carl Turner

Musgravetown

Jim Brown, George Greening

Port Blandford

Eric Squires, Chad Holloway

Sandringham

Glen Arnold, Rayburn Fifield

Terra Nova

John Davis, Allan McBride, Sam King

Traytown

Dan Garrett, Ron Lyttle, Leo Tulk, Hezekiah Arnold

Clarenville High School

Scott Thorne

Glovertown Academy

Bradley McCarthy

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Heritage Foundation for Terra Nova National Park of Canada

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Terra Nova National Park of Canada, Newfoundland East Field Unit

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Dave Côté, *Aquatic Biologist*

Boyne Drover, *Asset Management Coordinator*

Janet Feltham, *Park Warden*

John Gosse, *Terrestrial Biologist*

Darlene Hunter, *Executive Assistant to the Field Unit Superintendent*

Barbara Linehan, *Park Warden*

Karen Pitts, *Visitor Services Specialist*

Randy Power, *Park Ecologist*

Kevin Robinson, *Manager of Resource Conservation*

Mark Simpson, *Park Warden*

Greg Stroud, *Park Interpreter*

Atlantic Service Centre

Soonya Quon, *Management Planner*

Additional support from:

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Charles Burke, *Senior Archaeologist*

Debra Calder, *Cartographer*

Jim Candow, *Senior Historian*

Bill Flowers, *A/ Senior Policy Advisor,
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**Terra Nova National Park of Canada,
Newfoundland East Field Unit**

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Tracy Harvey, *Geographic Information
System Specialist*

Kristy Frampton, *Interpreter*

Dave Taylor, *Marketing Manager*

Wayne Patey, *Asset Manager (Retired)*

APPENDIX A**Overview of Public Consultation**

The management plan review process for Terra Nova NPC aimed to engage a wide range of the park's more than two hundred stakeholders, both groups and individuals. This was undertaken through a comprehensive three-phase public consultation process.

Phase 1 of public consultation commenced in spring 2005, when a first newsletter outlining the process, vision and key issues was sent by mail and email to Aboriginal communities, key stakeholders and politicians. Visitors to the park were also informed through the visitor guide and advance correspondence that the management plan review had commenced. A notice was placed on the Terra Nova NPC pages of the Parks Canada Web site.

Early in the process, a Community Working Group was established. The Community Working Group provided an opportunity for adjacent communities and youth representatives from local high schools to participate more directly in the management plan review process. The Working Group was convened during the review process to provide a community perspective on the vision, issues, draft management direction and public consultation approach. The Working Group met a total of five times over the course of the management plan review process, from March 2005 to May 2006.

Parks Canada staff were engaged through workshops and meetings held in April 2004, September 2005 and September 2006. A meeting with concessionaires was held in September 2005.

Phase 2 of public consultation was undertaken as a series of three multi-stakeholder Focus Group discussions with key stakeholders held in the park and in St. John's in October 2005. This provided an opportunity to discuss park management issues.

Phase 3 of public consultation involved the preparation and distribution of a newsletter in July 2006 that outlined draft management direction and solicited feedback on the draft direction. The newsletter was distributed to all households in the communities adjacent to the park and to all stakeholders on the mailing list. This was supplemented by two public open house sessions in August and September 2006. A summary of the feedback received was distributed in early winter 2007.

The Mi'kmaq communities of Miawpukek First Nation and the Federation of Newfoundland Indians were invited to participate in the management plan review process. Miawpukek First Nation, a status Indian community recognized by the federal government in 1984, is located on the southern bank of the estuary of Conne River on the south shore of the Island of Newfoundland. Mi'kmaq once travelled traditional waterways, connecting Miawpukek claimed traditional territory from the Baie du Nord River to the Northwest and the Terra Nova Rivers in the park. Miawpukek First Nation has collaborated with Terra Nova NPC in promoting Aboriginal culture, through projects such as the construction of a traditional birch bark canoe in 2005, and has a continued interest in communicating Aboriginal culture and heritage at the park.

The Federation of Newfoundland Indians was formed in 1973 to work toward federal recognition of Newfoundland's Mi'kmaq people. The Federation represents nine communities, including Sple'tk, Glenwood and Gander Bay in the central region nearest the park. The Federation shares Parks Canada's interests in protecting species at risk, ensuring ecological integrity, protecting cultural heritage and communicating Aboriginal heritage associated with the park and the region.

Miawpukek First Nation and the Federation of Newfoundland Indians were consulted during the management plan review process and their comments helped shape the final management direction. Consultation included meetings in summer 2005, a series of follow-up meetings held in winter 2006, and spring and summer 2006. Review of the final draft management plan was undertaken in winter 2007.

APPENDIX B**Results of Recreational Activity Assessment**

The recreational activities that occur in the park or that are emerging as activities of interest have been assessed for their compatibility with the park offer and ecological integrity of Terra Nova NPC. The following activities have been assessed as both permitted and appropriate in Terra Nova NPC, in some cases with conditions:

- Hiking
- Backpacking
- Running/jogging
- Road biking (internal park roads)
- Mountain biking (on designated trails only)
- Rollerblading
- Front country camping
- Primitive camping
- Campfires (in designated areas only)
- Touring by vehicle
- Group learning or activities (e.g., orienteering)
- Picnicking
- Nature viewing
- Pet walking
- Photography
- Geocaching
- Rock climbing
- Authorized sports activities and events (including triathlons)
- Golfing
- Recreational Fishing
- Swimming
- Kayaking
- Canoeing
- Sailing
- Windsurfing
- Scuba diving and snorkeling
- Tobogganing
- Cross country skiing
- Dog sledding
- Snowshoeing
- Snowboarding
- Ice skating
- Aboriginal ceremonies (conditions to be developed in cooperation with Aboriginal communities)

APPENDIX C**Research and Monitoring Initiatives****A. RESEARCH PROJECTS**

Moose exclosure study: Initiated in 1998, a collaborative project between Parks Canada, Memorial University and the Provincial Department of Natural Resources has enabled researchers to assess the long-term response of forest regeneration in Terra Nova NPC following the experimental removal of moose effects through fencing. Information has been obtained about seedling and sapling recruitment, understory plant diversity and abundance, and seed production. This initiative (component 1) is labour intensive and requires a yearly commitment to maintain infrastructure and to collect new long-term monitoring data.

Production and predation of balsam fir cones from non-native red squirrels: Red squirrels are known to remove a sizeable number of cones prior to dispersal. In addition various cone insects infest cones and cause the loss of up to 50% of seed, but the actual level of loss to these two sources and affects on the actual amount of seed dispersed is unknown in the park. Cone loss will be determined by monitoring loss on target trees throughout the park and loss to insects will be determined by sequential harvest from trees as the cones mature. The resulting seed rain will be monitored using the established seed traps.

Determining seeding densities to produce adequately stocked advance regeneration in fir prior to a potential reduction of moose density: Lack of adequate seed to re-establish advance fir regeneration dictates that seed must be added to the system; however, the impacts of other non-native herbivores on seedlings must be evaluated in order to add the sufficient seed to overcome their impact, following a potential reduction of moose.

To determine the impact of snowshoe hare, seeds will be planted at two densities (low and high) in sites with low and high densities of deciduous species (as these are known to suppress fir) with (– moose; – hare) and without caging (+ moose, + hare) and fir emergence and growth monitored. Seeds will also be sown within the large exclosures (– moose, + hare) and in the embedded hare exclosure (– moose, – hare). The impact of slugs on newly emerged seedlings will be determined by removal of slugs via non-toxic slugicides and/or trapping.

Abundance and habitat associations of meadow voles prior to the establishment of non-native red-backed voles in eastern Newfoundland: Compared with similar environments in eastern North America, the assemblage of small mammals on the Island of Newfoundland is less diverse. Only one microtine rodent, the meadow vole, is endemic and has an island-wide distribution. Southern red-backed voles recently expanded to insular Newfoundland in the late 1990's. The ecological consequences of this invasive species on native meadow vole populations have not yet been investigated on insular Newfoundland, however the potential impacts may be significant. A unique opportunity exists to investigate the interactions of these two vole species. The abundance and habitat associations of meadow voles will be investigated prior to and following the occurrence of red-backed voles.

Building the road to proactive and scientifically sound management of fish populations in Canada's National Parks: Recreational fishing is a rare example of a consumptive activity that occurs in national parks of Canada. Despite this status, monitoring and management of this resource, particularly

for nonanadromous species, has been very “loose”. Recreational fishing can severely impact species balance, abundance and the size structure of fish communities and has been identified as a contributing cause to the global fisheries crisis. A team of fisheries biologists has been assembled with the intent to develop a comprehensive, yet cost-effective fisheries management approach for national parks. Fisheries monitoring is moving away from collection of baseline data toward predictive modelling supported by minimal but focused monitoring. Such an approach will be scientifically defensible, economically feasible and allow managers to be proactive in their design of management plans. The ultimate goal of this project is to provide managers with tools for practical management.

Collaborators: Memorial University of Newfoundland, Indian Bay Ecosystem Corporation, Fundy National Park, Gros Morne National Park

Aquatic ecosystem connectivity – index and software development, application and communication: Fragmentation associated with dams and culverts is a pervasive stressor that impedes fish and invertebrate movement, results in lower fish production, reduced genetic diversity, demographic instability and impeded recolonization after disturbance. Parks Canada and its government, academic and greater ecosystem partners, have recently developed an index of ecosystem connectivity. This index will be refined through its application to aquatic ecosystems of three parks and their neighbouring working landscapes and develop software tools for users in other jurisdictions to inform managers on decision making, to educate Canadians on the impacts of fragmentation and report on ecological integrity.

Collaborators: Memorial University of Newfoundland, University of New Brunswick, Canadian Rivers Institute, Fundy National Park, Kejimikujik National Park and National Historic Site, Prince Edward Island National Park, Fundy Model Forest, Mersey-Tobeatic Research Institute, Fort Folly First Nation, Department of Fisheries and Oceans

Evaluating the efficacy of lake fish population monitoring using littoral zone sampling: One area of population assessment and monitoring affected by intra-lake movement patterns is mark-recapture netting or trapping programs. These types of programs are the dominant methodology for assessment of population status in temperate freshwater fishes. However, one of the difficulties of interpreting these data is determining effective recruitment of fish to the sampling gear across age and size classes, sex, and even sampling location. The precision and accuracy of current population assessment methodology (currently being tested in EILLF 0607-20) may be improved greatly by examining intra-lake movement patterns and how they interact with sampling equipment. These findings will enable for park workers to identify gear bias, correct for it in population assessment models and improve confidence in EI assessment, communication and management. We hope to test the hypothesis that intra-lake movement patterns of brook trout and recruitment to sampling gear are biased by size, age, sex, and possibly sub-population.

Collaborators: Memorial University of Newfoundland, Department of Fisheries and Oceans, University of New Brunswick, Canadian Rivers Institute, Indian Bay Ecosystem Corporation

Evaluation and development of aquatic and coastal monitoring protocols: Methods to monitor aquatic and coastal ecosystems in national parks will be field tested and evaluated. Findings will guide the implementation of monitoring in other parks in the Quebec-Atlantic bioregion. Protocols being developed and evaluated are water quality assessment through benthic invertebrates, monitoring of fish populations (stream and lake), monitoring climate change in lakes and monitoring bird, beaver and otter populations.

Collaborators: Memorial University of Newfoundland, national parks in the Quebec-Atlantic bioregion

B. MONITORING PROJECTS

- Distribution and abundance of Newfoundland marten
- Abundance of Atlantic salmon in Northwest River
- Eel grass mapping
- Population trend of coastal river otters
- Diversity and abundance of aquatic invertebrates
- Freshwater fish biomass
- Distribution and abundance of common loons
- Maritime shorebird survey
- Population trends of common and arctic terns
- Population trends of small mammal communities
- The diversity of ectomycorrhizal fungal communities
- Density of balsam fir/hardwood seedlings and saplings
- Forest biodiversity (Ecological Monitoring Assessment Network)
- Christmas Bird count
- Breeding Bird survey
- Distribution and abundance of beavers
- Exotic plant survey
- Water quality
- Long-term weather data
- Atmospheric deposition
- Stream hydrology

APPENDIX D
Bioregional Measures of the Forest Ecosystem

Table 1. Bioregional Measures of the Forest Ecosystem. **The measures that pertain to Terra Nova NPC are bold.**

<i>Measures</i>	<i>Link to EI Framework</i>		
	<i>Biodiversity</i>	<i>Process/function</i>	<i>Stressors</i>
Park landscape composition	% Successional stages by stand type	% Stands derived from natural disturbance processes (fire, insects, windthrow)	% Stands derived from past and current human activities
Park and peripheral landscape fragmentation			% Anthropogenic cover types, connectivity
Climate change			Temperature and precipitation trends associated with tree productivity
Forest birds	Richness	Abundance by guild types (trophic and succession)	Abundance/ occurrence of invasive and fragmentation sensitive species
Species at risk population trends	Abundance		
Key tree species		Productivity, mortality, recruitment and stand age structure	
Visitors and infrastructures impact			Number of visitor-days, km of trails-roads/km_, etc.
Focal mammalian herbivores		Abundance	Abundance/browse rate of overabundant species Hunting, road kills and poaching records
Focal mammalian carnivores		Abundance	Hunting, road kills and poaching records
Dead wood		Volume and state	
Non-tree vascular plants	Richness		Invasive aliens occurrence/ abundance
Decomposition		Rate of decomposition	
Lichens	Richness		Abundance/occurrence vs. pollution
Salamanders		Abundance	
Bryophytes	Richness		
Stand nutrient status		Concentration	
Soil arthropods	Richness	Abundance by trophic level/functional group	Invasive aliens occurrence/ abundance

APPENDIX E

Bioregional Measures of the Freshwater Park Ecosystem

Table 2. Measures selected for the stream monitoring sites.

Monitoring project	Protocol	EI measure	Metric
<i>Stream fish communities</i>	Multipass depletion electrofishing 50 m stream sections	Index of production	Biomass per unit area
		Stream fish biodiversity	Species richness/relative abundance
		Invasive species index	Native: exotic biomass ratio
		Fish health	Fulton's Condition Factor
<i>Stream invertebrate communities</i>	CABIN protocol (3 min. kicknet sample)	Stream invertebrate biodiversity	Species richness/relative abundance
		Index of eutrophication	EPT or similar index
		Index of aquatic health	Multivariate deviation from reference/distance to impact site
<i>Water quality</i>	Water sample chemical analysis	Water quality for aquatic health	WQI exceedances for relevant variables
		Index of acidification	WQI exceedances for relevant variables
		Index of eutrophication	WQI exceedances for relevant variables
		Index of land-use change	WQI exceedances for relevant variables
<i>Hydrology</i>	Fixed station stream gauges and pressure/temp. loggers	Stream flow variability	Richards-Baker index of flashiness
		Stream flow extremes	Ratio of yearly precipitation to runoff Low flow volume Annual maxima/minima
		Stream flow volume	Mean monthly flows
<i>Thermal regimes</i>	Fixed station pressure/temperature loggers	Salmonid stress	Days above 22° C
		Climate change	Degree days
<i>Freshwater mussels</i>	Live mussel collection and shell analysis	Aquatic productivity	Annual shell growth increments
<i>Anadromous fish</i>	Remote fence counts using motion detection video	Abundance by species	Adult counts
		Salmon fishing stress	Proportion of fish with net scars

Table 3. Measures selected for the pond monitoring sites.

Monitoring project	Protocol	EI measure	Metric	
<i>Pond productivity</i>	Triannual surface water samples – filtered on site	Primary productivity	Chlorophyll a levels	
<i>Water quality</i>	Biannual water samples (Long Range Transport of Air Pollutants – LRTAP)	Water quality for aquatic health	WQI exceedances for relevant variables	
		Triannual surface water samples	Index of long range transported pollutants	WQI exceedances for relevant variables
			Index of organic pollution	WQI exceedances for relevant variables
			Index of acidification	WQI exceedances for relevant variables
<i>Pond fish</i>	Index fyke netting in spring	Pond fish productivity	Biomass per unit area	
		Angling Stress	Proportion of biomass above minimum catch size	
		Fish health	Fulton's condition factor	
		Invasive species	Invasive species index	
<i>Temperature-depth profiles</i>	CDT sample Midsummer	Climate change	Mean temperature	
		Dissolved oxygen profiles in summer and winter	Thermal stress to fish	Water volume below thermocline
			Oxygen stress	Dissolved oxygen saturation

APPENDIX F

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