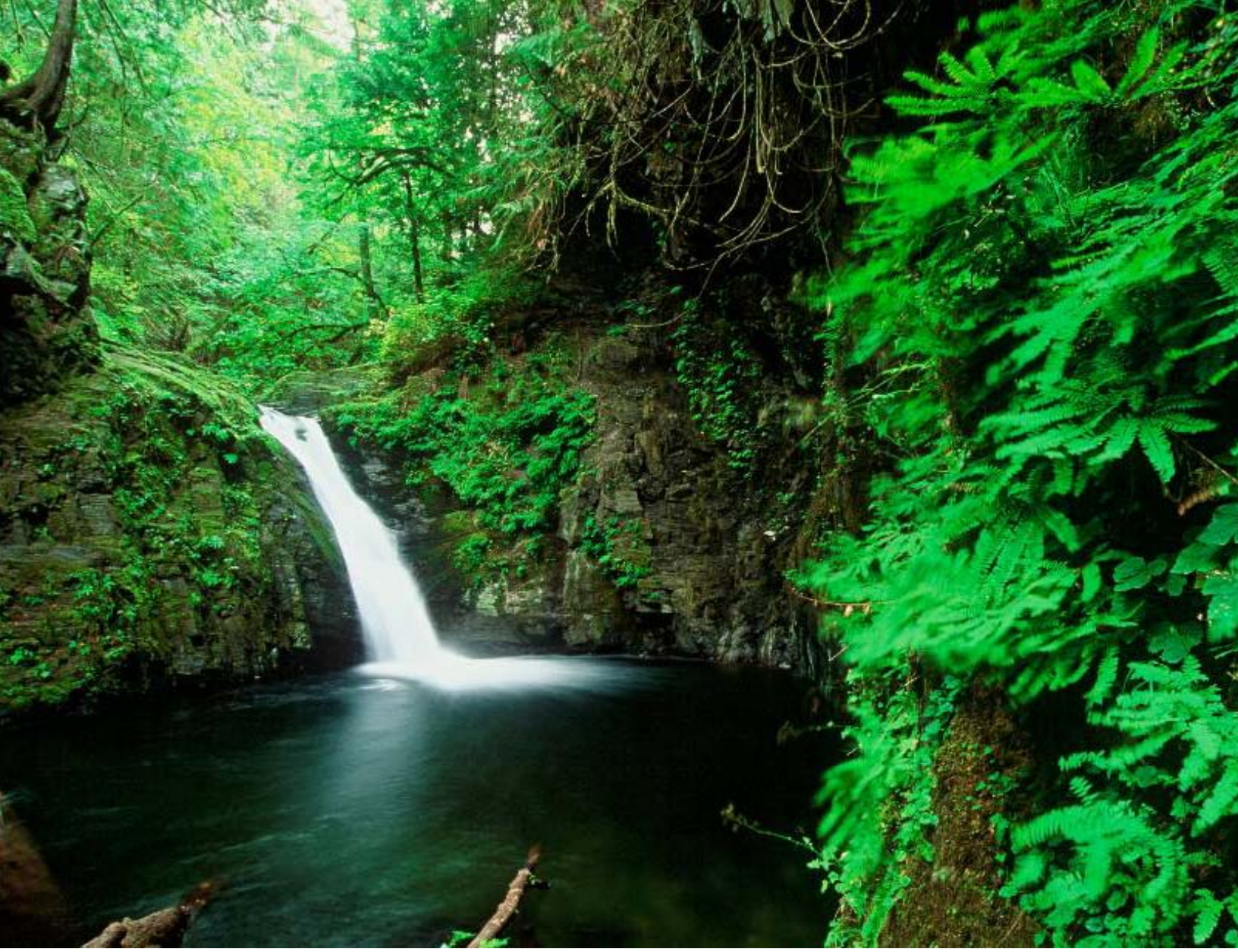


Canada’s 4th National Report
to the United Nations Convention on Biological Diversity

Cover Photo:

From “The Forests of Canada” collection,

Natural Resources Canada, Canadian Forest Services, 2003

Preface

Canada's 4th National Report to the Convention on Biological Diversity (CBD) is submitted in accordance with the Conference of Parties decision VIII/14. This report has been developed in accordance with the guidance provided in the Reporting Guidelines for the 4th National Report. As requested in the reporting guidelines, the fourth national report is organized around four main chapters, and includes a separate annex on implementation of the Global Strategy for Plant Conservation and the Programme of Work on Protected Areas.

The four main chapters are:

1. Chapter I: Overview of Biodiversity Status, Trends and Threats.
2. Chapter II: Current Status of National Biodiversity Strategies and Action Plans.
3. Chapter III: Sub-national Planning and Mainstreaming of Biodiversity.
4. Chapter IV: Conclusions - Progress Towards the 2010 Target.

The Ecosystem Status and Trends Report (ESTR) being developed under the Canadian Councils of Resource Ministers (CCRM) is the primary source of information for Chapter I. ESTR is the first product of the Biodiversity Outcomes Framework, approved by CCRM Ministers in 2006 and will provide a baseline assessment of ecosystem status and trends for future reporting. Status and trends in Chapter I are linked to the CBD's global framework of goals and targets for assessing progress towards the 2010 target to significantly reduce the rate of biodiversity loss. This will facilitate use of the information by the CBD Secretariat.

The Biodiversity Outcomes Framework approved by Ministers in October 2006 provides the organizing framework for reporting on status and trends in Chapter 1 and implementation of national biodiversity strategies in Chapter II. This will enable the establishment of a relationship between actions taken, desired outcomes and biodiversity status and trends.

Chapter 3 addresses the "mainstreaming" of biodiversity in Canada and includes examples of the growing number of players addressing biodiversity on a diversity of fronts. Chapter 4 includes a self assessment of Canada's progress towards the 2010 target as requested in the CBD guidelines including lessons learned and future directions.

Input to the content and format of the report has been obtained over the past several months from federal and provincial governments as well as a cross-section of non-government interests in Canada. With an aim to be illustrative, rather than comprehensive, this report highlights only a selection of biodiversity initiatives being undertaken within Canada.

Table of Contents

Introduction

The Nature of Canada's Biodiversity

Canada is defined by its vast expanses of wilderness, rich natural resource heritage and cultural diversity. The second-largest nation in the world, it encompasses a surface area of 9.98 million km², approximately 6.7% of the Earth's total. It is bordered by three oceans with 243,000 km of coastline. Freshwater covers 8.9% of Canada's surface; Canada has 7% of the world's renewable supply of freshwater and 20% of the world's total freshwater resources (including waters captured in glaciers and the polar ice caps). The country is characterized by a wide range of climates, which, along with many other factors, shape its diverse landscapes and waterscapes.

Canada is a steward of major portions of the world's tundra, boreal and temperate forest, and aquatic ecosystems, and of smaller expanses of grassland and polar desert ecosystems. About 40% of Canada is forests and woodlands, representing about 10% of the world's total forest cover. It has been estimated that Canada has about 25% of the world's wetlands, occupying roughly 14% of the country's area. Canada's Arctic constitutes about 20% of the world's circumpolar area.

Scientists have identified over 70,000 species occurring in Canada's diverse ecosystems, and as many more remain to be properly investigated. These range from well known-species of mammals, reptiles, amphibians, fish, birds and plants to less visible but equally important aquatic and terrestrial invertebrates, fungi and bacteria. Canada is home to some of the largest herds of free-ranging caribou in the world, as well as large wild populations of bears, wolves, martins, beavers, lynx and other mammals. Many of North America's migratory birds, including songbirds, waterfowl and shorebirds, take up residence in Canada during the spring and summer. Canada has a low percentage of endemic species compared to many countries, but approximately 54 species of vascular plants, mammals and freshwater fish and molluscs are known to be endemic to Canada.

Biodiversity's Contribution to the Health and Wealth of Canadians and the Sustainability of Canada's Natural Capital

Biodiversity is essential for healthy ecosystems, human health, prosperity, security and well being. For many Canadians, the diversity of spaces and species is also a source of emotional, artistic, and spiritual inspiration and cultural identity. Canada's diversity—often captured by painters, writers, and musicians—helps define Canada to its citizens. Care for the environment is constantly ranked as one of Canadians' top priorities in public opinion polls. Many Canadians recognize that biodiversity is a cornerstone of Canadian competitiveness, the foundation for Canada's natural resource sectors and the key to continued growth in other sectors such as ecotourism and recreation. Much of the Canadian economy is built on a natural resource base; recent statistics indicate that a significant portion of Canada's GDP is directly related to the use of natural resources, with approximately 2.7% from forests, 8% from agriculture and agri-foods (with 1.3% of total GDP from primary agriculture alone), 1.5% from the ocean sector, and many billions of dollars from nature-related tourism and recreational activities. Trade surpluses in the country largely depend on the export of natural resources. Biodiversity also serves as the basis for the emerging "bio-based economy", including the genomics, biotechnology and pharmaceutical industries. Many Aboriginal communities, particularly in the North, depend on the sustainable harvesting of biological resources for their subsistence as this harvesting provides a large portion of their food and income. Aboriginal peoples have also, over thousands of years, developed an intimate cultural and spiritual

relationship with nature.

The historical perspective on why Canadians care about biodiversity has been most focused on the direct benefits derived from forestry, fisheries, agriculture. Many Canadians associate biodiversity conservation primarily with wildlife, endangered species and protected areas. However, attention is increasingly shifting towards global "systems concerns" such as climate, water, and the global spread of pests and diseases. Governments and citizens are grappling with "big picture" issues and are developing new language and imagery to support this deeper understanding of the whole of biodiversity and its importance to providing not only natural resources and jobs but also ecosystem goods and services essential for human survival and well being. Recognizing that biodiversity conservation is as much about socio-economic systems as it is about species and habitats, initiatives such as the **Millennium Ecosystem Assessment**, provide a new way of looking at biodiversity and essential goods and services that flow from healthy and diverse natural systems, including:

- provision of food, timber, fibre and genetic resources;
- regulation of climate, floods, air and water quality and disease;
- pollination of plants, cycling of nutrients, and creation of soil and absorption of waste; and
- many recreational, aesthetic and cultural benefits.

These services provide economic, social and ecological benefits, many of which are irreplaceable by human systems. Those which could be replaced have been estimated to be worth trillions of dollars globally. Canada's boreal forest services alone have been valued at approximately $93 B per year, over 2.5 times greater than the net market value of boreal capital extraction in Canada.

Loss of biodiversity affects the ability of ecosystems to deliver these services in a changing environment. When demand for ecosystem services exceeds capacity, biodiversity is lost; when ecosystem services are in short supply, a small decrease can substantially reduce well-being. The depletion and degradation of ecosystem services represents a loss of a "natural capital" assets, the costs of which are poorly reflected in conventional economic indicators of well-being such as GDP.

In addition to providing valuable goods and services, conserving biodiversity maximizes ecosystem and human adaptability to unforeseen or difficult-to-predict changes in the environment and/or economy. As such, biodiversity provides Canada with *ecological resilience*, which is increasingly being recognized as essential if ecosystems are to be able to adapt to stresses such as climate change and invasive alien species and reduce the risk of catastrophic change. Biodiversity also provides Canada with *economic resilience* and a key competitive edge in the global economy that comes from natural capital/biodiversity-based industries, such as forest products, fishing, agriculture, and tourism.

Responsibility for the conservation and sustainable use of biodiversity is distributed across the breadth of Canadian society. Federal, provincial, and territorial governments all have jurisdiction over areas that impact biodiversity (see Annex I); additionally, municipalities, Aboriginal peoples, private landowners, industry, academic and scientific institutions, environmental non-governmental organizations, and Canadian citizens each play crucial roles in the maintenance of healthy ecosystems, species, and genetic resources. Due to the vast number of stakeholders involved, the conservation and sustainable use of Canada's biodiversity requires extensive collaboration and cooperation to ensure the well-being of biodiversity and citizens around the country.

Chapter 1: Overview of Biodiversity Status, Trends and Threats

1.0 Introduction

The status and trends presented in this chapter are organized to reflect outcomes in Canada's Biodiversity Outcomes Framework (see Chapter 2.0). Canada's federal, provincial and territorial governments have developed this action-oriented framework for implementing Canada's Biodiversity Strategy in harmony with the Framework for Measuring Progress towards 2010, developed by the Convention on Biological Diversity (CBD).

Most of the information in this chapter has been summarized from a report under development, Ecosystem Status and Trends Report (ESTR) for Canada. The ESTR is a federal/provincial/territorial initiative under the Canadian Councils of Resource Ministers and is intended, in part, to measure Canada's progress towards attaining the 2010 biodiversity target.

Where possible, the indicators used in this chapter have been selected to be compatible with the CBD framework of goals, targets and indicators (CBD Decision VIII/15). The indicators in this chapter focus on measuring progress at the national level. In a country as large as Canada, the national level is not always the most appropriate scale for measuring biodiversity. The ESTR uses 25 ecological units adapted from the National Ecological Framework for Canada. This ecological framework is hierarchical, and based on a combination of ecological, climatic and topographic factors. The boundaries of ecological units are identified in the map below and include terrestrial and marine units.

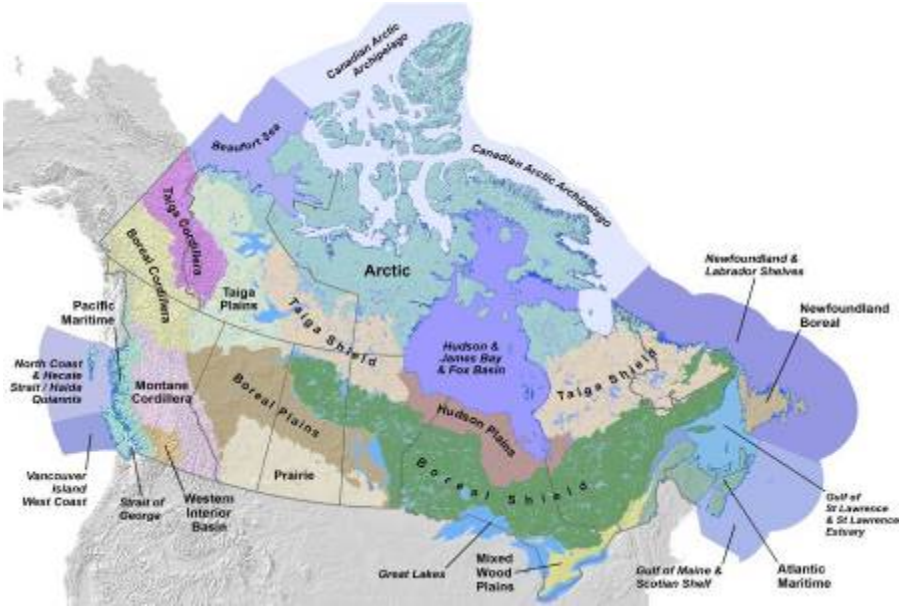


Figure 1: Boundaries of Ecological Classification System used in this report. The National Ecological Framework for Canada was updated to include marine units and to recognize changes in boundaries resulting from reinterpretation of the national system. In general the highest hierarchical level is used, except for two units at the second hierarchical level.

1.1 Outcome : Healthy and Intact Ecosystems

CBD Goal 1: Promote the Conservation of the Biological Diversity of Ecosystems, Habitats and Biomes

1.1.1. Indicator: Protected Areas

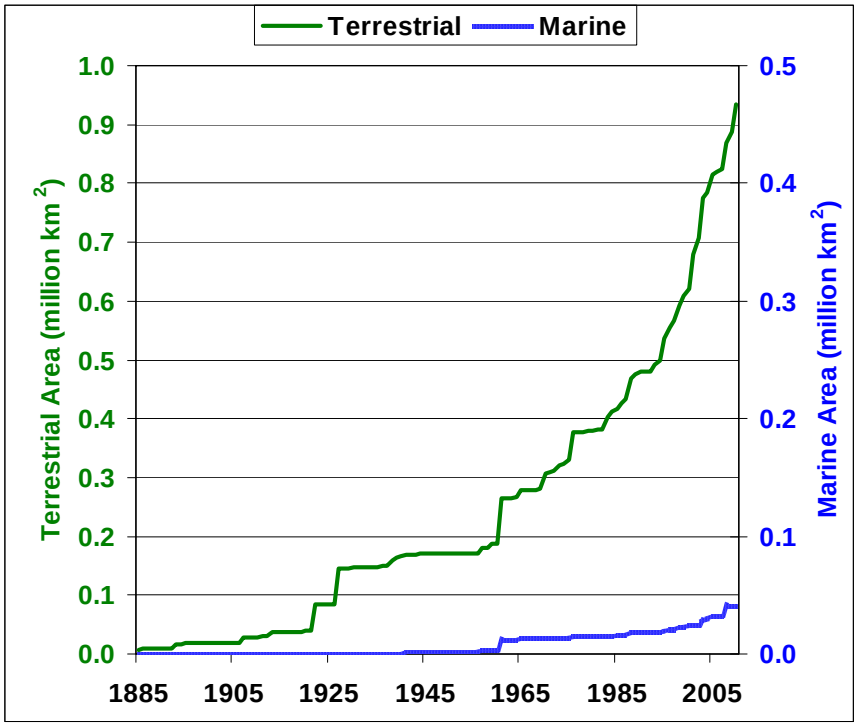


Figure 2: Cumulative area protected, based on sites with an IUCN category I-VI. Source:(Conservation Areas Reporting and Tracking System (CARTS), 2009).

Terrestrial Protected Areas Coverage

Canada's terrestrial protected areas cover 933,930 km^2. Since 1992 the number of protected areas has increased steadily and the percentage of land covered by protected areas is 9.4% as of June, 2009. Canada's terrestrial protected areas network consists of over 4850 protected areas, including some very old parks (e.g. Banff National Park is Canada's oldest park created in 1885, covering 6,641 km^2.), areas of international significance (e.g. Queen Maud Gulf Bird Sanctuary, a RAMSAR site, created in 1961, and covering 61,765 km^2 of Arctic tundra and marshes), and smaller areas representative of unique and endangered ecosystems (e.g. Point Pelee National Park, covering 15 km^2 in south-eastern Ontario, with many at-risk species representative of the Carolinian forest).

Marine Protected Areas

Approximately 45,280 km^2 (0.64 %) of Canada's oceans are protected. Although some terrestrial protected areas on Canada's coasts have marine components, the designation of specific marine

protected areas (such as designation of National Marine Conservation Areas by Parks Canada Agency and Marine Protected Areas by Fisheries and Oceans Canada) is newer. This includes some marine areas of global significance, such as Gully Marine Protected Area, the largest underwater canyon in eastern North America, situated 200 km off the coast of Nova Scotia.

Canada is known for its large freshwater lakes. The Great Lakes, for example, contain 20% of the world's accessible surface freshwater. Although only 0.54% of the Great Lakes system is protected, the largest freshwater protected area in the world, Lake Superior National Marine Conservation Area, is in the Canadian part of the Great Lakes. It consists of approximately 10,000 km^2 of lakebed and associated shoreline and 60 km^2 of islands and mainland.

Representativeness of the Protected Areas Network

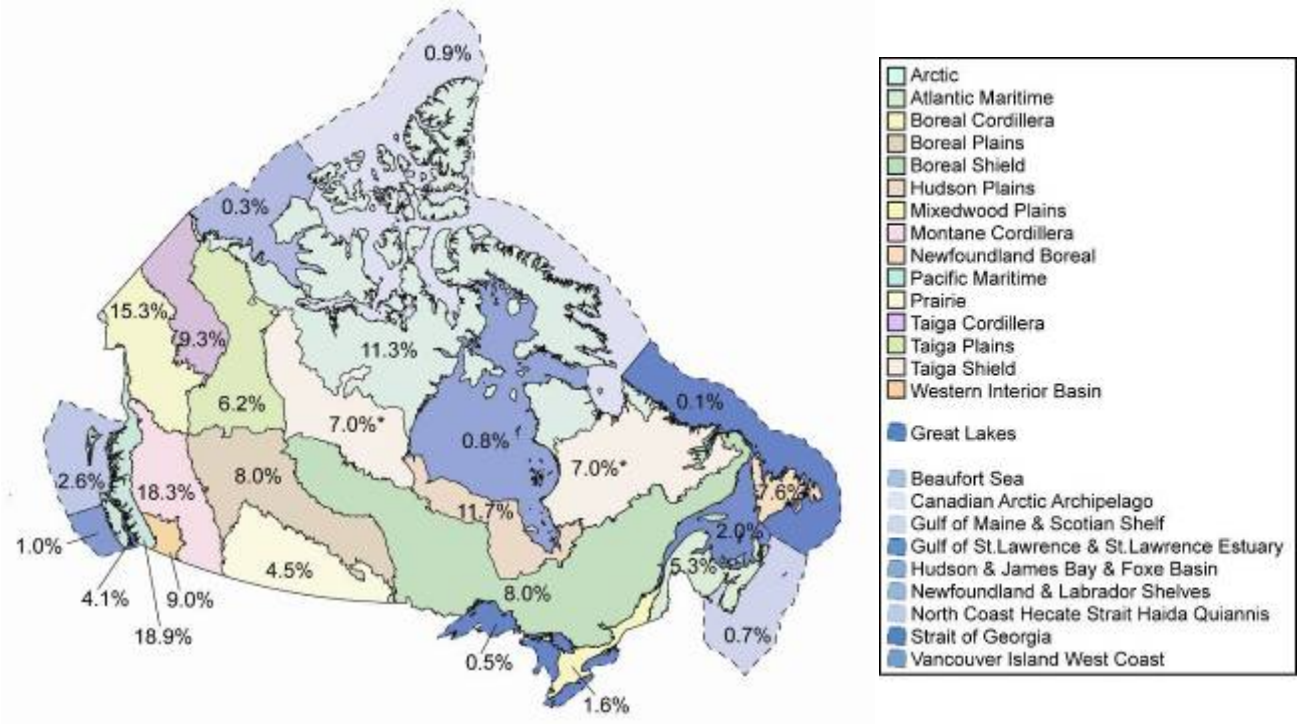


Figure 3: Representativeness of the terrestrial and marine protected areas networks by ecological units. Several terrestrial units in the north and west have over 10% of their total land area protected. The Mixed Wood Plains, which includes Toronto and Montreal, has only 1.6% protected. The Strait of Georgia, on the west coast of Canada, has the greatest percentage of its marine area protected (4.1%). Source: (Conservation Areas Reporting and Tracking System (CARTS), 2009).

The distribution of protected areas varies across the country (Figure 3). In the terrestrial context, greatest progress has been made in the Montane Cordillera, Boreal Cordillera, and Pacific Maritime ecological units, with 18.3%, 15.3%, and 18.9% protected. This partly reflects recent progress made by the province of British Columbia in completing comprehensive land use plans for major portions of the province. In the marine context the Georgia Strait has over 4% of its area protected. (see Annex II, Protected Areas for additional details).

1.1.2. Indicator: Deforestation and Newly Planted Forest Area

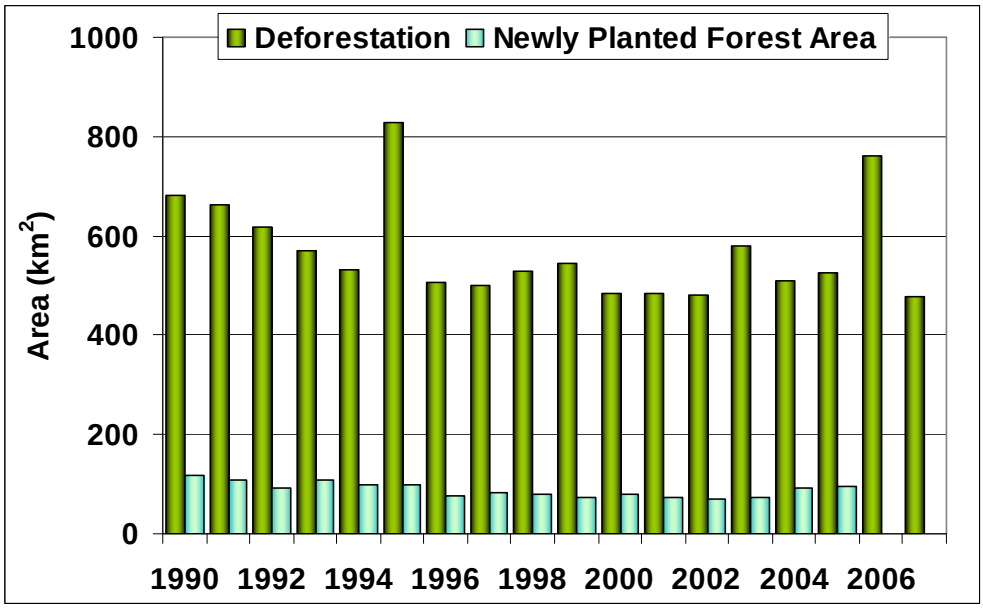


Figure 4: Annual area of deforestation, 1990-2007, and annual area of newly planted forests. Deforestation was reporte in Canada's 2009 submission to the Framework Convention on Climate Change (UNFCCC). Data for newly planted forest area do not include natural expansion of forests to other land cover types and thus underestimate the annual increase in forest area. Source: (Environment Canada, 2009; Natural Resources Canada, 2008).

The total forest area in Canada is 4.02 million km^2, including forests and woodlands. The annual amount of forest land deforested (i.e. permanently converted from forests to other land uses) is less than 0.02% of the total forest area in Canada. Between 1990 and 2007 annual deforestation ranged from 482 km^2 to 838 km^2 (Figure 4). Conversion of forest land to cropland accounts for about half of the total deforestation in most years. In some areas of the country resource roads, transmissions lines and oil and gas development are significant contributors to deforestation Peaks in deforestation in 1995 and 2006 represent flooding for new hydro reservoirs, normally a relatively small component of annual deforestation.

The annual net loss in forest area cannot be calculated from available data as no estimates are available for natural expansion of forest area to other land cover types. Between 1990 and 2005 the annual area of newly planted forests ranged from 69 to 110 km^2 (Figure 4).

The annual loss of forest area in Canada is relatively small compared to the total forest area. However, there are important changes in the quality of forests not considered in this indicator. There is some indication that the composition of Canadian forests appears to be changing, beyond what would be expected from natural succession. For example, the boreal forest in Ontario and north-western Quebec shows evidence of conversion from conifer dominated ecosystems to broad-leaved, deciduous forest and shrub ecosystems. In the Atlantic Maritime there is a shift from late succession species to early succession species

1.1.3 Indicator: Conversion of Grasslands

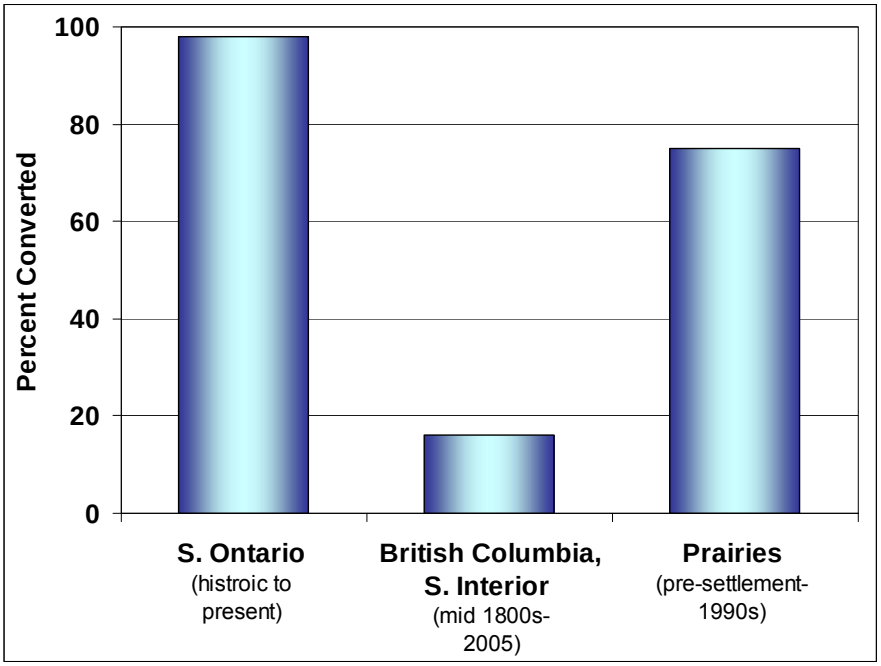


Figure 5: Historical Grassland Conversion. Source: (Riley et al., 2007a; British Columbia Grasslands Conservation Council, 2004; adapted from Ontario Ministry of Natural Resource, 2009).

Grasslands are one of the world's most threatened ecosystems. In Canada the largest area of native grassland is found in the Prairies. About 75% of native prairie grasslands have been converted to other land uses since European settlement (Riley *et al.*, 2007b) mostly to intensively managed agricultural systems and mostly prior to 1885. Tall-grass prairie, North America's most endangered type of grassland, and has been reduced to 1%, and mixed-prairie and short-grass prairie have been reduced to 20-30% of their original extent. Together these losses exceed those reported for any other major ecological community in North America (Gauthier et al., 2003). Although most of the conversion of prairie grassland occurred prior to 1990, loss of native prairie continues today (Watmough & Schmoll, 2007).

About 98% of the historical native tall-grass prairie of Southern Ontario has been converted to other uses. In British Columbia's interior approximately 15% of native grasslands have been converted to agriculture and urbanization.

1.1.4. Indicator: Change in Tundra Climate Group

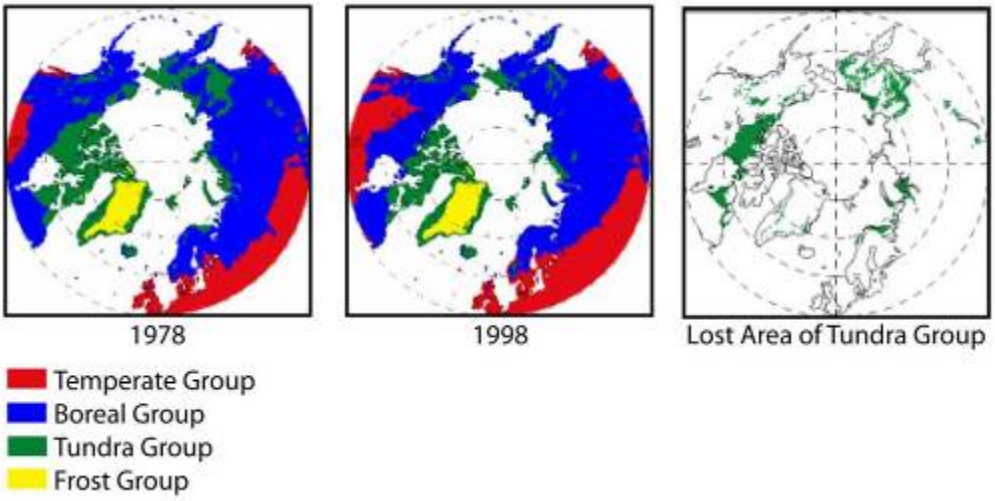


Figure 6a: Change in spatial distribution of climate classifications for 1978(left) and 1998(middle). Green colour indicates the tundra climate group. The right panel shows the changes in area of the tundra group from 1978 to 1998. Source: (Wang & Overland, 2004).

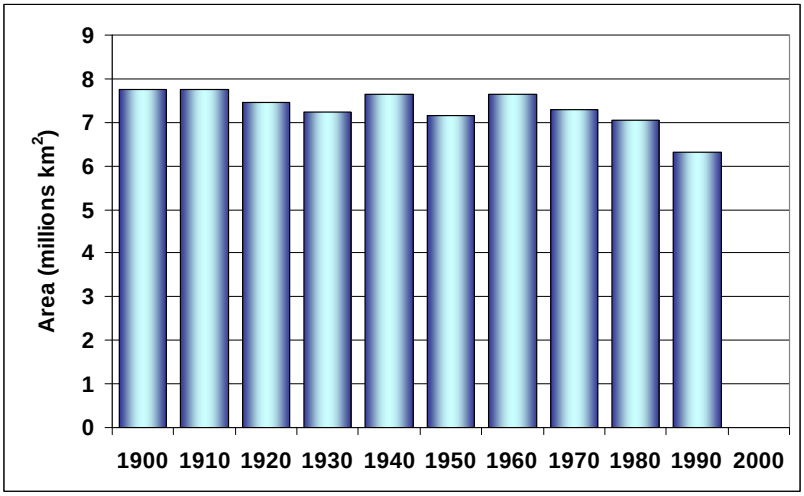


Figure 6b: Area occupied by the Tundra Climate Group by decade. The most significant drop has been from the 1980s to the 1990s. Source: (Wang & Overland, 2004).The tundra climate group is defined by the Köppen Climate Classification as the area having maximum summer temperatures between 0 °C and 10 °C. Biodiversity in much of the Canadian Arctic is adapted to life in the tundra climate group. Meteorological records indicate a 20% decrease, Arctic wide, in the extent of the tundra climate group over the past 25+ years (Figure 6a). Most of the decrease has been since 1990 (Figure 6b) and the areas most affected are north-western Canada and parts of Siberia (Wang & Overland, 2004).

In 1978 the tundra climate group was found along most of the Arctic coast regions and occupied most of the Arctic. Twenty years later, in 1998, most of the Canadian Arctic Archipelago – in the northern part of the Arctic- was still in the tundra climate group. In large parts of the Southern Arctic,

however, the tundra group was replaced by the boreal climate group – defined as having maximum summer temperatures greater than or equal to 10 °C for 1-3 months in summer.

Evidence suggests that Arctic vegetation is changing in concert with climate change. For example, comparisons of historical and contemporary photographs show increased shrub cover in northern Alaska (Sturm *et al.*, 2001; Tape *et al.*, 2006) and the Mackenzie Delta (Lantz & Kokelj, 2008). At a high Arctic site on Ellesmere Island, significant increases in biomass over the past 25 years were found in a heath community (Jones & Henry, 2003). Reports from Arctic indigenous people suggest similar changes are occurring elsewhere in the Arctic (ACIA, 2005).

1.1.5. Indicator: Decline in Summer Sea Ice in the Arctic

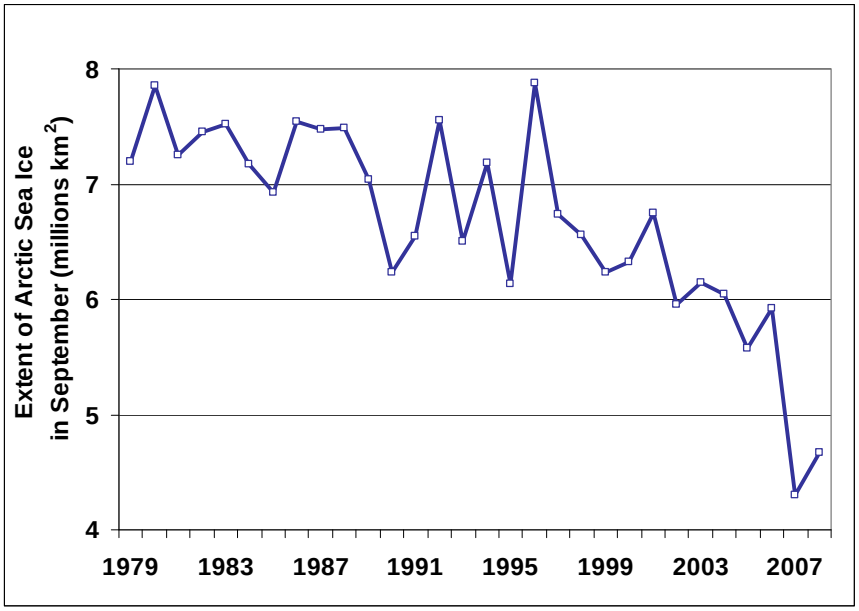


Figure 7: Trends in mean September sea ice cover, 1979-2008, showing the recent rapid decline. Source: (Fetterer & Knowles, 2009).

During the 2007 Arctic summer sea ice extent dropped to the lowest level since satellite measurements began in 1979; 2008 was the second lowest. Arctic summer sea ice is now 34% below the long term average from 1979 to 2000 (Fetterer & Knowles, 2009). The quality of sea ice has also changed, with an increase in younger, thinner ice and a decrease in the older, multi-aged and thicker ice (Gerland *et al.*, 2007). At the maximum ice extent in March 2009, only 10% of the Arctic Ocean was covered by ice older than two years, a much lower proportion than the 1981-2000 average of 30% (National Snow and Ice Data Center, 2009). This increases the likelihood of continued acceleration in the amount of ice-free water during summers to come.

Loss of sea ice would constitute the loss of an entire biome. Entire species assemblages are adapted to life on top of or under ice – from the algae that grow on the underside of multi-year ice, forming up to 25% of the Arctic Ocean's primary production (Gerland *et al.*, 2007) – to the invertebrates, birds, fish and marine mammals one or two steps up the food chain. Many animals also rely on sea ice as a refuge from predators or as a platform for hunting. Ringed seals, for example, depend on specific conditions of land-fast sea ice in the spring for reproduction, and polar

bears live most of their lives travelling and hunting on the ice, coming ashore only to den. Other animals, including beluga and bowhead whales and ivory gulls, are clearly drawn to and adapted to ice and ice edges for parts of the year and it is not certain how they would fare in an ice-free sea. Ice is the platform for life in the Arctic Ocean – and the source of food, surface for transportation, and foundation of cultural heritage of the Inuit.

Loss of sea ice is also correlated with a range expansion of some species, such as killer whales, into Arctic marine areas not previously occupied by those species (Gerber *et al.*, 2007).

The reduction and possible loss of summer and multi-year ice has biodiversity implications beyond the sea-ice biome. Bright white ice reflects sunlight. When it is replaced by darker water the ocean and the air heat much faster, a feedback that accelerates ice melt and heating of surface air inland, with resultant loss of tundra. Less sea ice leads to changes in seawater temperature and salinity, leading to changes in primary productivity and species composition of plankton and fish, as well as large-scale changes in ocean circulation, affecting biodiversity well beyond the Arctic.

1.1.6 Indicator: Historical Loss of Wetlands

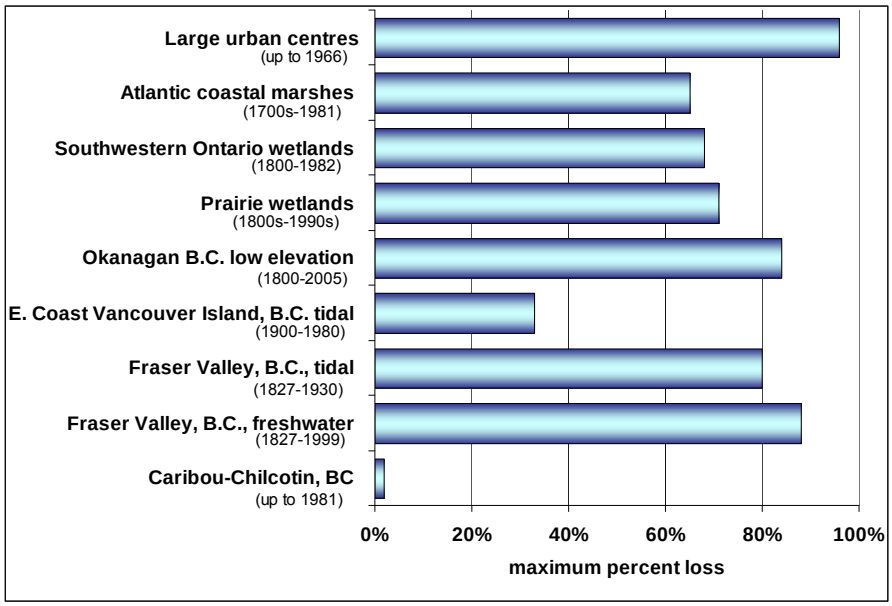


Figure 8: Historic loss of wetlands in selected areas across Canada. Accurate values for wetland loss are not available and these data represent the maximum historic loss based on specific detailed studies within the areas. These studies documented variable losses up to these percentages. Source: Adapted from (Lynch-Stewart, 1983; Buffett, 2009; Lea, 2008; Snell, 1987; Mosquin et al., 1995; Environment Canada, 1986; McKenzie, 1983; Eaton, 2009).

Although Canada is reported to have 25% of the world's wetlands, covering 14% of its land mass (Natural Resources Canada, 2004), neither a comprehensive inventory nor status and trends monitoring program exists. It is likely that most wetlands remain relatively intact in the vast forested and northern areas of Canada where settlement, agriculture, mining and hydro development are sparse.

There have been several local studies examining historical and recent wetland loss in areas where development pressure has been the greatest, but they are few and the data are generally old. Nevertheless, evidence shows that in the southern parts of Canada wetland loss was rapid in the 1700 and 1800s as Canada was settled by Europeans. Development, mainly dyking and draining for agriculture and urban areas resulted in an estimated loss of up to 65% of Atlantic coastal marshes, up to 68% of southern Ontario wetlands, up to 70% of prairie wetlands, and up to 88% of freshwater wetlands in the Lower Fraser Valley, British Columbia. Wetlands near large urban areas were particularly impacted. For example up to 96% of wetlands near major prairie urban centres had been converted to other uses by 1966 as had up to 70% of wetlands in the Vancouver area and up to 65% of wetlands near major cities in Ontario and Quebec. This loss continues.

1.1.7. Indicator: Loss of Wetlands since the 1970s

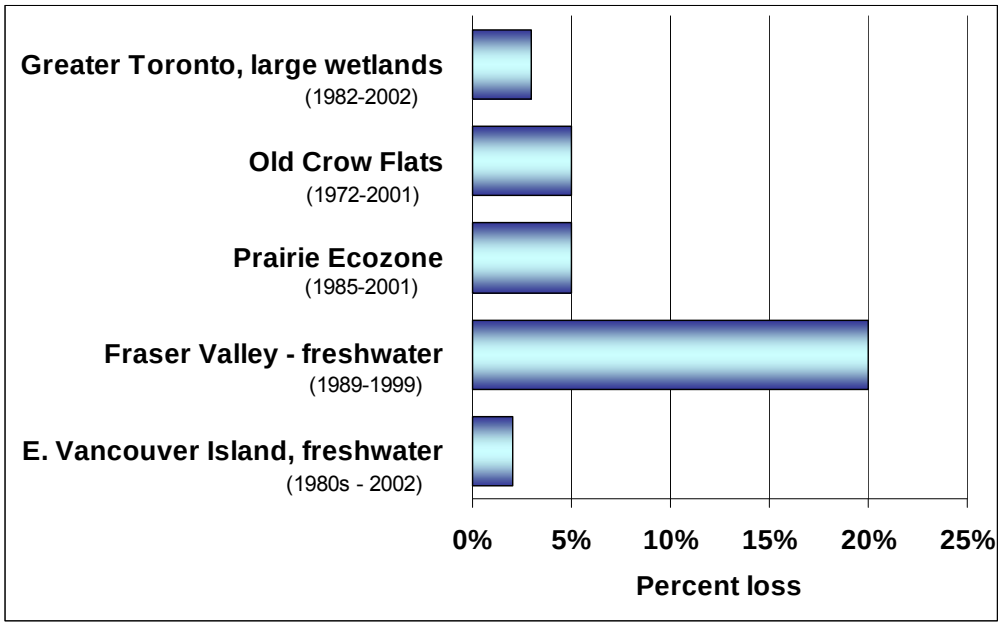


Figure 9: Percent loss of wetlands in recent years in selected areas. Only a few detailed studies have been conducted on recent wetland loss. These data reflect the best information available for those areas. Source: Adapted from (Ducks Unlimited, 2008; Watmough & Schmoll, 2007; Buffett, 2009; Labreque et al., 2009).

The *rate* of wetland loss appears to have declined in the areas where it has been measured. However, wetlands are still being lost in Canada. For example, Figure 9 shows 20% loss of remaining wetlands in the Fraser Valley, British Columbia, from 1989-1999, 5% loss in the Old Crow Flats, Yukon from 1972-2001, 3% loss of large wetlands in the Greater Toronto Areas, Ontario, from 1982-2002, 5% loss in the Prairies from 1985-2001, and 2% loss of freshwater wetlands on the east coast of Vancouver Island, British Columbia, from 1980s to 2002. These losses are a result of continued development, agriculture and climate changes.

In addition to direct loss, wetlands also continue to be degraded, fragmented, and suffer a loss of function due to development, pollution, invasive species and climatic factors. Small and seasonal

wetlands are particularly vulnerable; they are often overlooked and are extremely important to biodiversity. Climate change is affecting northern wetlands, particularly on peat lands and small ponds, through increased temperature and melting permafrost (see permafrost indicator). These impacts are resulting in loss of wetlands in some places and expansion of wetlands in other places. In addition, the thawing and subsequent decay of peat causes the release of greenhouse gases.

1.1.8. Indicator: Changes in River Flow in Natural Rivers, 1970 to 2005

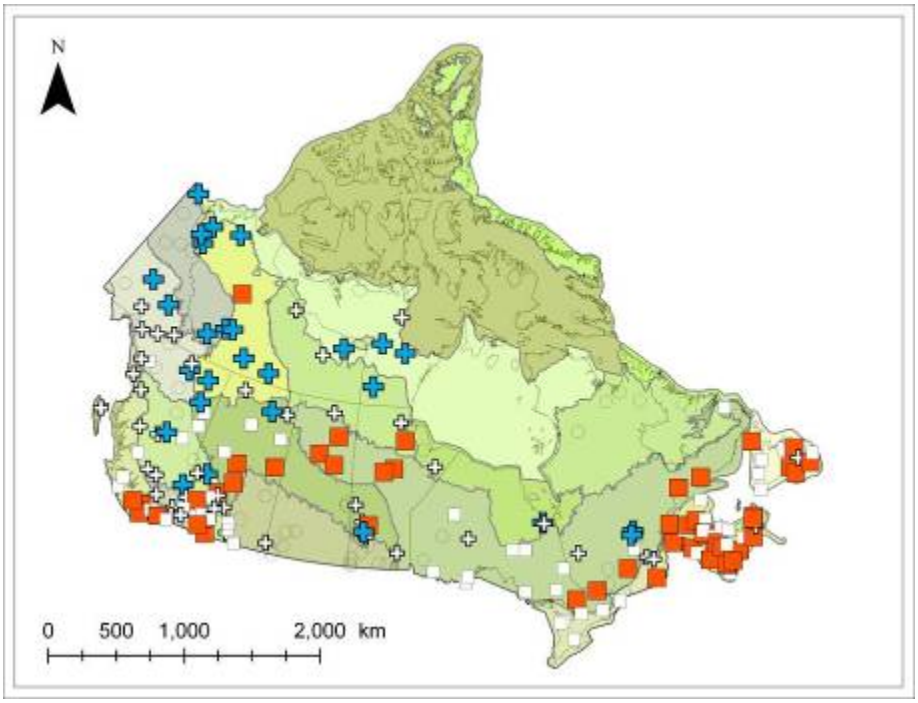


Figure 10: Trends in low flow in 201 natural rivers 1970 to 2005. ✚ significant increasing trend (p<0.1), ✚ non-significant tendency towards increasing trend (p>0.1), ■ significant decreasing trend (p<0.1),□ non-significant tendency towards decreasing trend (p>0.1), O no trend. Source:(Monk et al., 2009).

Approximately 8,500 rivers and over 2 million freshwater lakes cover almost 9% of Canada's total surface area. Of the 25 largest rivers in North America, ranked by annual flow, 14 are completely or partly within Canada. Lakes and rivers across Canada drain into five major drainage basins: Arctic, Pacific and Atlantic Oceans, Hudson Bay, and the Gulf of Mexico. Almost three quarters of Canadian rivers drain into the Arctic Ocean and Hudson/James Bay, representing almost half of the total discharge of Canadian rivers.

Annual flow is one of a suite of indicators that can be used to detect changes in river systems. The Water Survey of Canada tracks river flows and lake levels measured at gauging stations distributed across Canada. The Reference Hydrometric Basin Network (RHBN) is a sub-set of these gauging stations that represents natural gauging sites (i.e. less than 10% modification from natural conditions).

Most rivers in Canada have seasonal variation in flow. High flows usually occur in spring and are driven by spring snowmelt and seasonal rainstorms. The lowest flows generally occur in late summer – driven by low precipitation and high evaporation – and in late winter when precipitation is stored as ice and snow. Figure 10 shows trends in low flows from 1970 to 2005 at 201 RHBN

gauging stations. The lowest annual flow increased significantly at 51 sites, decreased significantly at 27 sites, and showed no statistically significant change at 123 sites. Sites with an increase in minimum (summer/winter) flow were concentrated in north-western Canada and the Arctic; sites with a decrease in minimum flow were concentrated in eastern and Atlantic Canada, and also in a band from southern British Columbia across the mid prairies. The lowest flow occurred significantly earlier at 16 sites, significantly later at 26 sites and showed no statistically significant trend in timing at 159 sites. Other studies have confirmed an increase in lowest (i.e. winter) flow in north-western Canada (Burn & Cunderlik, 2004) and central Canada (George, 2007).

Not shown are trends in the maximum spring flow, or spring freshet. Maximum annual flow increased significantly at 34 sites (concentrated in the western Taiga Shield and the western Arctic), decreased significantly at 20 sites (concentrated around the Great Lakes and St. Lawrence, the Boreal Plains and some sites in the Taiga Plains) and showed no statistically significant trend at 123 sites. The timing of spring freshet was significantly earlier at 20 sites and later at 15 sites. Other studies have shown a decrease in spring flow in the Prairies (Burn et al., 2008), an increase in spring flow in south-western rivers (Burn & Cunderlik, 2004) and confirmed an earlier spring freshet in north-western rivers such as the Liard, Peace and Athabasca (Burn, 2008), in western rivers such as the Fraser (Morrison et al., 2002), and Atlantic Maritimes (Swansburg & El-Jabi, 2004).

Changes in river flow have significant impacts on biodiversity. A decrease in minimum flow can, for example, affect the quantity and temperature of water for late-spawning fish, and increase thermal stress and exposure to predation to all fish. A change in maximum flow can affect species with life cycles synchronized to the spring freshet and the rich foods provided by flood plains.

1.1.9. Indicator: West Coast Marine Community Dynamics. Strait of Georgia Coho Survivals and Fishery Exploitation

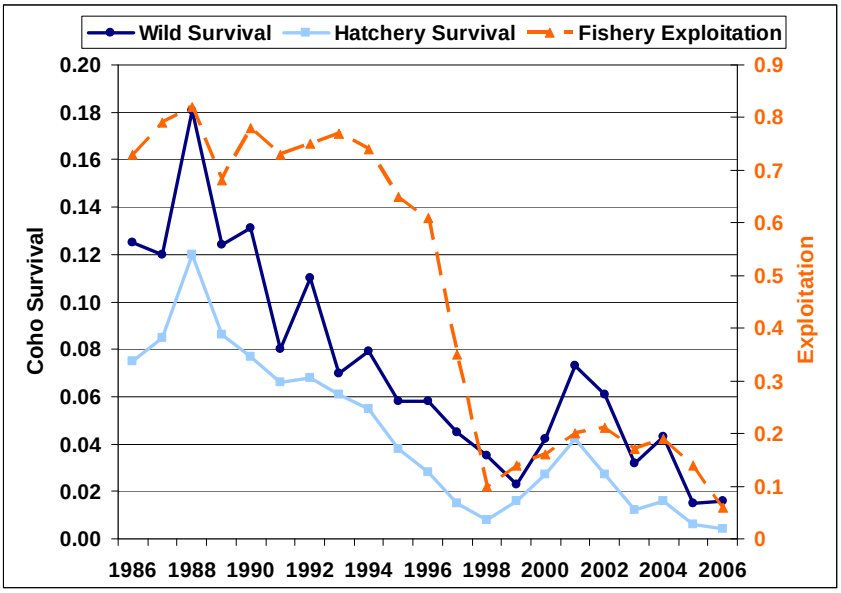


Figure 11: Strait of Georgia marine coho survivals and fishery exploitation. Source: modified by J. Irvine (2008) from (Simpson et al., 2001).

The Strait of Georgia is a semi-enclosed sea between Vancouver Island and the mainland Pacific coast of British Columbia. The Fraser River flows into the Strait of Georgia. Historically the Strait of Georgia has sustained important subsistence, recreational and commercial fisheries as well as diverse marine life (Pauly *et al.*, 1998).

There have been significant changes in the Strait of Georgia over the past 45 years. Zooplankton abundance has decreased and the maximum zooplankton abundance is peaking earlier (1960-2005). Populations of several piscivorous (fish-eating) fishes, such as coho and Chinook salmon, ling cod, Pacific cod and inshore rockfish have declined (1986-2006) while populations of predominantly plankton-eating fishes (i.e. chum and sockeye salmon, Pacific hake, Pacific herring, spiny dogfish, walleye pollock) are relatively stable or within the normal range of historical variability (1981-2006).The causes of these changes are complex. Some factors include warmer river temperatures for migrating salmon, changes in the timing of peak zooplankton biomass which favours some species over others, fishing pressure, loss of spawning and rearing habitat, contaminants and environmental influences such as large-scale oceanographic regime shifts and increases in seawater temperatures.

Other main trends in the Strait: seabirds are declining due to loss of habitat and changes in zooplankton; seal populations increased after the cessation of hunting and are now stable; killer whales are at risk due to cumulative stress from contaminants, traffic and loss of Chinook salmon; trends in benthos are not known but it is likely that benthic communities are threatened by declining oxygen and pH in the deep basin (Johannessen & McCarter, 2009).

1.1.10. Indicator: East Coast Marine Community Dynamics - Change in Dominant Species in Newfoundland and Labrador

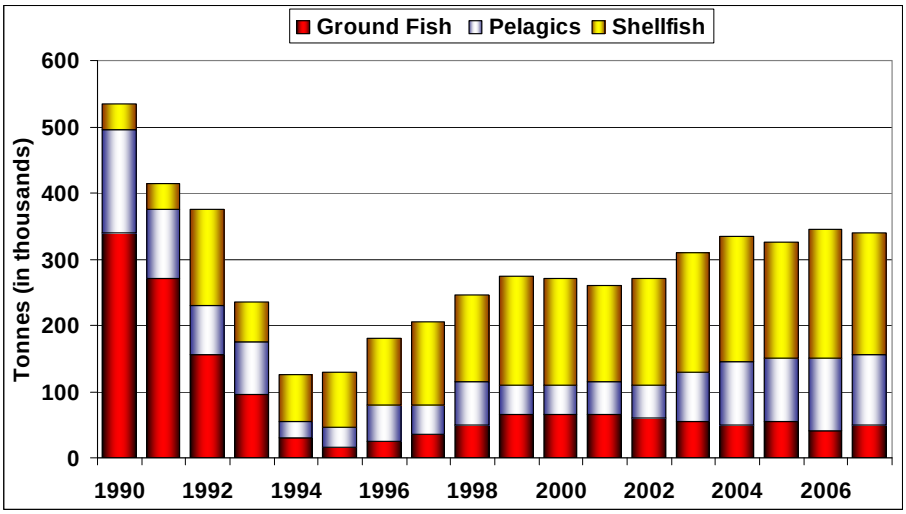


Figure 12: Annual fishery landings for Newfoundland and Labrador for the period 1990-2006. Source: (Department of Fisheries and Oceans, 2009a).

The biomass of northern cod (*Gadus morhua*) stock (3 years and older) off southern Labrador and eastern Newfoundland was about 3 million tonnes in the early 1960s. Fishing intensity increased greatly in the 1960s as non-Canadian fleets exploited dense offshore over-wintering aggregations.

The stock collapsed to about 0.5 million tonnes by the late 1970s. After extension of jurisdiction in 1977, the stock recovered partially to just over 1 million tonnes in the mid-1980s, but it declined again during the late1980s and collapsed to an extremely low level by the early to mid-1990s. A moratorium on directed commercial fishing was declared (Department of Fisheries and Oceans, 2009b).

In spite of the moratorium, cod stocks have not recovered as traditional stock recruitment models would predict. This suggests that a fundamental change in the fitness of northern cod has occurred (Leggett & Frank, 2008).

Ecosystems once dominated by large-bodied demersal fishes (i.e. groundfish) are now dominated by smaller pelagic fishes and benthic invertebrates (mainly shrimp and crab). The reasons for the shift are likely complex, but partly related to the demise of demersal predators as well as more favourable climatic conditions in the ocean.

Northern shrimp and snow crab fisheries have now gained in importance in eastern Canada. This could be considered an example of the global phenomenon of 'fishing down the food chain" (See indicator on Sustainable Fisheries below).

1.2. Outcome : Viable Populations of Species

CBD Goal 2: Promote the Conservation of Species Diversity

1.2.1. Indicator: Species Status

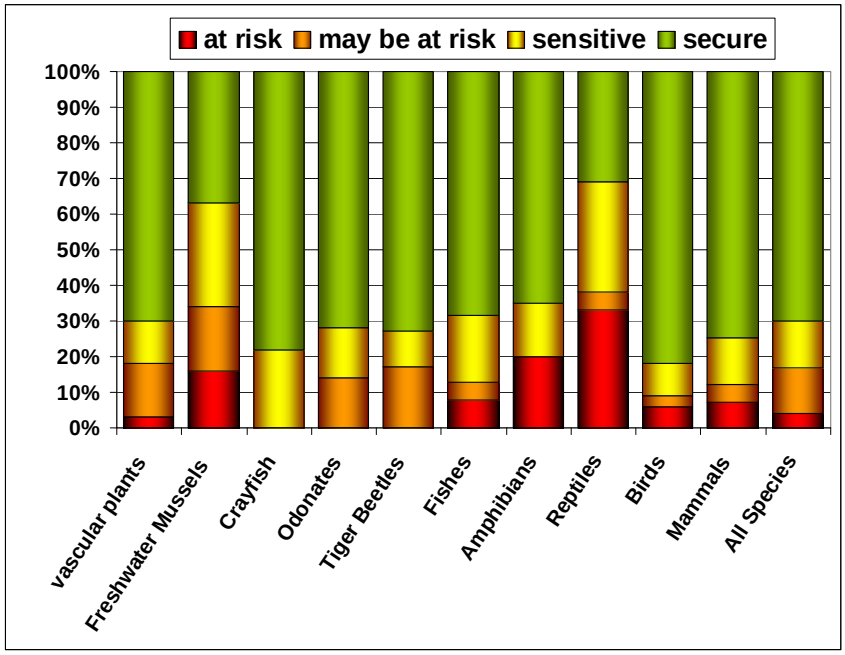


Figure 13: Status of Canadian native species assessed as At Risk, May be at risk, Sensitive or Secure in 2005. Source: (Canadian Endangered Species Conservation Council, 2006).

Over 70,000 species have been described in Canada. Of these, about 10% (7732 species) have been assessed, including all of Canada's vertebrate species, all vascular plants, and four invertebrate groups. This indicator shows the status ranking by taxonomic group for the 5038 species assessed as At Risk, May be at Risk, Sensitive and Secure. Of the 5038 species in Canada, 70% were considered secure in 2005; this included 82% of bird species and only 31% of reptiles. In total 17% of species in Canada are considered "At risk" or "May be at Risk", although this varies among taxonomic groups. For example, 34% of freshwater mussels are at risk while no species of crayfish are assessed as at risk.Freshwater mussels and reptiles have both the lowest proportion of species that are Secure and the highest proportion at risk. The four ocean regions, particularly the Eastern Arctic, have relatively high proportions of species ranked at risk.

In addition to the 5038 species included in Figure 13, Canada has assessed 30 Extirpated and 12 Extinct species and a large number (1254) of non-native species. Fishes are the only group with more than 6% of species in the Undetermined and Not Assessed category – 59% of fishes fall in these categories which reflects the difficulty of surveying fishes in remote, off-shore locations. The lack of data in this area makes it more difficult to assess the health of ocean ecosystems and their species.

The major threats to Canadian wildlife are habitat loss, fragmentation and degradation, pollution and contamination, overexploitation, invasive species, disease, by-catch, and climate change.

1.2.2. Indicator: Landbird Populations

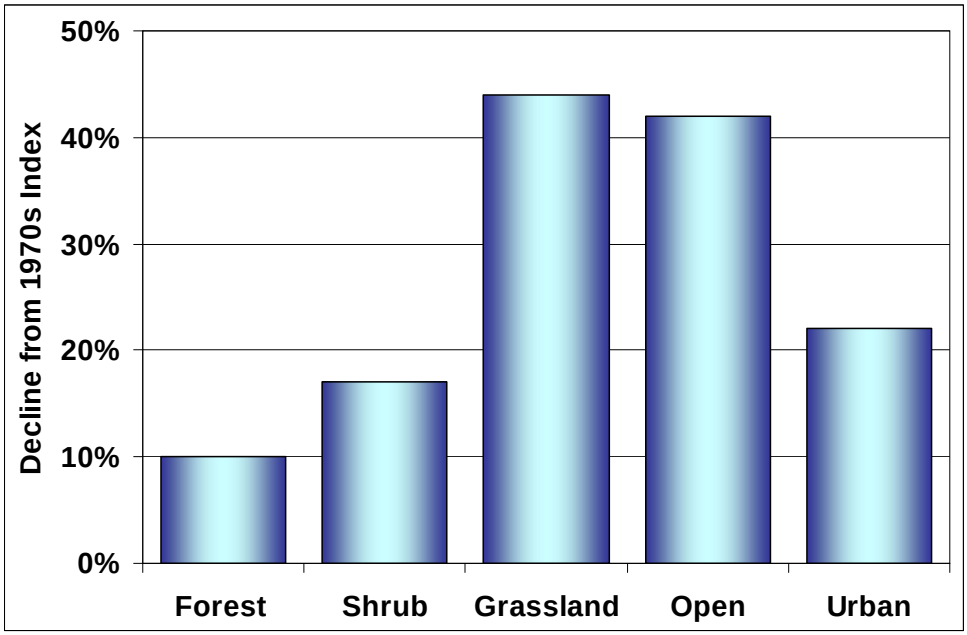


Figure 14: Magnitude of decline in bird assemblages in Canada between the 1970s and 2000-2006. Because of the general lack of survey coverage in northern Canada, these findings mainly reflect results from southern Canada. Source: Breeding Bird Survey (Blancher et al., 2008).

Birds are showing statistically significant declines in four of the five major habitat assemblages, although within each assemblage, and in different regions of the country, trends for individual

species vary from significant decreases to significant increases. Migrant birds, both those migrating short distances and those migrating to the new-world tropics, are showing significant declines in Canada, while resident birds tend to be relatively stable. Patterns in population trends also vary among feeding assemblages: aerial and ground foraging birds have declined whereas trunk and bark foragers have increased. Insectivorous aerial foragers stand out as a group showing large declines.

The **forest** bird assemblage has been essentially stable, although there has been a possible gradual decline in recent years. Forest birds include a wide variety of species that differ in habitat requirements, foraging habitats and migration pattern and thus differences in trends among individual species and feeding guilds have been observed. About 60% of Canada's landbirds breed in the boreal forest and many of these species have a high percent of their global population in Canada (Blancher, 2003).

Birds of **shrub/early-succession** habitats have declined by 17% overall. This overall trend for the assemblage is influenced strongly by declines in relatively abundant shrub-nesting sparrows. Patterns for this assemblage also vary widely across Canada.

Grassland birds have been showing steep, consistent and geographically widespread declines throughout North America (Sauer *et al.*, 2008). In Canada, 40 years of data indicate steep declines in all regions where grassland birds are found. The majority of species within the grassland assemblage reflect these declines. Some species have lost well over 50% of their populations in Canada since the 1970s. Reasons for declines vary among species and across the country, but are thought to be due to the combined effects of loss of marginal farmland to forest, especially in eastern Canada, habitat loss in the prairies, and more intensive use of the remaining agricultural lands where most of these birds nest (for example change from pasture to cropland).

Birds of **open and agricultural cropland habitats** have been declining since the late 1980s. These declines are thought to be related to changes in land use and agricultural practices. The Prairie region is the only region where this assemblage is stable. The assemblage contains several species of aerial foraging insectivores (swallows, nighthawks) which are declining as a group throughout Canada.

Birds of the **urban/suburban** assemblage have shown a decline of 22% overall since 1970. This assemblage is dominated by three species of introduced Eurasian birds (European starling, house sparrow, rock pigeon). European starling and house sparrow are still abundant but declining, mirroring declines in Europe.

1.2.3. Indicator: Seabird Populations

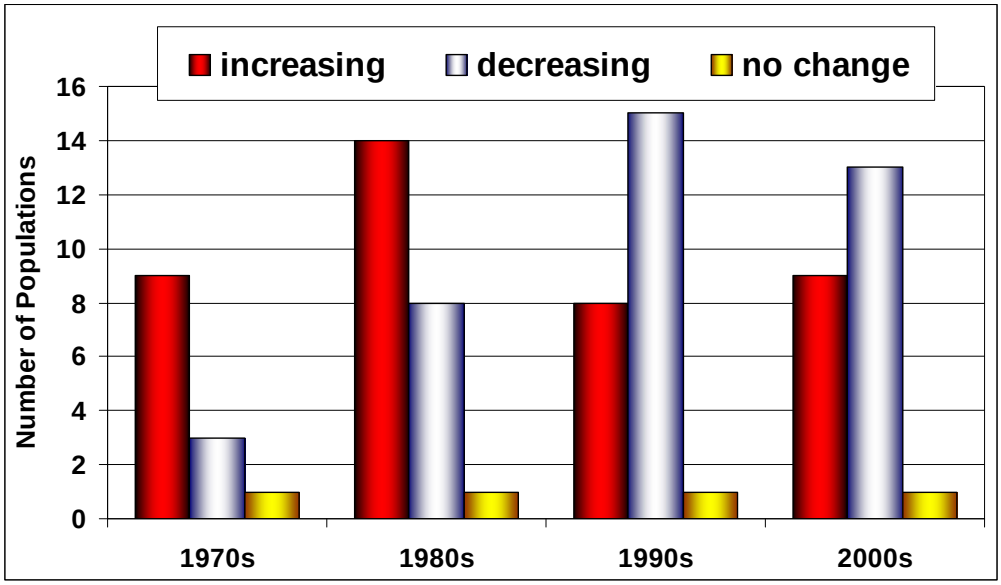


Figure 15: Trends in status of populations of seabirds. Source: Adapted from (Gaston et al., 2008).

In the 1970s, most seabird populations that were monitored were healthy and increasing; in the 1990s, most populations were declining - a trend that has continued in the 2000s. Seabird trends vary among regions across Canada, however, and also vary among decades within regions. During the past two decades, seabirds in northern British Columbia and in Labrador and eastern Newfoundland have generally increased. Conversely, populations in the Gulf of Maine/Scotian Shelf, Gulf of St. Lawrence, Canadian Arctic Archipelago and the very large colonies in Queen Charlotte Islands, British Columbia have mostly declined. In some northern areas, such as Hudson Bay, as well as in parts of British Columbia, some seabirds are breeding earlier. In the Pacific, some declines may be the result of changes in the timing of breeding and peak food availability (zooplankton).

1.2.4. Indicator: Imperilled Freshwater and Diadromous Fish

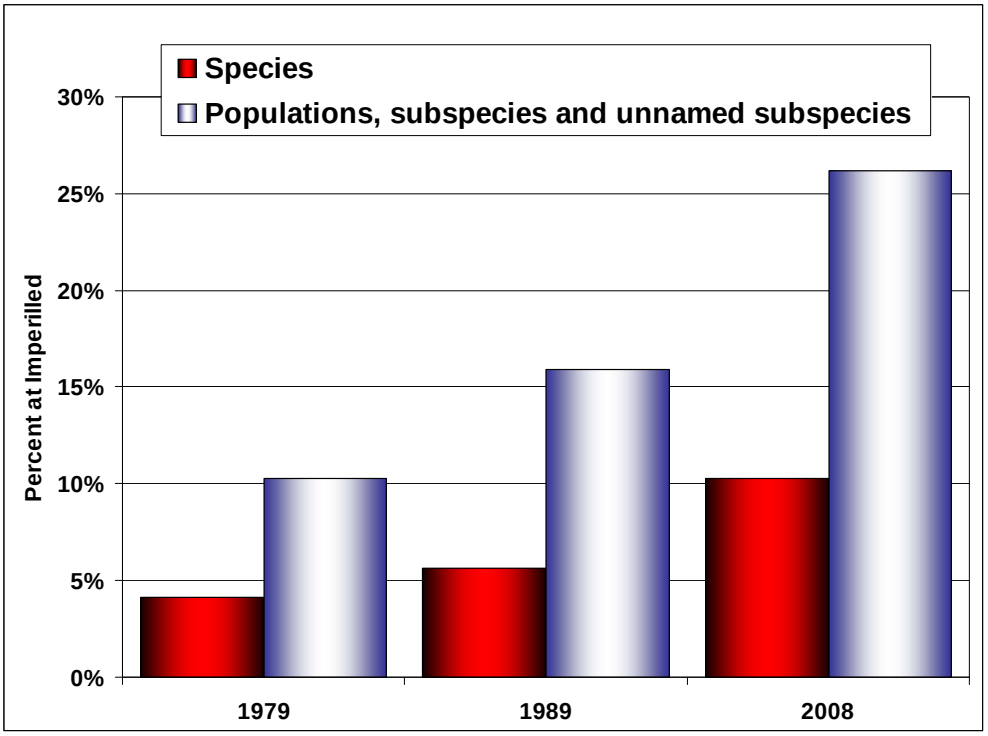


Figure 16: Trend in the percentage of freshwater and diadromous fish taxa in Canada that are imperiled. Source: Adapted for Canada from (Jelks et al., 2008).

As of 2008, 39% of North American freshwater fish were considered imperilled (endangered, threatened, or vulnerable); for Canada 10% are imperilled. This compares to 4% imperilled in 1979 in Canada. Habitat degradation and introduced species are listed as the main threats to aquatic species, many of which have restricted ranges. Globally it is estimated that 20% of the world's freshwater fish are imperilled (Jelks *et al.*, 2008). One study (Ricciardi & Rasmussen, 1999) estimated that freshwater species are five times more likely to become extinct in North America than are terrestrial species, although a lack of comprehensive long-term monitoring makes it difficult to verify this claim.

1.2.5. Indicator: Mammal Example, Caribou Trends

Figure 17: Current status of Rangifer in North America. Source: (Hummel & Ray, 2008).

In North America there are four different subspecies of caribou occupying ranges from close to the 49th parallel to the High Arctic Islands. Historically, caribou were found in all 13 Canadian provinces and territories compared to 10 in 2005.

Boreal Woodland Caribou

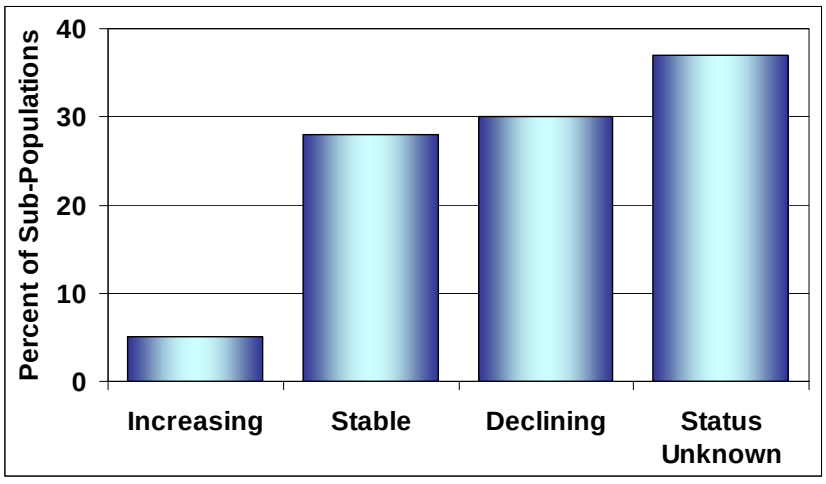


Figure 18: Status of sub-populations of boreal woodland caribou. Source: (Callaghan et al., 2009).

Boreal woodland caribou are forest dwelling, sedentary caribou found only in Canada. They are listed as 'threatened' by the Committee on the Status of Endangered Wildlife. Their total population is approximately 39,000, distributed widely from the northwest corner of the Northwest Territories to east Labrador and as far south as Lake Superior. Since the 1900s their range has been progressively receding in a northerly direction. Of the approximately 57 local populations, 5% are increasing, 30% are declining, 28% are stable and the status of 37% are unknown.

The principal cause of decline of the boreal woodland caribou is the loss, degradation and fragmentation of their habitat (primarily mature coniferous forest). Some boreal populations have always been small and as such are vulnerable to extinction. The populations that are stable or increasing occur in remote areas with little or no industrial activity or where predator control has been used as a management tool (Callaghan *et al.*, 2009).

Caribou of the Arctic and Taiga

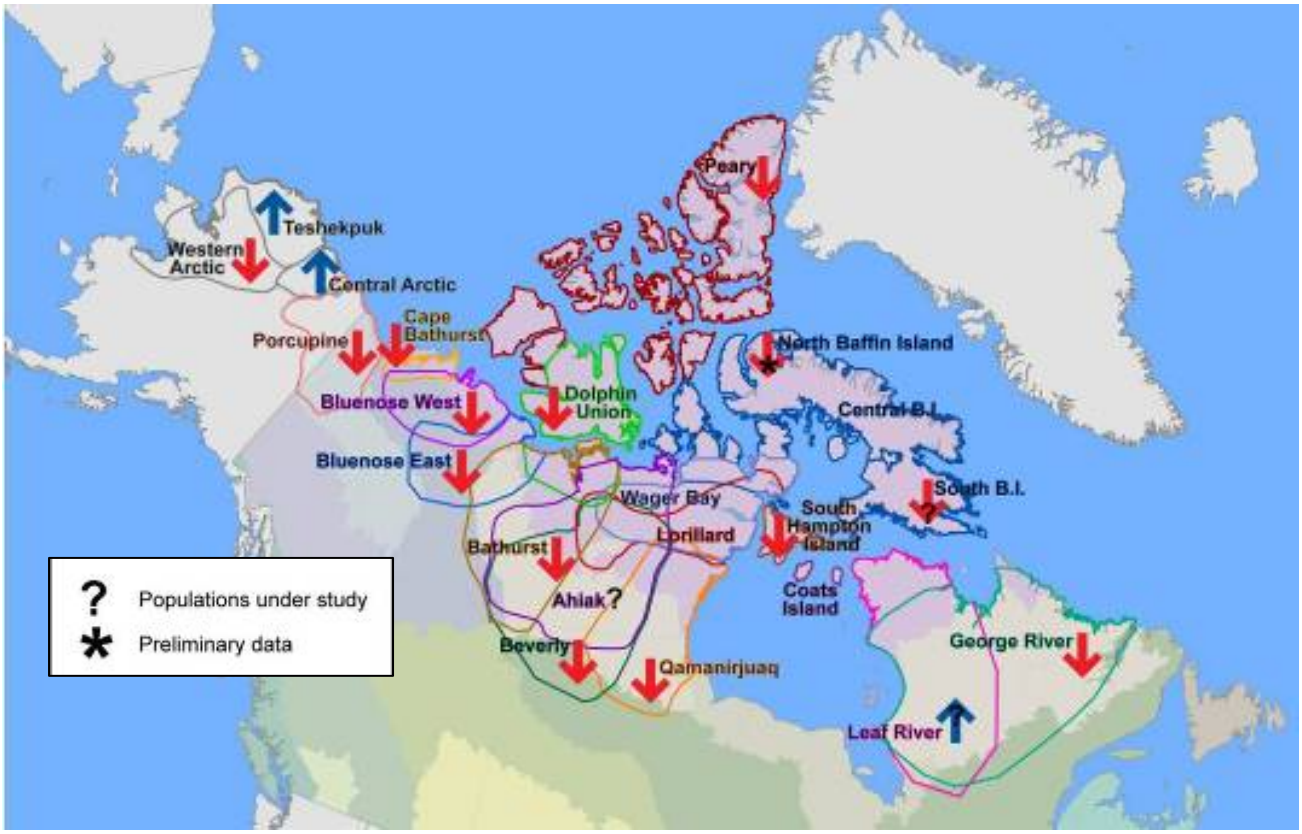


Figure 19: Status of Peary caribou, barren-ground, and other migratory Arctic caribou herds in Canada. The three herds with Alaskan ranges are included to provide a North American picture. The ↓ refers to downward population trends from the date of population peaks to the most recent population survey. The ↑ refers to increasing trends. Source: (Gunn & Russell, 2008).

The caribou of Canada's arctic and taiga regions play a critical ecological role as highly selective foragers, providers of nutrients in a nutrient-limited system, prey for large-bodied and medium-sized predators and scavengers, and as hosts for external parasites and blood-feeding insects such as mosquitoes.

For many people in northern Canada, caribou remain the basis of their culture and play a central role in their lives. One measure of the importance is the annual subsistence harvest, which in Nunavut averaged 24,522 caribou from 1996-2001 (Nunavut Wildlife Management Board, 2004). In the Northwest Territories, Dene, Inuvialuit, Métis and non-aboriginal people from almost all communities hunt the migratory herds and the minimum annual harvest is 11,000 caribou (Gunn & Russell, 2008).

Of the 14 caribou groups shown with ranges in Canada and with known population trends, 13 are decreasing and one, the Leaf River herd, is shown as increasing. This herd, however, was last censused in 2001 and information on body condition and calf survival indicates that the herd may now be decreasing (CircumArctic Rangifer Monitoring and Assessment Network (CARMA), 2009). On average, barren-ground caribou numbers in the north have increased from lows around 1975 to a peak around 1995. Current low numbers are similar to the mid-1970s. Barren-ground caribou are like other northern herbivorous mammals (voles, lemmings and hares) in that their abundance is cyclic. While experts believe that the current declining trends for the eight mainland barren-ground caribou herds are likely part of natural cycles in abundance, without long-term quantitative data this is difficult to confirm.

On the High Arctic islands weather has an overwhelming influence on Peary caribou numbers, as periodic severe winters trigger large-scale mortality and reduction in productivity. Peary caribou, which have been recommended for listing as Endangered under Canada's Species at Risk Act, have declined by as much as 98% on several islands (Gunn *et al.*, 2006). During two winters in the 1990s, more than 95% of the Peary caribou in the western Queen Elizabeth Islands were devastated by heavy snow and the formation of ice layers in the snow, events that are projected to become more frequent and more widely distributed with accelerated climate change (Miller & Gunn, 2003).

Some experts speculate that significant changes on the caribou range since the 1970s could prevent a recovery of caribou populations to previous peak numbers. These changes include an increasing presence of people and development (e.g. mining, oil and gas exploration); long range transport of chemical such as mercury; fire; and the effects of accelerated climate change. Hunting by humans and other predators are also known factors affecting caribou abundance.

1.3. Outcome: Genetic Resources and Adaptive Potential

CBD Goal 3: Promote the Conservation of Genetic Diversity

1.3.1. Indicator: Size of Ground Fish on the Scotian Shelf

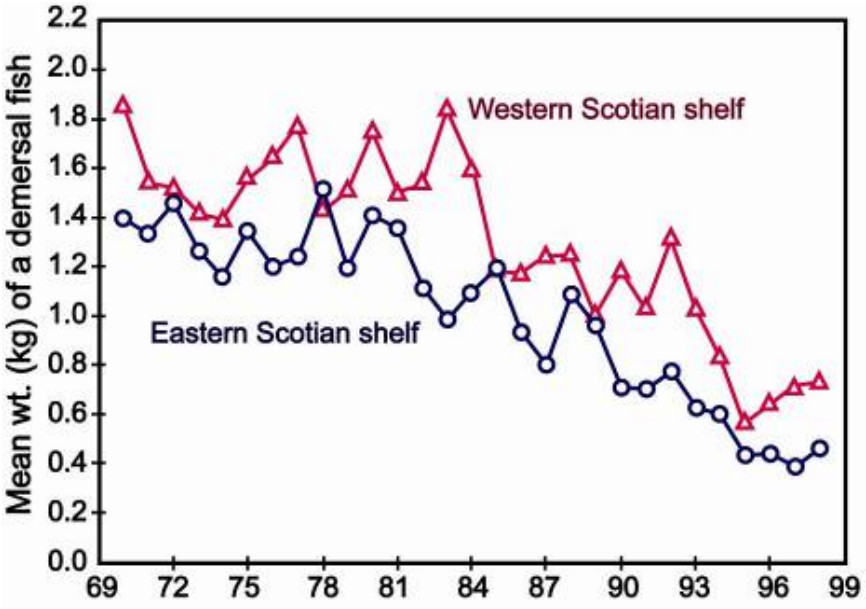


Figure 20: Trend in the average weight of all species of demersal (ground) fish from 1970 to 1998 for the eastern and western Scotian Shelf. Source:(Zwanenburg et al., 2002).

Between 1970 to 1995, the average weight of demersal or ground fish (data from 60 species combined) on the Scotian Shelf declined by 66%. The decline occurred during an increase in fishing effort. Fishing effort dropped sharply in 1993, when the ground fish stocks collapsed and a fishing moratorium was imposed on the eastern Scotian Shelf and a fishing reduction was imposed on the western shelf (Zwanenburg *et al.*, 2006). The declining trend bottomed out in 1995 (Leggett & Frank, 2008). Species such as adult cod, haddock, pollock and others are smaller than they were 40 years ago. Smaller fish have been shown to produce fewer and less viable eggs. This continuing trend towards smaller fish and earlier maturation has been attributed to genetic change induced by selective fishing of larger-sized fish.

1.4. Outcome : Sustainable Use of Biological Resources

CBD Goal : Promote Sustainable Use and Consumption.

1.4.1. Indicator: Sustainable Forestry Certification

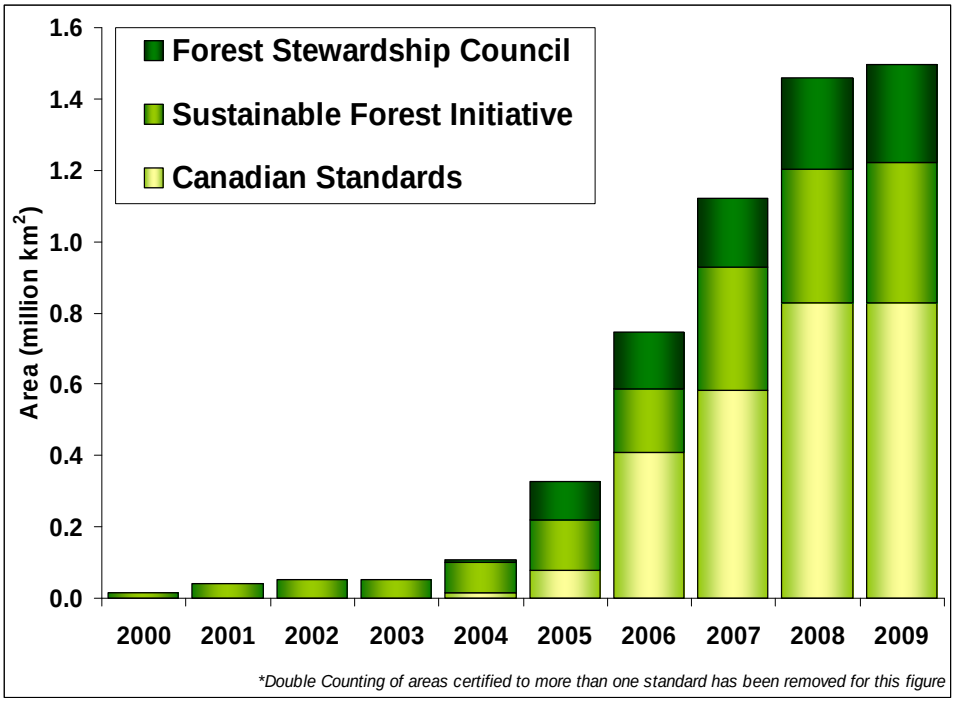


Figure 21: Amount of forest sustainably managed in Canada under three major certification programs, 2000 – 2009. CSA=Canadian Standards Association; SFI=Sustainable Forest Initiative; FSC=Forest Stewardship Council. Source: (Metafore's Forest Certification Resource Centre, 2009).

Almost 1.46 million km^2 of forest area were under three Sustainable Forest Management certification programs in Canada in 2009. This represents 40% of the world's certified forest area - the largest area of 3rd party independently certified forests in the world. The majority of forests in which forestry operations can occur are now certified.

1.4.2. Indicator: Wildlife Habitat Capacity on Agricultural Land

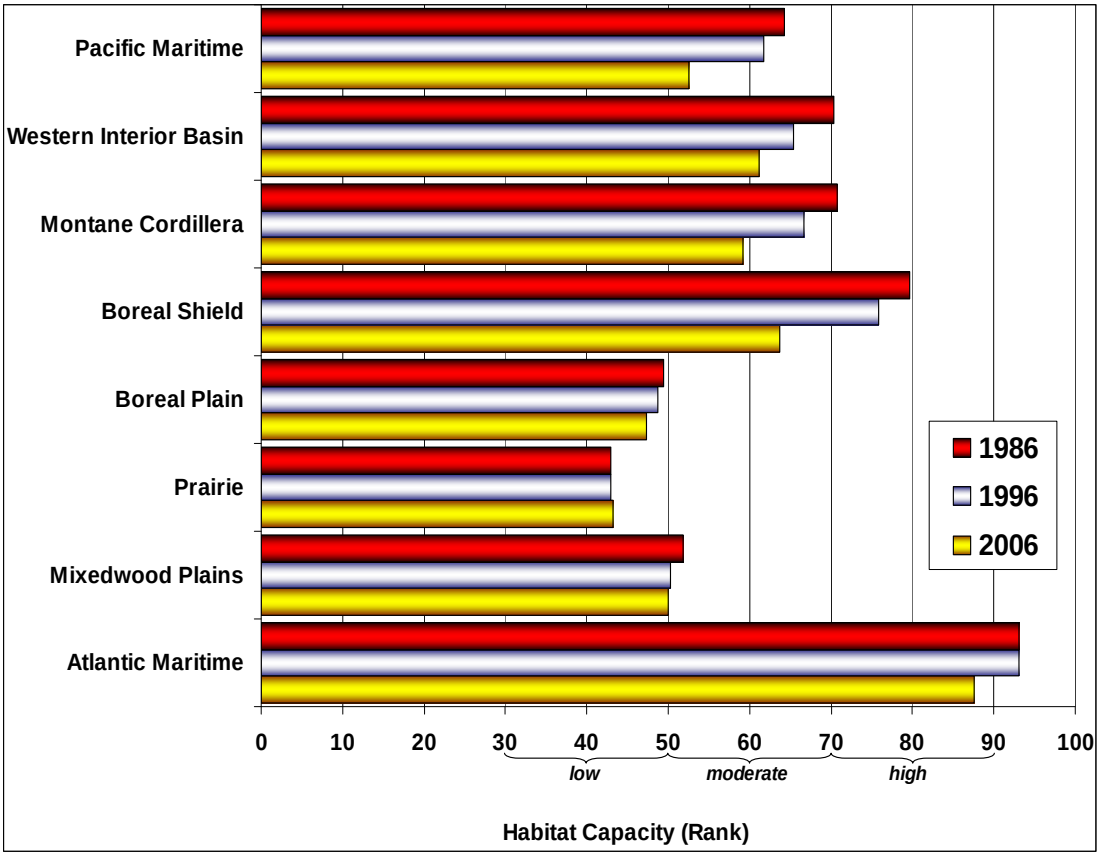


Figure 22: Trend in wildlife habitat capacity on agricultural land by ecological unit. Source: Adapted from (Javorek & Grant, 2009).

Canada has developed an index to measure the capacity of agricultural land to provide suitable habitat for terrestrial vertebrates. The index analyzes habitat use and habitat values for 588 species of vertebrates on 31 land cover types. Habitat capacity depends on cover types. Natural lands and unimproved pasture provide the highest capacity while croplands provide the lowest capacity. Between 1986 and 2006 the capacity for agricultural land to provide suitable habitat for wildlife has declined across the country.

1.4.3. Indicator: Sustainable Management on Agricultural Land

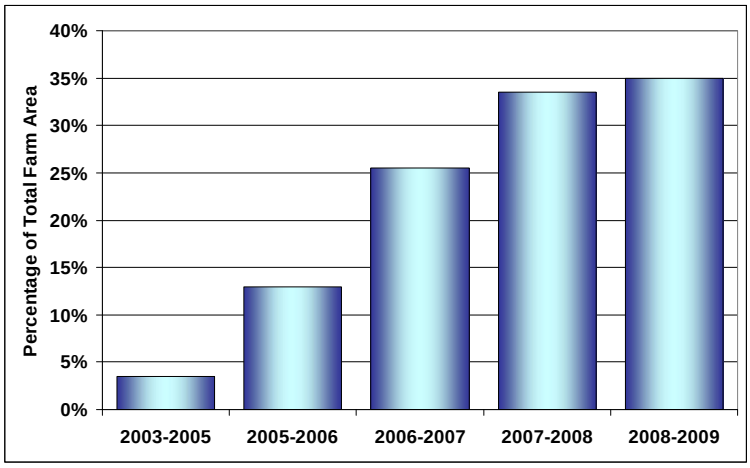


Figure 23: Trend in the percentage of total farm area in Canada with Environmental Farm Plans. Source: (Agriculture and Agrifood Canada, 2009).

In order to decrease the impact of agriculture on the environment, including biodiversity, Canada has encouraged farmers to produce Environmental Farm Plans. In 2008 approximately 34% of annual crop producers and 40% of livestock producers have Environmental Farm Plans. Biodiversity benefits include improved habitat for wildlife such as the preservation of wetlands on farms. Although wildlife habitat capacity on agricultural land has been declining, Environmental Farm Plans are a new program and benefits to biodiversity on the ground are likely not yet fully realized.

1.4.4. Indicator: Sustainable Fisheries Management

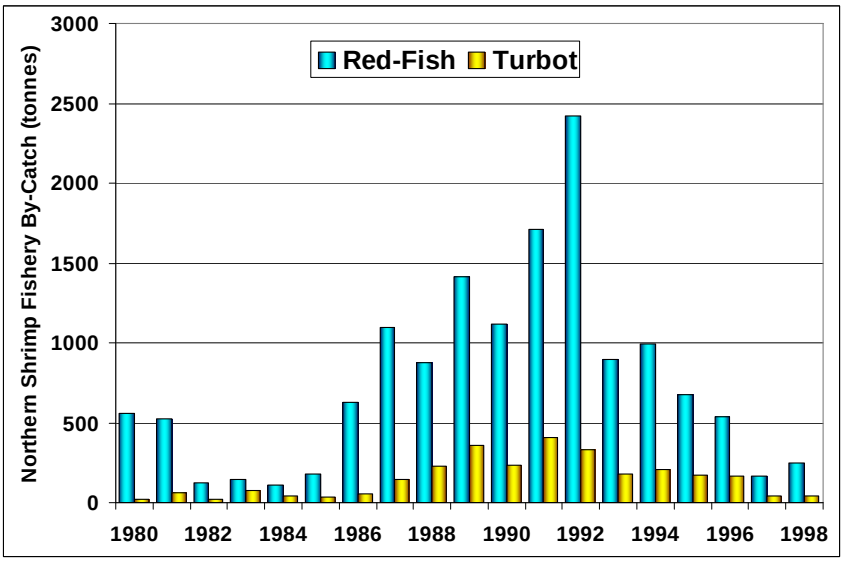


Figure 24: By-catch in the northern shrimp fishery, Davis Strait to Flemish Cap, 1980-1998. Peak by-catch corresponds to the shift in effort towards fishing shellfish following the collapse of the northern cod and other groundfish stocks. Red-fish are the major component of by-catch. Source: (Kulka, 1999).

The Canadian North Atlantic Shrimp fishery has changed, both in size of the fishery and fishing methods, since the collapse of Northern cod in the 1990s (see Indicator above, Easter Coast Marine Community Dynamics). In recognition of the potential for shrimp fishing to capture non target species, including some of the finfish by-catch listed as endangered under Canada's Species at Risk Act, mitigation measures have been put in place to reduce by-catch. The fleet has shifted from an entirely large vessel fishery to a fishery dominated by many smaller vessels that use less destructive fishing gear. As well, exclusion devices, gear restrictions, and other mitigation measures are now mandatory.

The Canadian North Atlantic Shrimp fishery is the largest coldwater shrimp fishery in the world to be certified by the Marine Stewardship Council, and is the first Canadian fishery to obtain this certification. According to the Marine Stewardship Council the stock is secure into at least the short to medium term with few impacts on cold water corals and bottom habitats. By-catch levels of cod, Greenland halibut and American plaice are less than one tenth of one percent (Fisheries Council, 2008).

The shrimp fishery on the west coast of Canada is not certified.

1.4 Sub-Outcome: Sustainable Use of Biological Resources - Availability of Local and Indigenous Knowledge Innovations and Practices Associated with Ecosystem, Species and Genetic Resources

CBD Goal 9: Maintain Socio-Cultural Diversity of Indigenous and Local Communities

1.4.5. Indicator: Knowledge of Aboriginal Languages

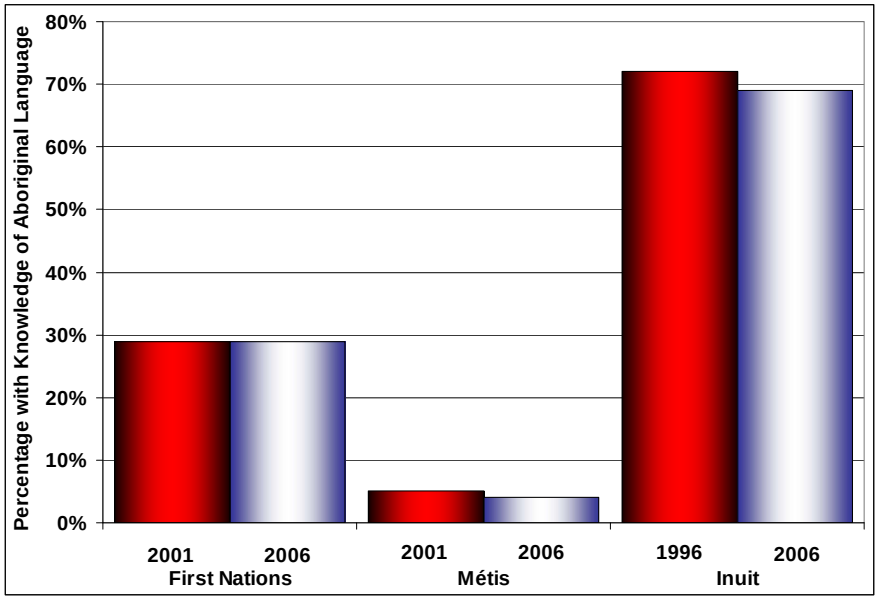


Figure 25: Percentage of Canada's three major groups of Aboriginal peoples that have knowledge of their Aboriginal language, 1996, 2001 and 2006. Source (Statistics Canada, 2008).

This report includes an indicator on knowledge of aboriginal languages because it is one of the CBD indicators. For some people language is critical to passing on Traditional Ecological Knowledge (TEK) between generations. TEK contains information on baseline states, terminology that affects ecological interpretations and long term trends in biodiversity. Hence, it has direct relevance to biodiversity. For other people it is the knowledge that is important, regardless of the language used to convey that knowledge. The CBD has considered these opinions and decided to include the indicator.

Over 60 different aboriginal languages are spoken by the three major groups of Indigenous Peoples in Canada: First Nations, Métis, and Inuit. Populations of Indigenous Peoples have all increased since 2001 and there has been an increase in the numbers of aboriginal language speakers in Canada.

For First Nations, the number of people with knowledge of an aboriginal language increased from about 176,600 in 2001 to about 202,400 in 2006. The percentage of the population that speak their aboriginal language remained constant at about 29% – and this trend holds for the younger generation.

The number of Métis speaking an aboriginal language increased from about 14,600 in 2001 to about 15,600 in 2006, but the percentage of the total Métis population speaking a traditional language declined slightly, from 5% to 4%. Although the traditional language of the Métis is Michif, Cree is now more commonly spoken and older people are more likely to speak an aboriginal language.

The Inuit have the highest rate of knowledge of aboriginal languages among Canadian Indigenous Peoples. The numbers of Inuktitut speakers increased from about 29,000 in 1996 to 34,800 in 2006. The proportion of Inuktitut speakers among Canada's Inuit population, however, declined slightly, from 72% to 69% over that period. Five distinct dialects of Inuktitut are spoken across Canada.

1.5. Cross-Cutting Threats

CBD Goal 5: Pressures from Habitat Loss, Land use Change and Degradation and Unsustainable Water use are Reduced

1.5.1. Indicator: Expansion of Urban Land

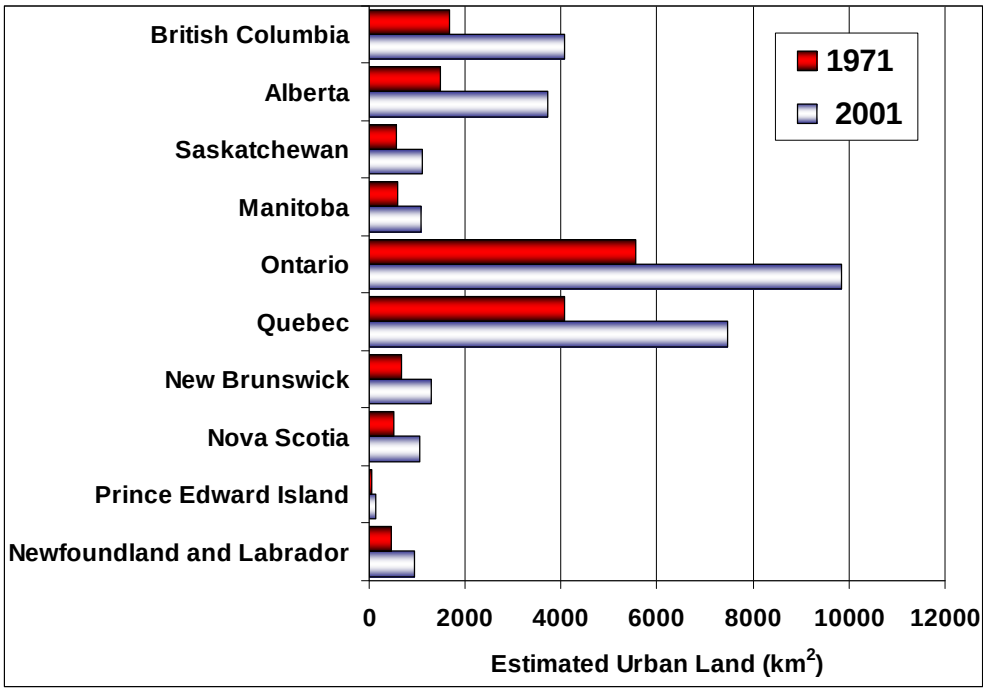


Figure 26: Growth in amount of land covered by selected urban centres by province, 1971 and 2001 Source: (Hofmann et al., 2005).

The total area of urban land in Canada almost doubled between 1971 and 2001, from 14,676 km^2 to 30,693 km^2. Although urban areas occupy a relatively small portion of Canada, they are often situated in places particularly rich in biodiversity, such as coastal areas and river valleys, where the impact of loss of habitat may be disproportionate to the size of the loss. Urban expansion can also alter watersheds, degrading water quality for aquatic biodiversity and increasing vulnerability to flooding. Historically, some ecosystems, such as wetlands, (see Wetland Loss Indicator) and forests (e.g. the Fraser Valley of British Columbia) have been particularly impacted by urban development. Some rare ecosystems have been particularly affected by urban expansion, such as the Garry oak ecosystem, one of Canada's most endangered ecosystems, which has been reduced by the expansion of Greater Victoria and agricultural development to 5% of its historical extent (Lea, 2002).

CBD Goal 6: Control Threats from Invasive Alien Species

1.5.2. Indicator: Invasive Alien Species in the Great Lakes

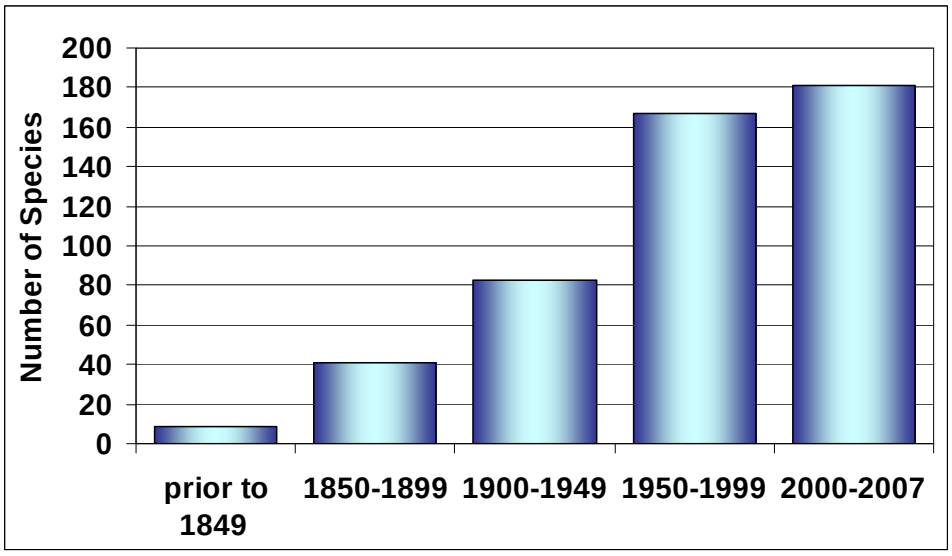


Figure 27: Trend in the number of invasive alien species established in the Great Lakes. Source:(Great Lakes Aquatic Nonindigneous Species Information System (GLANSIS), 2009).

Invasive alien species have had a major impact on biodiversity in many Canadian ecosystems. The Great Lakes, for example, have a long history of aquatic alien species introductions. The opening of the St. Lawrence Seaway in 1959 allowed ships to discharge ballast water from ports around the world, creating a major new pathway for introductions. As of 2007, over 180 alien species are reported to have reproducing populations in the Great Lakes (Great Lakes Aquatic Nonindigneous Species Information System (GLANSIS), 2009). Some of these species have had irreversible and unpredictable consequences on Great Lakes biodiversity. The native crustacean, *Diporeia* spp, provides a good example. It is a major component of Great Lakes food chains, and is being replaced with zebra and quagga mussels in all lakes except Lake Superior. The loss of *Diporeia* spp has impacted fish communities and fisheries throughout the Great Lakes. Thirty-three percent of the 36 species of native mussels in the Great Lakes are listed as endangered or threatened, partly as a result of competition from an invasive alien driessenid. The control of invasive species is expensive and their eradication is seldom possible. In the Great Lakes Canada and the United States have spent over $25 million per year to control one species, Sea Lamprey and protect a fishery estimated to be worth $4 billion annually. Prevention of future introductions, such as Asian carps from the Mississippi Basin, is a critical challenge.

1.5.3. Indicator: Lake Acidification

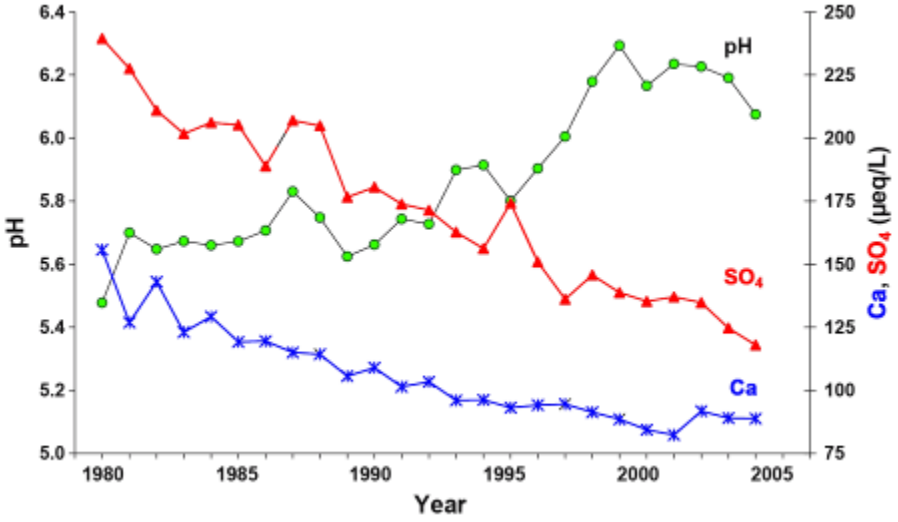


Figure 28: Changes in Acidity, Calcium and Sulfate in Whitepine Lake (89km north of Sudbury, Ontario). pH is a measure of acidity or basicity. pH values under 7, as in this graph, indicate acids. Ca is calcium. SO_4 is sulphate. The graph measures changes in lake chemistry following establishment of sulphur dioxide emissions reduction program in the 1970s. Trends in Whitepine Lake are representative of other affected lakes in the Sudbury area. Source: Adapted from (Keller et al., 2007) in (Monk et al., 2009).

Concerns about acidification of surface waters arising from atmospheric release of sulphur dioxide (SO_2) and nitrogen oxide (NO_x) have been prevalent since the 1970s, when scientists first observed increasing acidity (i.e. declining pH levels), particularly in southeastern Canada (Jeffries *et al.*, 2003). Acidification of lakes in these areas is now generally improving, as a result of a successful international sulphate emissions reduction program. Figure 28 illustrates the general effect of dramatically reducing sulphate inputs, i.e. declining water sulphate concentrations and recovery from acidic pH levels to levels more suitable for aquatic life. In many southeastern Boreal Shield lakes calcium concentrations are still low enough to negatively affect population of calcium-rich zooplankton, which are keystone species in many aquatic ecosystems. (Jaziorski *et al.*, 2008).

A general lack of any measurable recovery of the biota in some previously acidified regions with improving pH levels (e.g. Holt & Yan, 2003) illustrates the important point that it is biology, not chemistry which provides a true picture of a healthy aquatic ecosystem. Moreover, the fact that biological recovery necessarily lags behind physico-chemical recovery in remediated ecosystems underscores the importance of managing societal expectations of rapid improvements following costly remediation programs.

1.5.4. Indicator: Contaminants in Biota

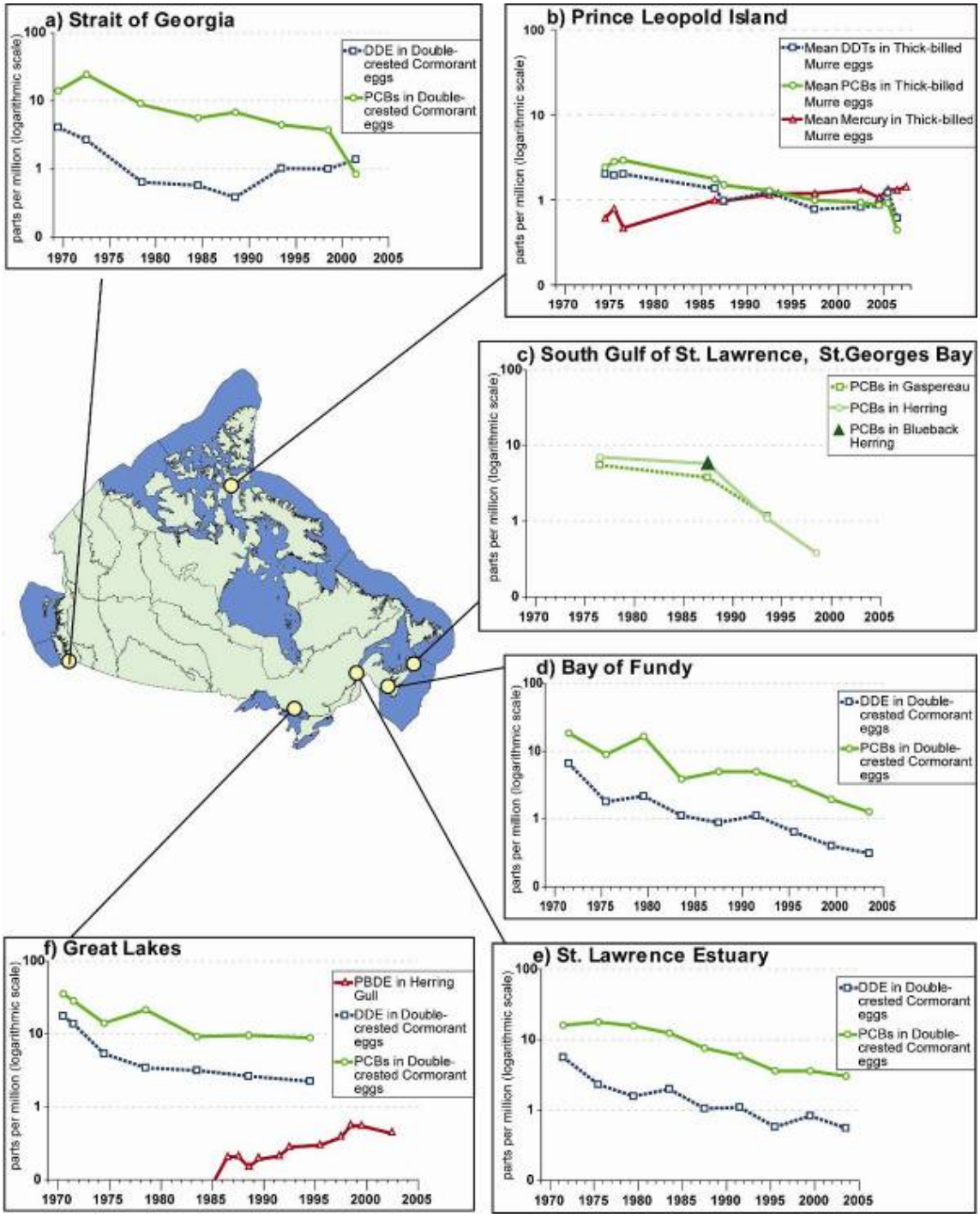


Figure. 29: Trends in Persistent Organic Pollutants (i.e.. the pesticide DDT, its breakdown product DDE and Polychlorinated biphenyls or PCBs), flame retardants (PBDEs) and mercury in wildlife species. Sources: a,c,d,e,f (Environment Canada, Information and Indicators Division, 2005), b Braune 2009 updated from (Braune, 2007).

The concentration of toxic contaminants in wildlife has been a concern in Canada since the 1970s and monitoring has been ongoing since then for some species and some compounds. In the late 1980s concerns about elevated levels of contaminants in wildlife species that were important to the traditional diets of northern Aboriginal peoples led to increased monitoring and research in northern Canada. Early results found a wide variety of substances, many of which had no Arctic or Canadian sources, but which were, nevertheless, reaching unexpectedly high levels in Arctic ecosystems primarily through long range atmospheric transport (Indian and Northern Affairs Canada, 2008).

Concentrations of all contaminants in wildlife vary depending on the individual, the species and the location. This indicator shows several examples of trends in toxic contaminants. Concentrations of persistent organic pollutants (POPs), such as the pesticide **d**ichloro**d**iphenyl**t**richloroethane (DDT), its breakdown product **d**ichloro**d**iphenyldichloro**e**thylene (DDE) and polychlorinated biphenyls (PCBs) have declined by between 70% and 90%, since the 1970s, in some wildlife (Figure 29) (Environment Canada, 2005). In some species recovery has been slower, for example in killer whales in the Strait of Georgia PCB levels have dropped by 2.5 times since 1972, but are still at high levels that likely affect their health, reflecting their high trophic level and very long lives (Hickie et al., 2007; Heise, 2005; Ross, 2006; Ross et al., 2007).

Brominated flame retardants, e.g. polybrominated diphenyl ethers (PBDEs) and fluorinated surfactants, e.g. perfluorooctane sulfonate (PFOS) are examples of toxic contaminants that have been increasing since the mid-1980s in most locations and some species (e.g. PBDE levels in herring gulls in the Great Lakes, Figure 29, and ringed seals in the Arctic (Ikonomou *et al.*, 2002). Following this relatively long period of increasing trends, concentrations in biota are showing signs of stabilizing or declining (e.g. beluga whales). This is likely due to recent restrictions imposed by several countries on production and use of these chemicals (Stow, 2008).

Mercury is a third example of a toxic chemical that finds its way into the tissue of wildlife. While some of the mercury found in wildlife is from natural sources, much of the mercury found in marine and aquatic systems is from industrial sources. Since the mid-1970s, increases in mercury have been observed in northern Canada in some marine mammals, seabirds, fish and some terrestrial mammals (Porcupine and Bluenose caribou herds). However, mercury concentrations in biota are quite variable year to year and in some locations and species there are no discernable trends (Stow, 2008).

CBD Goal 7b: Address Challenges to Biodiversity from Climate Change.

1.5.5. Indicator: Change in Temperature

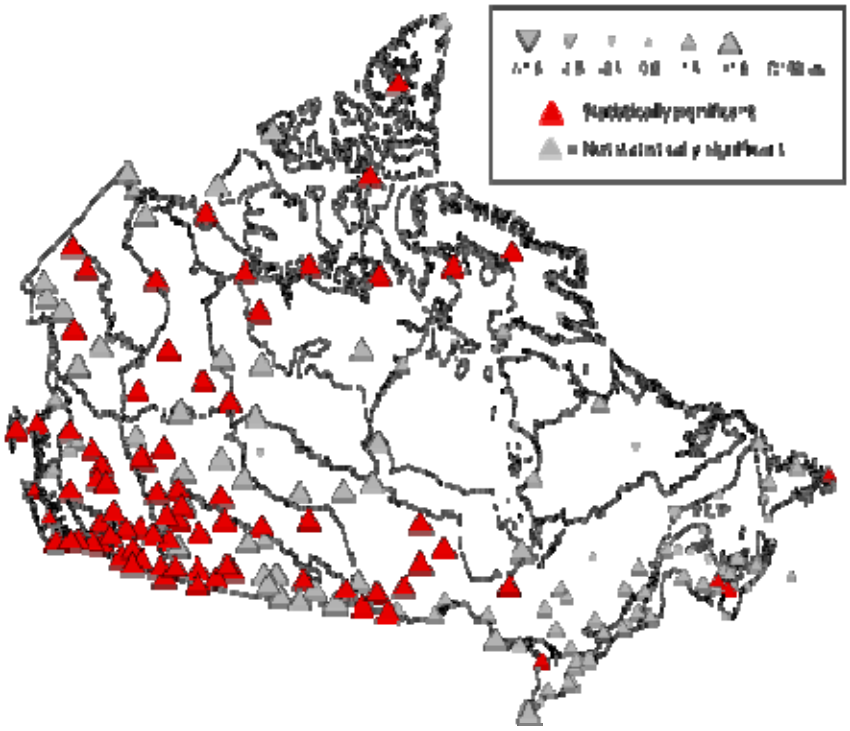


Figure 30: Trends in spring (March, April, May) mean temperature (197 stations), 1950-2007. Upward and downward triangles indicate increasing and decreasing trends respectively. Triangles are coloured when the trend is significant at the 5% level. The colour is red for significant increasing trends. There are no significant decreasing trends. Source: Environment Canada, (Zhang et al., 2008).

Between 1950 and 2006, temperature increased significantly, by between 1 to 2 degrees Celsius, across Canada. The strongest warming trends have occurred in the west and northwest and in the winter and spring. Studies indicate that most of the temperature increase in Canada can be attributed to human emissions of greenhouse gases (Min et al., 2008) (Zhang et al., 2006).

Warmer temperatures have resulted in significant changes to other climatic variables that drive ecosystem change. In Canada, these include a significant reduction in snow cover duration almost everywhere in the country, with the largest changes in snow-on and -off dates occurring in spring over western and northern Canada. This is consistent with the hemispheric-wide trend toward spring warming and earlier melt of snow and ice (Lemke et al., 2007). River and lake ice conditions are also trending towards earlier spring thaw at freshwater sites across Canada which impacts hydrology. Finally, a statistically significant increase in length of the growing season have been observed in many places in Canada, especially in the south and west. This is largely due to earlier start of growing season as a result of spring warming.

1.5.6. Indicator: Change in Spring Precipitation

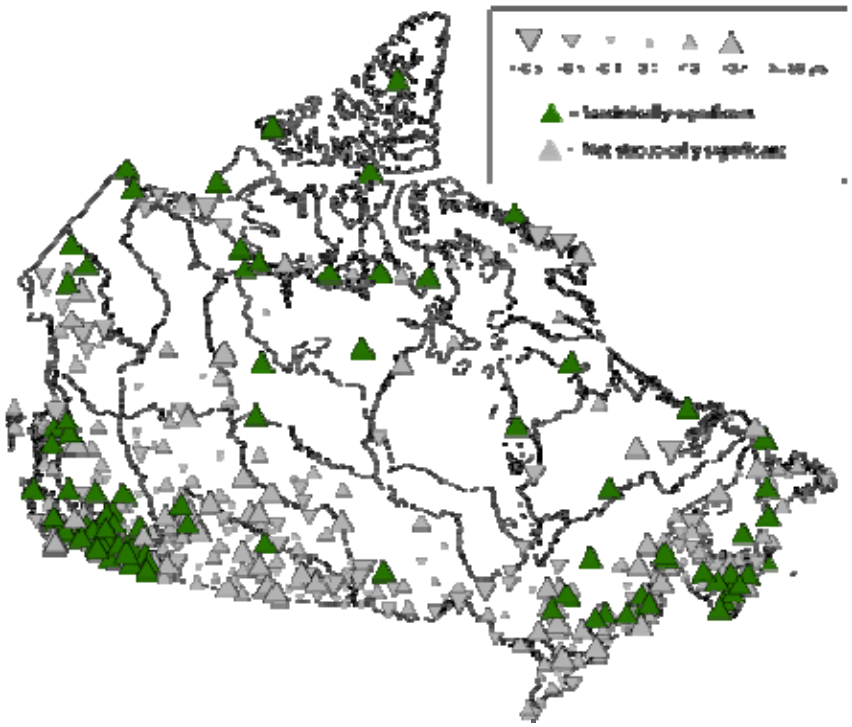


Figure 31: Trends in amount of spring (March, April, May) precipitation expressed as percentage change of 1961-1990 mean amount (436 stations), 1950-2007. Upward and downward triangles indicate increasing and decreasing trends, respectively. Triangles are coloured when the trend is significant at the 5% level. The colour is green for significant increasing trends. There are no significant decreasing trends. Source: Environment Canada (Zhang et al., 2008).

Precipitation has generally increased over Canada between 1950 and 2006, with the exception of the prairies. The largest relative increases have occurred in the Arctic. The number of days with precipitation has also increased right across the country in all seasons. While it is not yet clear what is responsible for the precipitation changes in Canada, a recent study (Min *et al.*, 2008) suggests that precipitation increases over Northern Hemispheric high latitudes (north of 55N), that include Canada, may have been a result of anthropogenic influences on climate.

Together with temperature changes, changes in precipitation patterns are associated with fundamental shifts in hydrologic regimes such as a significant decrease in the fraction of precipitation falling as snow over southern Canada, and earlier spring runoff.

1.5.7. Indicator: Change in Net Primary Production

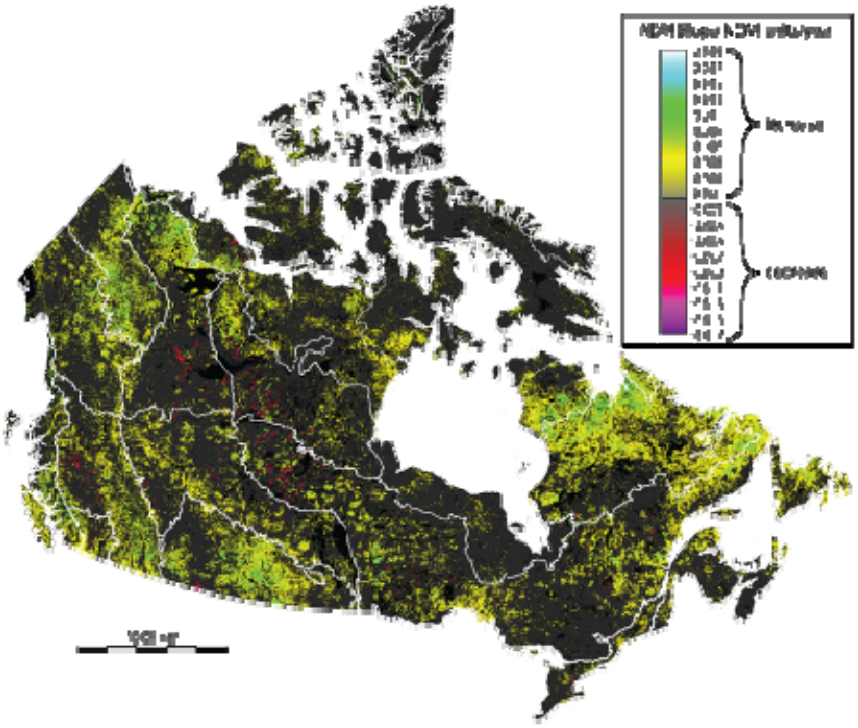


Figure. 32: Change in Normalized Difference Vegetation Index (NDVI) between 1985 to 2006. The yellows, greens and blues indicate an increase in NDVI and hence an increase in net production; the reds and purples indicate a decrease in NDVI and hence a decline in net production. Source (Ahern, 2008)

Normalized Difference Vegetation Index (NDVI) is a measure of the amount of photosynthetic activity of vegetation. It is often referred to as a measure of the "greenness of the earth".

Between 1985 and 2006 there was a significant increase in NDVI in many areas of Canada. The increase is most prominent in northern Canada, in the Taiga Cordillera, the Arctic and the eastern Taiga Shield. The increase in NDVI in the north is a direct consequence of increased temperatures. Implications for biodiversity are significant. For example, treeline encroachment on tundra is already happening in some areas and models predict that the treeline could advance as much as 500km by 2100, resulting in a loss of 51% of tundra habitat (Callaghan *et al.*, 2005). Some of the predicted impacts on biodiversity from warming include an increase in deciduous shrubs and graminoids and a decrease in mosses and lichens. Since more than half of all northern plant species are nonvascular, the fate of many mosses and lichens under future climate scenarios is of particular concern. Although the number of species in the north might increase over the long term as non-arctic species migrate northwards, there will likely be a loss of species particularly adapted to tundra ecosystems.

The increases in NDVI in most of the Prairies are more difficult to explain. Trends in NDVI in the Prairies are complicated by the large proportion of land in cropland. Crop species, variety and cropping practices all affect NDVI. For example, NDVI would be low in summer fallow fields, so the historic decline in summer fallow area could result in an increase in NDVI (Thorpe & Godwin, 2009).

1.5.8. Indicator: Thawing Permafrost

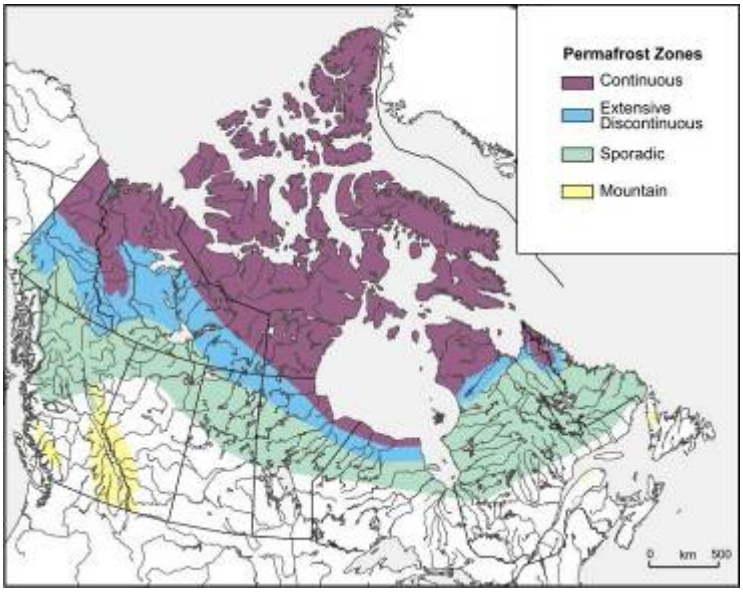


Figure 33: Extent of permafrost region in Canada. The permafrost region covers about half of Canada. Source: (Heginbottom et al., 1995).

Permafrost is an important feature of the northern Canadian landscape, with the permafrost region covering about half of Canada's landmass. Permafrost and its associated ground-ice affects entire ecosystems through its influence on ground stability, drainage patterns, soil moisture conditions, and surface and subsurface hydrology. It not only provides the physical foundation for vegetation communities but the freeze/thaw cycles create landscape features which define northern ecological communities.

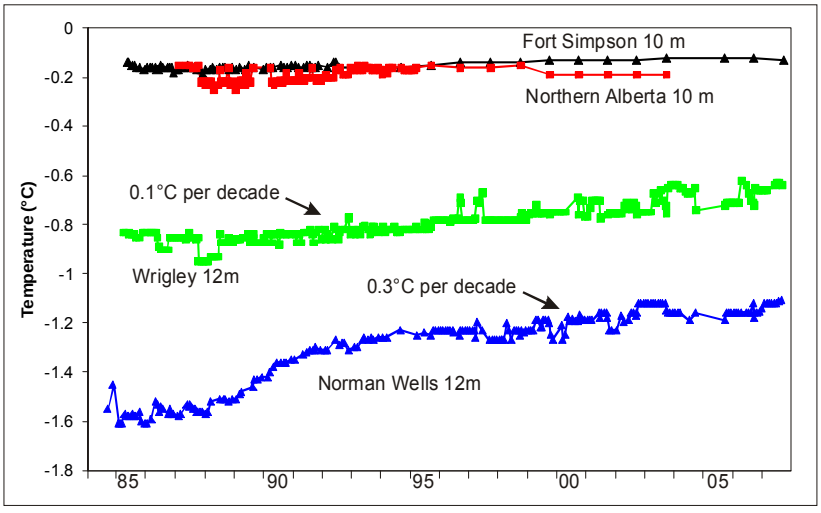


Figure 34: Ground temperatures between 1984 and 2007 at depths near 10 m in the Mackenzie valley south of Norman Wells (in Northwest Territories). Norman Wells is the most northerly site. Note that the frequency of measurements was reduced in the mid-1990s at the two most southern sites. Source: Updated by (Smith, 2009). from (Smith et al., 2005).

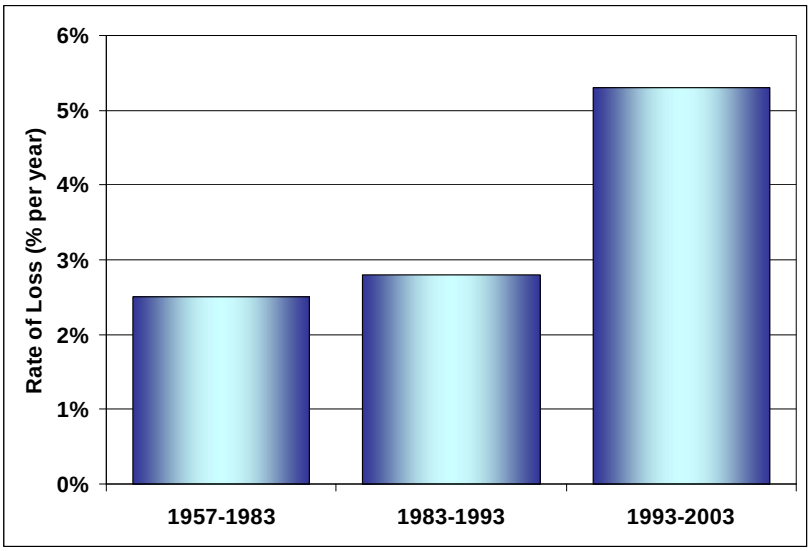


Figure 35: Permafrost decay rates for frozen peatlands in Northern Quebec. The annual percent loss of the permafrost layer has doubled from 2.5% (1957-1983) to 5.3% (1992-2003). Data source: (Payette et al., 2004).

Permafrost warming is occurring across the permafrost region, although the magnitude of this warming varies regionally. Since the 1980s, for example, warming of shallow permafrost of 0.3 to 0.6 °C per decade has occurred in the central and northern Mackenzie region of northwestern Canada (Fig.34), in response to a general increase in air temperature. Warming of shallow permafrost has also been observed in the eastern and high Arctic but this has mainly occurred in the late 1990s. In northern Quebec and the East Coast of Hudson Bay, permafrost has degraded since 1957, but the rate of permafrost degradation increased after 1993 (Fig 35). The main driver for the accelerated rate of permafrost thawing was increases in snow precipitation and air temperature.

The impacts of warming permafrost on Canada's northern ecosystems are significant and highly variable. In the northwest, where a transition to drier conditions is being observed, permafrost warming can result in the loss of aquatic ecosystems. A number of studies have reported a drying trend in thermokarst lakes. Thawing of permafrost could also lead to loss of wetlands in the polar desert of the high Arctic. (Smith, 2009)

Some authors have suggested that the thawing of permafrost could also result in changes in both the carbon cycle and carbon sources and sinks.

1.5.9. Indicator: Fire

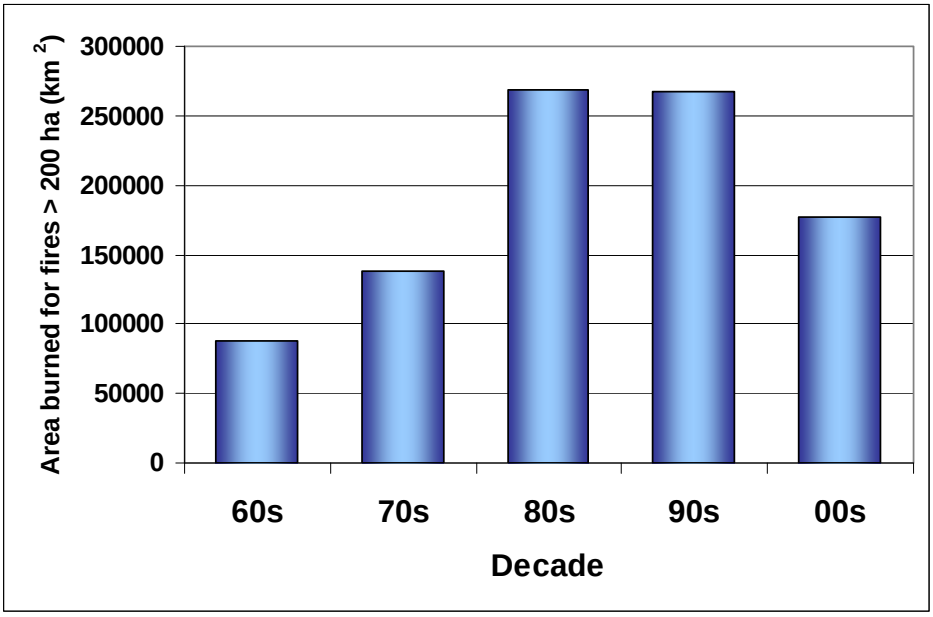


Figure 36: Trends in area burned for large fires (>200ha) in Canada. Although these large fires make up approximately 3% of the total number of fires that occur each year, they represent 97% of the area burned. The 2000s decade includes data up 2007. Source: (Stocks et al., 2003; Krezek et al., 2008).

Fire, an essential natural disturbance agent in Canadian forests, influences forest structure, function and species composition. The largest areas burned in Canada are in the Boreal Shield (37% of the area burned) and the Taiga Shield and Taiga Plains (32%). These ecological units encompass Canada's boreal forest. Fire is particularly important in the boreal forests, where many boreal tree species have evolved to rely on fire to perform important ecological functions including: regulating insects and disease, nutrient cycling, influencing species composition and age structure, maintaining productivity and diversity of habitats. (Krezek *et al.*, 2008)sFire occurrence, seasonality, extent and severity are influenced by many complex and interacting factors, including weather, large scale climatic patterns and human influences such as settlement and advances in forest fire suppression. Based on historical information about the relationship between fire and weather, and Global Circulation Model scenarios, researchers are predicting a 75% to 120% increase in area burned in Canada by the end of this century (Flannigan *et al.*, 2005) (Wotton & Stocks, 2006).

Figure 36 shows trends in large fires, greater than 200 hectares, over the past 50 years. Large fires account for approximately 3% of the number of fires in Canada, but 97% of the area burned. The trends show an increase in area burned from the 1960s to 1980s, followed by a levelling off in the 1990s and a decline in the current decade. The increase in the 1960s to 1980s is linked to increases in temperature (Gillett *et al.*, 2004) (Flannigan *et al.*, 2005). At first glance, the recent decline does not appear to be in line with the preceding increase and predictions that area burned is expected to continue to increase with warmer global temperatures. However, the predictions are not expected to be linear or consistent across the country. The decline in the current decade may be attributed to other climatic influences that affect fire occurrence, such as large scale ocean circulation patterns. Despite these shorter-term influences the long-term prediction remains that area burned is anticipated to increase (Krezek *et al.*, 2008).

1.5.10. Indicator: Changes in Glaciers and Ice Caps

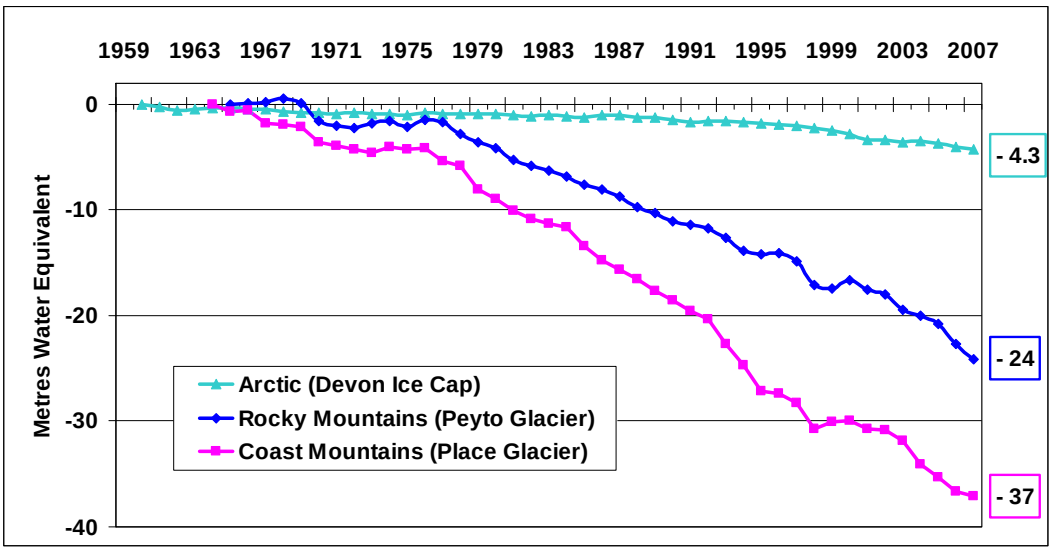


Figure 37: Loss of glacier mass since early 1960s for reference glaciers in the High Arctic, Rocky Mountains and Coast Mountains. Each year snow accumulates on glaciers in the winter and some of this snow and ice melts in the summer. Summer and winter changes in ice mass are added to calculate the net mass balance for a glacier, which is expressed as a change in its water equivalent. This figure plots the cumulative mass balances over the years to arrive at the numbers in boxes at the end of each line. These are the total amounts, in metres water equivalent, by which each glacier has thinned since the start of records. Source: (Burgess & Koerner, 2009; Demuth et al., 2009a; Demuth et al., 2009b).

Glaciers around the world reached their last maximum extent at some point during the Little Ice Age – generally in the mid to latter 19th century for Canadian glaciers. Since then, there has been a melting trend interspersed with periods of net accumulation of ice and much variability from place to place. In recent decades glaciers around the world have been melting at accelerating rates and the total loss of glaciers is projected for many mountainous regions (Gerland *et al.*, 2007; UNEP & WGMS, 2008).

Canada's landmass and climate support approximately 200,000 km^2 of glacier cover, with 75% of that found in the Arctic Archipelago. Canadian Arctic glaciers and ice caps represent half of the Earth's 300,000 km^2 of glaciers and ice caps (not counting the Greenland Ice Sheet) that drain to the Arctic Ocean (Williams & Ferrigno, 2002; Dyurgerov & Carter, 2004).

As can be seen in Figure 37, mountain glaciers in south western Canada (e.g. Peyto and Place Glaciers) show accelerating losses of ice starting in the mid-1970s, while the Arctic glaciers (e.g. Devon Ice Cap) began to show increased ice loss about 20 years later (UNEP & WGMS, 2008). The magnitude of the loss is much greater for the glaciers in south western Canada than for the Arctic.

Western Canadian mountain glaciers drain into river systems (e.g. Demuth *et al.*, 2008), regulating summer river flow and influencing ecosystem characteristics such as water temperature and chemistry that affect aquatic life. The influence of glaciers is especially important for cold-adapted species like salmonids (Petts *et al.*, 2006; Milner *et al.*, 2009; Moore & Demuth, 2001). Although the early phase of increased glacier melting is accompanied by an increase in the volume of melt water, this contribution to river flows will decline as the glaciers shrink in reaction to long-term warming.

While many western Canadian rivers are currently experiencing an increased flow phase (e.g. Fleming & Clarke, 2005), several regions in southwestern Canada are already showing evidence of this decline (Hopkinson & Young, 1998; Moore & Demuth, 2001; Demuth & Pietroniro, 2003; Stahl & Moore, 2006).

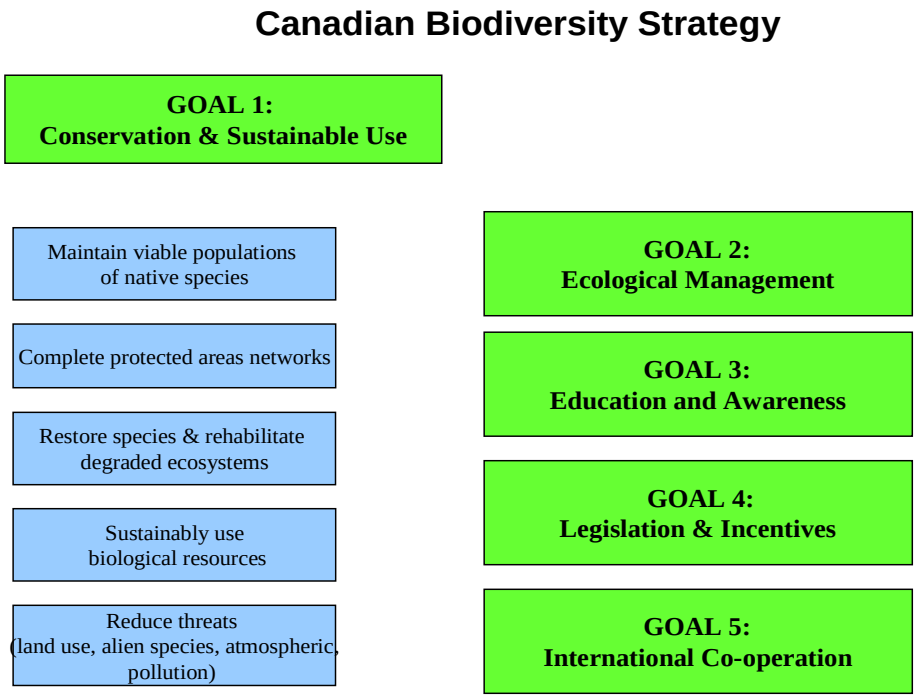
Melting Arctic glaciers are expected to have an impact on marine, terrestrial and coastal ecosystems. In the Arctic Ocean, melting glaciers account for much of the observed increase in freshwater input since the 1960s (Dyurgerov & Carter, 2004). This increase affects marine biodiversity because it alters temperature, salinity, and the availability of nutrients, especially in near-shore waters. In terrestrial systems the loss of area occupied by glaciers will increase the area of land for tundra ecosystems (Wolken *et al.*, 2008), although it can take over 300 years to achieve a fairly dense tundra plant cover after the ice melts (Jones & Henry, 2003). Coastal ecosystems around the world will be affected by rising sea levels. A study published in 2009 estimates that glaciers and ice caps around the world will contribute about 370 mm of sea-level rise over the next 100 years, nearly half of the projected rise in sea level for the period (Bahr *et al.*, 2009).

The loss of glaciers and ice caps represents loss of a prominent and iconic land feature of Canada. They are rare globally and not replaceable.

Chapter 2: Implementing Canada's Biodiversity Strategies and Achieving Biodiversity Outcomes

2.0 Introduction

The Canadian Biodiversity Strategy (CBS), developed jointly by federal, provincial and territorial governments and released in 1996, highlights the importance of Canada's natural assets and sets out a range of strategic directions for the conservation and sustainable use of Canada's natural capital. Since this time, Canada has moved forward in implementing the strategy, integrating it into planning, management and outcome oriented approaches.

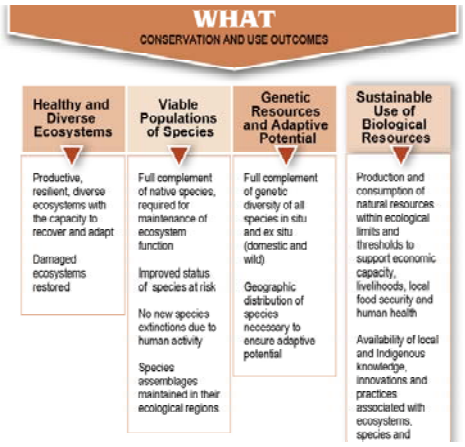


Federal, provincial and territorial partners agree that the 1996 strategy remains a useful guide to the conservation and sustainable use of biodiversity in Canada, and also recognize that it must be complemented with more specific guidance to identify measurable outcomes against which Canada can report progress. Its comprehensive coverage creates a need for priority setting both within jurisdictions and at the national level. The Strategy also calls for strengthened linkages at the ministerial level to oversee implementation and regular progress reports, including reporting to Canadians on the status of Canada's biodiversity.

In 2005, federal, provincial and territorial ministers agreed on the need for an outcomes-based

framework to provide a more systematic approach to identifying national biodiversity priorities; a framework for evaluating and reporting on progress; a mechanism for continuous learning, improvement and adaptive management; and a basis for communicating with both domestic and international audiences. In 2006 they endorsed a Biodiversity Outcomes Framework for Canada.

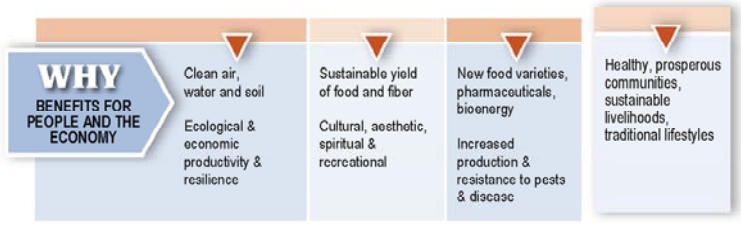
The centrepiece of the framework is a suite of national outcomes: healthy and diverse ecosystems, viable populations of species, genetic resources and adaptive potential and sustainable use of biological resources. The framework describes the societal benefits associated with these outcomes such as clean air, water and soil, sustainable food supply, pharmaceuticals, protection from pests and diseases, healthy communities, sustainable livelihoods and traditional lifestyles.



Biodiversity Outcomes Framework Focuses on the 'Why, What, How'

CBS VISION: A society that lives and develops as part of nature, values the diversity of life, takes no more than can be replenished and leaves to future generations a nurturing and dynamic world, rich in biodiversity.

MISSION: Working together to sustain Canada's natural assets and enrich the lives of Canadians.



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The framework puts forward an "assess, plan, do, track," adaptive management approach aimed at more effective planning and decision-making and continuous learning and improvement. It recognizes that although decision-makers may lack all the necessary information, they can still take action based on the best knowledge available.

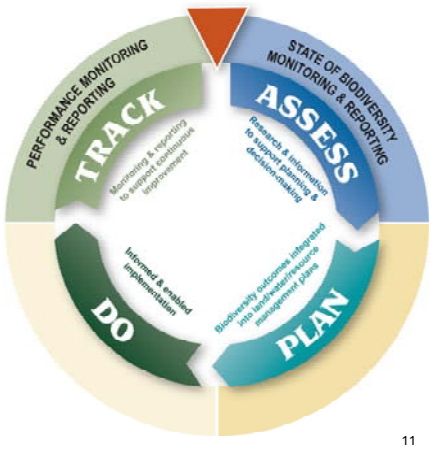
"How" – ***ecosystem approach & adaptive management used to achieve shared outcomes***

Assess: ***value and status of biodiversity assessed as basis for priority setting & improved decision-making***

Plan: ***biodiversity objectives & outcomes integrated into land, water & resource management plans***

Do: ***Users of land, water & resources encouraged, enabled or required to maintain natural assets***

Track: ***Progress in achieving outcomes is monitored & evaluated***



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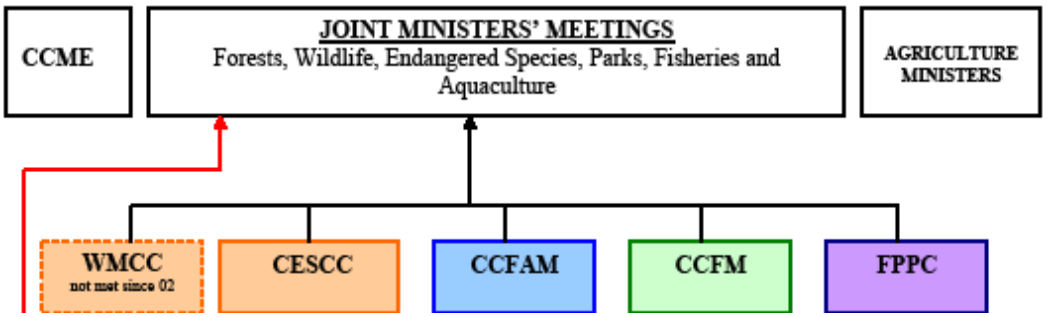
The framework was developed in collaboration with federal, provincial and territorial governments with input from non-government interests. It builds on and complements the 1996 Canadian Biodiversity Strategy. It encompasses a wide range of conservation and sustainable resource management initiatives that address issues such as species at risk, protected areas, invasive alien species, wildlife disease, sustainable forest and oceans management and climate change, all of which have an impact on the health and diversity of Canada's living resources.

Governance of Biodiversity in Canada

The Canadian Biodiversity Strategy was developed under the auspices of the Canadian Council of Ministers of the Environment (CCME). Once released, the Strategy was without a ministerial home, though many considered the Wildlife Ministers' Council to be the "de facto" lead. In 2000, Wildlife Ministers mandated the development of a suite of biodiversity priorities for Canada that were presented to a joint meeting of Wildlife, Forestry and Fisheries and Aquaculture Ministers in 2001. A document, entitled **Working Together,** proposed four priorities: biodiversity **science and information,** monitoring and reporting on biodiversity **status and trends**, **stewardship** of biodiversity, and **invasive alien species**. **Canada's Stewardship Agenda** and **An Invasive Alien Species Strategy for Canada** were two products of that cooperative federal-provincial-territorial work.

Joint meetings of Ministers, now called the Canadian Councils of Resource Ministers (CCRM) have taken place regularly since 2001. Following the adoption of the Biodiversity Outcomes Framework in 2006, the CCRM mandated the development of an **Ecosystem Status and Trends Report for Canada** as a first deliverable in 2007. They also called for a study of knowledge and information needs associated with biodiversity and adaptation to climate change.

Figure 1. Governance of Biodiversity Work in Canada



Provincial and territorial governments have adopted innovative governance arrangements to advance biodiversity planning and management. The Government of Ontario has created a multi-stakeholder Biodiversity Council to guide planning, implementation and reporting with respect to Ontario's Biodiversity Strategy. Alberta is developing its biodiversity strategy under the umbrella of a new land use framework and Nova Scotia is creating a High Level Panel under leadership of a former Chief Justice to oversee development of a provincial natural resource strategy that will include forestry, mining and protected areas.

The Northwest Territories has developed its biodiversity and protected areas strategy and action plan in partnership with aboriginal communities. Aboriginal peoples have also become important partners in governance arrangements related to protected areas in Canada. There are increasing numbers of private sector and NGO partnerships and governance arrangements as more companies begin to develop strategies for reducing their ecological footprint or seek ways to offset potential impacts.

The following four sections provide an overview of some of the policies, plans, and programs that are contributing to the achievement of the four outcomes of Canada's Biodiversity Outcomes Framework: healthy and diverse ecosystems, viable populations of species, genetic resources and adaptive potential, and sustainable use of biological resources.

2.1. Outcome - Healthy and Diverse Ecosystems

Productive, resilient, diverse ecosystems with the capacity to recover and adapt

Damaged ecosystems restored

Canada supports a remarkable diversity of tundra, forest, grassland, freshwater, and ocean ecosystems. Despite having vast wilderness areas, Canada is also an urban nation with densely settled lands and high resource demands. Most of Canada's ecosystems are now readily accessible and open to a broad spectrum of potential uses.

Habitat is declining in quantity and becoming fragmented due to combined pressures from urbanization and industrial activity including agriculture, forestry, fisheries, mining and oil, and gas development. Air and water pollution, invasive alien species and wildlife disease, are also putting pressure on ecosystems and species. Climate change is having an impact on ecosystems across the country and raising questions with respect to their vulnerability and adaptive capacity. Not all management practices currently in place in Canada were designed to cope with these increased, cumulative, and complex pressures. Land, ocean, freshwater and resource planning regimes are being re-examined and re-designed.

Part of this response has involved the increased use of the **ecosystem approach**, defined by the Convention as "a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way". Recognizing that all elements of an ecosystem are connected and that management must be approached in an integrated, adaptive, and collaborative manner, the ecosystem approach considers ecological goals in conjunction with economic and social goals. Canada is an international leader in the development and application of the ecosystem approach; the first formal adoption of the term "ecosystem approach" in Canada was

in the **Great Lakes Water Quality Agreement** in 1978.

Initiatives outlined in the following section describe actions being taken in Canada in support of its "healthy and diverse ecosystems" outcome. Steps are being taken to improve Canada's knowledge of ecosystem health, to coordinate the collection of biodiversity data to support decision-making, to undertake more integrated ecosystem based planning and to restore degraded ecosystems. A centrepiece of these efforts has been the completion of protected areas networks. Although Canada has made significant additions to its terrestrial networks there is recognition that more progress is needed with respect to marine networks. In addition, there is a need to connect islands of conservation, particularly in fragmented and human-modified ecosystems.

In the face of increasing threats and the declining state of many of the country's ecosystems, further integrated action and use of the ecosystem approach is necessary. Other areas where more effort will be required in the future include the long term monitoring and reporting of ecosystem status and trends, assessment of ecological thresholds and cumulative impacts, prevention of new invasive species introductions, assessment of projected climate change impacts and building of adaptive capacity, and mainstreaming of ecological goods and services' valuation into decision-making. Decision makers who understand the true cost of biodiversity loss in terms of human well-being will be more successful in their economic and development activities.

2.1.1. Assessment – Research and Information for Decision Making

Provision of biodiversity data

Investments in building the biological data base have been significant across Canada, providing information to a number of initiatives evaluating the status and trends of biodiversity. As examples at the national level, both the **National Land and Water Information System (NLWIS)** and the **Canadian Healthy Oceans Network (CHONe)** provide scientific information useful for decision making. **NLWIS** is an Internet-based service based on Geographic Information Systems technology that provides access to up-to-date information related to management of land, soil, water, climate and biodiversity; and, support tools furnishing advice, direction and common understanding to support and inform local and regional land-use planning and management. Stakeholders are providers of data and expertise and users of the Service. Stakeholders include producer organizations, other federal government departments and agencies, provincial and territorial governments, municipal governments, non-government organizations, academia and the private sector.

Case Study: The Canadian Healthy Oceans Network (CHONe)

Recently launched in Canada and funded by NSERC, CHONe will bring together Canada's marine science capacities and provide a baseline of information against which future changes in the oceans can be monitored and understood. CHONe is a large, interdisciplinary research network which includes DFO, seven other government laboratories, and 65 researchers from 15 universities and is aimed at providing scientific criteria for ensuring sustainable management and use of the country's ocean biodiversity resources. The network addresses a pressing need for scientific data to ensure proper conservation and the sustainable use of Canada's ocean resources; three main research themes will focus on marine biodiversity, ecosystem function, and population connectivity.

The Natural Sciences and Engineering Research Council of Canada (NSERC) is providing $5 million in funding over five years to CHONe, with Fisheries and Oceans Canada adding $1.9 million in in-kind contributions. The Government of Newfoundland and Labrador, through the Department of Innovation, Trade and Rural Development is also supporting the network with a contribution of more than $1 million from its Industrial Research and Innovation Fund. An additional $700,000 in cash and in-kind contributions has been secured from Memorial University, with other government and private sector partners contributing another $600,000 in in-kind support.

Canada has participated actively in the Global Biodiversity Information Facility since it was formally established in 2001. The Canadian Biodiversity Information Facility provides on-line access to millions of authoritative observational records and specimens housed in natural history museums, universities, and government collections.

Across the country, conservation data centres, which are discussed further in section 2.2.1, provide biodiversity data for management and planning. **NatureServe Canada,** a network of eight independent conservation data centres covering all ten provinces and the Yukon Territory, increases the quality, standardization and accessibility of this data. Recognizing the increasing necessity of computer-based decision-support systems, NatureServe has collaborated on the development of specialized software for conducting environmental impact assessments and for conservation and natural-resource planning.

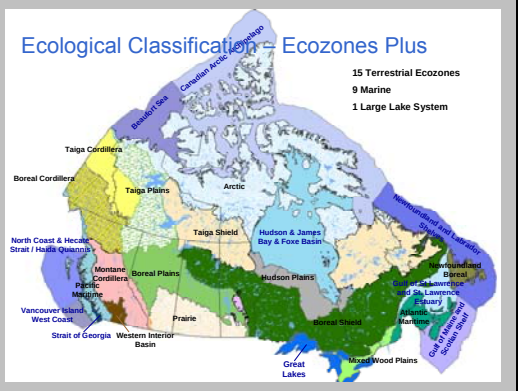
At the provincial level, the province of **Newfoundland-Labrador** has developed an **Institute for Biodiversity and Ecosystem Sciences and Sustainability (IBES)**, providing an opportunity for the academic community, government departments and agencies, industry, and other non-governmental organizations to collaborate on natural resource conservation research and its application to sustainable use. IBES assists with research in the areas of natural resources conservation, management, and sustainability, with more specific research in areas such as ecosystems ecology, climate change, fisheries and aquaculture science, and land use planning.

As another provincial example, **British Columbia** has developed **Hectares BC (HaBC),** a tool for collecting data, which will assist in the development of strategies by creating summary information for the entire provincial landbase. Developed by a partnership of conservation non-governmental organizations and the provincial and federal governments, HaBC is an open source web application based on a 1 hectare raster grid. It allows users, especially in the provincial government, to analyze geospatial information without the need for geographic information system software or skills. HaBC includes a considerable amount of data on ecosystems and human activities that affect them, and is designed to facilitate the integration of this information in decision making.

Ecosystem status and trends reporting

Case Study: Ecosystem Status and Trends Report

In 2001, the Canadian Councils of Resource Ministers identified biodiversity status and trends reporting as a priority, and in 2007 mandated the development of an **Ecosystem Status and Trends Report (ESTR)** on the status and trends of Canada's ecosystems as a first deliverable under the Biodiversity Outcomes Framework. A federal/provincial/territorial Steering Committee has been struck to produce the report which will be released in 2010 as a companion to Canada's 4th National Report and as a complement to the General Status of Wildlife Species Report. Using designated ecozones to collect data on status and trends across the country, ESTR utilizes the ecosystem approach by considering Canada's ecosystems in an integrated manner.



The Government of Saskatchewan released **Saskatchewan's** first **State of the Watershed Report** in 2007 as a benchmark tool for assessing watershed health to ensure source water protection and sufficient water supplies in Saskatchewan. It provides a basis for governments, decision makers, industry and the community to act in the long-term interest of environmental sustainability. It assesses the current health of Saskatchewan's watersheds, provides information about human activities that impact the environment within watersheds, and evaluates the effectiveness of the management activities.

Case Study: Taking Nature's Pulse

Taking Nature's Pulse, released in 2008 by **Biodiversity BC**, is a scientific report on the state of British Columbia's natural environment. The British Columbia government concurrently launched its science-based **Conservation Framework** that is intended, in part, to address many of the report's findings. Developed by the Minister of Environment in collaboration with more than 50 science experts, conservation organizations, industry and government – both provincial and international – the report assesses the status and significance of the Province's ecological, species, and genetic diversity. The Framework provides a set of science-based tools and actions for conserving species and ecosystems in British Columbia, and concludes that, compared to the rest of the world, biodiversity in B.C. is in relatively good shape, but could still be vulnerable to rapid deterioration, especially in light of climate change.

The Biodiversity Atlas of British Columbia released in June 2009 as a companion document to Taking Nature's Pulse, provides a broad overview of the province's range of terrestrial and freshwater biological diversity and presents a visual perspective of a number of human-induced threats, including climate change, affecting biodiversity in B.C. today. Bringing together data from numerous sources summarized in map form, the Atlas provides a window to B.C.'s diverse ecosystems, the species that live in them, and the elements of British Columbia's biodiversity that make it globally significant.

Assessing and adapting to climate change impacts

The ability of ecosystems and species to adapt to, or recover from, changing conditions, whether natural or anthropogenic, depends on ecosystem integrity/resiliency. The impact of a changing climate on ecosystems has been demonstrated in a striking way through the mountain pine beetle, a native Canadian insect historically kept at low abundances through low temperatures sufficient to kill overwintering larvae. Milder winter temperatures associated with climate change have allowed populations to explode decimating even-aged lodgepole pine stands produced by decades of fire suppression. Land management regimes may require assessment and redevelopment in order to reestablish the adaptive capacity of Canadian ecosystems in the face of increasing change.

Canada's assessment of climate change adaptation remains in early stages of development. The 2007 federal report **From Impacts to Adaptation** emphasizes the importance of mainstreaming climate change into ongoing planning and policy decision-making. Programs and policies dealing with natural resource management, land-use planning, and other climate-sensitive issues provide ideal opportunities for using an ecosystem approach and mainstreaming climate change adaptation.

As one of the northern jurisdictions of Canada, the impacts of climate change are already being felt in the Yukon through extreme weather events, the melting of permafrost, and changing species distributions. The Yukon Territory has a **Climate Change Strategy**, released in 2006, with goals to enhance knowledge and understanding of climate change, adapt to climate change, reduce greenhouse gas emissions, and lead Yukon action in response to climate change. A **Climate Change Action Plan** gives effect to the goals of the Strategy. It calls for establishment of a Yukon Research Centre of Excellence, development of climate scenarios, a forest health risk assessment and forest tree species and vulnerability assessment, and long-term monitoring of species, including invasive species.

The effective deployment of this adaptive capacity will be facilitated by increased knowledge and awareness of the impacts of changing climate, and broader understanding of the role of adaptation. Some adaptation actions in the context of climate change are already being undertaken in Canada. Most of these were initiated in response to isolated events or circumstances, as the need became apparent and where the capacity existed. A more anticipatory and strategic approach to adaptation would help reduce social and economic costs, increase efficiency and further reduce vulnerability in Canada. Moving adaptation forward in Canada involves building on the momentum gained through existing initiatives and considering additional steps to facilitate implementation of adaptation measures and policies. Building on present activities involves:

- maintaining and strengthening the knowledge base;
- synthesizing and sharing knowledge;
- broadening engagement and collaboration;and
- enhancing institutional capacity

2.1.2. Planning and Implementation

Freshwater ecosystems

Canadians are stewards of 20 percent of the world's total freshwater resources and 25 percent of the world's wetlands. An objective of the Canadian Biodiversity Strategy to increase understanding

of inland water ecosystems, and to use this information to improve the capacity for sustainable resource management. Canada's freshwater biodiversity is affected by overexploitation, pollution, flow modification, destruction or degradation of habitat, climate change, and invasion by alien species, with the significance of these main drivers of biodiversity loss varying across the country.

Inland water management planning in Canada is an inter-jurisdictional issue. All levels of government employ integrated water resource principles in their decision-making efforts, and the management of shared waters is progressively being undertaken from an ecosystem approach. The 1909 Boundary Waters Treaty established the **International Joint Commission**, a mechanism to administer equitable and sustainable management of transboundary waters shared by Canada and the US. The International Joint Commission reviews progress under the 1978 **Great Lakes Water Quality Agreement**, which marked the beginning of the formal use of the ecosystem approach in Canadian policy and planning. It was amended in 1987 to reflect a commitment to restore and maintain the integrity of the Great Lakes Basin Ecosystem. The parties consulted with state and provincial governments to create and implement **Lakewide Management Plans** for open waters of Lake Erie, Lake Superior, Lake Michigan, and Lake Ontario. A Lake Huron Binational Partnership is also currently in place.

Early action plans regarding water quality generally focused on remediation and pollution, but have evolved into ecosystem-based planning initiatives. For example, Environment Canada works with a broad spectrum of partners through "priority ecosystem initiatives" to address issues of concern in the Atlantic Coastal region, St. Lawrence River Basin and Great Lakes. The Government of Canada's **Action Plan for Clean Water** aims to restore Lake Simcoe, Lake Winnipeg, and Areas of Concern in the Great Lakes. Ontario's Lake Simcoe Protection Act became law on December 10, 2008. It enshrines watershed protection in law and requires the establishment of a protection plan for the lake and surrounding regions.

At the national level, the Canadian Council of Ministers of the Environment (CCME) provides a formal mechanism for intergovernmental discussion and coordinated approaches to regional and national environmental issues, including water demand and use management, the regulation of municipal wastewater effluents, and water quality. The CCME's Water Quality Task Group is mandated to undertake technical work on water quality initiatives that protect aquatic life, agricultural water uses, and wildlife that feed on aquatic biota.

Case Study: Restoring Lake Winnipeg

Lake Winnipeg receives inputs from Canada's second-largest watershed. It is the most eutrophic of the world's largest freshwater lakes due to severe phosphorus and nitrogen pollution from a myriad of non-point sources. The Lake Winnipeg Stewardship Board was announced by the government of Manitoba in 2003 as one of the six actions under the Lake Winnipeg Action Plan. The Board is working to reduce phosphorus and nitrogen in the lake to pre-1970 levels. Members represent a variety of interests, including fishing, agriculture, urban land use, First Nations, federal, provincial and municipal governments, and non-governmental organizations. A basin-wide watershed management plan will be developed using a consensus-based process and will direct and integrate individual basin plans currently under development by watershed authorities. Other actions under the Action Plan include the: introduction of new measures to help protect natural growth along the Red and Assiniboine rivers to complement the Riparian Areas Tax Credit introduced in 2001; provision of a program to expand soil testing to ensure appropriate fertilizer application; introduction of a new sewage and septic field regulation that will outline clear standards for the placement of systems; development of a shoreline protection project to help address erosion concerns; and commencement of cross-border nutrient management discussions. Additionally, **the Lake Winnipeg Research Consortium Inc. has** coordinated scientific research on Lake Winnipeg since 1998, with its current membership of 32 agencies representing various government and university departments, and corporate and other groups. The International Institute for Sustainable Development, funded by Environment Canada, recently completedAn Ecosystem Services Assessment of the Lake Winnipeg Watershed that estimates that billions of dollars could be gained by restoring the natural environment of Lake Winnipeg (see section 3. for more details).

In 2007 the governments of Canada and Ontario announced an agreement to establish the **Lake Superior National Marine Conservation area**. More than 10,000 square kilometres of Lake Superior, including the lakebed, islands and shorelands will be included, making this the largest freshwater protected area in the world. The announcement marked the culmination of a decade of planning and negotiations involving the federal, Ontario and local governments as well as First Nations in the region. National marine conservation areas are part of Parks Canada's growing number of national heritage sites, protecting key elements of ecosystems while preserving the livelihoods of local residents.

A number of water protection and conservation acts are in place in provinces and territories to ensure the sustainable use of freshwater and maintenance of healthy ecosystems. These include the new **Water Protection Act** (2005) in Manitoba, which divides the province into conservation districts and mandates the development of watershed management plans by designated water planning authorities; the **Conservation Authorities Act** (1946) in Ontario, under which conservation authorities act as local, watershed management agencies that deliver services and programs that protect and manage water and other natural resources in partnership with government, landowners and other organizations; the network of Watershed Organizations under Quebec's **Water Policy** (2002); and **co-management agreements** for aspects of integrated watershed management in all three territories, established under Land Claims Agreements with First Nations peoples. In 2006 the Government of Canada announced a **Plan of Action for Drinking Water in First Nation Communities** to improve access to safe, clean drinking water on reserves; a two-year investment followed in a **First Nations Water and Wastewater Action Plan** (2008), introducing new measures for improving drinking water and wastewater in First Nation communities.

Watershed stewardship groups have formed across the country as an important element of water management strategies. The groups work in a variety of roles, collecting water quality data,

monitoring biotic parameters, restoring shorelines in partnership with landowners and industry and participating in regional planning. Alberta's **Water for Life Strategy** recognizes the importance of these partnerships at provincial, regional and local scales in achieving stewardship of water resources. Manitoba's **Conservation Districts**, made up of adjacent rural municipalities, facilitate integrated watershed management planning and implement voluntary, incentive-based stewardship programs to protect water resources and aquatic ecosystems. Prince Edward Island has a **Watershed Management Fund** that provides resources to groups for watershed-based planning and implementation. At the municipal level, the Greater Vancouver Regional District is developing **Integrated Stormwater Management Plans** that integrate climate change scenarios with watershed health, land-use planning, engineering, and community values.

Marine ecosystems

0.37% of Canada's ocean surfaces and freshwater Great Lakes have been protected to date, representing 2,665,186 hectares of protected area. The **Department of Fisheries and Oceans Canada (DFO)** is the main body responsible for the management of Canada's marine resources. Their 1997 ***Oceans Act*** mandates the application of an ecosystem approach, the precautionary approach, and integrated management. The *Act*'s supporting policy, the **Canada's Oceans Strategy**, provides the national context for integrated ocean management. The **Integrated Management Policy and Operational Framework** provides further guidance on the development of integrated management plans and processes, while the 2009 Marine and Coastal Biodiversity Report outlines the implementation of **Integrated Marine and Coastal Management.**

Through the development and implementation of the **Resource Management Sustainable Development Framework**, DFO has applied an ecosystem approach in a number of fisheries and has implemented the precautionary approach in the management of some fisheries in Canada. For example, two coral areas off the coast of Nova Scotia were identified and have been closed to all fishing since 2001: the Northwest Channel Closure (424 km^2) and the Stone Fence Lophelia (15 km^2). On the west coast, four sponge reef areas in the eastern Queen Charlotte Sound & Hecate Strait areas have been closed to groundfish and shrimp trawling. Building on existing fisheries management practices, the Framework forms a foundation for implementing an ecosystem approach. This includes new policies and tools to implement the precautionary approach to fisheries management decision making, and manage the impacts of these fisheries on sensitive benthic areas and forage species. Over time, new national policies on other aspects of ecosystem management, such as the management of by-catch species, will be incorporated into this Framework.

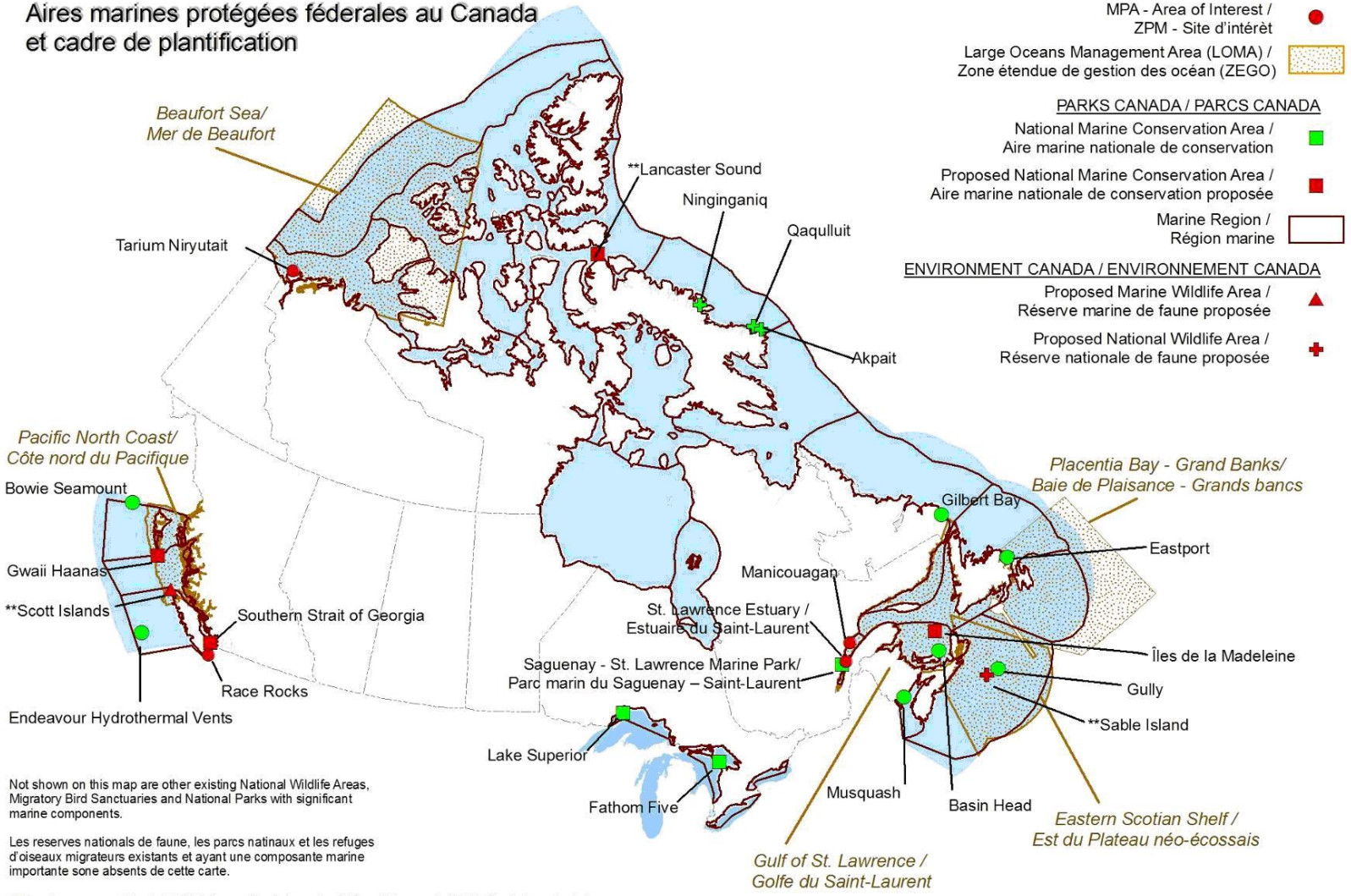
The commitment to establish **Large Ocean Management Areas** (LOMAs) for all of Canada's marine regions has arisen as a significant initiative in the protection of Canada's marine ecosystems. LOMAs extend from the coastline to the limits of jurisdiction under international law and will address large-scale ecosystem and economic development issues through the development and implementation of integrated ocean management plans. Comprehensive overview and assessment reports have been developed for each LOMA, and smaller-scale ecologically significant areas and ecologically significant species have also been identified.

LOMAs are being developed through collaboration between all levels of government, Aboriginal groups, industry organizations, environmental and community groups, and academia. Activities typically found within each LOMA include renewable and non-renewable energy development, shipping, fishing (subsistence and commercial), conservation, maritime defense, telecommunications, eco-tourism and scientific activities. The DFO thus continues to utilize

integrated management, long-term planning, and collaboration to advance an ecosystem approach to ocean management in Canada.

Canada's Federal Marine Protected Areas and Planning Framework

Aires marines protégées féderales au Canada et cadre de plantification



Not shown on this map are other existing National Wildlife Areas, Migratory Bird Sanctuaries and National Parks with significant marine components.

Les reserves nationals de faune, les parcs natinaux et les refuges d'oiseaux migrateurs existants et ayant une composante marine importante sone absents de cette carte.

** Denotes proposed Budget 2007 sites, not including six additional Oceans Act MPA sites to be selected.
** Indique les sites proposés dans le budget 2007, excluant les six Zones de Protection Marine à être identifiées en vertu de la Loi sur les océans

Terrestrial ecosystems

Land use planning

Most provinces developed or revised land use policies and planning acts in the 1980s and 1990s to emphasize ecological sustainability through an ecosystem approach, reflecting public concern related to population growth and increased natural resource demands. British Columbia was a pioneer in this area; as of 2008, approximately 85 percent of the province is covered by 26 strategic land use plans. Alberta released a 1977 Policy for Resource Management of the Eastern Slopes to address social, economic and environmental goals in a 90 000 square kilometre area of forested mountains and foothills. The Province has since established a new Land-Use Framework (2008), with a comprehensive strategy for addressing cumulative impacts of multiple industrial developments on the province's ecosystems. Additionally, the Integrated Land Management Program in Alberta involves governments, industries and recreationists in reducing their footprint on Crown lands allocated for development.

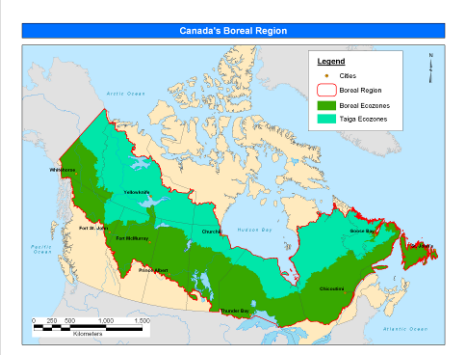
Case Study: Alberta's Land-Use Framework and Land Stewardship Act

The Government of Alberta established a new Land-Use Framework for the province in 2008. This Framework is a comprehensive strategy for addressing cumulative impacts of multiple industrial developments on the province's ecosystems. The subsequent **Alberta Land Stewardship Act** creates the authority for regional plans for each of the seven regions identified in the Framework. Albertans will be consulted to help define the future land-use in their region, with future development considering cumulative impacts on land, air, water, and biodiversity. The Act creates new conservation and stewardship tools to protect heritage landscapes and will make Alberta the first jurisdiction in Canada to compensate landowners whose property values are affected by conservation and stewardship restrictions under regional plans.

To address growing communities and subsequent ecological pressures, **Alberta's Plan for Parks 2009-2019** reaffirms the need to promote the inextricably linked objectives of recreation and conservation. To ensure the management of parks aligns with the province's strategic direction, the document includes key planning elements also found in the Land-use Framework, and both share overall desired outcomes and a commitment to working with local Aboriginal groups in Land-use planning.

An innovative partnership between the **Innu Nation** and the province of **Newfoundland and Labrador** resulted in an **Ecosystem-based Forest Management Plan** for a 17 million acre area in central Labrador. This Plan includes an extensive protected area network designed to protect ecological function at the landscape, watershed, and stand level. The Plan, which called for a number of changes to forest harvesting practices in the area, was the result of a far-reaching public participation process with Innu communities.

Case Study: Preservation of Canada's Boreal Forest



Canada's boreal region covers 58.5% of the country's land mass (as seen in Figure _) and represents 30% of the world's total boreal forest. Through a variety of collaborative initiatives approximately 10% of the boreal in Canada is protected [suggest verifying this figure – seems high.] At the national level, the **Canadian Boreal Initiative (CBI)** brings together diverse partners, including government, industry, conservation groups, major retailers, financial institutions, scientists, and First Nation groups, to create new solutions for boreal forest conservation. The CBI's goal is to protect at least half of Canada's boreal, with the rest under sustainable development, while respecting Aboriginal rights. Using an inter-connected landscape approach and fostering cross-sectoral partnerships, the CBI focuses on the whole landscape and relations between government and Aboriginal communities. Quebec has committed to 50% protection of the portion of its boreal forests occurring north of 49 degrees (representing 59 million hectares) in their Plan Nord, while the Northwest Territories has committed to the protection of over 14 million hectares. Additionally, Ontario has committed to the protection of more than 50% of its Far North boreal region, an estimated area of 22 million hectares. Manitoba and Ontario have signed a Memorandum of Understanding respecting a **Manitoba/Ontario Interprovincial Wilderness Area**. It encompasses over 940,000 ha of boreal forest and provides significant habitat for species at risk such as woodland caribou, the bald eagle, and the wolverine.

Despite significant efforts, there are still great pressures on the Boreal Forest – leading to fragmented and fractured ecosystems. **The Last Great Intact Forests of Canada: *Atlas of Alberta* (*Global Forest Watch Canada)*** discusses these pressures with particular insight into Alberta's landscapes. Outlining the detrimental contributions of the pace and scale of today's human activity, the report provides some basic information on current anthropogenic stressors and the subsequent state of Alberta's Boreal Forests that will hopefully encourage rapid progress toward entrenching and implementing key aspects of Land-use Frameworks and the conservation values associated with them.

Protected areas (Note: For greater detail on Protected Areas, please refer to Protected Areas Annex)

Protected areas are one of the best and longest-established conservation tools employed by all jurisdictions in Canada. Canada's terrestrial protected areas cover 93.4 million hectares, representing 9.4% of Canada's land base, and are extremely important in the maintenance of healthy and diverse ecosystems. Protected areas act as benchmarks by which the sustainability of uses on the Canadian broader landscape and marine environment can be assessed. They also conserve representative samples of natural areas and preserve ecological features and processes. Adequately connected and buffered, protected areas are at the core of ecosystem-based management. That is why integrated land use and urban planning are important to ensuring the ecological integrity of parks.

Canada has a long tradition of protected areas establishment and has earned a reputation globally as a leading steward of its natural resources. The 1992 **Statement of Commitment to Complete Canada's Networks of Protected Areas** catalyzed an impressive growth in protected areas across the country throughout the 1990s. Canada is currently faced with a variety of new opportunities to position protected areas planning and management squarely within the sustainable development objectives espoused by many jurisdictions. These opportunities include the emergence of integrated landscape and oceans management, the initiation of Canada's Oceans Agenda, international efforts to meet the United Nations Convention on Biological Diversity objective of developing global networks of comprehensive and effectively managed terrestrial and marine protected areas by 2010 and 2012 respectively.

A myriad of stakeholders have been involved in the establishment of protected areas across the country; involvement of Aboriginal communities is significant and increasingly a driving force behind protected areas establishment, particularly in the northern territories where negotiation of comprehensive land claims provides a formal mechanism for cooperative resource management. For example, on June 18, 2009, the Government of Canada, in partnership with the Dehcho First Nations, expanded Nahanni National Park Reserve by over 25,000 square kilometres of Canada's northern wilderness; thereby protecting important habitat for grizzly bears, woodland caribou, Dall's sheep, and many other species.

Canada's national, provincial and territorial park agencies collaborate through the **Canadian Parks Council**, which provides a Canada-wide forum for inter-governmental information sharing and action on parks and protected areas. The Canadian Protected Areas Status Report 2000 – 2005, released in 2007, provides a description of the state of terrestrial and marine protected areas across Canada. Governments and protected areas agencies conducted a "self assessment" regarding the status of protected areas design, planning, management and establishment across the country.

Recent Progress in Quebec

In the last few years, Quebec has made impressive progress in creating protected areas and protecting biodiversity. From 2002 to 2009, almost 124,000 km^2 of protected area were added through two strategic action plans. More than 53,600 km^2 were added in 2008-2009 alone, with the result that Quebec now has 135,450 km^2 in protected areas, representing 8.12% of its territory.

In 2002, most of the protected areas were concentrated in southern Quebec, close to populated areas. Today, they are scattered over all of the 13 natural provinces. A natural province represents the first level of subdivision of Quebec's ecosystems. In three of the 13 natural provinces, over 10% of the area is protected; in one, the protected area accounts for more than 25%.

The expansion of protected areas was especially noteworthy in the boreal forest. Since 2002, the protected area located in this zone went from 23,800 to 97,300 km^2. Now, 9.2% of the boreal forest area is dedicated to conservation.

On March 29, 2009, Quebec committed to protecting 12% of its territory by 2015.

Some recent advances:

- The proposed Rivière Dumoine aquatic reserve covers almost 1,500 km^2 in Témiscamingue and Outaouais. It will protect one of southern Quebec's last natural rivers.
- With an area of 4,259 km^2, the proposed Paakumshumwaau-Maatuskaau biodiversity reserve is of substantial ecological and cultural value, particularly for the Wemindji Cree community. The watersheds it protects are almost all in their natural state. Here, traditional and scientific knowledge combine in protected the territory.
- The Rivière George protected area and the Monts Pyramides National Park reserve adjacent to it cover an area of approximately 9,900km^2. The Quebec government is protecting this majestic river along its entire course, over about 350 kilometres from where it is joined by its major tributary, Rivière De Pas. This makes it Quebec's largest protected river. These protected areas will help protect one of the Quebec Arctic's largest caribou heards, with a population of 385,000 head.
- New proposed biodiversity reserves close to Lac Evans will help protect woodland caribou in this part of the boreal forest.
- The Baie aux Feuilles National Park reserve (3,868 km2) borders one of the biggest river estuary systems in northern Quebec, which is characterized by enormous seventeen metre tides. Among other things, this is the only site in Quebec where muskoxen are found.

Ontario and Manitoba Joint Actions

Exemplifying an integrated approach to protected areas, the **Ontario Ministry of Natural Resources** and **Manitoba Conservation** established the **Manitoba-Ontario Interprovincial Wilderness Area** in 2008. This wilderness area, which lies along provincial borders, encompasses over 9,400 square kilometres of boreal forest and links three provincial parks and a conservation reserve to prevent ecosystem fragmentation between protected areas. Manitoba and Ontario are committed to working together to conserve the national and international ecological integrity of this boreal forest by co-ordinating resource management, encouraging research, and developing recreational opportunities. The initiative also builds on Ontario's efforts to protect the Far North boreal region in cooperation with nearby First Nations, the Pimachiowin Aki World Heritage Project, and other local communities, while emphasizing that ecosystem protection should not be restricted by provincial borders.

Case Study: British Columbia's Central Coast and North Coast Land and Resource Management Plans

Another powerful example of integrated land use approaches is exemplified in **British Columbia**'s **Central Coast and North Coast Land and Resource Management Plans** (2006), which cover a combined area of approximately 6.4 million hectares, of which approximately 1.8 million hectares is protected. Unprecedented collaboration between First Nations, industry, environmentalists, federal, provincial and local governments and many other stakeholders led to this unique partnership that aims to support economic opportunity while preserving some of B.C.'s most spectacular wilderness areas and protecting habitat for a number of species, including the rare Spirit Bear. The decisions are particularly significant for the balance they bring between the environment and forest management. The land use decisions protect vast areas of temperate rain forest, while providing a framework of Ecosystem Based Management for the industry to work in.

Marine Ecosystems

In addition to freshwater ecosystems, there is increasing movement in Canada to the establishment of protected areas in marine ecosystems. These protected areas can be implemented in a variety of ways in Canada and serve as significant conservation tools in Canada, playing a vital role in protecting marine species and their habitats. At the international level, Canada participates in marine protected area network planning through initiatives such as the **Commission on Environmental Cooperation - Biodiversity Conservation Working Group's North American Marine Protected Areas Network** (NAMPAN). One of the most comprehensive projects of NAMPAN to date has been the development of a **NAMPAN Condition Assessment Scorecard**, which distils large amounts of complex technical and traditional/local ecological knowledge about MPA conditions for 10 piloted sites in Canada, the United States, and Mexico.

Nationally, **DFO** can create **Marine Protected Areas (MPAs)** to conserve and protect fish, marine mammals and their habitat, unique areas, or areas of high productivity; the **Parks Canada Agency** can establish **National Marine Conservation Areas (NMCAs)** in order to protect and conserve representative examples of marine ecozones across the country; and **Environment Canada** has authority to establish both **Marine Wildlife Areas** and **National Wildlife Areas** with a marine component in order to conserve and protect habitat for key wildlife species, including migratory birds and species at risk. The three core instruments of the Canadian marine protected areas program are supplemented by provincial and territorial programs, as well as other federal tools such as the marine components of National Parks and Migratory Bird Sanctuaries. Currently, 7 MPAs and 3 NMCAs have been set aside as protected areas of Canada's oceans and planning is underway for an additional 13-15 sites by 2012. At the federal level, departments responsible for marine protected areas are working together to be more strategic and collaborative in establishing new MPAs and participating in the development of a national system of bioregional MPA networks.

Case Study: Nunavut Parks and Cultural Landscape Resource Assessment

Using a n ecosyste m app roach by simultaneously addressing cultural and natural re sources, **Nunavut Parks** initiated a **Cultural Landscape Resource Assessment** to gain a better understanding of the overall landscape resources for a proposed park in the **Clyde River area**. The Assessment includes places to which oral traditions are attached, such as natural features, wildlife areas, archaeological and palaeontological sites, graves and burial grounds, and community use or recreation sites. Th rough co mmunity co nsultations, op en houses, commu nity radio shows, interviews wit h elders and other re sidents and o rganizations wit h related inte rests, peopl e were asked what was important to them about the landscape and resources in the Clyde River area, and invited to add information on maps of the study area. This information, recorded in a GIS database, will be combined with other knowledge of the area towards a comprehensive database for planning and managing the park area.

In 2008, Nun avut Parks started wo rk with re sidents of **Kugaaruk** to f urther develo p the mod el through a si milar study t owards a p roposed Te rritorial Pa rk. The e nd result of the cultural landscape resource invent ory will lea d to the pro duction of a cult ural la ndscape-based re source inventory framework that can be applied to all territorial parks throughout Nunavut. The project will also p roduce a Trainin g Manual to al low future Community Jo int Planning and Man agement Committees to use the framework to record and analyze all natural and cultural resources, capture related Inuit Qaujimajatuqangit and maintain a record of oral histories and knowledge related to all park la ndscapes. Ad ditionally, a ne w ecological and cultural -landscape ba sed System Pl an for Nunavut Parks will be d eveloped, se tting a precedent fo r ecosystem b ased pl anning that incorporates both cultural and natural resources.

A **Federal Marine Protected Areas Strategy (FMPAS)** was developed in 2005 to enhance cooperation, especially with Aboriginal peoples, towards completion of the federal component of the national MPA system. The largest marine canyon in eastern North America, **the Gully** was designated by DFO in 2004 as an MPA; this 2,364 km^2 area is recognized internationally for its exceptional species, such as deep-sea corals, and provision of habitat for species-at-risk, including endangered northern bottlenose whales.

Ecosystem Integrity in Parks

The integrity of protected areas following their implementation is being managed by relevant bodies across Canada. The first-ever Canada-wide guidance for ecological restoration has been recently developed by a multi-disciplinary working group of the **Canadian Parks Council,** with principles and guidelines focused on the restoration of Canada's protected natural areas. These principles and guidelines provide an approach that can be applied by all protected areas agencies across the country according to their needs. **Parks Canada** has established a comprehensive framework for action to maintain or restore ecological integrity in Canada's national parks in partnership with local communities, Aboriginal partners, stakeholders and park visitors. In this framework, knowledge generated through programs such as ecological integrity monitoring and reporting (including state of park reporting), research partnerships, and management planning, is used to identify priorities for active management and restoration and, subsequently, to assess the effectiveness of these management efforts. These approaches to restoration will help ensure that parks and protected areas continue to safeguard biodiversity and provide diverse environmental, social,

and economic benefits while providing opportunities for meaningful engagement and experiences that connect the public, communities, and visitors to these special places and help ensure their appreciation into the future. The integrity of ecological processes linked to natural fires and grazing by large herbivores has been recreated by Parks Canada and partner agencies through their **Prairie Persists** project in **Grasslands National Park**, Saskatchewan. In 2006, the release of 71 plains bison, prescribed burns, and efforts to reduce exotic and invasive species were undertaken in the park, helping to restore the overall ecological integrity of one of the most threatened ecosystems in the country. The project also focuses on partnerships and engagement with local First Nations and youth; for example, the Park's **Prairie Learning Centre** provides students with unique place-based learning experiences related to prairie ecosystems.

Parks Canada and other protected areas agencies have also taken steps to indirectly restore the health of parks by reducing their greenhouse gas emissions, thus aiding in the mitigation of climate change impacts on ecosystems. The PCA has already met its internal greenhouse gas reduction target to reduce emissions by 5.2% from 1998 levels by 2011. According to a 2008 survey, Parks Canada is the only protected area agency in the world to achieve or even set formal emission reduction targets; with this success remains future work in the development of climate change strategies, policies, and action plans.

Partnerships and Parks

A number of parks agencies are exploring innovative ways to foster meaningful relationships between citizens and nature. Using a highly collaborative approach rooted in partnerships with a wide range of organizations, the **Alberta Parks Outreach and Public Engagement Program** is conducting a pilot outreach program in Kananaskis County. The program includes initiatives such as the **Alberta Access Challenge**, in which people with disabilities are assisted by volunteers to allow their participatation in adapted backcountry camping, sea kayaking, and cycling; the development of an educational video series about the benefits of wilderness experiences; **Nature as a Second Language**, where over 700 new immigrants were introduced to parks through a digital guidebook in non-official languages, day trips, and presentations; and **Parks in the Boardroom**, a program being developed with various professionals to connect the corporate community with ecological, sustainability, and stewardship principles. **BC Parks**, in partnership with **Parks Canada**, **Metro Vancouver** and **Wild BC**, is developing a new curriculum guide entitled **Get Outdoors!** to encourage educators and outdoor leaders to take children outside; the guide has been endorsed by the Ministry of Education and the Environmental Educators Professional Specialist Association (EEPSA).

Biosphere Reserves are areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use. Each biosphere reserve is intended to fulfill complementary and mutually reinforcing conservation, development, and logistic functions and serve as a living demonstration of integrated management. As a program of the United Nations, over 530 Biosphere Reserves have been established worldwide in over 100 countries; within this network, exchanges of information, experience and personnel are promoted. Canada currently has 15 Biosphere Reserves. Biosphere Reserves are selected as representative of a major biogeographic region and contain

landscapes, ecosystems, or species which need to be conserved, providing an opportunity to explore and demonstrate approaches to sustainable development. Canada's federal government has provided funding for a secretariat.

Land Trusts Easements and Covenants

The protection of ecologically sensitive lands through acquisition, conservation covenants, easements and agreements with private landowners has become more effective over the last 25 years as a result of the work of land trust organizations, and a commitment of federal and provincial governments through improved legislation, investment and tax incentives. The land trust movement has responded to increased demand with the development of national standards and practices under the **Canadian Land Trust Alliance** that was established in 2006, and a commitment to the ongoing maintenance and management of lands for their intended conservation values. A variety of types of trusts has developed to deliver a range of objectives including contribution to protected areas networks, protection of sensitive habitats and protection from development. Some examples demonstrating the range of these objectives include: the **Lands and Legacies Conservation Partnership** between the Nova Scotia government and the Nova Scotia Nature Trust for the acquisition of lands contributing to representation targets for the provincial protected area network; Manitoba Habitat Heritage Corporation and Ducks Unlimited Canada's **Riparian Conservation Agreement Initiative** and **Conservation Agreements Program** facilitating long-term agreements for wetland protection; the **Southern Alberta Land Trust Society** that works with landowners to protect the land base and agricultural livelihoods associated with cattle ranching from development pressures and to facilitate intergenerational transfer; and, the **Edmonton and Area Land Trust**, which was created to support natural area conservation within the city and surrounding municipalities. It is estimated that Canadian Land Trusts have 1.3 million hectares of Canada's natural heritage land under permanent protection across the country with 25 000 active volunteers; the number of land trusts in Canada roughly doubled from 1995 to 2005. Between 2002 and 2008, the Quebec government invested over $20 million in private lands' conservation efforts, resulting in the acquisition by private conservation organizations of 166 properties representing over 14,000 ha. Almost 75% of these projects have contributed to habitat protection for species at risk. Representing the largest private conservation agreement in Quebec history, the provincial government invested $3.3 million to support the acquisition of more than 4000 ha of lands owned by a forest products company in the Sutton Mountain Range. In January 2009, the government of Quebec launched a new partnership program to build on these efforts. With a $25 million budget over five years, this program aims to further contribute to the development of a network of private protected areas in the province.

As part of Canada's Species at Risk Act (SARA), the federal government established the **Habitat Stewardship Program (HSP)** to contribute to the recovery of species at risk (as listed under the SARA), and to prevent other species from becoming a conservation concern, by engaging Canadians in conservation actions to benefit wildlife. Also under management by the CWS, the HSP became operational in 2000 and allocates up to $13 million per year to projects that conserve and protect species at risk and their habitats. The program also focuses on non-federal land such as private or provincial Crown lands; landowners can retain ownership of their land and use easements to achieve stewardship goals.

A unique federal program in Canada is the **Ecological Gifts Program,** which since 1995 has enabled individual and corporate landowners to protect nature by donating ecologically sensitive lands to environmental charities or the government. An "ecogift" is a donation of private land or a partial interest in land such as a conservation easement, covenant or servitude that has been certified by Environment Canada as being ecologically sensitive or having ecological value. The Program provides assurance to donors that the land will be managed in perpetuity based on mutually agreed-upon conservation goals and objectives. Donors are also eligible to receive income tax benefits for their donations, based on the fair market value of the property. Since the Program's inception, there have been more than 700 ecogifts processed, securing in excess of 120,000 hectares of land for conservation – valued at close to $500 million at the time of donation.

Canada's **Natural Areas Conservation Program**, started in 2007 and targeted for non-profit, non-government organizations, also contributes to the securing of ecologically sensitive lands. To carry out the objectives of the Program, the federal government entered into an agreement with the **Nature Conservancy of Canada (NCC)**. As a matching-funds initiative, the NCC and its partners, including organizations such as Ducks Unlimited Canada, secure matching funds for each federal dollar received. Priority is given to lands that are nationally or provincially significant, that protect habitat for species at risk and migratory birds, or that enhance connectivity or corridors between existing protected areas such as National Wildlife Areas, National Parks and Migratory Bird Sanctuaries. Through a federal contribution of $225 million to the program, 336 properties, totalling more than 103,600 hectares have been acquired resulting in the population of 74 species at risk.

Sustainable resource management practices such as wildfire management also contribute to the conservation of wildlife habitat in Canada. Section 2.3 includes many examples of how Canada's resource sectors such as forestry, fisheries and agriculture and agri-food are helping to sustain habitat for wildlife.

2.1.3. Tracking - Monitor and Report

A number of approaches and tools for monitoring biodiversity in Canada have been developed.

Monitoring biodiversity

Canada is monitoring Arctic biodiversity through participation in the **Circumpolar Biodiversity Monitoring Program (CBMP)**, an initiative of the **Arctic Council's Conservation of Arctic Flora and Fauna Working Group**. The CBMP is a mechanism for harmonizing and enhancing long-term biodiversity monitoring efforts across the Arctic in order to improve the detection of, and reporting on, significant trends and pressures. The resulting information will be used to assist policy and decision making at the global, national, regional and local levels. Five integrated expert monitoring groups (Marine, Coastal, Freshwater, Terrestrial Vegetation and Terrestrial Fauna) are comprised of existing place-based and network-based research and monitoring programs utilizing both community-based and other scientific monitoring approaches, representing a diversity of expertise and monitoring capabilities. The special attention to community-based observations reflects the

profound understanding of Aboriginal peoples of the Arctic environment.

Tracking ecological integrity in national parks

Maintenance of ecological integrity is embedded into the National Parks Act in Canada. **Parks Canada** has a comprehensive science-based monitoring system in place to assess ecological integrity. For each major park ecosystem, a set of monitoring measures is chosen based on an understanding of ecosystem structure, ecological function and the stressors impacting on the ecosystem. Monitoring results are recorded in an information system that provides regular updates of each park's ecological condition. Results are reported to the public in a state of parks report. When monitoring indicates ecological impairment, park managers incorporate corrective measures in the park's management plan and act accordingly.

Case Study: Alberta Biodiversity Monitoring Institute

Knowledge generated by the ABMI assists in maintaining a high quality of life for all Albertans by informing the sustainable management of the environment. It is an important, proactive risk management tool that provides early detection about biodiversity change, enabling resource managers to make informed land-use decisions and implement corrective actions before costly recovery programs are necessary.

The ABMI has several features that set it apart from other programs. First, the ABMI has a high degree of consistency across Alberta. This enables decision-makers to compare changes between multiple regions or within a single region across time. Second, the ABMI is highly responsive to the needs of decision-makers. Because the ABMI is a single, arms-length program that encompasses all aspects of biodiversity monitoring, it can rapidly respond to new and emerging needs. Finally, the ABMI's business supports the needs of decision-makers using scientifically rigorous, relevant, and impartial knowledge. As a result, decision-making processes in Alberta can focus on the application of biodiversity knowledge rather than on determining the credibility of that knowledge.

2.1.4. Ecosystem Science and Research

Although Canada has no national program of long-term ecological research, granting agencies such as the **Natural Sciences and Engineering Research Council of Canada (NSERC)** support projects of limited duration. For example, CANPOLIN is a new, five-year **NSERC** Strategic Network addressing the growing problem of pollinator decline and crop pollination in agricultural and other ecosystems in Canada. With 26 member institutions and research sites across the country, CANPOLIN is truly national and interdisciplinary in scope, bringing together leading experts in entomology, pollination ecology, plant physiology, prediction and economics to deliver critical insights to address rising concern regarding the state of pollination in Canada.

2.2. Outcome - Viable Populations of Species

Full complement of native species required for maintenance of ecosystem function

Improved status of species at risk

No new species extinctions due to human activity

Species assemblages maintained in their ecological regions

Canada is home to over 70 000 known species and scientists estimate that approximately the same number of species have yet to be discovered and described across the country. These species face a variety of threats, including habitat fragmentation and degradation, unsustainable harvesting, invasive alien species, wildlife disease and climate change.

Canada has a long tradition of wildlife management and has in more recent years invested in the development of a national regime for the protection of species at risk that includes a national accord, a ministerial council, federal, provincial and territorial legislation, enhanced assessment capacity and innovative governance mechanisms such as co-management boards and government-university partnerships.

2.2.1. Assessment – Research and Information for Decision Making

Assessing the status of Canada's species

Reports on the general status of wild species are now produced every five years. The first was released in 2000. Each province or territory determines the status of all species within its jurisdiction, which assists in determining the national status of these species. In the 2000 report **Wild Species: The General Status of Species in Canada**, general status assessments are presented for more than 1600 Canadian species, from all provinces, territories, and ocean regions. The 2005 report will provide results for 7732 species, including all of Canada's vertebrate species and vascular plants and four invertebrate groups. Progress on information and data sharing across government departments and jurisdictions, and with Aboriginal peoples, has enabled more information to be gathered, improving the assessments over time. The 2010 report is expected to assess even more species; the vast majority of species left to be assessed are insects and other invertebrates, non-vascular plants and algae, fungi and lichens, which will require information that is not as readily available.

The general status assessments integrate the best available information to create a snapshot of each species' status; its population, size and distribution and the threats that it faces in Canada. Each species receives a rank for each province, territory or ocean region in which it occurs, as well as a national General Status rank which reflects the overall status of the species and identifies information gaps. Of the 7732 species ranked in the 2005 report, 70% are *secure,* and the remaining 30% have some level of risk, sensitivity, or require further assessment. As the general status approach ranks species in all regions of the country, with periodic updates, the assessment can reveal regional patterns in decline or threats to "suites"

of species that have things in common. The report series is a resource for all Canadians, allowing the tracking of species and trends over time, promoting conservation efforts, and informing sound decision-making.

In addition to the Wild Species reports, the **Committee on the Status of Endangered Wildlife in Canada (COSEWIC)** has been assessing wild species suspected of being at risk since 1978. To date, 425 species have been given legal protection under the **Species at Risk Act (SARA)** (see section 2.2.2).

Conservation data centres

Canada has eight independent **Conservation Data Centres (CDCs)**, covering every province as well as the Yukon Territory. CDCs conduct biological inventories to find and document populations of rare species, study and classify vegetation communities, analyze critical conservation issues, provide customized information products and conservation services, and make their data widely available to the public via the Internet. Each CDC serves as a clearinghouse for reliable and current scientific information about plants, animals, and vegetation communities within its respective jurisdiction. The staff of CDCs include expert field biologists, ecologists, GIS specialists, and data managers. CDCs use their scientific and data management expertise to serve the conservation information needs of government, corporations, researchers, conservation groups, and the public.

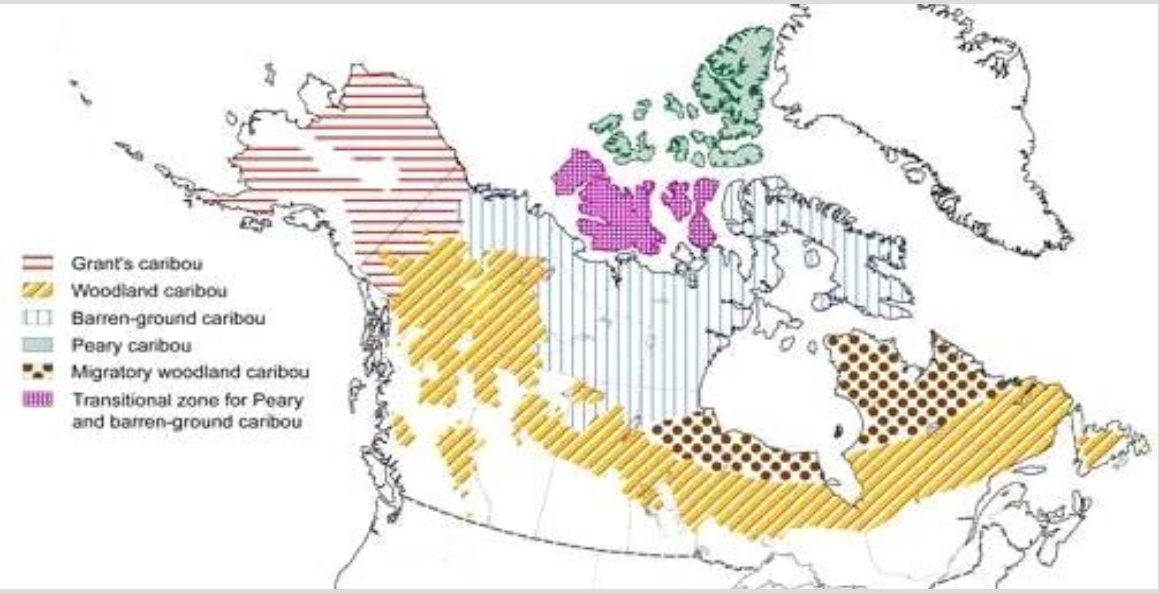
The use of consistent standards and methods for biological inventory and information management allows data from each CDC to be combined and analyzed at regional and national scales. All of Canada's CDCs are linked together by **NatureServe Canada**, a national not-for-profit conservation organization established in 1999 and governed by representatives from each of its member programs. A part of the international NatureServe network, it is a leading source for reliable information and analysis on the distribution and conservation status of Canada's plants, animals, and vegetation communities. NatureServe Canada works in close partnership with key federal and provincial agencies as well as international and multi-lateral initiatives concerned with conservation of biodiversity.

Science, research and university-based partnerships

The science underpinning Canadian species management is conducted principally by the federal, provincial and territorial governments, supported by strong, targeted programs from the some members of the conservation NGO community.

Case Study: Science Review - Woodland Caribou

A member of the deer family, and a key species in northern ecosystems, caribou are migratory and may move thousands of kilometres per year. Caribou play an important role in nutrient cycling as the only mammal adapted to feed mainly on lichen, a vegetation with the combined characteristics of fungi and algae. Lichens grow extremely slowly and do not disperse easily, so they are found in less disturbed northern ecosystems and old growth boreal forests, which also explains the distribution of Caribou. Caribou are important to the sustainability of indigenous cultures, a food source for humans, and also prey for wolves, grizzly bears and occasionally wolverine and lynx. Several subspecies of caribou exist in Canada (see map below).



Many caribou herds are in decline. Once present over much of Canada, their historic range has been moving northward in response to ecosystem change, human settlement and resource development. The COSEWIC designated the Peary and Woodland caribou (*Rangifer tarandus caribou*) as endangered and threatened respectively.

The provincial and federal/territorial governments are working with others concerned about the health and status of caribou and developing plans to protect caribou populations in their jurisdictions. **A national science review** on the state of knowledge of the **woodland caribou** was published in April 2009 but a number of information gaps remain to be able to determine the critical habitat required for their conservation. As a result, the government is planning to gather and integrate scientific studies and aboriginal traditional knowledge about woodland caribou to inform the recovery strategy, and consult on the strategy, including the recovery goals and objectives, potential threat mitigation activities, including land management regimes, industry best management practices, Aboriginal traditional practices, and other potential recovery activities. An example in the north is the CircumArctic Rangifer Monitoring and Assessment (CARMA) program, established during International Polar Year in 2004, with representatives from a cross section of disciplines and from co-management boards (aboriginal and territorial/federal governments) to monitor and assess biological and physical changes to the health of caribou in the circumArctic.

Several of Canada's universities and colleges have established programs of wildlife research and work cooperatively with governments in such areas as wildlife health. The following are just a few examples of these collaborative approaches.

Canadensys (formerly the Canadian University Biodiversity Consortium) brings together Canadian botanists, entomologists, and mycologists to support research on species; the main focus of the consortium is to put into place a network of biodiversity databases. These databases will be made universally accessible through the **Global Biodiversity Information Facility**, a global effort to harness biodiversity information at a species level.

The Canadian Museum of Nature is working to produce a revised Flora of the Canadian Arctic, covering all vascular plants occurring on the Arctic islands. To complete this project, the museum is working with the Panarctic Flora Project and the Arctic Council working group on Conservation of Arctic Flora and Fauna.

2.2.2. Planning and Implementation

Domestic wildlife conservation and management

Wildlife conservation and management is a shared responsibility between the federal, provincial and territorial government in Canada. The federal government assumes the lead role for managing oceans, migratory birds, and wildlife on federal lands - except where that responsibility is delegated to the territories or to others through mechanisms such as Aboriginal claims - and is responsible for international relations. The provinces are responsible for most wildlife decisions within their boundaries, including the regulation of most hunting and angling. Provinces also have the authority to regulate land use and management of wildlife populations. The three territories exercise similar responsibilities to the provinces, but through a series of delegated authorities from the federal government.

Aboriginal peoples have constitutionally protected rights relating to wildlife, and their activities influence a wide range of areas important to wildlife management within their claims area and across Canada. Their decisions can have an impact on adjacent areas and often impact on the actions of individuals beyond their communities**. Co-management boards** are the main organizations of wildlife management in many northern areas, representing wildlife resource user groups. The boards are comprised of Aboriginal peoples and federal and territorial or provincial governments. There are currently 11 co-management boards in Canada, covering land in the Northwest Territories, but also some lands in Northern Quebec and Labrador. Co-management boards meet regularly to make decisions about wildlife, including species at risk, environmental management and other issues.

Municipalities also have a considerable influence over wildlife conservation and management through their land use planning and zoning activities, as well as their municipal bylaws on such things as firearms discharge and the management of green space. **Private landowners** also have a tremendous impact on wildlife conservation and management, especially in provinces where the large majority of land is under private ownership, such as

New Brunswick, Nova Scotia, and Prince Edward Island, and Saskatchewan Governments have acknowledged the importance of stewardship through policy changes, such as the facilitation of conservation covenants and easements on private lands, and preferential tax treatment for ecological donations.

Non governmental organizations (NGOs), businesses and industry, botanical gardens and zoos, universities, museums and **other institutions** also play an important role in the conservation and management of wildlife. These include a wide range of business and industry associations representing fisheries, forestry, and agricultural, and aquacultural interests as they relate to wildlife management. Botanical gardens, zoos, and natural history museums are all represented by joint networks: the **Canadian Botanical Conservation Network (CBCN)**, the **Canadian Association of Zoos and Aquariums (CAZA)** and the **Alliance of Natural History Museums.**

The public at large also influences wildlife conservation and management decisions through its changing attitudes towards wildlife, wild spaces, and wildlife use (see section 2.4.2 for information on the sustainable use of wildlife resources). Canada has changed from a rural country where the majority of its citizens had close contact with the land around them to a highly urbanized society where the principal means of interaction with wildlife is often indirect, through television programming and other media. Canada's urban population is increasingly multicultural with potentially different priorities and aspirations with respect to the value of nature and wildlife.

Species at risk

The Species at Risk Act (SARA) was passed in 2002. SARA is the federal component of the legislative commitment in the 1996 Accord for the Protection of Species at Risk, with provincial legislation coming into force in each jurisdiction as parliamentary processes and political priorities dictate. SARA creates a federal/provincial ministerial council, and a "habitat safety net". The Act also recognises COSEWIC as the primary provider of advice on the national conservation status of species, making the COSEWIC decisions a driver for wide-ranging management action. From 2003 to 2008 COSEWIC assessed or re-assessed 373 species (species, subspecies or populations), of which 335 were proposed to the Minister of Environment for protection under SARA.

A number of provinces also have species at risk (SAR) legislation developed prior to or independent of SARA. **Ontario** has an **Endangered Species Act (ESA)** which came into effect in mid-2008, following a review and revision of the province's original ESA (1971), the first such act in Canada. **Manitoba, New Brunswick, Nova Scotia, and Newfoundland and Labrador** also have ESA's, established in 1990, 1996, 1999, and 2002, respectively. Other provinces including **Alberta**, **Saskatchewan and British Columbia** have provincial *Wildlife Acts* that protect species at risk. Yukon is currently in the process of drafting SAR legislation**. Prince Edward Island's Wildlife Conservation Act (2004)** provides for the protection of endangered or threatened species and their habitat and **British Columbia's** new **Conservation Framework** also addresses species at risk. Nunavut Territory recently amended its **Wildlife Act** to include species at risk, and the Northwest Territories passed SAR legislation in June, 2009.

SARA also requires that an **Aboriginal Traditional Knowledge Subcommittee** be established under COSEWIC to facilitate access to the best available Aboriginal traditional knowledge and integration of that knowledge into COSEWIC's status assessment process. Additionally, a **National Aboriginal Council on Species at Risk (NACOSAR)** has been established to improve the involvement of Aboriginal peoples in all relevant aspects of the implementation of SARA, including species assessment and listing; recovery strategy, action plan, and management plan development and implementation; permitting and related agreements; and critical habitat protection.

Case Study: Re-introduction of the Black-footed Ferret (*Mustela nigripes*)

(photo © Parks Canada / E.LeBel, 8.81.03.21(103) / 2005)

The Black-footed Ferret used to occupy a huge range from Western Canada to Mexico. In Canada, it occurred in mixed grass prairie in southern Saskatchewan and Alberta. In the early 1900s, with the arrival of European settlers and threatened by a number of factors, populations of Black-footed Ferret began to decline. Black-footed Ferrets share an almost identical habitat with Black-tailed Prairie Dogs, and are highly dependent on them, as their main food source and for their burrows which they use to escape predators and raise their young. The last wild Black-footed Ferret in Canada was seen in 1937.

For decades, scientists thought the species was globally extinct. Then, in 1981, a small population was found in Wyoming, and several of these ferrets were collected with the hope that the species could be saved and eventually restored to their natural habitat. Descendants of those ferrets have been successfully bred in captivity, and have been re-introduced to the wild in Wyoming, Montana, South Dakota and Mexico. The Metro Toronto Zoo's captive breeding colony had 12 males and 18 females in 1997. A COSEWIC assessment was completed in 2000 and the species was added to the Species at Risk Act. In 2004, a joint Black-footed Ferret/Black-tailed Prairie Dog Recovery Team was established and in 2005, Canadian, U.S. and Mexican specialists met to exchange experiences and plan a recovery strategy. Specialists think that Grasslands National Park and the surrounding land in south Saskatchewan is the only place in Canada where the ferret has a chance of survival. In 2009, the Proposed Recovery Strategy was published for consultation. The plan is to release about 30-50 ferrets into Grasslands National Park in the fall of 2009.

Bird conservation and management

In response to concerns over many declining populations of once abundant birds, Canada, Mexico and the United States formed the **North American Bird Conservation Initiative (NABCI)** in 1999. NABCI is a collaborative effort between organizations and agencies whose

vision is to increase the effectiveness of initiatives, enhance coordination and cooperation, build on existing structures, and stimulate new mechanisms as appropriate. In order to plan, implement, and evaluate conservation actions across the whole of North America, NABCI partners from the three countries have adopted **Bird Conservation Regions.**

Case Study: Conservation Plans for Bird Conservation Regions

Environment Canada is leading the development of conservation plans for the 12 Canadian BCRs. The large size of many of the regions, with provincial jurisdiction over management has required that some plans be prepared based on political sub-units. As such, 22 all-bird conservation plans are currently targeted for completion in 2010; the plans will provide a conservation framework. The information in the BCR plans will also be the foundation for Canada's comprehensive bird conservation programs and will aid in the identification of potential areas for land acquisition or protection and project effects under the *Canadian Environmental Assessment Act*.

Joint action has also taken place in waterfowl conservation, with the 1916 **Migratory Birds Convention** between Canada and the United States leading to the development of coordinated federal programs, especially in support of monitoring waterfowl populations and setting hunting regulations. Ducks Unlimited continued this joint approach by moving funding from supporters in the USA to deliver habitat conservation programs in Canada. This innovation led to development of the North American Wetlands Conservation Act in the USA as the financial underpinning of **North American Waterfowl Management Plan (NAWMP).** The Plan, agreed upon by Canada and the USA in 1986, and Mexico in 1994, continues to act as an international action plan in the conservation of migratory birds across the continent. The Plan is a partnership of federal, provincial/state and municipal governments, non-governmental organizations, private companies and many individuals, all working towards achieving better wetland habitat for the benefit of migratory birds, other wetland-associated species and people. Plan projects are international in scope, but implemented at regional levels; the Plan is considered one of the most successful conservation initiatives in the world. The **Prairie Habitat Joint Venture**, under NAWMP, permanently conserved a total of 2.2 million hectares from 1986 to 2005 through a variety of programs including securement, conservation agreements, and stewardship program.

Experience with migratory birds and NAWMP showed the way for the development of another trinational mechanism, the **Trilateral Committee for the Wildlife and Ecosystem Conservation and Management**. The Working Tables of the Trilateral bring together the program managers responsible for a wide range of programs in Canada, Mexico, and the USA, sharing information and experience around working tables on CITES, migratory birds and wetlands, law enforcement, ecosystem conservation and species of common concern. Working Tables develop 3 year work plans to guide their efforts. The Trilateral also works closely with the Commission on Environmental Cooperation, the environmental side deal associated with the North American Free Trade Agreement.

Case Study: Atlantic Habitat Partner Initiative

In May 2009, the Government of Canada joined the governments of the four Atlantic Provinces and Ducks Unlimited Canada in the $9 million **Atlantic Habitat Partnership Initiative**. The three partners are contributing an impressive $3 million each toward this five-year conservation partnership initiative – illustrating a significant investment and commitment to the conservation of Atlantic wetlands biodiversity.

The important partnership is designed to maintain critical infrastructure to sustain wetlands across Atlantic Canada in order to conserve habitat for migratory birds and other wildlife. Funding will help to ensure the conservation and protection of native and migratory birds along with many other types of wildlife in the Atlantic Provinces. The partnership will co-fund five years of infrastructure construction projects in wetland areas that will provide jobs and stimulate local economies.

Building upon these prospects, the Atlantic Habitat Partnership Initiative is designed to specifically maintain critical infrastructure to sustain 560 water control pipes and systems, 150 fish ladders and over 170 kilometres of dykes on more than 400 square kilometres of wetlands. Many of the wetlands were created or maintained over the past 15 years under the North American Waterfowl Management Plan and its agent in the Maritimes, the Eastern Habitat Joint Venture.

Through the protection and preservation of Atlantic natural heritage, along with the associated local economic benefits, this important conservation initiative is an example of the benefits derived from the collaboration between federal, provincial and private partners.

Fish conservation and management

Through cooperative agreements with provincial government agencies, **Fisheries and Oceans Canada (DFO)** works toward conservation and protection of marine and inland freshwater fisheries; they also lead responsibility for aquatic species under SARA and Aquatic Invasive Species programs. Data on fish stocks, fish habitat, and the broader ecosystem is regularly collected by DFO scientists and fishery officers for each fishery, and analyzed to evaluate the status and trends in the fisheries. The core legislation guiding fisheries management is the **Fisheries Act.** DFO administers a number of programs and initiatives in support of a stable and sustainable fishing industry including **fisheries renewal**, a short-term action plan to set in place the conditions and mechanisms necessary to support a robust and diverse fisheries sector over the long term; the **Aboriginal Aquatic Resource and Oceans Management program**, which provides funding to qualifying Aboriginal groups to establish aquatic resource and oceans management bodies; and the **Pacific Integrated Commercial Fisheries Initiative**, which aims to achieve environmentally sustainable and economically viable commercial fisheries, where conservation is the first priority and First Nations' aspirations to be more involved are supported.

Reducing the threats to wildlife

Invasive alien species

Invasive alien species (IAS) rank second only to habitat loss in terms of their threat to biodiversity, by taking over food sources, habitats, roles and functions of indigenous species and reducing their numbers and survival rates. Invasive alien species cause billions of dollars of economic damage each year in Canada (approximately $4.5 billion annually to the

agricultural sector alone) and are cited as a threat to 24 per cent of species listed by COSEWIC. The Wild Species 2005 report shows that, of all known species of vascular plants in Canada, 24 per cent are non-indigenous; the most of any of the taxonomic groups assessed. However, there is currently no comprehensive assessment of alien species trends in Canada. Most existing datasets are local in nature, based on literature review or expert opinions. In April 2009, the **Commission for Environmental Cooperation (CEC)** released the **Trinational Risk Assessment Guidelines for Aquatic Alien Invasive Species,** developed in cooperation with experts from Canada, Mexico and the United States. CEC's guidelines were announced during the **16th International Conference on Aquatic Invasive Species**, held in Montreal. The guidelines will be used as a tool for North American resource managers to assess the risk of introducing nonnative species into a natural ecosystem.

Through the National Invasive Alien Species (IAS) Program that is led by the Canadian Wildlife Service of Environment Canada, Canada continues to manage invasive alien species and conserve ecosystems from their effects. In 2004, the federal government, working in cooperation with its provincial and territorial counterparts, developed ***An Invasive Alien Species Strategy for Canada***, to provide policy direction to the important role of preventing new invasions, detecting and responding to new invasive alien species and in managing established invasive alien species through eradication, containment and control. The Provinces also have strategies, plans and initiatives in support of the national strategy, and act as leaders in the management and control of invasive species. All of the provinces, and one territory, have established invasive species councils. As part of the Strategy, the **Invasive Alien Species Partnership Program (IASPP)** was one of the first federal activities developed under the National IAS Program to implement the Strategy. It empowers grassroot-level work, engages multistakeholders and employs Canadians by providing funding to 143 projects to date, to provinces, territories, municipalities, aboriginal communities, educational institutions and non-government organizations, as well as to other groups who are working on invasive species. Funded projects have targeted over 215 identified invasive species, which has resulted in reducing and detecting harmful introductions of invasive species and improving the understanding and awareness of Canadians. A **Federal Invasive Alien Species Web portal** was launched on International Biodiversity Day May 22, 2009; the theme of which was Invasive Alien Species. The portal provides Canadians with an online resource to access information about actions being taken, along with information and steps that can be taken to help protect the environment from invasive species.

The **Canadian Food Inspection Agency (CFIA)** has initiated a number of programs and activities under the Strategy, including enhanced **Pest Risk Assessment** capacity and capability, a **National IAS Surveillance Program**, and enhanced capacity for import inspection and laboratory diagnostics, as well as **rapid response plans** for Invasive Plants and Plant Pests. The **DFO** has established a Canadian **aquatic invasive species network** and a **centre of expertise** for aquatic risk assessment, as well as completing **risk assessments** for several species, conducting early detection and monitoring, and leading in the management of IAS such as sea lamprey. **Natural Resources Canada's Canadian Forest Service** has led numerous projects under the strategy for forest products, including work on high risk pathways for forest pests, developing international phytosanitary standards,

science and research projects, novel and non-chemical control methods, DNA profiling, diagnostic tools, taxonomic guides and searchable databases for IAS and forest pests.

Wildlife disease

Wildlife diseases have affected Canadian society substantially in the past decade. Eradication of Chronic Wasting Disease, a prion-associated disease of deer, from Canadian farms has cost upwards of $40 million to governments and industries, while its emergence in wild deer in Canada in 2001 now jeopardizes those wild deer populations and associated economic activities. Bovine Tuberculosis in wild elk and deer in Manitoba is affecting international trade, has provoked conflicts and confrontations over acceptable management responses, and has the potential to spread east and west across Canada and south into the United States. West Nile virus, an invasive alien species in Canada, swept across the country from 2001 to 2003, causing human illness, straining response capacities and demonstrating the power of introduced infectious organisms to spread widely in new environments. These wildlife health issues are not unprecedented but, in their scale and number, they represent a new height on a rising curve of important health and economic issues linked to wild animal diseases. Some 70% of new or newly important diseases affecting human health and human economies worldwide are considered to have a wild animal source.

The objective of Canada's **National Wildlife Disease Strategy (NWDS)** is to establish a coordinated national policy and a disease response and management framework that aims to minimize the negative impacts of wild animal diseases on biodiversity, human and livestock health, the environment and the economy. The **Canadian Wildlife Directors' Committee** led the development of the Strategy in consultation with relevant federal departments, Canadian veterinary colleges, and provincial and territorial wildlife agencies. The six goals of the Strategy are: Prevention; Early Detection; Rapid Response; Disease Management; Education and Training; and Communication. The objectives of the Strategy are achieved through a series of action plans developed for each of the goals and implemented collaboratively among the responsible jurisdictions' action plans identify existing programs and agencies relevant to a particular NWDS component and address issues such as capacity requirements, key gaps and funding priorities. The Strategy was reviewed in 2004 and tested on chronic wasting disease, leading to the creation of the **National Chronic Wasting Disease Control Strategy.**

2.2.3. Species Monitoring and Reporting

Citizen science monitoring

A wide variety of citizen science monitoring programs are currently underway in Canada, providing valuable data, forming partnerships, affecting change, and linking thousands of Canadians to their local ecosystems and species. Bird monitoring programs are some of the most widespread citizen science initiatives in Canada. Among many others, the **Breeding Bird Survey**, beginning in 1966, is one of the oldest surveys of breeding birds in North America. The **Canadian Lakes Loon Survey** is a long-term citizen science project designed

to monitor the breeding success of loons on lakes across Canada. The **Monitoring Avian Productivity and Survivorship (MAPS) Program** was created in 1989 to assess and monitor the vital rates and population dynamics of over 120 species of North American landbirds, utilizing constant-effort mist netting and banding at a continent-wide network of monitoring stations staffed by both professional biologists and highly trained volunteers. The **Christmas Bird Count**, currently in its 109th year, is a census of birds conducted annually across North America by volunteer birders. **Wildlife Watchers,** a joint project of the Canadian Wildlife Service, Bird Studies Canada, and Ontario Nature, brings together programs for monitoring Ontario's birds and amphibians in an annual newsletter that reports on program highlights from the past year and provides current program contacts. The monitoring of many other kinds of species is also widespread across Canada. **Bird Studies Canada** works with Federal and Provincial governments, field ornithologists and NGO's to map the distribution of hundreds of bird species. **The British Columbia, Alberta, Maritimes and Ontario Breeding Bird Atlases** represent some of the most comprehensive wildlife studies in Canada. Planning is currently underway to repeat these Bird Atlas studies in a number of provinces.

Other **NatureWatch,** monitoring programs include **Frogwatch**, which uses frogs and toads as indicator species for the health of areas, especially wetlands; **Plantwatch**, which records flowering times for selected plant species and reports these dates to researchers; and **Wormwatch**, which uses earthworms to discover soil ecology.

2.3. Outcome - Genetic Resources and Adaptive Potential

Full complement of genetic diversity of all species in situ and ex situ (domestic and wild)

Geographic distribution of species necessary to ensure adaptive potential

Genetic diversity is nature's insurance policy. It allows increased production, assures ecological resilience and creates options for future innovative products. Conserving genetic diversity provides us with opportunities to discover and develop new food varieties, pharmaceuticals, timber, and bioenergy products. It provides options for mitigation of and adaptation to climate change.

Conservation and management of genetic resources within domesticated species is very important for human well being. People have been improving food production for thousands of years by growing and tending plants and animals, and then selecting and nurturing the best individuals for future use. Currently we use about 50,000 edible species of plants and animals world wide.

Many uses for plants and animal species are still unknown and await discovery. The opportunity to derive benefits from them will be lost if they disappear before new uses are discovered. For example, many of our spices (cinnamon, pepper) and medications (aspirin, tamoxifen, quinine, and digitalis) were found through observation of natural defences of plants and animals against pests and predators. Had these natural biological functions gone

unrecognized, we might not have valued these species and failed to conserve them.

Genetic resources can be conserved in specialized *ex situ* facilities such as seed banks, on farms or in the wild. In Canada, *ex situ* preservation plays a critical role in providing continued access to viable seed stocks and cell lines that could otherwise be lost as wild populations and species and traditional crops and breeds change or become extinct.

2.3.1 Assessment – Research and Information for Decision Making

Canada is the nation where the concept of DNA barcoding was developed and fostered, and is the leading force behind the International Barcode of Life (iBOL) project, whose goal is to assemble the sequence library and the technology necessary to identify biological species rapidly and inexpensively using standardized DNA barcodes. Canada is also an active participant in the Consortium for the Barcode of Life (CBOL), established with funding deployed by the United States, and currently including 150 member organizations based in 45 countries.

DNA barcoding is emerging as a global standard for species identification. Canadian support for iBOL has focused on a national research network, the Canadian Barcode of Life Network (see box). It has worked to both simplify protocols for DNA barcode acquisition and to develop the informatics platform required for the curation and analysis of barcode records. The latter effort has led to the creation of BOLD, the Barcode of Life Data System (www.boldsystems.org), which has more than 2600 registered users and holds barcode records for more than 580K specimens and 57K species.

Case Study: The Canadian Barcode of Life Network

The Canadian Barcode of Life Network represents the first national network dedicated to large-scale DNA barcoding. The network itself is made up of nearly 50 researchers who are working towards the development and application of DNA technologies in the area of species identifications. The Network seeks to develop an accurate, rapid, cost-effective and universally accessible DNA-based system for species identification. It is funded by a broad range of institutions across the country, with initial work focusing on barcoding species which are of particular economic, social, or environmental importance.

Research of genetic resources

The global **Census of Marine Life (CoML)** is a global network of researchers engaged in a ten-year initiative to assess and explain the diversity, distribution, and abundance of marine life in the oceans. **The Marine Barcode of Life (MarBOL)** initiative, a joint effort of the CBOL and the CoML, is an international initiative to enhance capacity to identify marine life by utilizing DNA barcoding to assess the diversity in the world's oceans. The Campaign Coordinator of MarBOL's Leadership Team is from the Canadian Centre for DNA Barcoding. Also in Canada, the **Centre for Marine Biodiversity** has begun the process of identifying knowledge and knowledge gaps about marine biodiversity in Canada's three oceans. At the federal government level, the **BioPortal** - the Government of **Canada's** biotechnology

resource for consumers, industry, scientists and educators - provides online information about research and other activities of departments and agencies involved in biotechnology.

Case Study: Conserving forest genetic resources

Launched in 2006, the **Canadian Program for Conservation of Forest Genetic Resources (CONFORGEN)** provides a coordinated approach to the conservation of forest genetic resources through a pan-Canadian network, with representation from jurisdictions and academia. National activities focus on monitoring, assessing, and reporting on the state of forest genetic resources and developing management guidelines. The **Canadian Forest Genetic Resources Information System (CAFGRIS)** is a key component of CONFORGEN and provides applications for assessing the status of native tree species and conservation efforts; predicting future status and conservation requirements under climate change scenarios; identifying data gaps; stimulating cooperative research efforts; and fostering voluntary efforts to conserve species before official species listing is warranted.

2.3.2 Planning and Implementation

Access and benefit sharing policy

The fair and equitable sharing of the benefits arising out of the utilization of genetic resources is one of the three main objectives of the CBD. As such, the CBD adopted the **Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization** in 2002, as voluntary guidance to countries in developing their domestic Access and Benefit Sharing (ABS) policies. In response to the Bonn Guidelines, Canada has begun work on a domestic approach to access and benefit sharing. A discussion paper on ABS is currently being used to engage Aboriginal peoples and other stakeholders. Although there is no official ABS system in place in Canada, there are practices, laws and regulations that affect access to genetic resources and the sharing of benefit from the use of genetic resources such as: permits to access/collect biological resources in national parks; agreements to transfer genetic material between academic institution, researchers and private businesses; establishment of institutions to support research activities; and aboriginal community protocols or guidelines.

The incorporation of traditional knowledge held by Aboriginal peoples into Canada's ABS policy is currently under discussion. Traditional knowledge associated with genetic resources may cover, for example: the location of unique species or specific genetic resources harvested for medicines, food and fibres; the cultivation, harvesting or hunting of genetic resources; and the processing and storage of genetic resources into products.

In 2006, Canada adopted the **Guiding Principles and Features of ABS Policies in Canada** as a basis for further policy discussions within Canada. The Canadian ABS Portal, maintained by ENV Canada, serves as a window on ABS policy in Canada.

In 2008, within the framework of Quebec-based research on access to genetic resources and ABS, the **Société Provancher d'histoire naturelle du Canada,** on behalf of the Quebec Ministère du Développement durable, de l'Environnement et des Parcs, conducted a survey

to investigate the use of genetic resources in Quebec. Most of the 81 Quebec-based respondents come from government and paragovernmental agencies and from private businesses in the for-profit sector. The study found that genetic resources are mainly used in Quebec in health, conservation, bioproducts and industrial bioprocesses, agriculture, the agri-food sector and forestry. The study also found that plant, microbial, and animal genetic resources were all used by respondents; that most respondents had to contact a recognized authority to access a genetic resources or traditional knowledge; and that respondents had signed a variety of monetary or non-monetary benefit-sharing agreements, although 44% had signed no agreement.

Canada's Aboriginal peoples have a vast knowledge of genetic resources (defined as material of plant, animal, microbial or other origin containing functional units of heredity that is of actual or potential value). This knowledge is increasingly being integrated into scientific research. Northern institutions, such as the **Nunavut Research Institute**, have already incorporated measures of access and benefit-sharing into their operating procedures that facilitate scientific access to their territory while ensuring the information generated is shared with Nunavut. A promising new initiative combining traditional knowledge, community development, and the scientific research of genetic resources is the **Northern Ontario School of Medicine (NOSM)**, run jointly by the Faculties of Medicine at Lakehead University and Laurentian University. NOSM has been involved in extracting genetic resources from Northern Ontario ecosystems, while establishing close contact with local communities. A major research initiative of NOSM, the **Boreal Bioprospecting Initiative (BBI)** involves communities, trains Northerners and First Nations peoples, and creates employment opportunities and economic development by establishing intellectual property and spin off companies. As there has been little bioprospecting in Northern Ontario, the BBI aims to gather information on new genetic resources using traditional knowledge and scientific methods.

Forest genetic resources

Various of initiatives related to planning and implementation for conservation of forest genetic resources are in place. On the international level, Canada has been involved in initiatives such as the United Nation's Food and Agriculture Organization (FAO) **State of the World's Forest Genetic Resources**, the **Global Forest Watch**, the **Montréal Process** (regarding forest management), and the **Global Strategy for Plant Conservation**.

Domestically, the **Canadian Council of Forest Ministers (CCFM),** a forum for federal, provincial and territorial governments, is responsible for promoting cooperation among stakeholders, providing leadership on national and international issues, and setting direction for the sustainable management of Canada's forests. Biodiversity, including genetic diversity, is addressed in their **Vision for Canada's Forest–2008 and Beyond** and the **CCFM Criteria and Indicators of Sustainable Forest Management**. Two indicators are used to track progress in managing and conserving Canada's forest genetic resources one describes genetic diversity of parent trees used in seedlots, the other describes the status of conservation efforts for native tree species. The CCFM also sponsors, with the support of the provinces and territories and Natural Resources Canada's Canadian Forest Service, the **National Forest Information System (NFIS),** with a vision to acquire and disseminate

authoritative information from jurisdictional sources in support of reporting on sustainable forest management.

Both in situ (within natural habitats) and ex situ (outside natural habitats) efforts play a role in the implementation of programs and activities for conserving forest genetic resources and their adaptive potential in Canada. Most provinces and territories have clone banks, seed orchards, provenance trials, and progeny tests for ex situ gene conservation for commercial and some other indigenous tree species. Seed banks that are managed at both the provincial and national levels, such as the **National Tree Seed Centre**, also provide ex situ conservation of the genetic diversity of Canadian tree and shrub species and are sources of germplasm for research, reforestation, or restoration projects.

Combining genetic, species, and ecosystem conservation and education, the **MacPhail Woods Ecological Forestry Project** in Prince Edward Island has been operating since 1991, collecting seeds from a wide variety of rare native trees and shrubs for propagation in the group's nursery. The **Trout River Environmental Committee** has partnered with MacPhail Woods to deliver two large-scale projects that involve the restoration of Acadian forest species on a watershed basis. The restoration forestry project and land reclamation project combined saw thousands of native trees and shrubs planted in over 50 acres of land, and hundreds of rare native species.

Focused research is currently underway to assess the status and properties of Canada’s forest genetic resources. The Canadian Forest Service hosts the National Tree Seed Centre, and conducts genetics research on topics ranging from improvement of dominant commercial species such as pines and spruces, through gene conservation of species such as butternut, whose populations have declined dramatically owing to attack of butternut canker, an invasive alien species.

Several provinces also have forest gene conservation programs. For example, **British Columbia’s Provincial Gene Resource Management and Resource Inventory** programs involve three ministries in genetic conservation, with a large focus on native tree species. Initiatives include arboreta breeding, ex situ plantations, and clone banks for more than 15 native tree species; and maintaining the provincial Tree Seed Centre. The **Centre for Forest Gene Conservation** at the University of British Columbia inventories and catalogues forest tree gene resources, advancing gene conservation theory through research and collaboration with other agencies worldwide. Additionally, the **Forest Genetics Council of British Columbia** is appointed by B.C.’s chief forester to guide tree improvement activities in the province.

Wildlife genetic resources

The conservation of genetic diversity and adaptive potential in Canadian wildlife also involves a variety of initiatives, including captive breeding programs, seed and gene banks, and the designation of species at risk. Governments, ENGOs, museums, botanical gardens, zoos, and aquaria are among those bodies involved in the conservation of genetic diversity in wildlife. Although domesticated animals and crops tend to receive more conservation attention at the genetic level, recent efforts have been made to increase the use of scientific knowledge in the conservation of genetic diversity in wildlife.

Genetic information on wildlife is used for a variety of purposes, from establishing the geographic bounds of populations to managing rehabilitation and reintroduction programs. For example, understanding gene flow between populations of the threatened Black Rat Snake is helping managers plan for its recovery. Genetic studies provide information about wild species that is difficult, if not impossible, to obtain through traditional field methods.

Wildlife enforcement officials in **Environment Canada** use genetic markers to identify illegally traded wildlife species, link individuals to a geographic area, and determine parentage and sex. The successful use of DNA analysis for a wide range of purposes related to wildlife management prompted the department to conduct a complete review of current and potential applications. The review recommends that, while genetic techniques are still comparably expensive and labor-intensive, there are many instances in which their use would greatly improve wildlife management efforts.

At the national level, the **Committee on the Status of Endangered Wildlife in Canada (COSEWIC)** uses genetic evidence as a determinant of species status. Ontario has developed the **Natural Resources DNA Profiling & Forensic Centre**, a partnership between the Ontario Ministry of Natural Resources, Trent University, and the Wildlife Forensic DNA Laboratory. The centre undertakes conservation-oriented genetics research on natural populations of animals and plants. DNA profiling initiatives are underway on caribou, white-tailed deer, elk, wolves, and black bears, as well as fish through the **Fish Genetics and Stock Assessment** program.

Exemplifying fish genetic conservation in Canada, the **World Fisheries Trust (WFT)**, created in 1995, is a Canadian non-profit organization dedicated to the equitable and sustainable use and conservation of aquatic biodiversity. WFT preserves genetic material from endangered fish through frozen sperm, offering genetic variability to fish hatcheries and rehabilitation projects around the world. WFT is a world leader in fish genetic conservation, with projects in salmon gene banking with the DFO and First Nations communities. The **International Fish Gene Bank (IFGB),** a program of WFT, has carried out notable work with the Shuswap Nation Fisheries Commission, training local aboriginal fisheries workers in gene banking procedures and the operation of regional gene banks, while at the same time accumulating genetic material for salmon fish stocks.

Agricultural Genetic Resources

At the international level, the **Food and Agricultural Organization (FAO**) of the United Nations plays a large role in the development of objectives concerning the global conservation of agricultural genetic resources. The legally-binding **International Treaty on Plant Genetic Resources for Food and Agriculture**, adopted in 2001, covers all plant genetic resources relevant for food and agriculture, aiming to provide an ABS regime for the use of genetic materials and recognize the contribution of farmers to the diversity of crops.

Canada, not unlike other countries around the globe, faces significant erosion of cultivated animal and plant genetic resources. It is estimated, for example, that three-quarters of agricultural crops species present in Canada in the early 1900s have since become extinct. Canada has a commitment under the CBD to the conservation and sustainable utilization of agricultural genetic resources as part of overall efforts to reduce environmental threats to

food security. As such, **Agriculture and Agri-food Canada (AAFC)** is involved in the investigation and conservation of genetic resources in Canada. The department has several long-term objectives concerning Canada's genetic resources, including the protection and conservation of genetic diversity, contribution to the security, protection and safety of the food system, enhancement of the environmental performance of the agricultural system, and contribution to the development of new opportunities for agriculture.

Efforts are also underway by AAFC to continue development of varieties of domesticated plants and animals at a number of research facilities. For instance, the **Prairie Farm Rehabilitation Administration Shelterbelt Centre** is involved in the conservation of genetic resources of trees and shrubs used in agro-forestry. The collections include sampling native populations and provide for ex situ establishment in gardens within the native range of the species to provide data on adaptability and performance of the species and future genetic material harvest.

A system of plant gene banks and research centers exist to conserve crop genetic resources. AAFC established **Plant Gene Resources of Canada (PGRC)**, Canada's national seed bank, in 1970. PGRC has expanded its program to include a component focused on Canadian wild plant species, with a focus on ex situ conservation through the keeping of plant germplasm of potential economic value. PGRC participates in the worldwide network of plant genetic resources centres and the **International Plant Genetic Resources Institute (IPGRI).** The **Canadian Clonal Genebank** is another national body that conserves plant germplasm, but with a focus on crop species. The **Canadian Seed Growers' Association** has provided specialized certification services for both native plant species and field crops.

As an example of an ENGO involved in genebanking, **Seeds of Diversity** is an organization dedicated to the conservation, documentation and use of public-domain, non-hybrid plants of Canadian significance. Seed growing members grow, propagate and distribute over 2,200 varieties of vegetables, fruit, grains, flowers and herbs as a living gene bank. Species are conserved by acquiring and storing germplasm samples; Seeds of Diversity shares this information through partnership with other gene banking initiatives. Only non-commercial varieties of plants are distributed, representing approximately 90% of crop genetic diversity. Seeds of Diversity holds annual seed exchanges and distributes information on seed-saving. They also organize initiatives such as the **Great Canadian Garlic Collection,** where member-volunteers receive free samples of diverse varieties of garlic and record characteristics.

Case Study: Pollination in Canada

Bees, birds, beetles, moths and mosquitoes all play a crucial role in pollinating the world's plants, including food crops. It has been estimated that one of every three bites of food eaten has resulted from successful animal-plant pollination. Declines in biodiversity have led to declines in valuable pollinators in Canada and the world. For Canada's honeybees, it seems that their predators, mites and bacteria, are becoming increasingly resistant to traditional treatments used by bee keepers, such miticides and antibiotics. The bees are unable to defend themselves, and those without natural genetic resistance die; nearly 36 percent of all Canada's honeybees died over winter in 2007, more than twice the normal mortality rate of 15 percent. As any bee population tends to crash to extinction once it reaches a threshold small number, research and conservation of bee populations is highly important for Canada's pollination, biodiversity, and agriculture.

Dr. Laurence Packer of York University, has built up a collection of over 100,000 bees from around the world to be identified. Packer heads up the bee portion of the **Barcode of Life** project; barcoding bee species would greatly increase the efficiency of studies in agriculture, pollination, and biodiversity. The researchers in Packer's lab have also published a guide to the genera of bees of eastern Canada and are completing a key for the families of bees of the world.

A number of Canadian initiatives aim to address the decline in honeybees across the country. A new research project by **Genome British Columbia** will develop a set of tools to identify disease resistance in natural bee populations. By understanding the traits that make bees naturally resistant to pathogens the long-term hope is that beekeepers will no longer need to use miticides, fungicides, and antibiotics to control them. Bees are also a model organism for studying the human health issues such as immunity, allergic reaction, antibiotic resistance, development, mental health, longevity and diseases of the X chromosome. Established in 2000, Genome BC is one of six **Genome Canada** centres across the country.

NSERC-CANPOLIN is a new, five-year NSERC Strategic Network that will address the growing problem of pollinator decline and crop pollination in agricultural and other ecosystems in Canada. **Pollination Guelph** is a local initiative dedicated to the conservation and development of pollinator habitat; their proposed 45 ha Pollinator Park will be one of the first and largest pollinator initiatives to occur in Ontario, Canada, and internationally.

There are a variety of initiatives for the conservation of domestic animal genetic resources in Canada. With the support of AAFC, there is a national framework of an Experts Board, and a Steering Committee for animal genetic resources conservation, both of which have been operating for the past five years. The **Canadian Agri-Food Research Council** has farm animal genetic resources conservation on its list of national priorities. Additionally, the **Canadian Farm Animal Genetic Resources Foundation** has been formed to promote and perform conservation activities through the coordinated action of industry, governments, and individuals. From stud fees to semen and embryo purchase and exports, there is a real market value for Canada's animal genetic resources. Legislation such as the **Animal Pedigree Act** helps govern market areas of animal genetic resources. Breed associations trace parentage and companies carry out blood and DNA typing of animals.

AAFC has also established the **Canadian Animal Genetic Resources Program** in collaboration with **Rare Breeds Canada,** an NGO that conserves farm animals and stores semen/embryo samples from threatened breeds/species for long-term conservation and education. The program aims to conserve, preserve, enhance and increase utilization of the

genetic diversity of plants, animals, microbes and plant viruses of economic importance for Canada, includes selected wild species. Additionally, it applies climate change scenarios to find germplasm with stress traits such as heat or drought tolerance and disease resistance. The program conducts research and incorporates knowledge with the **Germplasm Resources Information Network - Canada (GRIN-CA)** and other gene banks. **GRIN-CA** uses a computerized database management system to assist in handling the massive amounts of data associated with the genetic resources. Researchers can learn about specific characteristics for each accession in the collection and seed requests can also be made through their database.

At one time, several Canadian universities kept collections of specific breeds of farm animals. In the past decades, the number of universities keeping these breeds and the number of lines kept by each have both declined. However, in the last decade, there has been an increasing amount of research in molecular genetics of farm animals. This research, driven by individual researchers and funding agencies, includes genome scans for quantitative traits, sequencing of candidate genes, and development of markers for mapping.

Microbial genetic resources conservation

The importance of microbial genetic conservation is being increasingly recognized in Canada. Microbes are a large part of the diversity of life and are used in many areas of agriculture, sold as part of compounds in the food and beverage business, and studied as disease or biocontrol organisms. New technologies regarding the genetic diversity of microbes are quickly emerging and may be applied to a broad range of purposes, including biosecurity and monitoring organisms important to human or environmental health (like allergens).

The **Expert Committee on Plant and Microbial Genetic Resources** advises on plant genetic resource policies and activities in Canada, reporting to the Canadian Agriculture Research Council/Canada Committee on Crops (CARC/CCC). It draws its representation from Canadian federal and provincial government agencies, universities, industry, scientific societies, and non-government organizations. Specifically the committee discusses and advises on the activities of the national program in plant genetic resources, makes recommendations to CARC/CCC on issues relating to plant and microbial genetic resources, and participates in the formulation of national plant and microbial genetic resource policy and its relationship to international programs.

There is a public collection of microorganisms housed at **AAFC**, in addition to many privately owned collections in Canada. Also in the public domain, the **Canadian Collection of Fungal Cultures (CCFC)** holds 10,500 strains of fungal cultures representing about 2,500 species. The collection serves as the primary repository for fungal cultures in the AAFC research branch, functioning as a gene bank for this microbial resource and providing pure cultures to scientists.

Microbial genetic resources are the focus of concerted collecting efforts by a number of sectors, and among the most potentially economically significant organisms covered by the CBD. They can often be easily collected, grown, and conserved in ex situ culture collections. Microbial researchers have worked in a variety of ways with companies with an interest in

bioprospecting. Due to this significant interest in microbial genetic resources, a number of issues, such as access and distribution policies, intellectual property rights, and biosecurity, require further attention from the relevant bodies in Canada.

Preserving adaptive capacity in response to climate change

As climate change alters the abundance and distribution of species in Canada and redistributes agro-ecological zones, genetic diversity is key to species' ability to adapt to new situations. In agriculture, changes are already being observed by producers - Albertan farmers have reported, over the last ten years, changes in drought frequency, soil moisture reserves, winter temperatures, extreme weather events and the growing season. The high level of uncertainty regarding the effects of climate change increases the importance of fostering highly adaptive ecosystems and economies in Canada.

In support of adaptation to the expected impacts of climate change on agriculture, **AAFC** is collecting plant genetic resources containing applicable characteristics, such as drought/heat/cold tolerance and resistance to disease, from locations considered at high risk. Over 900 samples have been collected from high arctic sites threatened by flooding and the application of germplasm at northern sites needing reclamation is under study.

Additionally, **biotechnology** can use genetic diversity to improve Canada's ability to adapt to climate change. Techniques that increase resistance to pests and disease, hasten plant propagation, and fingerprint cultivars to confirm parentages and gene association, have all been used in Canada and may reduce chemical usage, increase overall production efficiency, and increase the adaptive nature of Canada's agriculture.

2.4 Outcome - Sustainable Use of Biological Resources

Production and consumption of natural resources within ecological limits and thresholds to support economic capacity, livelihoods, local food security and human health

Availability of local and indigenous knowledge, innovations and practices associated with ecosystems, species and genetic resources

Canada is a large nation rich in biodiversity that depends heavily on biological resources. As noted in Canada's Biodiversity Outcomes Framework, sustainable use of biological resources is the basis of healthy, prosperous communities and sustainable livelihoods. Hundreds of communities in Canada depend directly on employment in fisheries, forestry, and agriculture, including many indigenous communities across the country where fishing, hunting and trapping are important occupations. We derive thousands of products from farms, aquaculture facilities, and forest plantations, as well as from the harvest of natural populations. Given the importance of these biological resources, comprehensive policies, strategies, plans, and programs are necessary to ensure their sustainable use and conservation.

Natural areas and wildlife are major contributors to the economy and essential cultural and social elements that define Canadian society and contribute to its health. Sustainable use requires a balance between developing resources to meet economic and social goals and conserving the natural capital stock of resources. It recognizes that the supporting and regulatory services provided by ecosystems – such as pollination, pest and disease control, soil building, nutrient cycling, flood control - sustain the productive capacity of ecosystems, allowing the survival of all life forms and providing a continuing supply of goods.

2.4.1 Assessment – Research and Information for Decision Making

Science renewal, research and information sharing

Canada's government, organizations, and institutions are continuing to invest in improved technologies and practices in their numerous initiatives related to the assessment of sustainable use. In sustainable forest management, for example, advances in technology and development of innovative applications have led to improved methods for remote detection and characterization of wildlife habitat. Research on the impacts of forest management practices have led to the development of guidelines and biodiversity management objectives for sensitive and indicator species; additionally, research to improve understanding of the dynamics of natural disturbances has allowed for the concept of emulating natural disturbances to be incorporated into management planning. The **Sustainable Forest Management Network** is a Centre for Excellence that plans, conducts and develops applications for interdisciplinary, university-based research on issues related to sustainable forest management. The Network's Knowledge Exchange and Technology Extension Program, provides a focus on synthesis, integration and implementation of existing research results and also develops new tools and extension products for on-going research projects. As detailed in section 2.3.1, **CONFORGEN** and **CAFGRIS** also provide information on forest management through the monitoring and assessment of forest tree genetic resources.

In fisheries management, **Fisheries and Oceans Canada (DFO)** is working to address the demand for relevant scientific information and advice on issues regarding Canada's fisheries. Over the next five years, their **Science Renewal program** will enhance delivery of scientific information, advice and services in support of better policy development and decision-making. Science Renewal will focus on stability for long-term monitoring and data management, while maximizing flexibility in the areas of scientific research, advice, services and products to respond to evolving federal government priorities.

The **Global Biodiversity Information Facility (GBIF)** makes the world's primary data on biodiversity freely and universally available online; the national node for GBIF is the **Canadian Biodiversity Information Facility (CBIF)**. The CBIF web site provides on-line access to over 1.5 million records of specimens housed in Canadian natural history collections. CBIF provides a valuable resource that supports a wide range of social and economic decisions including efforts to conserve our biodiversity in healthy ecosystems, use genetic resources in sustainable ways, and monitor and control pests and diseases.

2.4.2 Planning and Implementation

Sustainable development

A number of national and provincial/territorial level initiatives involve the creation of sustainable development strategies. At the 1992 Earth Summit, Canada and numerous other participants committed to develop national strategies for sustainable development. Since 1995, designated departments and agencies have been required by law to prepare sustainable development strategies, updating and presenting them to Parliament every three years for assessment. In 2008, Parliament passed a new **Federal Sustainable Development Act**. Under the Act, Environment Canada will be required to develop an overarching **Federal Sustainable Development Strategy**, including legislated federal sustainable development goals and targets and an implementation strategy for meeting each target. Departments' and agencies' sustainable development strategies will be required to have plans and objectives that comply with the new Strategy, which will be drafted in 2010.

Many provinces and territories also have strategies, acts, and initiatives related to sustainable development. **Newfoundland and Labrador**, for example, approved a **Sustainable Development Act** in 2006, whose goal is to ensure the Province's renewable and non-renewable resources are developed to maximize benefits, while protecting the natural environment so that future generations have the ability to meet their own needs. It provides force of law for the enshrinement of sustainable development principles and calls for the creation of a **Strategic Environmental Management Plan** for the province, which will establish goals, policies, and implementation strategies for the province. The Act also calls for the development of sustainability indicators from which sound decisions and reports may be made on the sustainable development of resources in the province. The Government of **Nova Scotia** has set ambitious legislated targets through its recent **Environmental Goals and Sustainable Prosperity Act** and **Climate Change Action Plan,** which both set out long term goals and actions that will aid the Province in sustainable development and climate change adaptation. Some of these actions include: the creation of an Adaptation Fund to encourage adaptation research and development, the development of statements of provincial interest on adaptation to provide guidance on land-use planning, priority on conserving coastal wetlands in their policy to prevent net loss of wetlands, and the development of a strategy to ensure the sustainability of the province's natural capital in forests, minerals, parks, and biodiversity.

Forest resources

Canada has 402.1 million hectares of forest and other wooded land, covering about 40% of the country and representing approximately 10% of the world's forest cover and 30% of the world's boreal forest. The use of Canada's forest resources is a significant source of economic wealth - the forest industry contributes about 3 percent of GDP annually in Canada. Additionally, over 300 communities depend on the forest sector for at least 50 percent of their economic base. 93 percent of Canada's forest land is publicly owned, with over 70 percent under the jurisdictions of provincial governments. As a result, governments,

on behalf of the Canadian people, have set legislation and regulations in sustainable forest management on nearly all of the country's forest areas, while supporting voluntary efforts on private sites outside of their jurisdiction. Recognizing the necessity of long terms management plans for its valuable forests, Canada has long been an advocate of sustainable forest management and was the first country to adopt a **national forest strategy** in 1992. Canada was also a founding member of the Montréal Process, established to formulate international criteria and indicators for sustainable forest management.

A number of national initiatives are underway to promote and support sustainable forest management. The **Canadian Council of Forest Ministers (CCFM)** is the forum for federal, provincial and territorial governments responsible for forests to work cooperatively to address major issues of common interest and provide leadership on the stewardship and sustainable management of Canada's forests. Biodiversity outcomes are integrated into forest sector action plans through the CCFM. The Council Vision identifies biodiversity as a fundamental value critical for the maintenance of goods and services provided by forest ecosystems. As one of six criteria in the **CCFM Criteria and Indicators of Sustainable Forest Management** framework, biodiversity goals and targets have become a key management priority in forest management in Canada. The CCFM framework has evolved jointly with the Montréal Process Criteria and Indicators framework and is compatible with the 2010 targets developed by the CBD; provincial, territorial, and private policy-makers may develop appropriate legislation and management guidelines using guidance from this framework.

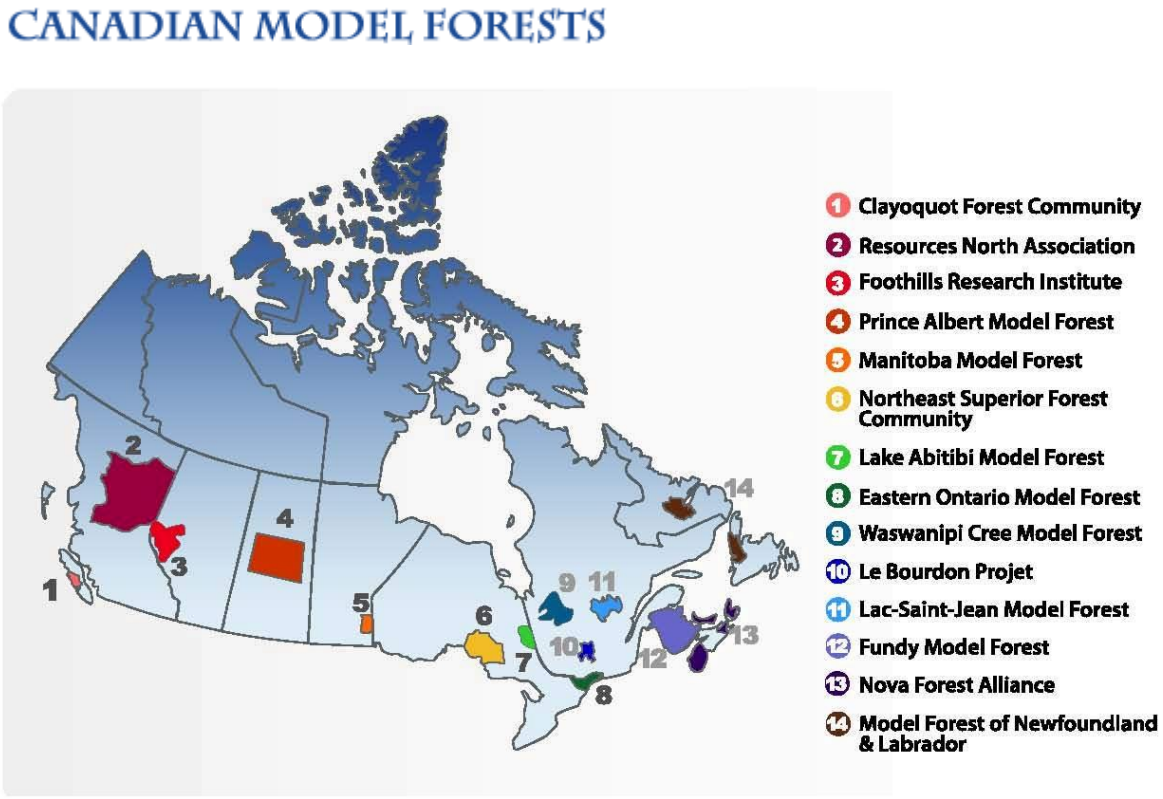
Forest management plans are one of most important elements in efforts to achieve sustainable forest management. They are required to take into account economic, social-cultural needs and goals as well as biodiversity values and conservation and sustainable use commitments. Over the past several decades, Canadian jurisdictions have developed and improved biodiversity objectives in their forest planning and management processes, utilizing adaptive management resulting from research, monitoring and assessments. Forest management plans are subject to review by the appropriate jurisdiction; each jurisdiction in Canada has its own process for reviewing and approving forest management plans. Overall, Canada's is considered to have among the strictest forest regulations and laws in the world.

Canada also has a **National Forest Pest Strategy** for responding to native and alien forest pests; a **First Nations Forestry Program**, to support capacity building for First Nations to develop forest resources, implement sustainable management practices, and benefit from forest-based development opportunities; and a new **Forest Communities Program**, designed to help forest-dependant communities develop and share knowledge, tools and strategies to address transitional challenges facing Canada's forest sector and capitalize on emerging forest-based opportunities through multi-sectoral approaches to forest management. Additionally, the new **Circum-boreal Model Forest Initiative** will improve understanding of conservation and sustainable use of biodiversity in the boreal ecosystem in order to help forest-dependent communities assess their vulnerabilities and adapt in the face of rapidly changing climate.

Exemplifying a multi-sectoral, ecosystem approach to sustainable forest management, the **Canadian Model Forest Network** was initiated at the Rio Earth Summit in 1992, and continues to be one of the world's largest experiments in sustainable forest management. Comprised of Canada's 14 Model Forests, the Network provides a liaison between Canada's

Model Forests, the International Model Forest Network and the Forest Communities Program. The Network considers input from a variety of stakeholders, from environmental groups to Aboriginal communities to forestry companies. The resulting collaboration has increased knowledge of sustainable forest management; in the **Lac-Saint-Jean Model Forest** in **Quebec**, for example, this multi-sectoral approach has been used to diversify the region's forest environment economy with initiatives such as forest biomass recovery, promotion of the use of non-timber forest products, the testing of new technologies, and investigation into eco-tourism.

The Model Forest Program has set the precedent for the **Forest Communities Program (FCP)**, a new $25-million, 5-year program that funds a number of sites across Canada, as well as other national projects. The FCP community partnerships are located in defined geographic areas at a regional scale, and include a mix of urban, rural and Aboriginal communities. Officially launched in July of 2007, the FCP is differentiated from the Model Forest Program by its strong focus on the sustainability of forest-based communities. While the CFP has replaced the Model Forest Program, the concept of the initiative continues through the use of partnership and on-the-ground solutions to sustainable forest management issues.



Programs are also available for woodlot owners to encourage sustainable management of privately owned forest resources. A range of tools exist, from technical and financial assistance for the implementation of beneficial management practices to increase productivity and protect soil, water and wildlife habitat, to protective agreements and programs for the conservation and restoration of rare ecosystems and species at risk. Some examples of programs from government and non-government organizations include: technical assistance programs such as the **Manitoba Agro-Woodlot Program**, the **Southern New Brunswick Wood Cooperative Working Woodlot Program**, and programs offered through the **Woodlot Association of Alberta** (Woodlot Extension Program) and the **Farm Woodlot Association of Saskatchewan**; silvicultural assistance through programs such as the **Private Forests Silvicultural Program** in Quebec and Nova Scotia's **Forest Sustainability agreements** where government and industry work together to provide cost-shared support to landowners; and, tax credit programs for sustainable woodlot management or conservation values such as the **Manitoba Riparian Tax Credit Program**, the **Municipal Tax Rebate for Silviculture** in Quebec, the Prince Edward Island **Environmental Property Tax Credit Program**, and Ontario's **Managed Forest Tax Incentive Program** and **Conservation Land Tax Incentive Program**.

Case Study: Forest Certification in Canada

Canada, with 40% of the world's certified forest area, is a world leader in third-party forest certification. Approximately 145.7 million hectares of forest is certified in the country (more than 87 percent of the productive forest land) under one or more of three internationally recognized certification schemes. Recognizing the need to ensure Canadians that forest operations on public lands are sustainable, forest companies have developed corporate social responsibility frameworks with specific commitments to conserve and use biodiversity in a sustainable manner. Forest companies also report on biodiversity status and trends for their management units as part of legislative requirements, certification processes and stewardship activities. The **Forest Products Association of Canada** is the first trade association in the world to make it a condition of membership for companies to certify all lands under their management.

Fisheries and ocean resources

Canada is surrounded by three oceans with approximately 244,000 kilometers of coastline. Canada's aquatic areas and resources are of enormous value as sources of natural resources, income, habitat and recreation. There are more than 30 federal acts and over 20 provincial and territorial acts, and numerous programs aimed at ensuring the sustainable use of aquatic areas and their biological resources in Canada.

The **Department of Fisheries and Oceans** has federal responsibility for developing and implementing policies and programs in support of Canada's interests in oceans and fresh waters. The Department's guiding legislation includes the **Oceans Act**, which established the legislative framework for a coordinated federal approach, and the **Fisheries Act**, which confers responsibility to the Minister for the management of fisheries, habitat and aquaculture. Canada's **Oceans Strategy** was released in 2002, outlining how the Oceans Act would be implemented for environmental, social, and economic development of Canada's oceans, offshore and coastal areas.

The DFO's 2005-2010 Strategic Plan, **Our Waters, Our Future**, highlights the Department's priorities for action over a five-year period. **Fisheries renewal** is one of the DFO's priority areas, with an objective to ensure a sustainable resource that provides for an economically viable and diverse industry, supported by a modern fisheries governance system. Recognizing that there is a requirement to better manage the pressures being placed on aquatic resources, protect species at risk, and participate in broader oceans management initiatives, the conservation and sustainable use of fisheries is one of DFO's top management priorities. The Fisheries Renewal agenda includes three streams of work to enable program renewal: conservation, stewardship and compliance renewal, legislative renewal, and the business modernization initiative. The Strategic Plan also outlines **aquaculture governance** as a priority area, with the DFO seeking opportunities to create the conditions for the development of an environmentally sustainable, internationally competitive aquaculture industry in Canada; development of regulatory streamlining as well as science-based and risk-based decision-making will be part of this approach, in keeping with the Aquaculture Policy Framework. Additional priority areas include **Environmental Process Modernization,** with a framework to reorient the Habitat Management Program (a federal regulatory program to conserve and protect fish habitat) and develop more proactive, cohesive processes; **science renewal**; the implementation of an **Oceans Action Plan**; **international governance**; and relationships in **Aboriginal policy and governance**.

The **Aboriginal Fisheries Strategy (AFS)** provides a regulatory framework for food, social and ceremonial fisheries, and employment opportunities related to fisheries management and is one of the most important tools for engaging Aboriginal groups. Through this program, the DFO has a relationship with about 225 Aboriginal groups. Additionally, the **Aboriginal Aquatic Resource and Oceans Management (AAROM)** and the **Aboriginal Inland Habitat (AIH)** programs support the involvement of Aboriginal groups in integrated watershed or ecosystem planning and management and build capacity in fisheries management and other areas.

The **Pacific North Coast Integrated Management Area (PNCIMA)** is one of five pilot Integrated Management Planning (IMP) initiatives being led by Fisheries and Oceans Canada (DFO) and designated as Large Ocean Management Areas (LOMAs). The marine biodiversity within the PNCIMA ranges from locally common to rarely seen species. PNCIMA integrated management practices are intended to be developed in a collaborative process involving federal, provincial, and First Nations authorities; stakeholders from a full range of sectors; and local community members. The sustainable use of the resources within the PNCIMA relies on the collaboration and involvement of all stakeholders.

British Columbia is becoming a leader in the global drive for fisheries sustainability, with a goal to have all their major commercial fisheries either be certified as sustainable by the **Marine Stewardship Council (MSC)** or in the full assessment phase of the certification process in the next one or two years. BC seafood is exported to over 80 countries worldwide, and major retailers and seafood processors in the U.S., E.U., and Japan are increasingly demanding MSC certification; as such, credible eco-labelling is increasingly important for the industry to succeed in competitive markets.

Case Study: Certification of a Northern Shrimp fishery

The DFO has moved to increase certification of fisheries in Canada, following rising trends of forest certification in the country. Exemplifying certification in Canada, the **Gulf of St Lawrence northern shrimp fishery** has been certified under the Marine Stewardship Council's Eco-label; certification is the culmination of a three-year joint effort of the primary partners in the fishery, including harvesters, processors, DFO and provincial partners (further information in section 3.6. 1). In addition to certification, a variety of voluntary codes of practice are available to support fisheries industry in the sustainable use of resources. The **Canadian Responsible Fisheries Board (CRFB)** promotes responsible fishing in Canada through their **Code of Conduct for Responsible Fishing Operations** and development of industrial training programs and technical information exchanges in responsible fishing. The Code of Conduct reflects the fishing industry's commitment to ensuring stewardship and sustainability as key elements of Canada's fishing industry.

Overfishing, collapsing fish stocks and degradation of marine ecosystems is a global problem requiring a suite of measures and approaches. This problem affects Canada most acutely on the Grand Banks, which straddles the limits of Canada's Exclusive Economic Zone. Fisheries in this area are managed by the **Northwest Atlantic Fisheries Organization (NAFO)**, a multilateral organization that considers scientific information and sets quotas for its member states. A particular priority for Canada is to develop options and a strategy to address overfishing, given the importance of fishing to coastal communities. Policy to manage the impact of fishing on sensitive benthic areas is expected to be adopted by DFO in early 2009 to guide fisheries activities in sensitive benthic areas including, but not limited to, areas rich in corals and sponge reefs.

Wildlife resources

Canada's wildlife resources are valuable in economic, cultural, social and aesthetic terms. Canadians spent billions of dollars pursuing wildlife related activities including, hunting, fishing and trapping as well as non-consumptive activities such as bird and whale watching. Nationally, wildlife-related activities sustain thousands of jobs. In many regions of Canada, fishing and hunting and trapping are subsistence activities for many indigenous people and their communities. Canada has a long and successful history in the sustainable management of wildlife resources, with management shared by the federal and the provincial/territorial governments.

Regulation and control of harvesting of most of Canada's wildlife are the responsibility of provincial and territorial governments. Wildlife Ministers for Canada have established guiding principles for hunting regulations that have guided sustainable wildlife management for several decades. These principles include the precedence of maintaining viable natural wildlife stocks over their use as resources; the cost of management essential to preserving viable populations of wildlife being borne by all Canadians; and the importance of a well-informed public in the conservation of wildlife.

Case Study: The Fur Institute of Canada

The overall mission of the Fur Institute of Canada is to promote the sustainable and wise use of Canada's fur resources. As a national non-profit organization, the Institute has acted as a round table for fur trade, animal welfare and furbearer conservation issues since 1983, and is the coordinator for overall implementation of the Agreement on International Humane Trapping Standards in Canada. Its Conservation Program promotes the conservation of furbearers throughout Canada, through evaluation, promotion and advocacy of the principles of wise and sustainable use and of applied management in relation to furbearers and their habitats. The Institute also supports the continued improvement of animal welfare through ongoing research, such as the Trap Research and Testing Program; the development of national and international trapping standards, with an International Relations Program fostering participation in international forums, such as IUCN and CITES; and respect for the right of Aboriginal peoples to pursue their Aboriginal and Treaty Rights, with an Aboriginal Communications Program.

Hunting, fishing, and trapping are an integral part of traditional Canadian life, especially in Aboriginal communities, and still contribute to the provision of essential goods in communities around the country, with an estimated six million Canadians participating in recreational hunting, fishing, and trapping during any given year. Legal hunting can promote the sustainable use of wildlife populations, playing a role in the maintenance of abundant populations within the carrying capacity of their habitat, with management based on sound science and long-term monitoring. Hunting regulation and licensing fall under both provincial/territorial and federal jurisdiction in Canada. The federal government is responsible for protecting migratory birds and nationally significant wildlife habitat, the regulation for endangered species and the international wildlife issues and treaties for Canada. All other matters fall under the provincial/territorial jurisdiction. Hunters contribute a great deal of time, money, and effort to wildlife management. Hunters are involved in a variety of volunteer programs that help maintain and enhance wildlife and their habitat. In Ontario, the money from hunter licence fees contributes to monitoring and protecting wildlife. Since 1985, Environment Canada and Wildlife Habitat Canada have produced the **Canadian Wildlife Habitat Conservation Stamp**, which is required to validate the Migratory Game Bird Hunting Permit, and is also sold to individuals interested in contributing to habitat conservation in Canada. Close to 33 million dollars has been raised for habitat conservation, restoration, and enhancement initiatives in Canada through this program.

Agricultural resources

The agriculture and agri-food system is also a major contributor to the Canadian economy, accounting for approximately eight percent of national GDP and 15 percent of total employment. Approximately seven percent of Canada's total land base is under some form of agricultural production, with approximately 230,000 farms engaged in primary food production worth over $25 billion annually. The impacts of agriculture on aspects of biodiversity such as soil erosion, water quality, wetland drainage, habitat fragmentation, and pollution and waste management, have been recognized and, in many cases, plans and initiatives are being implemented. As the federal department responsible for agriculture,

Agriculture and Agri-Food Canada (AAFC) has a number of initiatives addressing sustainable agriculture.

The Agricultural Policy Framework (APF) (2003-2008) was a five-year federal-provincial-territorial agreement developed in collaboration with the provinces and territories. Environmental programs and policies of the Framework have contributed significantly to efforts to ensure the sustainable use and conservation of biodiversity in agricultural areas. Building upon these initiatives the Growing Forward Policy Framework (2008-2013) will also provide programming addressing sustainable agriculture. The Agri-Environmental Risk Assessment initiatives will build upon the Environmental Farm Plan program and the On-Farm Action initiatives will support activities similar to those available under the National Farm Stewardship and Greencover Canada programs. A number of biodiversity related programs were initiated under the APF, including:

Case Study: Environmental Farm Planning

The National Environmental Farm Planning (EFP) Initiative encouraged producers to develop environmental farm plans, implement beneficial management practices (BMPs) and continuously evaluate their environmental performance, ultimately leading to the better management of Canada's agricultural resources, including the APF priorities of air, water, soil and biodiversity. Through provincially delivered Environmental Farm Planning (EFP) Programs, focused on education, producers were provided with information, tools, and technical assistance to conduct an assessment of the environmental risks and benefits of their operation and develop an action plan, which included specific BMPs, to mitigate potential risk. Plans were developed individually or by a group of producers with common interests on a watershed or commodity basis.

From April 1, 2003 to December 31, 2008, over 84,000 or 37% of Canadian producers participated in a provincially delivered EFP program, with 59,000 or 26% of Canadian producers developing a formal action plan to address risk and enhance stewardship. See table one for national breakdown.

Participation in the National Environmental Farm Plan Initiative by Province (April 2003 to December, 2008).

	Number of Farms with an EFP*
BC	2,747
AB	8,382
SASK	11,445
MAN	6,045
ONT	10,201
QUE	18,734
NB	694
NS	611
PEI	760
NL	257

** Includes Group Farm Plans and Individual EFPs.*

As part of the Environmental Farm Planning Initiative, the National Farm Stewardship Program provided technical and financial assistance to support the adoption of beneficial management practices included in approducers approved environmental farm plan. BMPs are agricultural practices or combinations of practice that minimize and mitigate impacts and risks to the environment by maintaining or improving the quality of soil, water, air and biodiversity, and ensure the long term health and sustainability of natural resources for agricultural production. NFSP was delivered on a provincial/territorial basis and supported a number of BMPs directly and indirectly aimed at mitigating biodiversity issues at the farm level. Since April 1, 2003, over $28 million in federal cost-share funding has been used to support the adoption of 12, 530 BMP projects across Canada that have direct or indirect benefits to biodiversity on agricultural landscapes.

Greencover Canada was another program funded by the APF. As a five-year, $110-million initiative, the program aimed to help agricultural producers improve grassland management practices, protect water quality, reduce greenhouse-gas emissions and enhance the provision of wildlife habitat. As part of this work, over 220,000 hectares of marginal land was converted to perennial cover with significant biodiversity benefit (potential species use in the

Prairie Ecozone and the Boreal Plan Ecozone has an increased potential use of 2.5% to 12%, and hatched waterfowl nests in the Prairie Pothole Region has an annual increase of approximately 6000.)

A longer-term program is the Community Pastures Program (CPP), an initiative spanning several decades. As one of the most important prairie agriculture biodiversity sustainability initiatives, the CPP now encompasses 85 pastures comprising 930,000 hectares of grasslands areas. The pastures represent some of the largest contiguous blocks of grasslands and functional prairie ecosystems in western Canada. Livestock grazing is seen as a natural approximation of function previously provided by millions of bison roaming the region prior to 1900 and approximately 230,000 head of cattle use the pastures each year. The pastures contribute to Canada's commitment to a number of international agreements covering biodiversity, climate change and protected areas.

2.4.3 Tracking - Monitor and Report for Continuous Improvement

Sustainability indicators

Environment Canada, Statistics Canada, and Health Canada are working together, with input from the provinces and territories, to develop and communicate national indicators of freshwater quality, air quality, and greenhouse gas emissions. The goal of these indicators is to provide Canadians and decision makers with more regular and reliable information on the state of their environment and how it is linked with human activities. The **freshwater quality indicator** provides an overall measure of the suitability of water bodies to support aquatic life at selected monitoring sites in Canada; the indicator is based on applications of the **Water Quality Index (WQI)** endorsed by the Canadian Council of Ministers of the Environment. The **Canadian Environmental Sustainability Indicators (CESI)** 2007 report provides policy analysts, decision makers and the public with national and regional pictures of the status of water quality for the protection of aquatic life.

On a regional level, the WQI has been used by many organizations and jurisdictions to inform the public, decision makers, and relevant stakeholders on the status and trends of local water bodies. It has also been used to track the effectiveness of remedial measures on local water quality and to report on the effectiveness of government programs and policies. Canada also undertakes ongoing monitoring and assessment of wild and aquaculture shellfish growing areas through its **Marine Water Quality Monitoring Program** – these include bacteriological assessments in the overlying water, and identifying and evaluating point and non-point pollution sources impacting on these areas

Agriculture and Agri-Food Canada has developed a set of **Agri-Environmental Indicators** (AEIs) specific to the agriculture and agri-food sector to assess how well agriculture and agri-food systems manage and conserve natural resources and how compatible they are with the natural systems and processes in the broader environment. These AEIs are a practical means of assessing environmental sustainability by combining current scientific knowledge and understanding with available information on resources and agricultural practices. The intent is to provide an objective, science-based assessment of the

overall environmental sustainability of agriculture.

Biodiversity is assessed using the Indicator of Wildlife Habitat on Farmland, which provides insight into trends in wildlife habitat availability on Canadian farms. Several other indicators are currently under development: risk of wildlife damage; invasive alien species; and soil biodiversity.

At the provincial level, Manitoba has used sustainability indicators in its **Sustainability Report**, required under the province's Sustainable Development Act. The first report, released in 2005, aims to provide Manitobans with timely, accurate information on important sustainability issues and trends. It is a way of monitoring Manitoba's sustainability by tracking and interpreting key indicators in the province's many sectors. By studying and reporting on these indicators, Manitobans are kept informed about the progress taking place and encouraged to participate in the long-term strategies for sustainable development in the province.

Chapter 3: Sub-national planning and mainstreaming of biodiversity

3.0: Introduction

This chapter describes efforts in Canada to integrate and mainstream biodiversity considerations into relevant sectoral and cross-sectoral plans, programs, and policies, as required by each contracting party under Article 6(b) of the CBD. Biodiversity is important both as a stand-alone issue *and* as an interconnected element in action concerning current issues such as climate change, food security, development, and international relations.

Achieving the objectives outlined in the CBD and CBS requires engagement of the main sectors and key actors that impact the conservation and sustainable use of biodiversity. This chapter outlines initiatives in each of the key Canadian sectors outlined by the CBS: federal, provincial and territorial government, urban areas, Aboriginal peoples, academic and scientific institutions, environmental non-governmental organizations (ENGOs), industry and business, and stewardship. Examples have been selected to demonstrate sectoral action and cross-sectoral collaboration across the country, recognizing that the activities of every sector cannot be comprehensively described in this report, which only serves as an introduction to the mainstreaming of biodiversity in Canada.

3.1: Provincial and Territorial Governments

Virtually all provincial and territorial governments have integrated biodiversity into government initiatives, using a variety of policies, strategies, legislation and voluntary approaches.

Quebec was the first province to develop a provincial biodiversity strategy and action plan in 1996; currently, the Province is developing its third strategy. Developed through public consultation and interministerial collaborations and commitments, its priorities include biodiversity in wildlife, forests, urban areas, biotechnology, and education. **Saskatchewan** released its Biodiversity Action Plan in 2002 as a supporting document to the province's wider-reaching Green Strategy. Its plan emphasizes shared responsibility, effective public participation, ecosystem-based management, balanced values, knowledge-based decisions and a government leading the conservation of biodiversity. **Ontario**'s Biodiversity Strategy was released in 2005, following cross-sectoral discussion among municipal, environmental and conservation, industry and Aboriginal leaders, with public consultation available through an informative, web-based Biodiversity Workbook. The Strategy outlines action to protect the diversity of Ontario, use and develop the biological assets of Ontario sustainably, and capture the benefits from such use. The **Northwest Territories** developed its Biodiversity Action Plan in 2005 through a Biodiversity Team consisting of territorial and federal government, First Nations, ENGOs, and citizens. The Action Plan displays the guiding principles of ecosystem based management, sustainable development, and shared responsibility for stewardship and collaboration.

New Brunswick launched a Provincial Biodiversity Strategy on June 18, 2009. The Strategy provides a framework for advancing a coordinated and collaborative approach to the conservation and sustainable use of biological resources, representing a significant evolutionary step forward. Influenced by the Biodiversity Outcomes Framework for Canada, the strategy will be followed up with the development of biodiversity action plans over the next 12 to 16 months. These plans will involve stakeholders and will identify specific actions assigned to Departments that will move us incrementally closer to achieving the strategy's management outcomes. A New Brunswick Biodiversity Secretariat will be established to provide coordination and support to the Strategy.

Several other provinces have integrated the principles of biodiversity into various provincial action plans or strategies. **Manitoba** has Sustainable Development Strategies for Natural Lands and Special Places, Forestry, Energy and Mines, Soil and Water, and Wildlife and Fish, as well as initiatives such as the Prairie Conservation Action Plan and long-term forest management plans. **Alberta** adopted a Land Use Framework in 2008 to better manage public and private lands and natural resources in the achievement of their long-term economic, environmental and social goals. The framework provides a blueprint for land-use management and decision-making that addresses Alberta's growth pressures by adopting an ecosystem approach and considering the cumulative impact of development on biodiversity. **British Columbia** developed a Conservation Framework in 2008 to provide a set of science-based tools and actions for conserving species and ecosystems in the Province.

3.2: Urban Areas

Urban areas in Canada play a significant role in the management and conservation of biodiversity, both locally, and globally as their patterns of resource consumption affect ecosystems around the world. Urban areas pose a growing threat to biodiversity through urban sprawl, loss and degradation of habitats, hotspots of pollution and greenhouse gas emissions, and the exploitation of species. The **Bonn Call for Action**, formulated by over 150 municipal leaders from around the world during the Mayors Conference on Local Action for Biodiversity in Bonn, Germany, outlines the commitment of urban areas to biodiversity conservation. Recognizing the experience local governments have in planning, awareness-raising and decision-making, the Call highlights the potential of cities to be key actors in the CBD's initiatives. With over 80 percent of Canadians now living in urban areas, the success of the CBS hinges increasingly on municipal-level commitment and the targeting of urban areas at the provincial and federal level.

City of Greater Sudbury

The City of Greater Sudbury is a growing northern Ontario community that places a high value on the sustainable management and use of resources. To promote cross-sectoral environmental action, **EarthCare Sudbury** was developed in 2000 as a partnership between the City, over 100 community agencies, organizations and businesses, and hundreds of individuals. Collectively creating a healthier and more sustainable community, EarthCare Sudbury has formulated a **Local Action Plan (LAP)** which aims to enhance Sudbury's

environmental health, take environmental responsibility through local action, and share the experience gained with Greater Sudbury citizens and other communities. A Monitoring Plan was developed and the first Progress Report was released in 2008.

A variety of initiatives related to biodiversity have taken place as part of the LAP. The **Freshwater Ecology Cooperative Unit** conducts research on the ecological state of local lakes and, with other EarthCare partners, monitors the quality of local surface and groundwater resources. Thirty-five **Lake Stewardship Committees** implement restoration strategies using thousands of community volunteers and partners. A **Green Space Advisory Panel**, formed in 2007, advises Council on improvements to the park and open space system. Initiatives like **Rainbow Routes'** ***Learning Through Trails*****,** the **Sudbury Community Foundation's Sprouts Program**, and the **Sudbury Children's Water Festival** undertake environmental activities for youth. In addition, the **Ugliest Schoolyard Competition** engages individual schools in the fostering of schoolyard biodiversity by distributing seedlings and enlisting students in tree-planting projects. Sudbury has won the Federation of Canadian Municipalities–CH2MHILL **Sustainable Community Award** and was also designated a **Regional Centre of Expertise** by the United Nations University, joining a network of existing education organizations mobilized to deliver education for sustainable development to a regional community.

Case Study: The City of Edmonton

As of 2007, the Edmonton is one of 19 cities around the world participating in a 3-year international study of local governments' involvement in biodiversity protection. The **Local Action for Biodiversity (LAB) Project** is headed by Local Governments for Sustainability (ICLEI), an international association of local governments and governmental organizations committed to sustainable development. Key steps of the LAB Project are: inventory and assessment through a biodiversity report, formal declaration of commitment to biodiversity, ongoing implementation of a 10-year Biodiversity Action Plan and Framework, and local implementation of biodiversity intervention projects. The LAB project enables Edmonton to showcase ecological initiatives being undertaken and to learn from other urban areas' initiatives around the world. Establishing the city amongst the leaders in the mainstreaming of biodiversity, Edmonton has been selected to host ICLEI's **2009 World Congress Conference**.

Edmonton recently completed its Biodiversity Report, which provides an overview of the City's ecology, outlines their conservation governance structure, and includes an inventory of local biodiversity initiatives, both City- and community-led. Some of these initiatives include: the **Natural Areas Conservation Plan**; the **Plan of Action** for a world-class metropolitan riverfront park; the **Ecological Conservation Assistance Program** to financially reward landowners for protecting privately-held natural areas; the **Roadways and Parks Naturalization Master Plan**; the **Biodiversity Monitoring Wetland Ecology Study**; the establishment of a **City Farm** accessible to urban children and their families; and **RiverWatch rafting** for students to conduct chemical and biological tests of the North Saskatchewan River Valley. One of Edmonton's new planning tools, the **Ecological Design Report,** aims to ensure that ecological design principles are integrated into development plans for new neighbourhoods, thus protecting biodiversity by reducing the impact of urban development.

Montréal

Montréal, host to the Secretariat of the CBD since 1996, continues to play a significant role in the promotion of biodiversity initiatives at the national and international level. Its mayor figures among the original five mayors who signed the **Curitiba Declaration on Cities and Biodiversity** and sits on the steering committee of the **Global Partnership on Cities and Biodiversity**. Action in Montréal ranges from education, conservation alliances, and scientific research to the eco-management of large parks, preservation of urban ecosystems, and eradication of invasive species. The City's 2004 **Policy on the Protection and Enhancement of Natural Habitats** promotes partnerships and concerted action to integrate and protect natural habitats. Other strategic development tools in place include the **Master Plan**, **Heritage Policy**, **Strategic Plan for Sustainable Development**, **Green Strategy**, and **Tree Policy,** which aims to diversify tree species lining city streets and expand canopy cover to offset the urban heat island effect and insect infestations. The City's network of large parks, covering more than 125 hectares, is managed in accordance with a frame of reference emphasizing biodiversity.

Case Study: Saint-Michel Environmental Complex in Montréal

Part of the City's network of large parks, the Saint-Michel Environmental Complex (CESM) is a one-of-a-kind park that has won many international environmental awards for its integration of culture, community, and sustainability. Previously a limestone quarry and the second-largest urban landfill site in North America, the site was acquired by the City of Montréal and turned into a waste sorting and elimination center. Eventually, the site became the CESM and, "the focus of the most extensive environmental rehabilitation project ever undertaken by the City." The areas where waste was landfilled are progressively being developed into a large and beautiful park. The park displays a circuit aimed to make people more aware of both built and natural environments, how nature changes, and where humanity fits within nature.

A number of innovative features have been undertaken by TOHU, la Cité des Arts du Cirque, the non-profit organization located at CESM; these innovations include on-site stormwater retention and treatment, an ice storage cooling system to reduce equipment costs and peak electricity demand, a greenhouse gas neutral heating source, and natural/hybrid ventilation system. CESM was one of 55 projects from around the world chosen to be displayed at the **Urban Best Practices Area of the World Expo 2010** in Shanghai. This builds on Montréal's relationship with Shanghai, its twin city, which is already evidenced through numerous joint projects and economic missions. The Montréal Garden in Shanghai and the Chinese Garden in Montréal symbolize the ties between the two cities; the Chinese Garden is the largest garden of its kind outside Asia.

Montréal's **Botanical Garden** ranks among the world's largest with its collection of 22,000 species and cultivars of live plants that maintain a living storehouse of genetic diversity. The Botanical Garden offers educational activities and the opportunity for youth to learn gardening techniques. A **Biodiversity Centre** will be added to the Garden in 2010 and will house several important plant, insect and fungal collections. The Centre aims to enhance research collections, foster innovative research and training; and build awareness of biodiversity by providing access to visitors and expert advice to decision-makers. The **Biodôme** showcases four vastly different ecosystems of the Americas and spearheads a

combination of conservation, education and research-based activities, taking part in national and international species conservation programs. Montréal's **Insectarium** is the leading museum devoted to entomology, enabling visitors to learn more about insects and arthropods. Additionally, Environment Canada's **Biosphère** is an interactive museum in Montréal which showcases the water ecosystems of the Great Lakes-Saint Lawrence River regions, informing the public about how issues such as climate change and sustainable development are important to water ecosystems. The Biosphere has, in recent years, taken on a national leadership role with respects to Environmental Education and is a key player in Canada's International Biodiversity Year preparations.

Winnipeg

The City of Winnipeg signed a **Memorandum of Understanding** (MOU) with the Province of Manitoba in mid-2007, taking a first step toward protecting the city's natural systems. Under the MOU, Winnipeg's ecologically significant natural lands, such as important waterways and natural areas, will be identified for greater environmental efforts and could receive stronger protection as a part of the Province's protected areas network. The Winnipeg and Manitoba governments have agreed to collaborate to enhance protection and conservation efforts including collaborative management and restoration to enhance biodiversity benefits and watershed management, the exploration of opportunities to promote the importance of stewardship, and collaboration in various stewardship forums, land plans, integrated watershed management plans and policies to conserve habitats on private and Crown lands. Also in 2007, City council adopted an **Ecologically Significant Natural Lands Strategy**, which designates natural areas that are ecologically significant and provides measures for the possible acquisition, preservation, protection and maintenance of such lands.

Among other biodiversity-related initiatives, Winnipeg has developed a **Climate Change Action Plan** in 2006, which requires quarterly progress reports, and an **Environmental Priority Plan**. It is currently developing a new **Official Plan**, themed **A Sustainable Winnipeg**, which will create a 25-year blueprint for the city's future. Displaying biodiversity in the city, the **Living Prairie Museum** is Winnipeg's 12 hectare tall grass prairie preserve, representing one of the last remaining fragments of the tall-grass prairie ecosystem and providing habitat to over 160 species of prairie plants and a great array of prairie wildlife. Additionally, Winnipeg's **Assiniboine Park Conservatory**, the longest established conservatory in Western Canada, serves as a hub for local biodiversity education. Visited annually by thousands of people, the extensive outdoor and indoor gardens serve as formal and informal classrooms for students and interested citizens.

A number of other cities have significant initiatives regarding biodiversity. Metro Vancouver is currently developing its own **Biodiversity Strategy,** involving NGO guidance as part of its development. Vancouver hosted the *Sustainable Cities - Turning Ideas into Action* session of the World Urban Forum in 2006, with over 15,000 people from municipalities, organizations, and governments around the world in attendance. Current planning for the 2010 Winter Olympics is focused on minimizing the Games' footprint and maintaining healthy ecosystems in the City, through strategic planning of sites and identification of species at risk, as well as extensive collaboration with stakeholders, including local First Nations.

3.3: Aboriginal Peoples

The Aboriginal population in Canada is very diverse. They are organized into three distinct political groups: First Nations, Métis, and Inuit. These groups vary widely in terms of demographics, political structure, cultural heritage, language, cultural practices, and spiritual beliefs. The engagement of Aboriginal communities in biodiversity-related initiatives and cross-sectoral partnerships is also key to Canada's achievement of the CBS goals. Engagement of indigenous communities is outlined in both the CBD and the CBS; the Strategy directs implementation of the Convention with a view to reflecting indigenous values and incorporating traditional knowledge. As Canada's first inhabitants, Aboriginal peoples have a unique relationship with its ecosystems, species, and resources. This relationship is reflected through their cultural and spiritual valuation of land, as well as their direct dependence on ecosystems through traditional activities such as hunting and fishing. They possess valuable knowledge of flora and fauna, gained from thousands of years of close interaction with Canadian ecosystems.

Case Study: Linguistic diversity and Aboriginal land claims

The ove r 60 curre nt lang uages of Ca nada's in digenous peo ples bel ong to 11 majo r lan guage families; from 2001-2006, there was a 7 percent increase in the number of speakers of Aboriginal languages in Canada. Aboriginal peoples play a major role in the conservation and sustainable use of biodiversity. Given their long -standing occu pancy and relatio nship with th e land, Abori ginal communities have con stitutionally-protected rights to traditional te rritories. Figure _ sh ows historic treaty area s and m odern land claim settlements of Abori ginal communitie s. Modern l and claim settlements cover roughly 40 percent of Canada and represent significant amounts of biodiversity under Abori ginal co -management. A large p ercentage of Abori ginal peo ples live in Ca nada's diverse fore sts and uniq ue Arctic e cosystems, acti ng as critical partners in the prote ction and maintenance of biodiversi ty acro ss Ca nada. Co-m anagement wi th Aborigin al people s are thus important elements in the conservation and sustainable use of Canada's biodiversity.

The incorporation of traditional knowledge (TK) has been a significant contributor to the effectiveness of Canada's various biodiversity initiatives, providing information regarding the sustainable use of plants and animals, as well as the relationships and current stresses in ecosystems. The importance of TK has been expressly recognized in Article 8(j) of the CBD and utilized in Canada in areas such as biodiversity strategies, land use plans, parks creation and species assessment. More recently, the negotiation of Aboriginal land claims and finalization of other agreements have helped to develop partnerships that promote mutual respect and the protection of cultural and ecological values. Aboriginal peoples are now extensively involved with a variety of stakeholders in the formation of plans and strategies, sharing of traditional knowledge (TK), establishment of protected areas, and formal stewardship of ecosystems in Canada.

Government and Aboriginal collaboration and engagement

A number of recent federal strategies, acts, and programs concerning biodiversity have recently been developed through strong consideration of, or in collaboration with, Aboriginal peoples. For example, the 2005 **Federal Marine Protected Areas Strategy** was developed

to enhance cooperation, especially with Aboriginal peoples, towards completion of a national MPA network. The **Canadian Boreal Initiative** brings together partners to create new solutions for boreal forest conservation; board members represent governments, industry, conservation groups, major retailers, financial institutions, scientists, and five Aboriginal groups. The **Aboriginal Fisheries Strategy** represents a relationship between the DFO and approximately 225 Aboriginal groups in the regulation of food, social and ceremonial fisheries, and employment opportunities related to fisheries management. Aboriginal TK and views are formally incorporated into high-level consultation regarding species at risk through the **National Aboriginal Council on Species at Risk (NACOSAR),** made up of six Aboriginal representatives. NACOSAR advises the Minister of the Environment on the administration of the **Species at Risk Act** and provides recommendations to the Canadian Endangered Species Conservation Council.

Provincial and territorial biodiversity strategies have all been developed in collaboration with Aboriginal groups. Additional strategies developed in partnership with Aboriginal peoples include: the **Northwest Territories Protected Areas Strategy,** where Aboriginal peoples communities played a critical role in ensuring the explicit accommodation of cultural values and respect of all Aboriginal and Treaty rights; Manitoba's **East Side Traditional Lands Planning and Special Protected Areas Act**, developed in consultation with Aboriginal peoples and granting greater authority to these communities to protect cultural and ecological values while planning for sustainable resource development; and Newfoundland and Labrador's partnership with the Innu Nation to implement a **Strategic Forest Management Plan** for a 2.27-million hectare management area in central Labrador. The importance of engagement with Aboriginal youth in biodiversity initiatives and traditional practices is also recognized by government and Aboriginal communities. In 2006, the Ontario Ministry of Natural Resources began the **Aboriginal Youth Work Exchange Program,** offering summer placements for three consecutive years to young Aboriginal peoples interested in natural resource based jobs. Additionally, the **Katannilik Park Knowledge Camp** introduces Aboriginal youth from Kimmirut to Katannilik Park and the Soper River Valley, with local elders and scientists collaborating to provide on-the-land knowledge of the area's wildlife, plants, and resources.

As a result of comprehensive land claims and self-government agreements, **wildlife management** and **co-management boards** can be created to oversee land and water resources on traditional territories designated as settlement lands and settlement areas. Through these boards federal, provincial, and/or territorial governments work with the Aboriginal land claim beneficiaries and other stakeholders, collaborating with communities, governments, and other stakeholders to develop research and management plans and working to ensure the lands are managed to meet community subsistence and cultural needs. The boards provide Aboriginal participants with important input over who has access to lands and resources.

Among other groups representing Aboriginal peoples, the **Assembly of First Nations Environmental Stewardship Unit** works on a broad spectrum of environmental issues by conducting research, developing policy, and advocating on behalf of First Nations. Additionally, the **Centre for Indigenous Environmental Resources (CIER)** is a national, First Nation-directed ENGO. CIER was founded by a small group of First Nation leaders who

recognized the need for Aboriginal peoples to have the capacity to solve environmental problems affecting their lands and resources. CIER helps to conserve biodiversity by working with First Nations to identify the state of biodiversity in their territories, implement strategies, and work with other stakeholders. A number of planning boards, comprised of members nominated by Aboriginal peoples and government, are in place around Canada to develop land use plans for the local Aboriginal territory.

The **First Nations Land Management Act,** established in 1999, is a sectoral self-government initiative that allows First Nations to resume control over the management of their lands and resources and to receive training and capacity development. By establishing a government-to-government Framework Agreement with First Nations, the Act allows them to opt out of 34 land administration sections of the **Indian Act**, giving them far more legal rights over reserve land and potential revenues. As of late 2007, 19 First Nations have operational land management codes. They can establish such governance tools as environmental laws dealing with development, conservation, protection, management, use, and possession of reserve land. Though title to the land remains with the Crown, the day-to-day administration of the lands, its resources, and the right to legislate is the prerogative of the First Nations; oil and gas, fisheries, endangered species, and migratory birds are exempt from the initiative.

Protected areas and model forests

Aboriginal leadership in biodiversity, ecosystem conservation, and land use planning is exemplified in their involvement in the creation and maintenance of protected areas, particularly in the northern territories. To date, Aboriginal peoples have been involved in establishing over one quarter of the total lands within Canada's protected areas. Many of the most significant protected area gains made in Canada in recent years stem from land use planning exercises established following claim negotiations, such as those in the Dehcho, Sahtu and Akaitcho regions of the Northwest Territories.

Case Study: Inuit Impact and Benefit Agreement

The Inuit Impact Benefit Agreement, negotiated between the Government of Canada, Nunavut Tunngavik Inc. and four regional Inuit associations, allows for the creation of 3 new National Wildlife Areas (NWAs) on Baffin Island to protect local species and habitat – including a population of bowhead whale that has been assessed as threatened in Canada.

Co-management committees comprised of both local and federal government members are responsible for the management of each of the protected regions in the Nunavut Settlement Area. The committees will act as stewards of the area, with responsibilities to review permit applications and to develop the area management plan, among other duties. Co-management and collaborative opportunities promote conservation and sustainable use through the inclusion of critical Inuit traditional ecological knowledge in the development of any management plan – a significant step forward, with respects to community-based management of internationally significant areas.

With great local cultural significance, the Inuit Impact and Benefit Agreement provides for the preparation of Cultural Resources Inventories, supporting the development of the interpretative materials and management plans for the ten existing and three proposed protected areas in the Nunavut Settlement Area, and will identify Inuktitut place names for these areas. Building upon these prospects, the Inuit Impact and Benefit Agreement aims to foster new means of economic development, such as ecotourism, diversifying the Inuit economy, confirming the ecotourism value of National Wildlife Areas, and assisting the Inuit to adapt to evolving socio-economic conditions.

The ecological, economic and cultural benefits associated with the agreement provides a significant step forward with respects to community based management, sustainable development and the conservation of internationally significant areas.

Parks Canada has incorporated TK into park management by establishing a research and planning base camp in **Torngat Mountains National Park** in 2006 that brings together scientists, Parks Canada staff, and Inuit peoples. Research in the park integrates Aboriginal knowledge and perspectives, while providing important learning opportunities for Aboriginal youth by connecting them with elders who pass on cultural traditions and TK. Additionally, the **Strategic Labrador Initiative** explores ways to incorporate modern forest science and policy with traditional ecological knowledge of Innu elders in order to define benchmarks for use in sustainable forest management. **Agay Mene Park** in the Yukon Territory was identified under Chapter 10 of the Carcross Tagis First Nation Final Agreement. A Steering Committee with membership from Carcross Tagish First Nation, the neighbouring Teslin Tlingit Council, and Yukon Government will be engaged in developing a management plan for the park. One of the park objectives, as identified in the land claim agreement, is to "recognize and protect the traditional use of the area by Carcross/Tagish and Teslin Tlingit people in the development and management of the park".

Aboriginal peoples and Canada's park agencies collaborate in the **management** of newly designated coastal conservancies in British Columbia which involve the protection of approximately 1.8 million hectares of ecologically diverse habitat, including critical Spirit Bear habitat, and also the preservation of **Great Bear Lake** in the Northwest Territories. The Pikangikum, Poplar River, Paunigassi and Little Grand Rapids First Nations have signed a **Protected Areas and First Nation Stewardship Accord** to promote protection of their

traditional lands in Ontario and Manitoba. Together with the provincial governments, they are promoting this area as a potential UNESCO World Heritage Site. Additional co-management initiatives include the **Park Management Board** for **Indian Arm Provincial Park** and Ontario's **Northern Boreal Initiative (NBI),** which provides opportunities for First Nations to lead community-based land use planning and forest management, and to foster sustainable economic opportunities in forestry and conservation.

As a federal sustainable development initiative in protected areas, model forests around Canada also exemplify collaboration between stakeholders and Aboriginal communities. The **Manitoba Model Forest** has supported the establishment of Advisory Committees composed of Aboriginal community representatives that advise their respective Chief and Council regarding resource management. As well, the Model Forest has integrated First Nations participation into other projects through training and employing Aboriginal youth and incorporating traditional knowledge. The **Foothills Research Institute** in Alberta has started a multiple-community traditional knowledge and cultural study in partnership with five local Aboriginal communities. The **Eastern Ontario Model Forest (EOMF)** currently works with industry, First Nations, government, landowners and other stakeholders to develop new ways to sustain and manage forest resources. One of the EOMF's key partnerships – the Mohawk Community of Akwesasne – is mandated to incorporate traditional knowledge into the decision-making, policy-making, evaluation and operating mechanisms of the model forest as a whole.

Local stewardship and business development

In addition to protected areas, model forests, and land use planning, Aboriginal peoples are involved in a variety of other biodiversity initiatives. Local stream and land stewardship by Aboriginal communities is widespread – in Vancouver, for example, a local reserve has worked with the David Suzuki Foundation to restore in-stream habitat through the **Musqueam Creek program**. Several watersheds in the Yukon, including the **Porcupine River**, **Teslin River**, and **Yukon River** watersheds have been the location of Aboriginal stewardship activities.

Aboriginal TK of ethnobotany and deep understanding of Canada's diverse species is also useful in the development of new medical and scientific discoveries, potentially increasing the valuation and sustainable use of Canadian species. This knowledge is being shared in a range of ways with a variety of local, national, and international stakeholders. For example, the newly created **Aboriginal Heritage Garden in New Brunswick**, operated by an arm of the Eel River Bar First Nation, showcases the ancestral heritage of the Mi'gmag culture through features displaying their practical, medicinal, and spiritual use of plants and sustainable development principles. **Brokenhead Ojibway Nation** is currently working in partnership with the **Manitoba Model Forest** and **Native Orchid Conservation** to raise money to build interpretive trails and boardwalks in the Brokenhead Wetlands adjacent to an Ecological Reserve so people can view these wetlands safely and without damaging the rare plants and wetland.

Plans to develop Aboriginal participation in business development are also significant, especially through eco-tourism ventures. **Grizzly bear viewing** in **Ni'iinlii'Njik**, British Columbia, involves the Vuntut Gwitchin First Nation in a partnership with government and the

tourism industry. This joint effort aims to promote a unique experience for tourists and bring economic development to the local Aboriginal community while protecting the bears and their habitat. Aboriginal tourism businesses have independently pursued sustainability and biodiversity conservation in their operations. For example, **Bathurst Inlet Lodge** offers paddling, fishing, hiking, and wildlife watching in the Arctic, exemplifying the Native respect of the land and environment, while the **Cree Village Eco-Lodge** in Moose Factory has earned accolades for its beauty and commitment to sustainability through composting toilets, menu of local meats, and organic bedding. The **Squamish Lil'wat Cultural Centre**, a world-class cultural centre formed through a co-management Protocol Agreement between two First Nations communities, was recently announced as a runner up for the 2009 Indigenous Tourism and Biodiversity Website Award.

To support sustainable tourism internationally, the CBD Secretariat hosted an **Indigenous Communities, Tourism and Biodiversity workshop series** focused on the Arctic region in Quebec City in 2007. The series of training workshops provided an opportunity for attendees to investigate training tools, such as web-based technologies and advertising, which might aid indigenous communities and lead to greater benefits from sustainable tourism projects. For its part, the **Ontario government** is helping eligible First Nations to carry out land use planning and identify forestry-based economic development opportunities by providing a $2-million grant to the **Forestry Futures Trust**, which will accept applications from eligible First Nations communities for relevant business projects.

3.4: Educational and Research Institutions

Universities, research institutes, museums, zoos, aquariums, and botanical gardens play an important role in biodiversity education and are some of the best places to explore biodiversity and issues relevant to the Convention on Biological Diversity. Such institutions interact directly with the public, and have both the knowledge and the capacity to develop and promote effective action to protect biodiversity.

The **Northern Ontario School of Medicine (NOSM)**'s Boreal Bioprospecting Initiative (BBI) investigates the diversity of Northern Ontario's boreal forests as it searches for new genetic resources that might be of medical value. The **University of New Brunswick** is collaborating with local ENGOs in a working group on invasive species, to raise awareness and to evaluate the status of invasive species in New Brunswick. **Canadensys,** formerly known as the Canadian University Biodiversity Consortium, aims to unlock the specimen information held by Canadian university-based biological collections and share this via a network of distributed databases, compatible with other biodiversity information networks like the **Canadian Biodiversity Information Facility (CBIF)**. In this way, workers in a variety of fields will be able to inform their studies with comparative data from other research centers, including universities, museums, and botanical gardens, leading to the conservation and sustainable use of genetic resources and species. Information found on the CBIF is also provided in significant amounts by academic and scientific institutions, such as the **Canadian Museum of Nature (CMN)**.

Case Study: The Canadian Museum of Nature (CMN)

The Canadian Museum of Nature (CMN) has promoted significant outreach regarding biodiversity in Canada. Its Canadian Centre for Biodiversity has established the online Native Plants Crossroads, which features resources and information on local conservation and community initiatives as well as information on pollination and invasive alien species. The CMN contributes large amounts of data to conservation data centres, is the national focal point for the Global Taxonomy Initiative, and is leading Arctic research such as the ambitious Flora of the Arctic Project, an international Polar Year research project. The CMN has also unified natural history museums by establishing the Canadian Alliance of Natural History Museums. Alliance members have highlighted significant threats to biodiversity, such as climate change during the International Polar Year (IPY) with events such as professional speakers' series.

The renovation of the Victoria Memorial Museum Building at the CMN is scheduled to open on International Day for Biological Diversity in 2010. The renovations, which began in 2004, are transforming the building into a contemporary science museum with new infrastructure, improved environmental and conservation controls, and better visitor amenities.

Botanical gardens also play a large role in Canada's mainstreaming of biodiversity and conservation of species. The **Royal Botanical Gardens (RBG)**, in Southern Ontario, is home to a vast variety of plant species, displaying biodiversity and promoting public understanding of the relationship between the plant world, humanity and the rest of nature. Its nature sanctuaries are among the areas of highest documented plant diversity in Canada. Although the sanctuaries constitute a small protected area (approx. 1000 ha), they include documented wild populations of approximately 23% of the entire flora of Canada. A Six Nations Herbarium is currently under development to connect cultural and biological knowledge.

The approximately 25 botanical gardens in Canada have been cooperating on a variety of projects related to education and the conservation of plant diversity. In 2001, the **Canadian Botanical Conservation Network (CBCN)** produced the **Biodiversity Action Plan for Botanical Gardens and Arboreta in Canada**. The **2010 Challenge for Canadian Botanical Gardens** updates the 2001 Action Plan. The Challenge reviews the progress on plant conservation and education related to sustainability by botanical gardens, places the International Agenda for Botanic Gardens in Conservation and the Global Strategy for Plant Conservation into context, and indicates how Canadian gardens can contribute to achieving the targets of the North American Strategy for Botanic Gardens in Conservation.

The **Canadian Association of Zoos and Aquariums (CAZA)** teaches over 1.3 million children and adults in Canada about the impact of human activities and the importance of species conservation. The CAZA-affiliated **Toronto Zoo** offers a wide range of camps, programs, and school trips that teach youth about the diversity of the world's creatures, interactions between humans and species, and the importance of zoos as ex-situ conservation sites.

3.5: Environmental Non Governmental Organizations (ENGOs)

A wide variety of Canadian environmental non-governmental organizations (ENGOs) have integrated biodiversity considerations into their initiatives. ENGOs are often the powerhouse behind many of the activities related to environment action, through activism, education, stewardship initiatives, research, and cross-sectoral collaboration. A number of networks and resources are available to ENGOs to enhance collaboration and action. Environment Canada's **Canadian Environmental Network (RCEN),** with its 6000 member organizations, actively supports ENGOs involved in public consultation, working groups, or as conference delegates. Co-sponsored by Environment Canada and Parks Canada, Nature Canada's **Canadian Nature Network** has approximately 375 ENGOs operating at either the local, regional, provincial or national levels, with a combined membership of approximately 100,000 members and supporters. The Canadian committee for the **World Conservation Union (IUCN)** plays a part in representing Canadian initiatives at the international level, as well as learning from best practices internationally.

Many ENGOs have national initiatives related to biodiversity. The **Nature Conservancy of Canada (NCC)** is a private, not-for-profit land conservation organization. Since 1962, NCC and its partners have helped to conserve close to 809,371 hectares of ecologically significant land nationwide through land donation, purchase, and conservation easement. NCC has been instrumental in establishing a network of conservation data centres across Canada that serve as permanent and dynamic data banks of the native biodiversity of the country. **Ducks Unlimited Canada (DUC)** works to conserve, restore, and manage wetlands and associated habitats for Canada's waterfowl by preserving habitats, conducting wetland and environmental research, and delivering education programs. In Ontario alone, DUC and its partners, which include more than 1,700 private landowners, have conserved over 364,217 hectares of wetland habitat. The **Canadian Wildlife Federation (CWF)** is a charitable organization representing 300,000 members and supporters that work from coast to coast to maintain a bright future for Canada's wildlife. CWF empowers Canadians to help protect wild species and their habitats through publications, award-winning programs and a balanced approach to wildlife issues. **Wildlife Habitat Canada (WHC)** works to support the conservation of wildlife habitat, running a granting program with a focus on wetlands and waterfowl habitat and initiatives such as the Forest Stewardship Recognition Program and Urban Stewardship Awards of Excellence. Their Wildlife at Work program focuses on corporate sustainability and WHC has worked with more than 1,500 facilities. **Nature Canada**, with the Canadian Nature Network, has a mission to protect nature, its diversity, and ecosystem processes, with attention to bird conservation, wilderness protection, endangered species, and national parks. Collaborating with governments, scientists, and citizens, Nature Canada focuses on education and advocacy to protect biodiversity.

Bird Studies Canada is a not-for-profit organization that uses the contributions of thousands of volunteer scientists to survey bird populations and undertake targeted research in support of conservation planning. The growth and emergence of land trusts is a new conservation force in Canada. In 2000, surveys were sent to 82 land trusts across Canada. The national land trust survey provided useful information on the land currently protected and on the conservation priorities and objectives of each trust. **The Canadian Land Trust Alliance**

promotes private land conversion and works to strengthen the land trust movement nationally.

Many more ENGOs operate at a provincial, territorial, or local level. Among numerous other ENGOs involved in biodiversity initiatives, the **Ontario Federation of Anglers and Hunters (OFAH),** with over 655 member clubs across Ontario, has been a major proponent of biodiversity in the Province. OFAH is dedicated to conserving Ontario's fish and wildlife populations, protecting woodland and wetland habitat, and promoting outdoors education; their conservation programming includes elk and wild turkey restoration, Atlantic salmon restoration, the Ringwood Fish Culture Station, the Community Stream Stewardship Program, and the OFAH/Ontario Ministry of Natural Resources Invading Species Awareness Program. The **Agence régionale de mise en valeur des forêts privées du Bas-Saint-Laurent** in Québec works with private landowners to establish conservation agreements focused on conserving three Exception Forest Ecosystems designated by the Province. Naturalist societies and clubs are active in a variety of conservation and education initiatives related to biodiversity in many Canadian cities and regions.

With a variety of focuses and approaches to conserving biodiversity, Canada's ENGOs play an important role in meeting the goals laid out under the CBS and CBD. Involved internationally, nationally, provincially, and locally, they work to educate and engage stakeholders, gain information on the state of Canada's ecosystems and species, and carry out stewardship and conservation initiatives.

3.6: Industry and Business

Virtually all business operations use natural resources in the production of goods or services, or consume products which have direct or indirect impacts on biodiversity. Significant improvements are being made to business operations to ensure the conservation and sustainable use of biological diversity. By taking action to conserve biodiversity, businesses can often increase the longevity of their resources, preserve the ecosystem services that their operations depend on, improve their consumer reputation, and become a regulation leader concerning the environment in their industry. The Conference of Parties of the CBD has noted the need to enhance voluntary commitments of the private sector and strengthen regulation in support of the objectives of the Convention; the private sector is thus far the least engaged major sector globally in biodiversity initiatives. Industry and business are highly influential, with vast knowledge, experience, and resources available; with cross-sectoral collaboration and support, this sector could become a major actor in initiatives to mainstream biodiversity considerations.

A number of standards and reporting initiatives are in place globally and nationally to encourage a high level of performance in biodiversity preservation. The **Global Reporting Initiative**, **World Business Council for Sustainable Development**, International Finance Corporation's **Business and Biodiversity Guidelines**, **Wildlife Habitat Council**, and **International Union for Conservation of Nature** all support business and industry efforts to integrate biodiversity considerations and capitalize on benefits. In Canada, natural resource

sectors have developed and implemented codes of good practice that promote the sustainable use of natural ecosystems and the conservation of fisheries and wildlife resources. The **Biodiversity Stewardship in Resource Industries Initiative** has played a significant role in these codes of practice.

A number of initiatives in the fisheries, forestry, mining and prospecting, tourism and agriculture and agri-food sectors are outlined in the sections below. Although, many more examples of mainstreaming biodiversity considerations can be found in other Canadian business sectors such as energy, aggregates, manufacturing industries and transportation.

Fisheries

The **Canadian Responsible Fisheries Board (CRFB)** promotes responsible fishing in Canada through its **Code of Conduct for Responsible Fishing Operations** and development of industrial training programs and technical information exchanges in responsible fishing. The Code of Conduct reflects the fishing industry's commitment to ensuring stewardship and sustainability as key elements of Canada's fishing industry.

The leading labeling program recognizing a high environmental standard for sustainable and well-managed fisheries is the **Eco-label.** Operated by the Marine Stewardship Council (MSC), the Eco-label is an independent, global, non-profit organization that promotes environmentally responsible stewardship of marine fisheries, which includes biodiversity considerations. Exemplifying certification in Canada, the **Gulf of St Lawrence northern shrimp fishery** has been granted permission to use the Eco-label. Managed under the DFO, the fishery has numerous measures in place to ensure a minimal environmental impact and good management. Otter trawls fitted with Nordmore separator grates ensure reduced bycatch as fish pass through the grate and escape from the trawl. The captain of each vessel keeps a logbook recording the location and number of hours fished and an estimate of quantities caught. Since the early 1990s, at-sea observers have been in operation, in addition to all shrimp landings being monitored at dockside.

Case Study: Clearwater fishery

Clearwater, a Nova Scotia company, has demonstrated a strong commitment to harvesting high quality products while pursuing the sustainable use of the fishery's natural resources. In the company's Code of Business, the protection of the environment is outlined as an integral factor in all decision-making of the Corporation. The company uses a variety of methods to reduce the incidental catch of non-target species. Clearwater also reduces habitat destruction by conducting extensive ocean bottom mapping in partnership with offshore scallop operators, the Canadian Hydrographic Service and the Geological Survey of Canada. This mapping has significantly reduced the area of ocean bottom towed, amount of lost equipment, and fuel use, while maintaining the same harvesting quantity. The reduced disturbance of the ocean floor allows for increased habitat and ecosystem health, as well as reduced energy requirements and subsequent pollution. Clearwater also pursues species-specific conservation through seeded boxes, voluntary coral closures, and coral codes of practice, while maintaining relationships with the DFO, academic institutions, industry partners, and NGOs.

Forest products

Forest industries in some provinces have their own codes of practice, such as in Ontario where industry has partnered with conservation groups like Ducks Unlimited Canada in the rehabilitation of wetlands and streams. Nova Scotia boasts the **Colin Steward Forest Forum** process which involves the Province's largest forest companies and a group of NGOs in an initiative to address gaps in the provincial system of protected areas by proposing suitable sites while mitigating impacts of land protection on the forest industry.

In addition to legislation, a variety of certification standards are used by industry to demonstrate sustainable use of Canada's forests. Certification can be achieved through Canada's **National Standard for Sustainable Forest Management**, the **International Social and Environmental Accreditation and Labeling (ISEAL) Alliance**, and the **Forest Stewardship Council (FSC)**. Canada is the world leader in FSC certification, with over 21% of the world's FSC-certified forests. Additionally, the **Natural Resources Canada's Canadian Forest Service** and **Sustainable Forestry Initiative** assist the forestry industry in developing sustainable performance measures.

Among the leading Canadian forestry companies in stewardship and sustainability is **Tembec**, a Canadian forest products' company principally involved in the production of wood products, market pulp and papers. Tembec operates in sites across Canada, as well as in France, the United States and Chile. In 2001, the company signed an accord with WWF-Canada, collaborating in order to promote the supply and use of forest products certified by FSC. The company certified Ontario's Gordon Cosens Forest, an area four times the size of PEI, under the FSC in 2003, creating one of the largest FSC-certified forests in the world. To meet its environmental commitments, Tembec has adopted an environmental policy and has established two Environmental Management Programs, Impact Zero®, and Forever Green® to minimize the impact of manufacturing activities and forest operations on the environment. Tembec has received awards such as the FSC-Canada *Winds of Change* award – recognizing innovation in certification on a significant scale – and the *Forest Leadership Partnership Award*, selected by an international panel for its partnership with WWF.

Mining and prospecting

Although the many different forms of mining processes can significantly disturb land and ecosystems, the implementation of responsible mining practices through exploration, planning, operations, restoration, and research can drastically moderate damage to biodiversity and the environment. The Canadian mining industry is a world leader in environmentally safe and clean mining practices. The **Mining Association of Canada (MAC)** and **Prospectors and Developers Association of Canada (PDAC)** have environmental codes of conduct that member companies are expected to follow wherever they operate.

The **PDAC**, consisting of approximately 6,000 individual - and 950 company and organization - members, encourages the highest standards of technical, environmental, safety, and social practices in Canada and internationally. PDAC offers a freely accessible Internet-based toolkit, *Environmental Excellence in Exploration*, which describes leading examples of environmental and social responsibility in the minerals industry.

The **MAC** launched its **Towards Sustainable Mining (TSM)** initiative in 2004 to align industry actions with priorities and values of stakeholders and improve the mining industry's sustainable development performance. Member companies follow guiding principles and report on indicators that measure their performance for specific mining activities such as tailings management, energy use and greenhouse gas emissions management, external outreach and crisis management. After years of consultation, frameworks have been developed for mining and Aboriginal peoples, biodiversity, and mine closure. MAC's protocol for biodiversity conservation management will undergo its first round of self-assessments in 2009, leading to public reporting in 2010. Recipient of the 2005 *Globe Foundation Award* in the industry association category, MAC has a history of engagement with conservation organizations, such as the Species at Risk Working Group, Biodiversity Stewardship in Resource Industries (BSRI), and North American Bird Conservation Initiative.

Case Study: The Biodiversity Challenge at Xstrata's Canadian operations

With a strong business case for conserving biodiversity, including social license, reduced reclamation costs, and anticipation and prevention of costly environmental impacts, MAC- member Xstrata has developed a comprehensive operating standard for biodiversity and land management. Xstrata's 17 standards are based on the principles of sustainable development, and also on the company's belief in operating responsibly and to the highest international standards. The standard supports the company's adherence to emerging industry standards, like the TSM framework on biodiversity, specifying that all major impacts, potential and actual, that the company's activities and operations have on the environment, biodiversity and the landscape must be identified, analyzed, evaluated and eliminated or otherwise addressed. As well, in managing the biodiversity and landscape functions around its operations, Xstrata will use scientifically sound technologies and procedures. To put this strong commitment into action, Xstrata's recently acquired Canadian operations began studies in 2007 to establish current biodiversity conditions and to assess the potential impacts of site activities, with site-specific biodiversity conservation plans subsequently implemented. Xstrata developed an index to help its Canadian sites assess the generic ecological value of their surrounding biodiversity based on habitat characteristics, biological (fauna and flora) components and the reliability of the biological data.

A member of MAC, **Vale Inco** is the second largest producer of nickel in the world, with three nickel mining operations in Canada. Among other environmental initiatives, Vale Inco is now in the second year of a five-year $1-million partnership with WWF- Canada that involves sustainability projects at various operating sites. The main objectives are to conserve species at risk, to develop a conservation stewardship approach for Vale Inco in Canada, and to explore work of a similar nature internationally. Vale Inco is also involved in reclamation, including research in the revegetation of disturbed land with native plants.

The **Iron Ore Company of Canada (IOC)** is also a member of MAC and is one of the world's leading suppliers of iron ore pellets and concentrate and has focused on making sustainable development an integral part of its decision-making. One demonstration of this focus is reflected in habitat restoration under a tailings stabilization project called *From Tailings to Biodiversity*. The project explores creative uses for the inert tailings of rock and sand produced at the IOC mine near Labrador City, such as the creation of wetland, upland, and riparian habitats. The IOC has constructed a mosaic of habitats spanning over 540 hectares, creating diverse ecosystems rather than stabilizing the landscape through the traditional

method of grass monoculture. In 2004, the IOC received the *Great Blue Heron National Award* from the North American Waterfowl Management Plan, acknowledging significant, long-term contributions that result in benefits to waterfowl and other North American migratory bird populations.

Energy

Canada has considerable energy resources; the country is the 8th highest crude oil producer globally and holds the second largest oil reserves in the world. With these significant resources comes the responsibility to deal with the considerable impacts that resource development can have on biodiversity. Biodiversity considerations have been mainstreamed into elements of energy resource development in a variety of ways across the country.

The **Canadian Association of Petroleum Producers** has a Stewardship Framework with an underlying commitment to environmental stewardship and responsible resource development. Members are encouraged to work through a stepped approach that demonstrates continued improvement in performance. The approach includes: stewardship commitment; implementation of a stewardship management system; mandatory benchmark reporting; and internal and external audits. Some member companies have demonstrated a commitment to biodiversity conservation by participating in cumulative effects management, species at risk planning and working in partnerships with conservation organizations. The program started in 1999 as a voluntary initiative, but became mandatory for all members in 2003.

The **Canadian Electricity Association** has an Environment Commitment and Responsibility Program that commits its members to stewardship related activities and includes a third party verification system. This Association has also signed a Memorandum of Understanding with the Department of Fisheries and Oceans to address habitat issues, identifying stewardship as one of five areas of cooperation. One of its members, the **Ontario Power Generation**, has implemented a voluntary biodiversity management plan (with implementation and monitoring protocols) focused on species at risk and their habitats.

Canada has 25 percent of the world's peatlands, covering almost 113 million hectares acres of the country, with more than 70 million tons of peat accumulating each year. Of this, Canada's sphagnum peat moss industry harvests only 1.3 million tons. The **Canadian Sphagnum Peat Moss Association (CSPMA)** is an association of peat moss producers and related enterprises devoted to promoting the long-term health of the industry. Representing 95 percent of Canada's total production, the CSPMA provides the public accurate information on peat moss harvesting, production, value and environmental issues. CSPMA also recently launched a new logo for sustainable peatland management and a national sign campaign to promote the awareness of its successes and commitment to restoration and reclamation of harvested bogs. Members of the CSPMA adhere to the Preservation and Reclamation Policy established by the association, which includes identifying bogs for preservation, leaving buffer zones of original vegetation, leaving a layer of peat below harvesting levels to encourage rapid regrowth, and returning harvested bogs either to functioning ecosystems, forests, wildlife habitats or agricultural production areas. The CSPMA is examining sustainability accounting and evaluating the potential of establishing sustainable peatland standards and certification systems, also taking a lead role in the International Peat Society's

efforts to create an international certification for Sustainable Peatland Management. Furthering the sustainable future of the industry, the CSPMA also engages in research investigating restoration practices, natural disturbances regimes, and climate change and emissions management.

Tourism

Tourism is an important component of the Canadian economy, representing approximately 2 percent of the country's GDP. Sustainable tourism affords travelers access to nature while at the same time inspiring increased appreciation for the environment and creating minimal negative impact. Canada participates in the CBD's international programme of work on sustainable tourism and is active in supporting sustainable tourism standards and guidelines. The **World Eco-tourism Summit** was hosted in Quebec City in 2002.

A number of guidelines and organizations provide direction for sustainable tourism in Canada. Since 1995, the **Canadian Tourism Commission (CTC)** has been working to meet the objectives of sustainable tourism through projects and initiatives such as the Catalogue of Exemplary Practices in Adventure Travel and Ecotourism, released in 1999. Other national bodies include **Parks Canada**, and the **Tourism Industry Association of Canada (TIAC).** The *Sustainable Tourism Toolkit* project developed for the TIAC is an interactive resource in electronic format which facilitates business decisions and presents the business advantages of sustainable tourism. International bodies and guidelines include, among others, the **United Nations Environment Programme's** *Sustainable Tourism in Protected Areas guidelines,* **Sustainable Tourism Stewardship Council (STSC), Green Globe 21,** Global Partnership for Sustainable Tourism Criteria, **World Tourism Organization, International Ecotourism Society**, and **Green Tourism Business Scheme.**

Parks Canada issues an annual **Sustainable Tourism Award** to recognize best practices in the tourism industry, with nominees exemplifying a variety of biodiversity initiatives. One of the award-winners, the town of **Bouctouche, NB**, implemented NB's **Ecotourism Master Plan**, leading a community-based initiative that resulted in strong economic renewal and new ecotourism development in the watershed area. Additionally, the **Niagara Parks Commission (NPC)** seeks to reduce environmental impacts and to improve tourism's contribution to sustainable development and conservation, while generating significant economic benefits for the community. The NPC has funded environmental projects within the Niagara River Corridor Ecosystem that are focused on the protection, preservation and rehabilitation of habitats containing species at risk and is also involved in a number of projects which promote ecological restoration, riparian habitat preservation, natural area conservation, and resource management. The **Oak Hammock Marsh Interpretive Centre** increases public understanding of the value of wetlands and encourages public support for their conservation through innovative education and outreach programs. The Centre is designed with features such as a green roof, anti-bird-strike windows, and a constructed wetland for sewage treatment.

Exemplifying provincial mainstreaming of biodiversity considerations into tourism, the **Wilderness Tourism Association of Yukon (WTAY)** promotes the adoption of sustainable practices by its members, such as leave-no-trace operations and conformity to the *Ten Principles for Arctic Tourism* advocated by the WWF. The Environmental Committee of the

Association has prepared a Code of Ethics for tourism operators and successfully lobbied for legislation to provide a framework for accountability by individual operators.

Aboriginal tourism businesses have also pursued sustainability and biodiversity conservation in their operations. **Bathurst Inlet Lodge** offers paddling, fishing, hiking, and wildlife watching in the Arctic, and aims to exemplify the Native love of the land and the environment, while the **Cree Village Eco-Lodge** in Moose Factory has earned accolades for its beauty and commitment to sustainability through composting toilets, menu appreciating local meats, and organic bedding.

Vancouver hosted North America's **Ecotourism and Sustainable Tourism Conference** in 2008 which provides opportunities for organizations and individuals to gain knowledge of the latest trends in ecotourism and sustainable tourism, learn practical skills, and participate in invaluable networking and knowledge sharing. Canadian organizations who participated included provincial ministries of tourism, environmental NGOs, universities, newspapers, and a wide range of tourism operators.

Agriculture and Agri-foods

The Alberta Riparian Habitat Management Society or 'Cows and Fish', aims to foster a better understanding of how improvements in grazing and other management of riparian areas can enhance landscape health and productivity, for the benefit of landowners, agricultural producers, communities and others who use and value riparian areas. The Society is available to help landowners, agricultural producers, stewardship groups and communities to: understand riparian area functions and values; examine and monitor health of their riparian areas; and evaluate and suggest management strategies. www.cowsandfish.org

The Grazing Mentorship Program offers producers the opportunity to receive individual input and suggestions on how to improve their grazing management practices. Mentors, respected fellow producers with extensive grazing management knowledge and experience, will work with producers to provide suggestions and input on fencing, watering systems, grazing systems, plant growth, forage species selections, dormant season grazing, winter feeding strategies and more. www.cattle.ca

3.7: Economics

Assessment of the value of ecosystem goods and services

Healthy ecosystems provide human society with a vast diversity of benefits such as carbon capture, pollination, water filtration, and the provision of food, fibres, fuel, shelter, and healthy soil. Damaged ecosystems, such as those heavily harvested or those invaded by alien species (IAS), cost billions of dollars to Canadians each year in lost goods and services; conservative estimates place the combined economic losses and direct costs associated with the invasion of only 16 of Canada's current IAS at $5.5 billion per year. Though humanity's well-being is totally dependent upon the health of ecosystems, ecosystem goods and services (EG&S) are predominantly public goods with no markets or prices, so are rarely

included in current economic measures. The most common measure of economic wellbeing, GDP, does not capture many vital aspects of national wealth and wellbeing, including changes in the quality and quantity of natural resources.

Without a market value, EG&S are often disregarded in decision making; as a result, biodiversity is declining, ecosystems are being degraded and humans are suffering the consequences, both economically and in a variety of other ways. Many international institutions, including the **CBD** and the **United Nations**, have recognized the importance of understanding the economic value of biodiversity for decision and policy making and have encouraged countries to pursue appropriate initiatives.

Case Study: Ecosystem Goods and Services Valuation

The valuation of the vast variety of EG&S, some of which are irreplaceable, and the mainstreaming of biodiversity into econo mic mea sures is u nder d evelopment nationally in Canada. **Counting Canada's Natural Capital**, a study completed in 2006 an d su pported by the Can adian Boreal Initiative and the Pembin a Institute, assesse s the value of Can ada's boreal ecosystems, which cover 58.5% of the country's land area. Final estimates of environmental services from the boreal were about $ 160 per hectare, or $93 billion per year in Cana da. If includ ed i n Canad a's GDP, services fro m the boreal alone, not to mention other e cosystems in Can ada, would am ount to roughly 9% of GDP. Using 2002 figures, the total non-market value of boreal ecosystem services is 2.5 times greater than the net market value of boreal natural capital extraction. This result suggests that the ecological and socio-economic benefits of boreal ecosystem services, in their current state, may be si gnificantly greater than the market value s derived from current ind ustrial development—forestry, oil and ga s, mini ng, and hyd roelectric energy—combined. This study and othe rs have presented important information for d ecision-making, showi ng that it is ofte n in Cana da's best economic intere st to sign ificantly minimize im pacts on eco systems an d value the integrity of ecosystem services before natural capital extraction.

The Value of Natural Capital in Settled Areas of Canada illustrates the econ omic values of natural capital from four g eographically diverse locations in Canada. Offering additional proof that the sub stitutes fo r n atural capital a re often far mo re expen sive to buil d a nd operate th an those provided by nature, th e p aper st resses the impo rtance of d ata coll ection o n EG&S to i nform economic measures and decision making. It recommends the use of policies that integrate the true cost of environmental de gradation with e conomic decision ma king, thu s le ading to the most economically efficient management of natural capital resources.

The Intern ational Institute for Sustaina ble Develo pment re cently completed phase I of a repo rt entitled **An Ecosystem Services Assessment of the Lake Winnipeg Watershed**. The report estimates th at billions of dollars coul d be gai ned by resto ring the natural e nvironment o f Lake Winnipeg, th e mo st e utrophic of the world's la rgest fre shwater l akes. T he degraded state of the lake i s a re sult of a multitude of hum an activi ties influencing water an d nut rient flows o n its approximately 950,000 km ^{2} multi-ju risdictional watersh ed. Seventeen ecosystem services commonly used in the literature were examined for each land cover type; the report concluded that if pre-settlement landscapes could be re-created, they would provide, on an annual basis, between $500 million and $3.1 billion of ecosystem services, and between $80 million and $1.4 billion worth of carbon offsets in the emissions market.

The economi c value of nature is also a pparent throu gh the partici pation in, an d expenditu re on, nature-related activities i n Can ada. To und erstand the e conomic b enefits of wildlife -related recreational activities, surveys on the **Importance of Wildlife to Canadians** were undertaken by Statistics Canada in 198 1, 1987, an d 1991. Work was the n reframed in the 1996 **Survey on the Importance of Nature to Canadians**, which expan ded to add ress mo re n ature-related activities, such as camping and boating. The survey examined the popul arity of these activities, parti cipation in these activities according to the natural area s in which they take place (such as the ecozones of Canada), an d the sig nificant benefits to the econo my resulting from sp ending on the se activities. The Survey found that, in 1996, Canadians spent $11 billion on these nature-related activities.

Mainstreaming of the economic value of nature and EG&S has been brought to the next level by several research projects that investigate recommendations to industry, business, government, and other stakeholders. For example, in 2007, Environment Canada and

participating banks released a research paper on the **Relevance of Canadian Banks' Activities to the Sustainability of Canada's Boreal Region**. The paper identifies options for Canadian banks to consider in developing lending, procurement and other strategies, fostering greater alignment of social, environmental and economic interests with the sustainability of Canada's boreal region.

In addition to studies investigating the value of EG&S and providing recommendations, there are currently several initiatives in Canada that offer compensation to encourage the mainstreaming of biodiversity into the economy through the conservation of nature and EG&S. These programs use measures such as: **conservation agreements**, which limit development rights in exchange for compensation; **tax credits**, such as those offered through the federal **Ecological Gifts Program** and the **Manitoba Riparian Tax Credit Program**; and **annual rental payments**, such as those offered through the **Rural Water Quality Program** in regions of Ontario to pay for land set aside for stream buffer strips, cover crops, shelterbelts, environmentally friendly cropping practices or retirement.

3.8: Human Health

Increasing research and initiatives have been undertaken recently to investigate the interconnections between the biodiversity and human health. The **International Symposium on Biodiversity and Health**, held in 2003 in Ottawa, presented a number of linkages between biodiversity and health. Firstly, the loss of biodiversity endangers important **ecosystem services**, such as protection against flooding and erosion; the filtration of toxic substances; the stabilization of local climates; and the provision of food, shelter, and important materials. Additionally, the loss of species deprives humans of tools for **biomedical research**; over 50% of commercially available drugs are based on bioactive compounds extracted or patterned from non-human species. Biodiversity is also important in providing models for medical research that help researchers **understand normal human physiology and disease**. **Denning bears** for example, including Canadian species such as polar bears and North American black bears, have been the focus of large amounts of research applicable to osteoporosis, renal failure, type I and II diabetes mellitus, obesity, and severe anxiety. Biodiversity can also **reduce the risk of human contraction of infectious disease**. For example, the risk of getting **Lyme disease**, a vectorborne disease in Canada and many other countries, is reduced when high levels of vertebrate-species diversity exist. A growing number of studies have also investigated the important effect of biodiversity and nature on **human psychology**. Nature is surprisingly beneficial for the brain, with studies demonstrating improved recovery from illness, restoration of attention and working memory, reduced symptoms of attention deficit disorder, and reduced stress, domestic violence and aggression, with increasing contact with nature. A recent paper has demonstrated that the psychological benefits of green space are closely linked to the diversity of its plant life, as subjects that spend time in a biodiverse park score higher on various measures of psychological well-being when compared with less biodiverse parks.

Many cross-cutting issues affect both biodiversity and human health and well-being, including pollution, loss of green space, climate change and degradation of genetic

resources and adaptive potential. As such, there are a number of initiatives in Canada that include or integrate elements of biodiversity and human health. The international One World - **One Health** initiative seeks to promote, improve, and defend the health and well-being of all species by enhancing cooperation and collaboration between physicians, veterinarians, and other scientific health professionals.

An ethnobotanical study conducted for **Health Canada** revealed that more than 200 plants, fungi, and lichens are used for various purposes by Indigenous people in Canada. In Canada, approximately 80% of Aboriginal communities are located within the nation's boreal or temperate forests; the **Northern Ontario School of Medicine's Boreal Bioprospecting Initiative (BBI)** aims to gather information for medical research using traditional knowledge and scientific methods, while ensuring the benefit-sharing of new developments with the Aboriginal communities.

3.9: Stewardship

Much of what Canada has achieved with respect to the mainstreaming of biodiversity can be recognized under the heading of "stewardship". Stewardship is generally seen as the responsible management of air, land, water and biodiversity that ensures the sustainable use of natural capital, maintenance of ecological integrity and conservation of biodiversity for future generations. Stewardship is often manifested at the community or individual level; Canada has gained a reputation internationally for its strong stewardship programs and initiatives involving Aboriginal communities, governments, and citizens across the country. Since the 1980s, stewardship programs have grown and evolved, becoming a mainstream delivery mechanism for conservation programs in Canada. It is currently estimated that there are millions of active environmental stewards in Canada, with several thousand organizations of many kinds, some linked together in an array of social networks; the contribution of these stewards is worth millions of dollars and contributes significantly to the preservation of biodiversity.

Stewardship has been ingrained into approaches concerning the prevention of species endangerment and biodiversity loss. **Canada's Stewardship Agenda (CSA)**, approved by the Federal-Provincial-Territorial Resource Ministers in 2002, is a plan for collaboration that proposes operating principles for stewardship under their vision of Canada as "a nation where Canadians are actively working together to sustain natural life-support systems". **Canada's Stewardship Portal** has compiled a variety of case studies based on geographical region, which outline several stewardship initiatives, including objectives, actions, and results for each project. The 2009 **State of Stewardship in Canada Report** prepared by the **Centre for Environmental Stewardship and Conservation (CESC)** outlines a wide variety of provincial and territorial initiatives.

Support for stewardship at the provincial and territorial level is also significant. For example, the **Ontario Ministry of Natural Resources' Ontario Stewardship** program includes 42 community-based stewardship councils involving thousands of partners. Approximately 16,000 volunteers take part in more than 600 Ontario Stewardship projects every year,

including natural resource education, shoreline restoration, wildlife habitat enhancement and forest-related, community-driven initiatives. Under Ontario Stewardship, more than 1,000 educational events have been hosted, more than 1,500 hectares of wetlands and headwater areas have been restored, and more than 40 kilometres of shoreline have been rehabilitated.

There are several community-based ecosystem and species monitoring programs raising public awareness on biodiversity issues by enlisting the help of Canadians in the collection of scientific data. **Wormwatch, Frogwatch, Icewatch** and **Plantwatch** are all programs under the **Environmental Monitoring and Assessment Network** that involve Canadians in citizen science and stewardship. A variety of networking bodies, including the **Land Stewardship Resource Centre** in Alberta and **Fish and Wildlife Management Board Stewardship Program** in the Yukon, promote local participation in stewardship initiatives.

Communities of stewards in Canada also include hunters, trappers and loggers. Their contribution to stewardship is described in reports such as *Investors in Habitat, Hunter Contributions to Wildlife Habitat Conservation in Canada*, trapping - *Trappers: Stewards of the Land*, and woodlot owners - *Private Woodlot Owners-Meeting the Stewardship Challenge*.

Active stewardship networks, such as the **Stewardship Centre for British Columbia**, the **Land Stewardship Centre of Canada**, the **Stewardship Network of Ontario**, the **Canadian Land Trust Alliance** and the **Stewardship Association of Municipalities** provide a forum for sharing information and collaboration on regional and national stewardship issues and programs. A number of conferences scheduled in 2009 will focus on strengthening stewardship. These include: Strengthening Stewardship Investing at Every Step to be held July 8-11, 2009 and the Canadian Heritage River Conference held June 14-17, 2009.

Chapter 4: Conclusions – Progress towards the 2010 target

Enhancing long term trend data will enable a more accurate assessment of the rate of biodiversity change and the effects of conservation and sustainable use policies and practices. Chapter 1 of the report uses selected indicators to provide a national overview of significant trends. It does not, however, tell the whole story. Canada lacks the long term biodiversity trend data needed to make accurate assessments of the rate of biodiversity change and the effects of conservation and sustainable use policies and practices. Canada's first ecosystem status and trends report, scheduled to be completed in 2010 will comprehensively assess individual ecological units providing a more comprehensive analysis on an ecozone basis and a more reliable baseline upon which to build a long term monitoring, assessment and reporting capacity.

Here we synthesize status and trends information contained in Chapter 1, and assess progress towards both the CBD goals and targets and Canada's biodiversity outcomes based in large part on the summary of actions and initiatives described in Chapters 2 and 3.

Status and Trends

Progress in Canada toward the 2010 target of "significantly reducing the rate of biodiversity loss" is mixed, with significant progress in some areas, and limited progress in others.

Chapters 1 and 2 and the protected areas annex describe significant additions to Canada's networks of protected areas with approximately 9.4% of Canada's terrestrial area currently protected. Only 0.64% of Canada's ocean area is protected, however, reflecting in part the more recent attention that marine protected areas have received both globally as well as in Canada.

Degradation, fragmentation, and shifts in the structure and composition of many ecosystems are taking place owing to a number of pressures. Direct conversion of wetland and forest ecosystems has slowed compared to historic rates. Native prairie grassland ecosystems have undergone the most extensive modification of any of Canada's major ecological units, mostly through conversion to agricultural land, with losses continuing today.

Increasing numbers of species of landbirds, seabirds, freshwater fish, reptiles, and fresh water mussels are imperilled. Most populations of caribou are declining. Some genetic resources and adaptive capacity are eroding – for example, the average weight of groundfish on the Scotian Shelf declined by 66% from 1970-1995 owing in part to genetic change induced by selective fishing of large individuals. In general a lack of long-term monitoring makes trends in genetic resources difficult to evaluate.

Canada is the world leader in forest certification. The percentage of total agriculture area with Environmental Farm Plans has increased substantially, but suitable habitat for wildlife continues to decline with the expansion of urban land and intensifications of agricultural practices.

Concentrations of most persistent organic pollutants in wildlife have declined, but mercury and polybrominated diphenyl ethers (PBDE's), organic compounds used as a flame

retardant, levels are rising. Invasive alien species pose a growing threat to biodiversity as illustrated by increasing rates of establishment of aquatic invasive species in the Great Lakes.

Climate Change is causing very rapid changes in the Arctic through increasing temperatures and precipitation, permafrost warming, loss of tundra and sea ice, and changes in species' ranges.

Indicators and trends presented in Chapter 1are summarized in the table below.

Assessment of Actions Toward Biodiversity Goals, targets and outcomes

Canada's Biodiversity Outcomes Framework was approved by ministers in 2006. Chapters 2 and 3 summarize some of the most significant results achieved in support of Canada's outcomes. These include integrated, ecosystem-based initiatives, significant additions to Canada's networks of protected areas, restoration of degraded ecosystems, legislation for the protection of species at risk, habitat stewardship programs, invasive alien species programs, sustainable resource management and a variety of ecosystem, species and genetic research and assessment initiatives.

The table below provides a self assessment of progress towards both the CBD goals and targets and Canada's biodiversity outcomes. It indicates in qualitative terms where work has been initiated and where change has occurred as a result. For example, a great deal of effort has been invested in a national regime for the protection of species at risk, including a National Accord, creation of a ministerial council, federal, provincial and territorial legislation, status assessments and listing processes, recovery and habitat stewardship programs. There is growing recognition, however, that a species by species approach is not sufficient and that multi-species and ecosystem-based approaches are necessary.

Many examples of integrated approaches show how sectors and jurisdictions can and are working together to ensure that ecosystem integrity is maintained and common species remain common. However, more can be done to develop and implement proactive and preventive strategies focused on whole landscapes, seascapes and watersheds. Protected areas are an important conservation tool, but remain most effective when connected by corridors and situated within broader landscape approaches, particularly within human modified ecosystems. In some cases however, the rates of change may exceed the capacity of certain species to adapt to predicted rates of climate change.

Sustainable resource use and management are also extremely important to ensure that exploration, harvesting and extractive activities do not cause net loss of biodiversity. The growing use of certification is helping ensure sustainable production and consumption of biological resources. Greater efforts to mainstream biodiversity into sector-based strategies and urban design are needed, given their potential to align economic, social and ecological objectives and achieve better overall results. Chapter 3, includes many examples where different levels of government, Aboriginal peoples, businesses, cities, stewardship groups,

and citizens are incorporating biodiversity in their actions.

DNA barcoding and associated databases afford a prospect of rapid and precise identification of species, including their responses to climate change. Work on a national policy framework for access and benefit sharing of genetic resources has begun and efforts are underway to engage and seek the views of Aboriginal communities.

Although significant advances in knowledge of biodiversity status and trends are being made as a result of the General Status of Wild Species report and Canada's first Ecosystems Status and Trends Report, improvements will be required in long term and consistent monitoring as well as modelling and prediction to strengthen the tracking and feedback mechanisms that support ecosystem and adaptive management approaches.

In addition, the valuation of ecosystem goods and services is increasingly viewed as an important knowledge gap. Decision-makers in Canada are currently making land and resource use decisions in the absence of good data on ecological, social and economic values associated with biodiversity. Filling this knowledge gap is urgent given the likelihood that climate change will exacerbate ecosystem change and create stresses that diminish resilience and adaptive capacity.

The following table provides an assessment of the actions taken in Canada to address the CBD goals and targets and Canada's biodiversity outcomes. Indicators and trends related to these goals are summarized where available – with the recognition that further trend assessment is ongoing through development of Canada's Ecosystem Status and Trends Report.

Summary Table

The following table provides a self-assessment of progress towards the 2010 target, using the CBD framework of goals, targets and indicators for measuring progress (CBD Decision VIII/15). It summaries progress from both the viewpoint of outcome indicators in Chapter 1 and actions taken in support of the goals and targets detailed in Chapters 2 and 3.

Rating of Trends for Indicators

−	Getting worse
~	Mixed or poorly understood impacts for biodiversity, or little recent change
+	Improving

Rating of Progress to Date

Progress	Description
	Very little progress to date
	Some progress to date
	Fair progress to date
	Good progress to date
	Excellent progress to date

† CBD goals § Canada's Biodiversity Outcomes	Indicators and Trends *(Chapter 1)*	Accomplishments	Progress
Protect the components of biodiversity: ecosystems, habitats and biomes			
† **Promote the conservation of the biological diversity of ecosystems, habitats and biomes** § Healthy and Diverse Ecosystems *(Chapter 2.1)*	Terrestrial Protected Areas: fourfold increase since 1992; 9.4% protected ✚ Marine Protected Areas: 0.64% protected but has been increasing in recent years ✚ Representativeness of Protected Areas: some well-represented; some areas not well represented ✚ ▬ Deforestation and Newly Planted Forest Area: Annual deforestation rates unchanged and remain low ✚ Grasslands: severe historical conversion; losses continue ▬ Tundra Climate Area: estimated 20% pan-Arctic loss in past 25 years ▬ Arctic Sea Ice Decline: 34% below long-term summer average by 2008 with major losses in last few years ▬ Wetlands: rate of loss may have slowed down; regional losses continue – little data ▬ ≈ Natural Rivers: changes in flow since 1970; change varies with regions as do impacts ≈ West Coast Marine Community Dynamics in Georgia Strait: fish-eating fishes declined since the mid-1980s while plankton-eating fishes increased ▬ East Coast Marine Community Dynamics off Newfoundland and Labrador: shift in dominant species from cod and other groundfish to small pelagic fish, shrimp, and crab ▬	• Preparation of ecosystem status and trends report (ESTR) • Significant additions to terrestrial protected areas • Increased use of land-use, watershed, oceans management planning Significant growth in land trusts • Aboriginal involvement in land use planning and protected areas planning and management	🍁🍁🍁

† CBD goals § Canada's Biodiversity Outcomes	Indicators and Trends *(Chapter 1)*	Accomplishments	Progress
Protect the components of biodiversity: species			
† **Promote the conservation of species diversity** § Viable Populations of Species *(Chapter 2.2)*	Species Status: 83% of assessed species are secure (i.e. not at risk). Trends in status are not yet available ~ Landbirds: declining, especially grasslands and open habitat species − Seabirds in Haida Gwaii & Newfoundland/Labrador Shelf: increasing; in Arctic and other areas: declining after 1970s + − Freshwater Fish: 10% of species imperilled, up from 4% in 1979 − Boreal Woodland Caribou: more populations becoming at risk; 30% now declining, status unknown for 37% − Arctic and Taiga Caribou: most herds declining, which may be partly related to population cycles; severe decline of Peary caribou −	• National Species at Risk Regime • Species assessments under SARA and General Status reports • Use of TK in species assessments • Increasing cross-sectoral collaboration in species management and conservation • High level of citizen participation in species monitoring • Habitat stewardship programs	🍁🍁🍁
Protect the components of biodiversity: genetic diversity			
† **Promote the conservation of genetic diversity** § Genetic Resources and Adaptive Potential *(Chapter 2.3)*	Size of Groundfish on the Scotian Shelf: average weight declined 66% from 1970 to 1995 −	• DNA barcoding/Barcode of Life • Genetic research in agriculture, forests, fish, wildlife • Discussion paper on access and benefit sharing domestic policy approach	🍁🍁

† CBD goals § Canada's Biodiversity Outcomes	Indicators and Trends *(Chapter 1)*	Accomplishments	Progress
Promote sustainable use			
† **Promote sustainable use and consumption** § Sustainable Use of Biological Resources *(Chapter 2.4)*	Sustainable Forestry Certification: now covers most commercial forests ✚ Wildlife Habitat Capacity on Agricultural Land: declined across the country ▬ Sustainable Management on Agricultural Land: 34% of crop and 40% of livestock farms have Environmental Farm Plans under a new program ✚ Sustainable Fisheries Management: Northern shrimp fishery off Newfoundland and Labrador coast certified, by-catch reduced; other fisheries not yet certified ✚ ~	• Canadian Healthy Ocean Network • Criteria & Indicators of Sustainable Forest Management • Almost all commercial forest certified • Upward trend in Environmental Farm Planning • Certification of Northern Shrimp • Sustainable Mining Initiative • Aboriginal Fisheries and Forestry Programs	🍁🍁🍁

† CBD goals § Canada's Biodiversity Outcomes	Indicators and Trends *(Chapter 1)*	Accomplishments	Progress
Address threats to biodiversity: habitat loss, land use change and degradation, unsustainable water use			
† **Pressures from habitat loss, and land use change and degradation, and unsustainable water use, are reduced** § Healthy and Diverse Ecosystems; Sustainable Use of Biological Resources *(Chapters 2.1 and 2.4)*	Expansion of Urban Land: area doubled from 1971 to 2001 —	• Increased land-use planning, ecosystem-based approaches • Additions to protected areas networks • Millions of hectares conserved through habitat stewardship programs	
Address threats to biodiversity: invasive alien species			
† **Control threats from invasive alien species (IAS)** § Healthy and Diverse Ecosystems; Viable Populations of Species *(Section 2.2)*	Invasive Alien Species in the Great Lakes: increased from about 10 species in early 19th century to over 60 in last half of 20th century —	• Development of national and provincial IAS strategies • Federal Invasive Alien Species web portal under development • Invasive Alien species partnership program • New regulations for ballast water and wood packing materials	

† CBD goals § Canada's Biodiversity Outcomes	Indicators and Trends *(Chapter 1)*	Accomplishments	Progress
Address threats to biodiversity: pollution and climate change			
† Address challenges to biodiversity from climate change and pollution § Healthy and Diverse Ecosystems; Viable Populations of Species; Genetic Resources and Adaptive Potential *(Chapters 2.1, 2.2 & 2.3)*	**POLLUTION**		
	Lake Acidification: lake chemistry generally improved but species have not recovered + −	• Pollution reduced through stricter regulation of point source pollution	🍁🍁🍁
	Contaminants in Biota: some improvement, e.g. PCBs and DDTs; some increasing contaminant concentrations, e.g. mercury and flame retardants + −		
	CLIMATE CHANGE		
	Change in Temperature: increasing - driving many major ecosystem changes across the country, on the balance with negative impacts on biodiversity −	• Increased attention on climate change mitigation and adaptation (Impacts & Adaptation Report) • International Polar Year research	🍁🍁
	Change in Precipitation: increasing at 66% of stations but decreasing in Prairies ~		
	Change in Net Primary Production: increase since 1985 especially northern Canada ~		
	Thawing Permafrost: widespread changes with permafrost warming in some places, thawing in some −		
	Fire: high variability from year to year. Area of large fires has increased since the 1970s. −		
	Changes in Glaciers and Ice Caps: accelerating melting of Arctic and mountain glaciers −		

† **CBD goals** § **Canada's Biodiversity Outcomes**	**Indicators and Trends** ***(Chapter 1)***	**Accomplishments**	**Progress**
Maintain goods and services from biodiversity to support human well-being			
† **Maintain capacity of ecosystems to deliver goods and services and support livelihoods** § Healthy and Diverse Ecosystems; Sustainable Use of Biological Resources *(Chapters 2.1 and 2.4)*	No indicators developed as yet for this goal	• Enhanced appreciation of the importance of Ecosystem goods & Services (EG&S) • EG&S included as a component of ecosystem status and trends report • Some regional studies in EG&S valuation • Agricultural pilot projects in payment for ecosystem goods and services, and conservation • Environmental Valuation Reference Inventory	

† CBD goals § Canada's Biodiversity Outcomes	Indicators and Trends *(Chapter 1)*	Accomplishments	Progress
Protect traditional knowledge, innovation and practices			
† **Maintain socio-cultural diversity of indigenous and local communities** § Sustainable Use of Biological Resources *(Chapter 2.4)*	Knowledge of Aboriginal Languages - recent increase in aboriginal language speakers reflects increased aboriginal populations; little change in proportion of populations of First Nations, Métis and Inuit speaking aboriginal languages ~	• Increased control over territorial lands through Land Claims agreements • Increased collaboration between government, business and Aboriginal peoples in protected areas, land-use planning, and conservation • Use of TK in species assessment, ecosystem and protected areas planning • Good governance models and best practices for use of TK	
Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources			
† **Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources** § Genetic Resources and Adaptive Potential *(Chapter 2.3)*	No indicators developed as yet for this goal	• Development of ABS policy options and engagement strategy	

Looking Forward

Despite the many actions being taken in Canada to prevent and redress the loss of biodiversity, many of which are presented in greater detail in Chapters 2 and 3, biodiversity is being lost and will come under increasing pressure as land is converted to urban and industrial use, the integrity of ecosystems is compromised by industrial pollution and invasive alien species and a changing climate challenges the capacity of species and ecosystems to adapt or in some cases survive. Canada is fortunate, however, to still have large, relatively intact ecosystems and the opportunity to proactively manage for adaptation and resilience in a rapidly changing world. The following represent some of the important challenges for Canada to ensure that biodiversity continues to support the resilience and adaptive capacity of ecosystems and meet the needs of Canadians for healthy communities and sustainable livelihoods.

The **ecosystem approach** and **adaptive management** are fundamental to ensuring sustainable decision-making that considers cumulative impacts on biodiversity and supports continuous learning and improvement. Biodiversity targets and outcomes, developed in a participatory fashion, are being incorporated within water, land and resource management plans. **Protected areas** are increasingly viewed within broader landscape and seascape approaches and supported by sustainable management regimes on working landscapes. Efforts are being made to expand Canada's network of marine protected areas will help to ensure the ecological integrity of marine ecosystems and the sustainability of marine resources.

Consistent, **long-term monitoring and reporting** of biodiversity **status and trends** is important to determine the rate of loss of biodiversity in Canada, support ecosystem-based and adaptive management, and evaluate the effectiveness of biodiversity initiatives. Due for release in 2010, Canada's first Ecosystem Status and Trends Report will provide a baseline for future reporting and identify priority monitoring requirements and information gaps.

Addressing threats such as invasive **alien species**, and **climate change**, that often emanate from outside our borders, will require enhanced monitoring, research and prediction as well as ecosystem-based approaches and international co-operation. For many species, reducing fragmentation and focusing on the maintenance of **connectivity** will enhance ecological resilience, and adaptive capacity of species and ecosystems. For some species and ecosystems, however, adaptation may not be possible. It will, therefore, be important to assess vulnerability and **plan for adaptation**.

Life cycle management and **eco-certification** are being increasingly adopted by industry to support sustainable production and consumption. By reducing resources and energy used, encouraging emissions and waste-reduction and harvesting sustainably, the impact of industrial processes and resource development on Canada's biodiversity will be lessened.

Identifying the economic contribution of **ecosystem goods and services** lead to policy development and land and resource use decisions that ensure the continued provision of these goods and services. In light of growing pressures, including the impacts of climate change, such analyses are becoming more and more important to our ability to plan for long-term sustainability of Canada's natural assets. Most valuation studies focus on a small selection of EG&S and the overall documentation for Canadian ecosystems is limited and fragmentary.

With close to one half of Canada currently under land claims and self government agreements, the role and contribution of Canada's **aboriginal peoples** has never been more important. There are a growing number of good examples of aboriginal involvement and co-management related to land use planning, protected areas creation, wildlife management and species at risk.

Canada must build on these positive examples of collaborative planning and management while recognizing and respecting the knowledge, innovations and practices of aboriginal communities.

Progress in Canada towards meeting the 2010 target is varied and uneven. There are many examples of action being taken by all sectors both public and private yet biodiversity continues to be lost. Canada's ecosystems, species, and genetic resources provide the country with economic and ecological resilience, while shaping its diverse cultures and lifestyles. Conserving and sustainably using Canada's natural resources is everyone's business. By making continuous learning and improvement a priority, Canadians can continue to benefit from and be enriched by Canada's natural assets.

Annexes

Annex I – Information on Canada and how this report was prepared

A. Reporting Party

Contracting Party	Canada
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Signature of officer responsible for submitting national report	B. James.
Date of submission	22-07-09

B. Process of preparation of national report

Responsibility for the conservation and sustainable use of biodiversity is distributed across the breadth of Canadian society. Canada's Constitution established a federal state, but was fairly unspecific on how capacities to act related to biodiversity were to be distributed amongst the different levels of governments. Canada's federal state now comprises one national, ten provincial and three territorial governments, as well as a large number of Aboriginal and municipal governments. Each government has a wide variety of conservation and sustainable use legislation, policies and strategies in place, the nature of which is dependant on their jurisdiction.

The **federal government** has exclusive federal jurisdiction over treaty-making, international and interprovincial trade and facilities, navigation and shipping, sea coast and inland fisheries. Further the federal government may impose taxation and spend resulting funds, as well as use its "peace, order and good government" clause to address issues ordinarily within provincial jurisdiction that have achieved a national dimension or concern. These powers are broad but constrained by provincial jurisdiction.

Provincial governments have exclusive control over natural resources, public lands belonging to the province and the timber and wood located on these lands, municipalities and any other local and private matters, and broad property and civil rights (including the right to carry on business and make contracts). Provinces share jurisdiction with the federal government over some areas such as agriculture and also may impose taxes of various sorts. In aggregate this jurisdiction gives the provinces the primary lead in conserving wildlife and habitat and in managing how biodiversity is used. This has translated into key legislation for provincial parks, wildlife management, public and private land use planning and a host of management agencies and programs. Some provinces have developed specific strategies and action plans to address the conservation and sustainable use of biodiversity, while other provinces are addressing biodiversity under the umbrella of provincial land use frameworks, natural resources strategies and conservation frameworks.

Territorial governments are established on the basis of delegated powers from the federal government, thus they do not have their own independent constitutional mandate as do the federal and provincial governments. Municipal governments are also under this type of derivative authority, conducting their affairs within the limits prescribed by provinces. Both territorial and municipal governments, however, are well-entrenched institutions and exercise substantial powers and political influence. Many cities are also beginning to incorporate biodiversity into urban planning and design in order to reduce their ecological footprint and create healthier communities.

Shared responsibility for biodiversity among governments in Canada often results in the joint development of strategies, policies and action plans, exemplified through the Canadian Biodiversity Strategy. In addition to the major authorities mentioned above, Aboriginal peoples, private landowners, industry, academic and scientific institutions, environmental non-governmental organizations, and Canadian citizens each play crucial roles in the maintenance of healthy ecosystems, species, and genetic resources. As can be seen throughout this report, collaboration and cooperation between stakeholders is common.

Canada's **Aboriginal peoples** play a key role in conserving biodiversity and ensuring the sustainable use of biological resources, as they have constitutionally protected rights and have more recently gained a greater share of authority over the management and development of their traditional lands. Self-government agreements and land claims,

including co-management arrangements, are important components in the management of biodiversity in Canada.

The importance of **private landowners** varies across the country; in the southern parts of Canada, over 90% of the landscape is under private ownership and is used for agricultural production, forestry, and other purposes. Many areas of public land are also leased for a variety of land uses, such as grazing. In these areas, governments and non-government organizations must work with landowners and land managers to achieve biodiversity goals and objectives.

Forestry, mining, oil and gas, and other **private sector industries** are also land owners and lease holders that have biodiversity responsibilities. They contribute to the conservation of biodiversity by ensuring that their activities comply with laws and regulations and through various conservation and sustainable resource-use measures.

Canada is fortunate to have numerous **educational and research institutions, ex situ facilities and citizen-based, non-governmental organizations** that have taken on responsibilities for the conservation of biodiversity and the sustainable use of biological resources. Their activities include enhancing public awareness, raising funds for projects, providing expertise, acquiring land for conservation purposes, and helping to develop and improve strategies, policies, legislation and programs.

Recognizing the important role that each of these stakeholders plays in the conservation and sustainable use of biodiversity in Canada, the preparation of this report included collaboration and consultation with a variety of governments, groups, industries, and experts across the country. A multi-sectoral workshop, with federal, provincial, territorial, non-governmental organization, educational and research organization, and urban area stakeholders in attendance, was held on March 2, 2009 to encourage input from a variety of groups. On March 3-4, 2009, the Federal Provincial Territorial Biodiversity Working Group (FPTBWG), representing most provinces and territories as well as several federal departments, met to collaboratively review aspects of the draft report.

To seek input from a variety of ENGOs, a study was contracted by Environment Canada to the Canadian Environmental Network, which actively supports its 6000 ENGO members in their involvement in public consultation, working groups, and as conference delegates. The survey, utilized input voluntarily provided by their member organizations. A copy of this survey is posted on the CEN website listed in the references section of this report.

Examples of initiatives being undertaken by industries, local and aboriginal communities, educational and research organizations contributing to the conservation and sustainable use of biodiversity were identified through a review of recipients of prestigious biodiversity-related awards, review of published reports, members of esteemed certification, commitment-based or collaborative networks, and through research and suggestion of federal, provincial, and territorial partners. Industries were also identified through a review of participant presentations at a June 6, 2008 workshop of Business and Biodiversity in Montréal.

Information for Ecosystem Status and Trends (Chapter 1) was collected through expert submissions from scientists in governments, academic institutions and non-government organizations.

Annex II – Progress towards targets of the Global Strategy for Plant Conservation

The 16 targets of the Global Strategy for Plant Conservation (GSPC) address a broad range of topics, including the documentation of plant diversity, in-situ and ex-situ conservation of plant species (including species at risk), protection of areas of importance for plant diversity, sustainable use of plant diversity, capacity-building, and communication, education and public awareness. In Canada, responsibility for programs that contribute to the GSPC is spread across levels of government and departments. Furthermore, substantial progress toward several targets is being made outside of government programs.

Canada submitted a supplement to its Third National Report in December 2006 which included updated information on the 16 targets of the GSPC. Here we report progress toward the targets of the GSPC in Canada since the Third National Report.

Target 1: A widely accessible working list of known plant species, as a step towards a complete world flora.

Working lists of known plant species within Canada have been available for some time. The flora of Canada is incorporated within the Flora of North America project. A decade ago an electronic interactive list of the plant species of Canada from a separate project, the North American Flora, was made available, which includes some analytical and sorting functionality.

The General Status of Species in Canada program is a cooperative effort among federal, provincial and territorial wildlife agencies, led by Environment Canada (see section 2.2). Reports are issued on a 5-year cycle. The 2005 report includes a working list of plant species in Canada, which will be updated in 2010. On-going development of the national vascular plant list is taking place through NatureServe Canada, which serves as a national coordinating organization for provincial and territorial Conservation Data Centres (see section 2.2.1).

Building on technical and scientific innovations in recent years, Canadian researchers are at the forefront of developing new approaches to taxonomy and new tools to support the study and management of biodiversity. Researchers at the University of Guelph (Ontario) have been leaders in the international Barcode of Life (iBOL) initiative (see section 2.3.1). Using methodology developed at the university, an initiative is under way to produce a DNA barcode-based Flora of Ontario under the Floristic Diversity Research Group.

A Federal Biodiversity Information Partnership (FBIP) oversees Canada's participation in the Global Biodiversity Information Facility (GBIF). It facilitates the inclusion of authoritative observational records and specimens from Canadian natural history museums, universities, and government collections on the GBIF portal, and manages the Canadian portal to the on-line Integrated Taxonomic Information System (ITIS*CA), which includes authoritative names and systematic classifications (from the phylum down to the sub-species level) for Canadian species, including plants.

A consortium of university-based researchers in Canada is developing Canadensys as on-line taxonomy and database tool linking plant collections at universities, botanical gardens and natural history museums. With funding support from the Canadian Foundation for Innovation, and in-kind support from FBIP, Canadensys is based at the Montréal Biodiversity

Centre and has the goal of networking databases and supporting the use and management of biological specimens, including herbarium specimens (also see sections 2.2.1 and 3.4).

In future, development of a single portal to an on-line national flora might be considered, in conjunction with existing on-line database efforts such as Canadensys and ITIS*CA.

Target 2: A preliminary assessment of the conservation status of all known plant species, at national, regional and international levels.

Canada has fulfilled this target, in large part through the work of the General Status of Species in Canada program (section 2.2.1), which in turn is largely based on the inventory and monitoring activities of Canada's network of Conservation Data Centres. The 2005 Wild Species report explicitly includes an assessment of the conservation status of all vascular plant species in Canada, corresponding directly to a national target equivalent to GSPC Target 2.

For plant species that may be at risk of extinction, the Committee on the Status of Endangered Species in Canada (COSEWIC) is mandated under the Species at Risk Act (SARA) to provided more detailed conservation status assessments (see section 2.2). Information on individual species at risk and the assessment process can be found on the SARA public registry web site (http://www.sararegistry.gc.ca/sar/index/default_e.cfm).

National conservation status ranks ("Canada ranks") are found in the 2005 update to the Wild Species Assessment (http://www.wildspecies.ca/wildspecies2005). In summary,

- 51% of Canada's 5074 species of vascular plants are "Secure" (2572 species);
- 11% "May Be At Risk" (552 species);
- 9% are "Sensitive" (460 species);
- 2% are "At Risk" (118 species);
- < 1% are "Extirpated" (22 species);
- no native plants are "Extinct";
- 24% of vascular plant species are "Exotic" (1216 species), the highest proportion of non-native species in any group covered in the Wild Species Assessment;
- 2% of Canada's vascular plant species have Canada ranks of "Undetermined" (112 species); and
- 1% have Canada ranks of "Not Assessed" (30 species).

Target 3: Development of models with protocols for plant conservation and sustainable use, based on research and practical experience.

Many organizations and agencies involved in plant conservation and sustainable use initiatives have prepared descriptions of their programs and published their protocols. To date, however, a comprehensive list of models with protocols relevant to plant conservation and sustainable use in Canada has not been prepared.

Canadian researchers and conservation professionals share their results, models and protocols freely with other organizations and institutions on a global scale. For example, Canadian agencies and organizations concerned with management of protected areas have been contributing to this target for many years.

The Recovery of Nationally Endangered Wildlife (RENEW) program under the federal Species at Risk Act (see section 2.2) is generating protocols and models for plant conservation. For example, in the province of Newfoundland and Labrador, recovery of Fernald's Braya (*Braya fernaldii*) and Long's Braya (*B. longii*) - both listed nationally as endangered - has included extensive community involvement, educational programs and research into the ecology of these two species, which are endemic to the North Peninsula of the island of Newfoundland. While these two small species in the Brassica family lack showy flowers, the local community has become excited about their conservation because they are endemic, providing an important point of local pride in something unique to their community.

Plant species recovery can also take place within urban areas. Red Mulberry (*Morus rubra*) is endangered within Canada because of habitat loss and hybridization with the non-native White Mulberry, introduced from eastern Asia. Some of the largest remaining Red Mulberry populations are within a large urban nature sanctuary – the Royal Botanical Gardens in Hamilton, Ontario (see section 3.2).

Target 4: At least 10 per cent of each of the world's ecological regions effectively conserved.

Detailed information on progress in conserving biodiversity within protected areas in Canada is provided in section 2.1.2 and in Annex IIIb. Chapter 1 (Fig. 3) assesses representativeness of the protected areas network by ecological units.

Target 5: Protection of 50 per cent of the most important areas for plant diversity assured.

A national target related to areas of plant diversity has not been formulated. At present there is no established program for identifying or protecting "important areas for plant diversity" within Canada. In this context, it is important to note the small number of species that make up the flora of Canada in relation to other countries of equivalent size, and the small number of endemic Canadian species. However, it is possible to identify Canadian vegetation communities that harbour large numbers of rare or endangered plant species, such as the Garry Oak (*Quercus garryana*) woodlands of British Columbia, the alvars and oak savannahs of Ontario, and the remnant tall grass prairies of Manitoba and Ontario.

Formal classification of vegetation communities has been carried out for some parts of Canada, but a national vegetation classification system is lacking. Efforts to complete such a system are ongoing – notably through efforts of the Conservation Data Centres and the Canadian Forest Service of Natural Resources Canada. This would enable assignment of status ranks to vegetation communities, and would facilitate identification and conservation of the most important areas for plant diversity.

PlantLife International has developed and is promoting a global system of "Important Plant Areas". It works with agencies and organizations within an individual country to refine a set of objective criteria for designating Important Plant Areas for that country. In the summer of 2007 Royal Botanical Gardens hosted an informal meeting of several agencies and organizations interested in plant conservation in Canada, and invited a representative of PlantLife International to discuss the idea of establishing an Important Plant Areas program in Canada. This idea received further support at a national consultation on the Global Strategy for Plant Conservation held in November 2008.

A number of existing protected areas are important for plant conservation. A recent example is the Cartwright Natural Area established by the Hamilton (Ontario) Naturalists Club. This

property was protected specifically because it is the site of a relatively large population of American Colombo (*Frasera caroliniensis*), listed as “endangered” by the Committee on the Status of Endangered Wildlife in Canada.

Among the areas of highest documented plant diversity in Canada are the nature sanctuaries owned by Royal Botanical Gardens, at the western end of Lake Ontario. Although these sanctuaries constitute only about 1000 ha, they include documented wild populations of approximately 23% of the entire flora of Canada.

Target 6: At least 30 per cent of production lands managed consistent with the conservation of plant diversity.

As explained in the technical rationale for the Global Strategy, production lands refer to lands where the primary purpose is agriculture (including horticulture), grazing, or wood production. Production lands are managed primarily to produce biological commodities of economic value, but conservation of biodiversity (plant crops, forage plants, trees) is an integral part of sustainable production systems. Progress in sustainable agriculture and in sustainable forest management is described in section 2.4.2. Almost 1.46 million km^2 of forest area are under three Sustainable Forest Management certification programs in Canada, well over half the forest area in which forestry operations can occur (Chapter 1, Fig. 23). Approximately 34% of annual crop producers and 40% of livestock producers have Environmental Farm Plans (Chapter 1, Fig. 24).

Target 7: 60 per cent of the world's threatened species conserved in situ.

The Committee on the Status of Endangered Species in Canada (COSEWIC, see target 2, above) only considers risk of extinction within Canada in its assessment processes, and does not take into account the status of a species in its range outside of Canada. Most “at risk” plant species occur in the southern portions of Canada and have ranges that extend further south (i.e., into the United States) where they may or may not be at risk. However, information on which species are globally rare or threatened is generally available and is taken into account in developing in situ conservation measures through recovery strategies and action plans.

As of April 2009, 179 species of vascular plants were listed by COSEWIC as being at risk, including 91 “endangered” (the category for species at greatest risk) and 51 “threatened” species. These two categories are assigned priority for recovery efforts under Canada’s Species at Risk Act. In addition, 25 species of lichens and mosses were designated as “at risk”, including 9 “endangered” and 5 “threatened” species.

Target 8: 60 per cent of threatened plant species in accessible ex situ collections, preferably in the country of origin, and 10 per cent of them included in recovery and restoration programmes.

Ex situ collections are created and maintained by a variety of sectors and agencies for a variety of purposes. Within the botanical garden community, globally, at least 80,000 species of plants are now in cultivation. The total number of species within Canadian botanical gardens has not been estimated. There are no available estimates of how many threatened plant species are found in ex-situ collections in Canada. Plant Gene Resources of Canada has a modern facility at the Saskatoon Research Centre of Agriculture and Agri-Food Canada with a large plant seed repository, which is being expanded to include native plant species occurring across Canada (see section 2.3.). The National Tree Seed Centre of the

Canadian Forest Service of Natural Resources Canada has given priority to conservation of rare and threatened tree species (section 2.3.2). Finally, as noted under the previous target, all species listed as “endangered“ or “threatened” under Canada’s Species at Risk Ask are given priority for recovery efforts.

Target 9: 70 per cent of the genetic diversity of crops and other major socio-economically valuable plant species conserved, and associated indigenous and local knowledge maintained.

Measuring progress towards this target is difficult, owing to a lack of available tools to assess the quantitative retention of genetic diversity within gene banks, seed centres, and other facilities and programs.

Canada continues to participate in international plant genetic resource conservation programs that are making progress toward this target (see section 2.3.2). Plant Gene Resources of Canada holds the principal world base collections of barley and oat, and duplicates of pearl millet, oilseed, and crucifers. The Canadian Clonal Gene Bank collects germplasm of fruit trees and small fruit crop species. The Fredericton research center holds clonal collections of potatoes. The National Tree Seed Centre conserves seed collected throughout the range of Canada’s major commercial tree species.

Target 10: Management plans in place for at least 100 major alien species that threaten plants, plant communities and associated habitats and ecosystems.

No specific national target has been established related to Target 10. At the federal level, the Canadian Food Inspection Agency (CFIA) is responsible for preventing the introduction, and limiting the spread, of invasive alien species that threaten plants (see section 2.2.2). This includes fulfilling Canada’s responsibilities under the International Plant Protection Convention. The CFIA’s 2007 Plant Protection Survey Report indicates that active surveys are being done for eight alien forestry pests, two weedy plants that threaten field crops, two invertebrate pests of field crops, two pests (a fungus and a nematode) of potatoes, and 13 insect and microbial pests that threaten horticultural and fruit crops. Eradication programs are under way for some of these invasive alien species.

Target 11: No species of wild flora endangered by international trade

Canada is a signatory to CITES and an active participant in activities to regulate international trade in endangered species, led by the Canadian Wildlife Service of Environment Canada. Four families of native Canadian plants are represented on CITES appendices. Two families have only one representative each (both medicinal plants): Goldenseal (*Hydrastis canadensis*) in the Ranunculaceae, and ginseng (*Panax quinquefolius*) in the Araliaceae; both are at risk. Four species of Cactaceae occur in Canada (all listed on Appendix II); one is at risk. Canada has 76 species in the Orchidaceae, (all listed by CITES); one (Yellow-Fringed Orchid, *Platanthera ciliaris*) is extirpated, 13 are at risk or may be at risk, ten are sensitive, and four are exotics.

All orchid species are listed by CITES on Appendix I or II. In July 2003, an Asian importer of orchids to Canada was convicted under the *Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act* and the *Customs Act* of illegally importing 211 individuals of several species of endangered *Paphiopedilum* orchids (listed on CITES Appendix I) under false import declarations. The company was fined $15 000, of which

$5000 was earmarked for the non-profit group Friends of the Conservatory, to build an educational display at the Winnipeg Plant Conservatory to house the seized orchids.

Target 12: 30 percent of plant-based products derived from sources that are sustainably managed

The number of products based on plants is immense. These range from agricultural and forest products, through plants used for pharmaceuticals and natural medicines, fibres, feed stocks for chemical and other industries, and biofuels. At present Canada does not have an overall inventory of plant-based products.

Target 12 and Target 6 are closely related, referring to “sources that are sustainably managed” and “lands managed consistent with the conservation of plant diversity”, respectively. As noted under Target 6, Canadian producers in the agricultural and forestry sectors have extensive programs in sustainable management.

Target 13: The decline of plant resources, and associated indigenous and local knowledge innovations and practices, that support sustainable livelihoods, local food security and health care, halted.

Canada lacks a national target related to GSPC Target 13. Some relevant information is included in this report: section 2.3.2 describes activities of local and indigenous communities related to access to genetic resources and sharing of the benefits of their utilization; and section 3.3 contains a general discussion of engagement of Aboriginal communities in biodiversity-related initiatives and cross-sectoral partnerships.

Target 14: The importance of plant diversity and the need for its conservation incorporated into communication, education and public awareness programmes.

Botanical gardens, arboreta, natural history museums, zoos, and other institutions that provide regular opportunities for public outreach and contact with living plants are key to the achievement of this target’s goals (see section 3.4). In Canada about 4 million people per year visit botanical gardens. Many more visit zoological parks and natural history museums.

The botanical gardens community has made significant progress in providing public education programs related to plant diversity and conservation through the “Investing in Nature: A Partnership for Plants in Canada” program, which concluded in 2006.

The Museum Assistance Program of the Canadian Department of Heritage has supported development of materials for use by educators at botanical gardens to integrate plant diversity messages into public and secondary school curricula across Canada. These materials are available on-line through the Plant Biodiversity web site (www.plantbiodiversity.ca).

The Canadian Museum of Nature’s Canadian Centre for Biodiversity has established the Native Plants Crossroads (http://nature.ca/plnt/index_e.cfm), which features information on local conservation and community initiatives as well as information on pollination and invasive alien species. This web site also includes a resources section for the general public (see the box on the Canadian Museum of Nature in section 3.4).

The Native Plant Society of British Columbia encourages knowledge, appreciation, responsible use and conservation of British Columbia’s native plants and habitats. It has developed E-Flora BC (www.eflora.bc.ca), an interactive on-line atlas which offers detailed

information on British Columbia's native plants for education, research and conservation purposes.

The Canadian Wildlife Federation chose "Our Home and Native Plants" as the theme for National Wildlife Week, April 2009. Extensive materials for educators are available on line at http://www.nationalwildlifeweek.ca/.

Target 15: The number of trained people working with appropriate facilities in plant conservation increased, according to national needs, to achieve the targets of this Strategy.

Most Canadian universities and colleges provide training relevant to plant conservation. This report mentions only a few examples, such as the Northern Ontario School of Medicine's Boreal Bioprospecting Initiative, the Canadensys project of networking biological databases (including herbarium specimens) led by the Montréal Biodiversity Centre at the University of Montréal in partnership with the Montréal Botanical Garden, and DNA barcoding work led by the Biodiversity Institute of Ontario at the University of Guelph.

Data are not available on the number of trained people working in plant conservation. Developing sustainable sources of funding so that trained people can find careers in this area is a continuing challenge.

Target 16: Networks for plant conservation activities established or strengthened at national, regional and international levels.

A Canadian target relative to Target 16 has not been formally established. Strengthening national networks in support of plant conservation objectives has been a goal of action plans developed since 2000 for botanical gardens and arboreta in Canada. A national network for plant conservation was established in Canada in 1995, the Canadian Botanical Conservation Network (CBCN). In 2006 both the CBCN and Royal Botanical Gardens formally joined the Global Partnership for Plant Conservation. Environment Canada has been a consistent supporter of these networking efforts since 1995. In November 2008 Environment Canada co-sponsored a national consultation on the GSPC at a meeting of CBCN representatives.

A significant new initiative of botanical gardens in North America resulted in the publication in 2007 of the North American Botanic Garden Strategy for Plant Conservation. The strategy is intended to link programs of individual botanical gardens and related organizations to the GSPC.

The Association of Zoological Horticulture (horticulturists working within zoological parks and aquaria) and Botanic Gardens Conservation International have established 18 May as an annual Plant Conservation Day. In 2009 the American Public Gardens Association announced that it would also adopt 18 May as an annual plant conservation and botanical gardens day, to be celebrated and promoted annually. A web site for resources has been established at http://www.plantconservationday.org/.

Annex III Progress towards the Programme of Work on Protected Areas

Purpose

The purpose of this Annex is to provide a broad overview of progress in Canada towards achieving the goals of the Convention on Biological Diversity (CBD) Programme of Work on Protected Areas. This includes both specific advances in protected areas establishment as well as a more thematic treatment of some of the key areas where Canada has experienced significant success over the past five years. The Annex also outlines several emerging issues facing protected areas agencies in the years to come.

The Annex begins with a brief overview of the particular Canadian context for protected areas, followed by sections on the following themes:

- The status of both terrestrial and marine protected areas planning in Canada;
- The success of recent and ongoing partnerships with Aboriginal communities in establishing and managing protected areas;
- Partnerships with other sectors of Canadian society;
- The increasing importance of integrated management planning;
- The importance of active management of protected areas;
- The role of protected areas in re-connecting Canadians with nature; and
- The important role of protected areas in climate change adaptation efforts.

The Annex draws largely on data generated through the development of the Canadian Protected Areas Status Report (2000-2005), published in 2006, which outlined progress and perspectives on protected areas planning and management by governments across the country. It also reflects information on additional successes since 2005, which have been identified in part through consultations with Canada's parks and protected areas agencies.

1.0 Overview

As the second largest country in the world, Canada is home to rich and diverse natural resources. A variety of tools are used to conserve the country's biodiversity, including private land stewardship, community education and action programs, species at risk recovery efforts, and others. Effectively managed protected areas form a critical component of this suite of conservation instruments, and to date have made a significant contribution to Canada's overall efforts to conserve, build awareness, and educate Canadians about biodiversity.

Canadian governments have made significant strides in recent years in establishing and managing networks of protected areas, in partnership with Aboriginal communities, environmental non-governmental organizations and local communities. While shifts such as climate change and a changing society present new challenges and opportunities for protected area managers, a strong foundation has been established upon which to build in the years to come.

Summary of Progress

Canada's terrestrial protected area covers 933,930 square kilometres (km^2). This represents 9.4% of Canada's land base.

0.64% of Canada's ocean surfaces have been protected to date. This represents approximately 45,280 km^2.

A global opportunity

Canada has an unprecedented opportunity to protect natural values that are of regional, national and global significance. In particular, we are one of the few remaining countries in the world that maintains large, relatively unfragmented ecosystems containing functioning natural processes.

For example, Canada's boreal region is one of the largest and relatively intact ecosystems on the planet. Canada's boreal provides habitat for sizeable populations of caribou, wolves, and bears, as well as breeding grounds for more than 30% of the North American bird population.

Canada's Arctic region encompasses vast expanses of tundra and permafrost, and is home to wildlife species such as polar bears, barren-ground caribou, and muskoxen. Both the Arctic and the boreal are home to Aboriginal peoples that have lived in these regions for thousands of years.

In addition, with their broad diversity of marine ecosystems and species, our oceans teem with life. Canada also has the longest coastline in the world, as well as access to nearly 20% of the world's freshwater resources.

Canada has a global responsibility to protect and conserve these exceptional places. A key tool for doing so is our national system of parks and protected areas.

At the same time, these networks also play an important role in our more fragmented southern and coastal landscapes by acting as core areas where biodiversity is concentrated, complemented by a range of other stewardship conservation tools.

Together these protected areas provide literally billions of dollars in ecological goods and services – among them clean air and water, productive forests and oceans, climate regulation and pest and disease control.

Globally Significant Ecosystem Services

A 2005 study commissioned by the Canadian Boreal Initiative suggested that the value of ecosystem services such as water filtration and carbon sequestration in the boreal represent roughly 2.5 times the net market value of industrial development in the region. A follow-up study in 2007 estimated the value of these ecosystem services in the Mackenzie Region alone at close to $500 billion.

Canada's parks and protected areas also provide an unparalleled opportunity for Canadians to enjoy, learn and experience the wonders of their natural world. They provide a foundation for nurturing a conservation ethic within society now and into the future.

A shared responsibility

Nature conservation is a shared responsibility in Canada. All governments – federal, provincial, and territorial –have legislation, policies and programs in place to establish and manage protected areas. Aboriginal governments and land claims organizations play an increasingly significant role in protected area establishment and management. Citizens also play a vital role in conservation efforts through private land trusts, non-governmental organizations, and through their own interactions with these natural places.

Currently, federal departments such as the Parks Canada Agency (PCA) and Environment Canada (EC) manage approximately 50% of the total area contained in Canadian protected areas, while 50% are managed by provincial and territorial governments. The federal government has traditionally played a greater role in marine ecosystems. Fisheries and Oceans Canada (DFO), PCA and EC administer almost 90% of the total area contained in all marine protected areas established to date.

Canadian governments collaborate through a variety of mechanisms on issues related to protected areas. Federal, provincial and territorial governments have all signed a Statement of Commitment to the Canadian Biodiversity Strategy, which recognizes the key role that protected areas play in conserving biodiversity and achieving the other goals of the Convention on Biological Diversity.

Federal, provincial and territorial officials also work together through the Canadian Parks Council, the Oceans Task Group, the Canadian Council on Ecological Areas, and other inter-agency coordinating committees on wildlife and habitat management issues. These councils provide invaluable mechanisms to exchange information and encourage cooperation across the country. They also support Canada's involvement in various international conventions, programs and organizations, such as the World Heritage Convention, UNESCO's Biosphere Reserves Program, and the World Conservation Union (IUCN) and its World Commission on Protected Areas.

Progress towards integrated national protected areas reporting and tracking

In close cooperation with the Canadian Council on Ecological Areas, Environment Canada is developing the Conservation Areas Reporting and Tracking System (CARTS). CARTS will allow jurisdictions to track the amount of lands and waters in Canada's protected areas in a consistent, standardized and authoritative manner. Significant progress has been made towards the finalization of this system.

2.0 Terrestrial Protected Areas

Canadian governments at all levels have made significant strides in recent years in establishing and managing Canada's terrestrial protected areas in support of biodiversity conservation.

Types of terrestrial protected areas in place across the country include national and provincial parks, migratory bird sanctuaries, national wildlife areas, wilderness areas, conservancies and ecological reserves. The specific design criteria, management objectives and levels of protection offered by each of these areas differ by jurisdiction.

For example, many protected areas agencies apply the principle of representation (i.e. ensuring that the diversity of natural features within each natural region is represented within the protected area system as a whole). Other criteria include the conservation and protection

of wildlife and wildlife habitat; unique and productive ecosystems/habitats; critical habitat for endangered or threatened species; and responding to initiatives of local indigenous communities. Many of Canada's parks and protected areas also have an important mandate to connect Canadians with their natural world, which is critical to their success as a conservation tool.

Protected area agencies are also increasingly recognizing the importance of maintaining key ecological processes and functions (e.g. natural processes such as fire) and enhancing connectivity within and between protected areas. Planning for these values in turn requires a greater understanding of and participation in broader regional planning efforts (See Section 6.0).

Many Canadian governments have established protected areas targets for their jurisdictions. For example, Nova Scotia's *Environmental Goals and Prosperity Act* establishes legislated targets for protected areas. It commits the province to protecting 12% of the province by 2015. The province has made significant inroads in increasing the amount of protected lands it manages since 2005.

Current Status

Canada's terrestrial protected areas currently include a total of 933,930 km^2 across the country. This represents 9.4% of the country. The distribution of these protected areas by ecological units is described in Chapter 1.

The distribution of these protected areas differs greatly across the country. The greatest progress has been made in the Montane Cordillera, Boreal Cordillera, and Pacific Maritime ecological units, where protected areas represent 18.6%, 16.4%, and 15.7% of their respective regions. In part, this reflects recent progress made by the province of British Columbia in completing comprehensive land use plans, including the establishment of protected areas, for major portions of the province (see Section 6 for additional details).

Freshwater Ecosystems

While historically, little attention had been given to considering effective representation of freshwater ecosystems within terrestrial protected areas planning initiatives, efforts are now underway by some agencies to enhance planning for protection of inland freshwater ecosystems. A number of jurisdictions are beginning to incorporate conservation of freshwater systems into their protected areas planning. However, no reporting currently exists on the amount of freshwater habitat contained within Canada's protected areas networks.

Significant progress in recent years includes efforts by the governments of Canada and Ontario to establish the Lake Superior National Marine Conservation Area. At just over 10,000km^2, this area will be the largest freshwater protected area in the world, and will help protect the pristine waters and aquatic biodiversity of the world's largest lake. Under the *Canada National Marine Conservation Areas Act*, the area will be managed for ecologically sustainable use of its biological resources while also fully protecting special features and sensitive ecosystem elements. Its management plan will be developed with the input of regional First Nations and an advisory committee, and will consider resource conservation, opportunities for visitor experiences and learning, as well as benefits to local communities and First Nations.

Moving Forward

Most governments have developed protected areas strategies to guide the selection of candidate sites within their jurisdiction. Significant progress has been made in a number of

provinces and territories to complete implementation of these strategies. These strategies will continue to guide work by individual jurisdictions towards meeting their protected areas goals in coming years.

Northwest Territories Protected Areas Strategy (NWTPAS)

The Northwest Territories Protected Areas Strategy (NWTPAS) is jointly administered by the governments of Northwest Territories and Canada, in partnership with Aboriginal communities, land claim organizations, industry, and non-profit organizations. Focused on protecting both special natural and cultural areas as well as representative core areas in each territorial ecoregion, the NWT PAS has become a vital mechanism for local communities to take the lead in identifying and nominating protected areas based on cultural values and traditional knowledge. Sixteen communities are currently involved in identifying and advancing 20 candidate areas throughout the territory.

Governments are also making progress on working collaboratively on a more ecoregional basis, including the establishment and management of transboundary protected areas. For example, British Columbia (B.C.) and Alberta have established an inter-provincial park that includes Kakwa Provincial Park in B.C., and Kakwa Wildland and Willmore Wilderness Parks in Alberta. These areas form the northern terminus of a complex of protected areas in the Rocky Mountains. This initiative will facilitate ecosystem-based management approaches to a number of transboundary issues, including wildlife management, forest health, visitor services, and recreation management.

Recent Progress in Quebec

In the last few years, Quebec has made impressive progress in creating protected areas and protecting biodiversity. From 2002 to 2009, almost 124,000 km^2 of protected area were added through two strategic action plans. More than 53,600 km^2 were added in 2008-2009 alone, with the result that Quebec now has 135,450 km^2 in protected areas, representing 8.12% of its territory.

In 2002, most of the protected areas were concentrated in southern Quebec, close to populated areas. Today, they are scattered over all of the 13 natural provinces. A natural province represents the first level of subdivision of Quebec's ecosystems. In three of the 13 natural provinces, over 10% of the area is protected; in one, the protected area accounts for more than 25%.

The expansion of protected areas was especially noteworthy in the boreal forest. Since 2002, the protected area located in this zone went from 23,800 to 97,300 km^2. Now, 9.2% of the boreal forest area is dedicated to conservation.

On March 29, 2009, Quebec committed to protecting 12% of its territory by 2015.

Some recent advances:

- The proposed Rivière Dumoine aquatic reserve covers almost 1,500 km^2 in Témiscamingue and Outaouais. It will protect one of southern Quebec's last natural rivers.
- With an area of 4,259 km^2, the proposed Paakumshumwaau-Maatuskaau biodiversity reserve is of substantial ecological and cultural value, particularly for the Wemindji Cree community. The watersheds it protects are almost all in their natural state. Here, traditional and scientific knowledge combine in protected the territory.

- The Rivière George protected area and the Monts Pyramides National Park reserve adjacent to it cover an area of approximately 9,900km^2. The Quebec government is protecting this majestic river along its entire course, over about 350 kilometres from where it is joined by its major tributary, Rivière De Pas. This makes it Quebec's largest protected river. These protected areas will help protect one of the Quebec Arctic's largest caribou herds, with a population of 385,000 head.
- New proposed biodiversity reserves close to Lac Evans will help protect woodland caribou in this part of the boreal forest.
- The Baie aux Feuilles National Park reserve (3,868 km2) borders one of the biggest river estuary systems in northern Quebec, which is characterized by enormous seventeen metre tides. Among other things, this is the only site in Quebec where muskoxen are found.

Several governments also participate in regional, national and international protected areas initiatives, such as the Circumpolar Protected Area Network of the Arctic Council. These broader efforts will provide important context for additional protected areas establishment work in Canada over the next five years and beyond.

Canada has not undertaken a national gap analysis to explore future biodiversity conservation needs.

3.0 Marine Protected Areas

The Pacific, Atlantic and Arctic Oceans bound Canada to the west, east, and north. Ocean waters within Canada have a combined surface area of approximately 7.1 million km^2 and almost 250,000 kilometres of coastline. These oceans are home to an astonishing array of species and special features, and have a rich human history of settlement, commerce and recreation. A large percentage of Canada's ocean waters are currently undeveloped.

Marine protected areas can play a vital role in conserving marine species and their habitats. Unlike terrestrial protected areas, which are relatively restrictive in terms of acceptable uses, marine protected areas typically reflect a mix of permissible and restricted activities at different surface levels. As a result, decisions regarding the appropriate scale and use of these areas are determined on a site-by-site basis.

While some provinces and territories have legislation that enables them to create marine protected areas in coastal areas, the federal government has primary responsibility for ocean management in Canada.

At the federal level, overall responsibility for leadership and coordination of oceans-related activities rests with Fisheries and Oceans Canada. However, three federal departments have legislative authorities enabling them to establish and manage marine protected areas:

- *Fisheries and Oceans Canada* creates Marine Protected Areas (MPAs) to conserve and protect fish, marine mammals and their habitat, unique areas, or areas of high productivity;
- The *Parks Canada Agency* establishes National Marine Conservation Areas (NMCAs) to protect and conserve representative examples of marine regions across the country and for public benefit, education and enjoyment; and
- *Environment Canada* has authority to establish both Marine Wildlife Areas (MWAs) and National Wildlife Areas (NWAs) with a marine component in order to conserve and protect habitat for key wildlife species, including migratory birds and species at risk.

In addition to these programs, the federal government also contributes to marine conservation through the establishment of marine components within a number of national parks and migratory bird sanctuaries, and through the establishment of other protection measures such as fisheries closures. Canada's emerging national network of marine protected areas will also include a number of existing and future coastal sites designated by provincial and territorial governments.

At the international level, Canada participates in marine protected area network planning through initiatives such as the Commission on Environmental Cooperation - Biodiversity Conservation Working Group's North American Marine Protected Areas Network (NAMPAN). One of the most comprehensive projects of NAMPAN to date has been the development of a NAMPAN Condition Assessment Scorecard, which distils large amounts of complex technical and traditional/local ecological knowledge about MPA conditions for 10 piloted sites in Canada, the United States, and Mexico.

Current Status

Approximately 45,280 km^2 (0.64 %) of Canada's oceans are protected. Although some terrestrial protected areas on Canada's coasts have marine components, the designation of specific marine protected areas (such as designation of National Marine Conservation Areas by Parks Canada Agency and Marine Protected Areas by Fisheries and Oceans Canada) is newer.

In general, progress on marine protected areas in Canada is newer than similar efforts on land. This is due in part to the relatively recent passage of applicable legislation to establish these areas, lack of knowledge marine ecosystems, lack of public awareness, and the fact that a large percentage of Canada's oceans are not yet under development pressure.

The Gully

The largest marine canyon in eastern North America, the Gully located off Nova Scotia near Sable Island, was designated as a Marine Protected Area in 2004 by Fisheries and Oceans Canada. This 2,364 km^2 area is recognized internationally for the exceptional species and habitats it contains, including deep-sea corals and habitat for the endangered northern bottlenose whale. The MPA contains varying levels of protection for the three management zones within its borders. Further guidance for long-term stewardship of the site is provided in the Gully MPA Management Plan, published in 2008.

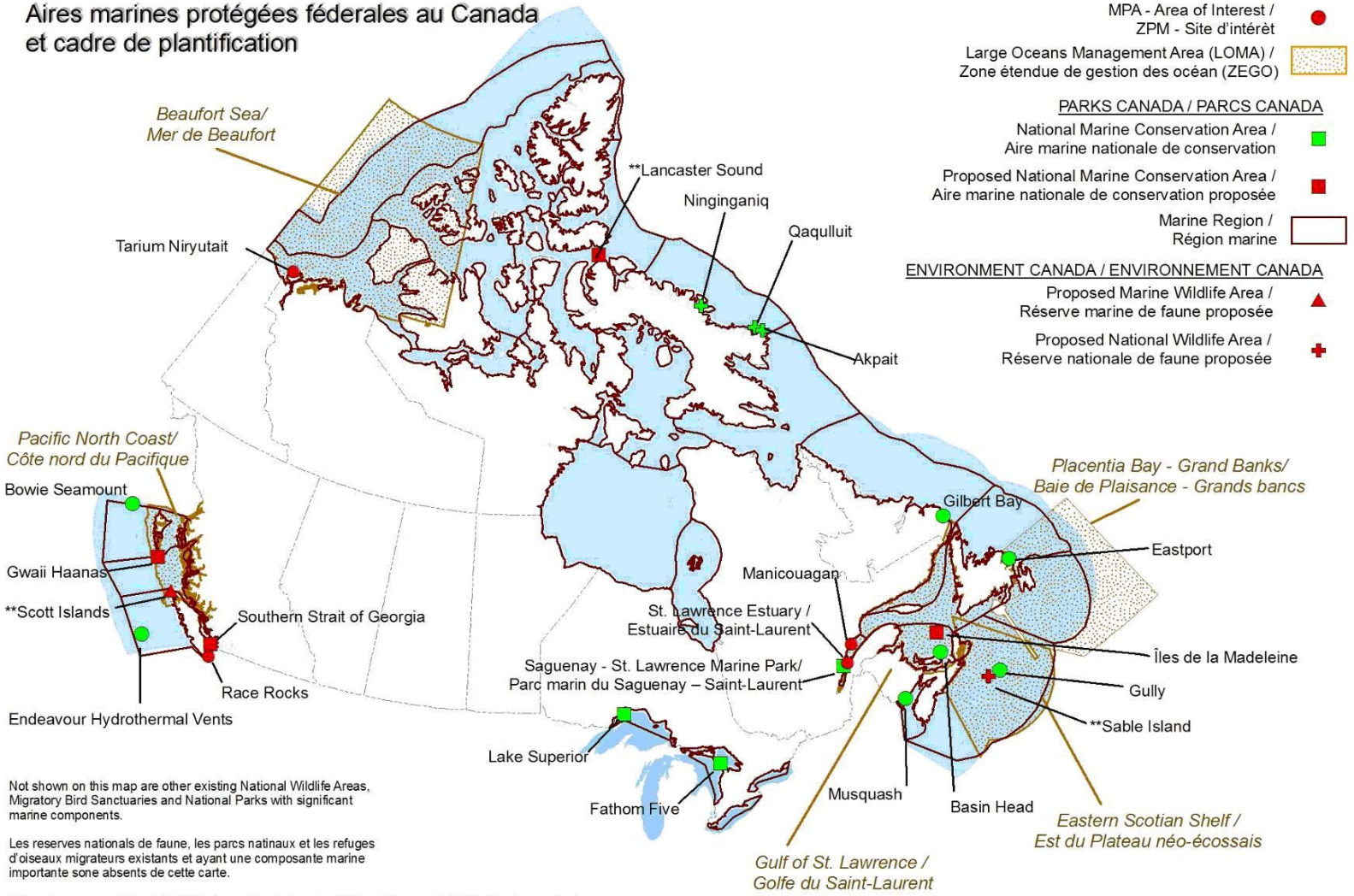
The Gully canyon contains over a dozen species of coral; as such, the Gully MPA makes an important contribution to coral conservation in Atlantic Canada. Conservation of corals and their habitats is also being addressed through broader integrated management efforts in the region. For example, a Coral Conservation Plan was released in 2006 to provide a more comprehensive conservation strategy for coral species in the Maritime region.

Moving Forward

Federal MPA agencies are presently working towards establishment of an additional 13 to 15 sites by 2012. The current extent of the federal network, as well as a number of areas where planning is underway, is outlined in the following figure.

Canada's Federal Marine Protected Areas and Planning Framework

Aires marines protégées féderales au Canada et cadre de plantification



Not shown on this map are other existing National Wildlife Areas, Migratory Bird Sanctuaries and National Parks with significant marine components.

Les reserves nationals de faune, les parcs natinaux et les refuges d'oiseaux migrateurs existants et ayant une composante marine importante sone absents de cette carte.

** Denotes proposed Budget 2007 sites, not including six additional Oceans Act MPA sites to be selected.
** Indique les sites proposés dans le budget 2007, excluant les six Zones de Protection Marine à être identifiées en vertu de la Loi sur les océans

At the federal level, departments responsible for marine protected areas are working together to be more strategic and collaborative in establishing new MPAs and participating in the development of a national network of MPAs with the provinces and territories.

For example, a Federal Marine Protected Areas Strategy (FMPAS) was released in 2005 to enhance cooperation towards completion of the federal component of the national network of MPAs. The Strategy has four primary objectives: 1) to establish a more systematic approach to marine protected area planning and establishment; 2) to enhance collaboration with other jurisdictions (including Aboriginal peoples) for the management and monitoring of marine protected areas; 3) to increase the awareness, understanding and participation of Canadians in the marine protected areas network; and 4) to link Canada's network of marine protected areas to continental and global networks.

To implement the first objective of the FMPAS, officials have developed a Federal Guide for Collaborative Planning of Marine Protected Areas. The guide outlines a framework for federal action that includes the systematic collection of information, assembly of conservation objectives, and prioritization of potential candidate network sites.

Several pilot projects have also been launched under the FMPAS to explore collaborative public education and awareness approaches among adjacent or neighbouring sites. For example, federal officials worked jointly to develop shared public outreach materials for the Saguenay-St Lawrence Marine Park (PCA), the proposed St Lawrence Estuary MPA (DFO) and several national wildlife areas/migratory bird sanctuaries (EC).

Efforts are also underway nationally to enhance collaboration between federal, provincial and territorial agencies with a mandate to establish and manage marine protected areas, coordinated by the Oceans Task Group of the Canadian Council of Fisheries and Aquaculture Ministers. These national efforts aim to ensure that the overall national network linking MPAs will attain ecological objectives that go beyond what individual sites could achieve on their own.

Intergovernmental Cooperation on Marine Protected Areas

The governments of Quebec and Canada are collaborating in the establishment of marine protected areas. For example, the 1,246km^2 Saguenay-St. Lawrence Marine Park was created in 1998 and is managed jointly by the two governments. In 2007, the two governments set up a bilateral group on marine protected areas, with the common goal of establishing a network of new marine protected areas in Quebec by 2012 that preserves the richness and represents all aspects of coastal, marine and benthic biodiversity in the province. Recent progress includes collaboration between the two levels of government to strategically align a proposed provincial aquatic reserve in Manicouagan with a proposed DFO marine protected area in the same region.

These national efforts also involve strengthened partnerships with a variety of players both in Canada and around the world. For example, in January 2008, Fisheries and Oceans Canada and World Wildlife Fund Canada co-hosted a workshop on international guidance and lessons learned for developing Canada's marine protected areas network. This session provided a unique opportunity for representatives of federal, provincial and territorial governments, ENGOs and Aboriginal organizations to seek advice from international experts.

Canada is also providing leadership on international efforts to identify marine areas beyond national jurisdiction in need of protection. Canada has hosted one expert workshop on this issue, with another taking place in Ottawa in September 2009.

These and other collaborative efforts will continue in coming years, as all jurisdictions work to complete and maintain comprehensive networks of marine protected areas in Canada.

4.0 Partnerships with Aboriginal Communities

As Canada's first inhabitants, Aboriginal peoples have a unique relationship to its lands and waters. Given this long-standing use and occupancy, many communities have constitutionally-protected rights with respect to their traditional territories. As such, they represent critical partners in the establishment and management of protected areas across the country.

The relationship between protected areas agencies and Aboriginal communities has sometimes been strained. Settlement of Aboriginal land claims and finalization of Impact Benefit and other agreements has been instrumental in helping to develop strengthened partnerships that promote mutual respect and support protection of both cultural and ecological values.

Documenting Best Practices

In 2007, Parks Ministers released a series of case studies profiling leading collaborative work between Aboriginal peoples and Canada's park agencies. These case studies highlight best practices in Aboriginal engagement across the country in a variety of areas including: cooperative involvement in park planning and management, participation in broader regional planning initiatives, incorporation of traditional knowledge into park planning and management, creation of economic opportunities such as tourism ventures, and the use of parks as cultural learning opportunities for Aboriginal youth. The case studies can be found at http://www.parks-parcs.ca/english/cpc/aboriginal.php.

Aboriginal peoples are now extensively involved in the establishment of protected areas in Canada. To date, Aboriginal peoples have been involved in establishing over one quarter of the total lands within Canada's protected areas. For example, on June 2009, the Government of Canada, in partnership with the Dehcho First Nations, expanded Nahanni National Park Reserve by over 25,000 square kilometres of Canada's northern wilderness, thereby protecting important habitat for grizzly bears, woodland caribou, Dall's sheep, and many other species.

The Quebec Inuit actively participate in all stages leading to the creation of protected areas in the Nunavik region of the province. Under the terms of an agreement signed with the government of Quebec in 2002, the Kativik Regional Government (KRG) is now directly responsible for key stages of the park establishment process, including community liaison and acquisition of both traditional and western scientific knowledge. In addition, once a provincial park is established in Nunavik, its management is delegated to the KRG. As such, the Pingualuit park created in 2004 is the first national park in Quebec to be managed by aboriginal peoples.

Indeed, Aboriginal communities are increasingly the driving force behind protected areas, particularly in the northern territories where negotiation of comprehensive land claims provides a formal mechanism for cooperative land and resource management. Many

significant protected areas gains made in the Northwest Territories in recent years are supported by claim negotiations.

Protecting historic and cultural values – Kusawa Park, Yukon

Kusawa Park in the Yukon Territory was established and is being planned through a cooperative effort by a number of First Nations and the Yukon Government. The park, which represents extremely important historic and cultural values for First Nations communities, is identified as a settlement agreement park within both the Kwanlin Dun First Nation and the Carcross Tagish First Nation Final Agreements. Although it is not identified in their Final Agreement, the Champagne Aishihik First Nation are also involved in park planning efforts, given that the site is also part of their traditional territory.

The park management plan under development also reflects the importance of First Nations participation in determining the overall direction, management policies and practices for the site. The Kusawa Park Steering Committee is composed of representatives of three First Nations and Yukon Government. It is addressing a full range of park management issues as it develops a recommended park management plan for the area.

Other leading examples include the work of four First Nations straddling the Ontario-Manitoba border. The Pikangikum, Poplar River, Paunigassi and Little Grand Rapids First Nations have signed a Protected Areas and First Nation Stewardship Accord to promote protection of their traditional lands. Together with the governments of Ontario and Manitoba, they are promoting this area, which is on Canada's tentative list of future UNESCO World Heritage Sites.

These First Nations have driven the protected areas establishment process since its inception. Their leadership, clear articulation of an overarching conservation vision for their lands, and integration of traditional knowledge and western science have been essential to its success. Recent steps towards achieving this vision include identification of dedicated protected areas in the Pikangikum First Nation's Whitefeather Forest Land Use Strategy. In this Land Use Strategy, called Keeping the Land, Pikangikum First Nation identified 35% of the Whitefeather Forest, over 4000 km^2, as Dedicated Protected Areas.

Recent negotiation of a land use plan by Poplar River First Nation that will ultimately protect over 8000 km^2 of their traditional territory also marks important progress in this area. In addition, in December 2008, the Manitoba Government introduced the East Side Traditional Lands Planning and Special Protected Areas Act, which will grant greater authority to these communities to protect cultural and ecological values while planning for the sustainable use of traditional over the long-term.

One of the factors behind the success of some of these initiatives is the incorporation of traditional knowledge and activities into protected area establishment and management. A powerful example of this approach is in the future Albanel-Temiscamie-Otish Park in Quebec. As a result of ongoing dialogue between the Cree Nation of Mistissini and Quebec officials, an important role for trapline tallymen has been confirmed in the development, management, and long-term stewardship of the park. These tallymen are senior hunters that play a key role in enforcing community rules regarding hunting and fishing on traditional traplines. Involving these tallymen in a leadership role, while also confirming that traditional activities will continue within park boundaries, has been instrumental in building community support for the park.

As the first inhabited park in Quebec, the site represents an important model for partnerships that promote both conservation and respect for cultural traditions and activities. It is also indicative of growing trends in northern Quebec and elsewhere across the country towards formal joint or delegated management, and the explicit protection of cultural values within protected areas. For example, the proposed Tarium Niryutait Marine Protected Area in the Beaufort Sea will provide protection not only for beluga whales and their habitat, but also the traditional beluga subsistence harvest that is of extreme cultural importance to the Inuvialuit.

Protected Areas and Cultural Landscapes – A Nunavut Example

Recognizing how difficult it is to separate cultural and natural resources, Nunavut Parks initiated a Cultural Landscape Resource Assessment to gain a better understanding of overall landscape resources for a proposed park in the Clyde River area. The assessment included places to which oral traditions are attached, as well as places associated with living heritage including natural features, wildlife areas, archaeological and palaentological sites, graves and burial grounds, and community use or recreation sites. Through a variety of means including community consultations and interviews with elders, residents were invited to add information about what is important to them about the landscape and resources in the area to maps of the study area. The collected information was recorded in a GIS database and will be combined with other knowledge of the area to produce a comprehensive database for planning and managing the park area.

In 2008, Nunavut Parks started working with residents of Kugaaruk to further develop this model through a similar study towards a proposed Territorial Park. This project will not only develop a cultural landscape resource inventory for Kugaaruk, but will also produce a framework that can be applied to all territorial parks throughout Nunavut. The project will also produce a Training Manual in order to facilitate the use of this framework by future Community Joint Planning and Management Committees as they record and analyze natural and cultural resources, capture related Inuit Qaujimajatuqangit (traditional knowledge), and maintain records of oral histories and knowledge related to all park landscapes. A further extension of this information will be the development of a new ecological and cultural landscape-based System Plan for Nunavut Parks. The fact that this process considers both quantitative and qualitative aspects of cultural heritage resources in the landscape makes the approach developed for Clyde River's cultural heritage assessment precedent setting.

Efforts are also underway to ensure that protected areas provide meaningful economic benefits for Aboriginal communities. For example, a cooperative eco-tourism venture with the Vuntut Gwich'in First Nation, Vuntut Development Corporation, Yukon Parks and a local company to support grizzly bear viewing in the Ni'iinlii'Njik (Fishing Branch) Park was formally launched in 2006. This joint effort aims to promote a unique experience for tourists in ways that benefit the local Aboriginal community while protecting the bears and their habitat.

New types of protected areas designations are also emerging as a result of Aboriginal land claims and partnership agreements. For example, as part of the coastal planning processes initiated in the temperate rain forests of British Columbia, the provincial government agreed to create a new Conservancy designation under their Parks Act that includes as one of its purposes 'the preservation and maintenance of social, ceremonial and cultural uses of first nations'. These conservancies will be managed in collaboration with First Nations, in order to

balance the protection of ecosystems with the maintenance of cultural uses and the diversification of the economies of coastal communities. First Nations are also assuming a greater role in direct operation of conservancies through community based guardian and watchmen programs.

These and other activities are helping to build strong and enduring relations between protected areas agencies and Aboriginal communities. It represents one of the most significant areas of success for Canada in recent years.

5.0 Partnerships with other sectors of Canadian society

In addition to growing partnerships with Aboriginal communities, Canada's success to date has relied on strong partnerships with private citizens, NGOs and industry.

Private donations of ecologically sensitive land are becoming an important conservation tool, particularly in the southernmost parts of the country where much of Canada's lands are privately held. As a result, many Canadian governments formally include private conservation lands in their protected areas networks.

A wide variety of private lands organizations are active across the country, including over 200 independent land trusts and conservation authorities. Many of these organizations now belong to the Canadian Land Trust Alliance (CLTA), which works to strengthen the land trust movement nationally through partnerships, communication and training.

Other active organizations include groups such as Ducks Unlimited Canada (DUC). DUC has completed over 7000 habitat projects across the country, and works in partnership with over 17,000 landowners in support of habitat conservation.

Working with Private Landowners in Alberta

In 2008, Alberta established the "OH Ranch Heritage Rangeland" and developed cooperative management guidelines in partnership with a private landowner of OH Ranch, the Nature Conservancy of Canada (NCC), Southern Alberta Land Trust Society (SALTS) and multiple government departments. This public-private partnership represents the culmination of a collaborative effort to conserve Alberta's native grassland ecosystems. Both the private land under conservation easement and the public land established as a heritage rangeland under protected areas legislation will continue to be managed as a single unit under one operating ranch to conserve the native grassland ecosystems. Ongoing management of the OH Ranch Heritage Rangeland represents a collaborative and cooperative effort between all partners.

In recent years, governments have introduced incentives to encourage private land conservation. All provinces have legislation that allows for conservation easements. In addition, both the federal and some provincial governments offer tax benefits for land donations, while several provinces have established matched-funds partnerships with local land trusts. More recently, the federal government eliminated the tax on any capital gains on charitable donations of ecologically sensitive lands certified under the Ecological Gifts Program in order to remove tax and financial barriers to conservation efforts.

In addition, in 2007, the Government of Canada invested $225 million in the Natural Areas Conservation Program to help non-profit, non-government organizations secure ecologically sensitive lands. This program is administered through an agreement with the Nature Conservancy of Canada (NCC), which will partner with other NGOs to match funds for each

federal dollar received. A science-based process will be used to identify and acquire ecologically sensitive lands through donations, purchase or stewardship agreements with private landowners. Priority is given to lands that are nationally or provincially significant, that protect habitat for species at risk and migratory birds, or that enhance connectivity or corridors between existing protected areas.

A recent success fostered through this program is the NCC's 2008 purchase of the Darkwoods property, which provides important habitat for a number of species at risk including the last remaining Mountain Caribou herd in the region. Located in south-central British Columbia, this 55,000 ha site represents the single largest private land conservation purchase in Canadian history.

Fostering a network of private protected areas in Quebec

Between 2002 and 2008, the Quebec government invested over $20 million in private lands conservation efforts. These investments, which have leveraged significant contributions by other conservation players, have resulted in the acquisition by private conservation organizations of 166 properties representing over 14,000 ha. Almost 75% of these projects have contributed to habitat protection for species at risk. Of particular note is a $3.3 million investment by the Quebec government in to support acquisition of more than 4000 ha of lands owned by forest products company Domtar Inc in the Sutton Mountain Range. This represents the largest private conservation agreement in Quebec history. In January 2009, the government of Quebec launched a new partnership program to build on these efforts. With a $25 million budget over five years, this program aims to further contribute to the development of a network of private protected areas in the province.

Partnerships with industry are also helping to achieve conservation successes in both the marine and terrestrial environments. For example, Fisheries and Oceans Canada has worked with the Canadian shipping industry to re-route some shipping lanes around the North Atlantic Right Whales' migratory path and establish a voluntary Area to be Avoided near the Roseway Basin south of Nova Scotia.

Working with industry to ban logging in Manitoba's Provincial Parks

The Manitoba government has introduced legislation that will prohibit logging in 80 of its 81 existing provincial parks, as well as in all future parks. Timber harvest activities dating back to the 1880s were allowed to continue in five major provincial parks when they were established in the 1960s and 1970s. The provincial government has reached agreements with the two major logging companies, Tembec Inc. and Tolko Industries Ltd., who held harvesting rights in four of these five parks. As a result, all commercial operations will cease in Whiteshell, Nopiming, Clearwater and Grass River Provincial Parks effective April 1, 2009. An additional 16 smaller quota holders will also be moved out of these four parks. The complexity of agreements with commercial harvesters in Duck Mountain Provincial Park will not allow operations to end at this time, as local mills and jobs are completely dependent on this wood supply. This policy decision by the government required a substantial amount of work to end a practice that was entrenched decades ago. It focused not just on environmental objectives but also took into consideration economic impacts and social dynamics. Ending the practice of logging within Manitoba's provincial parks is one more step toward permanent protection of these areas and will help ensure they remain natural landscapes for all to enjoy.

These initiatives and hundreds like them across the country illustrate the power of partnerships in achieving shared conservation goals. Continuing to work with all sectors of society will be critical for Canadian governments in their ongoing efforts to complete, enhance and maintain their protected areas networks over time.

6.0 Integrated Management Planning

Competing resource demands from different players require governments to make decisions and often trade-offs about where and how resources are developed and which areas receive protection. Historically, these decisions have often been made on an ad hoc, site-by-site basis.

At the same time, while parks and protected areas make a key contribution to maintaining ecological integrity, they rarely protect entire ecosystems. As such, engaging in broader ecosystem planning initiatives is important to help ensure that resource use outside of protected areas is sustainable, provides habitat connectivity, and contributes to overall ecosystem health.

Governments are increasingly establishing integrated planning processes to develop more holistic approaches for the conservation and sustainable use of Canada's lands and waters. In most cases, these integrated planning processes specifically include provisions to identify and establish new protected areas. They also typically provide a formal mechanism for bringing a broad range of players – including government officials, Aboriginal and local communities, industry, and conservation organizations – to the table to help collaboratively resolve competing demands.

Canadian governments have made significant progress in integrated management planning in recent years. This includes defining areas where planning will occur, establishing appropriate governance structures, developing frameworks to guide planning activities, and completing comprehensive plans in various parts of the country.

Current Status

Most provinces and territories have now initiated integrated planning processes for all or portions of the land bases for which they are responsible. For example, since 2006, B.C. has completed land use planning processes on the North and Central Coast (Great Bear Rainforest), Haida Gwaii, the Sea to Sky corridor between Vancouver and Whistler, and the Morice area in the northern interior. These land use decisions were arrived at through multi-stakeholder consultations, followed by government-to-government discussions with First Nations communities in each of the planning regions. These processes have contributed to the establishment of over 150 new protected areas and additions to existing protected areas encompassing over 20,000 km^2 of land and foreshore in that time.

Land-Use Framework for Alberta

The Government of Alberta established a new Land-Use Framework for the province in 2008. This Framework is a comprehensive strategy for addressing cumulative impacts of multiple industrial developments on the province's environment. Under the auspices of the Framework, the provincial government will work to develop regional land use plans in partnership with a range of regional and local organizations. A more detailed implementation plan is currently under development.

In addition, Manitoba has been working with First Nations since 2001 on a broad area planning process for their traditional lands on the East Side of Lake Winnipeg, an area covering 83,000 km^2 and an important tract of intact boreal forest in Canada. The Wabanong Nakaygum Okimawin (WNO) process brings together local communities, First Nations, industry and environmental organizations to develop a vision for land and resource use in the area.

Integrated management planning may also occur in the context of resource management planning. While these types of planning initiatives have not always provided for the identification of new protected areas, consideration of conservation values requiring longer-term protection is now increasingly incorporated into these processes.

For example, an innovative partnership between the Innu Nation and the province of Newfoundland and Labrador resulted in an Ecosystem-based Forest Management Plan for a 68,000 km^2 area in central Labrador. This 5-year Plan includes an extensive network of no cut zones designed to protect ecological function at the landscape, watershed, and stand level throughout the Plan's duration. In total, the 2003 approved Plan includes interim protection for candidate protected areas totalling over 32,000 km^2, including critical habitat for the Redwine Caribou herd. The plan, which also called for a number of changes to forest harvesting practices in the area, was the result of a far-reaching public participation process with Innu communities.

British Columbia's Central and North Coast Land and Resource Management Plan – A Global Model for Conservation

British Columbia's Central and North Coast Land and Resource Management Plan is a largely intact 64,000 km^2 area of temperate rainforest on the coast of British Columbia. This area was the subject of protracted environmental campaigns throughout the 1990s and early 2000s. In February 2006, the province of British Columbia, along with First Nations, NGOs, and forest companies agreed to establish more than 100 new protected areas covering almost 18,000 km^2 along the coast. The land use decisions also established 21 biodiversity areas, covering approximately 3000 km^2. These areas contribute to the conservation of species, ecosystems and seral stage diversity by being located adjacent to protected areas and by limiting the land uses within the zones. Commercial timber harvesting and commercial hydro-electric power projects are prohibited within these areas. Other resource activities and land uses will continue, subject to existing regulations and legislation. Finally, the decision requires the joint development of an ecosystem-based management system for forestry operations across the balance of the planning area. Legislation to establish the protected areas, or conservancies, was completed in April 2008.

In 2007, the Federal and BC Governments provided $60 million to support this initiative, matching contributions made by private donors and foundations. The resulting Conservation Investments and Incentives Initiative (CIII) fund will facilitate implementation of the land use plan over time by supporting economic diversification and conservation projects in coastal communities.

Large-scale ecosystem-based planning is also underway within our oceans. Five Large Ocean Management Areas (LOMAs) have been established in order to facilitate an integrated management planning approach that includes both marine protected areas establishment and effective resource management decision-making. These areas typically span hundreds of square kilometres, and reflect boundaries determined on the basis of a number of ecological and administrative factors. LOMAs may also include coastal management areas to ensure that planning efforts include estuaries and coastal areas[1].

Within each LOMA, ecological components such as Ecologically and Biologically Significant Areas, Ecologically Significant Species, Species of Concern, and Ecologically Significant Community Properties are identified as needing particular management. These components are also used to inform the selection of candidate protected area sites and associated management decisions. Similar approaches are now being explored in coastal management areas and in offshore areas beyond the boundaries of LOMAs.

Canada is also active in IM planning in the Arctic, through its membership in the Working Group for the Protection of the Arctic Marine Environment (PAME), one of six working groups of the Arctic Council. Its mandate, to address policy and non-emergency pollution prevention and control measures, is essential to protecting the Arctic marine environment. Three of PAME's current deliverables are particularly important for Canada, namely: an Arctic Marine Shipping Assessment (if adopted); an update of the Regional Programme of Action to

[1] For more information, see http://www.dfo-mpo.gc.ca/oceans/marineareas-zonesmarines/loma-zego/index-eng.htm

address pollution in the Arctic; and the application of an Ecosystem Approach in the Arctic Ocean.

Biosphere Reserves

Biosphere reserves, which are designated by the United Nations Educational, Scientific and Cultural Organization (UNESCO), represent a unique tool for promoting integrated planning and management approaches. Biosphere reserves typically incorporate large areas that include core protected areas with strict legal protection, along with buffer areas, and adjacent lands with agricultural or industrial development. There are currently 15 biosphere reserves in Canada, including the Frontenac Arch Biosphere Reserve, which covers approximately 2700 km^2 of intersecting terrestrial and freshwater ecosystems in southeastern Ontario. The reserve works with a wide range of partners, including St Lawrence National Park, on a number of initiatives designed to maintain the ecological integrity of the area as a whole. In 2009 the Federal Government approved $5 million over the next five years to support Canada's Biosphere Reserves.

Moving Forward

Recognizing the role that conservation of large, interconnected areas can play in protecting ecosystems, several provinces have recently announced major expansions to existing integrated land use planning processes, driven by ambitious conservation visions for the future. In July 2008, the Government of Ontario announced its intention to protect more than 50% of the province's Far North region, spanning an area at least 225,000 km^2 in size. This vision will be achieved in part through land use planning driven by Aboriginal communities.

In November 2008, Quebec announced a new vision for northern development by envisioning protecting half of all Quebec lands located above the 49th parallel from development. It could represent a significant contribution to conservation both nationally and internationally.

These and other large-scale planning initiatives offer a powerful opportunity for all jurisdictions to significantly enhance the contribution that their protected areas networks make to the ecological integrity of our ecosystems as a whole.

7.0 Management of Protected Areas

Rather than marking the end goal of conservation efforts, protected areas establishment is only the first step in a longer-term process to ensure that these areas provide meaningful ecological protection, both within their boundaries and within the greater ecosystem as a whole.

Habitat fragmentation, incompatible adjacent land uses, the rise of invasive species, and in some cases, managing increasing visitor use, have all been identified as challenges to the integrity of these networks and their ability to meaningfully contribute to the ecological health of the ecosystems in which they are found. Effective management is therefore essential to the success of Canada's protected areas networks.

Management Planning

Management planning is a key tool for considering the ecological challenges facing individual protected areas and developing solutions for addressing them over time. Protected area management plans are typically shaped by information generated from site monitoring and reporting programs, and reflect both ecological issues facing the site, as well as actions managers will take to achieve that site's goals and objectives.

A number of Canadian agencies are incorporating the maintenance of ecological integrity as a key goal for their management planning efforts. Parks Canada has introduced EI monitoring and reporting programs for the entire national park system. In addition, in 2006, Ontario introduced a new *Provincial Parks and Conservation Reserves Act* that establishes the maintenance of ecological integrity as the first priority in the planning and management of Ontario's system of provincial parks and conservation reserves.

Canadians have a critical role to play in this process. A number of protected areas agencies are working with local communities to inform management decisions concerning their protected areas. For example, New Brunswick has appointed close to 200 provincial residents to Protected Natural Area Advisory Committees to assist in developing management plans for sites within its protected areas network.

Canadian governments also work closely with local and Aboriginal communities, conservation organizations, and individual Canadians in implementing active management solutions. The success of many on-the-ground efforts across the country rely on these organizations and individuals. For example, volunteers in Kejimkuik National Park and National Historic Site have logged almost 10,000 hours since 2005 to support recovery efforts for the endangered Blanding's turtle. In addition, DFO's Marine Protected Areas each have an advisory committee that recommends management decisions.

Active Management and Ecological Restoration

In response to these challenges, protected areas managers have become increasingly proactive in implementing management actions to maintain or recover the values that these areas are meant to protect.

For example, ecological restoration refers to the process of intervening in an ecosystem to re-establish its mix of species and processes, through such actions as the reintroduction of native species and natural processes such as fire, orthe removal of invasive or alien species. Ecological restoration can help re-establish key ecosystem values, while also creating new kinds of opportunities for meaningful public education and engagement by Canadians.

A number of jurisdictions are working to enhance their ecological restoration programs. For example, Nova Scotia has adopted an ecological restoration policy for its provincial parks, and is currently defining system-wide priorities for restoration.

As a first step towards a more comprehensive approach to ecological restoration across the country, the Canadian Parks Council established a multi-disciplinary working group to develop Principles and Guidelines for Ecological Restoration in Canada's Protected Natural Areas. The Principles and Guidelines were reviewed by Ministers responsible for the Parks Council in 2007 and published in 2008. They represent the first ever pan-Canadian guidance

for ecological restoration practices, and provide an approach that can be applied by all protected areas agencies across the country according to their needs[2].

The approach is centred on three over-arching principles – that ecological restoration is effective, efficient, and engaging. Efforts are now underway with the IUCN World Commission on Protected Areas to work with protected area agencies around the world to adapt these guidelines as an international best practice.

Sometimes restoring ecological integrity and ecosystem health requires the re-introduction of natural processes that have been lost. As a result, many agencies are working to re-introduce fire into protected areas across the country, given the role it plays in creating habitat, controlling invasive species, and encouraging nutrient recycling in the soil.

For example, BC Parks has implemented an ecosystem management program using prescribed burning to address multiple management objectives. These objectives include: reducing wildfire risks to park facilities and adjacent communities through the reduction of fuel accumulations; restoring fire maintained ecosystems such as grasslands through the removal of forest in-growth; and addressing the impacts of the provincial mountain pine beetle infestations by reducing fuels and restoring habitats where required. BC Parks has undertaken prescribed burning projects involving 5000 ha in over 30 protected areas in the last two years.

The Prairie Persists Project

Prairie grasslands are one of the most threatened ecosystems in the country. As a result of widespread habitat degradation, the loss of millions of free-roaming bison in the 19th century, and more recent fire suppression efforts, the ecological processes that drive renewal in this ecosystem have disappeared or been significantly degraded.

In order to recreate the ecological processes linked to natural fires and grazing by large herbivores, Parks Canada and partner agencies initiated the Prairie Persists project in Grasslands National Park in Saskatchewan. In May 2006, 71 plains bison were successfully released into the park. Combined with prescribed burns and efforts to reduce exotic and invasive species, these efforts are helping to restore the overall ecological integrity of this rare ecosystem, while bringing back one of the most enduring symbols of our nation's history.

An important element of this project's success has been its focus on partnerships and engagement with local First Nations and with youth. For example, the Prairie Learning Centre, established by Grasslands National Park and the Chinook School Division, provides students from across the province and country unique place-based learning experiences about this fragile ecosystem.

Monitoring and Reporting

Monitoring and reporting programs provide important mechanisms for both informing the development of management programs across the country, and assessing their success over time. Governments across the country are actively seeking to improve their information and

[2] The principles and guidelines can be found at http://www.pc.gc.ca/docs/pc/guide/resteco/index_e.asp.

knowledge about the ongoing health of their projected areas networks, as well as adjacent areas.

For example, Ontario Parks has developed a structured monitoring framework including criteria and indicators for monitoring the status and health of Ontario's system of provincial parks and conservation reserves. Based on these criteria and indicators, Ontario Parks has assembled and analyzed information on ecological, social and economic aspects of Ontario's provincial parks and conservation reserves. The information is used to support the sustainable planning and management of Ontario's protected areas, and to report to the public on the state of Ontario's protected areas.

State of Ontario's Protected Areas: Healthy by Nature is a series of four technical reports that are nearing completion. Collectively, these reports describe the state of Ontario's system of provincial parks and conservation reserves during the period January 2001 to January 2006. The four technical reports will be used as the basis for preparing a plain-language State of Ontario's Protected Areas summary report to be released in 2009.

Moving Forward

The rise of active management approaches in recent years reflects a growing understanding of the need to sometimes intervene in protected area ecosystems in order to maintain the natural values those areas were intended to protect. In addition to promoting ecological integrity within and surrounding protected areas, these approaches can also play a valuable role in engaging Canadians in on-the-ground actions that enhance their experience of and connection to our natural world.

8.0 Connecting with Canadians

Canada's parks and protected areas exist for many reasons – to protect biodiversity and ecosystem health, to safeguard unique places and spaces, and to promote greater understanding of our natural world. They also provide irreplaceable benefits to people and their communities, by providing opportunities for recreation, restoration, inspiration, and connection to each other and the world around us.

However, Canadian society is shifting, and our values are changing simultaneously. Despite our history as a nation of rural communities separated by distance, time and language, we are now a largely urban society highly concentrated along our southern border. Particularly in our major population centres, we are connected not by our history and shared experience, but through technology and the Internet.

Canada's population is also aging. Most of our population growth is due to immigration, primarily to large urban centres in the south. Youth culture is highly urban and often conducted virtually. In part as a result of these trends, visitation to protected areas is in decline in many jurisdictions across the country.

These shifts pose new opportunities and challenges. If Canadians do not feel a deep personal connection to their natural world, they won't understand its importance, take the opportunity to experience its beauty or care about its stewardship. This in turn will impoverish not only our natural world but our society. This is particularly true for our youth, who stand to become increasingly disconnected from our environment and the wonder it instils.

This raises critical questions for park and protected areas agencies. How do we remain relevant to a changing world, an increasingly urban and multicultural society, and a youth population more comfortable with digital networks than trail networks? How do we provide meaningful connections to the natural world for all Canadians, regardless of where they live?

What opportunities do these shifts present in terms of new partnerships and ways of learning and experiencing our protected areas?

Protected areas agencies in Canada are at an early stage of considering how best to respond to these changing circumstances. However, initial work is underway across the country to explore strategies for connecting with all Canadians, particularly youth and those in urban centres. These efforts will help build a new generation of stewards and supporters across the country for whom protected areas are both relevant and essential.

For example, protected areas agencies are working together to find new ways of reaching Canadian youth, particularly Aboriginal and new Canadians. Initial research has been conducted into ways to effectively reach youth and 'plug them in' to parks and protected areas. The Youth Engagement Working Group of the Canadian Parks Council has undertaken research into best practices and has established a youth advisory panel to help in the development of a national strategy and toolkit for youth engagement across the country.

Individual jurisdictions are also exploring ways to engage youth more effectively. For example, in partnership with Parks Canada, Metro Vancouver and Wild BC, BC Parks is developing a new curriculum guide (Get Outdoors!) to encourage educators and outdoor leaders to take children outside. The guide provides both outdoor activities and background information for educators. Get Outdoors! has been endorsed by the Ministry of Education and the Environmental Educators Professional Specialist Association (EEPSA). Environment Canada's Bioshpere in Montreal has also developed a Biokit to encourage families to explore and discover natural areas in their neighbourhood.

Alberta Parks Outreach and Public Engagement Program

Alberta Parks is exploring innovative ways to foster meaningful relationships between marginalized or disconnected groups and the province's protected areas, and to enhance the quality of life for these people through wilderness experiences and outdoor recreation. Using a highly collaborative approach rooted in partnerships with a wide range of organizations, a pilot outreach program in Kananaskis Country has introduced several initiatives, including:

- The *Alberta Access Challenge*, in which 10 people with disabilities and over 60 volunteers participated in adapted backcountry camping, sea kayaking, and cycling, and are now helping to develop an educational video series about the benefits of wilderness experiences;
- *Nature as a Second Language*, where over 700 new immigrants were introduced to parks through a digital guidebook in non-official languages, day trips, and presentations; and
- *Parks in the Boardroom*, a program being developed with various professionals to connect the corporate community with ecological, sustainability, and stewardship principles.

In addition, Parks Canada is developing an internal strategy for reaching out to urban Canadians, whose proximity and access to the national park system is limited. Initial directions being explored include emphasizing the role that protected areas can play as gathering places or resources for communities. Partnering with community organizations to host gatherings, festivals, and recreational activities helps root individual sites more deeply

within the fabric of their surrounding communities, and connects them to new audiences who might not otherwise be exposed to the national park system.

Parks Canada is also exploring new ways to facilitate lifelong learning about nature conservation among urban Canadians. Working in a sustained and collaborative fashion with a wide variety of new partners will help create an integrated web of complementary learning experiences for Canadians regardless of their point of entry, be it a protected area or historic site, a zoo or aquarium, or a museum.

A related priority for protected area agencies is finding and working with new types of partners who can help build awareness of and support for natural areas. For example, artists reach and inspire us in unique ways. Through pictures, movement, and the written word, they can touch our emotions and evoke a deep sense of connection to the wonders of the natural world. As such, the arts community can play a unique role in promoting protected areas and the values they represent. These types of partnerships can be particularly valuable in the urban context.

Feel the Earth Move

In 2006 Montreal's renowned Coleman Lemieux Dance Company traveled to Gros Morne National Park in western Newfoundland. In seven days, they created a modern dance piece honouring the park's unique people and geography. A local film-maker captured both the creative process and the interaction between the company and the local community in a film that has subsequently been broadcast across the country. The company was involved in a similar multi-media project in Saskatchewan's Grasslands National Park in 2004.

While initial work is underway to respond to the changing social context for parks and protected areas in Canada, additional efforts will be required in coming years. New approaches, skills, and partnerships will be essential to our success in this regard.

9.0 Adapting to Climate Change

Climate change represents a key emerging issue for parks and protected areas over the coming decades. While the impacts of climate change pose a number of challenges for managers, protected areas can also play a vital role in buffering the effects of climate change.

For example, they can increase ecological resilience, provide protection against the physical impacts of extreme weather events and other climate change impacts, and help species and communities adapt to changing conditions. As such, they serve as what the International Union for the Conservation of Nature (IUCN) has called 'natural infrastructure' to help ecosystems adapt to the impacts of climate change.

Projected Impacts

With its northern latitude, Canada is expected to see major impacts from climate change, particularly in the Arctic. Many indications of ecological change – including rising temperatures, thawing permafrost and shrinking ocean ice cover - are already being observed.

While current climate models are unable to reliably predict future ecological conditions within Canada's land and seas, there is general agreement that climate change will result in a series of changes in vegetation succession, water regimes, wildlife habitat, species

distribution, and permafrost. Overall, scientists anticipate a general shifting of ecosystem distribution and composition, generally in a northward direction.

Over time, it is anticipated that western Canada will experience a more severe fire regime, while the Arctic Ocean may be ice-free in summer. Anticipated impacts in the southernmost parts of the country include changes in water quantity and quality, as well as exacerbated air pollution and the introduction of insect-borne diseases such as Lyme disease.

Climate change is also putting the world's oceans at risk by increasing the temperature of seawater and altering atmospheric and oceanic circulation. Coastal erosion and sea level changes are also anticipated, with coastal zones especially susceptible to the potential impacts of climate change. Recently attention has focused on oceans acidification due to the uptake of increased amounts of carbon dioxide, which is causing widespread and severe damage to marine ecosystems. The ocean water becomes more acidic as the gas dissolves to create carbonic acid. This increased acidity can hamper the ability of a wide variety of marine organisms to form calcium carbonate shells and skeletonal structures.

These changes will also have an impact on visitation across the country. Preliminary studies of the implications of climate change on park-related tourism suggest changes in both the overall level and the seasonality of park visitation. Potential increases in costs associated with ensuring staff and visitor safety may also result.

Moving Forward

There has been a growing recognition among Canadian parks and protected areas agencies of the need to develop strategies to address both the potential challenges and opportunities posed by climate change.

This includes considering potential climate change impacts during the protected area establishment and boundary setting process, as well as accelerating efforts to enhance connectivity within and between protected areas networks regionally and nationally. It may also include enhanced public education and outreach programs that emphasize the important role protected areas can play in helping us adapt to a changing climate, which will in turn help underscore the relevance of protected areas to Canadian society.

Addressing these challenges will also require greater collaboration between governments, Aboriginal communities, and others to look beyond existing protected area boundaries towards larger more integrated networks and broader regional planning exercises both on land and at sea. Over time, these efforts will help foster connectivity, ecological resilience, and species migration.

In recent years, protected areas agencies across the country have begun to assess potential impacts of climate change and to consider potential adaptation strategies. Parks Canada first developed a climate change impact assessment for national parks in Canada in 2000. Ontario and New Brunswick have also undertaken comprehensive vulnerability assessments of their protected areas networks.

Parks Canada is improving its understanding of future climate change scenarios for the natural systems it protects and manages and is incorporating indicators of the impacts of climate change into its ecological integrity monitoring program.

Parks Canada and other protected areas agencies have also taken steps to reduce its greenhouse gas emissions. The PCA has already met its internal greenhouse gas reduction target to reduce emissions by 5.2% from 1998 levels by 2011. According to a 2008 survey, Parks Canada is the only protected area agency in the world to achieve or even set formal emission reduction targets.

However, much work remains. Researchers from the University of Waterloo and the Canadian Council of Ecological Areas recently completed a collaborative Protected Areas and Climate Change (PACC) Survey. They found that while protected areas managers strongly believe climate change is an important management issue, relatively little progress has been made to date in developing relevant climate change strategies or policies.

The vast majority of protected area agencies across the country have not yet completed comprehensive assessments of potential climate change impacts or implications for areas under their management, although many agencies have initiated studies and/or pilot projects to inform longer-term adaptation strategies. Respondents to the PACC Survey also underscored the fact that protected areas agencies do not currently have the capacity to meaningfully plan for or manage the potential impacts of climate change. Developing this capacity will be an essential building block for future efforts in this area.

10. Conclusions

Protected areas represent one of many conservation tools available to protect and maintain biodiversity in Canada. We are only just beginning to understand the true value these areas provide, not only in terms of their economic and social benefits, but also in terms of the ecosystem services they nurture and sustain.

Significant progress has been made in recent years, both in terms of the amount of land and aquatic systems contained in protected areas, but also with respect to the types of partnerships and more integrated approaches that are now being employed in their planning and management.

Protected areas agencies are in the process of transforming their relationships with Aboriginal peoples, through formal consultations and agreements, as well as through new efforts to integrate Aboriginal knowledge and practices into protected area planning and management decisions. At the same time, Aboriginal communities are increasingly embracing the potential that protected areas represent to protect not only ecological values, but also cultural values and practices. This is one of the most significant areas of progress in Canada in recent years.

In addition, integrated management planning is emerging as a crucial mechanism for both identifying where to establish protected areas, and ensuring that resource use in adjacent areas is compatible with overall conservation goals. These processes also provide an important mechanism for involving a broader spectrum of interests in planning and management decisions.

Moving forward, renewed focus will be required in Canada’s northern and boreal regions, where governments have a unique opportunity to protect intact functioning ecosystems. At the same time, innovative approaches will be required to use protected areas and other tools to maintain ecological integrity in the southernmost part of the country where these values are most threatened. Further efforts to properly understand and value the ecosystem services these areas represent will help contribute to these conservation efforts in years to come.

Given the later start of marine protected areas establishment efforts, development of a national network of marine protected areas is a key priority over the next five years. These will require both accelerated efforts at the federal level, as well as a greater focus on partnership efforts with provincial and territorial governments.

New challenges will face Canadian protected areas agencies in coming years. Flexible and proactive approaches will be required to address key challenges such as climate change and

invasive species throughout the protected areas network. In particular, protected areas agencies can contribute to the development and implementation of climate change adaptation strategies that recognize the critical role protected areas play in helping whole ecosystems and the species within them adapt to the impacts of climate change.

At the same time, ongoing efforts will be required to ensure that protected areas remain relevant and meaningful to Canadians, that they continue to provide us with opportunities to experience and enjoy nature, and that these personal connections lead to an ongoing ethic and commitment to stewardship of our natural resources. This is an essential ingredient to the long-term health of our protected areas and our natural world and ultimately to our own health and well-being.

Annex IV – Indicators (Refer to Chapter 1)

Annex V – References, Further Information and Links

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Chapter 2- 3 Links for Further Information

International

Arctic Council's Conservation of Arctic Flora and Fauna Working Group (CAFF)
http://www.arcticportal.org/en/caff

Convention on Biological Diversity
http://www.cbd.int/

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
http://www.cites.org/

Convention on Wetlands of International Importance for Waterfowl (Ramsar)
http://www.ramsar.org/

Local Governments for Sustainability (ICLEI)
www.iclei.org

International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR)
http://www.planttreaty.org/

North American Bird Conservation Initiative (NABCI)
http://www.nabci.net/

North American Waterfowl Management Plan (NAWMP)
http://www.nawmp.ca/

Trilateral Committee for the Wildlife and Ecosystem Conservation and Management
http://www.trilat.org/

Millennium Ecosystem Assessment
http://www.millenniumassessment.org

National

Biodiversity
Canadian Biodiversity Information Facility
http://www.cbif.gc.ca

Canadian Biodiversity Information Network
http://www.cbin.ec.gc.ca

Canadian Biodiversity Strategy
http://www.eman-rese.ca/eman/reports/publications/rt_biostrat/intro.html

Agriculture and Agri-Food Canada
http://www.agr.gc.ca

Canadian Association of Zoos and Aquariums
http://www.caza.ca

Canadian Boreal Initiative

www.borealcanada.ca

Canadian Botanical Conservation Network
www.rbg.ca/cbcn/en/index.html

Canadian Climate Impacts and Adaptation Research Network
http://www.c-ciarn.ca

Canadian Environmental Assessment Agency
http://www.ceaa-acee.gc.ca

Canadian Environmental Network
http://www.cen-rce.org

Canadian Food Inspection Agency
http://www.inspection.gc.ca

Natural Resources Canada's Canadian Forest Service
http://cfs.nrcan.gc.ca

Canadian Model Forest Network
http://www.modelforest.net

Canadian Nature Network
http://canadiannaturenetwork.org

Canadian Wildlife Federation
http://www.cwf-fcf.org

Canadian Wildlife Service
http://www.cws-scf.ec.gc.ca

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

Ducks Unlimited Canada
http://www.ducks.ca

Ecological Monitoring and Assessment Network
http://www.eman-rese.ca

Environment Canada
http://www.ec.gc.ca

Fisheries and Oceans Canada
http://www.dfo-mpo.gc.ca

Hinterland Who's Who
http://www.hww.ca

Indian and Northern Affairs Canada
http://www.ainc-inac.gc.ca

Invasive Species Canada
www.invasivespecies.gc.ca

Natural Resources Canada
http://www.nrcan-rncan.gc.ca

Nature Canada
http://www.naturecanada.ca

Nature Conservancy of Canada
http://www.natureconservancy.ca

National Round Table on the Environment and the Economy
http://www.nrtee-trnee.com

Parks Canada
http://www.pc.gc.ca

Species at Risk Public Registry
http://www.sararegistry.gc.ca

Stewardship Canada
http://www.stewardshipcanada.ca

Wildlife Conservation Society Canada
http://www.wcscanada.org

Wildlife Habitat Canada
http://www.whc.org

World Wildlife Fund Canada
http://www.wwf.ca

Provinces and territories

Alberta
http://alberta.ca

British Columbia
http://www.gov.bc.ca

Manitoba
www.gov.mb.ca

New Brunswick
http://www.gnb.ca

Newfoundland and Labrador
http://www.gov.nl.ca

Northwest Territories
http://www.gov.nt.ca

Nova Scotia
http://www.gov.ns.ca

Nunavut
http://www.gov.nu.ca

Ontario
www.ontario.ca/biodiversity

Prince Edward Island
http://www.gov.pe.ca

Québec
http://www.gouv.qc.ca

Saskatchewan
http://www.gov.sk.ca

Yukon
http://www.gov.yk.ca

Featured urban areas

Edmonton
www.edmonton.ca

City of Greater Sudbury
http://www.city.greatersudbury.on.ca

Montréal
http://ville.Montréal.qc.ca

Vancouver

http://vancouver.ca

Additional resources

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http://www.iclei.org/fileadmin/template/project_templates/LAB-bonn2008/user_upload/files/BonnCall_3June2008_English.pdf

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http://www.pch.gc.ca/pc-ch/org/sectr/cp-ch/aa/trd-eng.pdf

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http://www.cws-scf.ec.gc.ca/publications/habitat/cpa-apc/pdf/cover_e.pdf

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http://www.ducks.ca/aboutduc/news/archives/pdf/ncapital.pdf

Wild Species reports (General Status of Species in Canada)
http://www.wildspecies.ca

Chapter 2-3 Case Studies

The Canadian Healthy Oceans Network (2.1.1)
Ecosystem Status and Trends Report (2.1.1)
Taking Nature's Pulse (2.1.1)
Restoring Lake Winnipeg (2.1.2)
Alberta's Land-Use Framework and Land Stewardship Act (2.1.2)
Preservation of Canada's Boreal Forest (2.1.2)
Nunavut Parks and Cultural Landscape Resource Assessment (2.1.2)
British Columbia's Central Coast and North Coast Land and Resource Management Plans (2.1.2)
Nunavut Parks and Cultural Landscape Resource Assessment (2.1.2)
The Alberta Biodiversity Monitoring Institute (ABMI) (2.1.3)
Science Review - Woodland Caribou (2.2.1)
Re-introduction of the Black-footed Ferret (2.2.2)
Conservation Plans for Bird Conservation Regions (2.2.2)
Case Study: Atlantic Habitat Partner Initiative (2.2.2)
The Canadian Barcode of Life Network (2.3.1)
Conserving forest genetic resources (2.3.1)
Pollination in Canada (2.3.2)
Forest Certification in Canada (2.4.2)

Certification of a Northern Shrimp fishery (2.4.2)
The Fur Institute of Canada (2.4.2)
Environmental Farm Planning (2.4.2)
The City of Edmonton (3.2)
Saint-Michel Environmental Complex in Montreal (3.2)
Linguistic diversity and Aboriginal land claims (3.3)
Case Study: Inuit Impact and Benefit Agreement (3.3)
The Canadian Museum of Nature (3.4)
Clearwater fishery (3.6)
The Biodiversity Challenge at Xstrata's Canadian operations (3.6)
Ecosystem Goods and Services Valuation (3.7)